FM 3-27

Army Global Missile Defense Operations

AUGUST 2023

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Preface

Field Manual (FM) 3-27, *Army Global Missile Defense Operations* provides an overview of global missile defense (MD) operations affecting one or more combatant command's (CCMD) area of responsibility (AOR). MD assets require synchronization to successfully defeat an attack. This publication provides doctrinal tenants and procedures for planning, preparing, executing, and assessing global MD operations. FM 3-27 is consistent with the principles in joint doctrine and links global MD operations doctrine at the tactical and operational level to Joint Publication (JP) 3-01, *Countering Air and Missile Threats*, and at the operational and strategic level to JP 3-27, *Homeland Defense*, as well as the United States Strategic Command (USSTRATCOM) *Global Ballistic Missile Defense Concept of Operations*.

FM 3-27 is applicable to all members of the profession of arms: leaders, Soldiers, and Army Civilians. It assists in understanding, planning, and incorporation of ballistic missile defense (BMD) capabilities into operations. It aids Army and joint force commanders (JFC) in executing cohesive joint operations throughout the operational environment (OE). Commanders and staffs of Army headquarters serving as joint task force or multinational headquarters should refer to applicable joint or multinational doctrine concerning the range of military operations and joint or multinational forces. Trainers and educators throughout the Army may also use this manual.

Army leaders must understand joint doctrine and use it when communicating and coordinating directly with the joint force. JP 3-0 establishes the baseline operations doctrine for the joint force.

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

FM 3-27 uses joint terms where applicable. Selected joint and Army terms and definitions appear in both the glossary and the text. Terms for which FM 3-27 is the proponent publication (the authority) are presented in italics and bold font in the text and marked with an asterisk (*) in the glossary. When first defined in the text, a term for which FM 3-27 is the proponent publication is bold font and italicized, and the definition is bold font. When first defining other proponent definitions in the text, the term is italicized, and the number of the proponent publication follows the definition.

FM 3-27 applies to the Active Army, Army National Guard/Army National Guard of the United States, and United States Army Reserve unless otherwise stated.

The proponent of FM 3-27 is the United States Army Space and Missile Defense Command (USASMDC). The preparing agency is the Space and Missile Defense Center of Excellence. Send comments and recommendations on Department of the Army Form 2028 (*Recommended Changes to Publications and Blank Forms*) by e-mail to usarmy.peterson.smdc.list.smdc-doctrine@army.mil or submit an electronic Department of the Army Form 2028.

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Introduction

This version of FM 3-27 reaffirms global MD operations as paramount to the security of the U.S. and its allies. The term global MD, as used throughout this document, implies defense against ballistic missile only; though future revisions may include other emerging technologies. FM 3-27 is the principle publication for describing the Army's role and mission in global MD of the U.S. homeland, deployed forces, friends, and allies from ballistic missile attack. In the changing geopolitical environment, a number of countries overtly hostile to the U.S. have acquired ballistic missile system capabilities. The proliferation of missile technology has made the fielding of global MD a critical aspect to U.S. national security. Global MD must be capable of engaging all classes of ballistic missile threats and is a key component in the Army's defense of the nation.

This FM establishes the doctrinal framework for Army global MD operations in the Joint community. Global MD is defense against ballistic missiles that start and in one CCMD AOR as well as ballistic missile threats that cross the boundaries of two or more combatant commanders (CCDR). It requires pre-attack synchronization between the affected CCDRs and consists of any defensive measures designed to destroy, nullify, or reduce the effectiveness of a ballistic missile attack.

To achieve the Army's objective of becoming a strategically responsive quality force, dominant across the range of military operations and fully integrated within the unified action environment security framework, the U.S. must fully integrate global MD. The Army's strategic MD forces contribute to this effort by employing sensor and interceptor capabilities as part of the global MD operations.

Commanders and staffs as well as the operational Army use the guiding principles in this manual for the successful execution of this global MD mission. In addition, other Services and Joint organizations can use this manual for doctrinal applications of global MD operations. Army trainers should use this manual for the curriculum in Army institutional training and leader development. This FM provides doctrinal guidance on the operations of the global MD elements and the integration of other BMD elements where applicable. This FM provides a short overview on the BMD elements such as the Patriot weapon system, Terminal High Altitude Area Defense (THAAD), the Army-Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) forward based mode (FBM) system, and ground-based midcourse defense (GMD).

Summary of changes

FM 3-27 was rewritten to document operational and force structure changes within the global MD environment. The current manual aligns global MD doctrine with current Department of Defense (DOD) policy, joint and Army doctrine. A summary of changes is outlined below:

- Arranged chapters for better document flow.
- Adds strategic level content articulating why global MD is existential for the security of the U.S. and our allies.
- Updates document to reflect changes to the Unified Command Plan and force structure.
- Updates OE material.
- Updates terminology consistent with DOD Dictionary:
  - Modified definition of global MD.
  - Eliminated *global ballistic missile defense* term, definition, and *GBMD* acronym.
  - Eliminated codified definition for *ballistic missile defense*—use of term and acronym still valid.

Chapter Organization

FM 3-27 contains seven chapters:

Chapter 1 lays the foundation for why global MD is necessary for the security of the U.S. and our allies. It describes the global MD overview and illustrates the layered approach to executing the mission. It clearly links the joint and Army's operational dependency to global MD. It also describes how MD contributes to the Army warfighting functions and the key coordinating organizations.

Chapter 2 discusses the OE in terms of strategic threats and the overall threat environments.

Chapter 3 discusses global MD operations, MD operating principles, and the utility of information fusion within the joint BMD community.

Chapter 4 identifies the command and control (C2) required for global MD, support and supported relationships, and C2 requirements. Global MD is placed into perspective of where it fits into theater counterair operations and its support to U.S. homeland defense.

Chapter 5 identifies the sensors, interceptors, and C2 components of global MD and the contributions from each system, as well as other contributing sensors that help ensure defeat of threat missile.

Chapter 6 identifies the communications infrastructure and networks used to make global MD a reliable, near real-time reactive system. It also addresses the external battle management systems used to provide C2 to the global MD sensor systems that help provide situational understanding to CCDRs and their staffs.

Chapter 7 discusses site characteristics, sustainment requirements; contract logistics support and sustainment concepts and principles; sustainment fundamentals and operations; security, and facilities.

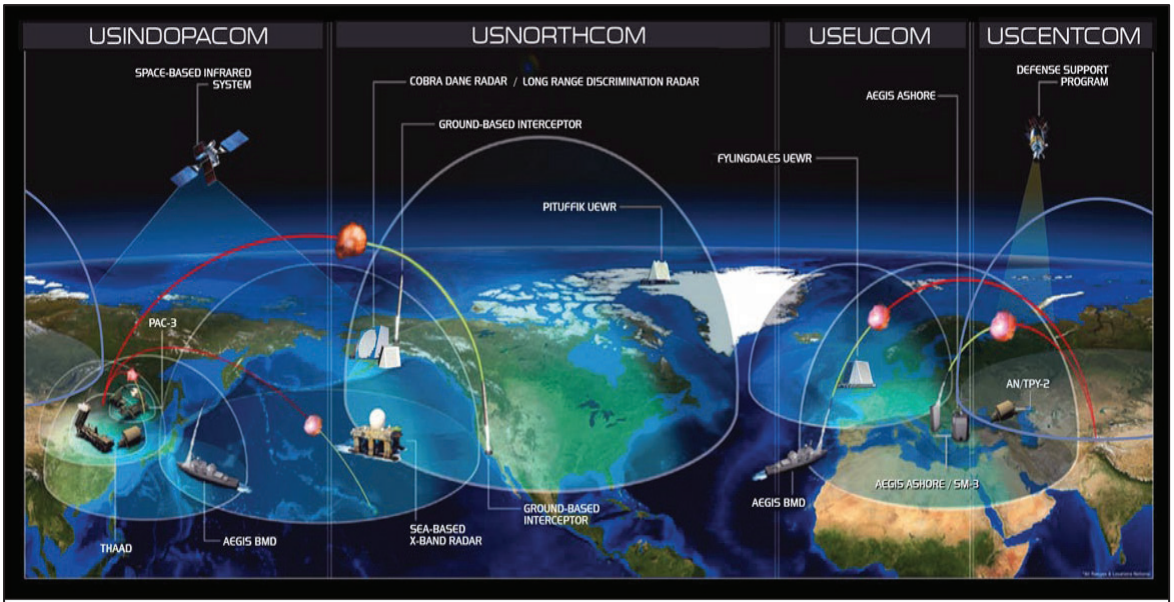
Chapter 1
Global Missile Defense Overview

This chapter identifies global missile defense (MD) doctrine. It uses *global MD* throughout the document and how global MD relates to the Army's role, mission, responsibilities, and relationships to global MD. It addresses ballistic missile flight phases, identifies the difference between global MD and ballistic missile defense (BMD), and identifies why defense against ballistic missiles is necessary. It highlights the layered global MD system to include BMD doctrine and joint concepts and Army warfighting functions for BMD operations. The chapter also addresses BMD concepts, doctrine, and concludes with a description of global MD organizations.

WHAT IS GLOBAL MISSILE DEFENSE?

1-1. A ***ballistic missile*** is any missile which does not rely upon aerodynamic surfaces to produce lift and consequently follows a ballistic trajectory when thrust is terminated (Joint Publication (JP) 3-01). Since a ballistic path is predictable after thrust is terminated, it is possible to predict an impact point and defend against the ballistic missile before it impacts its target. BMD is commonly understood—and used throughout this document—as defense against a ballistic missile. BMD can be provided by a stand-alone fire system, by a cohort of sensors and fire control systems which make up a regional web of protection, or an overlapping system of communications, sensors, engagement platforms, and command and control (C2) elements for an integrated air and missile defense (IAMD) system.

1-2. ***Global missile defense*** is MD operations, activities, or actions that affect more than one combatant command (CCMD) and require synchronization among the affected commands to deter and prevent attacks, destroy enemy missiles, or nullify or reduce the effectiveness of an attack (JP 3-01). Global MD affects two or more CCMDs—which may or may not be contiguous. The global MD system was designed to defend against current and emerging worldwide threats with an integrated and synchronized response. An operational viewpoint—a high level operational concept graphic—of global MD is illustrated in figure 1-1.



AN/TPY-2 - Army Navy/Transportable Radar Surveillance and Control Model 2
BMD - Ballistic Missile Defense
PAC - Patriot Advanced Capability
THAAD - Terminal High Altitude Area Defense
UEWR - Upgraded Early Warning Radar
INDOPACOM - United States Indo-Pacific Command
USNORTHCOM - United States Northern Command
USEUCOM - United StatesEuropean Command
USCENTCOM - United States Central Command

Figure 1-1. Global missile defense operational viewpoint

1-3. Global MD is a multi-Service, multidomain, integrated system comprised of sensors, interceptors, C2, and information systems. The global MD system provides planning and battle management software and hardware, which employs layered defenses to ensure missile defeat during the midcourse and terminal flight phases. BMD provides defense against traditional ballistic missile attacks from close-range ballistic missiles (CRBM), short-range ballistic missiles (SRBM), medium-range ballistic missiles (MRBM), intermediate-range ballistic missiles (IRBM), and intercontinental ballistic missiles (ICBM).

1-4. The friendly forces organization includes layered defenses with priority given to specific assets. This layered defense includes the ability for defense forces to engage and destroy the threat in the boost, midcourse, and terminal phase of flight. The defensive and complementary capability is attained from many independent systems, including sensors, weapons, C2, and communications networked together.

1-5. The Army has a major role in global MD against all categories of ballistic missiles in the midcourse and terminal phases of flight. Each Service is continuously upgrading their capabilities and deploying systems to keep pace with technology advancements being added to ballistic missiles. Global MD consists of multiple sensors and interceptors from all Services at every echelon of command as represented in figure 1-2.

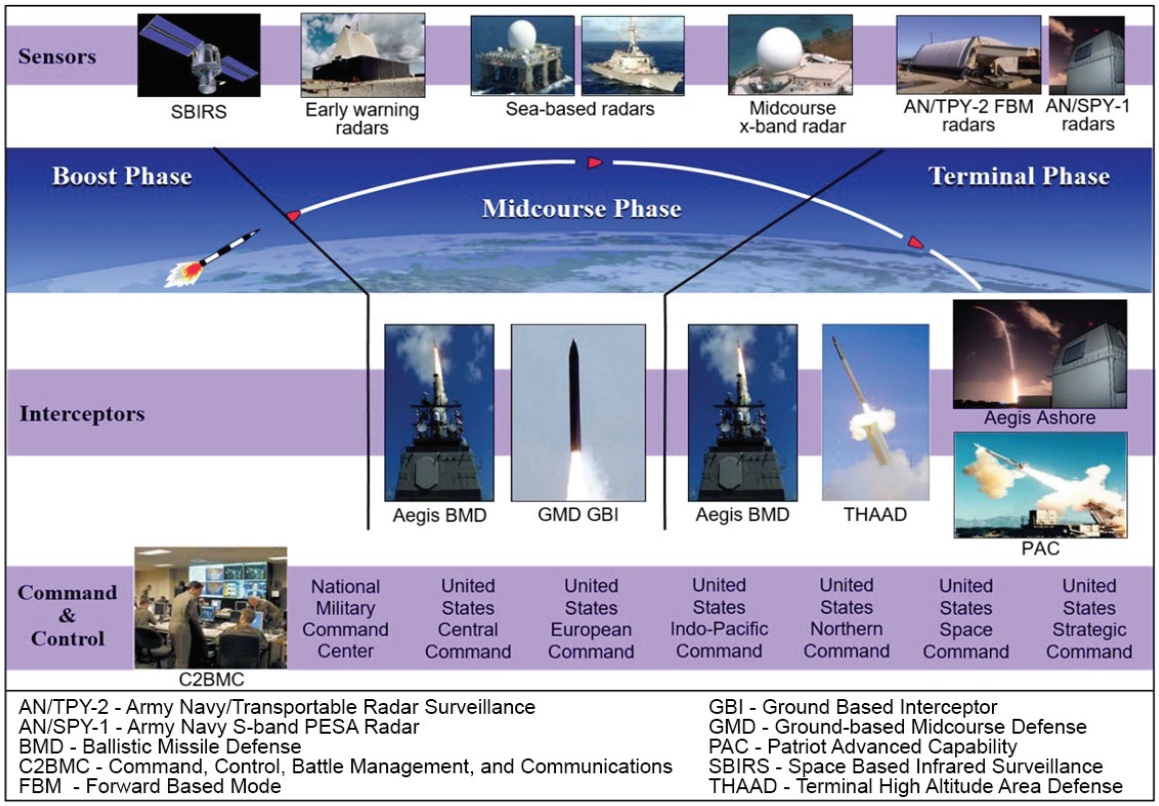


Figure 1-2. Global missile defense elements

1-6. BMD is dependent upon space-based, sea-based, and ground-based sensors, which are crucial for timely detection and communication of a ballistic missile launch against the United States (U.S.), our territories, our forces, and allies. An attack assessment—an evaluation of missile warning information to determine if the trajectory of a ballistic missile poses a threat—is made for the purpose of determining if a ballistic missile launch is a threat to the U.S. homeland. A positive attack assessment is used to direct active and passive defensive actions in a timely manner.

1-7. BMD consists of four major components: active defense, passive defense, attack operations, and battle management.

- *Active defense* is the employment of limited offensive action and counterattacks to deny a contested area or position to the enemy (JP 3-60). The role of active defense is to protect critical assets

designated by the appropriate authority which may include population areas, forces, allies, critical infrastructure, and force generating capabilities from attacks. Active air and missile defense (AMD) is direct defensive action taken to destroy, nullify, or reduce the effectiveness of air and missile threats against friendly forces and assets. It includes the use of BMD weapons, as well as aircraft, air defense weapons, electromagnetic warfare assets, sensors, and other available capabilities. BMD and air defense are closely integrated to provide the essential elements of active defense in support of joint counterair operations. BMD is unique because of the significance of the ballistic missile threat and the difficulty of the defense. The integration of BMD and air defense elements contributes to defense in depth, with the potential for multiple engagements that increase the probability for success. When destruction of the missile prior to launch is not possible or unsuccessful, all available weapon systems should engage threat missiles throughout all phases of flight.

- *Passive defense* are measures taken to reduce the probability of and to minimize the effects of damage caused by hostile action without the intention of taking the initiative (JP 3-60). Passive BMD include detection and early warning systems, signals intelligence, operations security, dispersion, camouflage, cover, concealment, redundancy, military deception, personal protective equipment, and protective construction. Dispersing forces limits the impact of a large scale attack while decreasing the likelihood of detection. Reducing vulnerabilities involves increasing speed of maneuver while limiting electronic signal emissions while in transit. Employing redundant systems and a decentralized command structure ensures a robust and layered defense that mitigates a single point of failure. Passive measures are used to limit damage and increase survivability of an attack by using protective construction measures like physical barriers, reinforced berms, and barricades to minimize attack damage.
- Attack Operations. Active offensive measures intended to disrupt, neutralize, or destroy the missile or launch capabilities prior to launch. The objective of these operations is to prevent the launch of ballistic missiles by attacking each element of the overall system, including such actions as destroying launch platforms, reconnaissance, surveillance, and target acquisition platforms, C2 nodes, missile stocks, and infrastructure.
- Battle Management. Commanders perform battle management functions using an arrangement of personnel, equipment, communications, facilities, and procedures to plan, direct, coordinate, execute, and control forces within their theater.

WHY MISSILE DEFENSE IS NECESSARY

1-8. A ballistic missile attack on the U.S. can have catastrophic effects and long term repercussions. Evan A rogue nation may be able to posture itself as an existential threat using a small number of weapons. Ballistic missiles can be launched without warning, at targets several thousand kilometers from the launch location and can be kept in a ready state until used. Offensive operations designed to neutralize the threat of ballistic missile weapons before hostilities are challenging. This is due to the location of the weapons and the risk of escalation to armed conflict.

1-9. Ballistic missiles are no longer limited to technologically advanced state actors. Advancements have increased the accuracy of ballistic missile weapons while increasing the survivability against defensive systems. They have simultaneously become cheaper to build, buy, and easier to operate. Proliferation of these systems have made them available to many smaller, often belligerent state and non-state actors.

1-10. Ballistic missiles are considered prestigious in some regions and critical to security. Smaller states, and some non-state actors have turned to ballistic missiles as a status symbol of government strength and power projection. Small countries without the means to develop and build their own capabilities can purchase these weapons from state actors willing to sell operational systems to any actor. Their resolve to use them is often a threat to regional stability and—as ranges increase—have become a threat to the U.S., our forces, and allies. This is why defense against a ballistic missile attack is necessary.

THE THREAT

1-11. The threat of a ballistic missile attack is increasing and trends indicate the threat is likely to continue for the foreseeable future. Current trends indicate that ballistic missile systems are easy to purchase, easy to

operate, mobile, reliable, and accurate. Some nation states are working to increase the protection of their ballistic missiles from pre-launch attack and to increase their effectiveness in penetrating defenses.

1-12. Several nation states are developing nuclear, chemical, and/or biological warheads for their missiles. Such capabilities could be significant sources of military advantage during a conflict. But they may be equally significant in the competition phase, when they anchor efforts to coerce states. The ballistic missile threat in regions where the U.S. deploys forces and maintains security relationships with allies and partners is growing at a rapid pace.

1-13. The threat environment becomes increasingly dangerous year after year and defensive measures should keep pace to ensure homeland and theater BMD are maintained. The pace and scale of proliferation is escalating and future missile threats are uncertain. U.S. BMD capabilities and planning must take into account the potential for continued missile proliferation among potential threats.

1-14. Potential threats are fielding modern offensive ballistic missile systems that can threaten U.S. forces abroad, allies, partners, and partnerships. Potential threats are—

- Increasing the capabilities of their existing missile systems.
- Adding new and unprecedented types of missile capabilities to their arsenals.
- Integrating offensive missiles thoroughly into their coercive threats, military exercises, and war planning.

1-15. Ballistic missiles of all types are used to provide leverage, political coercion, and military advantage in regional and international crises and conflict. Modernizing capabilities and expanding interoperability of global MD capabilities is imperative to counter the ongoing advancements of theater offensive ballistic missile systems.

ACTIVITIES TO ENABLE GLOBAL MISSILE DEFENSE STRATEGY

1-16. BMD requires a balanced approach to countering missile threats through a combination of active defense, passive defense, and attack operations. These three aspects of BMD create deterrence and contribute to regional security and stability. An adversary contemplating a missile attack, should consider the prospect of a U.S. response as a strong incentives for restraint.

1-17. The proliferation of missile technology and weapons of mass destruction (WMD) requires a globally oriented capability for defense of the U.S. homeland and overseas area of responsibility (AOR). An *area of responsibility* is the geographical area associated with a combatant command within which a combatant commander has authority to plan and conduct operations (JP 1, Vol 1). As ballistic missile technology advances and proliferation continues, ballistic missiles capable of threatening targets across multiple CCMD will become more common. The links from sensors to decision makers to interceptor needs to occur rapidly and reliably. Defensive forces need to be fully integrated to effectively counter the threats growing in diversity and lethality.

1-18. BMD strengthens U.S. diplomacy. BMD is an essential component of U.S. national security and defense strategies. BMD systems create an environment where threats are deterred from use of ballistic missiles by eliminating their confidence in the effectiveness of an attacks. BMD contribute to the deterrence of aggression and the security of allies and partners. It supports U.S. military operations if deterrence fails, and helps meet and defeat theater and cross-theater aggression.

1-19. Deterrence of attack. BMD contributes directly to both immediate and general U.S. deterrence strategies for regional missile threats and for rogue state threats to the U.S. homeland. Immediate deterrence is against a specific ballistic missile threat. General deterrence is derived from the U.S. reputation as an actor who takes decisive action against existential threats. Its deterrent reputation is generated by predictable behavior to encourage restraint on behalf of the threat actor. General deterrence targets the behavior of threat actors by focusing on the credibility of defensive actions to defeat a ballistic missile attack. BMD can undermine a threats' confidence in their ability to achieve their intended political or military objectives through missile threats or attacks. If a threat is contemplating a missile attack, the uncertainty regarding the effectiveness of attack plans, combined with the prospect of an effective U.S. response to aggression, provide strong incentives for restraint. By shaping a threat's decisions in this way, effective defense diminishes the perceived value of ballistic missiles as tools of coercion and aggression, thus contributing to deterrence.

1-20. BMD is stabilizing. BMD capabilities provide the U.S., allies, and partners the ability to prevent or limit damage from a threats offensive missile strike. By preventing or limiting damage from an offensive strike, escalation of hostilities is less likely to occur. BMD capabilities also cause a threat actor hesitation in launching a ballistic missile if they know the attack likely will not succeed, which helps foster stabilization. This is especially true of rogue actors who have limited ballistic missile inventories.

1-21. Assurance to partners and allies. BMD plays a critical role in assuring partners and allies the U.S. is vested in regional security within every AOR. It does so by helping to protect allied territory and interests during BMD deployments and activities, which helps creates a cohesive allied defense strategy. BMD deployments and cooperative activities strengthen relations with allies and partners and reduce the vulnerability to coercive threats and attacks. They also provide opportunities for cooperative allied co-development of BMD systems and defense collaboration.

1-22. Building partnership capacity. Helping allies, partners, and host nations better defend themselves against the full range of theater missile threats is a vital element of U.S. regional security strategy. The U.S. strengthens theater BMD capabilities and cooperative relationships with allies and partners on a broad range of BMD activities, and encourages allied investments in BMD including co-development of defense systems. Activities such as cooperative BMD training exercises between the U.S. and allies ensures regional security and contributes to building trust. A strong commitment to interoperability maximizes allies' and partners' contributions to the BMD mission and enables a more effective response to a missile attack.

MISSILE DEFENSE MISSION SETS

1-23. Global MD supports defense against strategic, cross-AOR, and theater ballistic missile attacks. All three depend on a persistent and reliable early warning network consisting of space-based, ground-based, and sea-based sensors. Timely detection and communication of ballistic missiles launched against the U.S., our forces, and allies are crucial components of global MD.

- Strategic missile warning is the notification of a missile attack against North America and may include attack notifications to some allied and partner nations. Integrated tactical warning and attack assessment (known as ITW/AA) systems are essential for the detection, confirmation, and notification of ballistic missile launches threatening the sovereign territory and population of the U.S.
- Theater missile warning is the immediate notification of a potential threat of a ballistic missile projected to impact an identified area within the same theater from which it was launched. Theater missile warning elements receive direct downlink signals from satellites and process the data as part of the theater event system. Theater missile warning uses tactical message dissemination and voice notification to operations and command centers a ballistic missile attack is occurring.
- Cross-AOR missile warning is theater-level missile warning that crosses the boundaries of one AOR and impacts in another AOR and likely have theater strategic level of war impacts. Cross-AOR missile warning requires CCMD-level operation plans to coordinate responses and synchronized actions between CCMDs to ensure effective defense and fulfill policy aims in support of the national strategy.

STRATEGIC

1-24. Protection of the homeland is—by its very nature—a strategic mission. *Homeland defense* is the protection of U.S. sovereignty, territory, domestic population, and critical infrastructure against external threats and aggression or other threats as directed by the President (JP 3-27). This is a call to defend U.S. territory against state and non-state attack. This is achieved by—

- Active global MD to protect the homeland.
- Deterrence and resolve to defeat aggression abroad.

1-25. Strategic missile warning is a mission which supports strategic decision making by national leaders for a missile attack against North America or allied and partner nations for the purpose of defending the U.S. homeland. It uses data and voice architecture different from what is used in theater BMD. Integrated tactical

warning and attack assessment systems are essential for the detection and notification of missile launches that threaten the sovereign territory and population of the U.S.

1-26. Strategic BMD recognizes IAMD assets are a significant contribution of every battlefield solution. The U.S. relies on ground-based midcourse defense (GMD) to maintain defense of the U.S. homeland against a limited ballistic missile attack from rogue nations. Complete integration of AMD allows faster, more efficient, and more effective sensor-to-interceptor engagements in theater. The primary difference between AMD and IAMD is that AMD is entirely focused on the theater defensive counterair mission whereas IAMD addresses defensive counterair missions supported by offensive counterair elements. Beyond the theater level, IAMD integrates these counterair operations with global MD, homeland defense, and global strike. This material is covered in more detail in the IAMD section of this chapter.

1-27. Global MD supports strategic missile warning decision making. It is an integrated, layered architecture that provides multiple opportunities to destroy ballistic missiles and their warheads before they can reach their targets. The architecture includes land, sea, and space-based elements to track, target, and destroy threat ballistic missiles of different ranges, speeds, and size after their launch.

THEATER

1-28. Theater missile warning is the immediate notification to operational command centers and warfighters of a potential threat due to a missile launch and projected impact location in a designated theater area of operations, joint operations area, or area of interest. Theater missile warning uses tactical dissemination and notification to operations and command centers that a launch has occurred.

1-29. The U.S. fields a number of defense systems to intercept threat ballistic missiles. These systems include mobile or transportable sensors and interceptors that can be surged to zones of crisis or conflict. If these systems are interoperable with allied and partner assets, they can support combined defensive operations. The theater BMD posture is flexible and adaptable to meet the evolving threats and new classes of offensive missiles as they are fielded.

1-30. Deployment of global MD elements are tailored to the unique deterrence and defense requirements of each theater or region. Theaters vary considerably in geography, types of threat, and both international and military-to-military relationships built on cooperative BMD agreements.

1-31. To help facilitate BMD integration, the U.S. works with allies and partners to strengthen theater deterrence architectures. To pursue an adaptive approach to BMD, the defense design for each region is tailored to the address the unique threats and circumstances of each region. The capabilities meet the defensive needs based on the threat and commander's intent.

CROSS-AREA OF RESPONSIBILITY

1-32. Threat actors have ballistic missiles that can launch in one CCMD's theater and threaten U.S. interests and territories in another CCMD's theater. As threat actors have evolved, U.S. BMD planning has increasingly become global in nature and coordinated across combatants command boundaries to address cross-AOR threats. Global MD roles, responsibilities, and authorities are aligned to maximize the integration and optimization of limited defensive assets—they are not constrained by theater boundaries.

1-33. Cross-AOR BMD is warning and defense against a ballistic missile that originates in or crosses one combatant commander's (CCDR) AOR and is projected to impact in a different CCDRs AOR. Effective defense against cross-AOR ballistic missile attacks require extensive planning and pre-coordinated responses between CCDRs and their staffs. The response activities of supported and supporting CCDRs during cross-AOR ballistic missile attack is very different than the response to a ballistic missile attack within a theater--it requires a much higher degree of situational awareness, interaction, and communications between all elements of all CCMDs.

1-34. Cross-AOR BMD is far more complex than a ballistic missile attack in one AOR. It includes the data distribution capability that facilitates the notification and situational awareness of a ballistic missile launch to CCMDs and requires near real time, complex interaction between many global MD elements, distributed networks, and the pre-coordinated interactions between supported and supporting CCMDs to determine the best response actions. The global MD operational view in figure 1-1 (page 1-1) illustrates the cross-AOR

global MD framework with a large bubble that covers both United States European Command (known as USEUCOM) and United States Central Command (known as USCENTCOM).

