ATP 3-01.16

Air and Missile Defense Intelligence Preparation of the Battlefield

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Air and Missile Defense Intelligence Preparation of the Battlefield (AMD IPB)

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Preface

ATP 3-01.16 provides detailed techniques for conducting Air and Missile Defense Intelligence Preparation of the Battlefield (IPB). Conducting Air Missile Defense (AMD) IPB reduces uncertainties regarding terrain, weather, and adversary capabilities and can assist in the development of potential adversary courses of action. It also provides the intelligence analyst the tools to support commander and staff planning and decision making at the joint, combined, and service levels by providing a systematic, continuous, and common methodology for analyzing the adversary Air and Missile force.

The target audience for this publication is the intelligence analyst or the senior AMD planner responsible for AMD IPB development. It will also aid the joint force commander in planning and executing cohesive joint operations against air and missile threats throughout the battlefield and can be beneficial for sensor employment, collection management, target development, and force application.

Participating service command offices of primary responsibility (OPRs) will review this publication, validate the information and, where appropriate, reference and incorporate it in service and command manuals, regulations, and curricula.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Soldiers operate in accordance with the law of war and the rules of engagement. (See FM 27-10.)

This publication implements these international agreements — Standardization Agreement (STANAG) 3805, Allied Joint Publication (AJP) for Airspace Control; Allied Joint Publication 3.3.5).

ATP 3-01.16 uses joint terms where applicable. Selected joint and Army terms and definitions appear both in the glossary and the text. Terms for which ATP 3-01.16 is the proponent publication (the authority) are italicized in the text and are marked with an asterisk (*) in the glossary. Terms and definitions for which ATP 3-01.16 is the proponent publication are boldfaced in the text. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition

ATP 3-01.16 applies to the Active Army, Army National Guard/Army National Guard of the United States, and United States Army Reserve unless otherwise stated.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

The proponent for this publication is the United States Army Fires Center of Excellence and Fort Sill. The preparing agency is the Directorate of Training and Doctrine, Air Defense Artillery Branch. Send written comments and recommendations on DA Form 2028 *(Recommended Changes to Publications and Blank Forms)* directly to Commandant, United States Army Air Defense Artillery School, ATTN: ATSF-DD, Fort Sill, OK 73503 or submit an electronic DA Form 2028 by email using the following link: usarmy.sill.fcoe.mbx.dotd-doctrine-inbox@mail.mil.

Introduction

Air and Missile Defense IPB is a systematic continuous process of analyzing the adversary's aerial and Tactical Ballistic Missile (TBM) forces and environment in a specific geographic area and the battlefield around it. By determining the likely adversary courses of action (COAs), their associated branches and sequels, and by describing the environment where air and missile defense forces are operating, this AMD IPB process helps the commander and staff selectively apply and maximize available AMD forces at critical points in time and space on the battlefield. Applied properly, AMD IPB provides for the timely and effective neutralization and/or destruction of the aerial and TBM threat, while minimizing the requirement for friendly AMD assets. This provides the commander and staff with an informed method for providing asset defense from an adversary's aerial and TBM force. A large number of adversary countries possess or are trying to acquire TBMs and Advanced Air Breathing Threats (ABTs) (i.e. Fixed-Wing (FW) aircraft, Rotary-Wing (RW) aircraft, Unmanned aircraft systems (UAS), Anti-Radiation Missiles (ARMs), and Cruise Missiles (CMs)), for prestige and/or military purposes. These aerial and TBM threats have the potential to give the adversary a military advantage against the United States (US) and multinational forces. The threat the adversary presents is a complex, multi-dimensional, intelligence problem. To assist in the development of potential adversary aerial and TBM COAs, the AMD IPB procedures are utilized to dissect and correlate the "5-W's" of adversary capability; "who (who are the primary adversaries, who may be providing capability to adversaries, and who are friendly or neutral forces); what (Enemy Threat characteristics (ETC), to include threat types, quantity, capability, support equipment and units, etc.); where (infrastructure, location of airfields, Ballistic Missile Operating Areas (BMOAs), mission command cells, and key terrain, etc.); when (predictive analysis, predicted length of overall operation/conflict, anticipated attack volley size, duration, and composition, etc.); why (enemy intent, adversary national policy, stability of regime, etc.); and how (operations, methods of employment, etc.)". Typically, aerial and TBM forces are equipped, organized, trained, and employed differently among various adversaries. AMD IPB is the process by which these differences are minimized as much as possible through utilization of a "templating" technique. Templating is the process of gathering and categorizing similar threat intelligence data in order to standardize the process of analyzing adversary aerial and TBM forces. Templates can be in the form of text, tables, or graphics. Templates in this publication provide a starting framework for analysis and development. They are not meant to be all encompassing, and they should be adapted for a particular geographic area or situation. AMD IPB is a continuous process consisting of four major iterative and parallel steps (Figure 1-1).

Chapters presented within ATP 3-01.16 discuss AMD IPB for the Air Defense Artillery branch.

- Chapter 1 discusses the overview of AMD IPB
- Chapter 2 describes the operational environment.
- Chapter 3 describes the environmental effects on operations.
- Chapter 4 describes evaluating the threat.
- Chapter 5 describes determining the courses of action.
- Appendix A discusses AMD IPB intelligence assessments.
- Appendix B discusses AMD IPB template examples.

Summary of Changes

ATP 3-01.16 has changed substantially from the previous version dated 03 April 2004. The current ATP aligns Theatre Missile Defense IPB with the new terminology of Air Missile Defense IPB.

- This ATP contains intelligence and preparation of the battlefield guidelines that were previously found in the Army Air Defense Artillery Proponent Field Manuals and Tactics, Techniques and Procedures series of manuals.
- Chapters contained within this ATP present IPB operational principles, mission command and support relationships.
- Chapters/Appendixes that have been revised from the previous version of FM 3-01.16, dated 03 April 2004 include:
  Chapter 2 Define the Battlespace Environment
  Chapter 3 Define the Battlespace Effects
  Chapter 4 Evaluate the TM Force
  Chapter 5 Determine TM Courses of Action
  Appendix A Common TMD IPB Processes
  Appendix B Suggested TMD IPB Templates
  Appendix C Automated Tools and Example Architectures
  Appendix D TMD IPB Checklist and Development Plan
  Appendix E TMD IPB Internet Links
- Key points within ATP 3-01.16 are the basics of AMD IPB, such as operational environment, effects of operations, evaluating the threat, and determining the courses of action that need to be taken.
- This publication aligns U.S. Army Air and Missile Defense operations with joint doctrine depicting defensive counter air (DCA) and integrated air and missile defense (IAMD) operations supporting the Joint Force Commanders (JFCs) Integrated Air Defense System.

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Chapter 1
AMD IPB OPERATIONS

OVERVIEW

1-1. This chapter describes operational techniques used to conduct intelligence preparation of the battlefield (IPB) analysis in support of AMD operations. AMD IPB is a systematic and continuous process for analyzing the operational environment, the environmental effects on operations, adversary aerial and TBM capabilities, and possible enemy courses of action to support friendly AMD operations. AMD IPB identifies facts and assumptions about the battlefield environment and the air and missile defense threat. AMD IPB determines enemy air and missile defense courses of action (COAs), their associated branches and sequels, and describes the operating environment for air and missile defense operations. This supports commander and staff planning and the development of friendly COAs. AMD IPB provides the basis for intelligence collection, synchronization, and target development to support the commander's chosen COA. Although this ATP focuses specifically on the manual method of performing IPB, Appendix B lists some supporting automated tools. This basic AMD IPB methodology is derived from the steps, functions, and the structure established by the United States Army (USA) ATP 2-01.3. This publication addresses unique aspects of the air and missile threats such as:

- Planning for AMD can encompass the strategic, operational, and tactical levels of war.
- Adversary aerial and TBM threats can operate non-continuous, noncontiguous, and asymmetric in time and space and over large noncontiguous geographic that span across Combatant Commands (COCOMs) and can significantly impact a wide array of friendly operations.
- Adversary attack does not require direct contact with friendly forces.
- Adversary targets are highly diversified such as infrastructure, population areas, Tactical Assembly Areas (TAAs), or even mobile targets like vehicle convoys and ships.
- Adversary attack assets can move atypical of enemy ground forces and launch from a wide variety of ranges and attack angles.
- Adversary attack assets can be covered and concealed easily.
- Adversary capable of employing Weapons of Mass Destruction (WMD) to create catastrophic effects.
- Use of aerial and TBM forces have geopolitical implications.

AMD IPB BROAD FOCUS

1-2. The examples used in this publication will cover the most common TBM and ABT threats, such as Fixed-Wing (FW) aircraft, Rotary-Wing (RW) aircraft, UAS, Anti-Radiation Missiles (ARMs), and CMs. This publication attempts to provide a complete AMD IPB methodology that assists in creating a holistic and diversified view of enemy capability and friendly AMD force options.

AMD MISSION AREAS

1-3. AMD mission areas are Battle Management Command, Control, Communications, Computers and Intelligence (BMC4I), Attack Operations, Active Air Defense, and Passive Air Defense. Adversary aerial and TBM threats are extremely diverse and complex. No single AMD mission area can contend with these threats. Successful air and missile defense relies on analyzing the threat and the subsequent defense across all of the AMD mission areas. See Table 1-1 on page 1-2.

Table 1-1. AMD Mission Areas, Objectives, and Associated AMD IPB Requirements

AMD Mission Area	*Objective*	*Associated AMD IPB Requirements*
BMC4I	Timely and accurate data and systems to plan, monitor, direct, command, control, and report AMD operations Integration of weapon systems, doctrine, organizational structures, facilities, communications, computers, supporting intelligence, aerial and TBM missile warning and cueing from sensors and ground stations Operational Security (OPSEC)	Location and availability of Theater Event Systems (TES) Enemy threat Courses of Action (COAs) Adversary knowledge of AMD capabilities Line-of-Sight (LOS) and Beyond Line-of-Sight (BLOS) Communication Requirements Mission command requirements and locations Adversary aerial and TBM Identification Authorities (IDA) Adversary aerial and TBM Engagement Authorities (EA) Common Tactical and/or Operating Picture (CTP/COP) Requirements Information Exchange Requirements (IERs) Adversary intent and national policy Adversary Tactics, Techniques, and Procedures (TTPs) Battlespace effects Air defenses supporting enemy operations Enemy mission command structure and weapons release authorities Prioritized Critical Asset List (P-CAL) and Defended Asset List (DAL)
Attack Operations	Destruction, disruption, or neutralization of enemy airfields, aerial airframes, TBM launch platforms, logistical support trains, Electronic Warfare (EW) platforms, Reconnaissance, Surveillance, and Target Acquisition (RSTA) platforms, and any other potential targets that can be destroyed before having the opportunity to be utilized against friendly forces Offensive Operations	Location of adversary airfields, Ballistic Missile Operating Areas (BMOAs) and other potential targets that can be destroyed offensively before being utilized against friendly forces. Joint Integrated Prioritized Target List (JIPTL) List of threats that current AMD assets cannot provide the Desired Level of Protection (DLOP) Adversary Weapons of Mass Destruction Battlespace effects Prioritized Critical Asset List (P-CAL) and Defended Asset List (DAL)

