FM 3-01.44

Short-Range Air Defense Operations

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HEADQUARTERS, DEPARTMENT OF THE ARMY

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Short-Range Air Defense Operations

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Preface

Field manual 3-01.44 provides guidance for short-range air defense (SHORAD). The manual describes how SHORAD is planned, coordinated, integrated, synchronized, and executed. It is not intended to provide prescriptive solutions for air defense. The manual provides general guidance and allows commanders the versatility to employ SHORAD forces as they deem necessary. Emerging SHORAD systems will be included as they begin to be fielded in the future.

The target audience for this publication encompasses leaders at all levels from the corps commander to the air defense artillery (ADA) team chief. It will also aid the joint force commander in planning and executing air and missile defense (AMD) operations throughout the battlefield and can be beneficial for sensor employment, collection management, target development and force application.

Commanders, staffs, and subordinates must ensure their decisions and actions comply with applicable U.S., international, and, in some cases, host-nation laws and regulations. Commanders at all levels must ensure their Soldiers operate in accordance with the law of armed conflict and applicable rules of engagement (ROE). See FM 6-27.

FM 3-01.44 uses joint terms where applicable. Selected joint and Army terms and definitions appear in the glossary and the text. For definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition. This publication is not the proponent for any Army terms. Most ADA and AMD terms are spelled out throughout the manual, instead of using acronyms, to support readability and understanding by non-ADA personnel.

FM 3-01.44 applies to the Active Army, Army National Guard/Army National Guard of the United States, and United States Army Reserve unless otherwise stated.

The Commandant, United States Army Air Defense Artillery School is the proponent of FM 3-01.44. The United States Army Fires Center of Excellence and Fort Sill is the preparing agency. Send written comments and recommendations on a DA Form 2028 (*Recommended Changes to Publication and Blank Forms*) to Directorate of Training and Doctrine, 700 McNair Avenue, Suite 128 ATTN: ATSF-DD, Fort Sill, OK 73503; by email to usarmy.sill.fcoe.mbx.dotd-doctrine-inbox@army.mil; or submit an electronic DA Form 2028.

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Introduction

The current strategic environment–with revanchist Russia and revisionist China–is typified by continuous competition among great powers which challenges the security environment and operational deterrence. Subsequently, today's operational environment is such that the joint force may face air parity, or even localized air overmatch, and an overmatch of surface-to-surface fires during large-scale combat operations. These realities make joint and Army forces vulnerable to air attacks by fixed and rotary-wing aircraft, unmanned aircraft systems (UAS), cruise missiles, and rocket, artillery, and mortar (RAM) munitions.

SHORAD systems are required to mitigate or defeat low-altitude surveillance and attacks by these aerial threats. SHORAD consists of dedicated ADA and non-dedicated air defense capabilities to defend critical fixed and semi-fixed assets and maneuvering forces. Dedicated refers to ADA systems operated and manned by 14-series Soldiers whose primary mission is to defeat air and missile threats. Non-dedicated refers to contributions that Army forces, other than ADA, provide in the execution of AMD operations, primarily to defend themselves when dedicated systems are not available.

FM 3-01.44 provides supported commanders and SHORAD commanders and leaders with basic-level SHORAD planning and employment doctrine to defeat aerial threats in any environment where SHORAD systems are deployed. Adherence to the SHORAD planning, preparation, and execution methods outlined in this publication will help to ensure the AMD scheme of employment effectively enables maneuver force freedom of action and requisite defense of other critical assets, such as airfields, power plants, and major headquarters.

FM 3-01.44 contains six chapters and supporting appendices.

- Chapter 1 provides an overview of Army AMD. It identifies the role of ADA and describes the AMD principles and employment tenets. It then addresses command and control (C2) of ADA forces.
- Chapter 2 introduces the SHORAD role, organizations, and C2, and discusses SHORAD support of large-scale combat operations in Army operations. It concludes with a brief discussion of SHORAD planning, preparations, and execution—preludes to further in-depth discussions in chapters 4, 5, and 6.
- Chapter 3 summarizes the air threats to be countered by SHORAD. It addresses the generic capabilities of UASs, manned rotary- and fixed-wing aircraft, RAM, and cruise and tactical air-to-surface missiles. It also briefly discusses the electromagnetic and cyberspace threats. The chapter concludes with a presentation on air threat employment.
- Chapter 4 addresses the SHORAD operations planning processes. It begins with an overview of AMD planning and continues with descriptions of command and support relationships. The chapter emphasizes planning at the SHORAD battalion level, describing actions in each step of the military decision-making process, and at the SHORAD battery, using troop leading procedures.
- Chapter 5 discusses the SHORAD preparatory actions for an operation, considered primarily from the SHORAD battery and platoon perspectives. It highlights the continuous need for coordination with supported maneuver units or fixed and semi-fixed assets. It continues with discussions of reconnaissance and defense design, and concludes with brief presentations on rehearsals (further discussed in appendix D), training, and ADA orders (see appendix B).
- Chapter 6 presents the roles and contributions of the SHORAD battery and platoon in executing offensive, defensive, and stability operations. The defensive operations section includes a discussion of the National Capital Region as part of homeland defense.
- Appendix A presents descriptions of the current SHORAD weapon systems, sensors, and supporting C2 capabilities.

- Appendix B addresses orders that SHORAD leaders use in planning, preparing, and executing operations. Formats and examples are provided for each.
- Appendix C discusses the steps in developing an air intelligence preparation of the battlefield (IPB), focusing on its application to SHORAD forces.
- Appendix D provides guidelines to support SHORAD leaders in planning for, preparing, and conducting rehearsals.

Chapter 1
Air and Missile Defense

This chapter provides an overview of air and missile defense (AMD). It discusses AMD within the context of the joint counterair framework, the AMD foundational principles and employment tenets, and AMD positive and procedural methods of airspace control. The chapter also addresses the role and capabilities of the Army's dedicated AMD force, air defense artillery (ADA), and C2 considerations for ADA forces. For more information on AMD, see JP 3-01 and FM 3-01.

AIR AND MISSILE DEFENSE OVERVIEW

1-1. *Air and missile defense* is the direct [active and passive] defensive actions taken to destroy, nullify, or reduce the effectiveness of hostile air and ballistic missile threats against friendly forces and assets (JP 3-01). AMD is embedded in, and will be used consistently throughout this document to refer to, the defensive counterair portion of the joint counterair operational framework. Though not specifically addressed in the AMD definition, AMD implies an interdependency of capabilities across the services and, often, with multinational forces. AMD is complemented by attack operations and C2 control capabilities. Attack operations destroy or neutralize enemy aircraft, missile launch platforms, and supporting infrastructure before and after launch. C2 capabilities enable and link the planning and execution activities of the offensive and defensive systems.

1-2. AMD, as noted in the definition above, consists of two operational elements: active AMD and passive AMD. Active AMD are direct defensive actions taken to destroy, nullify, or reduce the effectiveness of air and missile threats against friendly forces and assets. Passive AMD are all measures, other than active AMD, taken to minimize the effectiveness of hostile air and ballistic missile threats against friendly forces and critical assets. These measures include detection, warning, camouflage, concealment, deception, dispersion, hardening, and the use of protective construction (JP 3-01). Passive actions are the commander's first line of defense.

1-3. The Army's dedicated AMD force is ADA. *Air defense artillery* is weapons and equipment for actively combating air targets from the ground (JP 3-01); more precisely, ADA is the dedicated Army systems, personnel, and forces that provide active, land-based defense against air and missile attacks. ADA forces execute AMD operations. ADA consists of high-to-medium altitude air defense and short-range air defense (SHORAD) systems and forces. Current high-to-medium altitude air defense systems in a theater of operations are Patriot and Terminal High Altitude Area Defense. Current SHORAD systems are the Maneuver Short-Range Air Defense (M-SHORAD), Avenger, Land-based Phalanx Weapon System, and Sentinel radar. Figure 1-1 on page 1-2, presents the positioning of high-to-medium altitude air defense and SHORAD system forces across the areas of operation. While Patriot and Terminal High Altitude Area Defense are generally considered to be operational-level systems and M-SHORAD, Avenger, Land-based Phalanx Weapon System, and Sentinel tactical level, these designations are scenario and situational dependent.

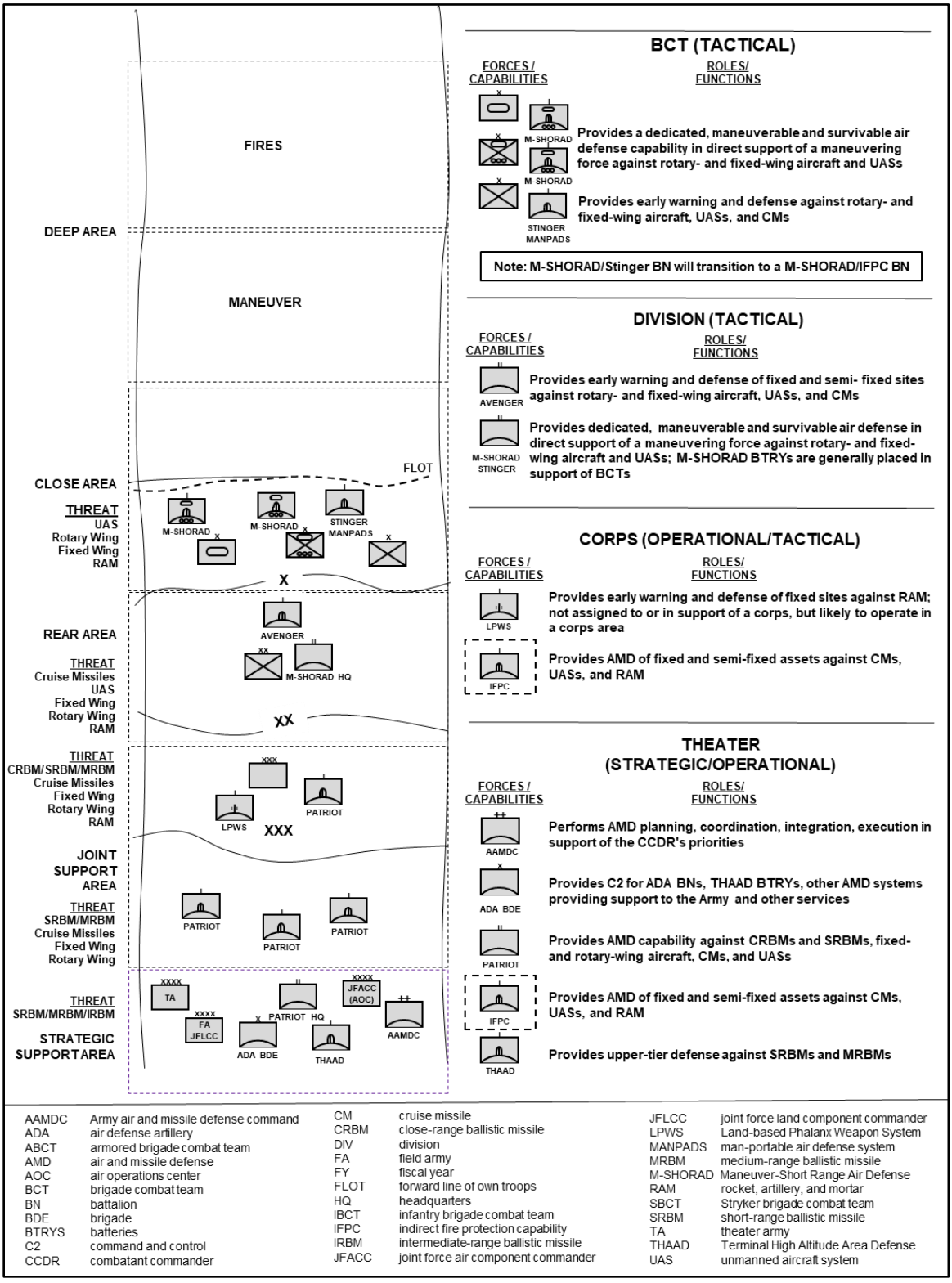

Figure 1-1. HIMAD and SHORAD force positioning across the areas of operation

Note: Dashes around indirect fire protection capability units indicate that the indirect fire protection capability systems have not been fielded. Fielding is projected to begin in the near term.

1-4. The role of ADA is to deter and defeat the range of aerial threats to assure allies, ensure operational access, and defend critical assets and deployed forces in support of Army operations. AMD operations span the range of military operations. AMD capabilities in executing AMD operations are—

- Defeat the full range of enemy air and missile threats encountered in current and future geo-strategic, operational, and tactical fights. The threat spectrum encompasses ballistic missiles, cruise missiles, hypersonic missiles, UASs, RAM, tactical air-to-surface missiles, and fixed- and rotary-wing aircraft.
- Integrate with Army, joint, interorganizational, and multinational elements. ADA forces establish and maintain linkages to other service and multinational forces conducting AMD operations. This includes the ability to integrate across multiple weapon systems, sensors, effectors, and C2 nodes at echelon.
- Provide early warning. ADA forces provide early warning by employing sensors to detect air and missile attacks and disseminating attack warnings to at-risk forces and, where appropriate, at-risk civilian populations.
- Enhance situational awareness. ADA sensors provide extended range surveillance of the airspace and detect, acquire, track, classify, discriminate, and identify aerial objects from near-ground level to high altitudes, in difficult terrain and in adverse weather conditions.
- Contribute to airspace control. Army airspace control functions involve identifying, coordinating, integrating, deconflicting, and regulating the Army need for and use of joint airspace. Army airspace control ensures that airspace users are synchronized in time, space, and purpose interdependently with joint and multinational forces.

AIR AND MISSILE DEFENSE PRINCIPLES

1-5. Armed with a thorough understanding of the operational environment that is further focused through the lens of current mission, enemy, terrain and weather, troops and support available, time available, and civil considerations (METT-TC) conditions, commanders apply AMD principles when planning active AMD operations. The AMD principles are mass, mix, mobility, integration, flexibility, and agility. Mass, mix, mobility, and integration are traditional principles that have stood the test of time. Flexibility and agility are inherent considerations for how ADA forces organize and operate on future battlefields (FM 3-01).

- Mass is the concentration of combat power sufficient to achieve the commander's intent. Mass, when applied to AMD, is achieved by allocating enough AMD firepower to successfully defend the force or the asset against aerial attack or surveillance. To mass AMD combat power in one area, commanders may have to accept risks in other areas of the battlefield.
- Mix is the employment of a combination of weapons and sensors to protect the force and assets from the threat. Mix offsets the limitations of one system with the capabilities of another and complicates the situation for the attacker. Proper mix causes the enemy to adjust tactics. Enemy tactics designed to defeat one system may make the enemy vulnerable to another system. For instance, an enemy aircraft flying low to avoid Patriot may be vulnerable to engagement by an Avenger system.
- *Mobility* is a quality or capability of military forces, which permits them to move from place to place while retaining the ability to fulfill their primary mission (JP 3-36). M-SHORAD is capable of matching the cross-country mobility of maneuvering forces. Avenger systems can move with and maintain defense of the maneuver force's semi-fixed assets. Mobility of SHORAD increases their survivability as well as that of their supported assets.
- *Integration* is the arrangement of military forces and their actions to create a force that operates by engaging as a whole (JP 1). Integration constitutes the combination of ADA and joint counterair forces, systems, functions, processes, and information acquisition and distribution required to efficiently and effectively perform the mission. Integration combines separate systems,

capabilities, or functions in such a way that they can operate singly or in concert without adversely affecting individual elements.

- *Flexibility* is the employment of a versatile mix of capabilities, formations, and equipment for conducting operations (ADP 3-0). Flexibility enables adaptive forces, facilitates collaborative planning and decentralized execution, and fosters individual initiative. The AMD principle of mix discusses the combination of ADA systems as task force tailored formations. The principle of flexibility is applied in AMD terms primarily by building METT-TC informed task organizations.
- "Agility is the ability of friendly forces to react faster than the enemy" (ADP 3-90). For AMD, at the platoon level, it is the ability to leverage digital capabilities (e.g., air picture) to maneuver to defeat an air and missile threat. At the battalion level, it is the use of continuous air IPB and digital systems to employ forces to defeat the threat by operating inside the enemy's decision space.

AIR AND MISSILE DEFENSE EMPLOYMENT TENETS

1-6. While commanders should always start AMD employment planning by applying the principles described above, they should also strive to adhere to employment tenets when planning and positioning their ADA resources. The tenets are desirable attributes that should be built into all plans and operations and are directly related to how assets should be employed. There are seven tenets (figure 1-2 on page 1-5).

- Mutual Support. Weapons are positioned so that the fires of one weapon can engage targets within the dead zone of the adjacent weapon. For guns, this dead zone is usually small. For missiles, the dead zone may be large, and mutual support is a critical element. Mutual support can also cover nonoperational weapons or weapons at lower states of readiness. Mutual support, when applied to sensors has the same connotation; that is, sensors are deployed to cover the dead zone of adjacent sensors.
- Overlapping Fires and Overlapping Coverage. Weapons are positioned so that their engagement envelopes overlap. Because of the many altitudes, directions, and ranges from which the enemy can attack or conduct surveillance operations, defense planners must apply mutual supporting and overlapping fires vertically and horizontally. Overlapping coverage is the positioning of sensors such that their coverage does not leave any seam in the defense that might be used by incoming threats. Overlapping fires and overlapping coverage should be planned during defense design.
- Balanced Fires. Weapons are positioned to deliver an equal volume of fires in all directions. This is necessary for AMD in an area where the terrain does not canalize the threat or when the avenues of approach are unpredictable. Balanced fires is a desired characteristic of defense design against cruise missiles and other air threats.
- Weighted Coverage. Weapons coverage is combined and concentrated toward the most likely threat air avenues of approach or directions of attack. Based on the tactical situation, a commander may risk leaving one direction of attack unprotected or lightly protected to weight coverage toward another direction. Weighted coverage and balanced fires are not mutually achievable, requiring the defense designer to give up most aspects of one to achieve the other.
- Early Engagement. Early engagement generally requires extending the defense away from the defended asset. Sensors and weapons are positioned so they can engage the threat before ordnance release or detection of friendly forces. Early engagements enable destruction of enemy platforms over enemy forces and unoccupied areas, thereby reducing the possibility of friendly collateral damage and fratricide. As with weighted coverage, early engagement is achieved at the expense of balanced fires.
- Defense in Depth. Sensors and weapons are positioned so that the threat is exposed to a continuously increasing volume of fire as it approaches the friendly protected asset or force. Defense in depth decreases the probability that attacking missiles, aircraft, or RAM will reach the defended asset or force.
- Resilience. *Resilience* is the quality of the defense to maintain continuity of operations regardless of changes in or unanticipated tactics by enemy air or losses of critical air and missile defense components (FM 3-01). ADA planners must plan for defense design adjustment based on ADA system attrition. Resilience is a key determinant when considering which tenet (or tenets) to use in maintaining the defense.

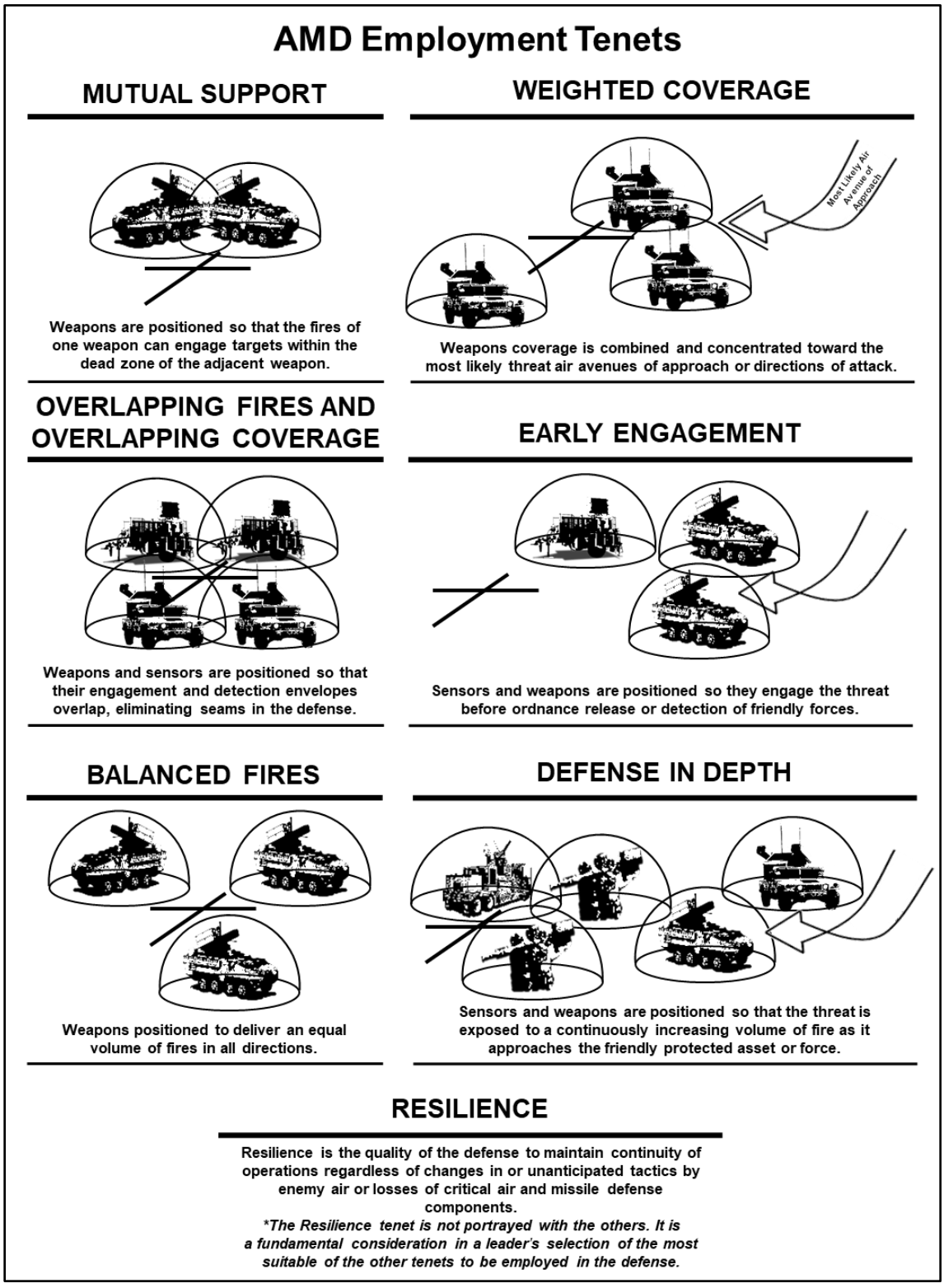

Figure 1-2. AMD employment tenets

COMMAND AND CONTROL OF AIR AND MISSILE DEFENSE FORCES

1-7. *Command and control* is the exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission (JP 1). Command of AMD forces and the control of AMD fires are derived from separate authorities. Army commanders exercise command. However, because AMD fires occur in the airspace, they are controlled by the area air defense commander. The area air defense commander is the component commander with the preponderance of air defense capability and the required command, control, and communications capabilities who is assigned by the joint force commander to plan and execute integrated air defense operations (JP 3-01). This complex C2 environment results in the following set of conditions, which characterize nearly all AMD operations:

- AMD operations are inherently joint and interdependent.
- Army AMD operations require an integrated and networked C2 system.
- Command of ADA forces is exercised by Army commanders.
- Control of Army AMD fires is exercised in accordance with JFC directives and by delegated authorities.

1-8. AMD operations are inherently joint and interdependent. The joint force commander depends on the Army to execute AMD of critical assets from the land within the context of a larger joint counterair mission, which includes offensive and defensive operations. As the primary land-based AMD force to the larger joint defensive counterair effort, ADA forces depend on other service capabilities to provide space-, air-, and land-based intelligence, surveillance, and reconnaissance to detect, track, provide early warning of air and missile threats, and cue ADA weapon systems to effectively counter these threats. The combination of Army AMD capabilities brought to the joint counterair effort, coupled with the support required of other services, make AMD operations inherently joint and interdependent.

1-9. Army AMD operations require an integrated and networked C2 system. ADA forces' dependence on other service capabilities, as well as on each other, requires that all contributing systems (or sensor and shooter components) be networked and integrated to the greatest extent possible to facilitate a shared understanding of the operational environment for the air domain. Current capabilities are somewhat limited in the extent to which they are able to network and integrate due to their unique system interfaces. These capabilities rely on joint tactical data links to share track data and coordinate engagements. To overcome the system-centric limitations to integration, the Army is developing a comprehensive and common networked C2 capability package that will leverage all relevant external data links for full joint integration.

1-10. Command of ADA forces is exercised by Army commanders. Although AMD operations are inherently joint and interdependent, the command of ADA forces is always retained by Army commanders and cannot be delegated. Command of ADA forces includes the authority and responsibility for effectively using available resources and for planning the employment of, organizing, directing, coordinating, and controlling forces for the accomplishment of assigned missions.

1-11. Control of Army AMD fires is exercised in accordance with JFC directives and by delegated authorities. Control of AMD engagements is executed through various personnel and agencies that collectively constitute the engagement authorities in the kill chain. An *engagement authority* is an authority vested with a joint force commander that may be delegated to a subordinate commander, that permits an engagement decision (JP 3-01). The joint force commander appoints an area air defense commander and delegates the responsibility for planning and coordinating air operations, as well as authorizing engagements, to this commander. The area air defense commander may further delegate these responsibilities to a regional or sector air defense commander. The area air defense commander normally has operational control of their service's component forces and tactical control or direct support of the other forces made available for tasking. Tactical control and the near-real-time exercise of the kill chain are generally applied to high-to-medium altitude air defense units, but not to SHORAD units. For more information on controlling authorities, see FM 3-01.

POSITIVE AND PROCEDURAL METHODS OF AIRSPACE CONTROL

1-12. Positive and procedural methods of airspace control facilitate the use of airspace to enable AMD fires. *Positive control* is a method of airspace control that relies on positive identification, tracking, and detection of aircraft within an airspace, conducted with electronic means, by an agency having the authority and responsibility therein (JP 3-52). *Procedural control* is a method of airspace control which relies on a combination of previously agreed and promulgated orders and procedures (JP 3-52). Examples of these orders and procedures include air defense warning conditions, rules of engagements (ROE), published identification criteria, and weapons control status.

ALERT STATES

1-13. An *alert state* is a condition that prescribes the amount of resources required to achieve ready to fire and desired radar emissions, and which specifies manning requirements and equipment configurations (FM 3-01). Alert states are METT-TC dependent and are determined by the senior ADA commander in coordination with the area air defense commander and regional or sector air defense commander.

AIR DEFENSE WARNING CONDITION

1-14. An *air defense warning* condition is an air defense warning given in the form of a color code corresponding to the degree of air raid probability with yellow standing for when an attack by hostile aircraft or missiles is probable; red for when an attack by hostile aircraft or missiles is imminent or is in progress; and white for when an attack by hostile aircraft or missiles is improbable (JP 3-01).

1-15. AMD procedural controls are used to posture units based on the assessed threat. The area air defense commander establishes the baseline air defense warning condition for the joint force during the planning stage. A condition may be different for an air threat and a missile threat. Subordinate AMD commanders may issue higher, but not lower, conditions for their region or sector.

1-16. Local air defense warnings—DYNAMITE, LOOKOUT, and SNOWMAN—are also used to alert forces to potential attacks at the local level. They should be incorporated into local tactical standard operating procedures, explaining what response the supported force desires when a local air defense warning condition is broadcast.

- DYNAMITE: Aircraft or missiles are inbound or attacking now. Response is immediate. As a general rule, a DYNAMITE status should be assumed when an air threat is within 15 kilometers of the division or brigade combat team's (BCT) area of operations (AO).
- LOOKOUT: Aircraft or missiles are in the area of interest but are not yet threatening, or if inbound, there is time to react. As a general rule, a LOOKOUT status should be assumed when an air threat is within 30 kilometers of the division or BCT AO.
- SNOWMAN: No aircraft or missiles pose a threat at this time. Aircraft and missiles are monitored but not broadcast over the early warning net.

RULES OF ENGAGEMENT

1-17. *Rules of engagement* are directives issued by competent military authority that delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered (JP 3-84). The joint force commander approves the theater rules. These established rules enable the area air defense commander to retain control of the air battle by prescribing the exact conditions under which engagements may take place. ROE apply to all warfare participants in the theater and are disseminated to all echelons. There are six AMD ROE categories: right of self-defense, identification criteria, fire control orders, weapons control status, levels of control, and modes of control.

- Right of self-defense. Commanders at all echelons must take whatever action is necessary to protect their forces and equipment against air or missile attack. When under attack, the right of self-defense is inherent to all ROE and weapons control procedures (JP 3-01).