CONTRIBUTING SENSORS

1-35. As threats have advanced and technical solutions mature, it is imperative to think strategically about the deployment of low-density, high-demand BMD elements in a regional context. Elements are combined to develop specific deterrence options melded into a defense design of the region where they are deployed. Each region varies considerably by geography, the overall characterization of all the threats in the field of view of overlapping sensors, and the international and military-to-military relationships on which the U.S. builds cooperative global MD objectives.

1-36. The U.S. has made significant progress in developing and fielding capabilities for protection against ballistic missile attacks. These include increasingly capable sensors, effectors, C2 elements, and communications networks. Systems contributing to BMD support all three mission sets, and include—

- Systems with sensors only—
  - Army-Navy/Transportable Radar Surveillance and Control Model 2 (AN/TPY-2) forward based mode (FBM) system.
  - COBRA Dane radar.
  - Long range discrimination radar (LRDR).
  - Overhead persistent infrared (OPIR).
  - Sea-based x-band radar (SBX).
  - Upgraded early warning radar (UEWR).
- Systems with sensors and interceptors—
  - Aegis BMD.
  - Aegis Ashore.
  - GMD.
  - Patriot batteries for point defense.
  - Terminal High Altitude Area Defense (THAAD).
- C2 elements—
  - Command and Control, Battle Management, and Communications (C2BMC).
  - Integrated Air and Missile Defense Battle Command System (IBCS).
- Communications networks—
  - BMD communications network.
  - GMD communications network.
  - Link 16.

BALLISTIC MISSILE BASICS

1-37. A ballistic missile does not rely on aerodynamic surfaces to produce lift—lift is generated by the thrust from the engines and the trajectory is controlled by the guidance and control system moving the engine thrust to steer the missile in the desired direction. After completion of the boost phase, one or more reentry vehicles (RV) separates from the booster and follows a ballistic trajectory throughout the midcourse and terminal phases of its flight path. As its name implies, an RV is the part of a missile designed to reenter the Earth's atmosphere. An RV contains a WMD designed to achieve the desired effect against a chosen target. The RV follows a prescribed trajectory dictated by the laws of physics and cannot be altered unless it is acted upon by an external force. An RV trajectory is acted on only by gravity, friction with the air, and winds throughout the midcourse and terminal phases. In less advanced ballistic missiles, the RV may not separate from the booster.

1-38. An RV may be equipped with specialized capabilities that allow the ballistic trajectory to be altered during the midcourse and terminal phases. An RV may be maneuverable, contain defensive countermeasures such as decoys and chaff, and be one of several RVs from the same booster. The use of maneuverable RVs,

multiple RVs, and countermeasures challenge defensive capabilities and increase the importance on building an integrated global MD system.

BALLISTIC MISSILE FLIGHT PHASES

1-39. Global MD forces deploy layered defenses that use complementary sensors, interceptors, and C2 to engage all classes of ballistic missile threats across the globe. These systems provide multiple engagement opportunities against ballistic missile threat targets in all phases of flight. Figure 1-3 depicts the ballistic missile flight ranges, phases and notional target engagement window (TEW). Each phase plays an important role in the design of a robust system intended to defeat a ballistic missile attack. Ballistic missile flight is divided into three phases:

- Boost.
- Midcourse.
- Terminal.

Boost Phase Defense

1-40. The boost phase of a ballistic missiles flight is the segment of flight lasting from launch through the completion of propulsion fuel burn. The infrared signature created by the combustion of the missile's fuel provides an exhaust plume detectable by satellite sensors. Satellites provide early warning of missile launches and usually provide the first indication of a missile's launch. The information collected during boost phase is also used to predict launch location, flight trajectory, projected point of impact, and determine missile type.

1-41. Boost phase is the ideal phase to destroy a ballistic missile as it struggles against the Earth's gravity (active defense), but it is extremely difficult to execute due to the short burn duration—usually less than 300 seconds and burns out at an altitude of less than 300 kilometers. Intercepting a missile in the boost phase will likely cause debris to fall onto or near the launch country and may cause collateral damage to civilian population. In the boost phase, it is not necessary to destroy the RV—destroying the booster with the RV still attached will essentially destroy the RV.

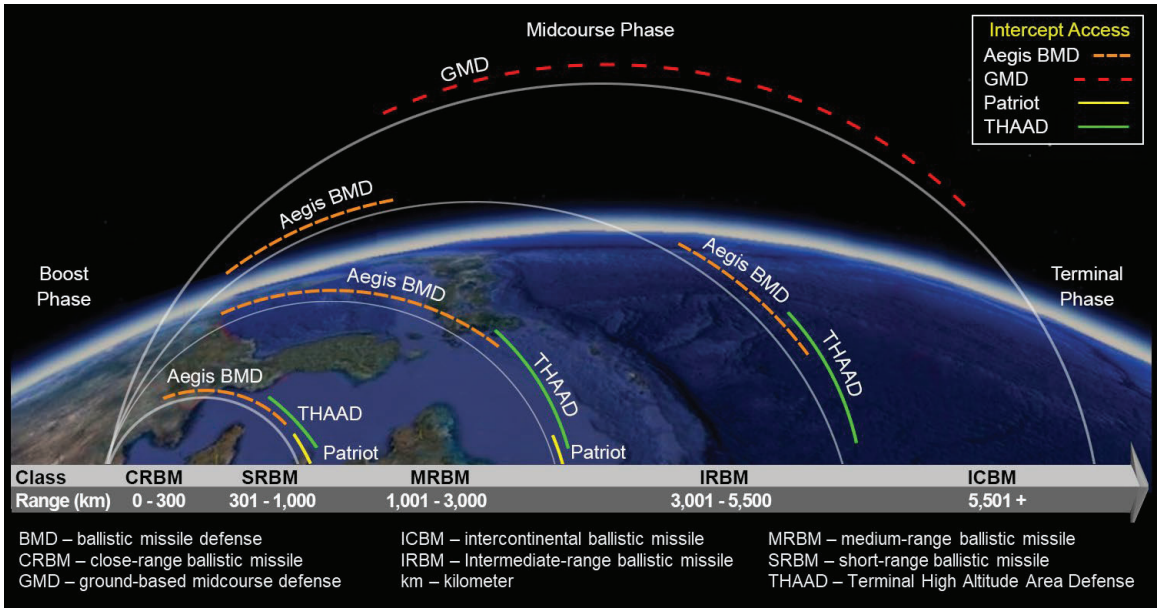


Figure 1-3. Ballistic missile ranges, phases, and notional intercept access

1-42. The U.S. does not have a dedicated boost phase interceptor capability. Current boost phase detection sensors in BMD are the spaced-based infrared system (SBIRS) constellation, AN/TPY-2 FBM system, Patriot, and Aegis BMD ships.

Midcourse Phase Defense

1-43. The midcourse phase begins immediately following booster burn out when the RV separates from the booster and continues along its established trajectory. This phase can last as long as 35 minutes for ICBMs, allowing opportunity to destroy the incoming ballistic missile outside the Earth's atmosphere. Any debris remaining after the intercept will likely burn up as it re-enters the atmosphere.

1-44. The more time a threat missile spends in the midcourse phase, the greater the possibility it may deploy countermeasures and penetration aids, if equipped. Conversely, sensors have more time to discriminate the RV from countermeasures, penetration aides, chaff, and other objects along the same trajectory. The primary midcourse phase defense of the homeland is the GMD system. For shorter range systems such as Aegis Ashore, Aegis BMD, and THAAD may have limited capability to intercept during midcourse.

Terminal Phase Defense

1-45. During the terminal phase of IRBM and ICBM flights, the RV reenters the Earth's atmosphere at extremely high speeds (14,000+ miles per hour) which results in this phase lasting only 60 to 120 seconds. Defensive systems designed for use in the terminal phase have a small TEW in which to provide adequate defense. It is the last opportunity to make an intercept before the RV reaches its target. Intercepting an RV during the terminal phase is difficult and the least desirable because there is little margin for error as the intercept will occur close to the intended target and debris will fall to Earth near the intended target.

1-46. Terminal phase interceptor elements include the Army's Patriot and THAAD systems, and the Navy's Aegis BMD system. These mobile systems are designed to defend against CRBM, SRBMs, MRBMs, and IRBMs. The Patriot system is most effective in protecting point targets such as troop concentrations, ports, airfields, and staging areas while THAAD and Aegis BMD provides area defense. The Aegis BMD, while capable or intercepting a threat in the terminal phase, must be properly positioned to affect an intercept.

INTEGRATED AIR AND MISSILE DEFENSE

1-47. Global MD consists of a layered system comprised of sensors, weapon systems, planning, battle management software, and hardware capable of managing and executing the global MD mission. The forces and capabilities employed by CCDRs may also support a layered defense beginning in the forward areas against strategic missile threats to the homeland. Global MD is the application of AMD and IAMD integrated across all CCMDs.

1-48. *Integrated air and missile defense* integrates capabilities and overlapping operations to defend the homeland and U.S. national interests, protect the joint force, and enable freedom of action by negating an enemy's ability to create adverse effects from their air and missile capabilities (JP 3-01). **A *target engagement window* is the period between the earliest and latest time a weapons system can launch an interceptor to engage against a specific threat target.** The TEW for each system is largely based on the flight time of the threat. CRBMs, SRBMs, and MRBMs have a smaller TEW because they have shorter flight times than IRBMs and ICBMs. Each BMD element will have a different TEW for a given threat based on the interceptor type, range, launch position, angle of approach to target; sensor's field of view, trajectory of the threat target, and other factors. For example, if two Aegis BMD ships are in a position to launch interceptors at a threat target, each ship will have a different TEW for the threat since each ship is in a different location. A larger TEW directly translates into increased weapons access and defeat opportunities.

1-49. *Air and missile defense* is 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). Global MD recognizes AMD elements are significant contributors and force multipliers to every battlefield solution. Complete integration of all AMD elements enables faster, more efficient, and more effective engagements. AMD gives numerous options for delivering simultaneous and sequential effects across all domains by using a layered defense infused with the best opportunities to defeat a ballistic missile threat.

1-50. The layered approach of defeating ballistic missile attack requires all AMD elements to operate with coordinated actions during an attack, best described as "any sensor, best interceptor". To utilize this construct, sensor elements that track a ballistic missile must be able to pass usable track data to other elements—sensors,

interceptors, and C2 systems. Some elements may be in a better position to engage a target while other elements may not. The any sensor, best interceptor construct promotes shared understanding, while increasing the collective TEW of available interceptors. This construct enhances force-wide protection of critical assets over larger, cross-AOR areas.

1-51. BMD is a key component of both the counterair mission for theater defense and IAMD for theater, cross-AOR, and global MD. The IAMD approach overlays on the counterair framework. IAMD expands on the defensive counterair framework at the theater level and adds a perspective that includes defense of the homeland and other capabilities to create the desired effects for BMD. Figure 1-4 illustrates the relationship between the AMD counterair mission and IAMD.

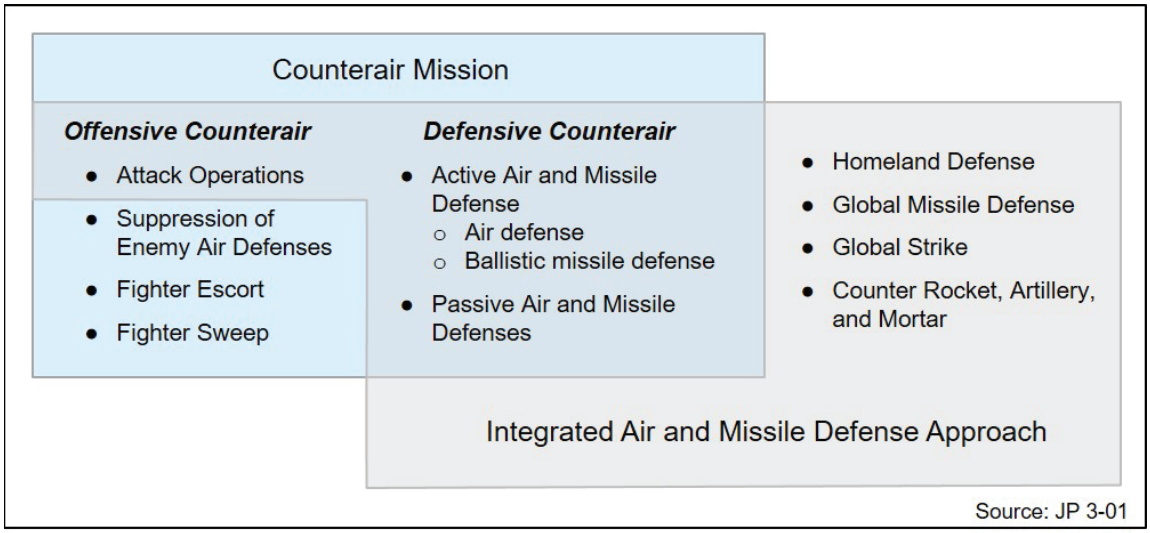


Figure 1-4. Relationship between counterair and integrated air and missile defense

1-52. The engagement sequence must occur rapidly and reliably due to the short TEW. A ballistic missile launch with a trajectory that crosses AOR boundaries complicates control of defensive elements and actions. Cross-AOR threats require extensive planning, coordination, and exercise rehearsal among the affected CCDRs prior to fielding a BMD element capable of defeating a threat launch. All CCDRs plan for and contribute to homeland defense strategy. CCDRs—and subordinate joint force commanders (JFC) as applicable—coordinate their BMD planning and support with Commander, United States Strategic Command (CDRUSSTRATCOM). Refer to JP 3-01 for more information on counterair.

Space Operations Contributions to Missile Defense

1-53. BMD is dependent on space capabilities as activities in the space domain to enable freedom of action for BMD operations. The use of space capabilities grants significant operational advantage to ballistic missile warning and defense. Abilities such as over-the-horizon sensing, beyond line of sight communications, situational understanding, precision timing, and increased navigational and targeting accuracy help ensure protection against an attack.

1-54. BMD is critically supported by missile warning, satellite communications (SATCOM), and space-based surveillance and reconnaissance. Space-based systems provide ballistic missile launch warnings, launch locations, predicted impact areas, and both theater centric and worldwide communications. Space-based capabilities enable attack assessments and provides track data that makes intercepting a threat missile possible. Refer to field manual (FM) 3-14 for information on space capabilities.

ARMY'S GLOBAL MISSILE DEFENSE

1-55. The Army mission is to deploy, fight, and win our Nation's wars by providing ready, prompt, and sustained land dominance by Army forces across the full spectrum of conflict as part of the joint force. This land power capability complements the other Services' capabilities. Furthermore, the Army is charged to

provide logistic and other executive agent functions to enable the other Services to accomplish their missions. The Army's mission and role with respect to global MD follows.

ARMY MISSION

1-56. The Army's global MD mission is to defend the U.S. homeland, territories, allies, and forward based forces against all range of ballistic missiles in all AORs. It accomplishes this mission by training, providing for, and equipping ground BMD forces of all CCMDs. Army specific responsibilities are to detect, deter, defend against, and defeat ballistic missile threats. The Army BMD weapon systems are designed to counter a limited number of strategic ballistic missile threats. United States Army Space and Missile Defense Command (USASMDC) is the Army's proponent for global BMD and provides planning, integration, control, and coordination of Army Forces, and capabilities in support of United States Strategic Command (USSTRATCOM) operations.

1-57. To accomplish the BMD mission the Army integrates and synchronizes the following Army elements into joint operations:

- Patriot.
- THAAD.
- AN/TPY-2 FBM system.
- GMD.

1-58. The U.S.' only dedicated homeland defense against ballistic missile threat is GMD. Other systems—if deployed in or around the U.S. homeland—can only provide limited point or area defense. The GMD element of global MD engages limited ICBM and IRBM threats from rogue nations in the midcourse phase using data from the suite of global MD sensors. GMD contributes to the development of advanced global MD capabilities with increased data sharing between systems to more effectively manage BMD elements and prepare them to engage ballistic missile threats. Global MD mission operations and employment plans are guided by capabilities as technology evolve.

1-59. The AN/TPY-2 FBM batteries are forward deployed in relatively static locations outside the continental United States (OCONUS). Particular locations are dependent upon the missions, collective consideration of all the threats' capabilities, terrain, and other operational considerations.

ARMY ROLE

1-60. The Army's role in global MD is to provide protection for deploying or deployed U.S. forces, allies, facilities, and to assure the freedom of action throughout the operational area. Joint doctrine presents fundamental BMD principles that guide the employment of Army forces in coordinated and integrated action to fulfill this role. The Army Air and Missile Defense Command (AAMDC) integrates the operational elements to synchronize Army BMD contributions with joint counterair operations.

1-61. BMD elements consist of Army systems integrated and coordinated between multiple CCMDs. Global MD operations are coordinated with other offensive and defensive actions and supporting systems to achieve unity of effort. Within homeland defense constructs, global MD activities support actions and plans as part of protecting the U.S. homeland, deployed forces, partners, and allies from ballistic missile attack.

1-62. As the lead Service for Army land-based BMD, the Army operates elements of global MD by planning, coordinating, and executing operations and integrating GMD with other defensive elements. Global MD forces employ a combination of fixed and mobile sensor and interceptor capabilities, as integral elements of global MD, providing protection for the homeland, allies, and power projection capabilities.

1-63. BMD characteristics form the basis for successful execution of BMD operations. BMD requires an integrated strategy to support the rapid, flexible application of defensive capabilities synchronized with offensive actions to deter and defeat increasingly complex and prolific missile threats.

JOINT DEPENDENCY ON ARMY MISSILE DEFENSE

1-64. National policy on BMD acknowledges the various emerging threats to the U.S., and directs the Secretary of Defense to proceed with plans to deploy a set of initial capabilities. To date, the Army operates the only fielded BMD system with the capability to defend the U.S. homeland against ICBM and tactical ballistic missile attack.

1-65. USSTRATCOM is required to synchronize the planning and coordination of the defensive capabilities designed to neutralize, destroy, or reduce the effectiveness of ballistic missile attacks whether within or across the boundaries of any CCDR AOR. Addressing cross-AOR threats require coordination and integration among the affected CCDRs. Global MD is dependent upon all Services, pre-planned cross-AOR operations, and a layered defense strategy.

1-66. Global MD is a joint operation by definition that drives interdependency between all Services. Department of Defense (DOD) sensor systems are used to provide early detection and tracking of missile launches originating within an area of interest. These systems provide continuous processing of near real-time warning, alerting, and cueing information on ballistic missile threats. Each Service component has unique responsibilities that are critical to the success of the entire global MD. The Service contributions are contained in DOD Directive 5100.01. These Service interdependencies allow data to be sent to all CCDRs to integrate BMD for the protection of military forces, civilian populations, and geopolitical centers.

1-67. Supported by the Services, USSTRATCOM has the unique task of conducting global MD operations support and linking it with decentralized execution. Global MD requires well defined command relationships because of cross-AOR threats and the ability of sensors and weapons to provide coverage of two or more AORs. The short reaction times and long ranges associated with ballistic missile attack demands close coordination between supported and supporting CCDRs.

1-68. At the strategic level, the collaborative planning process synchronizes each CCDR's BMD plans with the BMD plans of adjacent CCDRs. At the operational level, the Secretary of Defense or Joint Staff establishes CCDR relationships into supported and supporting roles. They balance defensive resources with AOR priorities for defended assets in accordance with priorities set forth for homeland defense.

1-69. Since ballistic missile threats may cross AOR boundaries, CCDRs must establish cross-AOR command relationships to effectively counter missile threats. The processes that enable cross-AOR collaboration and coordination are critical to ensure effective planning and execution. Successful execution of global MD requires pre-planned, integrated, cross-AOR strategy that supports the rapid, flexible application of defensive capabilities synchronized with offensive actions to deter and defeat ballistic missile attacks. This strategy is based on the Joint doctrinal principles of unity of effort, unity of command, centralized planning, and decentralized execution. Centralized planning is essential for integrating, synchronizing, and controlling the efforts of all available friendly forces. Unity of effort relates to coordinating organizations both within and outside the same command, as it is necessary to defend against a cross-AOR ballistic missile attack. Decentralized execution is essential to remain flexible and react to the varying operating tempo and uncertainty of enemy actions.

1-70. The Army's contribution to joint BMD operations is derived from Department of the Army functions, which include:

- Organize, train, and equip forces to defeat threats.
- Develop concepts, doctrine, tactics, techniques, and procedures in coordination with the other military Services, for employing forces operating on or from the land.
- Conduct AMD to support joint campaigns and assist in attaining air superiority.
- Provide support for space operations to enhance joint campaigns in coordination with other Services.
- Conduct reconnaissance, surveillance, and target acquisition.

JOINT DOCTRINE FOR BALLISTIC MISSILE DEFENSE

1-71. The Army has been at the forefront of BMD and incorporated BMD into doctrine long before the initial JP on theater BMD was promulgated in the early 1990s. The initial joint doctrine was based on the Army's concept for defeating SRBM threats.

1-72. Joint Doctrine presents fundamental principles that guide the employment of U.S. military forces in coordinated and integrated action toward a common objective. In the event deterrence fails, CDRUSSTRATCOM, in support of the other CCDRs, is tasked to coordinate the deployment and employment of strike forces to defeat limited ballistic missile attacks in all phases of flight or prior to their launch in order to defend the U.S., our deployed forces, friends, and allies. CDRUSSTRATCOM is also responsible to ensure continuity of operations, if required.

1-73. JP 3-01 provides the joint definition for active defense in the air domain, to include BMD. Attack operations such as attacks on missile sites and infrastructure are an element of offensive counterair operations. Defensive counterair operations include active AMD activities such as BMD.

1-74. JP 3-27 provides the doctrine for the defense of the U.S. homeland across the range of military operations from peacetime military engagement to major combat operations. The U.S. homeland is the physical region that includes the continental United States (CONUS), Alaska, Hawaii, U.S. territories, and surrounding territorial waters and airspace. Homeland defense is the protection of U.S. sovereignty, territory, domestic population, and critical defense infrastructure against external threats and aggression, or other threats as directed by the President. DOD is responsible for the homeland defense mission, and therefore leads the response, with other departments and agencies in support. This includes using an active, layered defense which integrates the efforts of the U.S. and defense security partners.

1-75. The Unified Command Plan tasks each CCDR with "Detecting, deterring, and preventing threats and attacks against the U.S.; its territories, possessions, and bases; and employing appropriate force across the full spectrum of competition and conflict to defend the Nation." CDRUSSTRATCOM conducts global MD operations support in coordination with other CCMDs and Services.

SUPPORT TO MULTIDOMAIN OPERATIONS

1-76. Global MD directly supports and enhances all six warfighting functions in support of multidomain operations. A *warfighting function* is defined as a group of tasks and systems united by a common purpose that commanders use to accomplish missions Army Doctrine Publication (ADP) 3-0. Commanders apply combat power through one, or a combination of warfighting functions using leadership and information to fulfill the core competencies. Global MD operations are integral to successfully conducting the Army core competencies.

COMMAND AND CONTROL

1-77. *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, Volume 2). The *command and control warfighting function* is the related tasks and a system that enable commanders to synchronize and converge all elements of combat power (ADP 3-0). C2 consists of the related tasks and a C2 system that support the exercise of authority and direction by the commander. Through the C2 warfighting function, commanders integrate the other warfighting functions into a coherent whole to mass the effects of combat power at the decisive place and time. Refer to ADP 6-0 for discussions on the C2 warfighting function.

1-78. Global MD operations encourage the Army's approach to C2: mission command. By employing the principles of mission command, unit commanders benefit from professional and technical competence. They issue a commander's intent and mission orders to create a shared understanding of capabilities which fosters mutual trust. Commander's balance disciplined initiative with risk acceptance to shape and influence the current battle while building cohesive teams. Refer to ADP 6-0 for discussions on mission command and mission command principles.

FIRES

1-79. The *fires warfighting function* is the related tasks and systems that create and converge effects in all domains against the adversary or enemy to enable operations across the range of military operations (ADP 3-0). Army fires systems supports offensive and defensive tasks by delivering specific lethal and nonlethal effects on a target. The two tasks of the fires warfighting function are:

- Integrate Army, multinational, and joint fires.
- Execute fires across all domains and in the information environment.

1-80. Global MD operations supporting the fires warfighting function include the theater event system which has the ability to estimate launch point of a ballistic missile. With this information, the commander may employ MD to attack fixed or mobile launch systems that may be used for follow on attacks, support areas, and installations. The commander may also employ fires to prevent incoming missiles from striking their target areas. Refer to ADP 3-19 for discussions on the fires warfighting function.

INTELLIGENCE

1-81. The *intelligence warfighting function* is the related tasks and systems that facilitate understanding the enemy, terrain, weather, civil considerations, and other significant aspects of the operational environment (OE) (ADP 3-0). Intelligence includes the synchronization of collection requirements with the execution of tactical tasks such as reconnaissance, surveillance, and related intelligence operations. This warfighting function includes specific intelligence and communication structures at each echelon. The four tasks of the intelligence warfighting function are:

- Provide intelligence support to force generation.
- Provide support to situational understanding.
- Conduct information collection.
- Provide intelligence support to targeting and information operations.

1-82. Global MD operations supporting the intelligence warfighting function include identification and early warning of threat activities and location through search, tracking, and cueing sensor operations. Space- based and ground-based global MD sensors are uniquely positioned to gather and provide near real-time mission essential data such as estimated launch and predicted impact locations that contribute to intelligence preparation of the battlefield (IPB). Information provided by OPIR systems support technical intelligence provided to CCMDs, staff planners, and policy makers. It contributes to scientific and technical intelligence on foreign threat systems, selected space programs or systems, and supports materiel acquisition. This information supports the commander in execution of the intelligence warfighting function in a near real-time manner, and influences the decision-making process with a more complete common operational picture. Refer to ADP 2-0, and FM 2-0, for more about intelligence warfighting function.

MOVEMENT AND MANEUVER

1-83. The *movement and maneuver warfighting function* is the related tasks and systems that move and employ forces to achieve a position of relative advantage over the enemy and other threats (ADP 3-0). Direct fire and close combat are inherent in maneuver. It is important for commanders to use maneuver to focus on the threat, not the terrain. Movement is necessary to disperse and displace the force as a whole or in part when maneuvering.

1-84. Global MD operations supporting the movement and maneuver warfighting function provides the commander the capabilities enabling rapid movement by providing a positional advantage to the friendly forces. Global MD supports identification of missile type, predicted impact point, time, and estimated launch point, which directly impact the organization’s ability to move and maneuver on the battlefield. Integrating this information into the common operational picture enhances the commander’s situational awareness of the OE. Additionally, global MD supports movement and maneuver by providing force protection that helps facilitate freedom of movement. Refer to ADP 3-90, for discussions on the movement and maneuver warfighting function.

PROTECTION

1-85. The *protection warfighting function* includes the related tasks and systems that preserve the force so the commander can apply maximum combat power to accomplish the mission (ADP 3-0). Preserving the force includes protecting personnel (friendly combatants and noncombatants) and physical assets of the U.S., host nation, and multinational military and civilian partners (ADP 3-0). There are 16 primary tasks of the protection warfighting function, but the 4 tasks directly supported by global MD operations are:

- Conduct area security.
- Employ safety techniques.
- Implement operations security.
- Coordinate AMD support.

1-86. Global MD operations supporting the protection warfighting function by preserving the commander's freedom of action and protecting forces in all domains. OPIR elements assist in the identification of probable missile and artillery launches that impact on the commander's freedom of action in the OE. Global MD is a necessary aspect of force protection. Refer to ADP 3-37 for discussions on the protection warfighting function.

SUSTAINMENT

1-87. The *sustainment warfighting function* is the related tasks and systems that provide support and services to ensure freedom of action, extended operational reach, and prolonged endurance (ADP 3-0). Sustainment determines the depth and duration of Army operations. Successful sustainment enables freedom of action by increasing the number of options available to the commander. Sustainment is essential for retaining and exploiting the initiative. The sustainment warfighting function consists of four elements: logistics, financial management, personnel services, and health service support.

1-88. Global MD operations supporting the sustainment warfighting function align closely with those of the protection warfighting function. Global MD operations provide defense for all echelons, allowing the commander's freedom of action. Refer to ADP 4-0 and FM 4-0 for discussions on the sustainment warfighting function.

GLOBAL MISSILE DEFENSE COORDINATING ORGANIZATIONS

1-89. Many organizations within a CCMD, subordinate CCMDs, or Joint Task Forces have a role in global MD operations. Global MD is inherently joint operations conducted according to joint doctrine.

UNITED STATES STRATEGIC COMMAND

1-90. USSTRATCOM is the CCMD responsible for synchronizing planning for global MD and coordinating support for global MD operations. CDRUSSTRATCOM, is the supported commander for global MD planning and operations support and is a supporting commander to other CCMDs for execution of global MD. CDRUSSTRATCOM—

- Conducts global MD operations support in coordination with other CCMDs, Services, and, as directed, appropriate U.S. Government agencies.
- Advocates for and assesses MD capabilities.
- Ensures continuity of operations, as required.

1-91. USSTRATCOM is organized to accomplish its missions using functional components which are assigned specific functional responsibilities. Joint Functional Component Command for Integrated Missile Defense (JFCC-IMD) is responsible for the day-to-day planning and operational oversight of all global MD operations.