Table 1-1. AMD Mission Areas, Objectives and Associated AMD IPB Requirements (continued)

Active Air Defense	Multi-tiered AMD assets configured to provide multiple engagement opportunities throughout threat flight Active Electronic Warfare (EW) to disrupt remote or on-board guidance systems Electronic Protection (EP) and Electronic Counter-Counter Measures (ECCM) Defensive Operations	AMD lethality versus adversary aerial and TBM platforms Threat countermeasures Adversary Electronic Counter Measures (ECM) Adversary Electronic Attack (EA) TBM warhead types and configurations Enemy Threat characteristics(ETC) Enemy threat Courses of Action (COAs) Enemy attack capabilities (timing, structure, targeting, etc.) Threat RF signatures Battlespace effects Enemy Air Avenues of Approach Prioritized Critical Asset List (P-CAL) and Defended Asset List (DAL)
Passive Air Defense	Cover and Concealment Deception Early Warning CBRN Protection Counter Surveillance Criticality, Vulnerability, and Threat (CVT)	Enemy Air Avenues of Approach and Time of Flight Adversary aerial and TBM accuracy Adversary WMD and CBRN capabilities TBM lethality radius Prioritized Critical Asset List (P-CAL) and Defended Asset List (DAL) Battlespace effects Location and availability of Theater Event Systems (TES)
AMD air missile defense BMC4I battle management command, control, communication, computers, and intelligence CBRN chemical, biological, radiological, and nuclear RF radio frequency TBM tactical ballistic missile WMD weapons of mass destruction		

BMC4I

1-4. Mission Command for AMD operations is a commander's exercise of authority and direction over forces assigned to AMD missions. The strategic and joint nature of a typical AMD deployment creates a unique challenge in planning and executing AMD mission command. Typically, Army AMD assets will maintain an Operational Control (OPCON) relationship with a senior Army command, such as the Army Air and Missile Defense Command (AAMDC), while also operating under the Tactical Control (TACON) of a functional component commander from a joint service, such as the Joint Forces Air Component Commander (JFACC). The AMD IPB must take into account these complex command, control, and support relationships, how this effects the Joint Kill Chain (JKC), and how these relationships can be leveraged to most efficiently and effectively execute the planned AMD mission. AMD systems typically have a very large area of influence (see Chapter 2 – Air Missile Defense Operating Area (AMD AO)), requiring detailed IPB considerations for the integration of these systems into potentially multiple Areas of Operations (AOs). These considerations may include integration of the air picture into the Common Tactical Picture and/or Common Operational Picture (CTP/COP), integration of multiple weapon systems to create a tiered defense, integration into the Theater Event System (TES) to provide Early Warning to applicable supported commanders, or integration of controlling authorities into the Joint Kill Chain. When conducting AMD IPB, consider using existing joint and service information systems and resources to efficiently accomplish mission command for joint AMD missions. This integrates other operational functions and optimizes the use of scarce resources. BMC4I links passive defense, active defense, and attack operations to provide timely assessment of the threat (to include IPB); rapid dissemination of tactical warning; and mission assignment, targeting data, and post-strike assessment to the appropriate joint AMD element. For each operational element, BMC4I must provide rapid communications among mission command facilities, communications among intelligence assets, communications between Engagement Authorities (EA) and Identification Authorities (IDA) and the applicable weapon systems, communications to and from Early Warning producers and consumers, and communications to and from the supporting and supported commanders. AMD IPB must consider all facets of the information environment, to include space assets, Multi-Tactical Data Links (MTDL), and national infrastructure to successfully link information between attack operations, active defense, and passive defense by provide launch warning, launch point prediction, launch point detection, threat type determination, impact point prediction, weapon systems cueing, communications, and related intelligence. Joint AMD communications capabilities must support the principles of centralized planning, decentralized execution, and coordinated efforts by forces assigned joint AMD tasks.

Attack Operations

1-5. Attack operations are characterized by offensive actions intended to destroy and disrupt adversary air and missile capabilities before, during, and after launch. Attack operations prevent launch of aerial attack assets, TBM launch (or additional launches) by attacking critical elements, such as aerial bed down locations, TBM launch platforms, RSTA (Reconnaissance, Surveillance, and Target Acquisition) platforms, mission command nodes, missile stocks, and infrastructure, of the overall system. The preferred method of countering adversary air and missile defense operations is to attack and destroy or disrupt the aerial platforms or the TBMs before their launch. Attack operations can be preemptive or reactive as part of counter air, strategic attack, interdiction, fire support, maneuver, antisubmarine warfare, anti-surface warfare, strike warfare, amphibious, or special operations. Attack operations are more challenging for TBM and small aerial platforms that do not require runways to launch because these systems are generally hard to detect and are normally dispersed, mobile, electronically quiet, and redundant. Thus, the detection, acquisition, identification, tracking, and attack tasks are highly dependent on a near-real-time communications process and rapid targeting capability. The AMD IPB should consider particularly stressing threats to the AMD assets as potential candidates for attack operations on the Joint Integrated Prioritized Task List (JIPTL). This type of planning can be crucial to allowing AMD assets to provide the Desired Level of Protection (DLOP) against threats that these assets have capability against, while using Joint capabilities to negate threats that the AMD systems cannot provide defense against.

Active Defense Operations

1-6. Active air defense is a 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 aircraft, air defense weapons, electronic warfare, and other available weapons (JP 3-01).

1-7. Active defense must consist of defense in-depth against all classes of aerial platforms and TBMs. When destruction of the aerial platform or the TBM launch platform before launch is not possible or successful, adversary attack platforms should be engaged by all means available throughout their entire flight profile. Defense in-depth provides multiple opportunities to negate these threats with differing capabilities, increases probability of kill, and prohibits the enemy from being able to counter the defensive system with a single technique. A successful AMD IPB will produce the information necessary to plan for an in-depth active defense with the friendly AMD assets available for the mission.

Passive Defense Operations

1-8. Passive Air Defense is all measures, other than active air defense, taken to minimize the effectiveness of hostile air and missile threats against friendly forces and assets. These measures include camouflage, concealment, deception, dispersion, reconstitution, redundancy, detection and warning systems, and the use of protective construction (JP 3-01).

1-9. Passive defense measures should be planned whenever United States (US) forces might face an air and missile threat. By examining various combinations of aerial platform weapon paring, missile warhead accuracy and effects, numbers of available missiles, and the adversary targeting process, the likelihood and timing of an attack may be predicted and passive measures selected for employment before, during, and after an adversary attack.

PHASES OF MILITARY OPERATIONS

1-10. US military operations can be broken into 6 major phases: Shape, Deter, Seize the Initiative, Dominate, Stabilize, and Enable Civil Authority. When conducting AMD IPB, the planned phase(s) that include AMD operations as well as all other phases of military operations should be considered in how they apply to the employment of AMD weapon systems.

Shape Phase

1-11. Joint and multinational operations — inclusive of normal and routine military activities — and various interagency activities are planned to dissuade or deter potential adversaries and to assure or solidify relationships with friends and allies. They are executed continuously with the intent to enhance international legitimacy and gain multinational cooperation in support of defined national strategic and strategic military objectives. They are designed to assure success by shaping perceptions and influencing the behavior of both adversaries and allies, developing multinational military capabilities for self-defense and multinational operations, improving information exchange and intelligence sharing, and providing US forces with peacetime and contingency access. Shape phase activities must adapt to a particular operational environment and may be executed in one theater of operation in order to create effects and/or achieve objectives in another. For instance, there may be shaping operations to emplace a peacetime long-range radar in one area of responsibility (AOR) that can be utilized in another AOR during it's dominate phase of operations. Except in cases of unpredicted crisis or hasty deployment operations, the majority of AMD planning will occur during this phase of operation. Deliberate planning for AMD during shaping operations allows for a thorough IPB that is necessary to support the extremely complex emplacement and configuration requirements for effective AMD asset deployment. Also, due to the far reaching influence of the AMD AO (See Chapter 2 - AMD AO), AMD planning in shaping operations is critical for cross-COCOM support, contingency operations, and crisis action planning.

Deter Phase

1-12. The intent of this phase is to deter undesirable adversary action by demonstrating the capabilities and resolve of the joint force. It differs from deterrence that occurs in the shape phase in that it is largely characterized by preparatory actions that specifically support or facilitate the execution of subsequent phases of the operation/campaign. Once the crisis is defined, these actions may include mobilization, tailoring of forces and other pre-deployment activities; initial deployment into a theater of operation; employment of ISR assets to provide real-time and near-real-time situational awareness; setting up of transfer operations at en route locations to support Aerial Ports of Debarkation (APOD) / Sea Ports of Debarkation (SPOD) for Non-Combatant Evacuation Operations (NEO) or mass evacuations in the event of a Chemical, Biological, Radiological, and Nuclear Equipment and high-yield Explosives) attack; and development of mission-tailored mission command, intelligence, force protection, transportation, and logistic requirements to support the JFC's concepts of operations. Combatant Commanders (CCDRs) continue to engage multinational partners, thereby providing the basis for further crisis response. Liaison teams and coordination with other agencies assist in setting conditions for execution of subsequent phases of the campaign or operation. AMD IPB that may have been started during the shaping phase of operations will continue during this phase, and may undergo significant refinement as more information about the adversary is realized, or in response to unanticipated enemy actions.

Seize Initiative Phase

1-13. JFCs seek to seize the initiative in combat and noncombat situations through the application of appropriate joint force capabilities. In combat operations this involves executing offensive operations at the earliest possible time, forcing the adversary to offensive culmination and setting the conditions for decisive operations. Rapid application of joint combat power may be required to delay, impede, or halt the adversary's initial aggression and to deny the initial objectives. If an adversary has achieved its initial objectives, the early and rapid application of offensive combat power can dislodge adversary forces from their position, creating conditions for the exploitation, pursuit, and ultimate destruction of both those forces and their will to fight during the dominate phase. During this phase, operations to gain access to theater infrastructure and to expand friendly freedom of action continue while the JFC seeks to degrade adversary capabilities with the intent of resolving the crisis at the earliest opportunity. In all operations, the JFC establishes conditions for stability by providing immediate assistance to relieve conditions that precipitated the crisis. The seize initiative operation is typically the least applicable to the traditional Defensive Counter Air (DCA) application of AMD assets. Generally AMD operations transition directly from deter phase to dominate phase in response to an adversary action that requires active air defense to neutralize the threat. However, considerations should be made during this phase for any necessary adjustments to the AMD IPB conducted during the shaping phase and possible utilization of AMD assets in an Offensive Counter Air (OCA) role in order to assist the JFC in seizing the initiative.

Dominate Phase

1-14. The dominate phase focuses on breaking the enemy's will for organized resistance or, in noncombat situations, control of the operational environment. Success in this phase depends upon overmatching joint force capability at the critical time and place. This phase includes full employment of joint force capabilities and continues the appropriate sequencing of defensive forces as quickly as possible. When a campaign or operation is focused on aerial and TBM threats, this phase normally consists of active air defense to neutralize enemy attack, and concludes with decisive operations that enable air superiority, air supremacy, or any other environment that negates the adversary capability to conduct aerial attacks and TBM launches against friendly forces within the JFC designated defended assets. Stability operations are conducted as needed to ensure a smooth transition to the next phase and relieve suffering. Dominate phase activities may establish the conditions for an early favorable conclusion of operations or set the conditions for transition to the next phase. The dominate phase is the most likely phase that will produce the largest changes in the AMD IPB, due to observed enemy actions during active adversary attack.