- Identification criteria. The employment of ADA weapon systems requires early identification of friendly, neutral, or hostile aircraft and missiles to maximize extended-range engagements and avoid fratricide. The problem of distinguishing friendly, neutral, and hostile aerial objects, while employing various weapon systems against the enemy, is a highly complex task; the same type of aircraft may be flown by friendly and enemy countries. The area air defense commander and the airspace control authority establish measures and procedures within the airspace control system to positively identify all airborne assets and permit the execution of AMD operations. These measures and procedures reduce delays in operations and prevent fratricide. Positive identification of tracks is normally the preferred method of operation. *Positive identification* is an identification derived from observation and analysis of target characteristics including visual recognition, electronic support systems, non-cooperative target recognition techniques, identification friend or foe systems, or other physics-based identification techniques (JP 3-01). Procedural identification separates airspace users by geography, altitude, heading, time, and/or maneuver. Generally, some combination of positive and procedural identification is used.
- Fire control orders. Fire control orders are commands that are used to exercise control over engagements on a case-by-case basis and can be transmitted electronically or verbally. They are given to direct or inhibit firing by surface-to-air weapons units based on the ROE and rapidly changing tactical situation (JP 3-01). There are three primary orders: engage, hold fire, and cease engagement or cease fire. *Engage* in air and missile defense, a fire control order used to direct or authorize units and/or weapon systems to attack a designated target (JP 3-01). Hold fire is an emergency fire control order used to stop firing. If technically possible, missiles already in flight must be prevented from intercepting (JP 3-01). Hold fire is primarily used to effect friendly protection or avoid intercepts on neutral tracks. Cease engagement or cease fire directs units to stop the firing sequence against a designated target; however, units may continue to track, and missiles already in flight are permitted to continue to intercept (JP 3-01). Cease fire is normally issued to preclude engagement of the same track by two or more weapon systems.
- Weapons control status. A *weapons control status* is an air and missile defense control measure declared for a particular area and time by an area air defense commander, or delegated subordinate commander, based on the rules of engagement that establish conditions under which fighters and surface air defense weapons are permitted to engage threats (JP 3-01). Weapon control statuses (weapons hold, weapons tight, and weapons free) prescribe the relative control of AMD fires. Weapons hold is the most restrictive status; units may fire only in self-defense or when ordered by a proper higher authority. Weapons tight is the normal status; units may only fire on targets identified as hostile in accordance with current ROE. Weapons free is the least restrictive status; it is used to indicate when any target not positively identified as friendly, in accordance with the current ROE [and law of armed conflict], may be engaged (JP 3-01).
- Levels of control. Levels of control describe the AMD commander/echelon permitted to authorize engagement of an air or missile threat (JP 3-01). Engagement authorization is normally vested with the area air defense commander at theater level and can be delegated to as low as an ADA team leader when the mission and threat environment demands such. Different levels of control may be established for ballistic missiles, cruise missiles, UASs, fixed-wing aircraft, and rotary-wing aircraft.

MODES OF CONTROL

1-18. There are three modes of control: centralized, decentralized, and autonomous. In the centralized mode, a higher echelon must authorize target engagements by the firing units (positive control). In decentralized, a higher echelon monitors unit actions, making direct target assignments on a management-by-exception basis. The authority to which decentralization is authorized makes decisions based upon ROE (procedural control). Autonomous operations are initiated when a firing unit has lost all communications (voice, data link, and tactical chat) to higher headquarters. The fire unit makes decisions based upon the latest published ROE (procedural control). The mode of control selected will depend upon the capabilities of the C2 system and weapons employed and both the friendly and enemy air situations.

STATES OF READINESS

1-19. States of readiness are alert postures for crews and systems that are tailored to the level of threat and warning. They are expressed as numbers, ranging from the highest state (state 1) to the lowest state (state 5). State 1, for instance, would be in effect when crews were engaging or would expect to imminently engage aerial threats; state 5 would be in effect for crews that were performing maintenance on their equipment, redeploying, or on crew rest. States 2 through 4 identify varying times to prepare for engagements; they are generally expressed in minutes. The time factors for these states often vary by system and will be expressed in a unit's standard operating procedures (SOP).

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Chapter 2

Short-Range Air Defense Fundamentals

This chapter discusses the role of SHORAD and its capabilities, how SHORAD battalions and batteries are organized, and how they fit within divisional and brigade operational constructs in support of Army operations. Finally, this chapter provides commanders an overview and general guidance on how SHORAD organizations and capabilities integrate into combined arms operations, allowing flexibility to employ forces as they deem necessary.

OVERVIEW

2-1. *Short-range air defense* is defined as capabilities that provide air defense against low-altitude air threats. (FM 3-01). The expanded definition of SHORAD is those dedicated ADA and non-dedicated air defense capabilities which enable movement and maneuver by destroying, neutralizing, or deterring low altitude air threats to defend critical fixed and semi-fixed assets and maneuvering forces.

2-2. SHORAD is comprised of dedicated and non-dedicated air defense capabilities. Dedicated air defense capabilities are provided by ADA branch formations manned by school-trained ADA Soldiers. Dedicated emphasizes the ADA organizations' primary mission: provide active air defense effects. Non-dedicated refers to contributions that Army forces, other than ADA, provide in the execution of AMD operations; the primary consideration is to defend themselves when dedicated systems are not available. Non-dedicated air defense is commonly referred to as combined arms for air defense (known as CAFAD). For more information on combined arms for air defense, see ATP 3-01.8.

2-3. Current dedicated SHORAD systems are the M-SHORAD, Avenger, Land-based Phalanx Weapon System, Sentinel, and Forward Area Air Defense Command and Control. The enduring indirect fire protection capability is in development and initial capabilities will be fielded in the near term. It will replace Avenger and the Land-based Phalanx Weapon System. Indirect fire protection capability will defend theater- and corps-level fixed sites and division semi-fixed sites against cruise and tactical air-to-surface missiles, UASs, and RAM. Threat details are provided in chapter 3.

Note: Land-based Phalanx Weapon System is used in lieu of counter-rocket, artillery and mortar (known as C-RAM) system throughout this document. It is one of the two current weapon systems in the Indirect Fire Protection Capability-Avenger battalion.

ROLE OF SHORT-RANGE AIR DEFENSE

2-4. The role of SHORAD is to defeat low-altitude air threats and provide directed early warning to supported maneuver forces and other designated critical assets in support of Army and joint operations. The low-altitude air threats consist of UASs, rotary-wing aircraft, fixed-wing aircraft, cruise missiles, and RAM. Threat details are provided in chapter 3.

2-5. SHORAD forces operate primarily at the tactical and operational levels. Tactical-level air defense operations support the overall objectives of the divisions, BCTs, and maneuver task forces. At this level, SHORAD forces include M-SHORAD, Avenger, and eventually indirect fire protection capability systems. SHORAD forces protect the maneuver forces and critical fixed and semi-fixed assets from air threats, thus reducing casualties and allowing the combat forces the freedom to maneuver and to conduct aggressive, sustained operations. They also provide early warning by employing sensors to detect air, missile, and RAM

attacks and disseminating attack warnings. At the operational level, SHORAD functions as a part of an ADA task force. The task force may include a mix of M-SHORAD, Avenger, Land-based Phalanx Weapon System, and Stinger systems, integrated with Patriot or Terminal High Altitude Area Defense forces, which may be used to provide early warning and defend fixed sites. SHORAD forces may also establish and maintain tactical data linkages to other service and multinational forces, where available and appropriate, to enhance defenses.

SHORT-RANGE AIR DEFENSE BATTALION ORGANIZATIONS

2-6. SHORAD battalions are organized with different weapon and sensor systems based on their primary intended missions. M-SHORAD battalions are assigned or organic to divisions. Avenger battalions are deployed at theater, corps, and division levels. Indirect fire protection capability-Avenger battalions are normally assigned at the theater or corps level. SHORAD battalion headquarters provide C2, administrative, and logistical support for SHORAD battalions and batteries regardless of type. Logistical support must be focused to ensure sufficient resupply of SHORAD mission essential equipment and all classes of supplies throughout the battlefield.

2-7. An M-SHORAD battalion (figure 2-1) is currently composed of one headquarters and headquarters battery, three M-SHORAD batteries, a man-portable air defense system battery, and one maintenance company. It is fielded to the active Army divisions; however, in the future, it will also be fielded to Army National Guard divisions. M-SHORAD battalions provide a maneuverable and survivable air defense capability in direct support of BCTs and their subordinate maneuver battalions (when so missioned) against rotary wing- and fixed-wing aircraft and UASs. A battalion's major items of equipment are the M-SHORAD systems, Sentinel radars, and Forward Area Air Defense C2. The M-SHORAD system is mounted on a Stryker vehicle and contains multiple weapon sub-systems, on-board radars, and a Forward Area Air Defense C2 link.

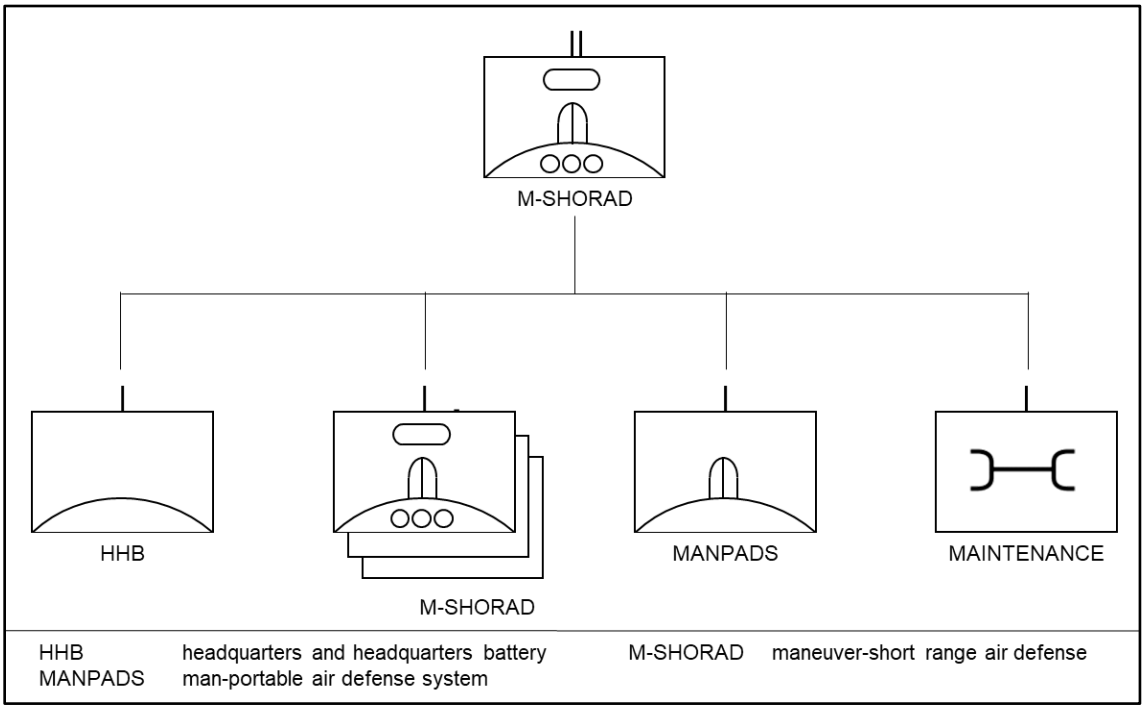

Figure 2-1. Maneuver Short-Range Air Defense battalion

2-8. Avenger battalions (figure 2-2 on page 2-3) include a headquarters and headquarters battery, three Avenger firing batteries with two firing platoons each, and a maintenance detachment. Avenger pure battalions exist in both the Active Army and Army National Guard. Avenger battalions provide dedicated SHORAD defense from air threats. Avenger battalions include Avenger weapon system, Sentinel radars, and

Forward Area Air Defense C2. The Avenger is a Stinger missile-based, vehicle mounted air defense system carrying up to eight Stinger missiles in a ready-to-fire configuration. The Avenger system can be slewed on radar cue to the direction of an approaching air threat. The Stinger missile can also be removed from the Avenger and fired in a man-portable configuration if desired or necessary. The Sentinel, AN/MPQ-64, provides persistent air surveillance and fire control quality data.

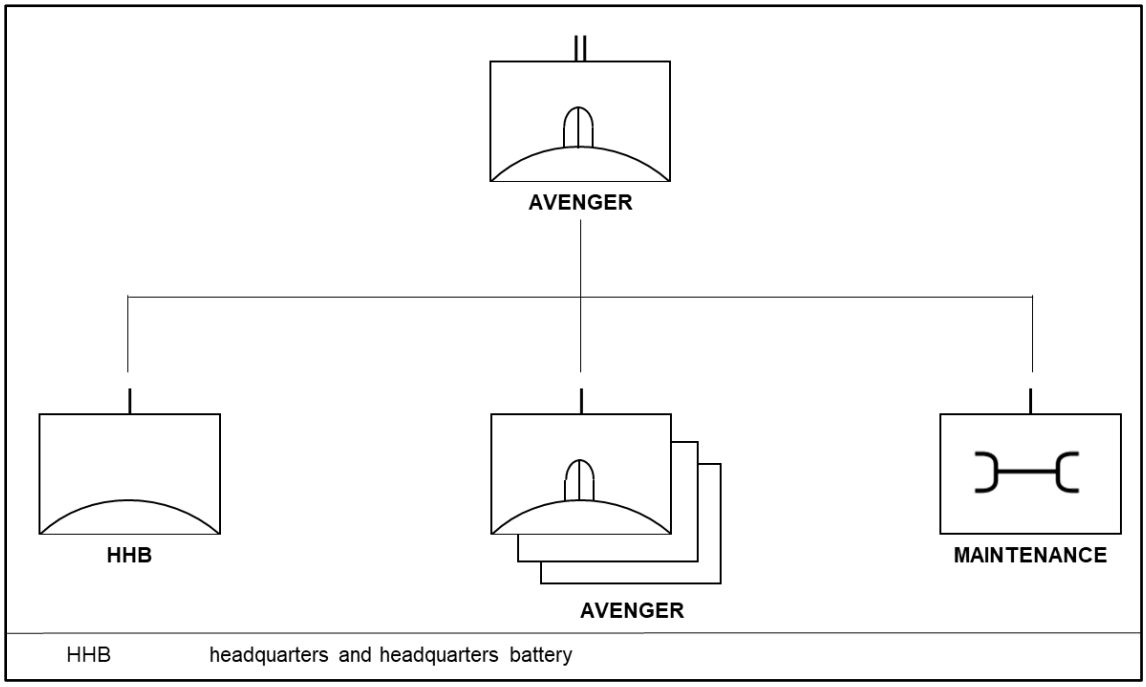

Figure 2-2. Avenger battalion

2-9. Avenger batteries are in pure Avenger battalions fielded in the Army National Guard, Composite Patriot-Avenger battalions, and indirect fire protection capability Avenger battalions. The battery consists of a headquarters section, two platoons with six Avengers each, four to eight Sentinel radars (depending upon the type battalion), and Forward Area Air Defense C2 systems. Avenger batteries normally defend critical assets at theater, corps, division, and BCT levels. Batteries generally deploy with their parent battalion or as separate batteries and are employed as batteries or platoons.

2-10. The indirect fire protection capability-Avenger battalion (figure 2-3 on page 2-4) consists of a headquarters and headquarters battery, two indirect fire protection capability intercept batteries, an Avenger battery, and a maintenance company. The indirect fire protection capability-Avenger battalion is normally assigned at the theater or corps level. The intercept batteries defend fixed assets and ground forces from RAM threats in support areas. RAM Warn system provides early warning of impending RAM attacks through a network with capabilities internal to the intercept batteries and external to supported elements.

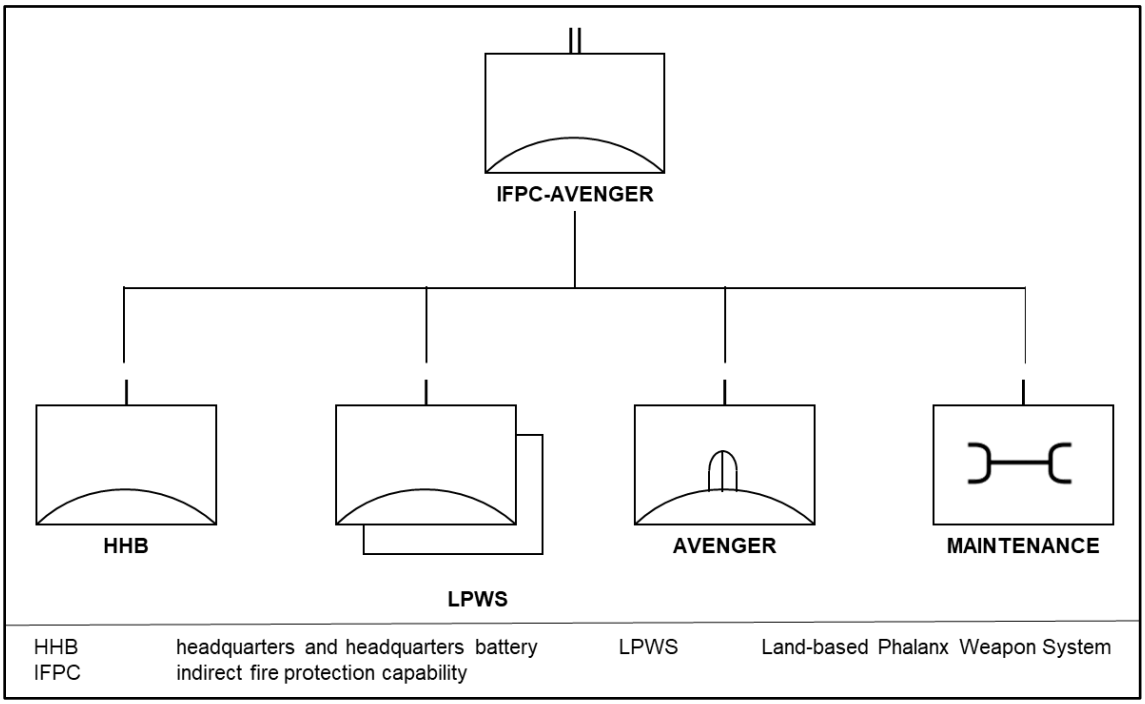

Figure 2-3. Indirect Fire Protection Capability-Avenger battalion

2-11. The intercept batteries are equipped with interceptors, sensors, and C2 systems. Engagement and intercept of RAM threats are performed by the Land-based Phalanx Weapon System, a fast reacting, short-range, fixed emplacement system that detects and destroys incoming RAM in the air before they hit ground targets. The Land-based Phalanx Weapon System is comprised of a radar slewed, 20-millimeter Gatling gun with automatic ammo handling system, and search and track radar antennas; two 60-kilowatt generator sets with a power distribution enclosure; and a chiller for cooling the weapons. All components are integrated on a flatbed semitrailer. It is also capable of providing early warning without conducting an intercept. Sentinel radars and Lightweight Counter Mortar Radars also provide data for both engagement and early warning. The sensors can classify and aid in the identification of air objects, facilitating situational awareness in proximity to a defended area and reducing the potential of fratricide incidents. In addition, the Lightweight Counter Mortar Radar, supplemented with data extracted from other Army sensors, determines predicted points of impact for RAM munitions, enabling in-time warnings to at-risk forces and areas through the RAM Warn system. Sensor data is available through the Forward Area Air Defense C2 nodes.

SHORT-RANGE AIR DEFENSE IN SUPPORT OF ARMY OPERATIONS

2-12. Operations are conducted to support all four Army strategic roles: operations to shape, operations to prevent, large-scale ground combat operations, and operations to consolidate gains.

- "Operations to shape consist of various long-term military engagements, security operations and deterrence missions, and actions intended to assure friends, build partner capacity and capability, and promote regional stability" (FM 3-0). SHORAD battalions plan and participate in building the capabilities of partner SHORAD forces. SHORAD battalions participate in multinational exercises to further coordination and interoperability.
- Operations to prevent "include all activities to deter an adversary's undesirable actions. They are typically conducted in response to activities that threaten unified action partners and require the deployment or repositioning of credible forces in a theater to demonstrate the willingness to fight if deterrence fails" (FM 3-0). Deployed SHORAD units, with other AMD forces, support the deterrence of an adversary's use of air capabilities to gain its objectives. SHORAD units are also

critical elements in preventing an enemy's ability to successfully attack geopolitical sites and infrastructure in the homeland. SHORAD systems are emplaced in the National Capital Region, encompassing Washington, D.C. and some surrounding areas, to protect against air threats.

- "Large-scale combat operations require the execution of multiple tasks synchronized and converged across multiple domains to create opportunities to destroy, dislocate, disintegrate, and isolate enemy forces" (FM 3-0). SHORAD battalions may operate as part of ADA battalion task forces or independently in support of maneuver, fixed, and semi-fixed assets designated by a division, corps, or higher commander. See chapter 6 for more information on the execution of SHORAD operations.
- *Consolidate gains* are activities to make enduring any temporary operational success and to set the conditions for a sustainable security environment, allowing for a transition of control to other legitimate authorities (ADP 3-0). During transition, SHORAD assets provide air defense for maneuver, fixed, and semi-fixed assets; an air picture to the supported team; and security.

2-13. SHORAD supports the specific mission of the supported commander against air threats. SHORAD employment should remain flexible to support dynamic changes to the mission or task organization. While SHORAD employments are facilitated by principles and tenets, there are no set deployment directives. Fundamentally, SHORAD deployments, like all AMD deployments, are governed by operational needs with considerations of requirements, anticipated operational environment/threat, and the availability of ADA resources.

SHORT-RANGE AIR DEFENSE IN THE DIVISION

2-14. A SHORAD battalion may be organic or assigned to the division. If not an organic element, the battalion may be apportioned or placed in a command or support relationship (see Chapter 4). SHORAD provides air defense of the division commander's designated critical assets.

2-15. Planning for SHORAD operations in the division is initiated by the SHORAD battalion commander and staff upon receipt of the mission from the division commander. The AMD element works for the SHORAD battalion commander and advises the commander and staff of division plans and operations. SHORAD battalion commander works with the AMD element and protection cell in identifying and planning the defense of critical assets and other protection requirements. The battalion commander advises the division commander and staff on AMD operations. The AMD element prepares the AMD portion of the fires annex/plan in coordination with the commander. The AMD element synchronizes AMD plans and requirements with other divisional staff elements, such as the fires cell and logistics sections. AMD cell personnel also collaborate with the battalion staff in integrating ADA organizations placed in support of the division or that are operating in the division's AO. For more information on the divisional AMD element, see FM 3-01.

SHORT-RANGE AIR DEFENSE IN SUPPORT OF THE BRIGADE COMBAT TEAM

2-16. A SHORAD battery is generally placed in a support relationship with a BCT. SHORAD platoons may be further task organized to support the brigade's maneuver formations. The SHORAD battery provides dedicated air defense capabilities to the BCT augmented by the BCT's combined arms for air defense (known as CAFAD) capabilities. SHORAD batteries have habitual training relationships with BCTs within a division, but they will be task organized by the SHORAD battalion when conducting operations to support the division's plan.

2-17. In support of the BCT and battalion task force, the battery or platoon maneuvers with the defended force, deterring and defeating air attacks. The SHORAD mission is defined by the BCT or battalion task force commander, who assigns air defense priorities. The SHORAD battery commander and platoon leaders develop their plans to allocate SHORAD systems to protect the designated priorities. The SHORAD unit commanders execute this plan in accordance with orders and published ROE.

2-18. The air defense airspace management (ADAM)/brigade aviation element (known as the BAE) cell is the primary Army airspace control element for the BCT. ADA personnel in the cell facilitate the BCT's

awareness of the air environment. ADA personnel advise the BCT commander and staff of air engagements, coordinate for or with supporting ADA task-organized units, and assist in coordinating the airspace to enable rapid, unimpeded engagements. ADAM cell personnel maintain continuous contact with the SHORAD battery commander, ensuring that the commander is aware of the BCT's plans and that battery operations are synchronized with those of the BCT. The ADAM cell, in coordination with the SHORAD battery commander and executive officer, develops the air defense appendix of the fires annex for the BCT operation plan or order.

SHORT-RANGE AIR DEFENSE COMMAND AND CONTROL

2-19. The Forward Area Air Defense C2 system-of-systems is fielded to SHORAD units and consists of common hardware, software, communications equipment, and shelters to meet the C2 and engagement needs of SHORAD battalions. Forward Area Air Defense C2 supports the AMD mission by providing near-real-time early warning and cueing information, correlated air track and C2 information, and intelligence assessments to higher, adjacent, and subordinate SHORAD units. Computer displays allow commanders to access the air picture, situation reports, enemy assessments, and friendly forces. The Forward Area Air Defense C2 system has the capability to interface with other Army C2 systems through the Air and Missile Defense Workstation. The Air and Missile Defense Workstation is integrated in Forward Area Air Defense C2-equipped battalions at the ADA battery and battalion command posts, as well as in the Air Defense Planning and Control System at divisions. The Forward Area Air Defense C2 provides air situational awareness to the supported force and alerts and cues SHORAD weapons. The Forward Area Air Defense C2 systems support Land-based Phalanx Weapon System batteries by receiving and correlating sensor inputs and then alerting the intercept system and the sense and warn elements of an impending RAM attack.

SHORT-RANGE AIR DEFENSE PLANNING, PREPARING AND EXECUTION

2-20. SHORAD planning is a continuous process which occurs at all levels of command. The area air defense commander at the theater level publishes the area air defense plan which provides critical planning information to include identification criteria, weapon control statuses, air defense warnings and self-defense criteria. The area air defense plan establishes a baseline from which further planning can occur and is regularly modified via the publication of subsequent orders and special instructions. The SHORAD air defense plan at the BCT and battalion level is developed using the subordinate area air defense plans and AMD orders from the SHORAD unit's higher headquarters. As the plan is being developed, the SHORAD commander begins preparing the unit for the mission. Preparation includes reconnaissance and defense design (which considers selection and occupation of position), crew and unit rehearsals and drills, and continuous coordination with the supported element and the parent ADA unit. Chapters four, five and six address planning, preparing, and execution in detail.

2-21. SHORAD operations are baselined on centralized planning and decentralized execution. This is driven by both the typical organization of SHORAD battalions (in the divisional construct, SHORAD batteries are task organized under separate BCTs) and the reality that SHORAD weapon systems can often be located many miles from their parent headquarters. Decentralized execution of SHORAD operations places engagement decisions at the individual crew and weapons system. This increases the likelihood that a hostile aircraft or missile will be engaged as soon as it comes within range of an ADA weapon system.

Chapter 3

Threats to be Countered by Short-Range Air Defense

This chapter summarizes the air threats facing Army and joint forces that SHORAD must counter. The summaries are generic threat capability descriptions. The threats to be countered are UASs, manned helicopters, manned fixed-wing aircraft, RAM, cruise missiles, and tactical air-to-surface missiles. In addition to air threats, SHORAD forces must contend with electromagnetic and cyberspace attacks as well as ground attacks by enemy forces, common threats to all Army and joint forces.

THREAT OVERVIEW

3-1. In the past, U.S. forces have enjoyed relative advantages over their adversaries with superior capabilities in the air, land, maritime, space and cyberspace domains. However, adversaries of the past have become near-peer threats, able to challenge U.S. operations in all of these domains. U.S. adversaries have closely observed emerging U.S. capabilities and have focused their capabilities and approaches that create or exploit U.S. vulnerabilities while avoiding U.S. strengths.

3-2. Today's air threats continue to evolve in capability and quantity, with a trend toward a greater investment in UASs, ballistic missiles, and cruise missiles. Within the last decade, the air and missile arsenals of today's adversaries have become more robust, diverse, and complex. Newer missile and some indirect fire threats can maneuver in various stages of flight. Not only do our adversaries have access to the increasingly sophisticated ballistic missiles, but they also have a growing array of cruise missiles, UASs, and RAM. Many of these are increasingly available on the world market. Additionally, traditional air threats will still exist in the world of tomorrow. Helicopters continue to pose a significant lethal hazard for ground forces. Fixed-wing aircraft continue to evolve as expensive but highly capable weapon systems. All of these air and missile threats must be addressed by Army and joint AMD forces within the context of anti-access/area denial operations and of defeating increasingly sophisticated countermeasures, electromagnetic attack, and cyberspace efforts.

3-3. The threat will attempt to develop an overmatch in an area to mitigate the capabilities of the U.S. force. One area of possible overmatch is advanced electromagnetic attack, in which a threat system jams or spoofs across the electromagnetic spectrum in an attempt to hamper an ADA system's ability to detect or engage a threat platform or projectile. As the ADA force becomes more network centric, a sophisticated cyberspace attack could potentially hamper the AMD network's ability to support the detection, identification, or engagement of a target. Another tactic is a complex integrated attack which is designed to overwhelm defense of a site by employing different capabilities. A *complex integrated attack* is a synchronized attack of a friendly asset by a mix of air and missile threats arriving near-simultaneously from different directions, altitudes, and range (FM 3-01). This mix may include any or all air and missile threats. Complex integrated attacks will likely be supported by enemy activities in other domains, such as jamming efforts in the cyberspace domain, as noted above, and special operations forces' attacks in the land domain.

3-4. Threat special operations forces can attack from any direction; ADA systems have a limited force protection capability, large perimeters, and vulnerability to special operations force attacks if force protection is not coordinated with and supplemented by the supported unit.

3-5. Potential adversaries are investing in anti-access strategies and area-denial capabilities to counter the U.S. ability to project military force into an operational area with sufficient freedom of action to accomplish assigned missions. The concept of anti-access/area denial is to control the access into and movement within a region. Preclusion is the combination of anti-access and area denial methods that seeks to influence the ability of an enemy, outside the region, to introduce forces into the theater and sustain combat power.

THREAT SET

3-6. The emerging air and missile threat set is diverse and complex, encompassing a wide range of air and indirect fire threats to be countered by SHORAD. The air threats are UASs, helicopters, fixed-wing aircraft, cruise missiles, and tactical air-to-surface missiles. The indirect fire threat consists of RAM.