1-92. To accomplish the global MD mission, USSTRATCOM integrates and synchronizes a wide range of sensors, interceptors, and command elements. Sensors include AN/TPY-2 FBM systems, UEWRs, COBRA

Dane radar, the LRDR, the SBX radar, and the theater event system elements providing theater missile warning. Systems with interceptors include Patriot, THAAD, GMD, Aegis Ashore, and Aegis BMD.

Joint Functional Component Command for Integrated Missile Defense

1-93. The JFCC-IMD mission is to support the CDRUSSTRATCOM, by synchronizing global MD planning and operations support. JFCC-IMD is responsible for the day-to-day planning and execution of global MD. JFCC-IMD plans, coordinates, integrates, and synchronizes global MD operations to provide layered BMD against ballistic missiles of all ranges and in all phases of flight. JFCC-IMD supports development of other capabilities for the DOD and when directed to provide alternate global MD execution support. JFCC-IMD works with other component commands to continuously coordinate, plan, integrate, and synchronize capabilities to provide tailored, responsive effects in support of national objectives and CCMDs.

1-94. JFCC-IMD coordinates with CCMDs and each Service on desired effects, capabilities, and operations support for global MD. They synchronize global MD operations support from all domains. JFCC-IMD monitors and coordinates activities with associated CCMDs, other USSTRATCOM joint functional components, and the efforts of the Missile Defense Agency (MDA). The JFCC-IMD commander advises the CDRUSSTRATCOM, on all aspects of global MD.

1-95. JFCC-IMD is the Asset Manager for the global MD elements and the mission communications portion of the BMD communications network. When any global MD element has a readiness change, the JFCC-IMD conducts an Asset Management Conference to ensure all command elements concerned are aware of a change to the global MD capability and status. The CCMDs are responsible for asset management for theater communications. JFCC-IMD is responsible for the Tier I (strategic level command centers) BMD communications network. They manage the Tier I BMD communications network assets through their continuous 24-hour operations center responsible for monitoring and reporting the availability, reliability and security of the BMD communications network and the global MD elements. They assist worldwide and theater network operations service providers with isolation activities, ensuring network outages affecting global MD are resolved in a timely manner.

1-96. The JFCC-IMD operations center coordinates scheduled and unscheduled maintenance to ensure BMD communications network system integrity and minimal impact from system outages. To ensure network operations capability gaps are closed, the center relies on support from DOD information network, network operations centers, Service and agency communication providers, and the BMD network operations support centers.

UNITED STATES NORTHERN COMMAND

1-97. United States Northern Command (USNORTHCOM) is responsible for homeland defense. USNORTHCOM deters ballistic missile attacks on the U.S., its territories, possessions, and bases within its AOR and other areas as directed. Should deterrence fail, and as directed by the Secretary of Defense, Commander, United States Northern Command (CDRUSNORTHCOM), will employ available global MD forces to defeat ballistic missile attacks. Within the USNORTHCOM AOR, the CDRUSNORTHCOM is responsible for:

- Planning, organizing, and, executing homeland defense operations.
- BMD.

1-98. USNORTHCOM has operational control (OPCON) for execution of BMD for the homeland defense mission. United States Army Forces Command provides forces under command of USSTRATCOM to execute BMD operations for the defense of North America. These forces are OPCON to USNORTHCOM for execution of BMD mission operations in defense of North America.

1-99. The CDRUSNORTHCOM, is the supported commander for homeland defense. If offensive operations are necessary to protect the homeland, all CCDRs are supporting commanders, as directed by Secretary of Defense.

UNITED STATES SPACE COMMAND

1-100. The United States Space Command (USSPACECOM) is designated as the global sensor manager. As designated, USSPACECOM has oversight and operations for strategic communication for global MD. USSPACECOM leverages DOD communications architectures to support the Army forces by working with the JFC, Defense Information Systems Agency, CCMDs, and Services.

1-101. Commander, United States Space Command (CDRUSSPACECOM), is responsible for planning, managing, and conducting operations of assigned forces, space domain awareness, support to MD operations, and is the global sensor manager. USSPACECOM provides—

- Theater and strategic (homeland) missile warning to CCMDs, U.S. Government agencies, international partners, and other entities.
- MD data to CCMDs and other entities.

1-102. USSPACECOM is the supported command responsible for providing space capabilities—including missile warning and MD data—and support to other CCMDs. USSPACECOM is the supported CCMD for space operations and is typically the supported commander for protection of friendly space capabilities, such as a terrestrial-based threat to space capabilities. CCMDs are the supported commands for all other terrestrial operations.

1-103. USSPACECOM integrates, synchronizes, and coordinates space operations and is responsible for providing the critical space capabilities necessary for supporting global MD. Of those capabilities, OPIR sensors usually provide the first indications of a missile launch event and ground radars provide follow on information when the launch trajectory crosses the field of view of a radar. The necessary MD data is provided from OPIR sensors and relayed via SATCOM—both are critical enablers of global MD.

Combined Joint Task Force-Space Operations - Combined Force Space Component Command

1-104. The Combined Joint Task Force-Space Operations - Combined Force Space Component Command optimizes planning, execution, and force management per direction of the Commander, USSPACECOM. Their mission is to continuously coordinate, plan, integrate, synchronize, and execute space operations to provide tailored, responsive space capabilities and effects in support of national objectives and CCDRs.

1-105. The Combined Force Space Component Command supports global MD with ballistic missile early warning and communications capability. It ensures Integrated tactical warning and attack assessment systems and the theater event system generate and report precise, timely, and engagement quality information on ballistic missiles launches and track data as available.

DEFENSE INTELLIGENCE AGENCY

1-106. The Defense Intelligence Agency is responsible for providing support to JFCC-IMD for global MD and supports oversight and management of the information collection enterprise. It develops and synchronizes operational information collection and associated processing, exploitation, and dissemination plans and allocation strategies to integrate national, theater and multinational information collection capabilities to satisfy CCDRs' requirements.

UNITED STATES ARMY SPACE AND MISSILE DEFENSE COMMAND

1-107. USASMDC is an operational force designated by the Secretary of the Army and serves as the Army Service component command to USSTRATCOM and USSPACECOM. USASMDC is the Army force modernization proponent for global ballistic MD and space capabilities per Army Regulation (AR) 5-22, and serves as the operational integrator for global MD Army space operations per AR 10-87. Refer to FM 3-14 for more information on Army space operations.

1-108. The Commander, USASMDC, is dual-hatted as the Commander, JFCC-IMD, due to the relationship to, and preponderance of global MD forces. USASMDC provides planning, integration, control, and coordination of Army Forces and capabilities in support of USSTRATCOM and USSPACECOM operations. USASMDC is responsible for:

- Providing continuous oversight, control, integration, and coordination of Army Forces assigned to USSTRATCOM and USSPACECOM.
- Planning and execution of global MD responsibilities by exercising specified administrative control of organic, assigned, and attached Army Forces.
- Overseeing, controlling, integrating, and coordinating Army Forces specified for high altitude, GMD, and IAMD.
- Advocating Army‘s role for space operations, high altitude, and GMD.
- Serving as the joint user representative, centralized manager, and integrator for the GMD system and executing horizontal integration across all IAMD systems.

ARMY AIR AND MISSILE DEFENSE COMMANDS

1-109. AAMDCs perform theater AMD planning, coordination, integration, and execution in support of a CCDR’s priorities. The AAMDC integrates the operational elements of Army Theater AMD to protect contingency, forward-deployed, and reinforcing forces as well as designated assets from the CCDR’s critical asset list (CAL).

1-110. The AAMDC normally has a command relationship of OPCON with the Army Forces commander or joint force land component commander and acts in direct support to the joint force air component commander (JFACC). These command relationships allow the AAMDC to assist in synchronizing Joint AMD operations.

1-111. The AAMDC commanding general performs several critical roles as they are the senior Army air defense artillery commander for AMD operations; the y serve as the theater Army air and missile defense coordinator (known as TAAMDCOORD) to the joint force land component commander; and they serve as the Deputy area air defense commander (AADC) to the JFACC (or combined forces air component commander) in support of multi-tiered AMD using global MD elements.

1-112. There are four AAMDCs that support CCDR priorities in United States Central Command, United States Indo-Pacific Command (known as USINDOPACOM), USNORTHCOM, and United States European Command. The AAMDC that supports United States Central Command also has a force provider responsibility and serves as the Army Forces Command executive agent for theater AMD operations and Army AMD force management. The AAMDCs are not in USSTRATCOM, JFCC-IMD, or USASMDC chains of command. However, the AAMDCs have a coordination relationship, when approved by their higher headquarters, with JFCC-IMD in its role as a global MD integrator for USSTRATCOM. For example, the AAMDC with the Army AMD force management responsibility supports JFCC-IMD in the global force management (known as GFM) process with Army Forces Command approval.

1-113. The air defense artillery fire control officer (ADAFCO) is responsible for coordinating Army AMD for designated assets or areas on the defended asset list (DAL) in that area, region, and sector and for coordinating and monitoring the tracking and engagement activities of individual Army air defense artillery fire units. They are responsible for the coordination and deconfliction of upper-tier and lower-tier ballistic missile engagements and acts as the upper tier coordination officer for upper tier battlespace deconfliction. Upper-tier engagements occur in the exo-atmosphere and lower-tier engagements occur in the endo-atmosphere. The ADAFCO is the Army AMD engagement expert for the AADC, regional air defense commander, or sector air defense commander on what course of action Army air defense artillery units would likely follow during any situation, especially with degraded communications. The AAMDC provides an ADAFCO to the AADC, while the air defense artillery brigades provide ADAFCO elements to the region or sector commanders. The ADAFCO element is normally placed under the direct control of the senior air defense officer, senior weapons director, or mission crew commander.

1-114. The AAMDC ADAFCO is typically located with the AADC, JFACC, or the senior air defense officer at the joint air operations center. During times of conflict, the ADAFCOs are collocated with the AADC regional air defense commander or sector air defense commander. When deployed with a regional air defense commander or sector air defense commander, ADAFCOs serve as Mission Control Officers under the direct control of a senior weapons director. Joint doctrine establishes the ADAFCO as the AMD link into

the Joint C2 architecture. AMD command nodes establish voice and data connectivity with the Engagement Authority and Identification Authority through the ADAFCO located at the Joint C2 node.

1-115. For ballistic missile threats, the ADAFCO is the conduit through which the engagement authority provides the authorization to engage. The ADAFCO is the Army AMD officer and is responsible for integrating Army AMD operations into the joint integrated air defense system and coordinating Army AMD for designated assets and areas based on the DAL. The AAMDC ADAFCO coordinates and deconflicts exo-atmospheric ballistic missile engagements. An air defense artillery brigade ADAFCO is responsible for coordinating and deconflicting endo-atmospheric ballistic missile engagements. ADAFCOs are provided by AAMDC and Army air defense brigades as part of a modular ADAFCO element.

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Chapter 2

Operational Environment and Threats

This chapter begins with an overview of the OE. Next, the chapter discusses the strategic threats in the OE related to global MD. A discussion of the challenges of BMD follows. The chapter concludes with a discussion of projected threat ballistic missile trends. Also addressed in this chapter are physical threats from different domains to the missile site, along with the potential of irregular threats posed by opponents employing unconventional means to counter traditional U.S. advantages.

THE OPERATIONAL ENVIRONMENT

2-1. A critical challenge for commanders, staffs, and unified action partners is creating shared understanding of their OE, an operation's purpose, problems, and approaches to solving problems (ADP 6- 0). A thorough staff-led mission analysis is essential to gaining a shared understanding of the OE.

2-2. 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). An OE includes five domains (air, land, maritime, space and cyberspace) represented through three dimensions (human, physical and information) and are analyzed using operational variables and mission variables. An OE for any specific operation includes isolated conditions of interacting variables that exist within a specific theater. The OE also addresses interconnected influences from regional perspectives, such as political and economic influences that impact conditions and operations. Defining the OE results in the identification of significant threat characteristics which may affect friendly, neutral, and enemy operations.

2-3. An OE is neither domain specific nor a Service component; however, there are domain-centric considerations that contribute to an overall OE understanding. While the operational and mission variables are most effective when fully and holistically integrated into mission planning, it is often necessary to isolate a specific capability—such as missile warning and the associated actions of BMD—to determine what operational and mission variables are critical and how they may be integrated into the larger battlefield OE. Such a focus is necessary when developing the most effective defense design possible.

2-4. Commanders should seek opportunities for exploiting success. As the OE changes, continuous analysis of both operational and mission variables help reveal opportunities, such as greater cooperation among the local population from shared BMD protection of a town or the ability to advance forces along a previously unsecured route. To exploit opportunities successfully, commanders and staffs should thoroughly understand and appreciate the application of the operational and mission variables.

2-5. When viewing an OE, it is important to take a holistic approach and identify friendly, neutral, and hostile actors, their intent, ballistic missile capabilities, and friendly BMD. An OE includes the interacting variables within a specific theater as well as connected regional and worldwide influences, such as politics and economics. Each commander's OE is a sub-set of a higher commander's OE. This is particularly applicable of the capabilities that support global MD due to its reach and tactical impact.

OPERATIONAL VARIABLES

2-6. The OE is described in terms of eight operational variables. The operational variables are fundamental to developing a comprehensive understanding of an OE. Analysis using the operational variables provides relevant information that senior commanders use to understand, visualize, and describe the OE. Operational variables are those aspects of the OE which differ from one operational area to another and affect operations. Operational variables describe both the military aspects of an OE and the population's influence on it—they

help improve situational understanding. The operational variables are political, military, economic, social, information, infrastructure, physical environment, and time (known as PMESII-PT).

2-7. Analysis of the broad aspects of the OE in terms of the operational variables provides relevant information to senior commanders and their staffs to understand the impact of global MD on the OE. It is important to note actions conducted during global MD must be coordinated in advance. The limited TEW available during global MD operations precludes coordination during the engagement of threat ballistic missiles. Advanced planning is the cornerstone of successful global MD.

2-8. Conducting analysis using the space capabilities framework may reveal significant insights and understanding of the leaders, population, and OE. Analysis of each variable, applied through the lens of both BMD and space capabilities that enable BMD, contributes to a comprehensive understanding of the OE and how the OE may affect mission operations. The IAMD staff planner, in coordination with other staff planners, gains a holistic and detailed understanding of the impact BMD has in the OE. Not all operational variables apply to global MD--a brief description, along with the considerations for how each applies to global MD follows. Lack of a specific operational variable is due to the limited connection a variable has to global MD.

Note: Not all operational variables may be easily applied to defense against ballistic missiles. Those variables not easily applied are not included.

Political

2-9. Describes the distribution of responsibility and power at all levels of governance – may be formally constituted authorities, informal, or covert political powers. Covers everything from recognized state leader to the tribal leader in a local village.

- Does a threat's political environment support the use of ballistic missiles?
- What drives the political establishment's decision-making to employ ballistic missiles?
- Is the use of ballistic missiles likely to be politically supported?
- Do threat actor national politics support the use of ballistic missiles to deliver WMD or conventional munitions?
  - Does attribution of actions from missile launches and state involvement drive public opinion? Does it drive political authorities?
  - Confirmation of events and battle damage assessments.

Military

2-10. Explores the military and or paramilitary capabilities of all actors, including friendly, neutral, and enemy in a given OE.

- AMD staff planners should consider the threat's ability to obtain and intent to conduct a ballistic missile attack.
- AMD staff planners should consider host nation and unified action partner's ability to counter a ballistic missile attack and whether they and neighboring states consider such operations as stabilizing or destabilizing.
- AMD staff planners should consider the impact that theater missile warning and shared early warning might have on regional stability and cooperation.
- AMD staff planners should consider the ability of threat actors and military to affect mission operations by placing Army, joint, and unified action partners in a denied, degraded, disrupted space OE, which could impact defensive operations.
- AMD staff planners should consider the dependency of threat actor's military on missile warning, SATCOM, and positioning, navigation, and timing capabilities as well as counterspace operations.

Economic

2-11. Encompasses individual and group behaviors related to producing, distributing, and consuming resources. AMD operations should consider financial means of regional actors to purchase ballistic missiles from a third party that may provide asymmetric advantages.

- Economic considerations are taken into account, but are not a significant driver when considering maximizing coverage of a defensive system.
- Economic considerations have a larger role when considering security from an economic stability perspective. Does the community have a high unemployment rate that makes it easy for threat actors to coerce or pay locals to become insider threats to either steal technologies or sabotage defenses?
- Missile warning and defense—provides warning indications and protection opportunities. A missile attack could cause large scale destruction of critical infrastructure and could cripple portions or an entire economic infrastructure.
- Placement of a BMD element is coordinated and arranged through contracts with the host nation. Contracts being large amounts of money to the host nation in the form of leased land, facility construction--often sourced using local material and labor—energy consumption, and facility support.

Social

2-12. Describes the cultural, religious, and ethnic makeup within an OE and the beliefs, values, customs, behaviors, and public opinions of society members. Consider who the influential people are in the community—for example, are they religious leaders, tribal leaders, warlords, criminal bosses, or prominent families.

- Public opinion and the behavior of society's members toward global MD is largely driven by the political and information variables.
  - If the political leaders look favorably on hosting U.S. global MD elements and disseminating favorable information, public opinion will likely respond in kind.
  - If political leaders look negatively on the U.S. or hosting global MD elements and negative information is disseminated, society will have a negative perspective of hosting a global MD element on its soil.
  - Attribution of actions from foreign missile launches and state involvement drives public opinion and political authorities.

Information

2-13. Describes the nature, scope, characteristics, and effects of individuals, organizations, and systems that collect, process, disseminate, or act on information. How much access to news media or the internet do the local leaders, influential personnel, and general population have? Capabilities such as SATCOM foster access to internet and worldwide influences may be increased or decreased.

- Use of strategic messaging to disseminating information about theater ballistic missile warning, shared early warning, and global MD capabilities adds a level of deterrence to all but the most determined threat actors.
- Will warning reports be provided to allies and host nation for broadcast to civilian populations?
- Is it more important to have warning of all events (with the possibility of false events) or no false reports with some events being reported late or not at all? What is the tolerance for false missile warning reports?
  - The host nation may have zero tolerance for false reports which subject its citizens to panic or mass hysteria due to anticipating bogus attacks.
  - CCDRs may have less restrictions on disseminating false reports of an attack to provide Soldiers the opportunity to don mission-oriented protective posture gear.
- What are the assessed limitations of space-based infrared system when detecting missiles with short duration burn times verses the requirement to provide timely information dissemination?

Infrastructure

2-14. Composed of the basic facilities, services, and installations needed for the functioning of a community or society. This may include the functionality of electrical generators and similar utility systems.

- The operations of most MD systems are designed to operate in unimproved areas where infrastructure may be austere. The only critical infrastructure is properly maintained roads capable of supporting large equipment with heavy loads such as tractor trailers and fuel delivery trucks. The ability to plug-in to host nation electrical grids may be beneficial, but is not a necessity as all deployable MD elements have the option to use generators to support both mission operations and site support power requirements.
- The infrastructure needs of a support community—U.S. nationals, local population, or both—is of significant consideration.
  - If placed in an austere environment where no community exists, all necessary services—including lodging, mission and mission support facilities, protection, sustainment—must be provided by the U.S. government.
  - If placed near an established community, local services may have the capacity to provide some level of services over the long term.

Physical Environment

2-15. Describes the degree to which the terrain imposes significant limitations on observation, maneuver, fires, and electromagnetic propagation, and includes natural geography, man-made structures, climate, weather, and hazards in the AOR. Helps determine factors such as what types of terrain or weather conditions in the AOR favor friendly, neutral, or enemy operations.

- IAMD staff planners should consider the effects of mountains, buildings, and other physical barriers on SATCOM and theater missile warning transmissions.
  - Consider the degree to which the terrain imposes significant limitations on observation, electronic line of site, and information collection assets, optics, and sensors.
  - Complex terrain is a topographical area consisting of an urban center larger than a village and or of two or more types of restrictive terrain or environmental conditions occupying the same space.
- Understanding and predicting the environmental impacts help to mitigate their effect through preparation (selecting different operating frequencies, boosting power, timing transmissions to occur during periods of minimum interference).
- In coordination with the staff weather officer, the space operations officer must monitor terrestrial and space weather and predict the effects on space systems. This coordination will enable development of courses of action to mitigate weather effects in support of Army operational planning and execution.
- Terrestrial weather affects space systems by way of clouds, rain and thunderstorms. Clouds may block access of electro-optical sensors which are part of the MD architecture. Rain may have effects on communication frequencies, and thunderstorms cause disturbances in the ionosphere and thermosphere. Considerations include:
  - What effects will terrestrial or space weather have on missile warning and the impacts on global MD operations?
  - What effects will space and terrestrial weather have on data gathered and transmitted by space assets regarding BMD elements?

Time

2-16. Describes the timing and duration of activities, events, or conditions within an OE, as well as how the timing and duration are perceived by various actors in the OE. Timing helps determine factors such as what times are people likely to congest roads or attend high density events, or conduct activities that provide a cover for hostile operations.

- Global MD is a temporal fight. Short flight times and small TEW demand timely, persistent, reliable, and accurate threat detection indications that enable real-time defensive responses. Responses must be coordinated and shared prior to an attack to ensure efficiency.
- CCDRs should provide execution authority to subordinate forces according to planned guidance and rules of engagement prior to a ballistic missile threat. Subordinate commanders should be flexible and have the authority to adapt to the situation in accordance with the commander's intent when situations do not develop as the staff planners envisioned.
- IAMD staff planners help commanders and staffs understand the time constraints associated with MD. Planners must take into consideration the constraints and limitations on BMD systems movement to locations required to provide defense and plan to have the systems in place prior to the start of hostilities.
- Although engagement authorization is centralized, effective engagement required decentralized execution for weapon system fire control. The speed at which attacking ballistic missiles can travel and the range and the speed at which intercepts occur makes rapid responses essential. Centralized execution would cause unnecessary delays, limit response, and have a negative impact on the TEW.

MISSION VARIABLES

2-17. Commanders and staffs require a mission analysis focused on their specific situation. Upon receipt of a warning order or mission, Army tactical echelon staff planners filter relevant information from the broader scoped operational variables identified by the operational headquarters to narrow their focus into information that directly affects their specific mission using the mission variables. Mission variables are used by staff planners during mission analysis to facilitate situational understanding when developing plans.

2-18. Mission variables are the categories of relevant military information used for planning operations as part of the joint planning process. Mission analysis uses the mission variables as a construct for developing plans and are used during intelligence analysis, to facilitate situational awareness, and provide situational understanding of the threats. The mission variables use the mnemonic METT-TC (I), and stands for:

- Mission.
- Enemy.
- Terrain and weather.
- Troops and support available.
- Time available.
- Civil considerations.
- Informational considerations.

Note: Informational consideration is not an independent variable, but an important component integrated into each variable to which leaders should pay particular attention when developing their understanding of a situation. The informational considerations (human, information, and physical) are aspects of an OE that affect how humans and automated systems derive meaning from, use, act upon, and are impacted by information.

2-19. An effective mission analysis considers the potential impact BMD capabilities have within an OE. The staff planners participate in planning to help form the problem statement, mission statement, planning guidance, initial commander's critical information requirements, and essential elements of friendly information. IAMD staff planners use the mission variables to identify critical BMD-related information applicable to mission planning. These provide the baseline for selecting the right capabilities to be used. Knowing the mission, threats, and OE allows commanders to identify and plan for the optimal capability package. Failure to identify or misidentify the effect mission variables might have on operations can hinder decision-making and result in the development of an ineffective battle plan.

2-20. The staff planner has to consider hazards (conditions), threats (hostile actions), and vulnerabilities (system characteristics) which may impact the mission in addition to the human, information, and physical

informational considerations which includes appropriate site locations meeting space and defense design requirements. Global MD operations are focused on ensuring hazards, threats, and vulnerabilities are mitigated as much as possible.

CHANGING NATURE OF AN OPERATIONAL ENVIRONMENT

2-21. An OE is not static but continually evolves. This evolution results from opposing forces and actors—organizations and individuals—interacting and their ability to learn and adapt. As actors take action within an OE, the OE changes. It is critically important commanders and staff should not view actors or the OE as static; both constantly change over time. Actors may become less or more hostile over time. Commanders, staffs, and Soldiers should continuously reassess an OE to identify changing conditions. The complex and dynamic nature of an OE may make attribution and determining the relationship between cause and effect difficult.

2-22. Fundamental to mission success is the ability for IAMD to anticipate and analyze potential problems and develop solutions. Based on their understanding and analysis of a problem, IAMD staff planners select and apply the right solutions to perform required tasks. Further adding to the challenge, the OE remains dynamic throughout all phases of conflict.

2-23. Understanding an OE is an on-going, iterative process that continues throughout an operation. The iterative steps are critical for a constantly evolving discipline like global MD operations. An OE consists of many interrelated variables and sub-variables, as well as the relationships and interactions among those variables and sub-variables. The OE during planning is different from the OE at the start of operations, and will likely be significantly different from the OE at the end of operations.

SUMMARY OF STRATEGIC THREATS

2-24. Ballistic missile threats are numerous and increasing. New and innovative technologies including BMD countermeasures, multiple RVs, maneuverable RVs, and controllable hypersonic glide capabilities, have increased the challenge. The development of structured attack tactics, techniques, and procedures (TTP) expand the complexity of protecting the U.S. homeland and friendly forces. Threat actors can acquire modern missiles with WMD capabilities and adapt dual-use technologies to increase their offensive missile capacity. Ballistic missiles and WMD capabilities are frequently linked. Global MD addresses the cross-AOR ballistic missile threats from state and non-state actors who may align with rogue states.

2-25. The deception and denial capabilities, engagement ranges, mobility, and lethality of ballistic missiles have significantly increased. Ballistic missiles are instruments of political coercion. Political targets include civilian population centers and government, cultural, and religious structures and locations. Additionally, propaganda value exists in attacking the U.S. and multinational forces to show their vulnerability.

2-26. Global MD sensors support multidomain operations to contribute solutions to counter theater antiaccess (A2) and area denial (AD) strategies. *Antiaccess* is action, activity, or capability, usually long- range, designed to prevent an advancing enemy force from entering an operational area (JP 3-0). *Area denial* is action, activity, or capability, usually short-range, designed to limit an enemy force's freedom of action within an operational area (JP 3-0).

2-27. Threats may employ A2 and AD strategies to prevent the buildup of U.S. forces. Threat actors may target population centers, infrastructure supporting U.S. power projection capabilities such as sea and air ports, or specific military and political targets. In an A2 and AD environment, the availability of global MD and the protection it provides is critical. This is because the use of WMD is more likely during the A2 and AD phases.

2-28. For a given operation, proper assessment for counterair planning should take into account the possibility that initial attacks may employ ballistic missiles in conjunction with other systems. Attacks may likely be against a variety of targets such as BMD sites, sensor elements, communications nodes, key infrastructure, key civilian facilities, and population centers.

"The contemporary and emerging missile threat from hostile states is fundamentally different from that of the Cold War and requires a different approach to deterrence and new tools for

defense. The strategic logic of the past may not apply to these new threats, and we cannot be wholly dependent on our capability to deter them. Compared to the former Soviet Union, their leaderships often are more risk prone. These leaders also see weapons of mass destruction as weapons of choice and not of last resort. Weapons of mass destruction are their most lethal means to compensate for our conventional strength and to allow them to pursue their objectives through force, coercion, and intimidation. The probability that a missile with a weapon of mass destruction will be used against US forces or interests is higher today than during most of the Cold War, and it will continue to grow as the capabilities of potential adversaries mature."

National Security Presidential Directive 23

2-29. Cyberspace is a global domain within the OE. Cyberspace operations rely on an interdependent network of information technology infrastructures, including, telecommunications networks, computer systems, the Internet, embedded processors and controllers, and the content that flows across and through these components (JP 3-12). Global MD depends upon cyberspace operations for interacting with and connecting to global MD elements and the C2BMC system. Each Service is required to provide assured network and information system availability, information protection, and information delivery for C2BMC system operations. Threat actors continuously use the cyberspace domain to achieve their own purposes. Commanders conduct thorough intelligence preparation of the battlefield in order to assess and address all risks to global MD operations.

PEER AND NEAR-PEER COMPETITORS

2-30. The U.S. constantly has to consider emerging trends when assessing the threat to its national security. Peer and near-peer threat actors are transforming the geopolitical landscape with dramatic impacts. This ever evolving OE plays a potential role in every national security decision. Identity based extremism continues to have a significant worldwide and regional impact, rallying ethnic, political, ideological, and national belief systems and likely involve leaders with an internal outlook.

2-31. Peer threats to the U.S. continue to be capable of attacking the U.S. homeland with ICBMs armed with nuclear weapons. India and Pakistan's aggressive and provocative missile development programs may pose a threat to regional stability, but neither are direct adversarial threats to the U.S. North Korea and Iran are persistent threats with aspirations for long-range ballistic missile development programs that pose a threat to both U.S. national security and regional stability.

NON-PEER COMPETITORS

2-32. Evolving nation states—once modeled on the U.S. and Russian forces—now take identities more distinctive to their own traditions and societies. A nation state is a sovereign state where most of the people are united by factors which define the nation such as language, culture, social ideology, religion, ethnicity, or common descent. It is a more accurate description than a country which may not have a predominant ethnic group and boarders determined based on geographical features such as rivers and mountain ranges. The nation state is an idea where boarders align with cultural boundaries.