Stabilize Phase

1-15. The stabilize phase is required when there is no fully functional, legitimate civil governing authority present. The joint force may be required to perform limited local governance, integrating the efforts of other supporting/contributing multinational, IGO, NGO, or USG agency participants until legitimate local entities are functioning. This includes providing or assisting in the provision of basic services to the population. The stabilize phase is typically characterized by a change from sustained combat operations to stability operations. Stability operations are necessary to ensure that the threat (military and/or political) is reduced to a manageable level that can be controlled by the potential civil authority or, in noncombat situations, to ensure that the situation leading to the original crisis does not reoccur and/or its effects are mitigated. Typically, AMD redeployment operations will begin during this phase due to the confirmed inability of the adversary to execute any further aerial and TBM attacks on JFC designated defended assets. Throughout this segment, the JFC continuously assesses the impact of current operations on the ability to transfer overall regional authority to a legitimate civil entity, which marks the end of the phase.

Enable Civil Authority Phase

1-16. This phase is predominantly characterized by joint force support to legitimate civil governance in theater. Depending upon the level of indigenous state capacity, joint force activities during phase VI may be at the behest of that authority or they may be under its direction. The goal is for the joint force to enable the viability of the civil authority and its provision of essential services to the largest number of people in the region. This includes coordination of joint force actions with supporting or supported multinational, agency, and other organization participants; establishment of MOEs; and influencing the attitude of the population favorably regarding the US and local civil authority's objectives. DOD policy is to support indigenous persons or groups promoting freedom, rule of law, and an entrepreneurial economy and opposing extremism and the murder of civilians. The joint force will be in a supporting role to the legitimate civil authority in the region throughout the enable civil authority phase. Redeployment operations, particularly for combat units, will often begin during this phase and should be identified as early as possible. The military end state is achieved during this phase, signaling the end of the campaign or operation. Operations are concluded when redeployment is complete combatant command involvement with other nations and agencies, beyond the termination of the joint operations, may be required to achieve to achieve the national the national strategic end state. Typically, the majority of AMD assets will redeploy prior to this phase, however there may be operations that require persistent presence of AMD assets for an enduring amount of time, until such time that the threat can be completely negated, or until civil authorities gain the control and capability to assume their own AMD capability.

CONDUCTING IPB

1-17. Many organizations have the role and responsibility to support the AMD IPB effort; Table 1-2 on page 1-2 lists some of these organizations. One important aspect not depicted in the table is the essential relationship between the intelligence producers and the operations staffs (intelligence consumers). This relationship must be 2-way for the AMD IPB process to work properly. It is essential that the intelligence procedures understands the current operational situation, plan, and weapon system threat set in order to facilitate a smooth and efficient production of intelligence information for use in the AMD IPB. It is also essential that the operations staff performing the AMD IPB adequately convey the intelligence information requirements to the intelligence producers in a timely manner. Teamwork is essential for AMD IPB to succeed.

Table 1-2. Organizations and Intelligence Roles and Responsibilities in Support of AMD

Sample List of Intelligence Producers for Use During AMD IPB	
Organization	**Roles and Responsibilities in Support of AMD IPB**
Defense Intelligence Agency (DIA)	General Military Intelligence; Measurement and Signature Intelligence (MASINT)
National Security Agency (NSA)	Signals Intelligence (SIGINT); Electronic Intelligence (ELINT)
National Air and Space Intelligence Center (NASIC)	TBMs >1000KM in Range ABT Threats (FW, RW, UAS, CM)
Missile and Space Intelligence Center (MSIC)	TBMs <1000KM in Range
National Ground Intelligence Center (NGIC)	Ground Forces; Rockets; CBRNE Intelligence
ABT air breathing threat IPB intelligence preparation of the battlefield TBM tactical ballistic missile CBRNE chemical, biological, radiological, nuclear equipment	

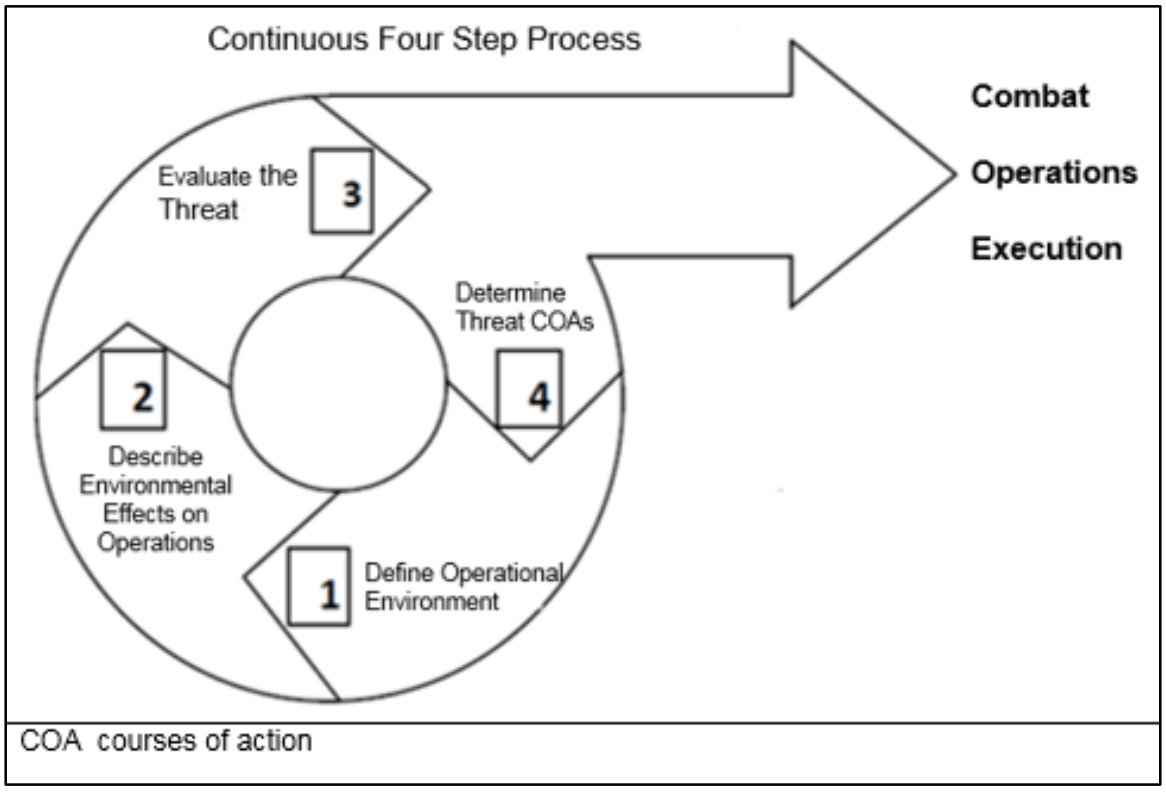


Figure 1-1. Continuous 4-step AMD IPB process

CONTINUOUS FOUR STEP IPB PROCESS

1-18. Define the Operational Environment (Focus). This step focuses the initial intelligence collection efforts and the remaining steps of the AMD IPB process. It analyzes the command's mission, and utilizes this analysis to define the limits of the AMD AO and the Area of Interest (AOI). The AMD AO focuses on the effect that adversary aerial and TBM threats and AMD assets have on the battlespace well beyond a commander's traditional Area of Operation. The AMD AO is a composite of the geographic areas where adversary aerial and TBM forces will be conducting operations, where friendly AMD forces will be conducting operations, and where these forces can affect the battlespace with their assigned sensors and weapon systems. The AOI is that area of concern to the commander, including the area of influence, areas adjacent there to, and extending into enemy territory. This area also includes the areas occupied by enemy forces and any areas outside enemy territory that provide enemy capability, which could jeopardize the accomplishment of the mission. Defining the significant characteristics of the operational environment aids in providing awareness of the entire AMD battlespace, and in identifying and filling current intelligence information gaps. See Appendix A for further information about intelligence gathering, sources, and assessments.

1-19. Describe the Environmental Effects on Operations (Influences). This step evaluates the environment's effect on both adversary aerial and TBM, and friendly AMD, force operations. This assessment examines terrain (to include observations and fields of fire, avenues of approach, key terrain, obstacles, and cover and concealment), weather, and other battlefield characteristics (with a focus on how these characteristics affect the employment of adversary aerial and TBM threats, and friendly AMD assets). The objective is to integrate the environmental effects with the operational environment to create a holistic understanding of the battlefield, which will be crucial to the development of enemy threat Courses of Action (COA) and the employment of friendly AMD assets.

1-20. Evaluate the Threat (Operational Model). This step examines in detail the capabilities and limitations of every threat aerial and TBM platform the enemy is assessed to possess, and how the adversary will organize for combat and conduct operations with these platforms under normal conditions. The results of the threat evaluation are portrayed in appropriate threat models and graphical representations of the adversary's aerial and TBM force capabilities and limitations, and will also include doctrinal templates depicting how the adversary operates under normal conditions.

1-21. Determine Threat COAs (Integrate). This step integrates the results of the previous steps into meaningful conclusions. At a minimum, this step will conclude one enemy Most Dangerous Course of Action (MDCOA) and one enemy Most Likely Course of Actions (MLCOA). The MDCOA is derived from the threat evaluation in the previous step, and how the enemy could conduct operations if unrestrained by the operational environment, the environmental effects, or even enemy intent and national policy. The MLCOA is derived from the threat evaluation in the previous step, and how the enemy will most likely conduct operations when restrained by the operational environment, the environmental effects, and the enemy intent and national policy. These COAs are developed by creating event templates and matrices focused on intelligence collection aimed at identifying the COA the enemy forces could execute, and the COA the enemy forces will most likely execute.

IPB FOUR STEP OPERATIONS SUMMARY

1-22. AMD IPB is a complicated and time-consuming process. Automated intelligence, terrain analysis tools, and system specific defense planning software greatly assist this process. Currently, several core intelligence systems, and integrated defense planning tools, are being developed and fielded that will greatly enhance the AMD IPB process. To more efficiently solve the threat air and missile defense problem, continued emphasis on these current and future automated AMD IPB techniques is essential. However, equally important is the emphasis placed on development of the intelligence data needed for the AMD IPB. It is critical to begin the AMD IPB process during the pre-hostilities phase, with well-developed intelligence databases, in order to successfully impact US and multinational air and missile defense operations.