UNMANNED AIRCRAFT SYSTEMS

3-7. An *unmanned aircraft system* is that system whose components include the necessary equipment, network, and personnel to control an unmanned aircraft (JP 3-30). Threat UASs are categorized in groups (1-5), typically based on weight, operating altitude, and speed. Groups 1 through 3 (table 3-1) are considered to be small UASs and are particularly dangerous due to the challenges which they present to friendly sensor systems for detection and identification and for weapon systems to consistently defeat them given their low and slow kinematic profile. These UASs are the targets for SHORAD systems.

Table 3-1. UAS groups

	Speed / Altitude	***Characteristics***
Group 1 Micro / Mini UAS	Normally operates below 1,200 feet AGL at speeds less than 100 knots	Generally hand-launched. Real time video and control. Small payloads; focus on reconnaissance, surveillance, and intelligence operations. Operates within LOS of user (limited range).
Group 2 Small Tactical	Normally operates below 3,500 feet AGL at speeds less than 250 knots	Launched in unimproved areas by a small number of personnel. Medium range and endurance. Payload focus: reconnaissance, surveillance, and intelligence operations; may add weapons. Requires LOS to ground control station.
Group 3 Tactical	Normally operates below 18,000 feet MSL at speeds less than 250 knots	Launched in unimproved areas by a small number of personnel. Range and endurance vary significantly. Payload focus: reconnaissance, surveillance, and intelligence operations; may add weapons. Requires larger logistics footprint than Groups 1 and 2.
Group 4 Persistent	Normally operates below 18,000 feet MSL at any speed	Can be used both strategically and tactically. Requires a runway for launch and recovery. Extended range and endurance. Payloads: reconnaissance, surveillance, intelligence operations, and ASM weapons. Operates at medium-to-high altitudes.
Group 5 Penetrating	Normally operates higher than 18,000 feet MSL at any speed	Strategic-level asset. Requires an improved runway for launch and recovery. Greatest range, endurance, and airspeed. Payloads: suite of optics for targeting and weaponry for engagements. Operates at medium-to-high altitudes. Logistics footprint similar to that of a manned aircraft.

AGL above ground level LOS line of sight UAS unmanned aircraft system
ASM air-to-surface munition MSL mean sea level

3-8. UASs include drones, characterized by preprogrammed flight paths and patterns, and remotely piloted vehicles generally controlled by ground-based operators. Some UASs may implement both drone and remotely piloted flight control types. Each can perform a variety of missions, ranging from reconnaissance and battlefield surveillance to attack and electromagnetic warfare. UASs have extensive commercial applications and, as a result, are readily available and arguably the most developed system in many armies around the world.

3-9. Due to the prolific use of unmanned systems, commercial off-the-shelf UASs are readily available and can be weaponized with relative ease. There are over 1,000 current and developing UAS programs worldwide today. UASs are typically comprised of a control element, communication systems, support elements, an unmanned aircraft, a payload or pod, and a human element.

3-10. UASs serve as intelligence, surveillance, and reconnaissance platforms for target detection, identification, and location; weapon targeting; target designation; and battle damage assessment. State-of-the-art sensors and data links provide real-time targeting for fire support systems, maneuver forces, and aircraft. UASs equipped with laser designators provide immediate targeting assistance and terminal guidance of munitions. UAS platforms also can serve as a means for weapons delivery or may themselves serve as the weapon, and have been used extensively to attack high payoff targets without endangering pilots.

3-11. UASs have relatively low radar cross sections, low speed, and low thermal signatures, thus making them difficult to detect, track, and engage. They may enter a friendly area of operations from multiple directions. Mission-dictated flight profiles take full advantage of terrain, increasing system survivability and optimizing coverage. Flight altitudes for UASs vary by their size and mission. UASs conducting intelligence, surveillance, and reconnaissance missions operate at altitudes consistent with their sensor systems. They normally fly at altitudes safe from small arms fire; UASs which SHORAD forces may encounter can stand off and detect from up to 25 kilometers.

MANNED ROTARY-WING AIRCRAFT

3-12. Most countries maintain helicopter fleets to support military operations. While the majority of helicopters can be armed to perform a variety of roles, the attack helicopter poses the greatest threat to maneuver forces. The versatility and survivability of helicopters make them ideal for use in most combat areas.

3-13. Threat ground force commanders rely primarily on helicopters to fulfill direct air support requirements. Helicopters can perform a variety of missions, including reconnaissance, intelligence, surveillance, and target acquisition; weapon targeting; target designation; battle damage assessment; troop insertion; and target attack. Hovering and low-flying helicopters, taking full advantage of terrain masking, are difficult to acquire and target.

3-14. An especially challenging ingress technique is nap-of-the-earth flying, in which a helicopter hovers at a masked point, dashes to the next mask point, and hovers again. This technique is challenging because of short exposure times and varying between near-zero Doppler and moderate Doppler velocities. Improvements in fire control and weapon capabilities enable helicopters to search, acquire, and fire at ground targets from longer standoff ranges, thus increasing their survivability and effectiveness.

MANNED FIXED-WING AIRCRAFT

3-15. Air power remains essential to virtually every type of military operation, and it will continue to play a role in future conflicts despite the emergence of ballistic missiles and cruise missiles. There are more than 40,000 operational military aircraft today; some 10,000 were produced during the Cold War era and are currently in third world inventories. Over 50 countries have an aviation industry of some kind, and over 20 countries design their own aircraft.

3-16. Manned fixed-wing combat aircraft are highly flexible and can perform a variety of missions in offensive and defensive operations: air interdiction, strategic attack, suppression of enemy air defense, close air support, and intelligence, surveillance, and reconnaissance. Fixed-wing aircraft can employ a variety of munitions, including bombs, guns, rockets, cruise missiles, and tactical air-to-surface missiles. Integrated navigation/bombing computers and related mission equipment provide new combat aircraft with a precision-strike capability, day or night and in bad weather.

3-17. New aircraft incorporate such features as radar warning receivers, on-board jammers, chaff, flares, and a lower radar cross section to improve survivability and mission success rate. In addition, the proliferation of fixed-wing aircraft throughout the world increases the probability that opposing forces may employ the same type of aircraft in a conflict; this exacerbates the already challenging problem of identification.

ROCKETS, ARTILLERY, AND MORTARS

3-18. RAM are traditional indirect fire threats to ground forces. These systems vary in size and effect. Rockets and artillery are usually fired from towed or self-propelled platforms while mortars are frequently transported by dismounted crews.

3-19. Rockets are unguided projectiles that generally fly ballistic trajectories with a short boost phase and unpowered flight. The most common type of warhead is high explosive with a point detonating fuse. Rockets are commonly fired from self-propelled platforms known as multiple rocket launchers. Multiple rocket launchers may fire large volleys of rockets (20 to 40) with multiple launchers being used in a volley. Rockets come in many calibers such as 57-millimeter, 68-millimeter, 80-millimeter, 81-millimeter, 107-millimeter, 120-millimeter, 122-millimeter, and 127-millimeter, and have ranges of 10 to 40 kilometers. Their high rate of fire, potential short reaction time, and volume of fire make them a stressing threat. Hybrid and irregular forces have used rockets as harassing fire, with improvised firing methods and delays to limit counterfire effects.

3-20. Artillery and mortar rounds are also unpowered and traditionally fly ballistic trajectories, though emerging artillery rounds may have maneuvering capabilities. All known armies throughout the world have some form of artillery. The most common artillery calibers are 122-millimeter, 152-millimeter, and 155-millimeter. Unless using rocket assisted projectiles, artillery systems are generally limited to 20 to 30 kilometers. The most common mortar calibers are 60 to 120-millimeter, but include many variants, such as 81-millimeter, 82-millimeter, 100-millimeter, and 160-millimeter.

CRUISE MISSILES

3-21. Cruise missiles can travel at low-to-high supersonic or high subsonic speeds, are self-navigating, and can fly non-ballistic trajectories at very low to very high atmospheric altitudes. Cruise missiles are reliable, accurate, survivable, and lethal. They can be launched from the land, air, or sea. Today's cruise missile can hit a target with remarkable accuracy; tomorrow's smarter, maneuverable, more accurate missile will pose a far greater threat.

3-22. Cruise missiles pose serious threats because of technological advancements and their operational characteristics. The incorporation of new technologies in airframe and warhead design, propulsion systems, and guidance systems has contributed to vastly improved systems. The increased use of composite materials in airframe construction has created stronger and lighter airframes. A range of low observable and stealth technologies has reduced their radar cross sections. The use of air-breathing turbojet and turbofan engines has given cruise missiles a longer range and the capability to fly at high, subsonic speeds and altitudes lower than 50 meters above ground level. Their flight paths can be programmed using sophisticated guidance systems, such as the Global Positioning System, inertial navigation systems, and terrain contour matching. Their guidance systems contribute to overall accuracy, optimize surprise, and help avoid air defenses. A terminal guidance seeker increases accuracy to less than 10 meters. A wide array of warheads, including individually targetable submunitions, allows targeting of both soft and hard targets. Operationally, they are difficult to detect, can fly indirect routes at low altitudes to avoid heavily defended areas, and can attack from any direction.

TACTICAL AIR-TO-SURFACE MISSILES

3-23. Tactical-air-to-surface missiles are air-launched, precision-guided munitions designed to strike ground targets. They are ideal against targets such as bridges that are difficult to destroy with conventional dumb bombs. Tactical air-to-surface missiles are an extremely lethal threat because of their versatility and pinpoint accuracy.

3-24. Most variants employ radio-command, laser, anti-radiation homing, or electro-optical guidance systems. Missiles that employ anti-radiation homing systems are referred to as anti-radiation missiles; they represent the greatest threat to radars such as those employed by SHORAD forces.

ELECTROMAGNETIC WARFARE AND CYBERSPACE

3-25. Electromagnetic warfare and cyberspace threats are continuously present throughout the tactical, operational, and strategic levels of warfare. Electromagnetic warfare consists of the threat's ability to detect U.S. emitters (radar and communications) and then deny, degrade, disrupt, or destroy those emitters and other electromagnetic spectrum dependent devices.

3-26. The most common form of tactical electromagnetic attack is electromagnetic jamming. Jamming consists of an emitter radiating electromagnetic energy to prevent a radar receiver from discerning the expected return from the background noise or a radio from receiving voice or data. Advanced jamming techniques allow the threat to project false location, speed, and altitude creating confusion for radar operators.

3-27. Regional powers, peer states, and transnational terrorist organizations have personnel with capabilities of conducting cyberspace attacks on installations and sites. Cyberspace attacks are expected against C2 nodes, theater and tactical data and voice networks, information systems, radars and their tracking and targeting systems, and missile guidance packages. The threat is expected to use cyberspace attacks in conjunction with physical attacks as part of a larger campaign. Cyberspace threats can prevent target detection, tracking, and engagement of threat munitions and platforms.

THREAT APPLICATION

3-28. Air threat employment against U.S. ground forces will vary from country to country. This employment will be driven by threat equipment, capability, organizational structure, military-political goals, and such other factors as terrain, weather, time, and friendly air defenses likely encountered.

3-29. By understanding air threat proliferation and equipment, the commander can make assumptions on how a threat may employ air assets to interdict U.S. operations. The following information describes the type of threat that may be associated with anti-access and area denial and large-scale combat operations.

3-30. Potential adversaries are investing in anti-access strategies and area-denial capabilities to counter the U.S. ability to project military force into an operational area with sufficient freedom of action to accomplish assigned missions. Entry forces in an anti-access and area denial environment may deploy in an air inferiority or air parity environment. The threat will use all available aerial assets against lucrative targets such as air and sea ports, assembly areas, and supply points in the areas of debarkation. The challenge to the SHORAD commander during this phase will be UASs conducting reconnaissance, intelligence, surveillance, and target acquisition operations supporting targeting of troop and logistical concentrations by low-altitude attack aircraft and missiles.

3-31. As U.S. forces buildup, threat UASs will focus on locating unit movements, gathering information on unit sizes and strengths, and determining their follow-on movements. Information obtained by reconnaissance, intelligence, surveillance, and target acquisition will be relayed back to commanders who can be expected to use any attack means necessary to inflict maximum casualties, inhibit momentum, and destroy forces. These aerial attack systems could be rotary- and fixed-wing aircraft, cruise missiles, lethal UASs, or combinations thereof in synchronized attacks.

3-32. The threat can counter large-scale combat operations with a myriad of aerial platforms. UASs will provide the threat commander the necessary information to determine friendly unit locations, movements, and objectives. Air and RAM strikes will be generated from the information collected about such targets as maneuver forces, forward arming and refueling points, C2 nodes, artillery assets, and reserve troop concentrations. Lethal UASs can be effective in disabling C2 nodes or destroying armored vehicles. Cruise missiles could be used against logistics concentrations, C2 nodes, or with sub-munitions for area denial. Helicopters could be used to attack forward elements and the flanks of the advancing maneuver forces to slow their tempo, cause confusion, and thereby inflict maximum casualties. Attack helicopters constitute the most widespread and capable air threat to ground forces in the close battle.

3-33. Threat ground forces, especially special operations forces, are a constant danger to AMD assets as they are considered to be critical targets. Ground forces can attack from any direction against SHORAD units which have limited force protection capabilities, large perimeters, and are quite vulnerable if force protection is not coordinated with and complemented by the supported unit.

3-34. During friendly offensive operations, threat forces will attempt to use their maneuver and fire support assets to regain the initiative. UASs will conduct reconnaissance, intelligence, surveillance, and target acquisition operations to support targeting and maneuver. Helicopters will be used as either dedicated attack assets or armed utility helicopters. Helicopter assets can be used in attack, air insertion, or reconnaissance. Helicopters in the attack will usually consist of at least two or more (taking full advantage of cover and concealment) with the mission of disrupting friendly operations. Helicopters in the reconnaissance role will operate in the same manner as UASs to support artillery targeting and maneuver. In some cases, helicopters will be used in conjunction with threat armored forces to deter friendly penetrations. Threat fixed-wing aircraft usage may be limited but cannot be counted out.

3-35. During defensive operations, friendly forces are the most vulnerable to the full spectrum of threat aerial platforms. The enemy will attempt to use aerial platforms to monitor friendly forces for targeting. The number one challenge to the SHORAD platoon will be to deny the enemy's use of air reconnaissance, intelligence, surveillance, and target acquisition assets. An enemy will use UASs, helicopters, and possibly fixed-wing aircraft to determine the locations of friendly artillery, C2 nodes, ADA assets, logistical sites, and troop concentration areas. Once these sites are located, threat forces will likely disrupt or destroy these sites with the use of RAM, air attacks, and air insertion.

3-36. Artillery and rockets will be the enemy's preferred weapons against U.S. forces and ADA assets. These weapons are usually numerous, inexpensive, survivable, and highly effective. UASs will be employed to provide targeting data and attack critical assets. Attacks by helicopters and fixed-wing are less likely due to the low survivability of these systems. Enemy air-insertion operations will be conducted by either fixed-wing assets or helicopters and probably during the hours of limited visibility.

SUMMARY

3-37. The air, missile, and RAM threats, as standalone systems or complemented by electromagnetic warfare/cyberspace and other capabilities in the land and space domains, create formidable challenges to SHORAD systems and the Army and joint forces that SHORAD units defend. Table 3-2 provides a summary of these threats, their primary targets, and their capabilities and trends.

Table 3-2. Air, missile, and electromagnetic warfare/cyberspace threats

System Category	*Targets*	*Capabilities*	*Trends*
Unmanned Aircraft Systems (Groups 1-3)	• Assembly areas, logistical areas, • C2 centers (seeing) • Troop movements (seeing) • C2 centers (jamming) • Maneuver formations/systems (attacking)	• Multi-mission – reconnaissance, surveillance, and target acquisition; electromagnetic warfare; attack • Range up to 125 kilometers; altitude near-ground to 17+ kilometers (dependent on group) • Standoff/detection to 25 kilometers (dependent on group) • Payloads – daylight television, cameras, missiles, laser designators, retransmitters	• More missions – decoy, suppression of enemy air defenses, and electromagnetic attack • Standoff range in excess of 25 kilometers • Detection to 40 kilometers; all weather, day/night • Perch and stare ability • Low radar signature • Low thermal signature

Table 3-2. Air, missile, and electromagnetic warfare/cyberspace threats (continued)

System Category	*Targets*	*Capabilities*	*Trends*
Helicopters	• Troops/armored vehicles • Convoys • C2 centers	• Multi-role – attack; reconnaissance, surveillance, and target acquisition; electromagnetic warfare • Combat diameters out to 460 kilometers; terrain masking/hovering • Payloads – daylight TV, cameras, missiles, laser designators, retransmitters	• Modular upgrades to airframes • Expanded night/adverse weather capability • Improved fire control systems/engagement capability – at greater ranges • Improved countermeasures
Fixed-Wing Aircraft	• Ports • Assembly/logistical areas • C2 centers • Geo-political/ population centers • Maneuver force vehicles/ formations	• Multi-role – close air support; reconnaissance, surveillance, and target acquisition; electromagnetic attack; interdiction; strategic attack; suppression of enemy air defenses • Precision strike • Equipment – missiles, rockets, bombs, submunitions, guns	• Multi- versus single-mission aircraft • Greater use of standoff and precision • Reduced radar and infrared signatures • Integrated electromagnetic attack • Proliferation increases identification challenges
Rockets, Artillery, and Mortars	• Troops/armored vehicles • Fixed/semi-fixed sites	• Variable payload • Saturation of airspace • Mass fires • Easily moved/relocated	• Extended ranges • Improved accuracy • Greater lethality
Cruise Missiles	• High-value military/industrial complexes • Airports and seaports • Logistical areas • C2 centers • Maneuver force concentrations	• 30-3,000 kilometer range • 360-degree threat; very low radar signature • Air, sea, or ground launched • Warheads – conventional, weapons of mass destruction, submunitions	• Increased number of land attack variants • Reduced radar signatures • Improved accuracy and increased range
Tactical Air-to-Surface Missiles	• Armored vehicles • Radars • Bridges or other point targets • ADA sites	• >100 kilometer range • Supersonic speeds (Mach 3) • Extremely accurate • Radio-command, laser, anti-radiation, or electro-optical guidance	• Improved accuracy and lethality • Lock-on-after-launch or loitering • Dual/tri mode seekers – increased reliability and all weather capability

Table 3-2. Air, missile, and electromagnetic warfare/cyberspace threats (continued)

System Category	*Targets*	*Capabilities*	*Trends*
Electromagnetic Warfare and Cyberspace	• C2 nodes • Tactical data and voice information, networks, and systems • Theater data and voice information, networks, and systems • ADA radars • ADA tracking and targeting systems • Missile and UAS guidance systems	• Disrupt data and voice communications • Locate C2 nodes for targeting • Disrupt targeting and guidance systems • Electromagnetic warfare techniques, such as interception and spoofing, to gain information on planning and operations • Radar jamming • Electromagnetic pulse to incapacitate electronic systems	• Cyberspace attacks in conjunction with physical attacks • Expanded attempts to penetrate networks for data collection and exploitation • Growing sophistication of threats • Increased exposure of tactical systems to cyberspace threats as office systems are combined with tactical systems

ADA air defense artillery C2 command and control UAS unmanned aircraft system

Chapter 4

Planning for Short-Range Air Defense Operations

"A good plan violently executed now is better than a perfect plan executed next week" – GEN George S. Patton

Planning is the art and science of understanding a situation, envisioning a desired future and laying out effective ways of bringing that future about (ADP 5-0). Planning helps commanders create and communicate a common vision with their staffs, subordinate commanders, and unified action partners. This chapter describes the SHORAD operation planning processes. Though the depth and scope of planning varies by echelon, all SHORAD planning is baselined on the military decision-making process (MDMP); IPB process; criticality, vulnerability, and threat methodology; and troop leading procedures (TLP).

INTRODUCTION

4-1. Planning is a balance between the science of the staff planner and the art of the commander. All planning is based on imperfect knowledge and assumptions about the future. Planning cannot predict exactly what the effect of the operations will be, how enemies will behave, or how civilians will respond to the friendly force or the enemy. Nonetheless, the understanding and learning that occur during the planning process have great value. Planning activities occupy a continuum ranging from conceptual to detailed. The conceptual end will focus on understanding the operational environment and the problem, determining the desired end state, establishing objectives, and sequencing the operation in broad terms. On the other end, detailed planning translates the broad operational approach into a complete and practical plan. It works out the scheduling, coordination, synchronizing and directing the force.

4-2. Fundamental to the development of SHORAD plans are three Army integrating processes: MDMP, IPB, and TLP. These processes are augmented by the AMD criticality, vulnerability and threat methodology. Descriptions of the MDMP, IPB, TLP, and criticality, vulnerability and threat methodology follow; specific application of each to SHORAD planning is presented in the SHORAD battalion and battery planning sections.

4-3. The MDMP is an iterative planning methodology, used at battalion level and above, to understand the situation and mission, develop a course of action (COA), and produce an operation plan or order. The MDMP combines the conceptual and detailed aspects of planning and integrates the activities of the commander, staff, subordinate headquarters, and other partners throughout the planning process. The MDMP helps leaders apply thoroughness, clarity, sound judgment, logic, and professional knowledge to understand situations, develop options to solve problems, and reach decisions. See FM 6-0 for more information.

4-4. The IPB is a collaborative staff effort led by intelligence personnel to develop and sustain an understanding of the enemy, terrain, weather, and civil considerations. IPB begins in planning and continues throughout the operations process. IPB products are developed and continuously updated to facilitate situational understanding and assist commanders and staffs in identifying relevant aspects within the AO and area of interest that can affect mission accomplishment. See ATP 3-01.16 for information on AMD IPB techniques.

4-5. TLP is a dynamic process used by company-level and smaller unit leaders to plan and prepare for operations. TLP extend the battalion and higher level MDMP to the small-unit level and enable small-unit leaders, such as SHORAD section and team chiefs, to maximize available planning time. SHORAD unit TLP are also considered in the development of a supported unit's MDMP. See ADP 5-0 for more information.

4-6. The criticality, vulnerability, and threat methodology is a tool used to assist in the allocation of ADA forces to mission requirements. It begins with an understanding of the supported commander's air defense protection priorities, determined in accordance with the unit's scheme of maneuver, projected threats, and terrain where the operation will take place. Protection priorities may include units, such as the main effort BCT or division artillery; a semi-fixed asset, such as a forward arm and refuel point; or events, such as a river crossing or passage of lines. The importance of each asset is analyzed with respect to its criticality to the mission, vulnerability, and likelihood of being surveilled or attacked. These high value assets are incorporated into a protection prioritization list, normally identified by phase of operation.

AIR AND MISSILE DEFENSE PLANNING

4-7. The basis for all AMD planning is the area air defense plan. The area air defense plan is the theater-level plan that delineates AMD guidance and directs efforts in support of the joint force commander's operation plan. The area air defense commander develops the area air defense plan, supported by representatives from the Army air and missile defense command and other service commands. The joint force commander approves the plan. From the area air defense plan and the airspace control plan, defense designers will extract identification criteria, specific instruction for implementation of the rules of engagement, airspace coordinating measures, air defense measures, air defense warnings, and self-defense criteria, and, as applicable, coordinate the integration of multinational AMD elements.

4-8. Army AMD planning is conducted at all echelons, from the Army air and missile defense command to ADA batteries and platoons. At each level of command, planning begins with the receipt of a mission from higher headquarters and culminates in the issuance of an operation plan or order. Planning for SHORAD operations must key on developing an air defense scheme of maneuver that defeats air threats before they can accomplish their missions. Because enemy air operations are often part of an integrated air attack plan, air defense planning at all levels must support the higher echelon plan. Simultaneously, the planning of SHORAD operations must be fully integrated with the supported force's plan to enable the maneuver force's freedom of action. Without this integration, the air defense effort is not unified, the chances of fratricide increase, and mission success decreases.

COMMAND AND SUPPORT RELATIONSHIPS

4-9. Command and support relationships provide the basis for unity of effort and are essential to successful mission accomplishment. Command relationships define superior and subordinate relationships between unit commanders and identify the degree of control of the gaining commander. Command responsibility and authority varies depending on the type of command relationships between units. Army support relationships define specific arrangements and responsibilities between supporting and supported units. Establishing clear command and support relationships are fundamental to organization of any operation.

COMMAND RELATIONSHIPS

4-10. There are five types of command relationship: organic, assign, attach, operational control, and tactical control. For additional discussion of these relationships, see ADP 5-0.

- *Organic* are those assigned to and forming an essential part of a military organization as listed in its table of organization for the Army, Air Force, and Marine Corps, and are assigned to the operating forces for the Navy (JP 1). Organic SHORAD forces, for instance, have command relationships with all other organic forces organized with its headquarters.
- *Assign* is to place units or personnel in an organization where such placement is relatively permanent and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit or personnel (JP 3-0). Assigned SHORAD forces have command relationships with the gaining unit, are assigned positions by that unit's commander, and have priorities established by that commander or by a subordinate commander if so delegated.
- *Attach* is the placement of units or personnel in an organization where such placement is relatively temporary (JP 3-0). Attached SHORAD forces have command relationships with the gaining ADA unit and are assigned positions and have priorities established by that unit's commander. Attached

units are subject to limitations specified in the attachment order. The attachment order should clearly state the administrative and support responsibility of the gaining unit to the attached unit. When a SHORAD unit is attached, the supported force provides administrative and logistical support to it.

- *Operational control* is 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 (JP 1). A commander is provided another unit to accomplish specific missions or tasks that are usually limited by function, time, or location. When operational control is the appropriate command relationship, it should only be maintained for brief periods of time. Also, it should never be assigned when the parent unit has the capability to exercise effective control. Operational control does not of itself include administrative or logistical control. Control of administrative or logistical support must be specified in the order for operational control. Command relationships, positions, and priorities are established by the gaining ADA unit.
- *Tactical control* is 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 (JP 1). The gaining ADA unit establishes command relationships, positions, and priorities.

SUPPORT RELATIONSHIPS

4-11. The four support relationships are direct support, general support, reinforcing, and general support-reinforcing (see figure 4-1 on page 4-4). Support relationships alone may not be sufficient to ensure properly resourced and maintained units. Prior coordination between commanders and supported unit staffs is necessary to ensure subordinate units can operate independently of the parent unit when necessary.

- Direct Support. A SHORAD unit with a direct support mission provides dedicated air defense for a specific element of the force which has none. The SHORAD unit provides close and continuous support and coordinates its movement and positioning with the supported unit.
- General Support. A SHORAD unit with a general support mission provides air defense for the force as a whole. It is not committed to any specific element of the force. This relationship is commonly used to protect corps- and division-level assets.
- Reinforcing. A SHORAD unit with a reinforcing mission augments the coverage of another ADA unit or strengthens the defense of the force. Reinforcing SHORAD units are positioned to protect one or more of the reinforced units' priorities as specified by supported ADA unit commanders.
- General Support-Reinforcing. A SHORAD unit with a general support-reinforcing mission provides support for the force as a whole and augments the coverage of another ADA unit. The supporting units must coordinate with the augmented ADA units to reinforce the coverage of assets in the AO.

Table 4-1. Air defense artillery support relationships matrix

ISSUE	*DIRECT SUPPORT*	*GENERAL SUPPORT*	*REINFORCING*	*GENERAL SUPPORT REINFORCING*
Who establishes priorities?	The supported commander.	The ADA commander who established the support relationship.	The supported commander.	The ADA commander who established the support relationship.
Who positions ADA fire units?	The ADA commander with the approval of the support commander.	The ADA commander in coordination with local ground commander.	The ADA commander with approval of reinforced ADA commander.	The ADA commander in coordination with the reinforced ADA commander.
Who coordinates for terrain used by ADA fire units?	The supported commander.	The ADA commander who established the support relationship.	The reinforced ADA commander.	ADA commander who established the support relationship.
With whom should liaison be established?	The supported unit.	As required.	As required and the reinforced ADA unit.	As required and the reinforced ADA unit.
With whom should communications be established?	The supported unit.	As required.	As required and the reinforced ADA unit.	As required and the reinforced ADA unit.

ADA air defense artillery

SHORT-RANGE AIR DEFENSE BATTALION PLANNING

4-12. The SHORAD battalion commander and staff use the MDMP process to develop the air defense plan. The plan is developed in parallel with the battalion's next higher headquarters. In the following discussions, the next higher headquarters is a division. During garrison operations, prior to receipt of mission, the SHORAD battalion intelligence staff officer (S-2) must develop a comprehensive database of known threat aircraft and missile systems (to include UASs) and train all S-2 section personnel on how the enemy normally fights with those systems. The division assistant chief of staff, intelligence (G-2) may not have personnel with expertise on the enemy air threat and may rely on the SHORAD battalion S-2 to provide that expertise during mission planning.

4-13. MDMP Step 1–Receipt of mission. SHORAD battalion planning begins with the receipt of a mission from the division. The SHORAD battalion commander receives the division commander's guidance and develops supporting guidance to lead the staff's planning effort. The SHORAD battalion commander is directly responsible to the division commander for the division's air defense plan and integrates air defense planning with the division staff (through the AMD section) throughout the MDMP. Additionally, if there is a corps ADA brigade unit, such as a Patriot battery, placed in support of the division, the SHORAD battalion commander addresses that unit in the division plan and scheme of maneuver. The SHORAD battalion commander depends on the AMD section in the division for accurate and timely information during this stage of planning. If the situation permits, the battalion commander may move to the planning cell, at the division main operations center, to best influence the planning cycle during the deliberate decision-making process. If the hasty decision-making process is being used, the battalion commander relies on the division AMD section to keep informed.