2-33. Alliances with larger nations to obtain subsidized weapons and forces for protection are no longer desired or required. Evolving nation states seek ballistic missiles with WMD capability to gain prestige, achieve deterrence, and exercise coercive diplomacy in the international community. Unconcerned with safety, reliability or proliferation concerns, some nation states—which may be characterized as having governments with terrorists or extremist connections—rapidly advance their weapon programs by any means. A nation state willing to use WMD for ideological beliefs poses a significant threat.

ASYMMETRIC BALLISTIC MISSILE DEFENSE THREATS

2-34. Many threat actors closely observe current U.S. capabilities in an effort to identify and exploit weaknesses using unconventional approaches. Sophisticated threat actors may use asymmetric capabilities or approaches. Asymmetric approaches typically use unsophisticated methods to negate U.S. BMD capabilities and avoid a direct match with U.S. strengths.

2-35. Fundamental capabilities a threat actor may pursue to counter U.S. strengths include WMD. One possible tactic is long-range ballistic missile attack with WMD against major population centers. Moreover, threats can simultaneously conduct asymmetric attacks at the strategic (militarily and politically), operational, and tactical levels:

- At the strategic level—
  - Militarily, attacks could include limited ballistic missile strikes with nuclear devices, or biological and chemical agents. These weapons have psychological, physiological, and geopolitical effects.
  - Politically, terrorists can attempt to disrupt or intimidate civilian activity, thus preventing the flow of war materials to ports and airfields.
- At the operational level, a denied, degraded, and disrupted space operational environment (D3SOE) or cyberspace attack can disrupt the transfer of information, leaving global MD elements unable to communicate in a timely manner. A cyberspace attack against programmable logic controllers or supervisory control and data acquisition systems may destroy, neutralize, or reduce the effectiveness of global MD elements.
- At the tactical level, special operations forces or terrorists could attack global MD sites or nodes in the confusion resulting from cyberspace or WMD attacks.

2-36. Within multidomain operations, it is likely a threat will use ballistic missile attacks on ports, airfields, and other staging areas as part of their A2 and AD strategies. It is anticipated a threats A2 and AD strategies will involve using all available weapons to create a layered defense in depth. The idea behind these strategies is to impose such a high cost on U.S. forces that they will either not engage or not be successful when engaging. Even limited ballistic missile attacks on OCONUS U.S. bases, ports, airfields, staging areas, and sanctuaries may be sufficient to significantly impede any joint and allied force.

2-37. A deliberate or unauthorized ballistic missile attack could precede or accompany a conventional attack on global MD systems. Threats to installations where global MD elements are deployed include those associated with high priority defense. These threats may be ground, air, sea, space, or cyberspace-based and include attacks on facilities and telecommunications systems. Further threats may include terrorist attacks, sabotage, and special operations.

THREAT CAPABILITIES

2-38. The OE confronting the U.S. today is always changing and drastically different from the recent past. The OE has become increasingly complex and the U.S. faces growing peer threats from WMD nation states who can deliver these weapons worldwide using ballistic missiles and emerging technologies. These threats range from terrorism to ballistic missiles intended to intimidate, coerce, inflict large-scale damage, and create mass casualties for the U.S., our friends, and allies. Globalization has brought rapid and significant change to threats faced by the U.S. and continues to be a defining feature of global MD.

2-39. WMD can cause, wide-spread damage and kill large numbers of human beings, animals, and plants. WMD includes chemical, biological, radiological, and nuclear weapons, excluding their means of transport and delivery where such means is a separable and divisible part of the weapon. The threat of WMD has a profound impact on diplomatic, informational, military and economic instruments of national power.

2-40. Army forces face a variety of ballistic missile threats, all with varying degrees of range and accuracy. While a peer or near pear threat may have an extensive inventory of varying types of ballistic missiles, lessor equipped threat forces have more limited options. Most threats will employ their ballistic missiles to create depth. The types of ballistic missiles with which a threat actor is equipped will likely determine how much depth a threat actor can create. While peer competitors can create a layered defense extending all the way from Army forces assembly areas in assigned areas of operations back to continental United States located bases, non-peer competitors might only be able to attack once Army forces arrive in the theater of operations. Other threats might have ballistic missiles with even more limited range, but that still enable them to hold tactical Army forces, especially C2, assembly areas, and sustainment sites at risk. Because the cost of building and maintaining ballistic missile capability is high, threat forces tend to employ these weapons against targets they assess will create favorable effects.

2-41. Ballistic missile attacks from rogue nations are envisioned in three potential limited attack scenarios:

- Authorized attack — Leaders of a nation-state, multinational forces, or non-state actors (including terrorists) can authorize a premeditated launch against the U.S.
- Unauthorized attack — Insurgent groups or other radical elements can perpetrate a premeditated attack against the U.S. by a nation-state, multinational force, or group, but is not accidental.
- Accidental launch — Unintended launches can result from a random event (such as mechanical failure or human error) that threatens the U.S. homeland.

Close-Range, Short-Range, and Medium-Range Ballistic Missiles

2-42. CRBMs have a range between 0 and 300 kilometers, SRBMs have a range from 301 to 1,000 kilometers, and MRBM have a range between 1,001 and 3,000 kilometers. Many nation states field CRBM or SRBM weapons and larger states considered as regional powers field CRBMs, SRBMs and MRBMs. Mobility increases the survivability of ballistic missiles and complicates Army forces targeting efforts. Many threat actors field both fixed and mobile missile launchers; their effectiveness is increasing along with the easy access to high technology necessary for ballistic missiles. CRMBs, SRBMs and MRBMs perform four primary threat functions:

- Increase regional prestige.
- Intimidate regional competitors.
- Deter threats by increasing the cost of aggression by external threats.
- Reinforce diplomatic efforts.

Intermediate-Range Ballistic Missiles

2-43. IRBMs are a class of missiles with a range of 3,001 to 5,500 kilometers. IRBMs are typically employed for strategic effect, and hold Army forces at risk at considerable range. Because of their considerable range, the employment of IRBMs by any nation, either as a demonstration, or against a specific target might be interpreted as escalatory. Some threat actors field mobile IRBMs. Mobile IRBMs enjoy the same benefits as mobile MRBMs, principally the benefit of increased survivability by complicating Army forces targeting activities. Relatively few nations field IRBMs. Modern IRBMs can be designed with a variety of features that increase the likelihood of a successful strike as well as increase strike effectiveness. These advanced features include varying trajectories, evasive maneuvers, and employing decoys. A single IRBM can carry multiple RVs which may deploy early to increase the likelihood of striking a single or multiple targets. IRBMs perform two primary threat functions:

- Pose a threat to forward deployed U.S. forces and theater allies.
- Deliver a variety of payloads with little or no warning.

Intercontinental Ballistic Missiles

2-44. ICBMs are a class of missiles with a range of greater than 5,500 kilometers. ICBMs are so named because they have intercontinental range. Traditionally, ICBMs carry nuclear weapons. Because of the very high cost of developing and maintaining ICBMs, and the relatively low number of nuclear armed nations, correspondingly few nations field an ICBM capable force. Russia, China, India, and North Korea are the only nations other than the U.S. known to field ICBMs. ICBMs can be fixed or mobile. Modern ICBMs can carry multiple warheads and a single missile can strike multiple targets. ICBMs can carry other than nuclear warheads, but this is atypical. Modern ICBMs employ all the same technologies as do modern IRBMs to increase the likelihood of a successful attack and maximize effectiveness. ICBMs perform one primary threat function: strategic deterrence.

2-45. Foreign ballistic missiles pose a unique threat to the security of the U.S. homeland because they provide an effective vehicle for delivering nuclear, chemical, or biological weapons globally. While WMD can be delivered by a variety of means including aircraft and artillery, missile-delivered WMD garners the most domestic and international attention. Countries with a WMD missile capabilities have the potential to influence the actions of other countries regionally or globally with the threat of destroying population centers

and national infrastructure of countries. Ballistic missiles are relatively inexpensive compared with their ability to penetrate defenses and strike strategic targets.

SUBMARINE-LAUNCHED BALLISTIC MISSILES

2-46. The range of a submarine-launched ballistic missile (SLBM) can vary but are usually IRBM and ICBM class missiles. The defining characteristic of SLBMs are various degrees of stealth, mobility, and ability to loiter near their intended targets imparted to them by the nature of the submarine. These characteristics greatly increase the threat actor's ability to strike targets at shorter range, reducing the time friendly forces have to defend against the attack, and the number of BMD systems they might engage. SLBMs allows retaliation and impose a high cost to the opponent that chooses a nuclear first strike. Because SLBMs can be from any class of ballistic missile, nations may equip them with a variety of payloads intended for different target types and to accomplish a variety of objectives. Modern SLBMs employ the same technologies as IRBMs and ICBMs to increase the likelihood of a successful attack and maximize effectiveness. Threat SLBMs perform the following primary threat functions:

- Strategic deterrence.
- Increased weapon system survivability.
- Likelihood of a successful first strike.
- Increased likelihood of being able to respond to a first strike.

2-47. The missile threat to the U.S., allies, and forward-deployed forces include all varieties of ballistic missiles. Although technologically far more difficult to develop and deploy, SLBMs are a challenge to defend against because once a submarine carrying ballistic missiles is submerged at sea, the ability to predict and prevent a SLBM strike becomes inherently much more difficult.

BALLISTIC MISSILE PROLIFERATION

2-48. Missiles have become a delivery system of choice, a symbol of national might for some countries, and they remain a central element in the military arsenals of nations around the globe. Nation states willingly devote scarce resources in efforts to develop or acquire ballistic missiles; build the infrastructures necessary to sustain development and production; and actively pursue technologies, materials, and personnel on the world market to compensate for domestic shortfalls, gain increased expertise, and potentially shorten development timelines. Many available ballistic missiles have advanced from liquid to solid-propellant technologies. Solid-propellant ballistic missiles have inherent operational advantages over liquid fueled systems, including stable fuel, safer operations, and road mobile launchers.

2-49. Estimates of the missile threat to the U.S. homeland continue to be controversial for a number of reasons. One reason is many missile programs have moved underground, and hidden in a country's civilian aerospace industry, making it much harder for intelligence organizations to track development. Today, the U.S. homeland is presumed to be within range of ballistic missiles from Russia, China, and North Korea. Many other countries have missiles within range of U.S. overseas forces, facilities, and interests.

2-50. Several countries are attempting to procure or develop longer-range ballistic missiles to accurately deliver WMD over great distances. There is concern a regional power, rogue state or non-sate actor undeterred by stringent political and military controls over WMD could launch an attack against the U.S.

2-51. The number of missile production and development facilities is increasing. A small number of countries have been exporting missiles or missile production facilities for decades, and more countries are entering the ballistic missile market as suppliers. Availability of nuclear material on the world market increases through clandestine sales, covert transfers, or outright thefts. Arms control agreements are no longer the assurance against proliferation. A number of nations fail to comply with existing treaties and non- proliferation agreements. Today, countries quickly transfer missile technologies, components, and complete systems to other countries and nation states.

CHALLENGES TO BALLISTIC MISSILE DEFENSE

2-52. There are four persistent and emerging challenges for Army BMD. However, the challenges are neither precise nor discrete and in most situations overlap CCDR AORs, occur simultaneously, or offer no easily discernible transition from one challenge to another. Many of these threats include non-state actors who may not be deterred by our overwhelming military superiority and are actually motivated by the prestige that comes with challenging a world power. The threat environment presents four types of security challenges.

- Traditional challenges. Traditional challenges to BMD include the enemy's deception and denial capabilities, the ability to attack with little or no warning, and an overmatch in quantities of ballistic missiles to interceptors.
- Irregular challenges. Irregular challenges to BMD include attack from rogue nation states, non-state actors, unauthorized attacks, and accidental launches.
- Catastrophic challenges. Catastrophic challenges to BMD include a preemptive or overwhelming first strike attack that poses an existential threat, use of WMD to disable or destroy communications and national leadership.
- Disruptive challenges. Threat actors are developing and fielding advanced delivery methods designed to counter Army MDs in all missile categories. Threat actors—
  - Seek to buy the latest ballistic missiles in niche areas to counteract key U.S. capabilities. Examples include ballistic and other missile systems, solid fuel boosters, WMD, sophisticated RVs with early release sub-munitions, penetration devices, terminal guidance systems, electromagnetic warfare weapons and assets with the capability to degrade advanced U.S. systems.
  - Seek to acquire the most advanced technologies, which include breakthrough technology which are perceived to be the most effective against perceived U.S. strengths, particularly U.S. reliance on digital technologies, the space domain, and communications.
  - Make extensive use of space capabilities, cyberspace capabilities, electromagnetic warfare, and the use of electromagnetic weapons or jammers to disrupt, delay, or degrade U.S. forces' active MD measures and C2 capabilities. Threat actors can present disruptive challenges to BMD with little time and monetary investments because of readily available commercial products such as SATCOM, imagery, navigation signals, and weather data.

SPACE CAPABILITIES IMPACT ON GLOBAL MISSILE DEFENSE

2-53. Space capabilities are integral to timely and accurate missile warning. Space assets provide critical SATCOM, precision timing, surveillance and reconnaissance information, support to C2, and weather observations—all of which directly contribute to successful defensive operations. Threat actors may use extensive counterspace operations, ranging from passive means such as denial and deception to more active means such as ground segment attack, sabotage, and electromagnetic attack to degrade BMD capabilities.

2-54. Commercial space-launch vehicles pose a unique threat. Space-launch vehicles represent a dual-use technology. A space-launch vehicle capable of launching an object into a low Earth orbit is capable of delivering a weapon anywhere in the world in less than an hour. A space-launch vehicle can place a weapon in space to destroy MD reliant space-based capabilities. As commercial access to space expands, so does the threat of ballistic missile attack against the U.S. homeland. CCDRs must remain cognizant and vigilant for the potential of a space launch to be a disguised ballistic missile attack. Refer to FM 3-14 for more information on Army space operations.

INFORMATION THREATS TO BALLISTIC MISSILE DEFENSE

2-55. The threats to the BMD communications network infrastructure are genuine, worldwide in origin, technically multifaceted, and growing. Today's threats come from individuals and groups motivated by military, political, social, cultural, religious, or personal gain. Threat information efforts against global MD elements use many capabilities, including offensive space operations, offensive cyberspace operations, electromagnetic warfare, the use of electromagnetic weapons or jammers, psychological operations, and

deception. These capabilities are used in concert with specified supporting and related capabilities to affect or defend information, information systems, and to influence decision making.

2-56. Globalization of networked communications creates vulnerabilities due to increased access to our information infrastructure from points around the world. Threats against computers, computer systems, and networks vary by the level of hostility (peacetime, conflict, or war), by technical capabilities, and by motivation. The bottom line is that threats to all forces, from strategic to tactical, exist from a variety of new and different sources, and they exist on a continuing basis even during periods of relative peace.

Chapter 3
OPERATIONS

"The new strategic challenges of the 21st Century require us to think differently, but they also require us to act. The deployment of effective missile defenses is an essential element of the United States' broader efforts to transform our defense and deterrence policies and capabilities to meet the new threats we face. Defending the American people against these new threats is my highest priority as Commander in Chief, and the highest priority of my administration."

President George W. Bush
National Security Presidential Directive 23

This chapter presents an overview of operations and considerations that Army BMD units need to apply when planning and executing their missions. This chapter describes the worldwide context within which Army units conduct planning to develop defense designs, employment guidelines for BMD elements, and implement protection operations.

GLOBAL MISSILE DEFENSE

3-1. Global MD is the overarching characterization of the cumulative (worldwide) planning, synchronization, integration, coordination, and asset management of defensive capabilities designed to destroy, neutralize, or reduce the effectiveness of cross-AOR ballistic missile attacks. Assets are low-density, high-demand, unique, and designed to work over vast distances across AOR boundaries; therefore, global MD only actively defends against threat ballistic missiles. Global MD also uses passive defense and battle management functions. Army organizations to global MD. The Army systems directly contributing to global MD include Patriot, THAAD, AN/TPY-2 FBM system, and GMD.

3-2. Global MD is a temporal fight; while it occurs in the three common dimensions of length, width, and depth (or height)—it is time dependent. Short flight times and shorter TEW demand timely, persistent, reliable, and accurate threat detection indications that enable real-time defensive responses. Responses must be coordinated and shared prior to an attack to ensure efficiency.

3-3. The mission of global MD consists of simultaneously defeating missile threats to all CCDR AORs, in support of CCMD operations. During global MD operations, the threat may include SRBMs, MRBMs, IRBMs, ICBMs, and SLBMs. All of these missile types have the potential to carry either conventional or WMD weapons and may be theater or cross-AOR. The number of threats can range from potentially hundreds of SRBMs to dozens of ICBMs. An enemy in large scale combat operations may employ ballistic missile attacks in waves, and in combination with other offensive operations against U.S. defended assets.

3-4. DOD is responsible for the homeland defense mission, and therefore, leads the homeland defense response, with other departments and agencies in support of DOD efforts. In today's complex threat environment, the approach to homeland defense should address all aspects of the OE as well as all ranges of missiles in all phases of flight. MD is best optimized by using integrated networked sensors and layered global MD systems. Layered defenses complicate enemy offensive actions.

3-5. Externally, the U.S. seeks to shape the international environment through the application of diplomatic, economic, military, and informational means. Confronting the homeland is a variety of interrelated threats that demand coordinated procedures and synchronized efforts among U.S. Government departments and agencies charged with law enforcement and national defense.

3-6. The threat defines the mission and the threat from ballistic missile types and ranges is increasing worldwide. These threats include any transnational activity including international terrorism, the proliferation of weapons, to include WMD, and the delivery systems for such weapons that threaten the U.S. national security.

3-7. CDRUSSTRATCOM, is responsible for synchronizing planning for global MD between CCDRs and is the supported commander for synchronizing planning. CDRUSSTRATCOM is a supporting commander to CDRUSNORTHCOM and Commander, United States Indo-Pacific Command, for execution of homeland defense. CDRUSSTRATCOM is a supporting commander to theater CCDRs during execution of global MD at the theater level. Detailed and continual planning is critical to mission success.

3-8. The Army participates in joint collaborative planning in preparation for deployment of global MD forces in the homeland or into an AOR for forward based forces. This is done in accordance with the CCMD priorities and DAL, development of the theater area air defense plan (AADP), finalization of rules of engagement and engagement criteria (as defined in JP 3-84), refinement of existing homeland defense plans, determination of cross-AOR operation coordination, and force allocation. Distribution of approved plans across the joint network to all global MD forces is critical to prevent disruption during engagement operations.

3-9. Properly employed BMD forces allow a nation the freedom of action to deliver forces and materiel to the required points of application across the range of military operations from peacetime military engagement to major combat operations to successfully conduct those operations. Global MD operations must be centrally planned, closely coordinated, and decentrally executed due to:

- Complexity of a coordinated response.
- Short TEW to defend against a ballistic missile attack.
- Large number of forces and population who may be threatened.
- Size of the geographic areas involved.

MISSILE DEFENSE OPERATING PRINCIPLES

3-10. Cross-AOR BMD supports allies who are developing organic BMD capabilities and partnering with U.S. forces on defensive weapon systems such as Arrow, Patriot and Aegis Ashore, and Aegis BMD. U.S. allies and multinational partners plan and execute global MD operations across AOR boundaries.

3-11. Joint operations are normally conducted within the context of an alliance or multinational forces. However, each operation is unique. The JFC should evaluate key considerations and differences involved in planning, coordinating, and conducting global MD operations in a national, bi-national or multinational environment. The U.S. views BMD from a significantly different perspective when compared with some allies. Theater level BMD to the U.S. may be considered as homeland defense for an ally or multinational partner.

3-12. The key operating principles for global MD are unity of effort, unity of command, centralized planning, and decentralized execution. The nature and attributes of a ballistic missile attack dictates rigorous application of these principles. Global MD plans are coordinated and integrated based on four operating principles. The four operating principles support the commander's vision of how global MD mission is accomplished for all phases of operations.

- Unity of effort - Coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization that is the product of successful unified action (JP 1, Volume 2). Coordination and cooperation between nations and military forces for a commonly recognized objective grow in importance with global MD forces. Unity of effort over complex operations is possible through decentralized execution of a centralized, deliberately derived concept plans or operations plans. Consider Joint and multinational relationships when addressing the need for near real-time response to the threat. In multinational operations in which unity of command may not always be possible, unity of effort becomes paramount. Unity of effort through cooperation and common interests is an essential component to multinational command.

- Unity of command - The operation of all forces under a single responsible commander who has the requisite authority to direct and employ those forces in pursuit of a common purpose (JP 3-0). Global MD places increased demands on CCDRs. To ensure complementary efforts and achieve synergy among all joint force components, global MD planning is continually coordinated and is best accomplished when all elements concerned with defense of a given area fall under one CCMD—this is the reason for pre-attack planning, identifying the supported and supporting relationships, and pre-planned responses. Since ballistic missile attacks often cross AOR boundaries, the command structures and C2 execution must be especially flexible and responsive to accommodate the real-time danger of ballistic missile attacks.
- Centralized planning - The process whereby one commander has responsibility and authority for planning and coordinating a military operation or group of operations. Unity of command and decentralized execution are best accomplished with centralized planning. Centralized planning enforces proper application of fundamental military principles, such as economy of force, ensures synchronization and or deconfliction among components and enables effective and efficient use of forces and other resources. Planning should establish:
  - Task organization and apportionment of forces between commanders.
  - Command relationships, including supported and supporting relationships.
  - The wide range of operations that may be appropriate.
  - Integration of the means and measures for different global MD elements.
  - The possible impact of global MD operations on other missions and tasks.
  - Global MD engagement priorities.
  - Prioritized CAL and DAL.
  - Rules of engagement.
  - Detailed global MD plans with sub-unit tasks.
  - Global MD preplanned responses and procedures to adjust based on situation.
- Decentralized execution - A centralized plan is best accomplished by decentralized execution. The speed of attacking missiles and the range at which intercepts occur make BMD operations unique, and therefore, requires an immediate response to threats. The real-time reactive nature of global MD operations requires CCDRs to provide execution authority to subordinate forces according to planned guidance and rules of engagement prior to a ballistic missile threat. Subordinate commanders should be flexible and have the authority to adapt to the situation in accordance with the commander's intent when situations do not develop as the staff planners envisioned.

DEFENSE DESIGN

3-13. A ***defense design*** **is a strategy for defense based on a compiled list of defensive tasks required to defend against a specific threat or support specific mission operations. Each defensive task is built using intelligence, features such as friendly force lay down, adversary forces lay down, named area of interest or ballistic missile operations areas, and characteristics such as defended assets, terrain, system location or orientation, and limitations**. A defense design is usually focused on the capabilities of a single BMD element.

3-14. A *named area of interest* is the geospatial area or systems node or link against which information that will satisfy a specific information requirement can be collected, usually to capture indications of enemy and adversary courses of action (JP 2-0). A named area of interest (NAI) is usually associated with an area where an enemy or adversary has forces and/or assets and is included as part of a threats force lay down.

3-15. A ***defense plan*** **is multiple defense designs combined together to create a cohesive plan for defending a broad area.** Critical assets must be identified and prioritized by the supported commander to complete the defense plan. A defense plan usually covers multiple threats in a theater or region. When applied to BMD, the specific information an NAI refers to is:

- Ballistic missile operating area.
- Support infrastructure.

- C2 node.

3-16. Global MD operations require pre-developed mission analysis to support the specific mission of each asset. Developing mission profiles are part of the pre-mission planning process and require long lead times in many instances. Each mission profile requires a list of object-related activities—such as track, discrimination, and data collection—for each threat NAI in the planning database. Deliberate planning takes place well in advance of a battle and allows the defender to study and, as appropriate, implement effective deployment and coordination schemes and assess acquisition strategies. When completed, the mission profiles developed through deliberate planning are used to maximize limited resources and determine the best course of action.

3-17. Defense planning should account for all the factors of mission variables and requires a detailed mission and situation analysis. The close coordination and discussion between staff planners and intelligence providers are critical in the defense design development process. Detailed air and ground intelligence preparation of the battlefield products are provided to the commander and staff to fully understand potential threat courses of action and OE considerations. Terrain analysis is conducted to identify critical NAI and missile threat types. The resulting defense design is continually analyzed against the evolving threat and is modified to provide timely updates to the supported commander's DAL.

PLANNING CONSIDERATIONS

3-18. Planning is critical for all aspects of global MD that directly apply to the placement of a deployed theater elements. The joint planning process is followed for deliberate planning in accordance with JP 5-0. Global MD planning involves joint, multinational, CCDR, Services, and functional component commands.

3-19. Due to the short flight time and TEW to defeat a ballistic missile threat, there is insufficient time to coordinate command relationships during the battle. Therefore command relationships and all C2 actions associated with defeating an attack are planned, coordinated, and established in advance of a defense system being deployed and generated for operations. All command relationships and associated C2 actions are established in accordance with joint and Army doctrine.

3-20. Employment of Global MD elements are included in the theater AADP which may include an action plan that describes the command relationships and procedures to transition from theater to a global MD role in support of strategic priorities. The AAMDC is responsible for planning and integrating global MD elements into Army air and missile defense (AAMD). At each level of command, planning begins with the receipt of a mission from higher headquarters and culminates in the issuance of operation plans or operation orders, which provide planning direction to subordinate commands. The plan is usually used instead of an order to prepare for operations far in advance. An operation plan may be put into effect at a prescribed time or as directed where it becomes the operations order.

3-21. Consideration of multinational BMD forces are included in all phases of the joint planning process. Not all multinational BMD forces may be included because of the systems they use, what may be authorized for release to a specific partner or ally, and other sensitive considerations. Training of multinational BMD forces across multiple security levels is a significant consideration. Refer to FM 3-16 for more information on multinational operations.

3-22. IAMD planning is a distributed process occurring at all echelons. The JFC or JFACC tasks supported commands to develop a detailed and prioritized CAL. The AAMDC commander, serving in the role of theater AAMD coordinator is involved in the development process by assisting Army forces in the coordination of the CAL and creation of the DAL. The JFC or JFACC goes through a staffing process with the components to merge all priorities into a single list. The JFC or JFACC is the final approval authority of the CAL and DAL.

3-23. The placement of elements and the allocation of mission objectives and priorities are performed as part of the deliberate planning process for global MD. Using the elements available to support a mission, senior leaders and planners at all echelons coordinate to conduct analysis to determine the best placement of each element in theater or region and determine specific objectives and priorities in support of specific missions. The process of determining the location of elements and determining specific objectives and

priorities is an iterative process which includes national strategy considerations; each CCDR's intent; strategic, operational, and tactical-level considerations; and agreements between allied nations.

3-24. Considerations should be synchronized with information and intelligence. It includes, but is not limited to launch points, launch systems, capabilities, intent, likely trajectories, and aim points. Planning enables the development of friendly courses of action and permits AMD commanders to create, analyze, and optimize feasible initial defense designs, with sensors and interceptors for approval by CCDR, JFC, or JFACC.

3-25. USNORTHCOM has primary responsibility for planning homeland defense, and coordinates closely with civilian authorities, other governmental agencies, and supporting CCDRs. Due to the consequences associated from failed homeland defense, the planning dictates a high degree of collaboration between supported and all supporting CCMDs. Because of the capability for the AN/TPY-2 FBM system and Aegis BMD to simultaneously support both theater-level and strategic-level threats, the CDRUSNORTHCOM, Commander, USSPACECOM (in its role as the global sensor manager), and supporting CCDRs all have a vested interest in understanding the planning and placement of each AN/TPY-2 FBM system and Aegis BMD element. A defense design must incorporate as many courses of action as possible to maximize system effectiveness, balance risk, and help limit vulnerabilities.

3-26. The threat, threat axis, terrain, weather, time-distance analysis, defended assets, desired engagement area, and surveillance requirements all have an impact on the location of a defensive element and, consequently the defense design. When choosing a location, staff planners must consider accessibility, connectivity, protection of sites, equipment, Soldiers, potential interference, and host nation support when planning to place the system in theater. An additional factor that must be considered during site selection is the need to protect friendly forces and facilities by dispersing of radio frequency emissions locations.

3-27. Selecting a location and orientation for a global MD element is part of the defense design development process. Global MD element location, orientation, and defense design must be accomplished as part of the joint force defense design to provide a mutually supporting and efficient IAMD. The planning effort is a continuous process. Staff planners must determine the location of the elements to optimize the development of the mission profiles to support the specific mission.

3-28. Elements location selection may be based on system coverage of defended assets against selected NAI. NAI are identified as an operating areas where potential threat ballistic missile, C2, infrastructure, and forces may operate. Staff planners must make every effort to place an element in a location that maximizes integration into the JFCs defense design.

3-29. Deployment planning includes the full range of support functions, including medical support, housing, supply support, transportation, subsistence, maintenance, morale, welfare and recreation, legal, postal, field services, and support services to families. Site specific deployment planning conditions are documented in a variety of documents, to include site operations plans, site activation plan, site safety plan, and standard operating process.

3-30. Planning tailors the defenses to incorporate the contributions of all global MD intercept capabilities. Planning should incorporate elements deployed in support of another CCMD that contribute to cross-AOR BMD. Regionally focused contributions include intelligence, target update information, and early engagements. OCONUS forces may be attached or assigned to support a CCMD; however, their dispositions and missions may be affected by global MD requirements.