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Chapter 2
The Operational Environment

OPERATIONAL ENVIRONMENT OVERVIEW

2-1. This chapter will define the operational environment and identifies the characteristics requiring in-depth evaluation. It analyzes the command's mission, and utilizes this analysis to define the limits of the AMD AO and the AOI. The AMD AO focuses on the effect that adversary aerial and TBM threats and AMD assets have on the battlespace well beyond a commander's traditional Area of Operation. The AMD AO is a composite of the geographic areas where adversary aerial and TBM forces will be conducting operations, where friendly AMD forces will be conducting operations, and where these forces can affect the battlespace with their assigned sensors and weapon systems. The AOI is that area of concern to the commander, including the area of influence, areas adjacent thereto, and extending into enemy territory. This area also includes the areas occupied by enemy forces and any areas outside enemy territory that provide enemy capability, which could jeopardize the accomplishment of the mission. Defining the significant characteristics of the operational environment aids in providing awareness of the entire AMD battlespace, and in identifying and filling current intelligence information gaps. Desired End Effect

2-2. Focus the IPB effort on the battlefield areas and characteristics that influence the command's mission. Acquire the intelligence needed to complete the AMD IPB process to the degree of detail required to support the decision-making process. Save time and effort by focusing only on those areas and features that influence AMD operations. Information must be to a level of detail required to support the command's decision-making process.

DEFINE THE OPERATIONAL ENVIRONMENT

2-3. The first step in AMD IPB is to identify for further analysis specific features of the environment or activities within it, and the physical space where those activities exist, that may influence friendly and threat operations. The sub-steps of step 1 are shown in figure 2-1.



Figure 2-1. Define the Operational Environment Sub-steps

Analyze the Commander's Mission and Intent in Relation to Air and Missile Defense

2-4. When conducting AMD IPB, it is critical to understand the commanders' specific intents for air and missile defense. "Commanders" is listed as plural, because there will often be many commanders who have input into the initial AMD defense design. At a minimum, there will be guidance from the Army service component commander or Army Air and Missile Defense Commander (AAMDC) with regards to the AMD capability and requirements for ground forces in theater as well as input from the Area Air Defense Commander (AADC) with regards to the AMD capability and requirements for integration into the Area Air Defense Plan (AADP). These inputs can come in the form of:

- Operations Plan (OPLAN)
- Operations Order (OPORD)
- Contingency Plan (CONOP)
- Fragmentary Order (FRAGO)
- Concept of Operation (CONOP)
- Time-Phased Force and Deployment Data (TPFDD)
- Area Air Defense Plan (AADP)
- Air Control Plan (ACP)
- Warning Orders (WARNOs)
- Deployment Orders (DEPOs)
- Critical Asset Lists (CAL)
- Defended Asset Lists (DAL)
- Air Tasking Order (ATO)
- Standing Rules of Engagement (ROE)
- Any other commander guidance document.

2-5. Any given Operational Environment may have a multitude of aerial and TBM threats from various adversaries within the geographically designated AOR. It is commander's intent that will focus the AMD IPB to the specific enemy, threat, and area of focus. For instance: Blue-Land may be surrounded by Red-Land 1, Red-Land 2, and Red-Land 3. For this specific OPLAN, the commander wants to posture AMD forces in defense of Blue-Land against Red-Land 1 and Red-Land 2. Though Red-Land 3 may be another possible adversary, and may be mentioned in the IPB process as a tactical risk, and possible tied to a Commander Critical Information Requirement (CCIR), an AMD IPB that includes considerations for Red-Land 3 would invalidate the IPB because it would be contrary to the commander's intent, possibly reducing capability versus Red-Land 1 or Red-Land 2 to gain capability for Red-Land 3 even though not directed in the CONOP. The same applies to threat systems. The commander's intent may be for a clear Anti-Theater Ballistic Missile Defense (ATBM) that does not take into consideration for the adversaries CM capability. As in the Red-Land example, to plan an AMD configuration that takes into account the CM threat would invalidate the commander's directed ATBM mission.

2-6. Objectives. Any AMD objective must be understandable, attainable, measurable, and allow room for a solution. It defines the specific AMD IPB problems to be solved. When possible, identify the specific starting and ending times for the objective as knowledge of the timing is critical to providing AMD IPB support. If possible, estimate latest time information is of value (LTIOV). This is the time by which information about the objective must be delivered in order to provide decision makers with timely intelligence. Another significant part of an objective is identifying the area in which to effect the adversary activity. This information narrows the geographical scope and simplifies the AMD IPB analyst's job.

2-7. Relationship of Objectives. The 3 broad levels of objectives are national, air defense, and component. The objective levels are intertwined and each successive level down becomes more detailed and specific. The component commander's objectives are based on the objectives set by the land commander and/or the air commander, the assigned mission(s), the resources available, adversary characteristics, and the military characteristics of the AO. Components normally supplement operation and contingency plans. The air defense commander sets objectives for the air and missile defense of operations, which are contingent upon the national objectives. Operation/contingency plans normally specify the command objectives, commander's concept of operations, the threat, and forces available. The President and Secretary of Defense are responsible for setting the very broad national objectives, which generally outline the overall desired outcome of the campaign. There should be no conflicting objectives among the levels and the AMD IPB developers must be cognizant of all objectives.

2-8. Objectives Template. A simple worksheet can provide a template for evaluating and recording mission objectives. Once a complete set of objectives is defined, summarize them in a list form. First develop the objectives for the command's overall mission if not already obtained from higher headquarters. Next evaluate AMD specific mission objectives. See Appendix B, for suggested template examples of an objectives summary template. The objectives summary template should be completed for each identified AMD mission.

2-9. Guidance provides the framework to achieve the objectives and establishes the force employment scope and restrictions.

2-10. Types. The law of armed conflict (LOAC) (also referred to as *law of armed war*) is that portion of international law that regulates the conduct of armed hostilities. The LOAC includes treaties, conventions, international agreements and customary international law. Ratified treaties, conventions, and international agreements, as well as applicable customary international law legally bind the US. Rules of engagement (ROE) are directives issued by competent military authority that delineate the circumstances and limitations under which US forces will initiate and/or continue combat engagement with other forces encountered. The ROE can change within each conflict, based on directives issued by competent military authority.

2-11. Command guidance comes in many forms and can entail a broad range of guidance for the employment of AMD assets. A template for recording the command's mission and AMD mission guidance is in Appendix C. List each of the identified command guidance, ROE, and applicable LOAC on the worksheet and describe each in as much detail as needed.

2-12. Objectives and guidance are the cornerstones of the AMD IPB process. They guide the 4 major steps of the AMD IPB process and should be clear and well defined. Once developed, air and command objectives are constantly reviewed to assure they accurately reflect the current command AMD mission. Everyone involved in the AMD IPB process should fully understand the commander's objectives and guidance or request further clarification.

Identify the Air and Missile Defense Area of Operation (AMD AO)

2-13. The next step in the defining the Operational Environment is to identify the limits of the AMD AO. For coordination and deconfliction of joint actions, CCDRs and/or JFCs will define doctrinal operational or joint areas. A doctrinal Area of operation (AO) is the geographical area where a commander is assigned the responsibility and authority to conduct military operations. For the purpose of AMD IPB, it is necessary to define an additional AO known as the AMD AO. The purpose of the AMD AO is to define the area where an Air Defense Artillery (ADA) commander can affect the battle with his assigned weapon systems, and is usually much larger than the doctrinal AO for a commander. For instance, a Terminal High Altitude Area Defense (THAAD) commander may have a doctrinal AO that accounts for the site that the THAAD assets operate on and maybe the security wire and forces associated with that site. Therefore, the THAAD commander’s authority to conduct military operations is limited to this site, and security for the site. However, the commander has a weapon system that is capable of effecting the battle in areas that are exponentially further and larger than his doctrinal AO.

2-14. The AMD system can affect the battlespace in many different ways and dimensions that are much larger in size and scope than the doctrinal AO. The AMD system may have a sensor capable of detecting a threat missile launch from hundreds of miles away. Upon detection, the commander can now begin operations toward mission accomplishment. The commander can provide early warning of launch to appropriate agencies or installations so that personnel can seek cover, or the sensor can be part of an Integrated Air and Missile Defense (IAMD) network, and utilize this launch information to cue other weapon systems that are responsible for target engagement. The AMD system may have interceptors that share the airspace with friendly air assets. It would be critical to the prevention of fratricide to define these areas of missile operation and areas in which missile engagements are expected to occur. These are just a couple of examples of the difference between the AMD AO and the doctrinal AO. The purpose of the AMD IPB is to identify all areas where the AMD system can affect the operational environment.

2-15. The overall mission planning process will provide the commander with doctrinal AO and associated considerations. For the purpose of AMD IPB, the focus of effort is on the areas and characteristics of the battlefield that most directly affect the AMD command's mission. Intelligence analyst will limit the analysis to the geographical areas supporting troops and capabilities that can influence AMD operations. This publication refers to that geographical area as the AMD AO. AMD AO are those geographical regions analysts use to define missile threat envelopes, the locations where AMD forces operate, and/or where AMD operations will be conducted. Some general guidelines for determining the AMD AO include but are not limited to:

- Geographical regions that define missile threat envelopes
- Maximum attack depth of the AMD weapon system
- Maximum sensor coverage (in azimuth, elevation, range, etc.) of the AMD sensor
- Primary, Secondary, and all other Target Lines (PTL, STL) of the AMD sensor
- Interceptor fly out regions
- Interceptor engagement regions

2-16. The AMD AO is very similar to the doctrinal "area of influence", which is a geographical area wherein a commander is directly capable of influencing operations by maneuver or fire support systems normally under the commander's command or control. The difference between the AO and an area of influence is that traditionally the area of influence refers to force projection outside of the commander's planned operational area, and the AMD AO is a much more in-depth consideration to the electromagnetic spectrum and capabilities of the AMD assets.

2-17. The purpose of defining the AMD AO is not to replace, but to augment, the term AO as it is defined in JP 1-02. This publication uses the term AMD AO to delineate the definition from that in JP 1-02. The use of AMD AO in this publication is for the purpose of identifying and defining capabilities how AMD assets can affect the battlespace, and does not infer that a specified AO commander, as defined in JP 1-02, has responsibility or authority for AMD operations, nor does it limit the size of the geographical area or limit it to only naval or land commanders. This term only defines a geographical area necessary to focus the IPB process for the intelligence analyst. The maximum attack depth of the commander's available AMD attack operations assets usually limits the AMD AO for AMD IPB. The evaluation of the battlefield's effects in the AMD AO is generally more thorough and detailed than it is within the AOI. The AMD AO for AMD IPB will be utilized for defense design planning that may result in the creation, completion, or update of such documents as the DAL, OPLAN, OPORD, AADP, or any other document that could be the result of the MDMP process. Remember that AMD IPB is a cyclic process. A Critical Asset List (CAL) may provide initial planning guidance for the conduct of an AMD IPB. The results of the analysis of the AMD AO may be a DAL that gives the commander choices on assets that can achieve the desired level of protection with the AMD resources assigned, the commander may then provide additional guidance (such as weighting factors in the criticality of a particular asset) that lead to a new proposed DAL and the subsequent re-initiation of an AMD IPB.

Identify the Air and Missile Defense AOI

2-18. AOI for AMD IPB. Air and missile defense operations battlefield defines the AOI for AMD IPB. To plan and successfully conduct the AMD mission, AOI information and intelligence are required. The limits of the AMD composite AOI are based on the ability of the adversary to project power or move air and missile defense forces into the AO. Geographical locations of other activities (for example, terrorists) or characteristics of the environment that might influence COAs or the commander's decisions are also considered. Because the aerial and TBM threat can cross country boundaries and even COCOM AORs, AOIs are based on threats to mission accomplishment rather than strictly terrain considerations. For example, if political developments in a neutral country might influence the accomplishment of the command's mission, that country should be included in the AMD composite AOI. Likewise, if another country provides a base of support for the adversary country's air and missile defense force, it should be included within the AMD composite AOI.