- At this stage, commanders provide guidance to their staffs based upon their visualization of the operation. Planning guidance conveys the essence of the commander's visualization, including a description of the operational approach. Effective planning guidance reflects how the commander sees the operation unfolding. The commander's planning guidance broadly describes when, where, and how the commander intends to employ combat power to accomplish the mission within the higher commander's intent. Broad and general guidance gives the staff and subordinate leader's maximum latitude; it lets staffs develop flexible and effective options.
- Commanders modify planning guidance based on staff and subordinate unit inputs and changing conditions during different stages of planning and throughout the operations process. Based on the commander's initial planning guidance, the staff can issue an initial warning order (WARNORD) to the SHORAD batteries, which includes, at a minimum, the type of operation, the general location of the operation, the initial timeline and any movement or reconnaissance to initiate.

- Each planning staff is different and habitual associations between the ADA battalion and batteries and their supported formations are critical to successful planning and execution of the missions.

4-14. MDMP Step 2–Mission analysis. During this step, the staff analyzes all aspects of the mission and the higher headquarters' plan. The battalion commander focuses on the mission and the specific roles of the battalion. The commander and staff review the division's protection prioritization list and analyze which assets can be defended with the available SHORAD units. The resulting linkage of SHORAD forces to designated assets constitutes the protected asset list. The end products are the unit's restated mission, commander's initial guidance, mission analysis brief, intelligence estimate, and WARNORD.

- Upon receipt of a WARNORD or mission, the SHORAD battalion S-2 conducts an IPB which includes air avenues of approach. The battalion S-2 provides the SHORAD battalion's air IPB for inclusion in the G-2's comprehensive IPB products. To predict how the enemy will use aerial platforms, the S-2 must develop refined IPB products. This process consists of four steps: define the battlefield environment, describe the battlefield effects, evaluate the threat, and determine potential threat COAs.
- The S-2 leads the staff in the development of the battalion's IPB, which directly supports the decision-making process. Every commander and staff member needs to understand and apply IPB during the planning process. In an immature theater, detailed threat information may not be available. Consequently, a doctrinal template and decision support template must be produced in the absence of real time data. Regardless of the maturity of the AO, IPB goals are the same; the S-2 must help the commander and the staff visualize the battlefield in time and space. Working with the battalion operations staff officer (S-3) and other staff members, the S-2 must identify enemy fixed- and rotary-wing air avenues of approach into the division's AO as well as developing air named area of interest (NAI) for detecting enemy aircraft/missiles in-bound to targets in the division AO. When a change of mission is received and situation permitting, the S-2 should accompany the battalion commander to the division main, for instance, to assist in the deliberate decision-making process. The S-2's presence at that location makes IPB refinements immediate, and also allows the S-2 to work directly with the G-2 to ensure receipt of the most current information. See Appendix C for more information on the air IPB.
- The S-3 uses the criticality, vulnerability, and threat methodology to determine the allocation of SHORAD units to the division's critical assets. After reviewing all assets on the protection prioritization list, the S-3 considers and ranks the importance of each based upon how critical they are to the commander's mission, how vulnerable they are to damage and reparability, and how likely they are to be targeted by air and missile threats.
- The battalion logistics staff officer (S-4) plans for fuel and ammunition resupply, maintenance and medical care for all units. The S-4 coordinates with the division G-4 (known as assistant chief of staff, logistics) and logistic support units, such as the brigade support battalions of the BCTs which the SHORAD batteries are supporting, for common sustainment needs such as food, fuel, and equipment maintenance. The S-4 will also plan for the deployment of battalion maintenance contact teams to support the specific SHORAD equipment needs of the deployed batteries.
- The commander develops the commander's intent for the mission and planning process and issues guidance to the staff on potential COAs for the staff to develop. The commander's intent contains the overall mission purpose, acceptable risk, resulting end state, prevailing AMD tenets, and any additional information that will serve to guide the staff. Immediately after the commander gives the planning guidance, the staff can send subordinate units a WARNORD that contains, at a minimum, the approved mission statement, the commander's intent, changes to task organization, unit AO sketch or overlay, commander's critical information requirements, risk guidance, specific priorities, and an updated operational timeline.

4-15. MDMP Step 3–COA development. As a prelude to COA development, the commander briefs the division commander and staff on the proposed air defense protected assets to support the division's mission and division commander's intent. Upon acceptance, or with directed changes, the SHORAD commander begins to size (task organize) and allocate SHORAD forces to the designated assets. Based on the mission, IPB results and the commander's intent and guidance, the staff will begin developing courses of action. Each COA must meet the following screening criteria:

- Feasible: the COA allows mission accomplishment within the established time, space and resource limitations.
- Acceptable: the COA balances cost and risk with the advantage gained.
- Suitable: the COA can accomplish the mission in accordance with the commander's intent and planning guidance.
- Distinguishable: each COA must differ significantly from the others.
- Complete: the COA must describe all subordinate operations that lead to mission accomplishment.

4-16. MDMP Step 4–COA analysis. COA analysis enables commanders and staffs to identify difficulties or coordination problems as well as probable consequences of planned actions for each COA being considered. During this step, the staff wargames the developed COAs. The wargaming process should begin with all staff members having a thorough understanding of the S-2's updated IPB. The S-2 uses NAIs from the division G-2's IPB to follow major enemy maneuver actions. The S-2 then integrates the aerial terrain analysis with this ground IPB. The S-2 identifies key points where the enemy will attempt to penetrate and or exploit and where aircraft may likely be used to best support the enemy's objective. The S-2 will then display the analysis using a decision support template, which is a drawing showing the G-2's condensed situation template with a terrain analysis and the appropriate ground and air avenues of approach, NAIs, target areas of interest, and decision points. The decision support template must show activities in time and space through the entire AO.

- The SHORAD battalion staff then analyzes the battalion's response to the S-2's anticipated enemy courses of action, focusing on developing a synchronized air defense response to the enemy's main air attack and ensuring the battalion has an integrated response, from early warning to engagement, for each COA. Contingency operations COAs must consider the reaction of the civilian population, refugee control, and collateral damage. The SHORAD battalion staff needs supported maneuver force graphics to pinpoint maneuver units which have the best potential to be in the vicinity of the enemy's main effort. Next, the staff discusses each contingency. The staff conducts a session to visualize the upcoming battle based on potential enemy actions, develops decision points, and identifies them on the decision support template. Anything can happen in an operation, and the potential decision points are thus limitless. However, the staff must assess friendly capabilities versus enemy intentions to determine what COAs the enemy will most likely adopt and identify these as decision points.
- The decision support matrix is the principal planning tool which allows the staff to visualize the battlefield, courses of action, and develop a synchronized response to varied enemy actions. The decision support matrix captures the ADA and the maneuver commanders' intents. An example of a battalion decision support matrix is shown in table 4-2 on page 4-7. The event row depicts activities/actions of the supported maneuver force; the intelligence row focuses on activities that require air defense responses.

Table 4-2. Example of a SHORAD battalion decision support matrix

DECISION POINT	***1***	***2***	***3***	***4***	***5***
EVENT	UAS activity VIC PL Illinois.	Enemy squad-sized elements VIC PL Nebraska.	Maneuver element VIC air NAI 2 reports enemy aircraft moving west along AAA2	Forward units report intense artillery fires focused on friendly air defense assets along AAA1 VIC PL Delaware	Engage enemy main body VIC PL Nebraska.
INTEL	Ground scouts report enemy UAS activity VIC PL Illinois.	Air defense radars indicate a probable FARP VIC PL Nebraska.	Possible SEAD mission is underway; hostile aircraft imminent.	Probable SEAD mission is underway.	Scouts report rotary wing aircraft VIC air NAI 1, along AAA1; enemy air assault imminent.
ALPHA Btry	DS to 1st Bde. ADW: Yellow WCS: WPNS TIGHT LADW: Lookout SOR: 3 Div main effort.	ADW: Yellow WCS: WPNS TIGHT LADW: Lookout SOR: 2 Cross PL Ohio.	ADW: Red WCS: WPNS TIGHT LADW: Dynamite SOR: 1 Cross PL Main.	ADW: Red WCS: WPNS TIGHT LADW: Dynamite SOR: 1	ADW: Red WCS: WPNS FREE LADW: Dynamite SOR: 1 Cross PL Red.
BRAVO Btry	DS to 2d Bde. ADW: Yellow WCS: WPNS TIGHT LADW: Lookout SOR: 3 Div spt effort.	ADW: Yellow WCS: WPNS TIGHT LADW: Lookout SOR: 2 Cross PL Ohio.	ADW: Red WCS: WPNS TIGHT LADW: Dynamite SOR: 1 Cross PL Main.	ADW: Red WCS: WPNS TIGHT LADW: Dynamite SOR: 1	ADW: Red WCS: WPNS FREE LADW: Dynamite SOR: 1 Cross PL Red.
CHARLIE Btry	DS to 3d Bde. ADW: Yellow WCS: WPNS TIGHT LADW: Snowman SOR: 3 Division Reserve.	ADW: Yellow WCS: WPNS TIGHT LADW: Lookout SOR: 2	ADW: Red WCS: WPNS TIGHT LADW: Dynamite SOR: 1		
DELTA Btry	GS to division. ADW: Yellow WCS: WPNS TIGHT LADW: Snowman SOR: 3	ADW: Yellow WCS: WPNS TIGHT LADW: Lookout SOR: 2	ADW: Red WCS: WPNS TIGHT LADW: Dynamite SOR: 1		
BN Sensors	Continue sensing forward of PL Ohio.	Continue sensing forward of PL MAIN.	Continue sensing forward of PL Delaware.	Prepare for passage of lines.	Occupy ALT positions; continue sensing NAI's 1&2.

Table 4-2. Example of a SHORAD battalion decision support matrix (continued)

DECISION POINT	*1*	*2*	*3*	*4*	*5*
COMMENTS	A&B Btrys: Prep to cross LD. C&D Btrys: Provide air defense of assets in the div rear.	Counter-recon battle begins. Div trigger to cross LD.	Screening force battle begins.	Expect main body to follow artillery prep.	Provide dedicated air defense for four bridges in division sector. C Btry: move fwd with div reserve.

AAA	air avenue of approach	LADW	local air defense warning
ADW	air defense warning	LD	line of departure
ALT	alternate	NAI	named area of interest
BDE	brigade	PL	phase line
BN	battalion	SEAD	suppression of enemy air defense
BTRYS	batteries	SOR	state of readiness
DIV	division	SPT	support
DS	direct support	UAS	unmanned aircraft system
FARP	forward arming and fueling point	VIC	vicinity
FWD	forward	WCS	weapons control status
GS	general support	WPNS	weapons

4-17. MDMP Step 5–COA comparison. COA comparison is an objective process to evaluate all COAs independent of each other and against set evaluation criteria approved by the commander. The staff compares the strengths and weaknesses of each to identify the one that offers the best possibilities to accomplish the mission. The staff identifies its preferred COA. The staff then delivers a decision briefing to the commander, including the following:

- Commanders' intent of higher and next higher commanders.
- Status of the force.
- Current IPB.
- COAs considered, including the assumptions used, a summary of the wargame for each COA, the advantages and disadvantages of each COA and finally, the recommended COA.

4-18. MDMP Step 6–COA approval. After the decision briefing the commander selects the COA to best accomplish the mission. After approving a COA, the commander issues the final planning guidance, a refined commander's intent and any additional guidance on priorities for defense, prepares orders, and directs and supervises rehearsals. Based on the commander's decision and final planning guidance, the staff issues an additional WARNORD to the batteries.

4-19. MDMP Step 7–Orders production, dissemination, and transition. Time permitting, the battalion commander and staff meet with the battery commanders to brief them on the commander's concept and the decision support matrix. After this briefing, the battery commanders backbrief the battalion commander. The battalion commander allocates sufficient time for the battery commanders to plan and prepare their units; generally, one-third of the time is reserved for battalion planning and two-thirds for battery planning and preparation. If time is constrained, this process may be abbreviated or modified.

4-20. The SHORAD battalion commander develops an air defense operations order for the battalion and an air defense appendix to the fires and protection annexes (in conjunction with the AMD section) for the division operation order (OPORD). The operations order serves as a directive to subordinate units to relay the commander's orders. It is intended to coordinate the activities of all organizations participating in the specified mission. The staff prepares, coordinates, authenticates, reviews, publishes and distributes written operations order and plans. Each section of the staff will contribute to the main body or a specific annex, containing information pertinent to its field of expertise. Appendix D describes the formats of ADA orders.

SHORT-RANGE AIR DEFENSE BATTERY PLANNING

4-21. Air defense mission accomplishment depends upon battery commanders and platoon leaders carrying out mission-type orders on a constantly changing battlefield. Battery and platoon planning is an interactive

process. SHORAD battery employment must support the higher ADA plan to defeat the threat. Simultaneously, battery commanders and platoon leaders must integrate their operations into the supported asset's operation plans. Without this coordination of effort, the chances of fratricide of friendly air increase and mission success for both the battery and supported asset decreases. The discussions that follow focus on a SHORAD battery placed in direct support of a BCT.

4-22. The battery may be employed as a separate task-organized unit, as a subordinate element of its parent battalion, or as part of an ADA task force defending maneuvering forces; maneuver force semi-fixed assets such as assembly areas, refuel or rearm points, bridge crossing; or the more fixed assets such as air bases. Coordination and support requirements will vary accordingly. However, regardless of the type of asset, the battery receives its initial mission from the SHORAD battalion (or task force) and then coordinates with the supported asset for additional information and direction. For instance, the battery commander and executive officer work with the BCT staff and synchronize their supporting air defense plan with the BCT's scheme of maneuver, developing an operations order and decision support matrix for the battery and an air defense appendix to the BCT operations order. The battery commander is responsible for ensuring the battery provides the required protection to the BCT and its subordinate elements. When the platoons are placed in support of maneuver battalions, or maneuver battalion task forces, the platoon leaders receive their guidance from the battery commander and support the maneuver formations' planning, developing air defense operations orders and appendices.

4-23. The battery commander and platoon leaders use TLPs in developing their plans. SHORAD battery and platoon planning is part of the supported unit MDMP process and not separated from or independent of it. The battery executive officer is typically the ADA officer participating in a BCT's MDMP process. The ADA platoon leader participates in the maneuver force's MDMP process.

4-24. Though presented as sequential steps, the execution of the TLP steps, presented below, may vary depending upon METT-TC. Much of the following discussion is expressed in terms of the battery operating as a task-organized unit, coordinating directly with the supported BCT. If operating as part of its parent battalion or a task force, most of the planning and coordination would be conducted with the battalion or task force. Though platoon leaders are not specified in TLP steps below, they take actions similar to those of the battery commander, coordinating with the battery commander and the supported maneuver formation.

4-25. TLP Step 1–Receive the mission. The battery commander meets with the SHORAD battalion commander and S-3 to receive the battery mission. The battalion commander briefs the battery commander on the battalion's mission and commander's intent and the battery's overall mission in support of the designated asset. As the battery is to be employed as a task-organized unit, the battalion commander reviews command and support relationships to ensure an understanding of authorities. A battery employed as a task-organized unit in defense of a BCT is generally placed in direct support.

- The battery commander meets with the battalion S-2 to discuss the air IPB for the battalion's AO and any specific data on air activity around the BCT which the battery will defend (see Appendix C for the air IPB procedures and considerations). The commander needs to know the types of air threats that the battery may face, the capabilities and doctrinal tactics of these threats, projected air bases or launch sites, and potential air avenues of approach. The commander and S-2 conduct a general terrain analysis of low-level approaches, those approaches formed by terrain, navigational aids, like rivers and roads, and attack profiles that lead into the target area. Severely restricted or restricted terrain is analyzed in terms of threat aircraft service ceilings. UAS employment is analyzed based on loiter time and surveillance range and flight range and time. After identifying when and where enemy aerial platforms are expected to approach and to be employed, the commander makes predictions on enemy activities by comparing what the enemy can do with what he has and intends to do. By mentally "wargaming" enemy intentions, the commander refines the NAIs generated by the staff during the initial staff analysis and IPB. NAIs are tools to know when, where, and what to look for. Analysis of activities or events within them confirms or denies predicted enemy intentions on the situation template.
- The battery may be placed in support of a BCT or a fixed asset, or it may be attached to or reinforce an ADA unit. The battery commander coordinates with the commander of the supported maneuver force or fixed-asset to receive the operation plan and critical assets to be defended (generally referred to as a protection prioritization list). A BCT typically has multiple assets requiring

protection, such as the maneuver battalions, the brigade command post, the brigade ammunition resupply point, and a bridge crossing site. A fixed-site asset will also have multiple subordinate elements within its area that require protection, vice the entire site; on an airfield, these may include the control tower, aircraft hangars, and the base operations center.

4-26. TLP Step 2–Issue warning order. The initial WARNORD alerts the platoon leaders to the upcoming mission. The WARNORD addresses, at a minimum, movement time, platoon task organizations, commander's location, and support relationships. The commander ensures that the platoon leaders understand the commander's intent.

4-27. TLP Step 3–Make a tentative plan. The commander considers the intelligence, operational, logistical, and security requirements in the battery plan. The battery commander identifies key items requiring coordination and acceptance by the supported commander.

- The commander checks with the battalion S-2 for the latest air IPB information. The commander also coordinates with the supported BCT's or asset's S-2 and S-3 personnel to review the latest ground intelligence assessments and obtain any information on air activity. The commander should be cognizant of planned friendly air operations as well as past, current, or potential enemy air actions. Additionally, when in support of a BCT, the commander should be briefed on the BCT's current and upcoming plans.
- The battery commander reviews the supported commander's protection prioritization list and drafts a protected asset list. This initial list proposes which assets can be defended by the battery, considering the AMD principles and tenets of employment. The battery commander meets with the BCT commander and staff (or those of another supported asset) and briefs them on the proposed list. The battery commander identifies the amount of defense the battery can provide to the defended assets and recommends the sensors to be employed. The platoons are task organized to meet the levels of protection required for the cited assets. The BCT commander approves the list or requests adjustments. The battery commander will agree to the adjustments or advise the BCT commander of potential risks to the mission if such adjustments were made. At the conclusion of the briefing, the protected asset list is confirmed.
- Based on the identified NAIs in the BCT's area, the commander identifies target areas of interest, geographic areas where the battery can delay, disrupt, destroy, or influence the enemy activity or course of action. The commander develops a decision support template to determine the most likely courses of enemy action. The decision support matrix is developed by the battery commander to illustrate the scheme of maneuver to counter the enemy's COAs.
- The battery generally relies on the BCT's brigade support battalion for feeding, Army-common supplies and repair parts, maintenance of common Army equipment, and petroleum products. The battery must rely on its parent battalion for air defense-specific maintenance and resupply. Contact teams and "push packages" may be positioned with the battery to provide on-site support. Contractor technical support may also be provided if available. Resupply of ammunition requires emphasis. The commander coordinates with the SHORAD battalion S-4 to identify where potential resupply points will be established and the method of resupply-pick-up or deliver.
- The commander must be cognizant of the BCT's security plan and by-pass criteria for enemy units to determine how the battery needs to operate with respect to any security consideration. This will require further coordination once the battery arrives on site. The commander must also consider any requirements for force protection support from the asset. For instance, if there is a need for an air defense sensor to be placed outside the secured area of the asset, the sensor and crew may require some protection from enemy ground forces beyond that which the battery is capable of providing.
- The battery commander briefs the battalion commander on the plan, as time and the situation permits. The battalion commander will provide any additional guidance or updates on the battalion's and division's plan.
- The battery commander briefs the key battery and platoon leaders on the plan. The commander restates the battery's mission; addresses the assets to be defended; presents the plan of defense, to include platoon responsibilities and positions; identifies the key battery locations; and provides the movement order (start points and times, routes, and release points).

4-28. TLP Step 4–Initiate movement. The battery begins its movement from the port of debarkation, assembly area, or other start point to the BCT's location. The deployment considers route suitability and the terrain to be negotiated. Reconnaissance, selection, and occupation of position (also known as RSOP) procedures, in accordance with the battery's standard operating procedures, are initiated.

4-29. TLP Step 5–Conduct reconnaissance. A leader's reconnaissance is conducted to verify the plan. The battery commander and platoon leaders must determine if the tentative map-selected locations will allow immediate occupation for accomplishment of the mission. Ground reconnaissance verifies whether the terrain provides good natural concealment; has access roads for primary and alternate routes into the position; provides good observation, fields of fire, and areas of search; and has firm ground that will support the weight of the equipment.

- Coordination is effected with the supported commanders to ensure that there is no conflict in positioning the battery and platoons' shooters and sensors.
- A back-brief takes place on terrain that offers visibility to the battery or platoon AO. This sequence will allow the commander and platoon leaders to further adjust the plan as necessary to synchronize platoon fires, identifying dead spaces and defense weaknesses (ground and air).

4-30. TLP Step 6–Complete the plan. The battery commander briefs the BCT commander and staff on the air defense plan. The commander ensures that requested support has been identified and acted upon by the BCT. After final approval of the plan by the BCT commander, the battery commander briefs the battalion commander of any adjustments to the initial battery plan.

4-31. TLP Step 7–Issue order. The battery commander issues the order to the battery and platoon leaders. The platoon leaders, in turn, brief their subordinate leaders. The plan may be issued in hard copy, digitally, or verbally. If time permits, hard copies or digital versions are transmitted. Verbal transmission may be required when time is limited.

4-32. TLP Step 8–Supervise and refine. The battery commander and platoon leaders conduct back briefs with their subordinates immediately after the order has been issued to ensure the mission, intent, and tasks to subordinate units are understood.

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Chapter 5

Preparing for Short-Range Air Defense Operations

Following the planning of the operation, the next step prepares a SHORAD unit to execute that operation. Preparation consists of those activities performed by units and Soldiers to improve their ability to execute an operation (ADP 5-0). A SHORAD battery may operate as part of an ADA task force or as a separate unit supporting a designated asset, with its platoons assigned to defend elements within that asset. This chapter focuses on the SHORAD battery and platoons as separate units and their preparatory considerations and actions in support of a BCT and its subordinate maneuver battalions. For information on SHORAD units operating as part of an ADA task force, see FM 3-01.

INTRODUCTION

5-1. The time that is left between finalizing the planning (with a commander's decision including the commander's intent and concept of operations) and the actual start of the execution of the operation determines how extensively and thorough the preparation can be performed. Therefore, the SHORAD battery commander needs to develop and communicate the commander's intent for preparation activities succinctly but with sufficient detail to ensure that the concept is understood by the battery and platoon leaders.

5-2. All activities during the preparation phase are to validate the planning results by selecting and assessing positions for sensors, weapon systems, headquarters and C2 nodes, and routes and areas for such sites and their supporting elements (for example, maintenance areas). In addition, a visual inspection of all terrain aspects, in the actual and predicted weather conditions, will contribute to validating an adversary's projected COAs and the commander's own developed COAs. All validating results from this preparation phase are used to review, refine, and adjust, as necessary, the initial plans and develop more detailed taskings for the subordinate and supporting units.

5-3. The need for continuous coordination between the SHORAD battery and its supported unit or asset, the SHORAD battalion, adjacent ADA units, and other air control elements cannot be overemphasized. Initial coordination conducted during the planning phase is a prelude to that which must be performed throughout the preparatory phase and subsequent execution of the operations.

COORDINATION

5-4. During planning, coordination of efforts between the SHORAD unit and the supported asset is established by the integration of the SHORAD battery commander into the BCT's operational planning process. The battery commander and platoon leaders continue interacting with their supported counterparts to advise them of the air defense capabilities they will bring in support, the current and projected air threat situation, and the local air defense posture. Commanders share and synchronize plans, commanders' intents, and operational concepts. SHORAD leaders must be cognizant of the friendly and enemy ground situation, while the supported commanders must be informed of the air environment and pertinent air defense directives. Situational information must identify who is operating where, when, and in what strength. SHORAD commanders must advise the supported commanders of any logistical support requirements, other than SHORAD-system specific items, and potential needs for force protection beyond the inherent capabilities in the SHORAD unit. The more frequent and thorough the interplay between the supported and supporting commanders, the more likely the potential for mission success.

5-5. The battery commander must be in constant communications with the supported unit's air defense airspace management cell, in the case of a maneuver BCT, maneuver enhancement brigade, field artillery brigade, combat aviation brigade, division artillery, or with other ADA personnel (if present) in a fixed site's operations center, such as a base defense operations center. The air defense airspace management cell or its counterpart is the conduit for air defense information within the supported asset. Cell ADA personnel keep the battery commander informed of current and future brigade operations. The battery commander, in turn, advises the supported asset of the SHORAD unit's on-going operations, capabilities, and limitations. The battery commander develops the air defense plan for the supported unit and coordinates with the air defense airspace management cell to ensure that the plan is nested with supported unit's operation plan.

5-6. The ADAM cell or operations center personnel may also be aware of another AMD unit or units operating within the asset's area and will so advise the SHORAD battery commander. The battery commander should coordinate with that commander to synchronize and ensure mutually supporting operations.

RECONNAISSANCE

5-7. Reconnaissance provides information about the AO. Preparation activities begin with a reconnaissance of the route to the area. The available preparation time and resources will determine to a large extent how (extensive and detailed) the reconnaissance activities can be performed and therefore influence the choice of reconnaissance type. There are three types of reconnaissance: map, aerial, and ground.

MAP RECONNAISSANCE

5-8. Map reconnaissance is the fastest way to conduct a reconnaissance and will always precede any other type of reconnaissance. When geographical limitations hamper physical reconnaissance, map reconnaissance is the only way. The positions of SHORAD sensors and weapon systems are plotted on a map and represent the best locations for providing air defense. Detailed physical and digital maps will provide specific information on terrain, buildings, roads, rivers, forest, and other terrestrial and man-made features. The most current and detailed digital and physical maps can be requested from the unit's space element. Overlapping current imagery and terrain data, space elements can provide the most accurate maps possible even if the ground topography has changed due to a recent battle or geographic event. The platoon leader must consider the AMD employment guidelines and tenets, weather, and mission variables in this initial reconnaissance.

5-9. Alternate positions should be identified at this time. After the weapon positions are plotted on a map, check points and primary and alternate routes are selected and plotted. The platoon leader identifies a reconnaissance route by conducting a map reconnaissance to the proposed area. Positions selected by map reconnaissance must be confirmed by additional reconnaissance if the tactical situation allows.

AERIAL RECONNAISSANCE

5-10. If time is limited and an aircraft is available, the battery commander or the reconnaissance officer (generally a platoon leader) can see the terrain. Aerial reconnaissance provides the fastest way to see the terrain, but is likely unavailable to SHORAD leaders. Even when available, aerial reconnaissance has significant limitations. For example, fields of fire, ground conditions, and local threat cannot be determined from the air. In addition, aircraft activity, to include that of UASs, may expose friendly interest in a particular area.

GROUND RECONNAISSANCE

5-11. Ground reconnaissance is an on-site examination of the terrain. A ground reconnaissance is the most accurate and desirable type of reconnaissance, though the slowest method. The route can be evaluated for road worthiness, obstacles, choke points, and key terrain. Firing positions, fields of fire, and air avenues of approach can be analyzed. However, ground reconnaissance is time-consuming and dangerous. Covering the distances over potential routes and checking alternate positions takes time. The small reconnaissance party could be subjected to threat observation en route or at the objective area.

5-12. Map reconnaissance is an important part of the preparation of the actual ground reconnaissance. The reconnaissance party will benefit from a detailed and thorough map reconnaissance.

5-13. Ground reconnaissance is performed to select the best SHORAD positions, march routes, start points, release points, checkpoints, sensor positions, and communications sites. The SHORAD battery commander or platoon leader should coordinate with the local maneuver commander and the supported element S-3 to determine what areas maneuver units plan to occupy, or, when in support of a fixed asset, with the on-site commander and base defense operations center to identify the best locations for SHORAD weapon systems and sensors. Mutual agreement must be established to make the best use of the available terrain.

5-14. The reconnaissance officer prepares for a ground reconnaissance by, at a minimum:

- Selecting personnel and equipment to conduct the reconnaissance and assigning tasks to the reconnaissance party personnel. The unit SOP establishes the normal composition and responsibilities of the party.
- Determining in detail the elements, positions, areas, routes, and related terrain considerations.
- Determining the priority order of the elements to be emplaced and setting up the timeline accordingly.
- Determining the products that must be developed as a result of this reconnaissance; products should include a list of sensor and weapon locations, sketches of these locations, sketches of the areas and routes, and identification of restrictive terrain locations.
- Coordinating instructions on C2, communications, and rendezvous locations with team members and higher headquarters (SHORAD battalion or battery). The higher unit and/or supporting unit can order a backbrief on previous reconnaissance in the area.
- Developing and issuing a reconnaissance plan/order with all of the above information.

5-15. As soon as preparations are complete, the reconnaissance party leaves. It ensures that the selected primary route meets equipment requirements (height, weight, width, and slope to be traversed), is passable, and avoids possible ambush locations. Road guides are positioned, as required.