3-31. Deployment decisions are based on strategic, operational, and theater mission priorities as well as USSPACECOM's global sensor manager responsibility to meet the needs of supported CCMDs. Additionally, the deployment of terminal elements such as Patriot, THAAD, Aegis BMD, and GMD contributes to the layered defense design and allows for added assurance and defense in depth.

3-32. Commanders and staffs require a mission analysis focused on their specific situation. The tactical echelons translate the operational variables identified by the operational headquarters into the mission variables. Mission variables are the categories of relevant military information used for planning operations. Mission variables are used by staff planners during mission analysis to facilitate situational understanding when developing plans. Upon receipt of a warning order or mission, Army planners use the mission variables

to filter relevant information from the operational variables to narrow their focus. Mission variables are discussed in the OE section of chapter 2.

ENGAGEMENT CRITERIA

3-33. Engagement criteria are critical elements of planning. A competent authority issues engagement criteria directives to delineate the circumstances and limitations under which U.S. forces initiate and continue combat engagement with other forces. The DOD provides guidance, fundamental policies and procedures governing the actions of commanders and Soldiers during all military operations with regards to rules of engagement and rules for the use of force for U.S. forces. All global MD weapon systems have system engagement criteria that must be met as part of the rules of engagement. Procedurally, the engagement criteria must be met before the fire control Director requests permission to place the weapon system into a weapons free state. The weapons release authority grants permission to place the weapon system into a weapons free state for the current threat. The specific procedures to place a system into a weapons free state is unique to each weapon system.

3-34. Supplemental rules may augment the standing rules of engagement and rules for the use of force. Approval of supplemental rules of engagement and rules for the use of force may be necessary before engagement. Rules for the use of force directives are a guide for U.S. forces during various operations. These directives may take the form of execution orders, deployment orders, memoranda of agreement, or plans. Supplemental engagement criteria are always applicable unless superseded by properly approved and directed supplemental rules of engagement and rules for the use of force. Other directives issued by the President, Secretary of Defense, or other competent authority, such as those delineating weapons free, may modify or supersede provisions in the standing rules of engagement.

Note: The fire direction entity for each global MD element is different. Each follows system unique procedures to ensure their weapons system is employed according to commander's intent, applicable rules of engagement, and safety rules.

ENGAGEMENT AUTHORIZATION

3-35. Although planning and engagement authorization is centralized, execution is decentralized for weapon system fire control. Effective engagement requires decentralized execution. The speed at which attacking ballistic missiles can travel and the range and the speed at which intercepts occur makes rapid responses essential—centralized execution would cause unnecessary delays and limit response and decision time. Fire control systems use automated processes with a human-in-control to ensure the system operates in a manner consistent with commander's intent.

CUED, ORGANIC, AND NON-ORGANIC ENGAGEMENT

3-36. Cued acquisition is a technique that requires the use of both organic and nonorganic elements in the missile defeat cycle and supports the any sensor, best interceptor construct. In a cued acquisition, an external—nonorganic—sensor provides sufficient track data for an organic sensor to locate and begin tracking an object. A cued acquisition may or may not be associated with an engagement. The cued acquisition may be used to provide track data to another radar as the objects trajectory carries it into the field of view of another radar.

3-37. Organic engagements use sensor data obtained from its own radar to develop ballistic missile track data. Nonorganic engagements enables an element to launch an interceptor using only track data obtained from another element. Organic and nonorganic engagement examples follow.

- Organic engagement: a weapon system receiving track data from its own sensor and engaging the threat with its own interceptor using its own track data.
- Nonorganic engagement: a weapon system receiving track data from another element—such as the AN/TPY-2 FBM system—and engaging the threat with its own interceptor using only the track data received from the other element.

3-38. Two types of nonorganic engagements are engage on remote and launch on remote.

- *Engage on remote* is the use of nonorganic sensor or MD system track data to launch weapon and complete engagement. (JP 3-01).
- *Launch on remote* is the use of nonorganic sensor data or ballistic MD system track to launch a weapon, with additional data provided by a different sensor(s) to complete the engagement. (JP 3-01).

3-39. Both engage on remote and launch on remote are possible because of the global MD system architecture. Both types may only occur when fire control indicates an interceptor has a TEW. Both type of organic engagement are useful because:

- The cued element may be focused on another task.
- The cued elements' field of view has not yet been breached by the tracked object.

3-40. Engage on Remote and Launch on Remote have two major benefits: of an increased TEW and an increased probability of a successful intercept. This is due to the increased time available to engage and ability to fire without being reliant on the organic sensor.

EMPLOYMENT OPERATIONS

3-41. The employment guidelines are to assist weapon system fire control operators in meeting commander's intent. The employment guidelines represent the best case application of combat power, and they represent the optimal way of utilizing the weapon system. General employment guidelines are—

- Understand the commander's intent.
- Visualize the OE.
- Select the best defeat opportunity.
- Retain flexibility.
- Maintain situational awareness.
- Assist fire control.
- Assure risk management.

COMMANDER'S INTENT

3-42. CDRUSSTRATCOM conducts global MD operations support through the JFCC-IMD. CCDRs define engagement criteria as part of commander's intent, possible or likely threat parameters, and national security objectives within their AOR. Service components and CCMDs conduct the detailed planning—in coordination with USSTRATCOM—to maximize capabilities.

3-43. For homeland defense, the CDRUSNORTHCOM, establishes commander's intent and rules of engagement used during planning. Homeland defense planning provides guidance to the global MD elements which defend against threat ballistic missiles capable of striking the U.S. homeland. A critical element of planning is the establishment of the CCMD's CAL and creation of the DAL. Locations and priority of assets on the DAL may affect the configuration of a sensor or weapon system's defensive task plans.

3-44. Staffs should keep the commander's intent foremost as they integrate specific systems into the defense design. The execution plan for various engagement scenarios is based on system-specific capabilities and element locations. Some portions of the commander's intent are translated into pre-defined, selectable system settings. Each element's execution plan has control parameters to establish or limit the system's operations to comply with commander's intent.

3-45. Most elements have the capability for multiple execution plans. Execution plans are developed in accordance with the commander's intent to address several probable event sequences. Operators should fully understand the commander's intent and which execution plan best meets the commander's intent for any given s threat.

Applying Commander's Intent

3-46. Guidelines focus on developing a thorough understanding of how the commander is responsible to defeat the threat, and how the commander wants the system fire control operations to fight the battle. Every member of a MD crew must understand the commander's intent prior to assuming shift on an operational system. They must be prepared to react immediately to a ballistic missile launch against the designated defended areas.

3-47. Key operator tasks associated with employment guidelines are—

- Conduct a thorough mission analysis to understand the commander's intent and guidance.
- Translate the commander's intent and guidance into requirements on how to configure their specific system, properly to allocate interceptors against threats.
- Understand the commander's intent for the system defense strategy and execution plans.
- Ensure all changes to the system configuration which are authorized for implementation are necessary to meet the commander's intent for missile allocation.
- Understand all situations in order to achieve commander's intent.

VISUALIZE THE OPERATIONAL ENVIRONMENT

3-48. Critical to employment is visualization of the OE as it relates to the threat and its current capacity to target the defended areas. Weapon system operators visualize the battle through analysis of information provided by the weapon system fire control communications and through information and intelligence provided by the Joint community. By understanding the threat, weapon system operators can best decide the appropriate allocation of interceptors to react to the incoming threat. Understanding the ability of the system to deal with that threat, they can identify key decision points during each engagement.

SELECT THE BEST DEFEAT OPPORTUNITY

3-49. Battle plan analysis takes place throughout the battle providing the weapon system operator with the flexibility to conduct battle redirection if necessary. The weapon system fire control identifies the best intercept opportunities to defeat the threat according to the commander's intent. Some systems may have a defense strategy and execution plans systems, which consist of the following four mission directives.

- Defended area—a geographical area, which defines for the fire control what areas to defend.
- Defense strategy and execution plans—selectable programmed system values that define commander's intent such as interceptor allocation and defended asset in the defended areas.
- Mission Constraints—control parameters that further refine interceptor allocation and engagement execution against a threat.
- Reserve—control parameters that restrict interceptor availability against a threat.

3-50. Once the weapon system operators understand the threat, they must decide if the current system configuration is going to be effective in fighting the threat they face. For example, the operators must understand if the allocation system allows them to effectively meet the commander's intent regarding the current threat. This requires continual analysis throughout the entire battle and the weapon system fire control operators may change the interceptor allocation and reconfigure specific system parameters at any time during the battle.

RETAIN FLEXIBILITY

3-51. Various defense strategies enable the weapon system operator to retain flexibility throughout the engagement sequence. The weapon system operator adheres to the employment guidelines and evaluates each threat to determine if they are correctly implementing the commander's intent. When accounting for the near term or follow-on threats, the fire control system can only fight threats for which it can plot a fire solution. Operators recommend all actions based on shot doctrine associated with manipulating the automated missile allocation based upon a track-by-track analysis and accounting for any near term future threat.

3-52. One way to retain flexibility is to build flexibility into the communications architecture. The communications architecture for global MD operations does not rely on fixed paths nor does it rely on only one SATCOM system. The BMD communications network uses multi-path routed messages through both military and commercial SATCOM to ensure sensor data is not disrupted and worldwide situational awareness of ballistic missile launch activity is maintained.

MAINTAIN SITUATIONAL AWARENESS

3-53. The purpose of employment guidelines is to maximize situational awareness for the weapon system operator throughout the fight. Through careful consideration of all the guidelines combined, the operator not only gains situational awareness of immediate actions at the tactical level, but also maintains greater awareness of guidance derived from operational and strategic leaders.

FIRE CONTROL

3-54. A fire control system is the brains of the system and is a suite of software, hardware, consoles, and communications equipment populated with track data to develop a fire solution to engage a threat. The fire control combines the data from a variety of sensors to build a fire solution by processing each sensor's data containing a targets track data to develop an integrated plan for every interceptor launched. Sensors continue to track and discriminate the target throughout flight, and refine the data used by the fire control to launch interceptors.

3-55. Although a fire control system will autonomously develop the best firing solution, trained personnel operating the system must control the release of interceptors to prevent unauthorized interceptor release. Each fire control crew analyzes the information provided by their respective weapon system to determine if the commander's intent for engagement is met before they allow an interceptor to be released.

3-56. A fire control system is a suite of software, hardware, consoles, and communications equipment populated with track data to develop a fire solution to engage a threat. A fire control system will autonomously develop the best firing solution. Fire control processes are designed to ensure human interaction in the engagement sequence to prevent an automated or unauthorized interceptor release. Fire control crews analyze the information provided by their respective weapon systems to determine if the commander's intent for engagement has been met before launching an interceptor. The system provides precision intercept and destruction of inbound ballistic missiles through the interceptors.

3-57. The weapon system fire control is the brains of the system. The fire control combines the data from a variety of sensors and radars to build a fire solution. The fire control processes each sensor's data containing a targets track data to develop an integrated plan for every interceptor launched. Contributing sensors continue to track and discriminate the target throughout flight, and refine the data used by the fire control to launch interceptors.

RISK MANAGEMENT

3-58. Commanders use several integrating processes and continuing activities while conducting global MD operations. The military decision-making process, joint planning process, and risk management should be applied throughout the lifecycle and especially during planning and operations. Overall operations should be synchronized and fully integrated with each other. Lack of inclusion of information operations and BMD-related information during mission assessment may lead to an inaccurate risk assessment for the mission.

3-59. A few risk management items to consider during every mission planning and execution risk assessment include, but is not limited to, information protection, personnel safety, safety zones, and security. Refer to Army Techniques Publication (ATP) 5-19, for more information.

3-60. Some of the more prominent risk management factors that must be addressed are below.

- Security. All military operations have some element of risk. The arriving forces and BMD assets are most vulnerable when they are undergoing reception, staging, and onward movement. It is the responsibility of the CCDR to protect the arriving force as the staff coordinates with inbound units

to mitigate any risk. Commanders implement appropriate security measures to reduce risk and vulnerability. Minimizing risk may require host nation or operational contract support.

- Hazardous material is any material including waste, which may pose an unreasonable risk to health, safety, property, or the environment, when they exist in specific quantities and forms. They also include materials that may endanger human life or property because of its quantity, properties, or packaging. Special storage, use, handling and shipment safety procedures and protocols must be followed to help protect against accidental exposure. Transportation of sensing equipment, interceptors, motor vehicles, and peculiar or specialized support equipment may all contain hazardous material. Commands establish local procedures to meet the requirements to minimize risk of compromise while permitting use of the most effective transmission or transportation means.
- Movement and emplacement of equipment can be dangerous with tractor-trailer sized pieces of equipment moving in close proximity to each other, often with a minimum amount of space to maneuver. Nonessential personnel should be kept at a safe distance to protect against getting too close to moving equipment, as well as being exposed to the consequences if an accident occurs.
- Electrical shock. Many relocatable and mobile systems require multiple pieces of equipment be connected with power cables and interconnected with communications cables. The power and communications cables must be properly connected to prevent electric shock. Care should be taken when making initial connections to ensure cables are properly connected.
- Tripping and fall hazard. Many relocatable and mobile systems require multiple pieces of equipment be connected with power and communications cables. These cables are large and pose a tripping hazard for personnel required to transit in areas where cables must be placed. Care should be taken by all personnel to minimize transit routes through areas where power and communications cables are laying.
- Safe operating areas should be planned for, identified, and signs clearly posted for personnel to prevent accidental movement out of safe operating areas. All personnel should receive an introduction to hazards when the initially arrive at a location.
- Radio frequency emissions make equipment placement considerations critical. Staff planners ensure no equipment, facilities, or transit routes are placed in or next to a keep out zone. Each system keep out zone varies by system based on specific power output, but may extend out from a radar face in excess of ten kilometers and sweep more than seventy degrees on each side from the system bore sight. Site personnel conduct routine functional tests of all warning devices and interlock systems to ensure proper function. An audible signal is automatically activated by the radar equipment to alert personnel the system is about to radiate. Site personnel receive initial and routine briefings on system hazards and the radiation protection program. Before radiating or going to remote operation, site personnel must ensure all crew members have vacated the personnel keep out zone.

DANGER - HIGH POWER LEVELS - DANGER

Dangerous radio frequency power levels exist on and near antennas and phased-array radars during operations. Electromagnetic radiation can cause serious burns and internal injury. All personnel must observe electromagnetic radiation danger indications and stay outside designated keep out zone.

- Fratricide is of utmost concern and can occur in the physical or virtual realms.
  - Physical fratricide is centered on a functional airspace control plan which is used to reduce the risk to friendly aircraft while facilitating successful defense. The AADC and airspace control authority establish measures and procedures within the airspace control system to positively identify all airborne assets and permit the execution of AMD and BMD operations. Establishing air corridors and adhering to applicable procedures are critical to maintaining safe air defense zones. Sound measures and procedures reduce delays in operations and help prevent fratricide.

- Virtual fratricide is focused on spectrum management, which is vital to communications. The spectrum management office conducts a spectrum risk assessment to identify spectrum-usage conflicts and providing awareness of potential spectrum conflict. They determine the effects of spectrum dependent devices that may result in electromagnetic interference in the AOR. Spectrum managers work to mitigate electromagnetic interference by actively managing allotted frequencies.

GLOBAL MISSILE DEFENSE PROTECTION OPERATIONS

3-61. Preserving BMD capability includes protecting personnel (combatants and noncombatants), physical security system level (SSL) assets, and information of the U.S. military. The protection warfighting function facilitates the commander's ability to maintain the force's integrity and combat power. Protection reduces the degree to which potential threats can disrupt operations. Emphasis on protection increases during preparation for missile engagements and continues throughout execution. Protection is a continuous activity that integrates all protection capabilities to safeguard BMD elements and protect forces. The protection warfighting function includes the following primary tasks:

- Coordinate AMD support.
- Conduct personnel recovery.
- Conduct area security.
- Apply antiterrorism measures.
- Conduct survivability operations.
- Conduct chemical, biological, radiological, and nuclear operations.
- Conduct risk management.
- Implement operations security.
- Implement physical security measures.
- Conduct police operations.
- Provide force health protection.
- Provide explosive ordnance disposal support.
- Conduct detention operations.
- Conduct populace and resource control.
- Conduct cyberspace security and defense.
- Conduct electromagnetic protection.

3-62. Continuous information collection and analysis is critical to effective security of global MD elements. Commanders working with their DOD and Service component intelligence agencies, and USSTRATCOM Special Security and Counter Intelligence, must analyze potential threats. Intelligence analysis should consider local, regional, and international factors bearing on the security threat to installations and global MD elements. It stresses the known capabilities of hostile elements to damage, destroy, or impede the planned use of SSL resources. Commanders use USSTRATCOM postulated threats to global MD and any theater specific threat assessments to develop local threat assessments. Commanders should conduct formal risk and vulnerability assessments of the global MD elements in their AOR. Up-to-date threat assessments should be developed and maintained as a vital part of evaluating the overall security of global MD.

3-63. It is the commanders' responsibility to apply more stringent security standards required by USSTRATCOM, the Army, and global MD security during increased threat level or high risk determinations. The security objectives for global MD sites are—

- Implement general policy for the security of personnel, installations, military operations, and designated assets in accordance with applicable USSTRATCOM and Army security regulations.
- Provide security guidance and general procedures that are realistic, harmonized with other security disciplines, and provide the necessary flexibility for commanders to protect personnel, installations, projects, operations, and related resources against capable threats from terrorists, criminal activity, and other subversive or illegal activity.

- Reduce the loss, theft, diversion of, or damage to DOD assets with advanced technologies; thereby enhancing overall security, while ensuring that warfighting capability is maintained.
- Standardize personal identification and authentication to DOD installations and facilities, including interoperability with other Federal entities.
- Utilize the DOD personal identity verification credentials on the Common Access Card as the universal authority of individual authenticity.

3-64. As many threats are localized, BMD elements are possible targets for sabotage. It is essential frequent and periodic security assessments are made of the potential threat, risks, and vulnerabilities associated with the BMD security programs. Other considerations are—

- The postulated threat to BMD elements, defended areas, annual threat statements, local threat, and other relevant factors are considered.
- Security programs are revised accordingly to ensure adequate protection at all times.
- Physical security processes must constitute a balanced, in-depth system responsive to all credible and potential threats and vulnerabilities.
- Construction projects require continuous security coordination between engineers and security personnel from planning through completion of the project.

PHYSICAL SECURITY PROGRAM

3-65. Physical security is a primary command responsibility and is the responsibility of commanders, directors, supervisors, and officers in charge, whether military or civilian. The physical security program is the part of security concerned with active and passive measures designed to prevent unauthorized access to personnel, equipment, installations, information, and to safeguard them against espionage, sabotage, terrorism, damage, and criminal activity. This security applies to global MD operations. In accordance with AR 190-13, physical security programs provide the means to counter global MD threat entities during peacetime, mobilization, and wartime. These include—

- Threat intelligence services.
- Foreign military and paramilitary forces.
- Terrorist or saboteurs.
- Criminal elements.
- Protest groups.
- Disaffected persons.

3-66. Physical security planning includes using biometric, electronic, and or mechanical technological security systems to mitigate both vulnerability to the threat and reduce reliance on fixed security forces. Follow guidance in AR 190-13 for the planning, evaluation, approval, and procurement. This includes any item, device, or system used to protect global MD elements.

Security System Levels

3-67. SSLs are identified for BMD elements which must be secured, and the security resources dedicated to those elements. SSLs are **a level of protection applied when the loss, theft, destruction, or misuse of the resource will result in great harm to US strategic capability. Resources may be designated as SSL-A, SSL-B, SSL-C, or SSL-D, depending on the criticality of the resource**. SSL-A resources assigned to global MD elements are resources for which the loss, theft, destruction, or misuse would result in great harm to the U.S. strategic capability. The SSL physical security system consists of complementary, integrated, layered, subsystems for intrusion and detection coverage during all site-specific weather conditions. Physical security measures are used to protect BMD elements from possible threats.

3-68. A BMD element may be hosted on a larger complex with other units or it may be an individual resource operating in an austere environment. When it is part of a larger complex, only select portions of the complex, such as the BMD element, require protection as a designated SSL resource. When it is an individual resource operating in an austere environment, the entire site will be designated an SSL.

3-69. The SSL-A security level must result in the greatest practical deterrence against and response to hostile acts. In-place security measures should provide an effective means to achieve detection, interception,

and defeat of a hostile force before they are able to seize, damage, or destroy elements. Entry control for SSL-A and SSL–B restricted areas is conducted by posted entry controllers through a single entry point. Exceptions to SSL requirements are approved in advance when the risk to the element can be minimalized. Bypassing SSL requirements should not be an ad-hoc decision based on a commander's prerogative.

Security Forces

3-70. There is sufficient security forces assigned and designated to provide necessary security requirements. Physical barriers should delay potential threat actors long enough to allow security forces to respond to, and neutralize the threat before they gain access to the protected SSL facilities. Security force considerations are:

- Being appropriately armed and trained for all possible actions taken, to include the use of deadly force (AR 190-14).
- Ensuring immediate re-occupation of a wrongfully penetrated exclusion area and establishing security of same.

READINESS CONDITION

3-71. A readiness condition (known as REDCON) is based on a BMD elements' ability to conduct the assigned mission. It is determined by a set of protocols used to determine individual equipment conditions and subsystem operating ability. The BMD element unit commander is responsible to determine the site status. The readiness condition of a BMD element affects all systems within the IAMD architecture. Readiness condition information is defined by USSTRATCOM.

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Chapter 4
COMMAND RELATIONSHIPS

This chapter describes the C2 framework that enables global MD to function. The chapter begins with an overview of C2. The chapter then describes the cross-AOR nature of global MD and the unique demands this places on the C2 system. This chapter concludes with a discussion of the support relationships inherent in global MD.

COMMAND AND CONTROL

4-1. The *command and control warfighting function* is the related tasks and a system that enable commanders to synchronize and converge all elements of combat power (ADP 3-0). This fundamental philosophy of command places people, rather than technology or systems, at the center. Under this philosophy, commanders drive the operations process through the activities of understand, visualize, describe, direct, lead, and assess. They develop teams, both within their own organizations and with joint, interagency, and multinational partners. Commanders inform and influence audiences, inside and outside their organizations. It is this philosophy that allows us to focus less on the physical attributes of the defensive system and more on the command relationships and integrated operations.

4-2. Successful execution of global MD C2 requires an integrated strategy that supports the rapid, flexible application of defensive capabilities synchronized with offensive actions to deter and defeat the sophisticated ballistic missile attack. This strategy is based on the principles of unity of effort, unity of command, centralized planning, and decentralized execution.

4-3. The Secretary of Defense, as the President's principal assistant on military matters, has overall authority for DOD and executes the homeland defense mission (JP 3-27). Global MD operators remain under the control of the established chain of command when conducting BMD operational duties.

4-4. USASMDC is the Army headquarters responsible for executing the global MD mission for the Army. USASMDC forces maintain a dedicated command structure to plan, integrate, and coordinate Army support to global MD. These capabilities are part of a responsive, layered offensive and defensive system capable of deterring, preventing, or defeating missile threats as part of the greater global MD mission.

4-5. Army organizations that have a role in global MD are USASMDC and the AAMDCs in their respective AORs based on the boundaries identified in the Unified Command Plan. However, since ballistic missile attacks may cross theater boundaries, CCMDs must establish cross-AOR command relationships to effectively counter ballistic missile threats.

4-6. By its very nature, BMD is inherently joint and may be executed in multiple AORs simultaneously by the affected CCDRs. Consequently, all Services and many other organizations have key roles in global MD. CCDRs use existing theater AMD commander such as AADCs, AAMDC commanders, regional air defense commander (RADC), and sector air defense commander (SADC) to conduct global MD and coordinate cross-AOR engagements.

COMBATANT COMMANDS

4-7. As directed, CCMDs provide support to the CDRUSNORTHCOM, for BMD of the contiguous 48 states, Alaska, Hawaii, and U.S. territories. For example, Commander, United States Indo-Pacific Command, is a supporting commander to CDRUSNORTHCOM, during protection of the homeland mission. During protection of the homeland, Aegis BMD ships and AN/TPY-2 FBM systems provide intercept quality track data to the ground-based midcourse defense fire control (GFC) on IRBM and ICBM.

4-8. CCDRs exercise CCMD (command authority) over forces assigned to them. CCMD authority is the nontransferable command authority, exercised only by CCDRs with command authority or specified CCDRs unless otherwise directed by the President or the Secretary of Defense.

COMMAND AND CONTROL

4-9. CCDRs plan for theater and global MD operations. Unless otherwise directed by the President or Secretary of Defense, the CCDR whose AOR is targeted is the supported commander for BMD planning and operations. It is likely more than one CCDR will be conducting BMD operations simultaneously; some of those operations may be cross-AOR.

4-10. Integrating and synchronizing offensive and defensive counterair functions requires a single commander responsible for both offensive and defensive counterair operations. The JFACC serves as this single commander with the responsibility to integrate offensive and defensive counterair components. In theater, offensive counterair attack operations are commanded by the JFACC. Defensive counterair operations are commanded by the AADC. 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 JFC to plan and execute integrated air defense operations (JP 3-01). Typically, the JFACC is designated as the AADC and the airspace control authority.

4-11. Countering air and missile threat operations requires integration and synchronization at the CCDR level and includes balancing theater BMD needs with global MD needs. Global MD focuses on a collaborative planning process between all CCDRs, coordinated by CDRUSSTRATCOM.

4-12. The CCDRs' counterair effort and the BMD planning actions are coordinated and synchronized with the efforts of other CCDRs and the worldwide synchronizing headquarters for BMD planning. The planning is headed by USSTRATCOM, and its subordinate JFCC-IMD.

4-13. Organizations with a role in global MD utilize a wide range of battle management systems. Each element has some level of organic C2 and battle management and each Service has a means by which they can conglomerate information for their situational understanding. These systems enable command relationships to mitigate complexities associated with cross-AOR operations. For global MD operations, the primary battle management, situational awareness, and engagement coordination system is C2BMC.

CROSS-AREA OF RESPONSIBILITY OPERATIONS

4-14. The Secretary of Defense establishes command relationships for global MD operations. CDRUSSTRATCOM, has the responsibility to synchronize planning for global MD. The cross-AOR OE is characterized by activities that include defense against longer range threats that cross one or more CCMD boundaries, and require coordination or integration among all affected CCMDs. It is a global MD imperative that elements in one AOR be positioned to provide support to an adjacent CCDR.

4-15. The cross-AOR OE requires an approach to C2 that provides the ability to coordinate selected aspects of IAMD at the strategic level while allowing most of the functions to be performed at the CCDR level and below. Since the CCDR is responsible for IAMD operations within the theater, the IAMD approach must also encompasses global MD beyond the theater level. Key force planning and employment decisions with cross-AOR impacts should be developed and implemented through a collaborative process led by the supported CCDR for global MD planning as directed by the President of the United States or Secretary of Defense according to JP 5-0.

4-16. Collaborative BMD planning may identify elements capable of supporting multiple AORs. For a given crisis situation, these elements may be assigned cross-AOR missions. Direct support relationships are established between CCMDs to define the supported commander's mission priorities and requirements that are codified in the appropriate documentation.

4-17. Some global MD elements may be positioned to concurrently support both homeland and theater defensive operations. If homeland and theater defensive operations occur simultaneously, the USNORTHCOM homeland defense mission has priority within the element. Before deployment of a BMD

element into theater, command and execution authorities establish clear lines of authority during crisis operations for concurrent homeland and theater defensive operations.

4-18. Joint command relationships are the interrelated responsibilities between commanders and include the command authority exercised by CCDRs, OPCON, tactical control, and support. Command relationships are established through deployment orders, concept plans, operations plans, crisis planning, or Execution Orders based on actual threats. The high demand, low density construct of global MD elements necessitates elements in one AOR be prepared to provide support to an adjacent CCDR.

4-19. USNORTHCOM is the supported CCDR for homeland defense and directs active defense engagement operations when the threat is to the U.S. homeland, its territories, and its possessions. USNORTHCOM is a supporting CCDR for ballistic missile threats to other CCDRs.

4-20. The AN/TPY-2 FBM system has regional capability, which results in element taskings in support of more than one CCDR. The desired outcome of cross-AOR planning includes—

- Identifying and planning information exchange requirements and links between all users of the radar data are included in the theater C2 and communications architecture.
- Identifying sensor management requirements.
- Codifying missions and taskings in support plans, operations orders, execution orders, or appropriate command agreements.
- Codifying defense plans in training plans, exercises, and Defense Readiness Reporting Systems.
- Assigning missions and defense across multiple AORs.
- Direct support relationships established to define the supported commander's requirements.

4-21. The AN/TPY-2 FBM system and Aegis BMD are OPCON to the CCMD in whose theater the radar physically resides. When an AN/TPY-2 FBM system and Aegis BMD are supporting cross-AOR defense against a ballistic missile attack, the these system are OPCON to the supported CCDR during a ballistic missile attack. This same supported CCDR simultaneously becomes a supporting commander to the CDRUSNORTHCOM, if the attack extends to homeland defense mission. There are scenarios where a CCDR may simultaneously be the supported and supporting commander. The CCDR may use the AN/TPY- 2 FBM system and Aegis BMD to concurrently support both homeland and theater defensive operations. Before deployment of these systems into a theater, command and execution authority must establish clear lines of authority during crisis operations for concurrent homeland and theater defensive operations.