Evaluate Existing Databases and Identify Intelligence Gaps

2-19. Evaluate Existing Databases and Identify Gaps. The available intelligence databases will not have all the intelligence and information required to evaluate the effects of each battlefield characteristic and each aerial and TBM threat. Databases only contain a fraction of the information required to support AMD IPB development. Hardcopy reports are still very valuable sources of information. Maps are essential and digital maps are required. Valuable on-line sources include intelligence link (INTELINK) and near real time links (that is, tactical related applications [TRAP] data dissemination service [TDDS], Integrated Broadcast System [IBS], Joint Tactical Information Distribution System [JTIDS], and moving target indicator feeds). Open source resources include books, periodicals, academia and industry. Identifying intelligence gaps early allows for data collection operations before the start of combat operations. In many cases, support from other intelligence organizations is needed to obtain and analyze data to fill gaps. Identifying gaps that cannot be filled within the time allowed is equally important in developing the AMD IPB. Maintain communication with the command staff regarding the gaps not expected to be filled and formulate reasonable assumptions. Identify gaps by identifying organizational sources and points of contact (POCs); identifying current, on-order, and desired information holdings and connectivity to evaluating the identified sources; and assess the critical gaps in the information relative to the AMD IPB steps.

2-20. IPB Holdings and Database Assessment (Knowledge Management). It is good practice to maintain a log of the information holdings. Each organization handles this function differently. Some organizations use a library function to keep a log of information holdings and others find it more efficient to develop and maintain one's own log. Ideally, maintain the catalog within a computerized database accessible over a network. The practice of good knowledge management will assist in expediting future AMD IPB processes, and will prevent wasting limited time and resources to conduct research on intelligence and threat information that has already developed in a previous IPB process.

2-21. POCs. No single organization can accomplish the AMD IPB process alone and support is needed from outside organizations. To develop a complete and accurate AMD IPB, it is important to identify and establish national through air level POCs early. Establish a POC for each of the organizations identified in the organizational sources template. A general purpose computerized personal information manager or contact manager is very useful in managing POCs.

Collect the Material and Intelligence Required to Support Further AMD IPB Analysis

2-22. Collect the material and intelligence required to support further AMD IPB Analysis. Collecting intelligence and incorporating it into the AMD IPB process is a continuous effort. The AMD intelligence team fills intelligence gaps by initiating collection operations through priority intelligence requirements (PIRs), essential elements of information (EEIs), and requests for information (RFIs). Additional intelligence data is applied to the appropriate steps to allow updating of all AMD IPB products.

PIRs, EEIs, and RFIs. PIRs represent the commander's most important intelligence requirements that are prioritized according to relative value. PIRs are single requirements, typically in the form of a single question and oriented towards identifying the COA an adversary is executing. Recommended PIRs are typically submitted to the command's intelligence collection manager who submits them and other command PIRs to the commander for approval. The collection manager is then responsible for submitting the PIRs to the appropriate intelligence functions for collection. EEIs identify information needed to support a wide variety of standing information requirements and may duplicate PIRs. The AMD IPB team typically submits EEIs to the command's intelligence collection management that then racks and stacks them with other command EEIs to form the command's collection requirements. RFIs are used to request any needed information that does not fall into the PIR or EEI categories and range from simple to very complex requests.

AMD AO AND AOI TEMPLATE CREATION

2-23. When creating AMD AO templates or graphical representation, it may be necessary to multiple templates in order to best represent the AMD systems capabilities as it relates to the AMD AO and AOI. Depending upon the situation, it may be beneficial to divide the AO templates into multiple areas based upon air and missile defense force weapon system category or capability. For example, there may be a significant difference between an AMD weapons systems capabilities against a TBM then for a CM. In this case, it would be better to build a set of AO and AOI templates for the TBM threat, and another set of AO and AOI templates for (CM) threat. Even within a category it may be necessary to create multiple AO and AOI templates. For instance, some countries have many more Short Range Ballistic Missile (SRBMs) than Medium Range Ballistic Missiles (MRBMs). Because of the differences between missile quantity, type, mobility, etc., this may warrant a separate AO and AOI template to best represent the AMD AO and AOI versus this category of weapon type. Each situation is different, and the AMD IPB analyst will have to use the best judgment in determining how to divide the AO templates. One final consideration is the extent of knowledge of the adversary air and missile defense force infrastructure data. If the air and missile defense force operating areas are unknown, then assume that the air and missile defense force (air, land, or sea-based) can operate from any part of the adversary's area of operations. See Appendix B for an example of an AMD AO and AOI template.

2-24. AMD Battlefield. The AO and AOI are geographic areas that can be defined not only in three-dimensions (height, width, and depth) but in other dimensions as well. In determining other dimensions of the AMD battlefield, the AMD intelligence function must move beyond addressing only the concrete, physical aspects of the geographic environment. The AMD battlefield includes all elements of the environment that are relevant to the command's AMD mission. The AMD forces use of the electromagnetic spectrum (for example, radios and radars); the capabilities of the AMD force to use satellites for communications and intelligence gathering; and AMD force information systems no capabilities and vulnerabilities, both inside and outside the AMD IPB AO, are examples of other environment elements that must be considered when determining the dimensions of the command's AMD battlefield.

ADDITIONAL CONSIDERATIONS AND INPUTS TO THE AMD AO AND AOI TEMPLATE

2-25. The creation of the AMD AO cannot happen in a vacuum consisting of only enemy and friendly platform locations. Though the specifics of adversary threat capabilities, and enemy intent is refined to much more detail in later steps of the AMD IPB process, there must be an initial assessment conducted in order to better define the AMD AO and AOI. Remember that this is a cyclic process. As necessary, the AMD AO and AOI can be updated when additional threat and friend capabilities and expectations are discovered in later steps of the IPB process

2-26. To create a more accurate AMD AO and AOI, determine the significant environmental characteristics of the battlefield that may affect the AMD AO. Battlefield characteristics that affect the commander's decisions or the available command or adversary COAs are of special significance in the AMD IPB process. For air and missile defense operations include at least:

2-27. Geopolitical and Regional Threat Assessment. An assessment of the geopolitical and regional situation is useful in developing a framework in which adversary aerial and TBM threats will likely be employed. This definition should address national security goals, regional factors, and relations with the US and allies, and be condensed into short bulletized statements. Use the existing enemy IPB, military capabilities studies, Defense Intelligence Agency (DIA), and other viable intelligence agencies as sources, and supplement as appropriate where intelligence gaps exist.

2-28. General aerial and TBM force capabilities. A general understanding of the adversary aerial and TBM force's capabilities helps orient the AMD IPB process. To develop an understanding, determine, at a minimum, the following air and missile defense force parameters. A much more detailed analysis of these parameters will continue through the AMD IPB process:

- Air and missile defense role/missions/targeting.
- Historical use.
- Threat characteristics (TC) data.
- Missile and launcher types and numbers.
- WMD capabilities and numbers.
- Known or potential mobile (that is, field operating areas) and fixed air and missile defense infrastructures, (that is, research, development, test and evaluation [RDT&E], production and operational garrisons/storage).

2-29. Performance data (that is, basic flight trajectory and accuracy and lethality data). Examine each characteristic in general terms to identify those of significance to the command and mission. Further evaluation of characteristic effects occurs later in the process (see table 2-1 on page 2-8).

Table 2-1. Performance data characteristics

Performance Data	*Characteristic Effects*
Asses the active Air Defense suppression capabilities	Assessing the adversary's intent and capability to suppress active AMD operations provides valuable inputs to active AMD operations and security planning. Consider the following information when doing this assessment: • Historical use of suppression against air and missile defenses. • Historical use of suppression against air and missile defenses. • Aerial and TBM threats configured with penetration aids (signature reduction, decoys, jammers, etc).
Major Terrain and Environment	An understanding of the general terrain environment is necessary for the creation of even an initial AMD AO and AOI. For AMD IPB, utilize the current hard copy or digital global geospatial information and services (GGI&S) databases, and imagery. The National Geospatial-Intelligence Agency (NGA), a primary source for this data, can provide terrain maps depicting surface configuration (plains, hills, and mountains) and vegetation (forested area, scrub, swamps, desert and open grassland). AMD IPB Step "Describe the Environmental Effects" will address the terrain and environmental effects on air and missile defense operations in detail.
Major Lines-Of-Communications	Defining the LOCs (road, rail, and telecommunication networks) is important for the detailed area limitation analysis later in AMD IPB process. In this step of the AMD IPB process, we define and use the primary road/rail network as an overlay when determining the AO and AOI. Rail networks will typically be less significant for aerial and TBM threat operations in most countries. An overlay is not needed if this is not a prevalent factor in the conduct or accomplishment of the adversary aerial and TBM threat attack objective. For instance, if the enemy utilized a rail network to move parts of a Ballistic Missile (BM) form its garrison location to a designated Field Operating Area (FOA), then this would warrant inclusion of at least these rail lines in the AMD AO and AOI. An overlay for telecommunication networks should be developed. The military telecommunications network is more important than the civilian network, though in many countries the military uses the civilian network. Landlines are of particular importance to enemy aerial and TBM operations. Use available country studies, or digital intelligence databases to obtain information about enemy infrastructure that may provide capability to enemy aerial and TBM operations
Amount of Detail Required and Feasible Within the Time Available	Understanding the AMD IPB development process is essential in order to collect the required information and to deliver that information in a timely manner. Failing to get the right information will most likely lead to poor use of limited planning time, wrong information being produced, incomplete plan, etc. To avoid this, develop an AMD IPB checklist to gauge the amount and detail of work that needs be accomplished, then build an AMD IPB development plan to schedule the work identified in the AMD IPB checklist (See Appendix B for an example of an AMD IPB Checklist). This helps in focusing the development effort to get the right information to the right place at the right time.

AMD air missile defense
AO area of operation
AOI area of interest
IPB intelligence preparation of the battlefield
LOC lines of communication
TBM tactical ballistic missile

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Chapter 3

Environmental Effects on Operations

AMD CONSIDERATIONS

3-1. The open and vast nature of airspace does not eliminate the need for terrain and weather analysis because both the enemy and friendly forces will still attempt to use the terrain and weather to their own best advantage. In fact, the open and vast nature of airspace make it critical to conduct as an in-depth analysis of the effects of the terrain and the weather on enemy and friendly forces in order to determine as close as possible how the enemy could employ its aerial and TBM forces and how friendly AMD forces can best be postured to predict and defend against adversary aerial and TBM threats.

3-2. Generally, the Environmental Effects portion of the AMD IPB is evaluated in more detail than the Operational Environment. The focus also varies for different AMD mission areas. For example, an ABT defense only IPB analysis would not require detailed missile infrastructure analysis. The battlefield is not homogeneous because certain areas or sub-sectors will affect various types of operations in varying degrees. During this evaluation, identify those areas that favor each type of air operation (i.e. ABT, TBM, CM, ARM, etc.), and consider them in regards to each AMD mission area (BMC4I, Attack Operations, Active Defense, Passive Defense). The following discussion focuses on adversary capabilities and effects, but the process is also required for analysis of friendly AMD operations.