5-16. As the reconnaissance party approaches the new location, the team leader must ascertain if the tentative map-selected locations will allow immediate occupation for accomplishment of the mission. Ground reconnaissance verifies whether the terrain provides good natural concealment; has access roads for primary and alternate routes into the position; provides good observation, fields of fire, and sectors of search; and has firm ground that will support the weight of the equipment.

DEFENSE DESIGN

5-17. Defense design for ADA is a strategy for defense based on a compiled list of tasks required to protect against air and missile threats in support of operations. SHORAD units are positioned to best protect the designated assets against the projected air threats in accordance with detailed defense designs. Sensor and weapon system placements are selected to maximize surveillance, tracking, and engagements. In designing a defense, sensors are positioned to provide surveillance and fire control tracking capability sufficient to protect assigned assets and prevent gaps in the coverage. Weapon systems and teams are positioned to optimize the defense of the defended assets, enabling lethal coverage over the assigned assets and extending firepower through as much of the defense coverage area as possible.

5-18. The AMD employment tenets and the latest intelligence assessments inform the defense design. Considerations for the defense design should also include the quantity, capabilities, and potential locations of combined arms for self-defense teams. Interspersing these teams with SHORAD systems will further enhance defenses.

SELECTING POSITIONS

5-19. Site selection begins upon receipt of a movement order. Careful consideration must be given to ensure that the selected positions for the sensors, launchers, and C2 nodes are oriented in the direction of the expectant air threats, are capable of maintaining required communications with the battery and supported asset's C2 elements, and, above all, can collectively provide the required defense. The need for dispersion of equipment, camouflage throughout the site, appropriate deception measures, and operational security must also be addressed.

5-20. Sensors must be carefully placed to ensure optimal surveillance of the area. Their positioning is generally the first consideration in establishing a defense. Sentinels have a 360-degree capability to detect and classify aerial threats. Lightweight Counter Mortar Radars in Land-based Phalanx Weapon System units provide 360-degree detection of RAM threats. See ATPs 3-01.48 and 3-01.60, respectively, for more information on positioning Sentinel and the Lightweight Counter Mortar Radar.

5-21. Considerations in selecting launcher positions are dependent upon the type of SHORAD weapon to be emplaced, asset to be defended, and the threat types. Positions should have clear observation and primary and secondary fields of fire, communications with the platoon command post and early warning sources, and available cover and concealment to facilitate survivability. Launchers positioned to counter potential rotary- and fixed-wing threats are generally near projected air avenues of approach. These positions may require adjustments if UASs are also a threat, as UASs can surveil or attack from any direction.

- M-SHORAD and Avenger systems and Stinger man-portable air defense (hereafter referred to simply as Stinger) teams require frequent movements once they commence engagements, as the firing signature of their missiles discloses their positions. Units should have primary, alternate, and supplementary positions with planned routes between them. A primary position is one from which the M-SHORAD, Avenger, or Stinger weapon system intends to accomplish its tactical mission. An alternate position is one to which the system moves when the primary position becomes untenable or unsuitable for carrying out the assigned mission. The primary positions should generally be near the plotted positions in the original defense design, at distances determined by clear line-of-sight, security, and survivability considerations; if not near the plotted positions, the defense may need to be redesigned. Communications must also be maintained with the other squads in the platoon.
- The Land-based Phalanx Weapon System's limited mobility and emplacement requirements may restrict its positioning options. Its position should be close to, but set back from, the perimeter of the base or other static asset which it defends. Its communication requirements include a linkage to the base defense operations center.

5-22. The primary consideration in selecting the headquarters or C2 node site is the ability to communicate with the supported asset and higher- and lower-echelon SHORAD units. Dependent upon terrain and the locations of the other SHORAD and supported asset's elements, the headquarters or C2 node should be positioned where it can best control the SHORAD units and communicate with the supported element. Other considerations for the site selection include available cover and concealment, alternate entrance and exit routes, and defensibility against ground attacks.

5-23. After selecting the positions, the platoon leader ensures the ground guides know exactly where all the vehicles and equipment should be emplaced. Preparation should include marking the location of each major piece of equipment. Everyone at the new position is given the new challenge and password, information on any known enemy activity in the area, and the approximate arrival time, location, and order of vehicles for the main party.

5-24. If time is limited and the unit must move before the reconnaissance party returns, road guide positions are selected, and Soldiers necessary for these tasks are included in the reconnaissance team. Actual inspection of the chosen routes and positions on the ground is desirable to confirm selections made from the map, or to make necessary adjustments in plans.

5-25. Key leaders provide the results of the reconnaissance and relay appropriate instructions for the movement of the main body. The platoon sergeant organizes the vehicles as ordered by the platoon leader. Platoon vehicles use movement techniques dictated by the factors of METT-TC; tactics, techniques, and procedures; and the unit SOP.

OCCUPYING POSITIONS

5-26. The occupation of positions should be coordinated with the supported unit to avoid mutual interference. When the mission-configured platoon arrives at the position, all vehicles move off the road into the position, without halting and without closing the interval between vehicles. The unit SOP should state the requirements and the priorities for occupying positions.

5-27. The first consideration is emplacing the sensor or sensors. Sensors are emplaced on terrain that provides the best, longest range line-of-sight in all directions. Sentinels should be positioned within the supported asset's AO along likely enemy air avenues of approach to surveil, detect, and provide early warning. Sentinel should not be collocated with any command post due to an enemy's ability to target emission signatures. The Sentinel's rotating antenna must remain clear of obstructions while operating to optimize the radar tracking range and air picture reliability. The Lightweight Counter Mortar Radar should be emplaced on a hill, rooftop, or flat plain. Any radar's performance is degraded when placed near obstructions, such as buildings, trees, vehicles, or power lines. The radars should be emplaced no closer than 1,000 meters from one another, and operating frequencies should be separated as much as possible.

5-28. The SHORAD platoon leader uses the ADA employment tenets to position launchers in accordance with METT-TC. The most important tenets for the M-SHORAD platoon leader to consider are normally early engagement, weighted coverage, and defense in depth. The Avenger platoon leader stresses mutual support, or overlapping coverage when possible, to enhance engagement opportunities. If fixed-wing aircraft are considered a major threat, the platoon may weight coverage to the most likely air avenue(s) of approach. The Land-based Phalanx Weapon System platoon leader positions the system launchers in pairs with mutual support if possible, or overlapping fires between pairs as a minimum, for RAM engagements given the relatively short range of the Land-based Phalanx Weapon System. The Land-based Phalanx Weapon Systems should be emplaced inside the perimeter, but no closer than 500 meters from the perimeter when possible. Gun system emplacement requires relatively flat (±5-percent slope) on hard-packed ground or pad. During emplacement, the unit will perform gun system mapping to ensure that no coverage areas are in the "no fire zone." Stinger teams are generally positioned along the most likely air avenues of approach. Care must be taken in positioning M-SHORAD, Avenger, Stinger systems to avoid placing them near terrain features easily recognized from the air. Positions are more vulnerable to enemy fires once spotted near an identifiable object.

5-29. When all squads have reported that they are in position and capable of providing coverage of their assigned sectors, the platoon leader will report the platoon "ready for action" to the supported force commander. Once in place, SHORAD units should implement passive defense measures, such as camouflage and protective works, and continuously improve them as long they remain at a location. Crew chiefs begin improving positions as dictated by the SOP or additional orders. Position improvements include:

- Using camouflage nets and supplementing them where possible with indigenous materials (for example, branches, leaves, and snow). These materials should be from the vicinity of the squad so they will blend naturally into the surroundings.
- Preparing deliberate fighting positions.
- Providing cover for M-SHORAD and Avenger systems by having the vehicles dug in, hull down, for protection from blast, fragmentation, and small arms. Engineer support is required and should be requested through the supported unit. If such support is not available, the vehicles should be placed in defilade positions.
- Developing alternate and supplementary positions. Work is initiated as early as possible.

5-30. A total security plan is then placed in effect. Positioning SHORAD units with maneuver forces or on installations allows the units to take advantage of security measures and the security forces of those assets. However, regardless of those added forces, the platoon must provide its own local security. This includes establishing observation points, positioning automatic weapons overlooking the main avenue of approach and alternate routes into the position, and initiating other security positions around the area to preclude gaps in the perimeter. A sector of fire, with a primary target line, is assigned to each squad, and communications are established with all the positions. Range cards should be prepared. At a minimum, range cards should indicate ranges to critical points on all likely avenues of approach, dead spaces, and likely targets (air and ground). Obstacles enhance security by blocking, disrupting, or canalizing enemy attacks. All obstacles must be coordinated with the supported asset's S-3 and the engineer officer. Other measures taken should also be integrated with the ground defense plan of the supported asset. Emission control measures should be developed and initiated, when directed, to reduce the electromagnetic signatures of the sensors and command posts.

REHEARSALS

5-31. Units conduct combat rehearsals to gain agility, ensure synchronization, increase individual and team initiative, and improve the proficiency of a force. Rehearsals are a critical part of the preparation and supervision steps in troop-leading procedures and occur throughout troop-leading steps. Commanders and leaders can determine the validity and suitability of their plan's concept of the operation, in addition to identifying any shortcomings in the concept not previously recognized, while performing their rehearsals.

5-32. Rehearsals allow leaders and their Soldiers to practice key aspects of the concept of operation. These actions help Soldiers orient themselves to their environment and other units before executing the operation and build a lasting mental picture of the sequence of key actions within the operation. Rehearsals are the commander's tool to ensure subordinate leaders understand the commander's intent and the concept of operations.

5-33. SHORAD units and leaders participate in the supported asset's rehearsals as well as conduct their own rehearsals. The challenge for SHORAD leaders and Soldiers is to understand the SHORAD rehearsal plan and schedule as well as the supported asset rehearsal plan and schedule. The rehearsal execution section addresses rehearsal sequences and SHORAD rehearsal execution considerations as well as the supported asset's rehearsal plan and schedule. During final coordination, the supported force conducts its briefing and rehearsal. Following the supported force rehearsal, a SHORAD rehearsal is conducted. The leaders should then update their air defense plans (or decision support matrix) based on changes from the various rehearsals and concept of support for critical logistics.

5-34. Planning and preparations are crucial to successful rehearsals. Rehearsal goals must be clearly defined and achievable, and individual responsibilities for conducting rehearsals must be identified.

5-35. Appendix D provides rehearsal guidelines for SHORAD leaders and their staff; it focuses on preparing SHORAD commanders and leaders to plan for and conduct effective rehearsals. Rehearsal preparations are addressed with a focus on checklists to make rehearsal execution run smoothly. The rehearsal execution section addresses rehearsal sequences and SHORAD rehearsal execution considerations. Each type of rehearsal is defined, followed by SHORAD considerations.

TRAINING

5-36. Training is a fundamental part of preparations and the means to the successful conduct of rehearsals and, ultimately, missions. SHORAD commanders must maintain vigorous training programs that sustain individual Soldier skills and team proficiency.

5-37. Training is the cornerstone of readiness. To achieve and maintain a high degree of readiness, SHORAD units should train in the most efficient and effective manner possible. SHORAD leaders should focus their unit training efforts to maximize training proficiency. Evaluating, assessing, recording, and reporting unit training proficiency and training readiness requires they have a firm understanding of the training fundamentals in ADP 7-0.

5-38. SHORAD gunnery tables provide guidance for individual and collective training and the required certifications. Gunnery tables are prescriptive while still allowing flexibility in selecting standardized engagements from a menu to enable achievement of training objectives within the scope of the commander's intent. Gunnery is a continuous process based on the unit's mission set and proficiency level to build and maintain lethal sections and formations. Gunnery must be incorporated into training at all levels with the necessary frequency and repetition to enable mastery.

5-39. SHORAD leaders must focus their units' efforts to optimize available time, ensuring units train the right tasks to meet mission requirements. Commanders look for every opportunity to coach and teach their subordinates. They give their subordinate leaders the commander's intent and the resources—including time—to plan, prepare, and conduct the training necessary to develop unit proficiency. Commander involvement makes a quantitative and qualitative difference in unit training and leader development.

5-40. Training should also be conducted with supported and supporting units. Leaders and Soldiers should understand the supported unit's plans and ensure that SHORAD operations are closely coordinated with and integrated into them. In addition, conducting collective training with supporting sustainment units will

facilitate successful and expedited execution of such tasks as resupply, rearming, refueling, and medical evacuation.

ORDERS AND APPENDICES

5-41. To execute a plan, the SHORAD commander, staff, and subordinate leaders must have a thorough understanding of the different types of ADA orders, annexes, and appendices received and those to be issued. The commander and subordinate leaders must be able and trained to organize the thoughts and concepts that were collaboratively developed and convey them in a concise and informative manner to their subordinates and any supporting units.

5-42. Appendix B discusses the different types of orders and appendices that the SHORAD leader and staff use. Formats and examples are also included.

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Chapter 6

Executing Short-Range Air Defense Operations

This chapter addresses the types of operations that SHORAD forces conduct in decisive actions. It focuses on the roles and contributions of the SHORAD battery and platoon in offensive, defensive, and stability operations. Each operation is introduced, and general SHORAD considerations for each follow. The various types of each operation are then addressed, with more focused discussions of SHORAD in each. The generic term "SHORAD" is henceforth used throughout this chapter to refer to dedicated SHORAD systems, batteries, platoons, and teams in general. The specific SHORAD weapon, sensor, or unit is cited when the discussion only applies to that element.

DECISIVE ACTION AND GENERAL SHORT-RANGE AIR DEFENSE CONSIDERATIONS

6-1. *Decisive action* is the continuous, simultaneous execution of offensive, defensive, and stability operations or defense support of civil authority tasks (ADP 3-0). The simultaneity of decisive action varies by echelon and span of control. At lower echelons, an assigned task may require all the echelon's combat power to execute that task in one operation. For example, a SHORAD platoon, by its very nature, provides defense of a designated supported unit or asset in any type operation, but does not have sufficient capacity to support a force in two simultaneous operations.

6-2. SHORAD batteries, platoons, squads, and teams are placed in support of designated assets and positioned where they can best conduct their primary mission-deterring, denying, or defeating air threats-regardless of type operation. SHORAD considerations are presented for offensive, defensive, and stability operations in the following sections. There is no discussion of defense support of civil authority tasks, as these tasks are conducted by all Soldiers, regardless of branch or echelon.

6-3. In conducting decisive actions, SHORAD leaders must advise supported units on active and passive AMD resources and procedures, especially those assets without dedicated ADA protection. SHORAD leaders inform these supported elements of the locations of the SHORAD weapons and their capabilities, AMD warning terms and procedures, passive defense measures that should be initiated and enhanced, and self-defense actions that all units can execute, irrespective of the presence or absence of dedicated SHORAD units. Continuous coordination is required.

6-4. There are three primary ROE which are applicable to SHORAD units and non-dedicated air defense elements (known as combined arms for air defense [CAFAD]) in the tactical fight: the right of self-defense, hostile criteria, and weapons control status.

- The right of self-defense is never denied. Unit commanders always retain the inherent right and obligation to exercise unit self-defense in response to a hostile act or demonstrated hostile intent. Unless otherwise directed by a unit commander, military members may exercise individual self-defense in response to a hostile act or demonstrated hostile intent. When individuals are assigned and acting as part of a unit, individual self-defense should be considered a subset of unit self-defense. As such, unit commanders may limit individual self-defense by members of their unit.
- The exact criteria enabling the fire unit to declare a target hostile may vary with the tactical situation. Some considerations in determining if a target is hostile are it is attacking friendly elements; violating airspace coordinating measures; visually identified as hostile; and responding improperly, or not at all, to identification, friend or foe (known as IFF) interrogation.

6-5. Weapons control status. SHORAD weapons are generally placed in weapons tight. See para 1-17 for a description of weapons tight and the other two control statuses. Reconstitution efforts are considered for each type of offensive and defensive operation. SHORAD commanders must plan and implement reorganization and regeneration measures for subordinate forces that have suffered attrition from enemy attacks. See FM 4-0 for additional information on reconstitution.

OFFENSIVE OPERATIONS

6-6. An *offensive operation* is an operation to defeat or destroy enemy forces and gain control of terrain, resources, and population centers (ADP 3-0). The offense is the ultimate means commanders have of imposing their will on enemy forces. Maneuver forces conduct offensive tasks to defeat and destroy enemy forces as well as gain control of terrain, resources, and population centers. Commanders seize, retain, and exploit the initiative when conducting the offense. Taking the initiative from an enemy force requires conducting offensive operations, even in the defense.

6-7. SHORAD forces do not generally conduct offensive tasks. However, M-SHORAD, Avenger, and Stinger units enable offensive operations by providing defense against enemy air surveillance and attacks. Land-based Phalanx Weapon System units do not have the mobility to support offensive operations. Air defense tasks to enable offensive operation include:

- Planning air defense coverage to provide freedom of maneuver for forces and their critical assets, to include denying surveillance by threat UASs.
- Developing air aspects of the IPB in conjunction with the S-2.
- Developing air defense priorities protecting forward based infrastructure, such as lines of communications and command nodes, from aerial attack.
- Planning early warning and surveillance.
- Maneuvering to maintain air defense coverage.

6-8. M-SHORAD is the predominant air defense weapon system in offensive operations. M-SHORAD's mobility, survivability, and shoot-on-the move capability make it extremely effective in defense of maneuvering forces and other assets that have the potential to move forward rapidly, such as reserves, artillery, and maneuver support elements.

6-9. Understanding the supported unit's scheme of maneuver is the first step in providing adequate air defense. Air defense priorities are established to ensure the effective and continuous support for the offensive operation. The M-SHORAD or Avenger battery commander and the supported force's S-3 develop and recommend priorities to the supported commander. Command or support relationships between SHORAD units and other units are directed by the S-3 in coordination with the SHORAD commander.

6-10. The SHORAD battery commander must weigh the main effort and preserve the supported force's ability to maneuver. Because movements to contact are characterized by rapid and aggressive action, the commander should task-organize for maximum flexibility and plan for decentralized execution. Since the lateral movement may be to the left or to the right, the commander must read the battlefield, analyzing the terrain throughout the entire route of march and looking for key indicators to determine what the enemy is doing. The battalion S-2 will keep the commander informed of changes in intelligence assessments. The battalion S-4 will keep the commander updated on maintenance, ammunition, and fuel status as well as projected resupply. Decision support, synchronization, and execution matrices are tools commanders use to aid their flexibility and reaction time to contingencies and plan branches and sequels.

6-11. SHORAD systems (except for Land-based Phalanx Weapon System) displace frequently, whether deployed in forward or rear areas. They move to support the maneuver force plan in response to mission changes. They also move to enhance survivability.

6-12. There are four types of offensive operations: movement to contact, attack, exploitation, and pursuit. For more information on offensive operations, see ADP 3-90.

MOVEMENT TO CONTACT

6-13. *Movement to contact* is a type of offensive operation designed to develop the situation and to establish or regain contact (ADP 3-90). The goal of a movement to contact is to make initial contact with a small element while retaining enough combat power to develop the situation and mitigate the associated risk. Commanders conduct a movement to contact when an enemy situation is vague or not specific enough to conduct an attack. A movement to contact may result in a meeting engagement. Meeting engagements are combat actions that occur when an incompletely deployed force engages an enemy at an unexpected time and place.

6-14. In a movement to contact, forces deploy from assembly areas in attack formations that facilitate movement and mass sufficient combat power to ensure decisive victory. Commanders adjust their tempo appropriately as they anticipate closing with enemy forces. They decide where their forces can deploy into formations that facilitate the initial contact and still provide freedom of action for the bulk of their forces.

6-15. M-SHORAD platoons are integrated with the maneuvering forces. M-SHORAD platoons must be able to posture themselves quickly to counter any enemy surveillance or attack efforts. They are positioned based on the maneuver force's type of travel (for example, deliberate movement when contact with enemy forces is likely) and formation. M-SHORAD systems will generally be placed behind the lead elements of the supported force during movement to provide overwatch of enemy air avenues of approach. Air defense coverage is extended forward of the lead elements.

6-16. Avengers may be deployed with the covering force, along the flanks, or in overwatch positions of the maneuver force. Avenger fire units are light-skinned vehicles and should not be integrated into the maneuver force when contact is expected. The Avenger may be positioned on the maneuver force flank and rear where it is best suited to defend enemy air avenues of approach. Positioning of the Avenger fire units is dependent on METT-TC factors. The battery commander or platoon leader makes a decision based on preventing enemy aircraft from successfully observing or attacking the vulnerable moving elements.

6-17. During the movement, the Avenger platoon will be employed to protect the supported unit's critical assets, such as the maneuver formations executing the main effort, artillery units, and C2 elements. The Avenger can be used to provide coverage for choke points along the march route or to defend the maneuver force as it moves prior to contact. The platoon leader should position the squads and teams so that two-thirds of the weapon system's effective range extends in front of the maneuver force, if possible.

6-18. Stinger teams may also be involved. They may be used to augment Avengers at choke points but will primarily be used to protect C2, maneuver support, and fire support assets. Stinger teams must be careful not to get caught up in the direct fire fight. Once contact has been initiated, teams need to assume overwatch positions.

ATTACK

6-19. *Attack* is a type of offensive operation that destroys or defeats enemy forces, seizes and secures terrain, or both (ADP 3-90). Attacks incorporate coordinated movement supported by fires. They may be part of either decisive or shaping operations. An attack differs from a movement to contact because in an attack commanders know at least part of an enemy's dispositions. A commander may describe an attack as hasty or deliberate, depending on the time available for assessing the situation, planning, and preparing. A commander may decide to conduct an attack using only fires, based on an analysis of the mission variables. In a hasty attack, the commander must move quickly to gain the advantage. Speed and violence of action can overcome lack of preparation. A deliberate attack is much more thoroughly planned and prepared.

6-20. Hasty attacks are not based on detailed planning, but the commander must anticipate and plan for them as much as possible. They are conducted to catch the enemy off-guard. The maneuver commander can use assets available and synchronize all available support and combat multipliers provided they can be committed without significant delay. Hasty attack plans are disseminated through fragmentary orders. The use of standard operating procedure and battle drills are critical for effective execution of hasty attacks.

6-21. The success of SHORAD units in a hasty attack will depend on thorough prior planning. Prior to the mission, on-order M-SHORAD, Avenger, and Stinger positions, aerial areas of interest along suspected enemy air avenues of approach, and decision and execution matrices must be developed. SHORAD platoon

leaders plan their schemes of maneuver based on the maneuver force scheme of maneuver and designated priorities. Unit SOPs and battle drills, combined with rapid, aggressive execution, aid in mission accomplishment.

6-22. The deliberate attack requires more time for detailed IPB and detailed preplanned positions throughout the entire zone. For a deliberate attack, SHORAD coverage must be extensive and well-coordinated. This requires a thorough IPB analysis that includes–

- Ground and air avenues of approach.
- Aerial attack profiles.
- Probable enemy aviation attack locations.
- Aerial surveillance positions and routes.

6-23. From the IPB, the SHORAD platoon leaders develop and use system-specific graphic control measures and those directed by the supported unit to control M-SHORAD, Avenger, and any Stinger team movements. All movements are conducted to support the supported unit's scheme of maneuver. During an attack, M-SHORAD systems are normally positioned to support the main effort. Avengers are positioned to protect maneuver support, C2, and fire support assets. The M-SHORAD or Avenger platoon leader must, however, retain the flexibility to shift and redirect platoon fires in support of the entire zone of action.

6-24. An attack may require a forward passage of lines through a stationary force. In a passage of lines, the stationary force's SHORAD units protect the passage lanes. The attacking force's SHORAD units accompany the passing units. Airspace coordinating measures and weapons control measures must be planned and disseminated by either the division AMD cell or brigade ADAM cell. Similar procedures apply for rearward passage of lines.

EXPLOITATION

6-25. *Exploitation* is a type of offensive operation that usually follows a successful attack and is designed to disorganize the enemy in depth (ADP 3-90). Exploitations seek to disintegrate enemy forces to the point where they have no alternative but to surrender or retreat.

6-26. Exploitation follows any successful attack and is conducted to take advantage of the success. A M-SHORAD platoon may move with the main body (exploitation force), or it may be task organized to provide support for both the exploitation force and the logistics elements. Avenger and Stinger elements are used to keep maneuver force lines of communications open and protect key logistics facilities and C2 posts. C2 is critical to support constantly moving units.

PURSUIT

6-27. *Pursuit* is a type of offensive operation designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it (ADP 3-90). There are two variations of the pursuit: frontal and combination. A pursuit normally follows a successful exploitation. However, if enemy resistance breaks down and enemy forces begin fleeing the battlefield, any type of offensive operation can transition into a pursuit. Pursuits entail rapid movement and decentralized control.

6-28. The pursuit is oriented on the enemy rather than on terrain objectives. Since penetration occurs deep in the enemy rear, the same caution as in a movement to contact must be practiced. M-SHORAD maneuvers with the pursuing forces, normally traveling at their flanks. Avengers are generally positioned at the rear of a maneuvering force to defend the maneuver support, C2, fire support, and maneuver reserve forces.

DEFENSIVE OPERATIONS

6-29. A *defensive operation* is an operation to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations (ADP 3-0). The purpose of the defense is to create conditions for the offense that allow Army forces to regain the initiative. The inherent strengths of the defense are the defender's ability to occupy positions before an attack and use the available time to improve those defenses. A defending force stops improving its defensive preparations only when it

retrogrades or begins to engage enemy forces. Defensive operations are conducted to identify or create enemy weaknesses that allow for the opportunity to begin offensive operations.

6-30. In the defense, the maneuver commander prioritizes requirements for air defense coverage based on mission analysis, IPB, and METT-TC. Priority for air defense in the defense may be to the main battle positions, C2 elements, or logistics assets. The SHORAD platoon leader must clearly understand where its supported force's effort will be weighted. Based on these considerations, the platoon leader will develop a coverage plan to support the defensive concept of operations.

6-31. Artillery and rockets will be used extensively against SHORAD-defended assets. They are usually numerous, inexpensive, survivable and highly effective. UASs will be employed to provide targeting data. UASs are extremely effective in this role due to their small size, low radar cross section, and standoff capability. In addition to RAM and UASs, rotary- and fixed-wing aircraft continue to present formidable threats to a defense.

6-32. SHORAD engagements of air threats are executed locally (decentralized) by team chiefs and section chiefs in accordance with the air defense warning, weapons control status, and ROE. SHORAD engagement decisions are made and executed locally within the ROE. Identification authority is also exercised at the local level. The identification friend or foe capability assists SHORAD team and section chiefs in the identification of potential targets. Positive visual identification is required for all aircraft prior to engagement.

6-33. To combat aerial targets, SHORAD fire units are assigned sectors of fire and primary and secondary target lines.

- *Sector of fire* is that area assigned to a unit, a crew-served weapon, or an individual weapon within which it will engage targets as they appear in accordance with established engagement priorities (FM 3-90-1). Sectors of fire are specified by left and right limits in azimuth.
- *Primary target line* is an azimuth assigned to a weapon system or unit along which the system fire control personnel and or gunners focus their attention (FM 3-01). Primary target lines are established along the centerline of the assigned sector of fire to assist in the distribution of fires when defending against multiple targets that are attacking from different directions. Primary target lines are typically aligned with air avenues of approach.
- *Secondary target line* is a pre-planned alternative target line used to shift the orientation of fires to assure all likely threat avenues of approach are adequately defended (FM 3-01). Secondary target lines allow mutual support and overlapping coverage. Secondary target lines are planned in advance to allow the proper positioning of equipment to accommodate both primary and secondary target line requirements.

6-34. The platoon leader designates sectors of fire and primary and secondary target lines after reviewing fire unit positions to ensure that all aerial targets threatening the protected asset can be engaged. Each fire unit concentrates its fires on the most threatening aerial target within its assigned sector or closest to its primary target line. Controls provide efficient fires and reduce the probability of simultaneous engagements from two or more systems.

6-35. The SHORAD platoon leader uses the AMD employment tenets to position launchers in accordance with METT-TC. The M-SHORAD platoon leader may initially position the M-SHORADs for early engagements. The Avenger platoon leader stresses mutual support, or overlapping coverage when possible, to enhance engagement opportunities. If fixed-wing aircraft are considered to be a major threat, the platoon may weight coverage to the most likely air avenue(s) of approach. The Land-based Phalanx Weapon System platoon leader positions launchers in pairs with mutual support if possible, or overlapping fires between pairs as a minimum, for RAM engagements given the relatively short range of the system.

6-36. Early warning of enemy air surveillance or attack is facilitated by Sentinel and the other Land-based Phalanx Weapon System sensors which are positioned to extend sensor detection over the defended area. Warnings are transmitted by audio or visual means to units or assets in the actual zone of danger and not the entire base or AO, unless area coverage is directed by the supported commander.

6-37. In addition to enabling focused early warning of friendly personnel, the Land-based Phalanx Weapon System sense function alerts the intercept systems for engagements of incoming RAM munitions. The Land-

based Phalanx Weapon System's intercepts require acquisition and tracking of incoming rounds that have predicted point of impact within the designated protected area.

6-38. There are three types of defensive operations: area defense, mobile defense, and retrograde. For more information on defensive operations, see ADP 3-90. In addition, defense of the homeland by SHORAD elements is discussed.