COMMAND RELATIONSHIPS

4-22. Command relationships are the interrelated responsibilities between commanders, as well as the operational authority exercised by commanders in the chains of command—they are defined further as CCMD (command authority), OPCON, tactical control, or support.

4-23. The President of the United States establishes command authorities in the Unified Command Plan. Service-specific considerations are subordinate to command authority. Consequently, no individual Service can limit the authority of a CCDR to employ forces in support of Presidential directives. A CCDR must be able to employ the capabilities of all subordinate units. See figure 4-1 (page 4-4) for command relationships.

4-24. The Secretary of Defense establishes command relationships for global MD operations. USSTRATCOM has responsibility for global MD operations support. USSTRATCOM provide recommendations to the Secretary of Defense and Joint Staff to balance homeland defense requirements with the defensive needs of all other CCMDs. USSTRATCOM does this by synchronizing CCMD plans with the plans of adjacent CCMDs. Balancing theater priorities for defended assets with global MD elements in accordance with priorities set forth for homeland defense is challenging and requires active participation from all CCDRs. Regarding global MD, the CDRUSSTRATCOM, is responsible for:

- Leading strategic deterrence planning in coordination with other CCMDs and Services.
- Conducts global MD operations support in coordination with other CCMDs and Services.
- Advocates for and assesses MD capabilities.
- Ensures continuity of operations.

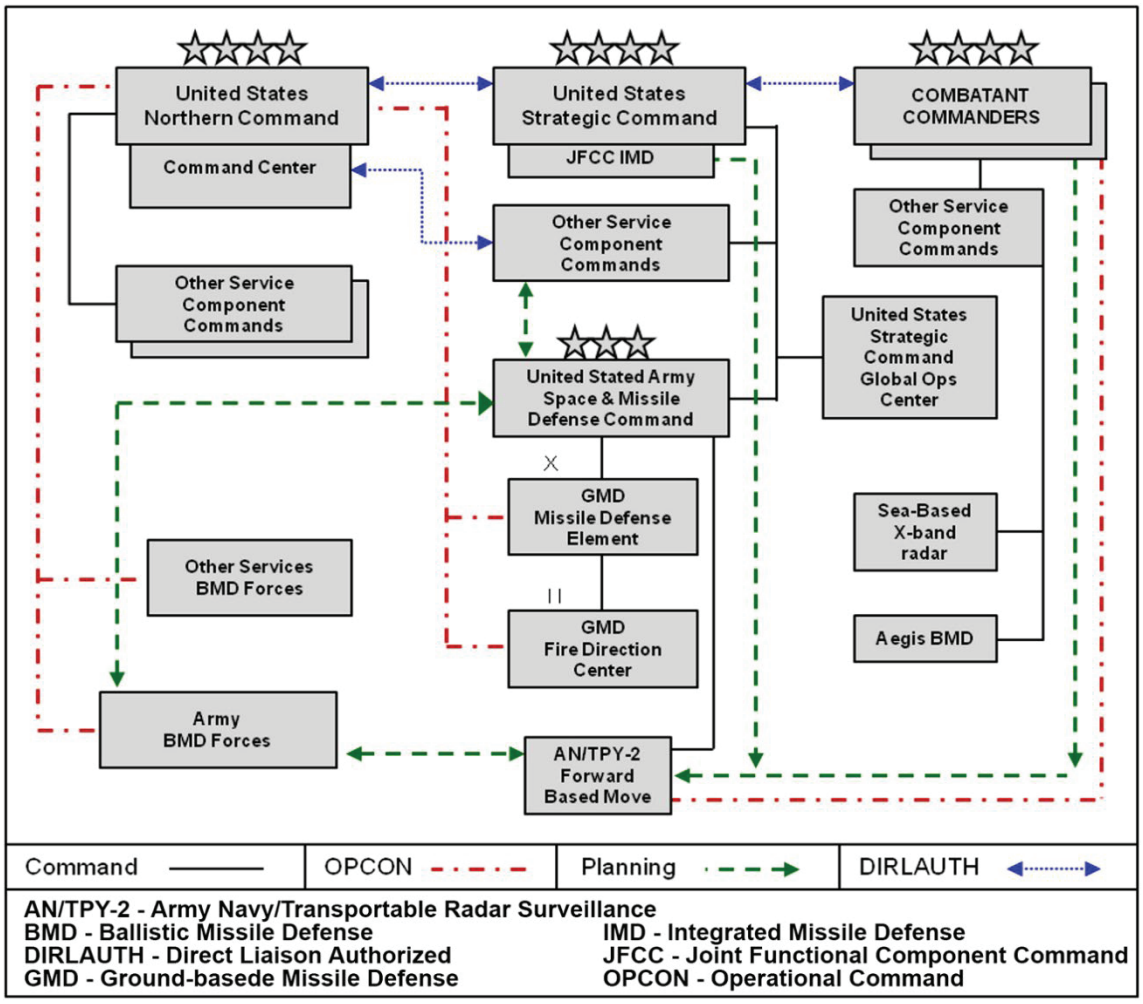

Figure 4-1. Command relationships for ballistic missile defense threats

4-25. Increased ballistic missile range necessitates operations in one theater provide direct support to an adjacent CCDR. CCMDs coordinate and synchronize their plans and actions with other CCMDs. The supported CCDR issues commander's guidance for the global MD mission. The supported commander's guidance establishes the overarching framework used by supporting commanders. Staff planners use the supported commanders' plans to develop the supporting commander's plans for theater BMD development.

4-26. USNORTHCOM is the supported CCMD for homeland defense and directs engagement operations that require active defense when the threat is to the U.S. homeland, its territories, and its possessions. USNORTHCOM is a supporting CCMD for BMD threats to other CCMDs.

4-27. While a CCDR has the authority to employ capabilities as deemed necessary to support theater objectives, this authority may be subject to prioritization when ballistic missiles simultaneously threaten the CCDR's theater and the U.S. homeland. As a supporting commander, a CCDR supports the CDRUSNORTHCOM, in the conduct of the homeland defense mission.

4-28. There are situations where a CCMD may simultaneously be both a supported and supporting commander. For example, a CCMD may use an AN/TPY-2 FBM system to concurrently support both homeland and theater defensive operations. Before deployment of any BMD element capable of supporting cross-AOR operations—the supporting and supported relationships are firmly established for concurrent homeland and theater defensive operations.

Chapter 5
COMPONENTS

This chapter describes the components of the global MD system. The chapter begins with an overview of the components of the global MD system. The chapter then describes in detail the components of the global MD system by domain, and how they work collectively to defeat threat ballistic missiles. The chapter concludes with a discussion of the battle management elements, consisting of various systems that enable the components to work together.

COMPONENT OVERVIEW

5-1. Global MD uses a variety of Service unique sensors, which provide target search, acquisition, track data, classification, discrimination, and communications support for global MD.

- Track data is the summary information used to indicate the successive positions of a moving object that describes the trajectory of a ballistic missile around the Earth. System track data includes state vectors—a grouping of mathematical values to describe the three-dimensional location, direction, and speed of an object in relation to the Earth's surface—and discrimination estimates that account for and correlate the data provided by different sensors.
- Classification is the capability to categorize a target based on observed characteristics. Categories include RV-like, non RV-like, tank-like, and debris-like objects. Lower frequency radars typically accomplish classification of a threat.
- Discrimination is the capability to positively determine a target based on observed characteristics. The type of target based on target features distinguishing between RVs, fragments, canisters, fuel tanks, decoys and other objects.

5-2. Sensors that contribute to the layered global MD include SBIRS, UEWRs, COBRA Dane, SBX radar, AN/TPY-2 FBM systems, and the LRDR. Systems with sensors and interceptors that contribute to the layered global MD include Patriot, THAAD, Aegis BMD, Aegis Ashore, and GMD. Collectively, these elements contribute to the defeat engagement mechanism with the ability to locate, select, and defeat the incoming RV.

5-3. BMD contributing sensors make up a system-of-systems consisting of multiple early warning sensors on land, in space, and at sea that provide data to enhance engagement operations. Global MD sensors provide synchronization and integration of capabilities to destroy or disrupt a ballistic missile attack. Early warning sensors are a key element to defense of U.S. homeland.

LAND DOMAIN

5-4. The land-based elements that enable the global MD mission are the Aegis Ashore, AN/TPY-2 FBM system, GMD, Patriot, THAAD, theater event system elements, the UEWRs, and the COBRA Dane radar. The Patriot and THAAD systems are both mobile, forward deployed system. The AN/TPY-2 FBM system is a transportable, forward deployed system. The UEWR, COBRA Dane radar, and LRDR sensors support long-range surveillance and tracking. These systems provide early target characterization and tracking information, permitting launch of a correctly tailored interceptor package during midcourse intercepts for GMD.

AEGIS ASHORE MISSILE DEFENSE

5-5. The Aegis Ashore system is designed to protect U.S. deployed forces and NATO allies in Europe against the threat of MRBM and IRBM attack. The Aegis Ashore is very similar to the sea-based version of the Aegis weapon system using the same detection radar, interceptors, software, and engagement procedures. Aegis Ashore provides long-range surveillance and tracking capability to support BMD engagements. The Aegis Ashore weapon system with the Standard Missile-3 provides intercept against SRBMs, MRBMs, and IRBMs.

5-6. The antenna array provides wide angle coverage and the AN/SPY-1 data provides sufficient target information to launch the systems interceptors. During a nominal engagement the target data is used to cue other global MD elements. Aegis Ashore weapon system may receive cues directly from other sensor data and determines classification quality information during late boost and early mid-course phase of a ballistic missile trajectory.

5-7. Aegis Ashore weapon system is equipped with the AN/SPY-1 radar is an S-band phased-array system. The AN/SPY-1 can achieve acquisition of the threat through autonomous search using pre-planned search sectors, cueing from SBIRS sensors, or cueing from other global MD elements such as other Aegis BMD ships or AN/TPY-2 FBM system. Once a threat is acquired, the Aegis Ashore weapon system continues to track the target to the maximum extent of the AN/SPY-1 radar or until manual operator action is initiated.

5-8. Planning for use of Aegis Ashore weapon system to support homeland defense requires additional considerations when compared to other global MD elements.

AN/TPY-2 FORWARD BASED MODE SYSTEM OPERATIONS

5-9. The AN/TPY-2 FBM system is a U.S. Army transportable surveillance system that complements other DOD sensor systems to provide detection and tracking of missile launches originating within a systems field of view. It is a forward based, multi-role radar system that supports the defense of the U.S. homeland and theater forces from ballistic missile attacks.

5-10. The sensor management functions configures and controls the AN/TPY-2 FBM system using C2BMC. The AN/TPY-2 FBM system provides continuous processing of near real-time warning and alerting of ballistic missile threats that pass through the sensors field of view. It is a high resolution, medium to long- range search and target acquisition phased-array radar operating in the X-band. The sensor is capable of providing early warning, target type- classification, engagement quality data, external sensor cueing, launch location, and target impact-point estimates. Data is transmitted and available to CCDRs for the protection of military assets, civilian populations, and geopolitical centers. Dissemination of data uses existing worldwide communications networks and those available within theater.

5-11. The AN/TPY-2 FBM system has a wide field of view; it is capable of simultaneously supporting theater, cross-AOR, and homeland defense. The radar provides engagement quality track data through C2BMC to Aegis BMD and GMD. It is capable of discriminating between RVs and debris for Aegis BMD, but cannot discriminating between RVs and debris due its location relative to RV separation in regards to homeland defense.

5-12. The AN/TPY-2 FBM system automatically performs object classification such as RV, tank, bus, decoy, chaff or junk, with no operator intervention required under nominal conditions. The AN/TPY-2 FBM system design supports cross-cueing of detection and track data with other sensors.

5-13. The AN/TPY-2 FBM system provides object track information to the tactical data link (TDL) or Link-16 communications network and provides cueing data to Aegis BMD and SBX. Other missions may include support to theater warning, support to targeting operations for global strike, theater attack operations, and cueing and tracking support to theater BMD operations.

Note: Refer to ATP 3-27.5 for additional information on AN/TPY-2 FBM system operations.

AN/TPY-2 System

5-14. The AN/TPY-2 system is used in two distinctly different configurations for two different missions. When it is used as an integral part of the THAAD system, it is said to be in terminal mode operations. When it is used as a standalone surveillance and warning sensor, it is said to be in FBM operations. These two configurations are indicated in figure 5-1.

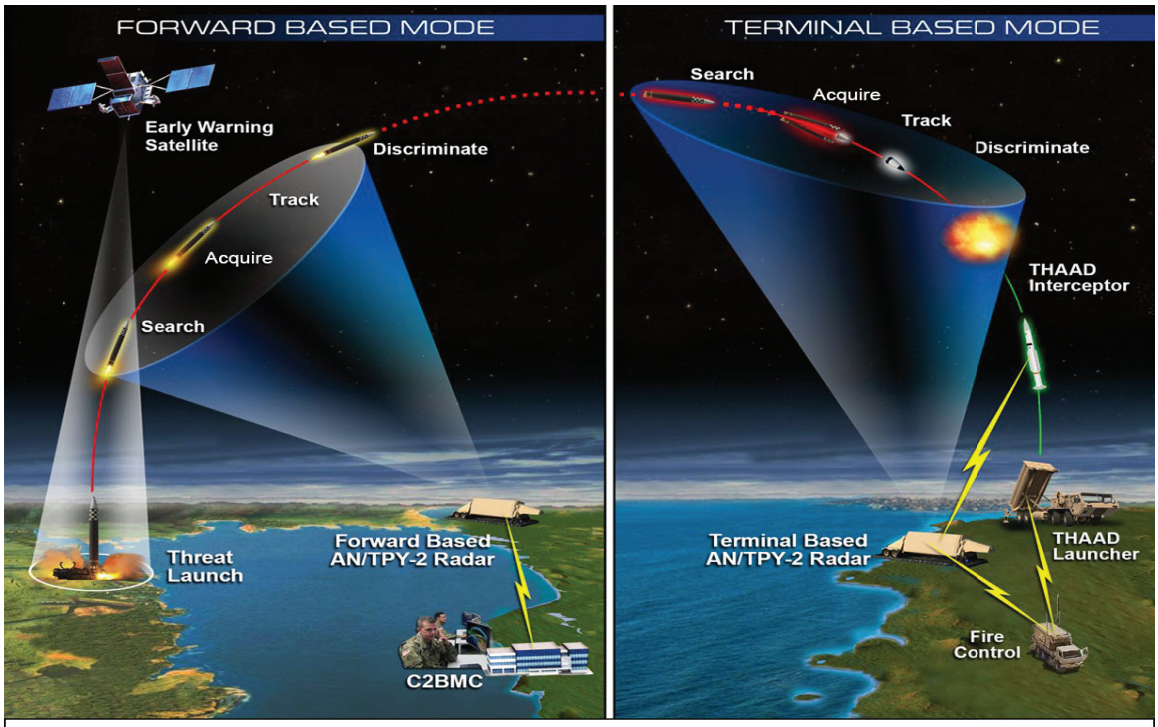

Figure 5-1. AN/TPY-2 modes of operation

5-15. The AN/TPY-2 FBM system uses the same primary mission equipment as the Terminal Mode radar; however, the systems have different software, operating logic, and communications packages to accomplish their two different missions. Both systems have the same power requirement and use different power sources. THAAD is also equipped with organic fire control system launchers and interceptors. The common equipment for both THAAD and FBM operations are below:

- Antenna Equipment Unit.
- Electronics Equipment Unit.
- Cooling Equipment Unit.

Note: If an AN/TPY-2 FBM system is used as a theater only sensor, the radar may not be linked into the global MD system and it does not contribute to cross-AOR operations or to U.S. homeland defense.

GROUND-BASED MIDCOURSE DEFENSE

5-16. The ***ground-based midcourse defense*** is a surface-to-air ballistic MD system for exo-atmospheric midcourse phase interception of long-range ballistic missiles using the ground-based interceptors (JP 3-01) GMD weapon system is a hit-to-kill operationally deployed BMD program to defend the homeland against limited long-range ballistic missile attacks. The system uses early detection and tracking during the boost

phase, midcourse target classification and discrimination to provide precision intercept and destruction of inbound IRBMs or ICBMs. GMD uses multiple sensors, communications systems, fire control capabilities, and ground-based interceptors (GBI) that are capable of detecting, tracking, and destroying IRBMs and ICBMs during the midcourse phase of flight.

5-17. The ground system is made up of the GFC, in-flight interceptor communications system, a Launch Support System, the LRDR, and GMD communications network. The GFC orchestrates the battle and is staffed by Soldiers who operate the GFC system. The GMD communications network links the components of the system together to provide seamless information exchange via fiber optic cables and satellites. The GMD system communicates with an exo-atmospheric kill vehicle (EKV) during flight. The Launch Support System communicates with the GBI on the ground and passes information between the GFC and the GBIs.

5-18. The GBI is comprised of a boost vehicle, Booster Avionics Module, and the EKV. The EKV uses the kinetic energy from a direct hit on the incoming RV to destroy it. The EKV is a sensor-propulsion package that collides with the oncoming target.

5-19. The GFC system component consists of the hardware, software, and communications systems necessary for planning, tasking, and controlling the GMD components during threat engagements Before a GBI is released for launch, it must have a TEW and a fire solution calculated by the GFC. Additionally, a detected ballistic missile must be identified as a threat to the U.S. homeland and direction given by a weapons release authority to launch an interceptor.

5-20. When authorized, the GBI flies toward a projected intercept point and release the EKV when the booster has burned out. The EKV adjusts its position if it receives updated track data via In-Flight Target Updates. The EKV uses on-board sensors to detect the threat cluster and performs discrimination to acquire the likely RV. The EKV maneuvers itself to collide with the RV, destroying the RV with a kinetic impact.

5-21. Human-in-control capabilities allow real-time battle changes to meet commander's intent and pre-approved shot doctrine as the battle evolves. Once a determination is made the engagement criteria are met, the weapons release authority authorizes weapons free, and the USNORTHCOM MD Officer passes weapons free authorization to the missile defense element (MDE) crew director, who ensures the fire direction center (FDC) initiates an engagement sequence for each threat.

5-22. Sensors support the GMD by providing data the system relies upon to calculate a firing solution. The sensors that provide data to the GMD are the SBIRS, Aegis BMD, the AN/TPY-2 FBM system, UEWRs, COBRA Dane radar, and LRDR. The SBX provides support to GMD operations if it is in position to detect an actual IRBM or ICBM launch.

5-23. The GFC provides predictive engagement planning and automated execution as soon as the GBIs are made available to the GFC for execution. Based on input from global MD elements, the computers assess the trajectory of the incoming threat, identifies a predicted impact location, and determines the best firing solution from all available elements.

Missile Defense Element and Fire Direction Center

5-24. The MDE and FDC crews are organized and operated similarly and cooperatively conduct the operational level execution of the GMD mission. The FDC manages resources and executes operations against the current threats. The MDE directs the tactical fight through the FDC crews, synchronizes operations between the MDE and the FDC, and provides operational and tactical recommendations to the CDRUSNORTHCOM. Crews at the MDE and FDC operate independently of each other should either crew become incapacitated and unable to participate.

Note: Refer to ATP 3-27.3 for additional information on GMD operations.

PATRIOT MISSILE

5-25. The Patriot weapon system provides a coordinated, secure, integrated, battalion-level, mobile air defense system that contributes to the layered defenses of global MD. A Patriot battalion is capable of

defending assets in support of joint forces against CRBM, SRBM, MRBM, and a variety of air threats. A Patriot battalion has automatic data processing and communications capabilities to communicate with other networked BMD systems. It also has interfaces allowing integration with other weapons and surveillance systems.

5-26. A Patriot battalion is normally assigned to an air defense artillery brigade at theater or corps level and is configured to interoperate with the AMD planning control system at the brigade. Placement of Patriot batteries is driven by the defense of specific assets or area and not by strategic placement to maximize defense.

5-27. The Patriot radar set provides three-dimensional airspace surveillance, target detection, discrimination, identification, classification, simultaneous tracking of targets, missile guidance, and engagement support. Patriot radars are the most capable sensors and the only sensors currently able to provide fire control quality data against ballistic missile threats (other than the AN/TPY-2).

5-28. The Patriot launching stations house, transport, store, and fire Patriot missiles. The third generation family of missiles with Patriot advanced capability (known as PAC-3) was designed with the primary mission to counter the SRBM threats. Due to the short flight times of SRBMs, the TEW of a Patriot is very short compared to other BMD weapon systems. Patriot batteries can be configured with a mix of missiles. The missile configuration of each battery is based on the threat as determined through analysis using mission variables.

5-29. Patriot is transitioning from its system-specific C2 system to IBCS. The current Patriot C2 system consists of C2 components at battalion and battery levels, such as the Information and Coordination Central and the Engagement Control Station, that distribute and collectively accomplish engagement operations. IBCS will provide a common C2 capability across all air defense artillery forces and allow Patriot to defend more assets with the same number of systems.

5-30. The objective of Patriot defense planning is to maximize protection of the force and designated assets in accordance with the commander's intent and priorities. AAMDCs and air defense artillery brigades collaborate in the development of defense plans in order to best allocate Patriot forces. AMD planning is a top down interactive process that covers the full range of AMD operations from the JFC to the battery level. Patriot defense planning is a distributed process capable of being performed at all air defense artillery echelons.

Note: Refer to ATP 3-01.87 for additional information on Patriot operations.

TERMINAL HIGH ALTITUDE AREA DEFENSE

5-31. The THAAD system—as a component of the global MD—supports theater and cross-AOR operations. THAAD provides endo-atmospheric and exo-atmospheric engagements of MRBMs in the terminal phase. Due to the short flight times and MRBMs—coupled with THAADs design to intercept ballistic missiles in the terminal phase of flight—yields a TEW for THAAD that is longer than a Patriot's, but shorter than the Aegis BMD and GMD weapon systems.

5-32. The THAAD battery is deployable worldwide, providing anti-ballistic missile capability for any joint area of operations. The battery contains six launchers, an AN/TPY-2 (terminal mode) radar, and THAAD Fire Control and Communications equipment.

- The THAAD radar is capable of tracking multiple objects to include multiple interceptors during engagements.
- The launcher is a mobile, vehicle-mounted, stabilized missile launch platform carrying a pallet of missiles. The launcher has a high rate-of-fire and can be rapidly reloaded. THAAD interceptors destroy incoming threat warheads with a lethal, high-energy impact (hit-to-kill) at long ranges and high altitudes.
- The THAAD Fire Control and Communications equipment provides capabilities to conduct THAAD battery operations. This equipment integrates the launchers and the radar and provides

the planning, control, coordination, execution, and communications necessary to fulfill the THAAD battery mission. The THAAD Fire Control and Communications equipment is interoperable with external AMD and intelligence systems and agencies.

5-33. THAAD employment is included in the theater AADP which may include an action plan that describes the command relationships and procedures to transition THAAD to a global MD role in support of strategic priorities. The AAMDC is responsible for THAAD planning and integration into the AADP. All global MD planning must be coordinated and integrated with the CCMD plans and reflect Secretary of Defense priorities. The AADC is responsible to establish communications with the GMD communications network. THAAD has the ability to modify the defense design to a point defense or multiple point defense for interceptor conservation purposes.

5-34. The AAMDC deploys into an AOR and conducts joint theater AMD in support of designated operations plans and contingency operations. The AAMDC provides sensor management support for global MD utilizing C2BMC operations. The active defense and passive defense cells of the AAMDC consist of two air defense system integrator remote monitor workstations with a tactical situational display, an AMD workstation, an Army CCMD joint warning and reporting network display, processing display system– migration, and laptop computers.

Note: Refer to ATP 3-01.91 for additional information on THAAD operations.

THEATER EVENT SYSTEM

5-35. One of the primary missions of the USSPACECOM is to provide space-based missile warning to U.S. forces worldwide. The theater event system receives and processes OPIR sensor data, then provides imminent attack notification for 'duck-and-cover' protection.

5-36. The mission of the theater event system is to provide in-theater processing of direct downlink OPIR data in near real time and disseminate early warning notification for CCDR and JFC. Theater missile warning units provide in-theater processing of ballistic missile launches and disseminate notification of the impact prediction location throughout the depths of the forces as a force protection measure. Theater missile warning units are stationed at central locations to facilitate immediate message dissemination of detected missile threats. The resulting information is disseminated to forces using a variety of methods including the Common Interactive Broadcast, Link 16, and the Global Command and Control System–Joint.

5-37. The theater event system units provides timely, accurate, and assured warning through existing communications systems to CCDRs and JFCs in accordance with CCDR operational plans and combined space tasking orders. The units receive direct downlink signals from OPIR sensors detection of ballistic missile launches and process the data to determine if it is a threat. They disseminate notification messages to JFCs, tier 1 command centers, forward joint forces, and other interested units. Notifications are disseminated to tier 2 command centers, operations centers, and command posts to ensure all forces are aware of an impending impact on their vicinity.

Note: Refer to ATP 3-14.5 for additional information on Joint Tactical Ground Station operations.

UPGRADED EARLY WARNING RADARS

5-38. UEWR are ground-based radars that provide notification of missile warning attacks against North America and Europe. The UEWR systems have a co-primary mission to provide missile tracking data for the GFC. UEWRs report and receive data via worldwide communications networks and provide track data into the BMD communications network. UEWRs support three missions:

- Integrated tactical warning and attack assessment.
- Global MD.
- Space domain awareness.

5-39. UEWRs were modified from Ballistic Missile Early Warning System (known as BMEWS) and PAVE Phased Array Warning System (known as PAWS). The early warning radars converted to UEWRs were designed to detect, track, and provide target classification data on SLBM, IRBM, and ICBM attack against the U.S. The UEWRs radars are located at—

- Fylingdales, United Kingdom. This is a three-faced system looking over the polar region. The Fylingdales system is operated by the British Royal Air Force.
- Pituffik Space Base Air Base, Greenland. This is a two-faced system looking over the polar region.
- Clear, Alaska. This is a two-faced system looking over the eastern polar region.
- Beale Space Force Base, California This radar is a two-faced, phased-array radar system. This radar provides coverage over the Pacific Ocean from the southwest portion of the U.S. and Mexico up to the southern portion of Alaska.
- Cape Cod, Joint Base Cape Cod, Massachusetts. This radar is a two-faced, phased-array radar system. It provides with coverage over the Atlantic Ocean from the Gulf of Mexico to Greenland.

COBRA DANE

5-40. The COBRA Dane radar is a ground-based, national technical intelligence sensor that incorporates software upgrades and modest hardware changes required to support the global MD mission. COBRA Dane provides early detection, acquisition, tracking, and threat-object classification in support of global MD. Its data can be used for interceptor and ground-based radar cueing. COBRA Dane is similar in size and appearance to the UEWR, but only has one radar face. The COBRA Dane radar is a multi-mission radar that is capable of supporting homeland defensive operations.

5-41. The COBRA Dane radar is located at Eareckson Air Station on the island of Shemya, Alaska, in the Aleutian chain. Its location allows detection of IRBM and ICBM launches out of North Korea. Its primary mission is information collection, but it has been upgraded to provide ballistic missile track data when the system is cued. It provides target acquisition and tracking information, allowing it to detect RV-like objects giving the system the ability to classify objects. COBRA Dane is a highly reliable phased-array radar owned by Defense Intelligence Agency.

LONG RANGE DISCRIMINATION RADAR

5-42. The mission of the LRDR is to provide persistent long range midcourse discrimination and precision tracking against long range missile threats originating in the Pacific theater in support of homeland defense. It is an organic element of the GMD system designed to enable conservation of GMD GBIs. This radar contributes to the layered architecture to defend the U.S. from limited ballistic missile attacks from rogue nations.

5-43. The LRDR is located at Clear, Alaska. It has a solid state radar designed to track ballistic missiles and discriminate RVs from decoys and other objects. It provides fire quality track data enabling the fire control system to develop more precise fire solutions.

MARITIME DOMAIN

5-44. The sea-based sensors provide data to global MD elements for cueing and engagement. The sensors' data allows various global MD elements the ability to track, discriminate, and assess incoming missiles. Aegis BMD and SBX are the sea-based sensors providing high resolution for medium to long-range threat missiles and enhance target acquisition. These sensors send data via the BMD communications network for early warning, target classification (Aegis BMD), target discrimination (SBX), engagement data, external sensor cueing, and target impact-point estimates.

AEGIS BALLISTIC MISSILE DEFENSE

5-45. The Aegis BMD weapon system is equipped with the AN/SPY-1 radar is an S-band phased-array radar system on the Navy Aegis Ticonderoga-class cruisers and the Arleigh Burke-class destroyers. Aegis BMD ships concurrently provide long-range surveillance and tracking capability to support BMD

engagements. The Aegis BMD weapon system configured with the Standard Missile-3 provides intercept capability against SRBMs, MRBMs, IRBMs, and ICBMs. The short flight times of MRBMs—coupled with Aegis BMD forward patrol location—gives a TEW comparable to the THAAD weapon system.

5-46. Aegis BMD is a forward based element supporting global MD. It can receive cued data directly from other sensors and it provides target classification information to designated fire control and C2 elements. The Aegis BMD needs to be in proper position to be effective as the ships are particularly important for early detection and engagement of ballistic missile threats overflying large bodies of water such as the Pacific Ocean.