3-3. It is important to conduct as in-depth of an analysis as possible, however this analysis must still have specific focus (as derived from enemy threat capabilities, friendly capabilities, and commander's intent) because performing a detailed analysis for the airspace and terrain across an entire theater of war is generally unrealistic. Aerial and TBM platforms normally operate over much more constrained geographic areas (i.e. airfields, BMOAs, etc.) and often within definable Air Avenues of Approach (AAA) (i.e. direct vector from BMOA, canalization points, etc.). An assessment is made to define the aerial and TBM threat force's field operating or launching areas and to focus terrain and weather analysis to those areas from which the adversary and friendly forces are likely to operate.

3-4. Use of available tools to conduct terrain assessments. The best AMD IPB terrain analysis technique is a combined approach using automated terrain analysis tools supplemented by reconnaissance and manual techniques using high-resolution maps and imagery. A comprehensive AMD IPB terrain analysis integrates data developed during previous AMD IPB Steps and is iterative throughout the effort.

ANALYSIS OF MILITARY TERRAIN ASPECTS

3-5. To conduct this analysis, break down the elements of the battlefield terrain and analyze each aspect. Key aspects are:

- Observation / Fields of Fire.
- Avenues of Approach.
- Key terrain.
- Obstacles.
- Cover and Concealment.

3-6. Other aspects that may provide additional relevant information include:

- Surface configuration and composition (includes land, sea and littoral).
- EM Spectrum.
- Transportation and LOC infrastructures.
- Urban areas.
- Cross-country mobility (CCM).

3-7. Consider all of these factors when analyzing terrain but focus on the ones most relevant to the specific situation and the commander's needs. Evaluate the factors in the order that best supports the analysis. Once appropriate templates are created, this data will be utilized later in the MDMP process to feed enemy COAs, commander's intent, tactical risk, defense design considerations for emplacement and configuration of friendly AMD assets, CCIRs, and other areas relevant to the AMD IPB process.

3-8. The execution of a traditional terrain analysis (OAKOC) is considered a common core task and is taught at various Primary Military Education (PME) levels. What makes this process challenging in the AMD IPB, is that the analyst must take an idea that traditionally has been used to analyze the effect of the terrain on the combat Soldier and his tactical ground equipment, and apply it from the perspective of a Beyond-Line-of-Sight (BLOS) weapon system.

Terrain Feature Data

3-9. Terrain feature data is used throughout the terrain analysis process. NGA's foundation feature data (FFD) classifies terrain feature data across multiple GGI&S products.

3-10. Terrain Reconnaissance. Identify the terrain knowledge gaps that analysis cannot satisfy. Use these gaps as a guide for reconnaissance planning and focus the reconnaissance on the area's most important to the mission. When feasible, supplement the pre deployment terrain analyses with actual reconnaissance.

Terrain Analysis and Weather

3-11. Terrain analysis must always consider weather effects. The terrain analysts should work closely with the weather detachment or staff weather officer to ensure that the analysis incorporates the effects of current and projected weather. Terrain analysis is a continuous process, and changes in the battlefield environment and weather may alter the evaluations of its terrain-derived effects. If significant environmental or weather conditions change, reevaluate the impact of these changes on military operations.

Terrain Analysis and Adversary Threat COAs

3-12. Evaluating terrain effects identifies the battlefield areas that affect each aerial and TBM force's COA. For example, terrain effect evaluation helps identify areas best suited for launch sites/areas, airfields, ports, fire control sites, hide sites, trans loading areas, forward operating area (FOAs), and forward storage areas.

Terrain Analysis Templates

3-13. There are 5 primary types of terrain analysis templates applicable to AMD IPB development. Templates provide a good method for tracking the status of the terrain analysis. See Appendix B for an example of a terrain analysis template. The following sections provide the primary terrain analysis steps and resultant templates.

Observation and Fields of Fire

3-14. An observation and fields of fire template depicts the ability of adversary aerial and TBM assets and the ability of the friendly AMD assets to achieve and maintain the required optical and/or electronic Line-of-Sight (LOS) to successfully accomplish the mission. Fields of Fire is an additional consideration for weapon system capabilities and limitations along specific aspects and/or linear distances.

Observation

3-15. Other terrain aspects like *obstacles*, *cover*, or *concealment* may cause an inability for a weapon system to achieve and maintain the required LOS, however this should not be the focus of the observation template. The

observation template is intended to specifically analyze the ability of the adversary to attack, or the friendly assets to defend, based on expected LOS capabilities of the weapon system in the terrain (i.e. airspace) and weather that it operates in. Indirect denial of observation from other terrain aspects, should be captured in the applicable terrain template. See Appendix B for an example of an Observation and Fields of Fire Template.

3-16. Planned AMD Sensor has a capability to detect TBM launches out to 100 miles. Enemy is anticipated to have a capability to launch from a distance of 200 miles from the defended asset. This would be a critical observation limitation that should be included in the AMD IPB. If the sensor could observe the TBM during launch, this would be advantageous to the AMD weapon system and therefore change the way it could be planned for in the AMD defense. An observation analysis that reveals such limitations may result in a commander determining that an asset is not defendable, or that an additional long range detection sensor is necessary, or requesting follow-on information on available engagement battlespace based on this analysis in order to make an informed decision on tactical risk, etc.

3-17. Planned AMD sensor has a "dead-zone" that extends from the sensor out to 1 mile. This dead-zone produces an observation limitation out to 1 mile, and prevents the execution of the AMD mission within this particular area. A dead-zone observation limitation may result in the requirement for additional considerations about the enemy capability to operate within the dead-zone, additional terrain analysis to consider the effects of clutter or close-in objects on the sensor when not within the sensor's detection capability, or at the very least provides quantifiable information for the commander to define the tactical risk and possible gap fill requirements.

3-18. Friendly AMD interceptor requires a target illumination by a ground-based sensor. Interceptor is kinematically capable of intercepting a target further than the ground-based sensor is capable of illuminating the target. The observation limitation of the ground-based sensor should be included in the observation template so that the limitations of the AMD interceptor can be better understood and planned for.

3-19. Adversary UAS has a control signal strength that limits the combat radius of the UAS to a distance that is less than its kinematic capability. This observation limitation may be utilized later in the AMD IPB process to better define the enemy aerial threat.

Fields of Fire

3-20. Fields of fire is a more specific observation analysis that generally applies to an engagement capability as a subset of the holistic weapon system capability. Field of fire analyses will typically feed into future engagement envelope depictions.

3-21. Enemy Anti-Radiation Missile (ARM) requires 50 miles or less distance from target sensor to Lock-on-Before-Launch (LOBL) this distance is lowered to 25 miles if sensor conducts a low-power option it has available. Sensor has an aircraft engagement envelope that extends to 40 miles in regular operations, and 30 miles in low-power. Overall system observation capabilities are reduced in low-power, however low-power does provide the commander an option that allows the engagement of an aircraft carrying the ARM prior to the ARM maximum LOBL distance. Templates depicting this field of fire limitations of the ARM and the sensor's ability under an ARM threat will give the commander planning options and quantifiable risk for considerations.

3-22. Planned AMD system is capable of detecting adversary threat at 100 miles, but is unable to engage threat until 20 miles from the defended asset.

AIR AVENUES OF APPROACH (AAA)

3-23. An Air Avenue of Approach is an air route of an adversary aerial or TBM force of a given size leading to its objective or to key terrain in its path. Good Air Avenues of Approach permit maneuver while providing terrain masking from surface-to-air weapon systems. Common air avenues of approach include valleys, direct lines from the threat point of origin, and riverbeds. There are also AAA considerations for TBMs. The AMD weapon system may have specific threat angle requirements that must be met in order to operate effectively. See Appendix B for an example of an Air Avenue of Approach (AAA) Template. Some factors that should be used to entry and exit Air Avenues of Approach:

- Access to key terrain and adjacent avenues.
- Degree of canalization and ease of movement.

- Use of the military aspect of terrain (OAKOC) in accordance with mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC) factors.
- Sustainability (LOC support).
- Access to the objective.
- Location of Ballistic Missile Operation Areas (BMOAs)

KEY TERRAIN

3-24. A key terrain overlay depicts terrain features that afford a marked advantage to either combatant if seized, retained, or controlled. Like the *observation* terrain template, this is an analysis that must be focused on the adversary aerial and TBM threat and the friendly AMD forces instead of the ground forces. See Appendix B for an example of a Key Terrain Template. Some notional examples of an AMD key terrain analysis would be related to disputed areas of land, adversary surface-to-surface missile (SSM), and the AMD sensor.

3-25. There is a disputed area of land between the adversary and friendly forces that is currently within the control of friendly forces. As long as the disputed area remains under friendly control, the adversary is unable to move Close Range Ballistic Missiles (CRBMs) within range of the defended assets. This disputed area would be key terrain because of the effect on the AMD defense design in the event that control of this land were gained by enemy forces.

3-26. Adversary SSM garrison is the center of the enemy TBM launch capability. Destruction of this garrison would negate the adversary TBM launch capability. This SSM garrison could be listed as key terrain, which may result in follow-on considerations for attack operations against this garrison.

3-27. AMD sensor would gain significant capability if an enemy-controlled mountain could be seized allowing the sensor to be emplaced on the higher ground.

OBSTACLES

3-28. An obstacle template depicts the location and type of man-made or natural movement and Line-of-Sight (LOS) obstacles. It is used with the other terrain analysis templates to produce *Air Avenues of Approach (AAA)*, *key terrain*, *cover*, *concealment*, and may assist in the production of a Modified Combined Obstacle Overlay (MCOO). Obstacles should be analyzed on how they apply to enemy air mobility and friendly AMD capability. See Appendix B for an example of an Obstacle Template. Some examples of considerations and obstacles are:

- Terrain features that exceed the aircraft's service ceiling
- Restrict nap-of-the-earth flight
- Force the aircraft to employ a particular flight profile
- Tall buildings (skyscrapers)
- Cellular telephone towers
- Telephone and power lines
- Rapidly rising terrain features
- Mountains (High mountainous regions can impact rotary- and fixed-wing aircraft lift capabilities)
- Smoke, and other obscurants

COVER AND CONCEALMENT

3-29. A cover template depicts locations, terrain features, and man-made objects which can provide the adversary or friendly forces protection from the effect of fires. The cover template is often used for Passive Air Defense considerations, for battle calculations of enemy attack effectiveness or friendly AMD forces survivability, and as an input into the Criticality, Vulnerability, and Threat (CVT) analysis. Remember that cover does not necessarily provide concealment. See Appendix B for an example of a Cover and Concealment Template. AMD cover considerations should include physical protection from such threats as:

- Ballistic missiles
- Fragments of exploding rounds
- Flame
- Nuclear effects
- Biological warfare
- Chemical agents

3-30. A concealment template depicts potential adversary and friendly force hide locations. Concealment is protection from observation. The concealment template is often used for Passive Air Defense considerations, for battle calculations of enemy and friendly force survivability, and as an input into the CVT analysis. Remember that concealment does not necessarily provide cover. Do not only consider concealment to the human eye, but also to the EM spectrum. Some example of concealment techniques include:

- Trees
- Underbrush
- Tall grass
- Cultivated vegetation
- Weather conditions such as snow, fog, or rain
- Manmade camouflage and objects
- Radar scattering and Radar transparent materials

ADDITIONAL ASPECTS FOR CONSIDERATION

3-31. These are some additional considerations that may have applicability to either the adversary aerial or TBM forces and/or the friendly AMD forces. This is not an all-inclusive list, and templates or graphics for these would need to be created based on the applicable information that is obtained.