AREA DEFENSE

6-39. *Area defense* is a type of defensive operation that concentrates on denying enemy forces access to designated terrain for a specific time rather than destroying the enemy outright (ADP 3-90). The focus of an area defense is on retaining terrain where the bulk of a defending force positions itself in mutually supporting, prepared positions. SHORAD forces in an area defense are generally more focused on protecting designated fixed or semi-fixed assets, rather than denying access to terrain.

6-40. In defensive situations, SHORAD commanders support established battle positions based on the IPB, METT-TC, and the maneuver commander's scheme of maneuver. These positions need to be planned and prepared in depth to provide decisive fires against enemy air attacks. During preparation of the defense, air defense priority normally goes to the unit preparing positions and obstacles. Once the defensive positions are prepared, priority may shift to C2 and maneuver support assets. When maneuver is required, priority shifts to the maneuvering elements. In each situation, SHORAD assets focus on the main air avenues of approach. If M-SHORADs or Avengers are tasked to provide coverage for the maneuver force reserves, they should be positioned along identified enemy air avenues of approach that influence the reserves' initial positions, as well as routes to their defensive positions.

6-41. SHORAD systems will be used in areas that maximize their significant capabilities but minimize their exposure to the direct fire fight. M-SHORADs and Avengers are most suited for early engagement of UASs. They may initially be positioned with counter-reconnaissance forces or along enemy air avenues of approach that allow the enemy surveillance of defensive positions and preparations. For more information on countering UASs, see ATP 3-01.81.

6-42. Actual positioning of SHORAD systems should be based on the air IPB, the commander's priorities for the air defense, and the location of the supported unit's assets. Avengers, for instance, could be positioned as far as 3,000 meters apart; however, the distance between systems is dependent upon line-of-sight and METT-TC considerations. M-SHORAD and Avenger systems may be prioritized for engineer effort and dug-in to maximize survivability.

6-43. The M-SHORAD guns and the Avenger's machinegun are capable weapons that may be used by their crews to defend their position against ground attacks, as well as to engage air targets as required. The supported commander may also task the M-SHORAD or Avenger platoon to defend a portion of the asset's perimeter. Care must be taken if this task is assigned to ensure that their positions do not now weaken or create gaps in the defense against air threats. If they do, the battery commander or platoon leader must so advise the supported commander.

6-44. Air defense may be allocated to reserve or counterattack forces, C2 and logistics facilities, and fire support units. If the supported unit is defending against an enemy main attack, air defense risks may be taken in the rear area to achieve the mass and early engagement needed to defeat the likely attack helicopter threat. If defending against a supporting attack, more Avenger and Stinger teams may be allocated to static assets in the unit's rear. The ADA plan must be flexible enough, however, to quickly mass against the attack helicopter threat should the enemy's main effort shift and occur in the supported unit's sector.

6-45. Since Land-based Phalanx Weapon System units can designate the grid for the point of origin of RAM fires sooner than other sources, collocation of Land-based Phalanx Weapon System leaders in a base defense operation center or supported unit's operation center is a tactical procedure that helps Land-based Phalanx Weapon System units more rapidly synchronize positive identification and clearance of fires. The platoon leader can interact with the base commander or supported unit commander for engagement authorization. While some units collocate Land-based Phalanx Weapon System leaders with base defense operation centers or protection cells, operational experience suggests the best mission command practice is to collocate a sense and warn leader in the portion of the supported unit's operation center where intelligence, surveillance, and

reconnaissance and fires decisions are made. This facilitates positive identification with UASs and results in rapid clearance of fires. The warning function can be triggered as easily from the operation center as from a base defense operation center or protection cell; however, synchronization with intelligence, surveillance, and reconnaissance and fires is typically more difficult from a base defense operation center or protection cell than from the unit's operation center.

MOBILE DEFENSE

6-46. *Mobile defense* is a type of defensive operation that concentrates on the destruction or defeat of the enemy through a decisive attack by a striking force (ADP 3-90). The mobile defense focuses on defeating or destroying enemy forces by allowing them to advance to a point where they are exposed to a decisive counterattack by a striking force. A fixing force supplements the striking force by holding attacking enemy forces in position, by canalizing attacking enemy forces into ambush areas, and by retaining areas from which to launch the striking force. The key aspects of supporting mobile defense are mobility and survivability. The moving elements in a mobile defense will be the most vulnerable to attack and surveillance.

6-47. Counterintelligence, surveillance, and reconnaissance are critical because the plan relies on surprise. M-SHORAD units may accompany the striking force, protecting it against enemy air attacks. Avenger units and Stinger teams may support the fixing force by engaging aerial surveillance and attack platforms from pre-positioned locations. Both have limited mobility and survivability; they cannot keep pace with mechanized forces on the move and lack suitable protection. Avengers and Stinger teams will generally be emplaced to defend the security force and the more critical static assets of the supported unit (for example, the C2 elements).

RETROGRADE

6-48. A retrograde is a transitional operation. It is always part of a larger scheme of maneuver designed to regain the initiative and defeat the enemy.

6-49. Depending on the size and the mission of the covering force, the SHORAD plan may allocate some air defense to the covering force, assuming that the covering force's mission is to not to destroy the lead elements of the enemy force. M-SHORAD can maneuver with the covering force and provide the required protection against air threats. Avenger and Stinger are adept at providing over watching fires of a covering force that is used as a screening force providing information. Since the covering force units are typically not the air defense priority, the covering force units normally rely on passive air defense.

HOMELAND DEFENSE

6-50. *Homeland defense* is the protection of United States sovereignty, territory, domestic population, and critical infrastructure against external threats and aggression or other threats as directed by the President (JP 3-27). This calls for defending U.S. territory against attack by state and non-state actors through an active, layered defense that aims to deter and defeat aggression abroad and simultaneously protect the homeland. The Army supports this strategy with capabilities in forward regions of the world, geographic approaches to U.S. territory, and within the U.S. homeland. During homeland defense, Army forces work closely with federal, state, territorial, tribal, local, and private agencies.

6-51. SHORAD units play a significant role in the National Capital Region, which includes Washington, D.C. and parts of Maryland and Virginia. The air defense mission is to provide C2 and air defense to detect, deter, divert, and, if necessary, destroy enemy air threats, thereby allowing freedom of action for national senior leaders. The joint air defense operations center, a multi-service military capability, provides C2 of the ground-based air defense weapon systems, supported by sensors and a warning system.

STABILITY OPERATIONS

6-52. A *stability operation* is an operation conducted outside the United States in coordination with other instruments of national power to establish or maintain a secure environment and provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief (ADP 3-0). This

may involve establishing civil security or control, or reverting to offensive or defensive operations. Offensive and defensive operations may be necessary to defeat enemies that oppose a stability operation.

6-53. Army forces work with and through host-nation authorities in cases where the host nation can meet most or all of the population's requirements. Army forces operating in a failed state may need to work with civilian organizations to restore capabilities to support the local population.

6-54. Stability operations are inherently complex and place great demands on small units. SHORAD leaders must develop interpersonal skills, such as cultural awareness, negotiating techniques, and learn critical language phrases, while maintaining warfighting skills.

6-55. SHORAD support to stability tasks is identical to that in conducting offensive and defensive tasks. While each stability task is different, air defense coordination, planning, and execution to meet the mission requirements of the maneuver commander remain the same. The ability of SHORAD commanders to stabilize a crisis is directly related to their perceived ability to defend the supported force and civilian critical assets, as necessary.

Appendix A

Short-Range Air Defense System Descriptions

This appendix presents brief descriptions of SHORAD system capabilities: M-SHORAD, Avenger, Stinger, Sentinel, Land-based Phalanx Weapon System, and Forward Area Air Defense C2. SHORAD systems are generally considered to be tactical-level systems. However, this designation is scenario and situational dependent. Avenger defending the National Capital Region, for instance, is conducting a strategic mission.

MANEUVER SHORT-RANGE AIR DEFENSE

A-1. M-SHORAD (figure A-1) provides air defense protection of Stryker and Armor BCT maneuvering forces against fixed- and rotary-wing aircraft and UASs throughout the range of military operations. It employs a mix of sensors and weapons. A mix of different sensors provides the capability to detect, identify and track a variety of aerial objects, including fast moving targets and small signature objects. A mix of different, selectable weapons enables the M-SHORAD gunner to precisely match munitions to targets, increasing efficiency and effectiveness against targets of all types.

Figure A-1. Maneuver Short-Range Air Defense system

A-2. The M-SHORAD system consists of a digitized Stinger Vehicle Universal Launcher, four Multi-Mission Hemispheric Radars, maneuver and Forward Area Air Defense C2 systems, and associated fire control, power generation, and related components on a Stryker vehicle. The launcher mounts four Stinger missiles, a 30-milimeter cannon, a 7.62-milimeter coaxial machine gun, and sensor system with electro-optical and infrared cameras for target acquisition and general situational awareness. The Multi-Mission Hemispheric Radars are small, fixed-position, active electronically-scanned array radars positioned on the front and back of the Stryker. The radars detect, track, and identify low-altitude air targets up to 360 degrees

using onboard acquisition and tracking sensor capability, including under obscured, day and night conditions. The radars can also "stare" at a specific track while continuing to scan. M-SHORAD is integrated with Forward Area Air Defense C2 and is interoperable with the Sentinel radar. The maneuver C2 system allows M-SHORAD to integrate into maneuver forces.

AVENGER

A-3. The Avenger weapon system (figure A-2 on page A-3) is a mobile lightweight, day or night, limited adverse weather fire unit employed to counter enemy reconnaissance, surveillance, and target acquisition efforts and low-level fixed and rotary-wing threats. The fire unit consists of two turret-mounted standard vehicle mounted launchers, carrying Stinger infrared homing, fire-and-forget missiles; a M3P .50 caliber machinegun; and a sensor package. The Avenger turret provides the gunner with unobstructed fields of view rotating through 360 degrees in azimuth. The fire unit is mounted on a high mobility multipurpose wheeled vehicle.

A-4. The Avenger sensor package aids in the acquisition and identification of air tracks. The package includes an optical sight, forward-looking infrared radar, laser range finder, identification friend or foe, and a fire control computer. The optical sight is a driven reticle heads-up display which allows the gunner to manually acquire targets through the turret canopy and to aim the missiles. The forward-looking infrared radar provides enhanced acquisition capability in various environments: night, smoke, rain, background clutter, and haze. The laser range finder is used to determine if the target is within the normal performance range of the missile. The identification friend or foe aids the gunner in the identification of targets; it distinguishes aircraft as positive friend, possible friend, or unknown.

A-5. The Avenger mounts eight Stinger missiles, four in each launcher. Should the Avenger system or turret malfunction, the missile can be converted to a man-portable configuration by removing it from one of the Avenger missile pods. A grip stock and battery coolant unit is attached to the launch tube, and the Stinger becomes a ready-weapon. See paragraphs A-7 and A-8 for discussion of man-portable Stinger.

A-6. Avenger links to the Forward Area Air Defense C2 for air battle management, early warning and cueing, and aids for track identification. The Avenger system is air transportable by cargo helicopters (CH-47 and CH-53) and C-130, C-17, and C-5 aircraft. For more information on Avenger, see ATP 3-01.64.

Figure A-2. Avenger

MAN-PORTABLE STINGER

A-7. Stinger (figure A-3 on page A-4) is a shoulder-fired, infrared radiation homing, heat-seeking, guided missile system that tracks to the target through proportional navigation. It is designed to counter low-level fixed and rotary-wing aircraft and UASs. The Stinger components are a missile housed in a fiberglass launch tube; a permanently attached, hinged, open sight assembly located atop the launch tube, a grip stock with an identification friend or foe antenna; and a battery coolant unit. For more information on the Stinger system, see ATP 3-01.18.

A-8. To assist the gunner in aircraft identification, the identification friend or foe antenna is unfolded and the identification friend or foe cable is connected. Interrogation of aircraft is accomplished by pressing the interrogate switch located at the rear of the grip stock. Stinger is a "fire-and-forget" system. This means that, immediately after firing, the gunner removes and discards the coolant unit from its receptacle, folds and stows the identification friend or foe antenna, unlatches the latch mechanism located at the forward end of the grip stock, and removes the grip stock from the launch tube. The gunner can now ready another missile round for

engagement or opt to seek cover after launch. The grip stock is reused continually until failure. After firing, the gunner has no control over the missile and is required only to observe the missile's flight trajectory to the target.

Figure A-3. Stinger man-portable air defense system

SENTINEL

A-9. The Sentinel radar (figure A-4 on page A-5) is an X-Band, pulse-Doppler phased array radar that provides 360-degree curing and target identification. It's extremely low noise design and Doppler signal processing result in exceptional ability to detect small, low-flying targets in clutter. It can acquire, track, and classify cruise missiles, UASs, and fixed- and rotary-wing aircraft. The Sentinel can detect and classify rotary-wing aircraft, including hovering rotary-wings, at ranges beyond firing unit's maximum weapon detection and engagement range in a severe electronic countermeasures environment. Targets can be detected and tracked in all weather, day or night, under the most extreme battlefield conditions. Sentinel's air defense interrogator provides improved identification friend or foe to aid in positive identification and preventing fratricide. Due to its three-dimensional pencil beam and frequency-agile mode of operation, the Sentinel is difficult to detect and locate accurately, improving its survivability.

A-10. The Sentinel radar is towed by a heavy high mobility multipurpose wheeled vehicle with a mounted 10-kilowatt generator in the rear of the vehicle. Sentinel is capable of 24-hour operations and can be located within 10 kilometers of the forward line of own troops if the mission and situation so dictate. It should have a clear field of view (360 degrees), be positioned to ensure overlapping coverage with adjacent radars such that their search areas do not leave any seam in the defense that might be used by incoming threats, and should be placed away from power sources of similar radiating frequency bands to avoid interference.

A-11. Sentinel is air transportable by medium-lift rotary-wing aircraft for the high mobility multipurpose wheeled vehicle variant, and by transport fixed-wing aircraft for the medium tactical vehicle variant. For more information on the Sentinel system, see ATP 3-01.48.

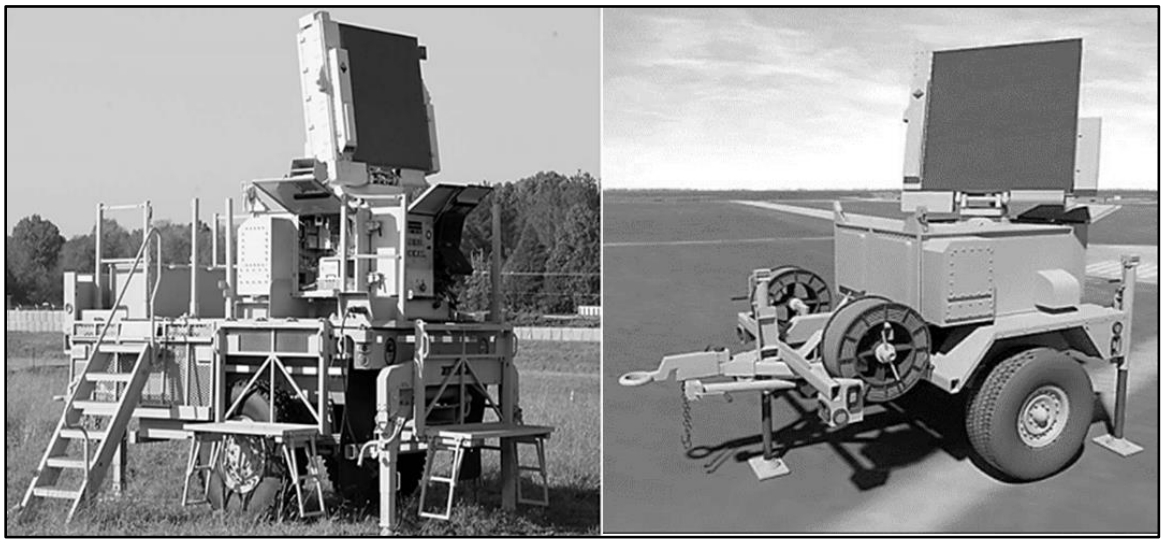

Figure A-4. Sentinel

LAND-BASED PHALANX WEAPON SYSTEM

A-12. The Land-based Phalanx Weapon System is a fast reacting, short-range system used to detect incoming rockets and mortars, provide focused early warning, and destroy inbound rockets and artillery and mortar projectiles in the air before they hit their ground targets. The intercept system has an integral sensor for targeting and a multi-barrel gun system to destroy RAM threats. For more information, see ATP 3-01.60.

A-13. The Land-based Phalanx Weapon System (figure A-5 on page A-6) consists of a trailer-mounted close-in weapon system. The close-in weapon system is a 20-millimeter Gatling gun, with six gun barrels, separate search-and-track radars, and forward-looking infrared radar. The gun system is capable of firing at a selectable rate of 3,000 to 4,500 rounds per minute, with an advanced K_u-band radar to provide autonomous target detection and engagement. Using the K_u-band radar, the Land-based Phalanx Weapon System detects threats early in flight and hands them over to the track mode only when those targets are determined to threaten the area protected by the system. Two 60-kilowatt generators mounted on the trailer supply power to the entire system.

Figure A-5. Land-based Phalanx Weapon System

A-14. The Land-based Phalanx Weapon System leverages ADA and field artillery sensors to provide alerting and cueing of incoming threats. The Sentinel radar and AN/TSQ-50 Lightweight Counter Mortar Radars are organic to the Land-based Phalanx Weapon System formation. The Lightweight Counter Mortar Radar is operated as either a counterfire sensor (Special Operations Command mode) or in the counter-RAM mode. It provides 360-degree surveillance and about 7.5-kilometer range. In either mode, the Lightweight Counter Mortar Radar detects RAM fire, and predicts the suspected points of origin and impact. In the counter-RAM mode, the Lightweight Counter Mortar Radar utilizes either the local area network or high-speed radios to send this data to the Forward Area Air Defense C2 to be used for track confirmation/correlation, cueing of other sensors, and countermeasures (by relaying data to friendly artillery and air assets). The Land-based Phalanx Weapon System also pulls data from the AN/TSQ-53 Firefinder radar while Firefinder is executing is primary counterfire mission. In addition, the AN/TPQ-36/37/46 counterbattery radar found in forward operating bases with field artillery units may be tied into the sensor network.

A-15. The RAM Warn system (figure A-6 on page A-7) capability provides localized RAM early warning and impact point prediction and can be used within Land-based Phalanx Weapon System units or as an independent warning capability. RAM Warn system uses local sensors and a network of broad area sensors, as available, to sense attacks and disseminates warnings using audio and visual methods, both outdoors and indoors. Warnings are limited to the zone of danger, not to an entire base or AO unless directed by the supported asset commander. Emplacement considerations in positioning RAM Warn system components include the size of the defended area, heavy traffic areas, designated logistical arrival and departure points, and dead space areas.

Figure A-6. RAM Warn system

A-16. A Forward Area Air Defense C2 variant, with specific counter-RAM modifications, provides the requisite battle management. It links the weapons, sensors, and warning systems for Land-based Phalanx Weapon System intercepts. It provides situational awareness to the air and missile defense workstation and engagement commands to the Land-based Phalanx Weapon System.

FORWARD AREA AIR DEFENSE COMMAND AND CONTROL

A-17. The Forward Area Air Defense C2 system-of-systems (figure A-7 on page A-8) consists of common hardware, software, communications equipment, and shelters to meet the C2 and targeting needs of SHORAD battalions. Forward Area Air Defense C2 collects, processes, and disseminates real-time target tracking and cueing information to all SHORAD weapons and provides C2 for the Land-based Phalanx Weapon System.

A-18. Forward Area Air Defense C2 hardware consists of shelters (Army standard rigid wall and command post platform shelters) and fire unit components, such as the forward area computer terminal. The terminal provides Avenger fire units with airspace situational data, engagement commands, and weapon coordination, status, and control. C2 software provides engagement and force operations functions, air battle management and situational awareness, low level air picture, and automated integration with Army C2 systems.

A-19. Forward Area Air Defense C2 supports the AMD mission by providing real-time, correlated air tracks and C2 information, and intelligence assessments to higher, adjacent, and lower units. Computer displays allow commanders to access the air picture, situation reports, enemy assessments, and friendly forces. The Forward Area Air Defense C2 system has the capability to interface with joint and NATO C2 systems, as well as Army C2 systems. The engagement operations subsystem provides a joint air picture via tactical data links B and J, transmitted using various joint range extension applications protocols.

A-20. The C2 software assists with digitization of the battlefield by providing air situational awareness to the supported force and alerting and cueing to SHORAD systems. The Forward Area Air Defense C2 systems support Land-based Phalanx Weapon System units by receiving and correlating sensor inputs and then alerting the intercept system and the sense and warn elements of an impending RAM attack.

Figure A-7. Forward Area Air Defense Command and Control shelter

Appendix B

Orders and Air Defense Appendix

This appendix presents the types of orders that SHORAD leaders at all echelons use in planning, preparing, and executing operations. SHORAD leaders must have a thorough understanding of the orders and appendices they will receive and issue. These orders allow leaders to organize their thoughts and convey them in a concise and informative manner to their subordinates.

WARNING ORDER

B-1. WARNORDs give subordinate units advance notice of a contemplated action or order which is to follow. The purpose is to initiate the troop-leading procedures of subordinate units.

B-2. WARNORDs have no prescribed format. The amount of detail included in a WARNORD is dependent on the time available, the means of communications available, and the information necessary for subordinate leaders. As more information becomes available, additional WARNORDs should be issued. WARNORDs are normally brief oral or written orders. An example WARNORD is depicted below.

WARNING ORDER

Alpha Battery moves night of 5-6 Aug to assembly area Pinto (VIC YR1016); prepare to advance early 7 Aug to provide air defense for river crossing over Wart River. 1st Platoon, on order attached to Bravo Company effective 051900Z. Road movement plan and OPORD to be issued at 051300Z.

B-3. The following is essential information required in a WARNORD:

- Heading. "Warning Order" stated so that addressee will recognize that orders follow.
- Addressees. To whom the WARNORD pertains.
- Situation. A brief description of the enemy and friendly situation.
- Time and nature of the operation. The time that the mission begins and the mission or probable mission to be accomplished.
- Movement time. Earliest time to move.
- Operation order (OPORD). The time and place that the OPORD will be issued and who must attend.
- Special instructions. Any details of early coordination, rehearsals, special equipment requirements, attachments, environmental considerations, and any other information.
- Acknowledgment. If there is an acknowledgment statement, then an acknowledgment is required that the WARNORD has been received and understood.

OPERATION ORDER

B-4. The Army's OPORD format standardizes the content and organization of information essential to clarity and execution of the plan. Leaders at all levels must practice writing and presenting OPORDs. With a little practice, the time consumed writing and presenting the OPORD will be significantly reduced.

B-5. The five paragraph OPORD tailored for a SHORAD unit should, as a minimum, contain the following information:

- Situation.
- Mission.
- Execution.
- Sustainment.
- Command and Signal.

B-6. Once developed, the commander should brief subordinate leaders and ensure that the supported commander is cognizant of the SHORAD plan. In briefing subordinate leaders, the commander begins by orienting all with maps or suitable graphics. Upon completion of the briefing, the commander conducts a back-brief to confirm that the leaders understand the order. Figure B-1 on page B-3, presents a sample air defense OPORD.

(CLASSIFICATION)

OPORD NO _____
References: Maps, charts, and other relevant documents.
Time zone used throughout the order: Zulu.

1. SITUATION
Information of the overall situation essential to subordinate commanders' understanding of the current situation.

a. Enemy Forces. Weather, terrain, identification, location, activity, and strength.
(1) Ground Forces.
(2) Air Forces.
- Identification, type of aircraft, and markings.
- Location of known and suspected airfields and estimated loiter and turnaround times.
- Strength of enemy air forces including number of aircraft sorties available per day by type aircraft.

b. Friendly Forces. The mission of next higher headquarters; locations and planned actions of units on left, right, front, and rear; fire support available; and the mission of any complementary air defense, if applicable.
(1) ADA forces.
(2) Supported forces.

c. Weather and Terrain.
(1) BMNT time.
(2) EENT time.
(3) Moonrise and moonset times.
(4) Percent illumination.
(5) Weather forecast for next 48 to 72 hours (including the daily highs, lows, and chance of precipitation).
(6) Terrain information concerning vegetation, type of terrain features, trafficability of roads, cross-country movement, and local water features.

2. MISSION
The mission includes who, what, when, why, and where. Include the command and support relationship and priority.

3. EXECUTION
This paragraph contains the commander's visualization of the execution of an operation from start to completion.

a. Commander's Intent for the Operation. The commander's intent is the commander's vision of the battle, how the commander expects to fight, and what is expected to be accomplished.

b. Concept of Operation (support of maneuver forces, stationary asset, or convoy). This should include the overall plan and missions of the platoon.
(1) Scheme of maneuver relevant to the supported force.
(2) Fire support (weighted or balanced coverage; PTLs and SOFs).
(3) Coordinates of priority asset, if applicable.
(4) Air defense priorities.

c. Subunit Missions (using the platoon execution matrix assign mission to each organic and attached unit to include the priority of protection for each unit).

(CLASSIFICATION)

Figure B-1. Air defense operation order

CLASSIFICATION)

d. Coordinating Instructions.
(1) Time of leader's reconnaissance— departure and return. Time of the supported force's reconnaissance.
(2) WCS and ADW.
(3) Rallying points and actions at rallying points.
(4) Actions at supported unit's objective or upon enemy contact to include disengagement criteria.
(5) Any information concerning two or more units not covered by SOP.
(6) Rehearsals, back-briefs, and inspections.
(7) Formations to be used by the platoon or supported force.
(8) Sleep plan.

4. SUSTAINMENT
This paragraph contains sustainment instructions supporting the operation.

a. Radios, POL, and water.

b. Ammunition control, ASP location, and resupply plan.

c. Maintenance: Motors, ADA systems, and communications (contact teams).

d. Uniform and equipment.

e. Method of handling sick, wounded, and EPWs.

5. COMMAND AND SIGNAL
This paragraph contains instructions relative to command and to the operation of communications equipment.

a. Command:
(1) Chain of command and locations.
(2) Locations of headquarters CPs and alternate CPs (battalion, battery, platoon, and supported unit headquarters).

b. Signal:
(1) Supported unit frequency.
(2) Convoy frequency, if applicable.
(3) Challenge, password, signals, and code words.
(4) Early warning frequency; IFF code book number.
(5) Listening silence instructions.
(6) Artillery or FIST element frequency.
(7) Alternative frequencies.

(CLASSIFICATION)

Figure B-1. Air defense operation order (continued)

FRAGMENTARY ORDER

B-7. A fragmentary order is an abbreviated form of an OPORD used to make changes in missions to units or to inform them of changes in the tactical situation. Like WARNORDs, these are usually brief oral or written messages. Mission orders are a form of a fragmentary order that provide experienced leaders with the essentials of an order: their mission or a change to a previously issued mission. Fragmentary orders may be oral, written, or graphic; in all instances, they are brief. An example of fragmentary order is presented in figure B-2 on page B-5.

FRAGORD

Reference OPORD

Task Organization: 4th Platoon DS to Brigade Support Area
Effective 141400ZJAN

1. Situation: Estimated tank battalion delaying advance of TF 1-6
2. Mission: No change
3. Execution: 1st Platoon LOC TS456835, PTL 400 mils, SOF 5600 mils to 1600 mils; 2nd Platoon LOC TS481814, PLT 3200 mils, SOF 800 mils to 5600 mils
4. Sustainment: No change
5. Command and SIGNAL: Battery CP currently at TS454814

Acknowledge.

CP	command post	LOC	location	SOF	sector of fire
DS	direct support	OPORD	operation order	TF	task force
FRAGO	fragmentary order	PTL	primary target line		

Figure B-2. Fragmentary order example

AIR DEFENSE APPENDIX

B-8. An appendix is an integral part of an order which deals with one aspect of an operation. Its purpose is to keep the basic text of an order short. Appendices allow the distribution of certain information to key players in the supported force. The air defense appendix is a sub-element of the Fires annex to an OPORD.

B-9. Many times the senior SHORAD officer supporting a specific force will be required to draft the air defense appendix to the supported force's OPORD. Appendices may be issued simultaneously with the order or distributed separately. Unless there is a reason to the contrary, each copy of an order is issued complete with all annexes. Figure B-3 on page B-6, presents a sample air defense appendix.

(CLASSIFICATION)

Copy number____ of____ copies
Issuing headquarters
Place of issue
Date-time group
Message reference number

APPENDIX 7 (AIR DEFENSE) TO ANNEX D (FIRES) TO OPERATION ORDER NUMBER_____
References: Maps, charts, and other relevant documents.
Time zone used throughout the order:

1. SITUATION
Items of information affecting air defense support not included in paragraph 1 of the operation order or which need to be expanded.

a. Enemy Forces.
(1) Reference to intelligence annex, if applicable.
(2) Enemy air capabilities.

b. Friendly Forces.
(1) Outline higher headquarters plan.
(2) Outline higher and adjacent unit air defense plans.
(3) Note additional air and missile defense resources supporting the unit.

c. Attachments and Detachments: Air defense resources attached and detached to include effective times, if appropriate.

2. MISSION
A clear concise statement of the air defense task.

3. EXECUTION

a. Commander's Intent. The commander's vision of the battle— how the commander expects to fight and what is expected to be accomplished.

b. Concept of Operation. A brief statement of the air defense operation to be carried out, to include air defense priorities and reference to deployment overlay, if necessary.

c. Tasks to Subordinate Air Defense Units.

d. Coordinating Instructions.
(1) Instructions applicable to two or more subordinate units.
(2) Reference to supporting appendixes not referenced elsewhere in the annex.
(3) Weapons control status and rules of engagement..