5-47. Aegis BMD can carry out organic, nonorganic, or cued engagements. Organic engagements use the ships AN/SPY-1 radar to develop ballistic missile track data. Cued acquisition of the AN/SPY-1 radar enables launch on remote with track data from another Aegis ship or other elements. This provides the capability to conduct midcourse exo-atmospheric engagements against threats and provide cueing data to designated fire control and C2 elements. To take full advantage of launch on remote capability, an Aegis BMD ship must be in a position where an interceptors can effect a threat.

5-48. The AN/SPY-1 radar provides target information during the boost and early mid-course phases of a threat missile. The antenna array consists of independent antennas providing wide-angle coverage. AN/SPY-1 data provides the fire control system sufficient target information to launch GBIs and cue other global MD elements.

5-49. The AN/SPY-1 can achieve acquisition of the threat through autonomous search using pre-planned search sectors, cueing from national sensors, or cueing from other global MD elements such as AN/TPY-2 FBM system or other Aegis BMD ships. Once acquiring a threat, the Aegis BMD continues to track the target to the maximum extent of the AN/SPY-1 radar or until manual operator action is initiated. Once the threat is beyond the radar tracking capability, the Aegis BMD continues to report the track with degraded accuracy using predicted track position errors (or until manual operator action).

5-50. Planning for use of Aegis BMD elements to support homeland defense requires additional considerations compared to other global MD elements. As a mobile multifunction maritime elements, there must be consideration given for ship location, logistical support, AMD protection, C2, and mission priorities.

SEA-BASED X-BAND RADAR

5-51. The SBX radar is a state-of-the-art advanced X-band radar placed on a former ocean-going oil derrick. The SBX vessel is government-owned and contractor-operated with full sovereign immunity. The x- band radar is a discrimination-class system that includes the stabilization platform, radar, radar support equipment, a SATCOM terminal, and has the capability to both classify and discriminate objects.

5-52. The SBX is able to track, discriminate, and assess incoming missiles. It greatly increases the ability of global MD to conduct strenuous operations and realistic testing. Its mobility allows it to reposition to provide operational forward based coverage as needed, or relocate for optimum support of the test program. SBX provides midcourse cued target search, acquisition, track, classification, discrimination, hit assessment, and in-flight interceptor data communications support for global MD. SBX transmits collected data into the GMD communications network operations if it is in position to detect an actual IRBM or ICBM launch.

5-53. The SBX platform is a semi-submersible, twin-hulled, self-propelled vessel designed for stability in high winds and sea states. With the mounted radar, the SBX towers more than 280 feet from its keel to the top of the radome. The main deck houses living quarters, work space, storage, power generation, bridge and control rooms, and the floor space and infrastructure necessary to support the X-band radar antenna array; command, control, and communications suites.

SPACE DOMAIN

5-54. Since ground-based sensors cannot observe a target that is obscured by the curvature of the Earth, space-based systems are needed to provide initial detection, target characterization, and track information. SBIRS satellites use infrared detection (heat sensing) technology to track a ballistic missile from launch through fuel burnout of the booster. The SBIRS constellation provides space-based surveillance, missile

launch detection, warning data, and track data to initiate global MD operations in support of attack assessments, cueing of other sensors, and engagement planning.

5-55. The SBIRS constellation provides the initial ballistic missile launch detection with continuous worldwide coverage. Information detected by SBIRS satellites are relayed to the SBIRS Joint OPIR Planning Center where it is injected into the GMD communications network and routed to various operations centers and fire control system. SBIRS provides an estimated launch location, estimated launch time, missile type, and predicted point of impact. The SBIRS data provides initial indications of a launch, enables threat assessment, and cues other systems to begin searching specified locations for a threat projective.

5-56. As SBIRS sensors detect an infrared heat plume from a ballistic missile launch, the satellite transmits infrared data to SBIRS Joint OPIR Planning Center —the theater ground stations receive direct downlinks to generate theater missile warning reports and disseminate messages to the force. To support the global MD mission, the SBIRS Joint OPIR Planning Center generates and transmits quick alerts, boost reports, state vector, and covariance information to the GMD communications network.

BATTLE MANAGEMENT ELEMENTS

5-57. Global MD uses a combination of shared and dedicated components from multiple Services to accomplish the joint objective of destroying an incoming RV before it impacts U.S. homeland. The battle management elements are essential to detect a ballistic missile, track the missile, calculate its trajectory, launch an interceptor, and send updated track data to interceptors until it successfully engages the ballistic missile warhead.

COMMAND AND CONTROL, BATTLE MANAGEMENT, AND COMMUNICATIONS

5-58. C2BMC is neither a fire control system nor an IAMD C2 system. C2BMC system is a ballistic missile battle management and engagement coordination tool used at the strategic and operational levels and at the tactical level where sensor managers use it to control the AN/TPY-2 FBM system. C2BMC is a suite of hardware and software applications that facilitate planning, monitoring, and coordination of BMD engagements across the global MD community to enhance the defeat of ballistic missile attacks and provide situational awareness to leaders. It provides BMD related engagement coordination and battle management tools with the worldwide communications connectivity required to link all global MD elements. C2BMC provides the foundation for conducting campaign and contingency planning for global MD in accordance with JP 5-0.

SYSTEM OVERVIEW

5-59. All BMD elements are tied into the global MD system through the C2BMC. The situational awareness and battle management provided by C2BMC supports the complex execution of the global MD. C2BMC is deployed at the strategic and operational level and provides a persistent integrated ballistic missile picture of the global MD status. Many C2BMC workstations are fielded at CCMDs, joint air and space operations centers, the National Military Command Center, and a variety of other organizations responsible for implementing AMD. C2BMC components are deployed in host centers with infrastructure and communications interfaces with BMD elements and external systems.

5-60. C2BMC has three major BMD functions the global MD community relies upon. Each of the individual functions depend upon data at all levels of the system. C2BMC has three major functions:

- C2BMC Planner—a software tool to support efforts of the staff planner.
- Situational Awareness.
- Battle Management.

5-61. C2BMC communicates with sensors and weapon systems to establish an operating picture of global MD, transmit threat missile launches, and enable the successful negation of those threats. C2BMC interacts with external elements to share information for more effective planning and to leverage non-BMD elements

to respond to threat situations. Figure 5-2 (page 5-10) illustrates the plan, monitor, and coordinate the fight framework of C2BMC.

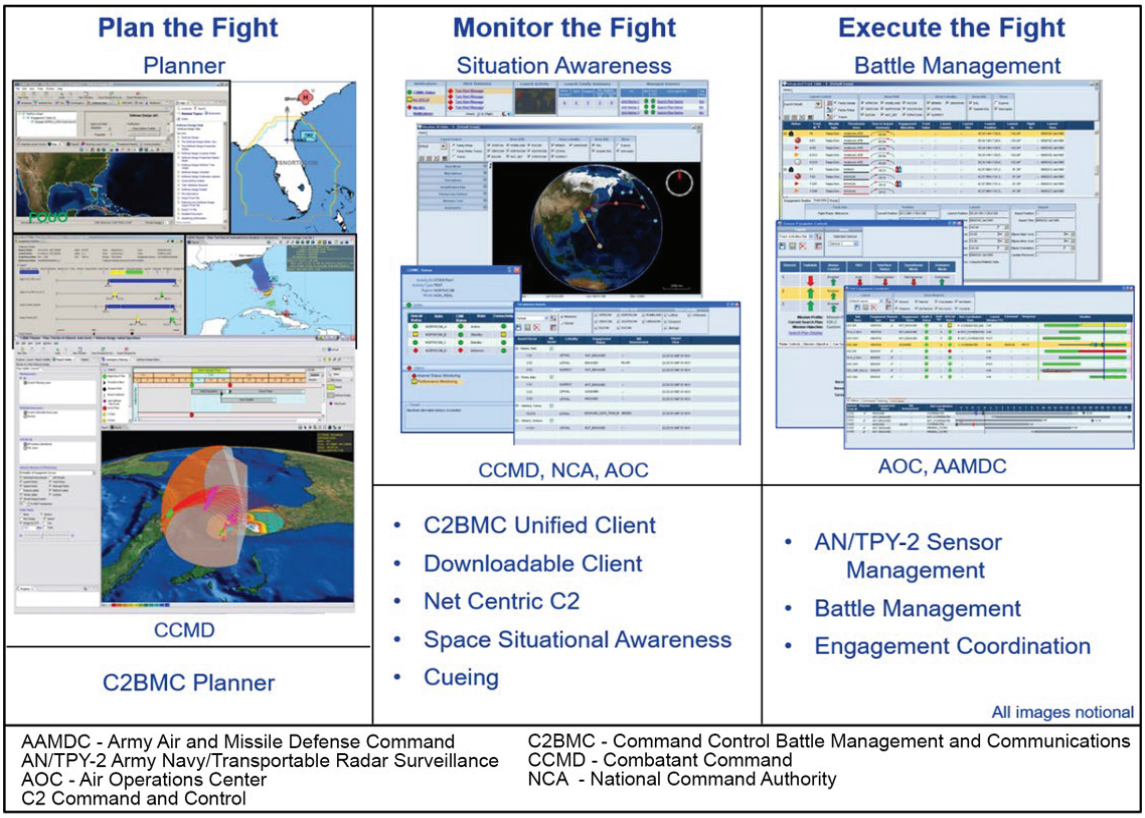

Figure 5-2. Plan, monitor, and execute the fight

5-62. The C2BMC system is comprised of the hardware, specialized software, data, and communication architecture that links all BMD elements into global MD. It provides commanders and staff with the capabilities to plan and maintain situational awareness. C2BMC processes source track data from all sensors with interfaces to the C2BMC system. It correlates the data to produce individual system tracks, which are displayed on an integrated ballistic missile picture. C2BMC missile track data includes state vectors and discrimination estimates that account for the information provided by the source tracks from the different sensors.

5-63. System Interfaces. To be effective, C2BMC must communicate with external systems. External system interfaces include those with GMD, some OPIR sensors, Aegis BMD (via Gateway), Global Command and Control System, and other C2BMC nodes.

5-64. Link 16 is a node-less, high-capacity, multifunctional, secure, and jam-resistant TDL designed for the exchange of fixed format and voice messages using the Joint Tactical Information and Multifunctional Information Distribution System or equivalent terminal. Tactical Information Distribution Systems and Multifunctional Information Distribution System use time division multiple access architecture that employs channel sharing based on an assigned time slot from the divided signal to provide multiple, simultaneous shared communications. Since Joint Tactical and Multifunctional Information Distribution System is an ultra-high frequency system, units that are utilizing this system must be within line of sight of the transmission.

5-65. The joint range extension application protocol is an Army System that supports the TDL message format and is the foundation for joint range extension of Link-16 and other TDLs to overcome the line-of-sight limitations of radio terminals, such as the Joint Tactical Information Distribution System and Multifunctional Information Distribution System. It allows the unit to overcome the existing limitations of Link-16 enabling tactical data to be transmitted over digital media and networks originally designed for

tactical data exchange. Joint range extension application protocol allows the theater BMD mission to be fully supported.

5-66. Sensor Management. The Sensor management function of the AN/TPY-2 FBM system is performed by a sensor manager. The sensor manager has operational functional control of the AN/TPY-2 FBM system using a C2BMC workstations. Sensor managers are responsible to—

- Initialize and configure the sensor.
- Manage mission profiles, focus radar emission activities by selecting pre-designed mission profiles and search plans.
- Monitor operational status of the system.
- Provide early warning and cueing data to other elements.
- Optimizes the radar's performance in support of the AADP.

Note: Refer to ATP 3-27.5 for additional information on C2BMC.

COMMAND AND CONTROL, BATTLE MANAGEMENT AND COMMUNICATIONS PLANNER

5-67. Unity of effort through planning is essential to accomplish the global MD mission and it plays a critical role in effectively engaging ballistic missile threats. The C2BMC Planner capabilities lay the foundation for global MD engagement and management operations. It is an independent, common BMD planning tool providing collaboratively planned, coordinated, optimized, and integrated analysis for BMD elements. It is used to initialize the C2BMC node with the approved defense design.

5-68. The C2BMC Planner enables coordination of multiple theater defense designs into a larger, regional defense plan. It can analyze defense designs to identify gaps, weaknesses, and overlap of sensor coverage in blue force designs and compare them to actual and future threat scenarios. It assists in optimizing sensor coverage and weapons systems placement before deploying an element.

5-69. During campaign and contingency planning, CCMDs use C2BMC Planner to assess potential threats ballistic missile courses of action, and draft coordination strategies. It can create branches to the current defense design to represent different courses of action based on events such as an emerging threat or a degraded or destroyed sensor. It can publish its plans to allow other users to access and download an individual defense design or an entire defense plan.

5-70. The C2BMC Planner integrates with Army's AMD Work Station and the Navy's Maritime IAMD Planning System to provide information exchange with Aegis BMD Planner. The capabilities may not be utilized in a standard manner or synchronized across all with other planning systems across all CCMDs.

SITUATIONAL AWARENESS

5-71. Situational awareness is critical for understanding enemy actions and defending against ballistic missile attacks. Situational awareness capabilities are designed to provide an integrated view of both theater- and strategic-level operations. The defense designs and integrated sensor information form the basis for C2BMC situational awareness. The C2BMC maps with three-dimensional track data overlays provide global MD awareness to operators and decision-makers via real-time processing and display of missile trajectories.

5-72. C2BMC establishes a common view of global MD, display threat missile launches, and the interceptors employed to successfully negate those threats. C2BMC provides situational awareness of active defense elements and response operations.

5-73. The situational awareness screens provide engagement status and engagement coordination messages that enable the AADC and Deputy AADC to maintain situational awareness of specific threat engagements, launched interceptors, and peer-to-peer coordination between designated global MD elements. C2BMC computes and displays the kinematic access of contributing elements and weapons. It also displays the coverage sector and remaining TEW for each global MD element.

5-74. C2BMC generates the data for multiple real-time reports with time sensitive information to support operational analysis and decision making. The operations capability (known as OPSCAP) tool improves situational awareness of the all elements by containing options to filters sensors, weapon systems, and communication links within the defense design to perform rapid planning and analysis based on real-world element outages, predictive analysis, or scheduled outages.

BATTLE MANAGEMENT

5-75. Battle management facilitates the integration of capabilities and addresses planning in support of global MD operations. It recognizes the importance of integration and collaboration of all global MD elements. Battle management functions support cross-AOR integration and synchronization of active and passive IAMD. Battle management functions provide situational awareness, fosters conservation of interceptor inventories, more efficient use of sensors, and minimized cross-sensor interference.

5-76. Battle management consists of the deliberate planning and employment of BMD elements and rules of engagement to enable effective and efficient execution of sensor tasks, engagement monitoring, and directed engagements to defeat attacks while conserving system resources. Battle management functions include all the activities that support control of the global MD elements during operations. Those functions include the creation of a global MD integrated ballistic missile picture using the source track data provided by element, the distribution of global MD track data throughout the architecture, the management of global MD sensors, the conduct of engagement planning, and oversight of engagement operations conducted by the global MD system.

INTEGRATED AIR AND MISSILE DEFENSE BATTLE COMMAND SYSTEM

5-77. The Army's IBCS is a common C2 capability that will be resident in all Army AMD forces, from platoon to the AAMDC. The IBCS hardware and software support scaling and tailoring of mission-focused force packages for the Army's integrated AMD system of systems. IBCS provides a network-centric approach, integrating different systems or sensors and interceptor components to present a holistic view of Army AMD systems across the theater of operations. IBCS is the common integrating fire control element that provides the functional capabilities to control and manage the Army AMD systems, sensors, and interceptors.

5-78. IBCS is interoperable with certain elements of global MD and is the Army's gateway into the joint all domain command and control (known as JADC2). Each Army system, sensor, and interceptor platform will have an interface module, which provides the capability for distributed battle management functionality to enable network-centric operations.

Chapter 6
COMMUNICATIONS

This chapter describes the worldwide communications systems needed to support the global MD and it provides a general review of the existing architectures in support of worldwide communications. The worldwide communications network is the link that connects global MD elements with fire control networks for missile intercepts. Additionally, key organizations that support global MD have duties and responsibilities to ensure specific communications systems and equipment are always available to support battle management and C2 for global MD.

COMMUNICATIONS

6-1. Global MD uses many secure voice and data communication systems to execute the mission. The global MD communications capabilities are secure, survivable, interoperable, and collaborative to provide connectivity to the entire community. Information assurance is built into every aspect of the system to ensure a high probability of mission success. The communications infrastructure consists of interoperable systems spread across theaters with considerations for host nation interface and multinational forces. To support inter- and intra-theater communications, a comprehensive network has been developed.

6-2. Reliable communications are imperative for the BMD elements conducting individual mission operations. Effective battle management requires reliable communications support to enable the commander to conduct operations during stressing situations, for prolonged time periods, over vast distances. The commander should retain the flexibility to operate global MD elements across the battlefield and to maintain communication links with the C2 elements, space-based systems, and maintain access to time-sensitive data to influence the battle.

6-3. Seamless, integrated secure communications networks provide for the horizontal and vertical integration of voice, data, graphics, imagery, and video information. Integrated networks support combat operations with the purpose of keeping the commander informed. This means connectivity to joint communications links, worldwide connectivity of extended-range assets, and integrated communications. These networks must connect to existing military and civilian, Joint and multinational partners, operations, forces, intelligence centers, sustainment centers, and support administrative functions.

6-4. SATCOM supports all battlefield systems to significantly enhance the speed and accuracy of useful information that commanders exchange with subordinates. Communications networks provide entry at key points within the force structure to facilitate situational awareness through data exchange and through automated routing capabilities.

6-5. Global MD communications systems require the capability to collect, process, display, and communicate large amounts of information while denying the enemy access to the information. Communications systems supporting global MD are capable of providing secure, near real-time exchange of essential information between commanders and subordinate commanders. The communications architecture is sufficiently flexible and responsive to allow timely redirection of resources even during degraded operations caused by an intermediate level outage.

6-6. The global MD communications infrastructure needs interoperable systems that facilitate the conduct of MD operations against a threat. The organizations with responsibilities in global MD communications are uniquely organized to accomplish their mission. Responsibility for providing communications resides with all agencies from the combat developer down to the elements.

6-7. The BMD communications network was established for communication integration and data transfer of ballistic missile information. The notifications are targeted at three tiers:

- Tier I—strategic level command centers and those relevant to subordinate and adjacent commands, command centers, forward joint forces, and other interested units within global MD.
- Tier II—command centers, operations centers, and command posts necessary to ensure forces are notified of a possible impact in their vicinity. Includes surveillance, tracking, engagement, and reporting elements in support of global MD operations at the theater level.
- Tier III—other elements not included in Tiers 1 and 2—managed by individual command.

6-8. JFCC-IMD manages the Tier I assets and the CCMDs joint command, control, and communications systems directorates manage the Tier II assets. Tier III consists of the individual global MD user elements. The BMD communications network includes the leased GMD communications network, TDL, and all physical and logical links providing data and voice communications.

GLOBAL MISSILE DEFENSE NETWORKS

6-9. To support global MD operations, communications are established and maintained using all available means, including strategic, tactical service component, sustaining base, commercially-leased, multinational, and host nation communications. The required communications supports high-speed data systems with data storage, retrieval, and dissemination capabilities. The following types of information are exchanged:

- Situational-awareness—consists of common operational picture and alerting and early warning.
- C2—consists of command, OPCON, and tactical control.
- Operations and intelligence—consists of planning, coordination, orders, reports, warning intelligence, target intelligence and packages, and combat information on targets.
- Administrative/sustainment—consists of personnel and unit information, status reports, and sustaining information.

BALLISTIC MISSILE DEFENSE COMMUNICATIONS NETWORK

6-10. The purpose of the BMD communications network is to ensure commanders have access to the information required to execute the global MD mission. The BMD communication network is comprised of numerous distinct communications systems including military and commercial SATCOM and Defense Information System Agency provisioned terrestrial services. Global MD is supported by the BMD communications network to connect homeland and theater MD operations. The communications architecture includes the BMD communications network and GMD communications network.

6-11. The BMD communications network is a collection of telecommunications switching, routing, and ancillary equipment and interconnecting virtual circuits that distribute global MD information among subsystems, using the DOD telecommunications infrastructure such as the global information grid and the Defense Information Systems Network. The communications architecture is not a dedicated network for global MD; rather, it shares the same transport and communications systems used to support a variety of distributed missions. The infrastructure consists of both hardened and non-hardened commercial and military SATCOM. The BMD communications network supports operations, research, development, test, and evaluation activities.

6-12. The BMD communications network provides communications links between the C2BMC suites, Aegis BMD, AN/TPY-2 FBM system, Patriot, THAAD, GMD, and SBIRS. The BMD communications network includes all the data, voice, video, and transport systems independently installed and operated across multiple AORs supporting the global MD mission. The BMD communications network assists worldwide and theater service providers with isolation activities, ensuring network outages affecting the global MD are resolved in a timely manner.

GROUND-BASED MIDCOURSE DEFENSE COMMUNICATIONS NETWORK

6-13. The GMD communications network is a dedicated worldwide network providing communications connectivity for GMD elements, but is also a congruent communications network with interfaces to the larger BMD communications network. The GMD communications network connects the elements of GMD with a

secure, fire control system supporting the defeat of threat missiles. The GMD communications network integrates multiple separate sub-components collectively, capable of secure data, secure voice links, and encrypted long-haul multimedia communications links. It uses both government and leased civilian equipment. A fundamental criterion to select the elements of the GMD communications network was the need to configure a data and voice network that was both accurate and rapid.

6-14. The purpose of the GMD communications network is to ensure the GFC elements have direct access to the information required to execute the GBIs in support of homeland defense. The network provides the infrastructure that connects all BMD elements, including sensors, weapons, and battle management systems. The network includes the leased GMD communications network, commercial and military SATCOM, radio frequency line-of-site systems, TDL, and all physical and logical links providing data and voice communications. Figure 6-1 depicts the topology of the major various elements in the GMD communications network.

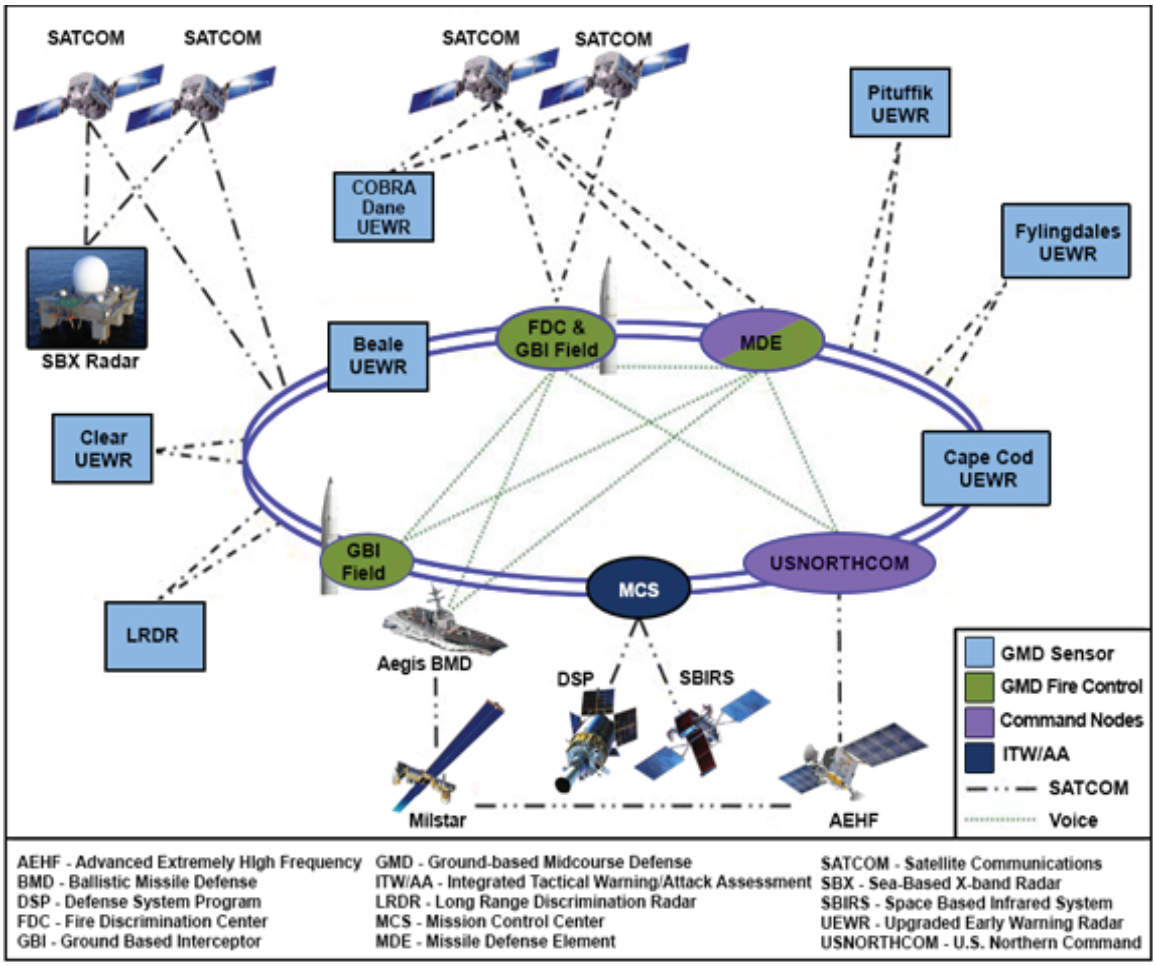

Figure 6-1. Ground-based midcourse defense communications network topology

6-15. The GMD communications network provides:

- Links between the sensors and GFC.
- Connectivity between GFC nodes.
- Connectivity to the GBI missile fields.

6-16. The GMD communications network is composed of long-haul communications, long-haul communications system manager, communications node equipment, and network system manager. The long-haul communications provides secure, reliable, multi-path, wide area network services between all geographically separated GMD locations, using fiber optic cable and SATCOM. The long-haul communications system monitors the health and status and controls the wide area network. A single long-haul communications system monitor workstation is collocated with each GFC node.

6-17. The communications node equipment and the network status monitor provide each GMD element access to the secure, survivable GMD communications network. The communications node equipment is that portion of the GMD communications network subcomponent that provides communications interface to each GMD element. Ground stations are the components that provide the data communications access to the GMD element within each local geographical area.

6-18. The network status monitor collection station, collocated with each communications node equipment, provides local communications and ground stations equipment performance monitoring, fault detection, isolation and resolution, and status reporting. Two network status monitor workstations are collocated with each GFC node. The network status monitor workstations are responsible for fault detection, insertion, recovery, and the issuance and tracking of trouble tickets, as well as ground stations system status reporting. Also collocated with each GFC node is a maintenance execution center to facilitate coordination between the onsite sustainment centers and the system operators.

6-19. The GMD communications network operations center provides status reporting to the Global Integrated Network Operations Integration Center for distribution to appropriate CCMDs and the BMD communications network. The GMD communications network operations center is responsible for network restoration, coordination of scheduled maintenance events, near real-time analysis of circuit performance, issuing of trouble reports, and resolving network status alarms. The GMD communications network operations center also implements transitions for simultaneous test and operations across the GMD communications network. These transitions are directed and implemented by the GMD communications network operations center network operators, engineers and trained and certified field engineers located at the various GMD sites.

6-20. USNORTHCOM uses situational awareness data provided by the C2BMC system, GFC remote workstation, and voice communication with the MDE to exercise OPCON of GMD elements. USSPACECOM has OPCON of some GMD-related sensors. GFC nodes have the ability to directly task some sensors in support of operations. Other sensors' support is coordinated through the C2BMC.

6-21. SBIRS satellites send data to the Joint OPIR Planning Center. The SBIRS Joint OPIR Planning Center uses external system interfaces to connect to C2BMC and GMD communications network. The Aegis BMD elements use satellite TDL and multicast TDL to send data to the GMD communications network using the external system interfaces. The GFC nodes are connected to the C2BMC system via the GMD communications network and the BMD communications network using long-haul communications.

6-22. The AN/TPY-2 FBM system provides data into the GMD communications network. The AN/TPY- 2 FBM system interfaces with the C2BMC network through the C2BMC Network Interface Processor. Data is passed to the GFC. Execution of the AN/TPY-2 FBM system sensor management function is through the C2BMC terminals, which are generally located remotely from the radar.

6-23. Voice communications required for support and coordination of global MD operations is through Red and Black phone switch networks. The radar site operations element and the sensor management element are participants in both switched networks. Communications requirements for collateral mission support are determined by the CCMD.

IN-FLIGHT INTERCEPTOR COMMUNICATIONS SYSTEM

6-24. The in-flight interceptor communications system is a dedicated system of a high-powered communication terminals and antennas used by the GFC nodes to communicate with launched EKVs. It establishes data communication links between the data terminals and in-flight EKVs. The data terminals provide communication support for the transmission of in-flight target updates from the GFC nodes to the EKV and the reception of the in-flight status report from the EKV to the GFC nodes. The terminals are located in diverse sites over a broad area to ensure line-of-sight with the EKVs at all times.

Chapter 7
SUSTAINMENT

This chapter provides the framework by which the Army sustains the global MD program. The chapter begins with an overview of ballistic missile sustainment, to include Army responsibility and unique ballistic missile site characteristics. The chapter then describes the support concept and principles that enable sustainment of global MD. The chapter concludes by describing the combination of unique contractor and Army provided support to the specialized facilities and personnel required to maintain readiness.