SURFACE MATERIALS AND CONFIGURATION

3-32. A surface materials' template shows the natural and engineered terrain areas that are applicable to the emplacement, employment, and operation of adversary aerial, adversary TBM, and friendly AMD platforms. This template helps determine friendly and enemy system emplacement, employment, and operation capabilities. Some considerations for surface materials may be:

- Ground density
- Ground impedance
- Ground stability
- Terrain slope
- Ground composition

EM SPECTRUM

3-33. The Electromagnetic (EM) spectrum template shows the frequency, power, azimuth, and other relevant data that will support future Electromagnetic Interference (EMI) deconfliction and considerations. Adversary EM templates can be used to assist in passive detection and electronic protection techniques. Template should take into account all EM emitters to include:

- Radars
- Radios
- Jammers
- GPS

TRANSPORTATION AND LOC INFRASTRUCTURES

3-34. Transportation and LOC infrastructure templates show the 2 infrastructures. Transportation is all the routes (land, sea, and air) within the operating area that effect adversary aerial and TBM forces and friendly AMD operations. LOCs are all the supply and equipment routes (land, sea, and air) that connect enemy and friendly operating military forces with their applicable base(s) of operations.

URBAN AREAS

3-35. An urban areas template depicts built-up areas that could affect the overall use of enemy aerial and TBM forces and/or friendly AMD assets.

CCM

3-36. A Cross-Country Mobility (CCM) template depicts the mobility of enemy aerial and TBM forces and friendly AMD assets. The CCM may be used to create the AAA, create potential Attack Operation opportunities, will feed into enemy COAs, and possibly lead to the creation of branches and sequels to the current OPLAN. The CCM template depicts the mobility corridors and best off-road routes. It also shows the terrain that these vehicles cannot cross, which can be utilized along with other terrain aspects to create a Modified Combined Obstacle Overlay (MCOO) for better understanding of enemy and friendly capabilities and limitation. The CCM relies on many of the previously produced templates, such as surface material and configuration and obstacle templates, and is reanalyzed when more information about system surface limitations are better understood during the next step of the AMD IPB.

WEATHER EFFECTS

3-37. Assess Weather Effects on enemy aerial and TBM operations and on friendly AMD Operations. Weather analysis evaluates the weather's direct effects on these systems. Terrain and weather analyses are inseparable. The weather assessments needed to support AMD IPB are climatology, current weather, and forecast weather. Every enemy and friendly weapon system has operational limitations associated with weather conditions. Only a few examples are noted below. The weather analysis may in-fact be more complicated and in-depth then the preceding terrain analysis. In order to complete this template, the planner must acquire the applicable operational specification documents, to determine the environmental conditions that both enemy and friendly platforms are designed to operate in. These conditions may include, but are not limited to: Rain, snow, wind, dust, heat, cold, humidity, and icing. With this analysis, the planner can determine which environmental conditions will be advantageous to the enemy (i.e. TBM threat is capable of launching at a temperature that is lower than the allowable operating temperature of the AMD weapon system, and this temperature has been observed in the theater of operation for 2 months out of the year. With this analysis, the planner has now uncovered a window of opportunity where the enemy could have uninhibited attack capability with TBMs against friendly assets and forces) or are advantageous to friendly forces (i.e. TBM cannot be launched after winds exceed a certain speed. The onset of these winds is predictable and observable, and are prevalent in the theater of operation. With this analysis, the planner can provide the commander with opportunities that the enemy cannot launch TBMs, in order to conduct maintenance, or movement operations, or attack operations, etc.)

Weather Effects Template

3-38. Climatology Assessment. Climatology assessment is statistical weather data collected or calculated for an area. It focuses on mean weather conditions likely to affect peacetime readiness planning phases and/or future enemy and friendly force operations. Favorable climatology factors for friendly AMD forces may be cloud cover that obscures observation of AMD force operations and locations, and detrimental factors may be high winds that prevent interceptor launch, or temperature inversions that create radar ducting. Favorable climatology for the enemy aerial and TBM forces may also be cloud cover that obscure the launch of a TBM from space-based sensors that rely on Infra-Red (IR) signatures for launch detection, and detrimental factors may be temperature extremes that prevent the fueling of liquid-based TBMs. Some examples of effects that the Climate/weather can have on both enemy and friendly forces:

- Impacts the tempo of operations by reducing missile crew efficiency.
- Adversely affects technical performance of the aerial, TBM, or AMD platform and associated support equipment. This analysis will be skewed accordingly based on the varying capabilities to operate in inclement weather among the different platforms.
- Enables the adversary and/or the friendly forces to tactically exploit effects on respective platforms.
- Impacts the effectiveness and likely use of WMD, both negatively and positively.

3-39. Current and forecast weather are used during combat operations. Current assessment is used to support active missions and operations. Forecast assessment is used for mission planning and AMD IPB development out to 5 to 7 days. To focus weather analysis, begin with available weather trend information or climatology-based overlays for specific locations within the AMD AO, and analyze each military weather aspect. Evaluate the aspects that have the most bearing on enemy aerial and TBM operations and friendly AMD operations (such as visibility, precipitation, and winds). Weather has both direct and indirect effects on missile operations. Integrate the effects of the different weather aspects into a single template to provide current and forecast effects on missile operations. Use it in conjunction with other terrain analysis products to further refine estimates of enemy COAs. Use local climatology data and then fine tune with more current information.

3-40. Winds can affect adversary operations by reducing crew efficiency in performing trans loading operations, reducing crew efficiency in performing prelaunch missile operations (that is, launch site setup and missile erection and alignment), and degrading missile accuracy if the wind's effects are not accounted for during the prelaunch operations (particularly for certain types of warheads). Winds can affect friendly AMD operations by reducing crew efficiency when emplacing, operating, and performing maintenance on AMD equipment, and could degrade interceptor accuracy if the wind’s effects cannot be accounted for by the AMD platform, or are beyond the interceptors launch capability. Wind-generated blowing sand, dust, rain, or snow reduces the effectiveness of friendly AMD systems (that is, radar and communication systems). Strong winds hamper the efficiency of directional antenna systems by inducing antenna wobble and can detrimentally impact friendly attack operations.

3-41. Precipitation affects visibility and soil traffic ability and can hamper air and missile defense crew performance at the launch, trans loading, and fueling sites. Combined with lightning, it would likely stop launch activity. It can degrade the functioning of electro-optical systems (i.e. some radars are more susceptible to water droplets in the air then others, and may reduce the radar’s capability to detect enemy threat platforms). Heavy snow cover can reduce mobility, affect communication systems, and degrade the effects of many munitions and air operations.

3-42. Temperature and Humidity extremes reduce personnel and equipment capabilities and may require the use of special personnel shelters or equipment. Missile range performance is slightly sensitive to temperature conditions. Temperature extremes can reduce the maximum range performance of liquid propellant systems by 5 percent under severe conditions (<-30° Celsius (C) and >50° C). Nominal operational conditions (0°-30° C) generally do not impact the performance. Solid propellant missiles are more sensitive to temperature and humidity constraints. The missiles are stored at nominal temperature ranges of 5-25° C. Environmental covers on the TEL or heating cloths placed on the missile maintain missile temperature. Maintaining solid propellant motors within nominal temperature bounds decreases the variation in propellant burn rate and corresponding variation in delivered thrust. High temperatures will increase burn rate (and delivered thrust), while cold temperatures will significantly degrade missile delivered thrust. Unexpected thermal variations may adversely impact accuracy. The most likely effect of the temperature will be on the electronics of the weapon systems. Extreme temperatures will affect the electronic components of the various friendly and enemy platforms, likely causing malfunctions that may degrade or even render these platforms non-mission capable.

Visibility

3-43. Low Visibility can conceals AMD unit movement and field deployed activities and enhances the possibility of surprise. Can hinder Indications and Warnings (I&W) if concealing enemy activity. Consider all aspects when evaluating visibility. Low visibility can be an analysis of visible light, infra-red, precipitation, clouds, smoke, and other obscurants that have an affect have effect on AMD operations. For example, cloud cover can negate friendly overhead reconnaissance of enemy aerial and TBM force activity. A major factor in evaluating visibility is the effect on data collecting platforms, Space-Based Infra-Red Sensors (SIBRS), ground-based sensors, and other intelligence gathering platforms. Considerations should also be made to how the visibility may affect enemy forces, i.e. TBM reload efficiency and time, and any other limitations that may be attributable to low visibility conditions. For visible light, consider phases of the moon, times associated with sunrise, sunset, moonrise, and moonset. Night or low visibility operations can screen launches and limit Transporter/Mobile Erector Launchers (TEL/MEL) and Ground Support Equipment (GSE) visual signatures (during DESERT STORM, the majority of Iraqi missile launches occurred at night). In future conflicts, air and missile defense forces are likely to conduct missile launch operations at night or during periods of reduced visibility and cloud cover. During periods of low visibility and/or poor flying weather, attack operations are degraded by a reduced capability to search for enemy aerial and TBM platforms and equipment. Extreme darkness can cause crew disorientation and slow both enemy and friendly force movement.

OTHER CHARACTERISTICS OF THE BATTLEFIELD

3-44. Any other characteristic of the battlefield, whether terrain and weather associated or not should be compiled for analysis in the AMD IPB. For instance, it may be important to the AMD IPB to define RDT&E facilities, production facilities, WMD facilities, airfield locations, Aerial/Sea Ports of Debarkation (APODs/SPODs), fixed operational sites, Field Operating Areas (FOAs), BMOAs, Named Areas of Interest (NAIs), etc. As with terrain and weather, express other battlefield characteristics in terms of their effects on adversary aerial and TBM and friendly AMD COAs. The graphical depictions (templates) of the other battlefield characteristics developed during previous AMD IPB steps provide a template to annotate broad COA assessments.