4. SUSTAINMENT

5. COMMAND AND SIGNAL

ACKNOWLEDGE: include only if the appendix is distributed separately from the base order.
OFFICIAL: Last name of authenticator and position
DISTRIBUTION: show only if distributed separately from the base order.

(CLASSIFICATION)

Figure B-3. Air defense appendix

Appendix C

Air Intelligence Preparation of the Battlefield

IPB is a systematic, continuous process of analyzing the threat and environment in a specific area. The commander uses the IPB process to understand the battlefield and the options it presents to friendly and threat forces. This appendix discusses the four steps in developing an air IPB: define the operational environment, describe environmental effects on operations, evaluate the threat, and determine threat courses of action. Discussions are focused on the IPB for SHORAD forces.

STEP 1-DEFINE THE OPERATIONAL ENVIRONMENT

C-1. An *operational environment* is a composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander (JP 3-0). Defining the operational environment results in the identification of significant characteristics that can affect friendly and threat operations and any gaps in current intelligence holdings.

C-2. During step 1, the intelligence staff must identify those significant characteristics related to the mission variables of enemy, terrain, weather, and civil considerations that are relevant to the mission. The intelligence staff evaluates significant characteristics to identify gaps and initiate information collection. There are four sub-steps in defining the operational environment: define the air defense AO, define the air defense area of interest; evaluate current operations, existing databases, and identify intelligence gaps; and initiate collection of information required to complete the IPB.

C-3. A doctrinal *area of operations* is an operational area defined by a commander for land and maritime forces that should be large enough to accomplish their missions and protect their forces (JP 3-0). The air defense AO defines the area where the SHORAD commander can affect the battle with assigned weapon systems. The air defense AO is generally identical to the ground AO in width and depth and extends vertically to the maximum altitude capability of SHORAD systems. It may be much larger than the doctrinal AO for a commander, in that SHORAD sensors may project coverage well beyond the supported asset's area. Such longer-range surveillance and detection capabilities are significant contributors to early warning and protection of the force.

C-4. A doctrinal *area of interest* is that area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory (JP 3-0). The area of interest is the geographic area and the airspace above it from which information and intelligence assessments are required to facilitate planning or successful conduct of the commander's operation. Because the commander and staff need time to process information and plan and synchronize operations, the commander's area of interest is generally larger than the AO. It is also larger due to the great distances that air and missile systems can rapidly cover. The air area of interest will extend vertically to cover the maximum service ceilings or trajectories of aircraft, UASs, RAM, and missile systems. Horizontally, it will extend to cover the maximum range of aircraft, UASs, RAM, and missiles plus threat airfields, forward arming and refueling points, navigation aids, and missile sites. The area of interest extends to the limits from which information must be collected about enemy forces which could affect friendly forces.

C-5. In evaluating current operations and developing future plans, commanders must identify the types of friendly and threat information that will affect success or failure of said operation. Not all information will be available in the time allotted or to the degree required. Information gaps should be identified early and prioritized based on the commander's initial guidance and intent for intelligence and information collection.

C-6. The intelligence team fills intelligence gaps by initiating collection operations through priority intelligence requirements, essential elements of friendly information, and requests for information.

Information requests are processed and expedited to ensure required data is available as quickly and as complete as possible. The SHORAD battalion and the supported asset are generally the two primary sources of intelligence for SHORAD batteries and platoons. Other AMD units operating in the vicinity of SHORAD forces may provide relevant data on threat air elements and capabilities.

ENVIRONMENTAL EFFECTS ON OPERATION

C-7. SHORAD leaders and staffs must conduct an in-depth analysis of the effects of terrain and weather on the enemy and friendly forces to project how a threat may project its air forces and how SHORAD forces may be positioned to defeat them. Each potential air threat must be considered with respect to the AO and the area of interest.

TERRAIN ANALYSIS

C-8. Terrain analysis in support of air defense is significantly different from terrain analysis for ground operations. The nature of airspace does not eliminate the need for terrain analysis because enemy air and friendly ADA will still attempt to use terrain to their own best advantage. IPB focuses on what impact the geographic factors have on the ability of threat air to approach, acquire, and engage a target, or deliver airborne or air assault troops.

C-9. Analysis of the terrain for IPB follows the same principles as ground analysis and uses the military aspects of terrain observation and fields of fire, cover and concealment, obstacles, and key terrain.

C-10. Observation and fields of fire. Observation and fields of fire relate to the influence of terrain on reconnaissance and target acquisition. In the IPB context, observation relates to optical and electronic line of sight. Many battlefield systems require line of sight to effectively operate or acquire and engage targets. These systems include radios, radars, jammers, direct-fire weapons, and airborne and ground sensors as well as SHORAD systems. Fields of fire relate to the terrain effects on weapon systems. Airspace must be analyzed with regard to routes which provide the best protection for air threats entering the target area and those which provide the best fields of fire once they reach the target area.

C-11. Cover and concealment. Cover and concealment have slightly different applications with respect to air systems. The following tactics and techniques are considerations of cover and concealment.

- Contour flying is flying a constant altitude above ground level of less than 22.8 meters (75 feet). This allows for maximum use of terrain masking.
- Popup tactics are the use of a low-altitude approach to the target area. Target acquisition and engagement is made by popping-up in altitude at a predetermined position or time to minimize exposure.
- Masking is using terrain to protect an air system from visual and electronic observation or detection. Electromagnetic warfare supplements natural masking.
- Cover is using terrain to provide protection from direct-fire weapon systems.
- Ground clutter can be characterized as a reduction of electromagnetic signal-to-noise ratio due to the signature of a background. It is different for each type of terrain or feature.

C-12. Threat aircraft (especially attack helicopters), cruise missiles, and possibly even UASs will use contour flying, masking, and ground clutter to avoid detection and to provide cover from direct fires. Aircraft will also use the terrain by loitering on reverse slopes, using pop-up tactics, and by using ground clutter and vegetation as a backdrop to enhance concealment.

C-13. Obstacles. There are three primary types of obstacles:

- Those which prevent the effective employment of ADA systems.
- Those which restrict contour flight.
- Those which force air threats to employ a particular surveillance or attack profile or route, or to gain excessive altitude.

C-14. Of particular interest are obstacles and terrain which restrict lateral movement within an avenue of approach. This will canalize movement or restrict evasive action. Additionally, terrain may stop the employment of certain air threat systems if the terrain exceeds the system's maximum operating ceiling.

C-15. Key Terrain. Key terrain is any locality or area in which the seizure, retention, or control of it will afford a marked advantage to either combatant. In the aerial dimension, key terrain consists of terrain features which canalize or constrain air threat systems, and terrain with an elevation higher than the maximum ceiling of these systems. Additionally, areas that can be used for airfields, missile and UAS launch sites, landing and drop zones, or forward arming and refueling points also need to be considered as key terrain, since these areas could be used to support friendly or threat air operations. Terrain can be used as an aid to navigation. Man-made features are also used as cues to navigate to targets.

C-16. Air avenues of approach. Air avenues of approach are evaluated using the same criteria as for the ground. A good air avenue of approach will permit maneuver while providing terrain masking from surface-to-air weapon systems. Some common air avenues of approach are valleys, direct lines from the enemy point of origin, and river beds. See figure C-1. Consider the following in determining air avenues of approach, both ingress and egress:

- Type of air threat, attack profile, and ordnance. UASs are small and elusive. They usually fly low. Altitude can vary. Once in the target area, they may fly an orbit attempting to stay out of engagement range of ADA. Most surface-launched cruise missiles are terrain following and they use terrain masking. Cruise missiles can fly indirect routes at low altitudes and can attack or surveil from any direction. Tactical air-to-surface missiles usually fly direct routes from launch platform to the target. Rotary-wing aircraft primarily conduct contour flights. They follow ridge lines and military crests, using the terrain to mask their approach to the target area. Fixed-wing aircraft usually follow major terrain or man-made features. Depending on range, they may fly a straight line to the target. Ordnance or payload may affect range and altitude of the air system and thus influence the selection of avenues of approach. RAM fly ballistic trajectories from the launch point to the objective.

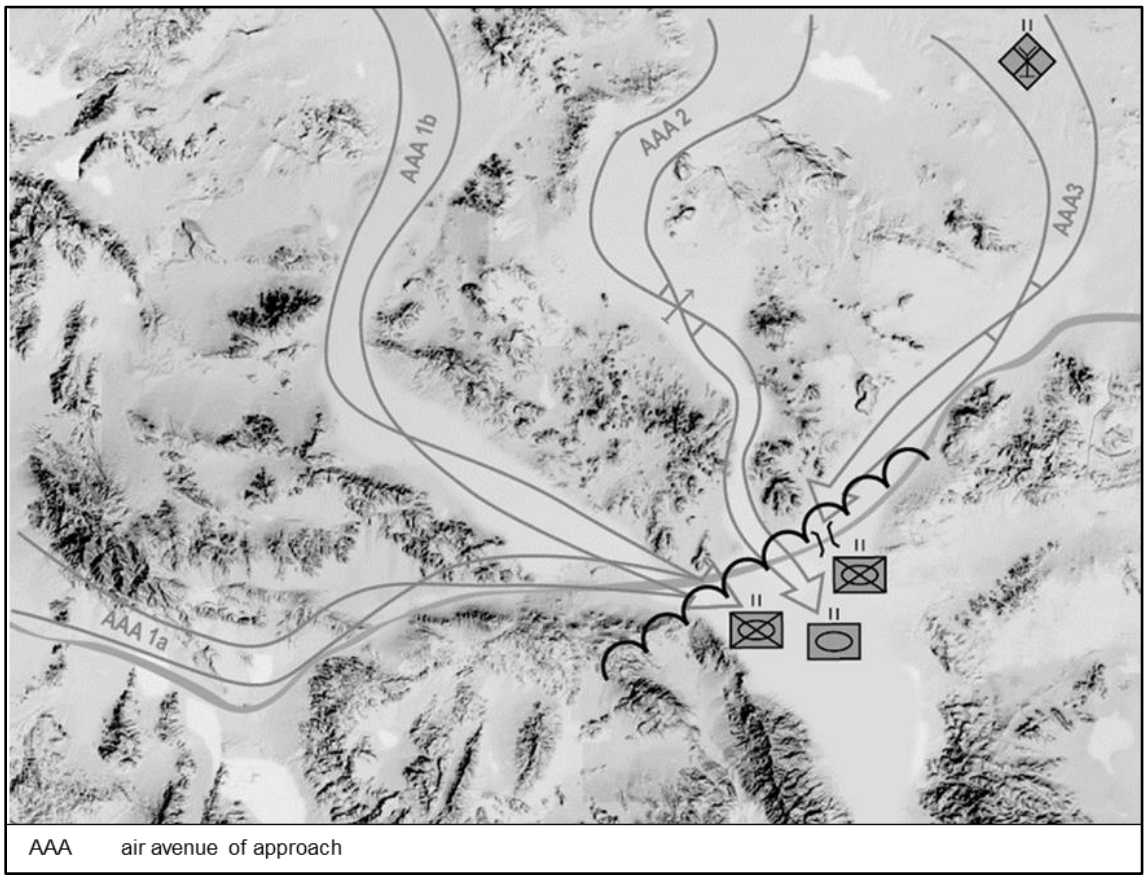

Figure C-1. Example of air avenues of approach, based on terrain aspect

Note: Air avenue of approach (AAA) 1a and AAA1b are two broad AAAs that come together near the forward line of own troops; separately or when combined, AAA1 depicts a fixed wing AAA with a mechanized infantry battalion target. AAA2 is a rotary wing AAA, depicted as an attack helicopter route with an armor battalion target. AAA3 is a rotary wing AAA, depicted as an air assault battalion mission attacking the bridge.

- Air threat point of origin and ground control radar positions. When determining air avenues of approach, the staff looks at the commander's entire area of interest. Analysis begins at the threat airfield or UAS or missile launch site and works toward the probable enemy objective. This allows a look at the big picture. The staff considers the range of the air systems and location of navigation aids and ground-control sites.
- Probable threat objective. Each avenue of approach must end at a target, drop zone, or landing zone; or within reconnaissance, intelligence, surveillance, or target acquisition range of a target. Use a reverse IPB to select potential threat objectives.
- Potential to support maneuver forces. Air assets which are used to achieve ground objectives will seek to use air avenues of approach coincident with ground avenues of approach. Air assets attacking deep are not limited to these ground avenues. Missiles and reconnaissance, surveillance, and target acquisition UASs are not limited by ground corridors.
- Freedom to maneuver within the air avenue. Does the avenue—
  - Canalize the air system?
  - Have access to adjacent avenues?
  - Provide the ability to acquire a target and use available munitions?
  - Assist in navigation?
- Protection for the air system and pilot. Does the avenue provide—
  - Terrain masking (cover and concealment)?
  - For the full use of air system speed?
  - Protection against radar detection?
  - Protection from air defense weapon systems and tactical air support?
  - A standoff orbit location?
  - A standoff orbit?
- Air threat and pilot capabilities. Can the air system or pilot—
  - Perform contour flying?
  - Fly at night?
  - Fly in all weather conditions?
  - Range the targets?

WEATHER ANALYSIS

C-17. Air operations are especially susceptible to the effects of weather. Weather analysis for air and air defense operations is designed to predict the most likely time over target and other considerations based on weather effects and light data. Many of these considerations are the same factors the intelligence officers use for ground operations: visibility, obstruction, winds, precipitation, cloud cover, and high temperatures and humidity.

C-18. Visibility has a significant impact on offensive air operations and reconnaissance, surveillance, and target acquisition. Visibility has the same effects on visually-directed ADA systems and sensors.

C-19. Obscuration. Friendly smoke operations and fires may have an impact on friendly air defense operations. ADA personnel should coordinate with chemical, biological, radiological, and nuclear and fires personnel to ensure the likely impacts of smoke operations do not degrade ADA operations. ADA personnel must know when and where large-scale operations are planned.

C-20. High winds will hinder maneuver, close air support, and target engagement, especially in tight air avenues of approach. Missiles and UASs will be adversely affected in performance and accuracy.

C-21. Precipitation affects aircraft, missile, and UAS performance and reduces the effectiveness of sensors. Precipitation reduces ADA sensor range.

C-22. Cloud cover and ceilings may restrict operations by setting low operational ceilings and restricting visibility and target engagement. Low ceilings, overcast, and clouds may restrict visually-directed ADA weapons' detection and acquisition ranges.

C-23. Extreme temperature and humidity have a severe effect on aircraft and UASs by decreasing combat range, altitude (particularly rotary-wing aircraft), and ordnance payloads. Rotary-wing aircraft are particularly affected.

STEP 3-EVALUATE THE THREAT

C-24. Threat evaluation for air operations consists of a detailed study of enemy air capabilities, organization, and doctrine. There are three steps in evaluating the threat: collect and analyze doctrinal threat data, analyze threat air capabilities, and conduct target evaluation.

COLLECT AND ANALYZE DOCTRINAL THREAT DATA

C-25. The following are typical questions which should be answered during this step. They must also include the commander's critical information requirements and priority intelligence requirements.

- What are the major strategic, operational, and tactical objectives of the enemy's air operations?
- Which objectives may be targeted for destruction or suppression?
- Where do friendly air defense assets fit into the enemy's objectives? Do they need to be destroyed or suppressed for the enemy plan to work? Answers to these two questions may result in modification to air avenues of approach.
- What is the enemy's air order of battle? How are the assets organized? Knowledge of threat organization, and who has operational control, will indicate the importance of the AO. For example, does the threat have mobile, fixed, or both types of launchers?
- Who has tactical control of aircraft at the point of attack?
- How will UASs be used: attack, reconnaissance, surveillance, or battle damage assessment? What are the associated profiles?
- How does the enemy doctrinally attack? Will the enemy use airborne, air assault, or special operations forces in conjunction with an air or ground attack? What size are these forces and to what depth are they used? Will the enemy synchronize the air attack? Does the enemy have the capability to coordinate an air attack (possibly with varied air platforms that can overmatch friendly air defense capabilities)?
- What are air system combat ingress and egress speeds?
- Where are the potential missile and UAS launch points? What are the likely targets? What are the range, endurance, and profile of these systems?
- What are the doctrinal distances for forward arming and refueling points?
- How and where will the enemy attack ground targets for interdiction?
- At what altitude will the enemy approach the target, deliver munitions, and exit the target area?
- How does the enemy employ reconnaissance assets?
- How has the enemy historically fought?

ANALYZE THREAT AIR CAPABILITIES

C-26. ADA intelligence officers evaluate a broad range of order of battle data and threat capabilities to include the ground force and electromagnetic warfare threats upon SHORAD units. They also evaluate the answers to the following questions with respect to fixed- and rotary-wing aircraft, UASs, RAM, and cruise missiles. The questions are not inclusive; they are representative of those that will provide relevant and timely threat information.

- What are the fixed- and rotary-wing aircraft—
  - Capability to coordinate air-to-ground attacks?
  - Capability to coordinate air and artillery operations? Are ground forward air controllers used?
  - Capability for suppression of friendly air defense?
  - Performance (for example, speed, altitude, airfield restrictions, troop and weapon load capacity)?
  - Endurance, range, and ingress and egress altitude and speed?
  - Levels of combat readiness and sortie generation rate?
  - Capability to conduct pop-up maneuvers? What is the standoff range?
  - Target acquisition capability, night and adverse-weather capability, and identification range?
  - Typical ordnance load (maximum weight, type, load mixture, and level of sophistication)?
  - Navigational capability? Can it fly at night or in adverse conditions?
  - Combat radius (with or without external tanks, ordnance, or location of staging bases)?
  - Expectant loiter time (how long will it have on station over the target area)?
  - Type, quantity, and quality of training the pilot received?
  - Pilots' likelihood to conform to doctrine?
  - Ability of pilots to fly at night or perform contour flying? During peacetime did the pilot conduct the type of mission expected to be conducted during war?
  - Type and capability of ordnance? Each type of ordnance should be evaluated for range, accuracy, release altitude (how high or low must the aircraft fly?), reload and refire time, number of ordnance available, and guidance modes (how does the pilot acquire and engage?) Does the ordnance need to acquire and guide? If so, how?
- What is the UAS—
  - Performance (speed, altitude, and launch restrictions)?
  - Endurance and range?
  - Contour flying or terrain limiting factors?
  - Target acquisition and standoff range?
  - Sensor package and payload (maximum weight, type, and load mixture)?
  - Loiter time (how long can the UAS stay on station)?
  - Visibility effects on acquisition?
  - Modes of recovery and turnaround time?
  - Real-time data link capability?
  - Guidance modes (ground controlled and preprogrammed)?
  - Crew proficiency?
- What is the RAM—
  - Type?
  - Performance (flight time, speed, altitude, and launch restrictions)?
  - Maximum and minimum lethal ranges?
  - Warhead size?
  - Accuracy?
  - Burn time?
  - Potential launch site(s)?
  - Launch types (stationary vehicle, stationary site, moving vehicle)?
- What is the cruise missile—
  - Performance (flight time, speed, altitude, and launch restrictions)?
  - Maximum and minimum ranges?
  - Accuracy?

- Targeting capability and type?
- Contour flying capability?
- Vulnerability to countermeasures?
- Guidance mode?
- Warhead type and size?

CONDUCT TARGET VALUE EVALUATION

C-27. The target evaluation must determine what targets are to be labeled as high-value targets. High-value targets are assets the enemy or friendly commander has deemed as important for the successful accomplishment of the mission. High-value targets are determined by operational necessity and weapon system capability.

C-28. Key questions that must be answered with respect to target value include—

- Criticality of each? Impact of its loss on operations?
- Vulnerability of each?
- Recuperability of each?
- Redundancy of capabilities? Can other assets perform the mission or provide the capabilities?

C-29. The responses to these questions will help in shaping the defense. The most critical assets will be defended with active and passive defense capabilities, while those of less criticality may be defended by passive defense measures and combined arms for air defense capabilities.

STEP 4-DETERMINE THE THREAT COURSES OF ACTION

C-30. To complete step four, determine both the threat air and ground COAs and integrate the results of the previous three steps into a meaningful conclusion. Given what threat air and missile forces prefer to do and the effects of the operational environment, what are the enemy's likely objectives and what COAs are available to the enemy? The intelligence officers develop enemy threat models that depict the threat's air and missile COAs. They also prepare event templates and matrices that focus information collection on identifying which COA the threat will likely execute.

C-31. Situation templates are graphic depictions of expected threat dispositions should they adopt a particular COA. They usually depict the most critical point in the operation as agreed upon by the intelligence officers. However, the intelligence officers might prepare several templates representing different snapshots in time, starting with the initial threat array. The situation template integrates air attack and surveillance profiles with terrain. It focuses on specific air avenues of approach and mobility corridors to determine which avenues are the most capable of supporting specific attack techniques, profiles, and the most direct routes to landing and drop zones to protect and ensure the survivability of air threat systems.

C-32. The event template is a guide for collection and reconnaissance and surveillance planning. It depicts NAIs where the commander expects to see certain activities of tactical significance and is used to confirm or deny an enemy course of action. The NAIs are based on the terrain constraints of air approach routes to potential targets and analysis of the enemy's attack and reconnaissance, surveillance, and target acquisition profiles. The intelligence officers develop an event matrix to support the event template by providing details on the type of activity expected in each area, the times the area is expected to be active, and its relationship to other events on the battlefield. Examples of NAIs include landing and drop zones, forward arming and refueling points, forward staging areas, aerial choke points, and RAM and UAS launch points.

C-33. The decision support template is an integrated staff product that results from the wargaming of potential friendly COAs. The decision support template is based on the situation and event templates, event matrix, and the wargaming of friendly COA results. It should depict—

- Air avenues of approach.
- Airborne and air assault objectives.
- Landing and drop zones and the largest size enemy element which could be employed at the zone.
- Ranges of enemy systems.

- Ranges of friendly air defense systems.
- Target areas of interest.
- Decision points.

C-34. Air target areas of interest and decision points are determined in the same manner as for ground operations. However, due to the high speeds of air systems, decision points must be placed significantly farther in advance of the target areas of interest.

Appendix D

Rehearsals

This appendix will provide rehearsal guidelines for SHORAD commanders and leaders. The information focuses on preparing them to plan for, prepare and conduct effective rehearsals for their own units, regardless of echelon, and with supported elements. For additional information on rehearsals, see FM 6-0.

INTRODUCTION

D-1. Each rehearsal type achieves a different result and has a specific place in the preparation timeline. The first step in rehearsal planning is to determine the type rehearsal the unit will use to practice the operation prior to execution.

D-2. Regardless of the type of rehearsal used, most successful ones share common rehearsal practices. The following are some of the best practices commanders and leaders can use to guide their rehearsal planning and rehearsal execution evaluation:

- The commander or leader establishes a standard for a successful rehearsal.
- Commanders and leaders emphasize critical actions and key events that trigger friendly actions.
- Rehearsal occurs near or on terrain similar to the actual operation terrain.
- Rehearsal occurs under the same conditions (for example, weather and time of day) as expected during the operation.
- Rehearsals identify problem areas, contingency actions, and enhance coordination.
- Rehearsals include all information from the operations overlay including known and suspected enemy positions, airspace coordinating measures, and names of key terrain features.
- Rehearsals use the decision support matrix and the decision support template as guides.
- Critical actions in an operation are practiced.

D-3. Rehearsals must be planned, prepared, and executed. The planning section beginning on page D-5 addresses rehearsal planning considerations and recommended responsibilities for ensuring effective rehearsals. The rehearsal preparation section presents checklists that focus on the responsibilities of the commander, executive officer, and staff to make rehearsal execution run smoothly. The execution section identifies commander and staff responsibilities and SHORAD rehearsal step-by-step actions.

REHEARSAL TYPES

D-4. Each rehearsal type achieves a different result and has a specific place in the preparation timeline. There are four types of rehearsals: the backbrief, combined arms rehearsal, support rehearsal and the battle drill or SOP rehearsal.

BACKBRIEF

D-5. A backbrief is a briefing by subordinates to the commander to review how subordinates intend to accomplish their mission. It is used in conjunction with other rehearsals to ensure the operation and rehearsal standards are met. A subordinate briefs the commander or leader on what the subordinate's orders are and what the subordinate is supposed to do and why. This briefing allows commanders to clarify the commander's intent early in subordinate planning and identify any problems in the concept of operations.

D-6. Commanders and leaders should conduct backbriefs with subordinates at the following critical times:

- Immediately after the OPORD has been issued, to ensure the mission, intent, and tasks to subordinate units are understood.
- After the subordinates have formulated their concept of the operation, but before the subordinate OPORDs are issued. This is to ensure the subordinate's plans are consistent with the commander's intent and mission.

D-7. SHORAD commanders and leaders may not have the luxury of face-to-face backbriefs. Commanders and leaders may have to use other communications means, such as the radio, to get their backbriefs. Subsequent backbriefs are especially difficult to have face-to-face due to the physical dispersion and commitment of the various commanders; the SHORAD battalion is especially limited in the ability to gather battery commanders.

COMBINED ARMS REHEARSAL

D-8. A combined arms rehearsal is a rehearsal in which subordinate units synchronize their plans with each other. A higher unit's headquarters normally executes a combined arms rehearsal after subordinate units issue their OPORD. This rehearsal type helps ensure that subordinate commander's plans achieve the higher commander's intent. When SHORAD commanders choose to conduct a combined arms rehearsal with their subordinate unit, they must select one (or a combination) of the available rehearsal methods and focus on the effective execution of the operation.

SUPPORT REHEARSAL

D-9. A support rehearsal helps synchronize each warfighting function with the overall picture. Throughout preparation units conduct support rehearsals within the framework of a single or limited number of warfighting functions. SHORAD commanders participate in the supported unit's rehearsal and must maximize the time they have during this rehearsal. Support rehearsals and combined arms rehearsals complement preparations for the operation. The following is an example of a sequence the air defender could use during a rehearsal:

- Point out enemy air avenues of approach, possible aerial enemy targets, landing zones and drop zones in the units' area and the expected aerial platform that the unit may face.
- Address actions on air attack during the rehearsal's particular critical action(s).
- Point out the locations of ADA assets (fire units, sensors, and ADA command posts).
- Address any synchronization issues necessary to get SHORAD assets in the right place at the right time.
- Address actions taken to mitigate or defeat air attacks during the rehearsal's particular critical action(s).
- Address combined arms for air defense.
- Disseminate the early warning plan emphasizing the need to rebroadcast early warning over the supported unit command nets.

BATTLE DRILL OR STANDARD OPERATING PROCEDURE REHEARSAL

D-10. Battle drill or SOP rehearsal is a collective action rapidly executed without a deliberate decision making process. A battle drill or SOP rehearsal ensures that all participants understand a technique or a specific set of procedures. SHORAD commanders can identify one or more specific procedures and/or techniques, they consider critical or essential for the success of the operation.

METHODS OF REHEARSAL

D-11. There are several methods for executing rehearsals. These techniques are arranged by the amount of time and resources needed and available to conduct each method (see figure D-1 on page D-3). The first step in rehearsal planning is to determine the rehearsal method the unit will use to practice the operation prior to execution. As listed from left to right in the figure, each successive method takes more time and more resources. Each method also imparts a different level of understanding to participants.

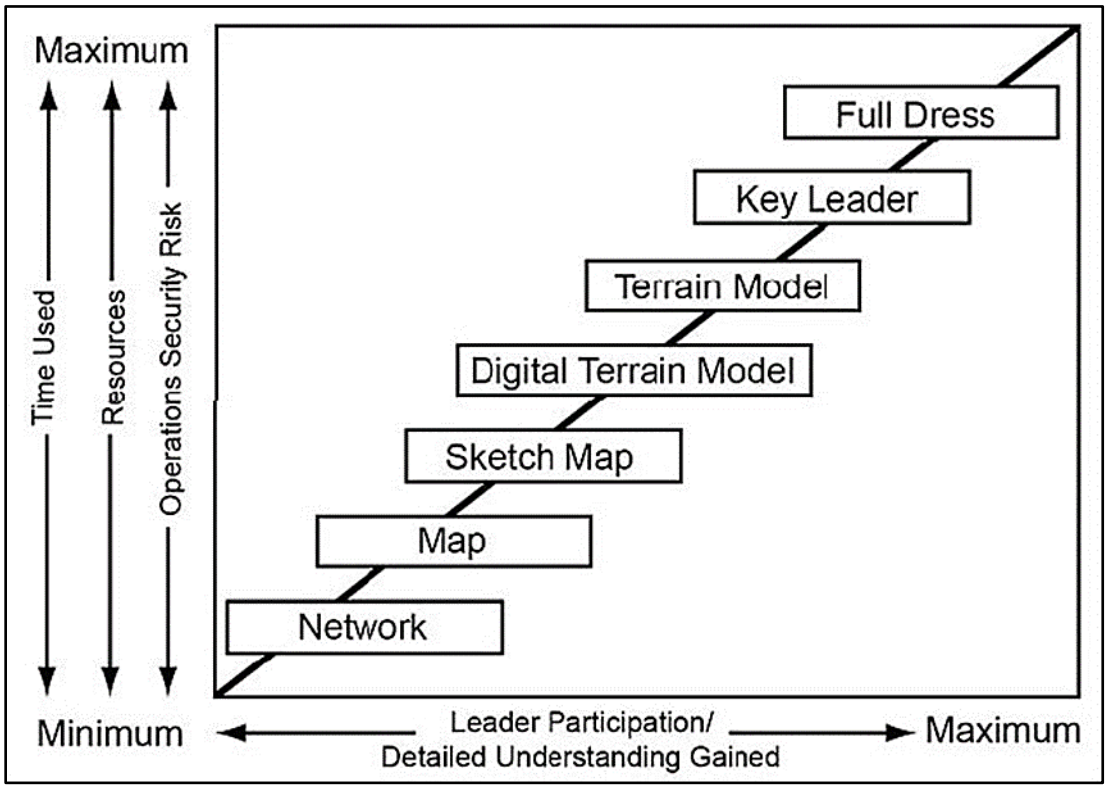

Figure D-1. Rehearsal methods

NETWORK REHEARSAL

D-12. The network rehearsal is less desirable because the personal interaction is not possible. The network rehearsal does have advantages, however. It can be conducted at any time, and it can verify a unit's communications capabilities. If used, the network rehearsal must focus on the critical actions in an operation. Lengthy transmissions should be avoided and alternate frequencies should be used to avoid compromising the unit and the operation. All participants must have reliable communications, OPORD, overlays, maps, and must understand the rehearsal sequence. The network rehearsal depends heavily on SOPs that establish procedures for network rehearsal execution.