SUSTAINMENT REQUIREMENT OVERVIEW

7-1. The Army's responsibility for global MD sustainment support extends into a CCMD AOR and may be modified when sustainment support is otherwise provided for by agreements with host nation agencies, joint Services, or by CCDRs. The CCMD may determine that common servicing would be beneficial within the AOR or a designated operational area. If so, the CCMD may delegate the responsibility for providing or coordinating service for all Service components in the AOR or designated area to the Service component that is the dominant user. Service components identify and validate support requirements in both the deliberate and crisis action planning processes, and then provides these requirements to the supporting Service component as soon as possible.

7-2. Global MD units have several characteristics that affect their sustainment.

- Continuous 24-hour operations. Oversight must be consistent and include careful scheduling of maintenance activities to avoid unintended gaps in coverage.
- Many homeland defense elements are large permanent structures, which are decades old and may require frequent service life extension upgrades.
- Many global MD elements are mobile by design and reside in locations with increased threats.
- Many sites are in northern latitudes where operation in cold weather is a factor.
- The limited number of sites create a very low density for line item replaceable units and trained military occupational specialty positions.
- Some BMD systems require extensive contractor support maintenance concept, which requires contractor life-cycle support.
- Planned upgrades are in phased incremental capability deliveries. Successive capability deliveries increase the overall capability of the system to meet the evolving threat. However, these planned upgrades pose operational and sustainment challenges.

SUPPORT CONCEPT

7-3. Originally, the GMD system was a test bed operation that was primarily designed to serve as a test and development environment. When the system was directed to transition to operational status, the GMD system provide an initial, limited defensive operational capability. However, the requirement to simultaneously use the GMD system as a test bed to perform non-operational development, test, exercise, training, and maintenance activities remained. The requirement for simultaneous use of the GMD elements to conduct both tactical operations and other necessary activities remains valid. This ideal has expanded too many other global MD elements. Simultaneous use means a partial set of elements is continuously available and on operational alert regardless of any non-operational activities taking place. Consequently, the support

concept developed to meet the varying needs of all global MD elements are broad and cannot simply focus on operational support.

SUPPORT PRINCIPLES

7-4. Support of the commander's plan and intent is the goal of all sustainment efforts. Successful support is both effective and efficient. Effective support requires a thorough understanding of the commander's intent and synchronizing support plans with the concept of operations. Successful support must be both effective and efficient. Even though global MD is unique in many aspects, there are seven common principles of support that apply to facilitate effective and efficient support operations. The seven principles are responsiveness, simplicity, flexibility, economy, attainability, sustainability, and survivability.

- Responsiveness. The right support in the right quantity in the right place at the right time. Among the logistic principles, responsiveness is the keystone; all else becomes irrelevant if the logistic system cannot support the concept of operations of the supported commander.
- Simplicity. Fosters efficiency in the planning and execution of national and AOR logistic operations. Mission-type orders and standardized, interoperable procedures contribute to simplicity. Establishment of priorities and pre-allocation of supplies and services by the supported unit may simplify logistic sustainment.
- Flexibility. The ability to adapt logistic structures and procedures to changing situations, missions, and concepts of operation. Logistic plans and operations must be flexible in order to achieve both responsiveness and economy. This principle is a guide for strategic thinking and forms the template for synchronized and coordinated joint logistic planning.
- Economy. Achieved when effective support is provided using the fewest resources at the least cost, and within acceptable levels of risk. At some level and to some degree, resources are always limited. When prioritizing and allocating resources, the commander must continuously consider economy and optimize use of resources to ensure effectiveness and mission success while supporting every effort toward achieving efficiency.
- Attainability. The ability to provide the minimum essential supplies and services required to begin combat operations and is sometimes referred to as adequacy. The commander's logistic staff develops the concept of logistic support, completes the logistic estimate, and initiates resource identification based on the supported commander's requirements, priorities, and apportionment.
- Sustainability. A measure of the ability to maintain logistic support to all users throughout the AOR for the duration of the operation. Sustainability focuses the supporting commander's attention on long-term objectives and capabilities of the supported forces. Long-term support is the greatest challenge for the logistician, who must not only attain the minimum essential materiel levels to initiate combat operations (readiness) but must also sustain those operations.
- Survivability. The capacity of the organization to prevail in the face of potential destruction. Logistic units and installations are also high-value targets that must be safeguarded by both active and passive measures. Active measures must include a defense plan for supply with provisions for reinforcement and protection against air and missile threats. Passive measures include dispersion, physical protection of personnel and equipment, deception, and limiting the size of an installation to what is essential for the mission.

GLOBAL MISSILE DEFENSE SUSTAINMENT CONCEPT

7-5. The government furnished equipment support concept provides support to the commander by including:

- A single life-cycle support contractor who is responsible for all system peculiar maintenance support and is responsive to the commander's direction. Through its prime contractor support system, the prime contractor manages all logistical areas of maintenance and system upgrades.
- Supply support.
- Support equipment, training, and training devices.
- Technical data.

- Computer resources.
- Facilities and system facilities maintenance.
- Packaging, handling, storing, and transporting.

7-6. In addition, commanders must have a thorough understanding of the contractors' statements of work and their benchmarks and provisions for ensuring responsive and appropriate logistics support. The centralized logistics management support structure is under the support contractor's responsibility as detailed below.

- A logistics control center is the support contractor's responsibility. The logistics control center provides a single point of contact for all sustainment actions and readily accessible sustainment information, such as repair parts usage, due-ins, equipment status, and equipment readiness reporting data.
- The contractor operates the onsite control center tailored to the needs of the elements at each location.
- The onsite support center is the main element through which the contractor manages the maintenance support of elements and reports to the commander. Within the onsite support center, the maintenance management center is the single point of contact to facilitate the military oversight of the support contractor, and ensures the contractor's responsiveness to the commander's direction.
- The maintenance of government furnished equipment exists at two levels: unit-level (onsite) maintenance and depot-level (offsite) maintenance. Some depot-level maintenance may be performed onsite due to the requirement for continuous 24-hours operations.
- Extensive use of both diagnostic and prognostic maintenance capabilities using build-in test equipment, built-in test, and Condition Based Maintenance Plus procedures to automatically predict, detect, and isolate faults down to the line replaceable unit without interfering with mission performance while the system is operating.
- The contractor replaces the line replaceable unit and repairs it onsite or offsite, as required.
- For the long term, the Army considers the use of commercial equipment and practices best for the fixed sites.
- Reachback is the use of prime contractor assets outside of the support contract when it becomes necessary to sustain acquisition, construction, maintenance, operation, and disposition of facilities.
- Fix or fight criteria – Operators and maintainers determine System Capability failure analysis criteria to evaluate system's capabilities and to determine if components are likely to fail during crisis or combat operations.
- Logistics considers the parameters that have negative effects on the probability of engagement success such as time to troubleshoot, time to repair, availability of line replaceable unit for repair operations, criticality of defended asset, and time to impact. These criteria determine if operations proceed or if a system is taken offline for repair.
- The MDA continues to have primary responsibility for development and production contracts, which encompass the hardware and software development efforts, obsolescence risk reduction, testing and site System hardware procurement. They retain responsibility for software configuration management and for post deployment software support regardless of whether a MDA or Army contract is used.

7-7. The key imperative is contractor support must be responsive to the operational need and sustain operations on a noninterference basis. This is critical given the importance of the global MD mission and the need to generate forces in crises. Commanders must be familiar with ATP 4-10 to ensure contractor operations support the mission.

CONTRACTOR LOGISTICS SUPPORT

7-8. The maintenance strategy is a two-level maintenance concept referred to as Field and Sustainment maintenance. The Army normally refers to this concept as organizational and depot levels of maintenance. However, since supporting the global MD components are conducted via contractor logistics support, the field and sustainment maintenance is often referred to as onsite and offsite maintenance. The prime contractor

is responsible for identifying and accomplishing onsite tasks, and tasks which require equipment to be sent offsite for repair or replacement by the prime contractor or the original equipment manufacturer.

7-9. Onsite maintenance consists of tasks performed on both the installed equipment and removing failed items for repair at maintenance facilities within the compound. All maintenance activities are conducted via contractor logistics support. The prime contractor is responsible for planning, acquiring, and implementing all activities necessary to support the program. For example, the contractor logistics support contract for the AN/TPY-2 FBM system requires the contractor to sustain the AN/TPY-2 FBM system at all deployed locations. Support equipment and services may be obtained from the host command or host nation. Trade studies have been conducted to improve global MD maintenance concepts.

7-10. Offsite maintenance is performed by the prime contractor or the original equipment manufacturer as agreed upon between the Army and MDA. Offsite maintenance includes depot level repairable items, other unit maintenance (environment, transportation), and initial spare parts as required.

7-11. Condition Based Maintenance Plus is the application and integration of appropriate processes, technologies, and knowledge-based capability to improve the reliability and maintenance effectiveness of DOD systems and components. Condition Based Maintenance Plus is maintenance performed on evidence of need provided by reliability centered maintenance analysis and other enabling processes and technologies such as system health monitoring and management using embedded sensors. To the commander, Condition Based Maintenance Plus is the ability to meet mission requirements with proactively driven maintenance, as well as the ability to optimize the competing demands of warfighting and planned maintenance.

PRIME CONTRACTOR SUPPORT SYSTEM

7-12. The deployment and maintenance system of the prime contractor provides contractor logistics support to meet the readiness objective for the fielded global MD elements. To accomplish this, the deployment and sustainment system has put in place a prime contractor support system that uses a two level maintenance concept of on and offsite maintenance. The Office of Emergency Management and the prime contractor develop and implement a single integrated support infrastructure as the method for implementing an executable support system.

7-13. The prime contractor support system is composed of organization, functions, information systems, tools, and a communications infrastructure. The deployment and maintenance system support organization centrally manages the prime contractor support system through the logistics control center. Each BMD element has its own logistics control center.

7-14. Prime contractor support system overview:

- Prime contractor support system provides the support infrastructure and maintenance management system for support of prime mission equipment, associated support equipment and operational facilities.
- Logistics control center provides centralized management of the support system.
- Offsite support centers execute hands-on maintenance of prime mission equipment at sites.
- Offsite support centers perform depot support located at prime mission equipment repair facilities.
- Integrated data management and communications links prime contractor support system together.

LOGISTICS CONTROL CENTER

7-15. A logistics control center provides centralized management of all sustainment development program resources and activities. A logistics control center is located at the prime contractor facilities and manned by subject matter experts from all the prime offices. Each BMD system has its own logistics control center responsible for serving all elements of the system. MDA provides key interfaces for the logistics control center and the site managers for the operations center. Listed below are the principal functions and responsibilities of the logistics control center:

- Coordinates the repair, replenishment, movement, inventory, distribution, and modification of all prime mission equipment elements.
- Maintains support data on global MD elements including status and location.

- Provides scheduled and unscheduled maintenance information to track relevant statistical data on all global MD elements, as required.
- Analyzes prime contractor support system sustainment performance data to determine improvement in the system effectiveness.
- Provides reports as required to government and prime contractor management.
- Provides centralized management of processes and procedures, acquisition control, transportation coordination, and authority for parts re-route.
- Provides training to personnel prior to deployment.
- Collects maintenance data from sites, compiles reports, and distributes reliability, availability, and maintainability data and other analyses.
- Provides program administrators for sustainment management information systems, computerized inventory and maintenance management system, and training records databases.
- Maintains prime contractor support system metrics.

Use of Spiral Development

7-16. Global MD systems frequently use a spiral development process. The concept allows a system to be developed and deployed now, then undergo regular system improvements over the lifetime of the system to respond to changing threats. Spiral development uses planned upgrades to gradually add advanced capabilities while spreading the cost over decades. Spiral development includes physical space, power upgrades and distribution, and air handling without interference or impact to mission operations.

7-17. The local commander is centrally involved in all systems upgrades and maintenance decisions to ensure current operations are not degraded and ensure there are no impacts to system sustainment operations. Because the mission requires continuous operations, windows of opportunity to shut down specific sections of a system for routine and preventive maintenance are closely monitored. Performing maintenance in real-time without interference and before malfunctions cause secondary and tertiary faults is critical to the mission. Redundancy and multiple nodes in systems allow sub-elements to be off-line while performing maintenance. Managing maintenance windows for equipment is accomplished through the asset management process.

7-18. The system requires certification testing of new hardware and software for fixes and upgrades. Any equipment or software connected to operations must be rigorously tested and certified before incorporation in the operational configuration. Some testing may be conducted on a non-interference basis and some testing may require the entire system to be shut down.

Other Sustainment Operations

7-19. Global MD elements require continuous, reliable electrical power, air handling, and fire protection. Primary considerations are:

- The site operates on tactical generators that are high-altitude electromagnetic pulse (known as HEMP) hardened. Where possible, the site operates on commercial power when low threat conditions allow. The extreme dependence of the system operation on both electrical power and cooling equipment requires that the sites have their own backup power generators.
- Heating, cooling, and ventilation must be available to support year-round continuous operations. Chemical, biological, radiological, and nuclear protection must be integral to the design of system operations facilities.
- Fire protection is an operational concern for global MD elements that must operate continuously. The unit coordinates for fire protection and equipment not likely to cause collateral damage to the system, and allow the system to operate through all emergencies.
- Limited time operation by personnel within enclosed environments is possible (for example, using breathing apparatus to accomplish emergency functions, as required).

Sustainment Reporting and Activity Processes

7-20. Operational reporting is conducted by all elements for sustainment actions and situational awareness purposes. The fire control node forwards equipment outages reports (known as OUTSPOT) up their chain and to the appropriate command center. An Asset Management Conference is conducted with key agencies to evaluate the impacts and effects to operations capability. Immediately following the Asset Management Conference, outages affecting operations and protection capabilities are reported and posted to all global MD agencies.

7-21. The BMD operational readiness reporting system is the system of record to collect operational readiness and system configuration data generated by the BMD elements. It is a portal-based reporting and data collections system developed specifically to provide operational readiness and system configuration information for the global MD. It accumulates operational readiness and system configuration information from data received within the operations support centers or from any site with access to their portal. The operational readiness reporting system asset list is maintained on a classified portal.

Unit Readiness

7-22. Unit readiness is directly tied to sustainment operations. Global MD elements must remain ready to successfully complete the global MD mission while managing many factors such as routine maintenance, equipment upgrades, and training. Commander ensures elements are operationally ready according to the potential for attack, the threat level, force protection, information protection, operational area security, antiterrorism, survivability, chemical, biological, radiological, and nuclear, safety, and readiness condition. Ultimately it is the commander of a global MD element who is responsible for unit readiness. Therefore, the commander participates in Asset Management Conferences and is involved in making schedules and readiness decisions.

ARMY SUSTAINMENT FOR GLOBAL MISSILE DEFENSE

7-23. The Army's sustainment objective is to ensure mission success. Global MD elements must be operationally ready according to the force protection condition, and the readiness condition to defend against potential attack, Operations and sustainment are interdependent. Sustainment provides the commander the means to initiate and maintain operations at all levels of warfare.

SUSTAINMENT FUNDAMENTALS

7-24. The science of sustainment fundamentals for the Army applies to global MD elements and integrates strategic, operational, and tactical sustainment efforts. The sustainment fundamentals include mobilization and deployment of units, personnel, equipment, and supplies in support of the global MD operations worldwide. Properly employed global MD forces allow a nation the freedom of action to deliver forces and materiel to the required points of application across the range of military operations from stability operations to major combat operations to successfully conduct those operations. A nation's capability to deliver logistic resources has historically been a major factor in military operations (JP 4-0).

7-25. During materiel acquisition, the Army requires critical systems be militarized, ruggedized, or hardened to operate reliably in environments which might be subject to attacks. An example of militarized, ruggedized, and hardened is the global MD tactical support facilities which can withstand chemical and biological attacks. Deployed forces must take steps to decrease their vulnerability to, or reduce the effectiveness of, an attack. For example, during deployment, forces can—

- Use site reconnaissance and selection, field fortifications, and dispersal.
- Implement post-attack recovery and reconstitution procedures.
- Ensure critical functions and capabilities remain intact by using backup or alternate systems (redundant or robust means) to reduce vulnerability to attack.

FACILITIES

7-26. The Army must maintain support and facilities for global MD sites both within the continental United States and OCONUS. For the Army facilities management and responsibilities, see AR 420-1.

7-27. Installation Management Command has responsibility for facilities and support. The basis for additional OCONUS considerations are the Status of Forces Agreement or host nation agreement that may augment the method of support provided by Installation Management Command.

7-28. Sustainment at BMD locations include maintenance support for mobile elements, fixed facilities, site complex, and support facilities.

- The base must be a closed area in the territory of the host nation used by U.S. forces pursuant to the provisions of the agreement for the purpose of deployment of GBIs. The base constitutes an agreed facility and area as defined in the U.S.-host nation supplemental Status of Forces Agreement. The base corresponds to a U.S. installation.
- The BMD complex is a restricted area. Restricted areas are located within the military base or installation where all system components, support equipment, installation and maintenance is under U.S. control.
- BMD facilities are permanent structure built within the complex to house, operate, or support system operations.

MISSION TACTICAL FACILITIES

7-29. Mission tactical facilities are those facilities that contain, or are essential to, the operation of launch essential mission critical equipment and systems. The design of BMD facilities meet specific operating requirements and environments. These requirements include—

- Power and heating plant.
- Fuel storage facility.
- Interceptor field.
- Mechanical electrical building.
- Interceptor monitoring building.
- In-flight interceptor communications system data terminals.
- Communications Support Complex.
- Site infrastructure such as, but not limited to communications, power, and water distribution lines, that directly connects to or operates with launch essential mission critical equipment and systems.

MISSION SUPPORT FACILITIES

7-30. Mission support facilities are collocated with the tactical facilities in the launch farm complex and are required to operate and sustain those components. The design of facilities meet the operating requirements and environments of the system being sustained. The baseline tactical sustainment facilities are:

- Administration and maintenance facility.
- Security monitoring and response facility.
- Entry control station.
- Logistic warehouse.
- Interceptor storage facility.
- Water supply building.
- Waste water treatment facility.
- General site infrastructure such as water, sewer, electrical, fire protection, roads, fences, parking areas.

PERSONNEL

7-31. Army Soldiers and prime contractor personnel staff and maintain systems for continuous 24-hour operations. The approach for operational and support personnel are qualified and certified military personnel and the maintenance and support personnel are provided via a contractor logistics support concept. Contract personnel fall under a chain of command established by the prime contractor.

7-32. The Army, in conjunction with the prime contractor and individual global MD element, specifies the quantities and skills of labor required for the element. Military personnel are expected to have completed their respective institutional resident training courses, been awarded their required Army military occupational specialty codes or area of concentration, upgraded their proficiency via on-the-job training and experience, and attended advanced residence courses. These individuals may occupy operations, maintenance, and support positions that include operator, command, staff, instructor, and test functions. The local unit commander of each element is responsible to certify personnel in their positions. Contractor personnel are qualified and certified by their respective organizations on assigned positions and duties.

MISSILE DEFENSE AGENCY

7-33. The MDA keeps CCMDs informed of the programs, plans, system capabilities, characteristics, limitations, and sustainment plans of global MD. They provide responses to requests for information and analysis in support of global MD planning, operations, and sustainment. The Secretary of the Army signed an overarching memorandum of agreement between MDA and the Army establishing the conditions for the transition and transfer of capabilities to the Army. The overarching memorandum of agreement addresses GBIs, ground systems, AN/TPY-2 FBM system, and other systems.

7-34. MDA has provided limited material release for the Patriot, THAAD, AN/TPY-2 FBM systems, and GFC nodes which allows the Army to field these operational systems and focus entirely on operations. A limited material release allows MDA to maintain configuration control, determine the schedule for ongoing development, and assess upgrades for all global MD elements collectively based on the current OE. After limited material release, the Army is responsible for sustainment costs not associated with configuration control or upgrades.

7-35. Prior to deployment of any new or upgraded capability affecting Army forces, MDA provides a detailed briefing on the operational capabilities, limitations and in-AOR support requirements. The purpose of these briefings is to identify the actions required to integrate improved capabilities within the existing C2 and support infrastructure and to plan sustainment.

Glossary

The glossary lists acronyms/abbreviations and terms with Army or joint definitions, and other selected terms. Where Army and joint definitions are different, (Army) follows the term. Terms for which FM 3-27 is the proponent (authority) manual are marked with an asterisk (*). The proponent manual for other terms is listed in parentheses after the definition.

SECTION I – ACRONYMS AND ABBREVIATIONS

A2	antiaccess
AADC	area air defense commander
AADP	area air defense plan
AAMDC	Army Air and Missile Defense Command
AD	area denial
ADAFCO	air defense artillery fire control officer
ADP	Army doctrine publication
AMD	air and missile defense
AN/TPY-2	Army-Navy/Transportable Radar Surveillance and Control Model 2
AOR	area of responsibility
AR	Army regulation
ATP	Army Techniques Publication
BMD	ballistic missile defense
C2	command and control
C2BMC	command and control, battle management, and communications
CAL	critical asset list
CCDR	combatant commander
CCMD	combatant command
CDRUSNORTHCOM	Commander, United States Northern Command
CDRUSSTRATCOM	Commander, United States Strategic Command
CRBM	close-range ballistic missiles
DA FORM	Department of the Army form
DAL	defended asset list
DOD	Department of Defense
EKV	exo-atmospheric kill vehicle
FBM	forward based mode
FDC	fire direction center
FM	field manual
GBI	ground-based interceptor
GFC	ground-based midcourse defense fire control
GMD	ground-based midcourse defense
IAMD	integrated air and missile defense
IBCS	integrated air and missile defense battle command system

ICBM	intercontinental ballistic missile
IRBM	intermediate-range ballistic missile
JFACC	joint force air component commander
JFC	joint force commander
JFCC-IMD	Joint Functional Component Command for Integrated Missile Defense
JP	joint publication
LRDR	long range discrimination radar
MD	missile defense
MDA	Missile Defense Agency
MDE	missile defense element (fire control system)
MRBM	medium-range ballistic missile
NAI	named area of interest
NSPD	National Security Presidential Directive
OCONUS	outside the continental United States
OE	operational environment
OPCON	operational control
OPIR	overhead persistent infrared
RV	reentry vehicle
SATCOM	satellite communications
SBIRS	space-based infrared system (satellite)
SBX	sea-based x-band radar
SLBM	submarine-launched ballistic missile
SRBM	short-range ballistic missile
SSL	security system level
TDL	tactical data link
TEW	target engagement window
THAAD	Terminal High Altitude Area Defense
U.S.	United States
UEWR	upgraded early warning radar
USASMDC	United States Army Space and Missile Defense Command
USNORTHCOM	United States Northern Command
USSPACECOM	United States Space Command
USSTRATCOM	United States Strategic Command
WMD	weapons of mass destruction

SECTION II – TERMS AND DEFINITIONS

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. (JP 3-01)

area of responsibility
The geographical area associated with a combatant command within which a geographic combatant commander has authority to plan and conduct operations. (JP 1, Volume 1)

combatant command
A unified or specified command with a broad continuing mission under a single commander established and so designated by the President, through the Secretary of Defense and with the advice and assistance of the Chairman of the Joint Chiefs of Staff. (JP 1, Volume 2)

***defense design**
A strategy for defense based on a compiled list of defensive tasks required to defend against a specific threat or support specific mission operations. Each defensive task is built using intelligence, features such as friendly force lay down, adversary forces lay down, named area of interest or ballistic missile operations areas, and characteristics such as defended assets, terrain, system location or orientation, and limitations.

***defense plan**
Multiple defense designs combined together to create a cohesive plan for defending a broad area.

deterrence
The prevention of action by the existence of a credible threat of unacceptable counteraction and/or belief that the cost of action outweighs the perceived benefits. (JP 3-0)

engage on remote
Use of nonorganic sensor or ballistic missile defense system track data to launch weapon and complete engagement. (JP 3-01)

ground-based midcourse defense
A surface-to-air ballistic missile defense system for exo-atmospheric midcourse phase interception of long-range ballistic missiles using the ground-based interceptors. Also called GMD. (JP 3-01)

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. (JP 3-27)

integrated air and missile defense
The integration of capabilities and overlapping operations to defend the homeland and United States' national interests, protect the joint force, and enable freedom of action by negating an enemy's ability to create adverse effects from their air and missile capabilities. (JP 3-01)

intelligence preparation of the battlefield
The systematic process of analyzing the mission variables of enemy, terrain, weather, and civil considerations in an area of interest to determine their effect on operations. (ATP 2- 01.3)

launch on remote
Use of nonorganic sensor data or ballistic missile defense system track to launch a weapon, with additional data provided by a different sensor(s) to complete the engagement. (JP 3- 01)

named area of interest

The geospatial area or systems node or link against which information that will satisfy a specific information requirement can be collected, usually to capture indications of enemy and adversary courses of action. (JP 2-0)

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. (JP 3-84)

theater
The geographical area for which a commander of a geographic combatant command has been assigned responsibility. (JP 1, Volume 1)

threat
Any combination of actors, entities, or forces that have the capability and intent to United States forces, United States national interests, or the homeland. (ADP 3-0)

unity of effort
Coordination and cooperation toward common objectives, even if the participants are not necessarily part of the same command or organization that is the product of successful unified action. (JP 1, Volume 2)

weapons of mass destruction
Chemical, biological, radiological, or nuclear weapons capable of a high order of destruction or causing mass casualties and exclude the means of transporting or propelling the weapon where such means is a separable and divisible part from the weapon. (JP 3-40)

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Department of the Army Forms

DA Form 2028, *Recommended Changes to Publications and Blank Forms.*

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04 August 2023

By Order of the Secretary of the Army:

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General, Acting United States Army
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MARK F. AVERILL
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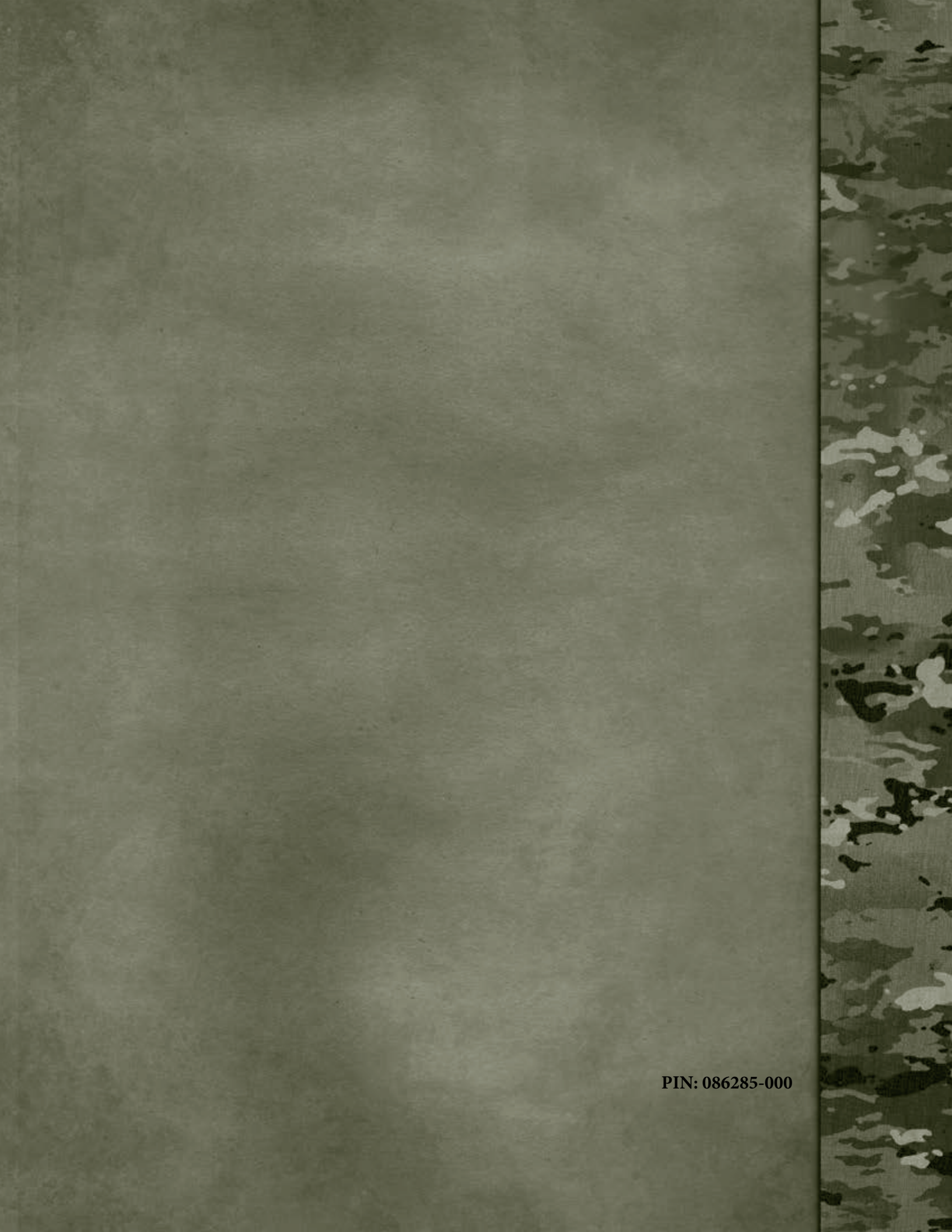

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