D-13. Network rehearsals can be executed over wide-area networks or local-area networks. Commanders and staffs execute network rehearsals by talking through critical portions of the operation over communications networks in a sequence the commander establishes. The organization rehearses only the critical parts of the operation. These rehearsals require all information systems needed to execute that portion of the operation. All participants require working information systems and a copy of the OPORD and overlays. Command posts can rehearse battle tracking during network rehearsals.

D-14. The network rehearsal will probably be used more at the SHORAD battalion than other rehearsal techniques. The distances between batteries and the batteries supported unit planning and rehearsal responsibilities will consume the time necessary to conduct more time-intensive rehearsals at the battalion level. The Forward Area Air Defense C2 system will depend heavily on network rehearsals to verify communications systems are operational and let fire units acknowledge receipt of early warning information. SHORAD commanders should consider using the network rehearsal to augment other rehearsals or involve more participants.

MAP REHEARSAL

D-15. A map rehearsal is normally the easiest technique to set up since it requires only maps and graphics for current operations; however, it is time consuming. The map rehearsal has many variations. The most common is to use a large scale map and operations overlay laid on a table with the participants seated around the map.

D-16. Markers (such as cardboard cutouts, self-sticking note pads) are used to track each unit as it moves and each event as it occurs. Participants are responsible for representing their scheme of maneuver with the markers.

D-17. This method requires the least terrain of all rehearsals. An optimal site overlooks the terrain where the unit will execute the operations.

SKETCH-MAP REHEARSAL

D-18. This method uses a large scale sketch-map of the operations overlay and key terrain features; the sketch is used in the same manner as the map. A technique is to draw this sketch on the side of a tracked vehicle. Yet another option is to move to an area overlooking the operations terrain and have the participants use their own maps and overlays to follow the rehearsal. This technique has the added advantage of familiarizing the participants to the terrain. The sketch map technique is one of the two most commonly used rehearsal techniques (the other is the map rehearsal).

D-19. The procedures for this rehearsal are the same as for a terrain-model rehearsal (see paragraph D-22) except the commander uses a sketch map in place of a terrain model. Sketch-map rehearsals take less time than terrain-model rehearsals but more time than map rehearsals.

DIGITAL TERRAIN MODEL REHEARSAL

D-20. Digital terrain models are virtual representations of the AO. The time it takes to create the digital three-dimension model depends on the amount of available data on the terrain being modeled. An accurately constructed terrain model helps subordinate leaders visualize the commander's intent and concept of operations.

D-21. This type of rehearsal is best suited to small units, such as SHORAD batteries and platoons. However, with a suitable local area network, a wider audience can view the graphics.

TERRAIN-MODEL REHEARSAL

D-22. The terrain-model rehearsal takes less time and fewer resources than a full-dress or reduced-force rehearsal. Like the digital terrain-model, an accurately constructed model helps subordinate leaders visualize the commander's intent and concept of operations. When possible, place the terrain model where it overlooks the actual terrain of the AO. However, if the situation requires more security, place the terrain model on a reverse slope within walking distance of a point overlooking the AO. The model's orientation coincides with that of the terrain.

D-23. Integrating air defense information into a supported unit's terrain model is critical. Ensuring the enemy air avenues of approach, possible enemy aerial targets, potential landing zones, and weapons engagement ranges are depicted is crucial to ensuring all participants understand the enemy air capabilities.

KEY LEADER REHEARSALS

D-24. A key leader rehearsal involves only key leaders of the organization and its subordinate units. Terrain requirements can be the same as for a full-dress rehearsal, even though there are fewer participants. The commander decides the level of leader involvement. The selected leaders then rehearse the plan while traversing the actual or similar terrain. This technique is useful to rehearse fire control orders and rules of engagement for an engagement area during defensive operations. A key leader rehearsal may be used to prepare key leaders for a full-dress rehearsal.

D-25. SHORAD battalion and batteries use this type of rehearsal rather than a full dress rehearsal as distances between batteries, platoons, and fire units likely preclude the gathering of all Soldiers and systems other than at home station or as the first rehearsal when time and resources are available. However, SHORAD units will participate in their supported assets' full-dress and key leader rehearsals and need to ensure all aspects of air defense are considered and integrated into these rehearsals.

FULL-DRESS REHEARSAL

D-26. A full-dress rehearsal produces the most detailed understanding of the operation. Every Soldier and system is involved in a rehearsal over terrain and weather conditions at least similar to that expected in the operation. A full-dress rehearsal helps Soldiers clearly understand what commanders expect of them.

D-27. Full-dress rehearsals consume more time than any other rehearsal method. For batteries and platoons, full-dress rehearsals most effectively ensure all units in the operation understand their roles. However, as noted above, SHORAD battalions generally do not conduct full-dress rehearsals given the distances between subordinate units, though the battalion, batteries, and platoons will participate in their supported assets' full-dress rehearsals.

OTHER REHEARSALS

D-28. Each unit should plan rehearsals for the Soldiers to practice techniques and procedures associated with mission essential requirements. The following rehearsals apply to combat operations tasks:

- Operation center drills. Combat requirements should be anticipated and rehearsed in the form of operation center and command post drills. The shift officer in charge is the rehearsal director. Examples of these battle drills include the OPORD, WARNORD, and fragmentary order receipt and dissemination; casualty evacuation; and resupply.
- Engagement drills. SHORAD fire units and sensors should rehearse their engagement drills in their assigned position or in terrain similar to their expected position. This allows them to adapt their operations to the existing conditions.
- Movement. SHORAD fire units and sensors should rehearse the movement techniques they expect to use in an operation. These rehearsals will occur with supported units as well to synchronize all the moving pieces in an operation. These rehearsals are especially useful in breaching and obstacle-crossing operations.

REHEARSAL PLANNING

D-29. Rehearsal planning is crucial in every operation. A hasty rehearsal is less effective than a deliberately planned and resourced rehearsal.

D-30. Rehearsal time allotment must be considered up front. The SHORAD commander or leader decides which type of rehearsal to prepare for based on the planning and timeline work completed during the planning process. The most effective rehearsals are those that are planned from the receipt of the first WARNORD until rehearsal execution. Time lines are the most effective tool to aid in allocating time for events.

D-31. When considering the total amount of time available and the 1/3-2/3 rule (1/3 of the time allocated to the higher headquarters and 2/3 to subordinate organizations), the rehearsal planner can determine the type of rehearsal the unit can afford to perform. In order for rehearsals to be mutually beneficial, the SHORAD leader should plan a rehearsal window that allows subordinates enough time to develop their own plans.

D-32. Figure D-2 on page D-6, illustrates the level of planning and time line development necessary to determine when rehearsals can and should occur. This figure does not consider, however, the supported unit time line which will significantly complicate the process.

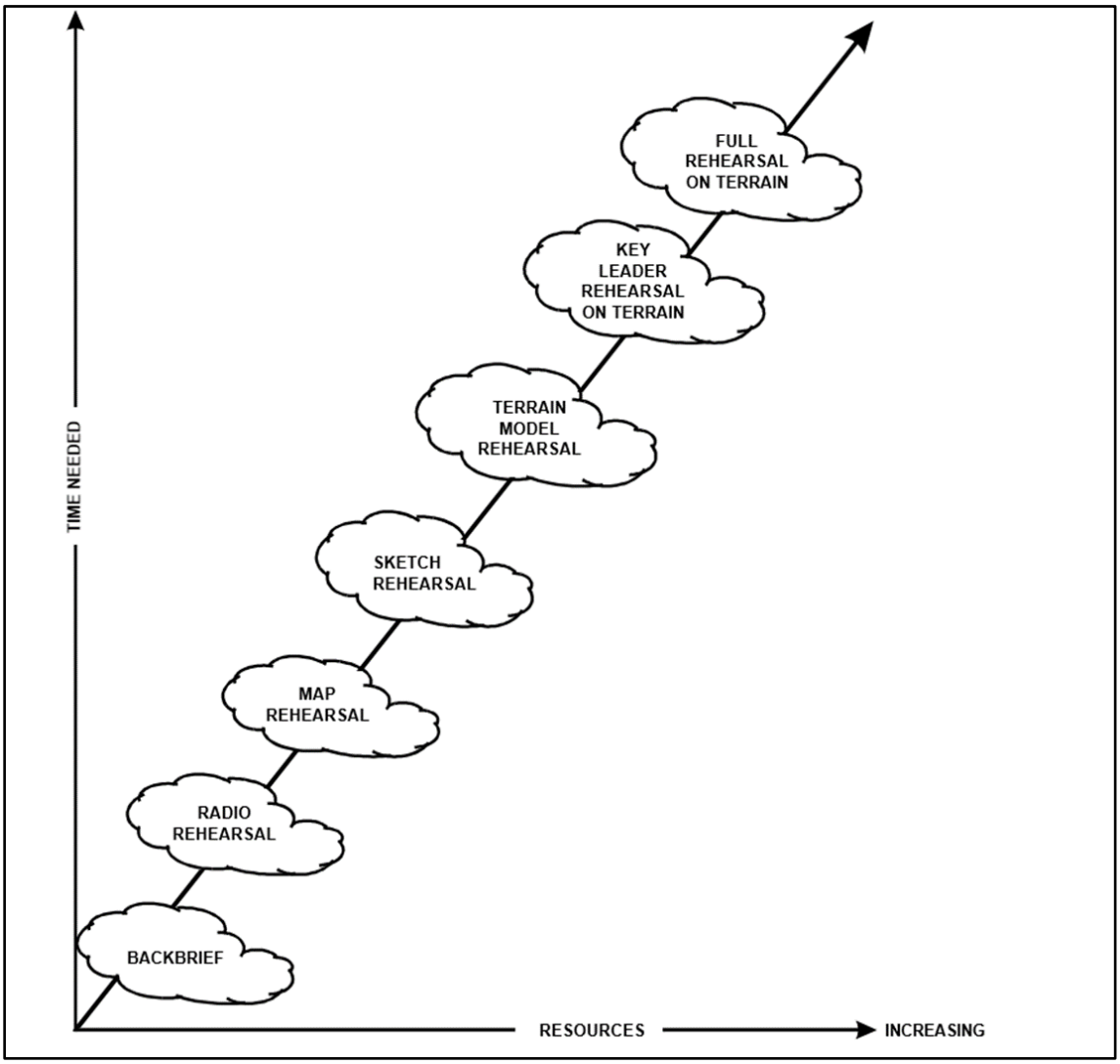

Figure D-2. Rehearsal timeline

D-33. Commanders and executive officers plan rehearsals. They address rehearsal planning consideration and identify responsibilities for ensuring effective rehearsals.

D-34. Commanders provide certain information as part of the commander's guidance during the initial mission analysis. They may revise the following information when they select a course of action:

- Type of rehearsal and rehearsal method.
- Key events to rehearse (prioritized) and the time allocated for each event.
- Location and attendees.
- Enemy courses of action to be portrayed.

D-35. The executive officer ensures all rehearsals are included in the organization's timeline. The executive officer's responsibilities include:

- Publishing the rehearsal time and location in the operation or WARNORD.
- Conducting any staff rehearsals.
- Determining rehearsal products, based on type, method and mission variable.

REHEARSAL PREPARATION

D-36. Once the decision has been made on the type of rehearsal and when and where it will occur, preparation begins. Everyone involved in executing or supporting the rehearsal has responsibilities during preparation.

D-37. Commanders provide the requisite guidance for the rehearsal. They identify and prioritize key events, allocate time for each event, and review the completeness of unit's organization, readiness of personnel and equipment, and the unit's level of preparation.

D-38. The executive officer is the rehearsal director. Through wargaming and coordination with the commander, the executive officer—

- Coordinates and allocates time for key events requiring rehearsal.
- Establishes rehearsal time limits per the commander's guidance and mission variables.
- Verifies rehearsal site preparation, appropriate markings and associated training aids and parking areas.
- Determines the method for controlling the rehearsal and ensuring its logical flow.

D-39. The headquarters' staff conducting the rehearsals—

- Develop an operation order with the necessary overlays.
- Deconflict all subordinate unit graphics.
- Publish composite overlays at the rehearsal.
- Nominate a recorder.

D-40. Subordinate leaders complete their planning; this planning includes—

- Complete unit operation orders.
- Identify issues derived from the higher headquarters' operation order.
- Provide a copy of their unit operation order with graphics to the higher headquarters.
- Perform personal preparation similar to that of the commander.
- Ensure they and their subordinates bring all necessary equipment.

D-41. Preparatory actions vary for each rehearsal method. The following example depicts those actions required during a terrain-model rehearsal.

- When the commander choses the terrain model technique, the site must be prepared to replicate the operations graphic and fire control measures and terrain features. To aid the preparation, the operations center should maintain a terrain model and sand table kit.
- The size of the terrain model or the time available may necessitate using additional personnel for preparation. The size of the terrain model can vary from a table-top arrangement (sandbox) to a model where the participants actually review a scaled-down version of the terrain. A terrain model large enough to allow the key leaders to walk over a scaled-down version of the terrain helps participants to visualize the battlefield.
- The first step in creating an accurate terrain model is to prescribe the scale. This is easily accomplished by walking off several steps per kilometer or using some other form of measurement. For example, if the zone of attack is 10 kilometers by 6 kilometers, the builder of the terrain model could assign one step per kilometer and walk off the scale of the terrain model.
- The second step is to lay down selected grid lines based on the tactical map. With the grid lines established, the builder has a handy reference to measure the size and locations of the terrain features. This simple step greatly increases the accuracy of the terrain model and ensures that the terrain features are the proper scale.
- The terrain model should depict all required information shown on the operations overlay and situation map to include key terrain features, enemy positions (known and suspected), and airspace coordinating measures. Place an arrow on the terrain map to depict north for orientation. Label all phase lines, numbered hills, and objectives with their appropriate names. The terrain should mirror the operations and enemy overlays and include the air portion of the IPB. Once the terrain model is complete, position a map and operations overlay behind or at the side of the model as a point of reference.

REHEARSAL EXECUTION

D-42. During the rehearsal execution, the commander, executive officer, subordinate leaders, recorder and staff from the conducting headquarters have specific responsibilities before, during, and after a rehearsal. Before a rehearsal, the rehearsal director states the commander's expectations and orients the participants on the details of the rehearsal. During the rehearsal, participants rehearse their roles to ensure that they understand how their actions impact an operation. After a rehearsal, participants ensure that they understand any changes to the operation order and to any coordination required.

D-43. Commanders command the rehearsal just as they command an operation. They maintain the focus and level of intensity, allowing no potential for confusion by subordinates. An effective rehearsal validates the synchronization (the what, when, and where) of tasks that subordinate units will perform to execute the operation and achieve the commander's intent.

D-44. The executive officer—as the rehearsal director—ensures each unit accomplishes its tasks at the right time and cues the commander to upcoming decisions. The executive officer's script is the execution matrix and the decision support template. The executive officer as the rehearsal director—

- Starts the rehearsal time.
- Initiates a formal roll call.
- Ensures everyone brings the necessary equipment, including organizational graphics, and previously issued orders.
- Validates the task organization; link-ups must be complete or on schedule, and personnel and materiel must be on hand.
- Ensures synchronization of the operational framework being used.
- Synchronizes the timing and contribution of each participant.
- Ensures that the most important events receive the most attention.
- Keeps within time constraints.

D-45. The operations officer (S-3)—

- Portraits the friendly scheme of maneuver.
- Ensures subordinate unit actions comply with the commander's intent.

D-46. The intelligence officer (S-2) portrays the enemy forces and other variables of the operational environment during rehearsals. The S-2 bases actions on the enemy course of action that the commander selected during the planning process. The S-2—

- Provides participants with current intelligence assessments.
- Portrays the best possible assessment of the enemy course of action.
- Communicates the enemy's presumed concept of operation, desired effects, and end state.
- Explains other factors of the operational environment that may hinder or complicate friendly actions.
- Communicates the key civil considerations of the operation.

D-47. The logistics officer (S-4)—

- Presents the logistics support concept.
- Identifies critical sustainment shortfalls.
- Communicates the transportation support identified for supply distribution and other sustainment actions.

D-48. Subordinate leaders, using an established format, effectively brief their units' actions and responsibilities as well as record changes on their copies of the graphics or operation order.

D-49. The recorder is normally a representative from the S-3. During the rehearsal, the recorder captures all coordination made during execution and notes any unresolved problems. At the end of the rehearsal, the recorder presents any unresolved problems for resolution, restates any changes directed by the commander, and estimates when a fragmentary order codifying the changes will follow.

D-50. The rehearsal director frees the commander to command and participate rather than run a rehearsal. While the SHORAD battalion conducts its rehearsal, the SHORAD battery and platoons should also rehearse with their leaders and with the supported unit. Final changes are made to the execution matrix following rehearsals, and WARNORDs are issued to reflect any necessary changes.

D-51. The following example outlines a step-by-step process for conducting a rehearsal:

- Step 1. Start at the appointed time and conduct a formal roll call. Ensure everyone brings binoculars, maps, and necessary equipment.
- Step 2. Ensure the rehearsal director orients the map, sketch-map, or terrain model to the actual ground. Generally describe and point out the overall AO and explain the markers used on the terrain model.
- Step 3. Brief the time line. Designate the rehearsal start time. For example, have the rehearsal begin by depicting the anticipated situation one hour before leaving the line of departure. Set the time interval to be used to start and track the rehearsal: in effect, specify a ten-minute interval to equate to one hour of real time during operation.
- Step 4. Highlight the ground rules and incorporate ground rules into the unit SOP. Include who controls the rehearsal, who actually walks the terrain, how the rehearsal will be controlled, and when staff officers brief.
- Step 5. The S-3 (or executive officer at battery level) reads the mission statement, the commander reads the commander's intent, and the S-3 or executive officer lays out the friendly situation as it currently exists, using the map, sketch-map, or terrain model.
- Step 6. The S-2 (or executive officer at battery level) briefs the current enemy situation. The S-2 then briefs the most likely enemy course of action (the enemy situation should already be set up on the map or terrain model). The S-2 also briefs the status of the reconnaissance and surveillance plan, for example, citing the most recent early warning tracks.
- Step 7. The S-3 (or executive officer at battery level) briefs friendly maneuver unit dispositions at the rehearsal start time, including sensor positions. Other staff officers brief their subordinate unit positions at the start time, as well as any particular points of emphasis.
- Step 8. The commander gives appropriate commands. Battery commanders and or platoon leaders tell when they occupy positions and anticipate an air attack. The executive officer talks for any staff section not present and ensures all actions listed on the synchronization matrix or decision support template are addressed at the proper time or event. Avoid re-wargaming except as absolutely necessary to ensure subordinate unit commanders fully understand the plan. If the staff has developed an order that addresses contingencies, there is little need to re-wargame the operation at the rehearsal site.
- Step 9. The S-2 (or executive officer at the battery level) portrays the enemy. The S-2 section describes the enemy's most likely and most dangerous courses of action (situation template), pointing out enemy air avenues of approach, possible aerial targets, landing and drop zones in the unit’s area, reconnaissance routes, objectives, security force composition and locations, probable main force objectives, likely chemical, biological, radiological, and nuclear attack times and locations, and the commitment of reserves. The S-2 must be specific by tying enemy actions to specific terrain or friendly unit actions. The walk-through should be an accurate portrayal of an event template.
- Step 10. Terminate the first phase of the rehearsal after the desired end state (from the commander's intent) is achieved. In the defense, this is usually after the decisive action, such as destruction of the air threat or withdrawal of the enemy.
- Step 11. When it becomes obvious that additional coordination is required to ensure success of the operation, try to immediately accomplish it. This coordination is one of the key points of the rehearsal. Make sure it is clearly understood by all participants and captured by the recorder and all changes to the published operation order are in effect. As soon as possible, the S-3 (or executive officer at the battery level) should collect the verbal fragmentary orders and incorporate as written changes to the operation order.
- Step 12. After the initial review of the base order, recheck the situation at the initial decision point. State the criteria for a decision to change the plan.

- Step 13. Go to the next decision point and ensure that the criteria have been met. Repeat step 12. (Repeat step 13 for all decision points).
- Step 14. Key sustainment items need to be briefed, including the plans for casualty evacuation (routes, ambulance exchange point locations, refuel on the move, Class IV and V resupply points, forward logistics bases, planned locations and effective times, logistics release points, displacement times and locations for support areas, and prisoner of war collection points). These items should be integrated into the rehearsal at the appropriate times. Summarizing these actions at the end of the rehearsal adds to the value of the rehearsal as a coordination tool.
- Step 15. After the rehearsal is complete, the recorder should restate any changes, coordination or clarifications directed by the commander, and estimate the time that a written fragmentary or operation order, to codify the changes, will be issued.
- Step 16. The commander should stress any points needing additional emphasis. The commander should consider reiterating the commander's intent (purpose, method, and end state) to remind all participants that the goal is to accomplish the mission.

Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. The proponent publication for other terms is listed in parentheses after the definition.

SECTION I – ACRONYMS AND ABBREVIATIONS

AAA	air avenue of approach
ADA	air defense artillery
ADAM	air defense airspace management
ADP	Army doctrine publication
AMD	air and missile defense
AO	area of operations
ATP	Army techniques publication
BCT	brigade combat team
C2	command and control
COA	course of action
DA	Department of the Army
DOD	Department of Defense
FM	field manual
G-2	assistant chief of staff, intelligence
IPB	intelligence preparation of the battlefield
JP	joint publication
M-SHORAD	maneuver short-range air defense
MDMP	military decision-making process
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, civil considerations
OPORD	operation order
NAI	named area of interest
RAM	rocket, artillery, and mortar
ROE	rules of engagement
S-2	battalion or brigade intelligence staff officer
S-3	battalion or brigade operations staff officer
S-4	battalion or brigade logistics staff officer
SHORAD	short-range air defense
SOP	standard operating procedure
TLP	troop leading procedures
UAS	unmanned aircraft system

WARNORD warning order

SECTION II – TERMS

air and missile defense

Direct [active and passive] defensive actions taken to destroy, nullify, or reduce the effectiveness of hostile air and ballistic missile threats against friendly forces and assets. Also called AMD. (JP 3-01)

air defense artillery

Weapons and equipment for actively combating air targets from the ground. Also called ADA. (JP 3-01)

air defense warning condition

An air defense warning given in the form of a color code corresponding to the degree of air raid probability with yellow standing for when an attack by hostile aircraft or missiles is probable; red for when an attack by hostile aircraft or missiles is imminent or is in progress; and white for when an attack by hostile aircraft or missiles is improbable. Also called ADWC. (JP 3-01)

alert state

A condition that prescribes the amount of resources required to achieve ready to fire and desired radar emissions, and which specifies manning requirements and equipment configurations. (FM 3-01)

area defense

A type of defensive operations that concentrates on denying enemy forces access to designated terrain for a specific time rather than destroying the enemy outright. (ADP 3-90)

area of interest

That area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory. Also called AOI. (JP 3-0)

area of operations

An operational area defined by a commander for land and maritime forces that should be large enough to accomplish their missions and protect their forces. Also called AO. (JP 3-0)

assign

To place units or personnel in an organization where such placement is relatively permanent, and/or where such organization controls and administers the units or personnel for the primary function, or greater portion of the functions, of the unit or personnel. (JP 3-0)

attach

The placement of units or personnel in an organization where such placement is relatively temporary. (JP 3-0)

attack

A type of offensive operation that destroys or defeats enemy forces, seizes and secures terrain, or both. (ADP 3-90)

command and control

The exercise of authority and direction by a properly designated commander over assigned and attached forces in the accomplishment of the mission. Also called C2. (JP 1)

complex integrated attack

A synchronized attack of a friendly asset by a mix of air and missile threats arriving near-simultaneously from different directions, altitudes, and ranges. (FM 3-01)

consolidate gains

Activities to make enduring any temporary operational success and to set the conditions for a sustainable security environment, allowing for a transition of control to other legitimate authorities. (ADP 3-0)

decisive action

The continuous, simultaneous execution of offensive, defensive, and stability operations or defense support of civil authorities tasks. (ADP 3-0)

defensive operation

An operation to defeat an enemy attack, gain time, economize forces, and develop conditions favorable for offensive or stability operations. (ADP 3-0)

engage

In air and missile defense, a fire control order used to direct or authorize units and/or weapon systems to attack a designated target. (JP 3-01)

engagement authority

An authority vested with a joint force commander that may be delegated to a subordinate commander, that permits an engagement decision. (JP 3-01)

exploitation

A type of offensive operation that usually follows a successful attack and is designed to disorganize the enemy in depth. (ADP 3-90)

flexibility

The employment of a versatile mix of capabilities, formations, and equipment for conducting operations. (ADP 3-0)

homeland defense

The protection of United States sovereignty, territory, domestic population, and critical infrastructure against external threats and aggression or other threats as directed by the President. Also called HD. (JP 3-27)

integration

The arrangement of military forces and their actions to create a force that operates by engaging as a whole. (JP 1)

mobile defense

A type of defensive operation that concentrates on the destruction or defeat of the enemy through a decisive attack by a striking force. (ADP 3-90)

mobility

A quality or capability of military forces which permits them to move from place to place while retaining the ability to fulfill their primary mission. (JP 3-36)

movement to contact

A type of offensive operation designed to develop the situation and establish or regain contact. (ADP 3-90)

offensive operation

An operation to defeat or destroy enemy forces and gain control of terrain, resources, and population centers. (ADP 3-0)

operational control

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. Also called OPCON. (JP 1)

operational environment

A composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. Also called OE. (JP 3-0)

organic

Assigned to and forming an essential part of a military organization as listed in its table of organization for the Army, Air Force, and Marine Corps, and are assigned to the operating forces for the Navy. (JP 1)

planning

The art and science of understanding a situation, envisioning a desired future, and laying out effective ways of bringing that future about. (ADP 5-0)

positive control

A method of airspace control that relies on positive identification, tracking, and direction of aircraft within an airspace, conducted with electronic means by an agency having the authority and responsibility therein. (JP 3-52)

positive identification

An identification derived from observation and analysis of target characteristics including visual recognition, electronic support systems, noncooperative target recognition techniques, identification friend or foe systems, or other physics-based identification techniques. Also called PID. (JP 3-01)

primary target line

An azimuth assigned to a weapon system or unit along which the system fire control personnel and or gunners focus their attention. (FM 3-01)

procedural control

A method of airspace control which relies on a combination of previously agreed and promulgated orders and procedures. (JP 3-52)

pursuit

A type of offensive operation designed to catch or cut off a hostile force attempting to escape, with the aim of destroying it. (ADP 3-90)

resilience

The quality of the defense to maintain continuity of operations regardless of changes in or unanticipated tactics by enemy air or losses of critical air and missile defense components. (FM 3-01)

rules of engagement

Directives issued by competent military authority that delineate the circumstances and limitations under which United States forces will initiate and/or continue combat engagement with other forces encountered. Also called ROE. (JP 3-84)

secondary target line

A pre-planned alternative target line used to shift the orientation of fires to assure all likely threat avenues of ingress are adequately defended. (FM 3-01)

sector of fire

That area assigned to a unit, crew-served weapon, or an individual weapon within which it will engage targets as they appear in accordance with established engagement priorities. (FM 3-90-1)

short-range air defense

Capabilities that provide air defense against low-altitude air threats. Also called SHORAD. (FM 3-01)

stability operation

An operation conducted outside the United States in coordination with other instruments of national power to establish or maintain a secure environment and provide essential governmental services, emergency infrastructure reconstruction, and humanitarian relief. (ADP 3-0)

tactical control

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. Also called TACON. (JP 1)

unmanned aircraft system

That system whose components include the necessary equipment, network, and personnel to control an unmanned aircraft. Also called UAS. (JP 3-30)

weapons control status

An air and missile defense control measure declared for a particular area and time by an area air defense commander, or delegated subordinate commander, based on the rules of engagement that establish the conditions under which fighters and surface air defense weapons are permitted to engage threats. Also call WCS. (JP 3-01)

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21 July 2022

By Order of the Secretary of the Army:

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