Chapter 4
Evaluate the Threat

TACTICAL BALLISTIC MISSILE (TBM) TEMPLATE

4-1. There is a wide range of TBMs currently deployed and available to adversary countries. The first step in narrowing down the threat analysis is to determine which category of TBMs are applicable to this AMD IPB. For instance, the enemy may have an Intermediate Range Ballistic Missile (IRBM) capability that they cannot use due to friendly assets being located closer than the TBM's minimum range capability. In this example, it would serve no purpose to conduct an extensive analysis of the enemy IRBM threat for this AMD IPB. In another example, the enemy may have a SRBM capability that currently cannot use due to friendly assets being located further than the TBMs maximum range. However, analysis of the terrain in the previous AMD IPB steps has determined that there is Key Terrain identified that could bring SRBM forces within range of friendly assets. In this example an extensive analysis may be warranted for further use in the AMD IPB and MDMP process, to include enemy COAs, Commander Critical Information Requirements (CCIRs), and branches or sequels to the friendly AMD defense design plan. The following are the major categories of TBMs:

- Close Range Ballistic Missiles (CRBM) – TBM with range capabilities of less than 300 km
- SRBMs – TBM with range capabilities between 300 km and 1000 km
- MRBMs – TBM with range capabilities between 1000 and 3000 km
- Intermediate Range Ballistic Missiles (IRBMs) – TBM with range capabilities between 3000 and 5500 km
- Inter-Continental Ballistic Missiles (ICBM) – TBM with range capabilities beyond 5500 km
- Submarine-Launched Ballistic Missiles (SLBMs) – Any TBM launched from a submarine

4-2. Technologically, TBM systems span a spectrum of sophistication that has direct implications for the AMD IPB process. The most widely deployed TBMs today are systems with technologies (analog guidance and control systems, liquid-propellant propulsion, and airframes) dating from the 1940s through the 1960s. These systems have simple delivery computations, large logistical requirements (manpower and equipment), limited trajectory control options, and few (if any) countermeasures. However, these types of systems are generally cheaper and easier to maintain than more modern systems and therefore are highly proliferated. Advanced TBM systems are currently deployed in fewer numbers and include solid-propellant, improved digital G&C, digital flight computers and global positioning systems (GPSs), improved airframe, and modern Ground Support Equipment (GSE) technologies. These more modern technologies allow for quicker reaction times, increased accuracy, increased lethality, advanced trajectories, advanced countermeasures, and a need for less support vehicles and operational support. Operationally these systems require significantly less manpower and GSE. Although limited in number, these systems are pose a growing threat to AMD operations.

TBM EQUIPMENT OVERVIEW

4-3. Develop a set of templates for the most critical equipment data. Templates are necessary to answer relevant questions on EOOB, sustainable logistic footprint (for determining BMOA sizes), emplacement limitations (for creating the MCOO and determining potential Field Operating Areas (FOAs), etc. In terms of equipment, a TBM force has a missile system, launcher, fire control, and associated Ground Support Equipment (GSE). Equipment template detail varies significantly depending on mission requirements and the time and depth of the AMD IPB analysis. They address composition, strength, logistics, and force effectiveness factors, which is used later for the ETC analysis. More detailed templates may be developed later for all other equipment areas.

TBM IN-DEPTH ANALYSIS TEMPLATE

4-4. This template provides an in-depth analysis of the TBM threat and addresses critical information requirements for the AMD IPB. Required missile system data varies between AMD mission areas. The composition and quantity of the TBM templates will vary based on the mission, the analysis requirements, and the data gathered. Typical data may consist of photographs, external line drawings with TBM dimensions and structural configurations, internal line drawings annotated with propellant type and number of stages, key performance, parameters/characteristics, warhead data including mass and type, flight trajectories (maximum, 2/3 maximum, and minimum ranges), nominal reaction times, and median in-flight signature data. Tailor the data template to the specific country of interest (for example, available warhead types), and augment with textual data such as missile descriptions and operational status. The Missile and Space Intelligence Center (MSIC) and the National Air and Space Intelligence Center (NASIC) are responsible for developing detailed missile engineering and flight data. This data is distributed in missile handbooks, detailed systems reports, engineering reference documents, and spot reports. Data and missile expertise is also accessible through on-line SIPR sources such as INTELINK, published Ballistic Missile Reference Documents (BMRD) or direct interface with the appropriate intelligence center to gather missile design information that is detailed enough to proceed with the AMD IPB. Below is a list of some critical considerations for analysis of the TBM threat. This is not an all-inclusive list, but is intended to provide the planner/analysis with a solid starting point for analysis of the TBM threat from an AMD perspective. These templates will be utilized later in the MDMP and AMD IPB process to provide data for the decision on friendly courses of action. The TBM templates, along with all the other threats discussed later, must be as thorough and complete as possible. Information from these templates will be used to determine which assets may or may not receive AMD defense resources based on the analyzed threat to each asset and will be used to define/quantify commander's risk.

TBM PERFORMANCE CONSIDERATIONS

4-5. TBM performance considerations consists of questions of necessary and relevant data. Answers to these queries are oriented towards the mission objectives. TBM performance queries and mission objectives are the focal point of determining IPB templates to use in situations that involve the possible enemy use of ballistic missiles.

MISSILE FLIGHT TIMES

4-6. How long will it take for TBMs to traverse from the launch points to the impact points. Missile flight times can be used to determine allowable AMD weapon system readiness postures (when can they go down for maintenance? For how long? What will be the effect of unscheduled maintenance? What should the manning requirements be? Etc.)

- Short missile flight times may feed into requirements for Indicators and Warnings (I&W) from external sources (i.e. it may be necessary for a Defense Support Program (DSP) confirmed threat launch in order to ensure the AMD system is prepared for the pending TBM engagement, or it may be necessary to ensure an Integrated Air and Missile Defense (IAMD) posture with another AMD sensor that would be capable of cueing the AMD shooter in time to support the TBM engagement)
- Early Warning. How much Early Warning will the protected assets receive? What Early Warning architectures need to be in place, based on missile flight times, to ensure that personnel have adequate time to seek protection in the event of TBM leaker?

MISSILE SPEEDS

4-7. Missile velocities can feed into battlespace determinations (how long will the threat remain in any particular AMD systems engagement window?) Missile velocities can feed into system effectiveness calculations (is the AMD system capable of neutralizing a threat of that velocity? Which systems can engage this threat, which cannot? Which interceptor types can engage this threat, which cannot?)

- Missile velocities may affect the way that this threat is classified by the AMD system, and how the threat is reported on any external links.

MISSILE TRAJECTORIES

4-8. How does the TBM fly while travelling to the defended asset:

- Does the TBM fly minimum energy trajectories? How does this affect the AMD system? How does this affect the AMD systems ability to detect, classify, discriminate and engage this threat?
- Does the TBM fly shaped trajectories (lofted and depressed)? How does this affect the AMD systems ability to detect, classify, discriminate and engage this threat?
- Does the TBM fly non-ballistic trajectories (i.e. out-of-plane maneuvering)? How does this affect the AMD systems ability to detect, classify, discriminate and engage this threat?

4-9. Missile Launch Restriction template question can be:

- What limitations are there that could prevent an adversary TBM launch? These can be terrain, weather, and physical weapon system limitations. These restrictions will assist in the determination of BMOAs and readiness postures that can be assumed when these limitations (i.e. high winds) exist on the battlefield.

MAXIMUM AND MINIMUM OPERATIONAL RANGES:

4-10. What is the maximum range that the TBM can travel on a minimum energy trajectory? (The maximum distance a TBM can travel with a given amount of fuel). The quickest method to scale down the scope of the AMD IPB is to determine threat TBM platforms that cannot range the proposed defended assets or would have to occupy *Key Terrain* in order to do so.

4-11. What is the minimum range that the TBM can travel on any trajectory? An often missed step in the threat analysis process is to filter out TBMs that cannot range proposed defended assets due to minimum range limitations. For instance, a two-stage TBM may have a requirement to completely expend the first stage, giving the TBM a minimum range that it must travel that may take it beyond the range of the defended asset.

CIRCULAR ERROR PROBABLE (CEP)

4-12. Define the TBM accuracy. The CEP is a mathematical median that predicts where 50% of the ballistic missiles launched at a defended asset will land. For instance, if a TBM has a CEP of 500 meters and the adversary launches 10 TBMs against the asset, the analyst can plan that at least 5 of these TBMs will fall within a 500 meter radius of the aim point. This analysis goes beyond basic TBM impacts per TBM launches. CEP calculations are used in complex Probability of Hit (P_{hit}) formulas to determine the probability of enemy TBM impact. The determination of TBM accuracy is absolutely critical to the AMD IPB process. Almost every calculation and risk decision in the MDMP process is going to hinge on the calculations of the accuracy of the enemy's TBM forces. See figure 4-1 on page 4-4 for CEP formula.

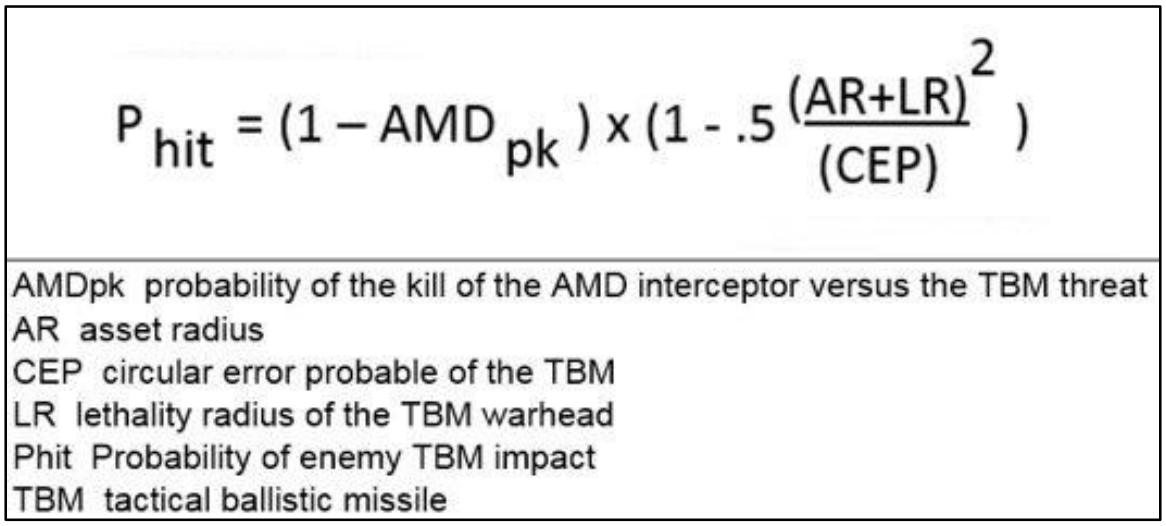


Figure 4-1: Sample Probability of Hit Formula

ENEMY THREAT CHARACTERISTICS (ETC)

4-13. Define the enemy threat characteristics, or how many TBMs they have and how fast they can be fired.

NUMBER OF MISSILES

4-14. How many TBMs does the enemy possess? Is there enough of them to warrant the defense? Based on the accuracy determined earlier, does the enemy possess enough TBMs to impact the target at the commander's determined threshold? These numbers will also be utilized later in enemy most likely courses of action (i.e., if the enemy only has limited number of TBMs, how will this affect the enemy's ability to sustain TBM launch operations). (See table 4-1 on page 4-).

Table 4-1. Missile number characterics

Missile Numbers	*Characteristics*
Number of Mobile Erector Launchers (MELs) or Transporter Erector Launchers (TELs)	• How many launch platforms does the enemy possess? • Do they have to share launch platforms with multiple TBM types? • Are there any other types of launchers (i.e. Under-Ground Launchers (UGLs), Silos, Commercial Vehicles, Coffins, Ships, etc.). These numbers will help refine later the enemy's maximum rate of fire of TBMs, will feed into enemy Most Dangerous and Most Likely Courses of Action (MDCOA / MLCOA), and may produce other requirements for I&W and possible targets for prioritization in attack operations.
Number of Launch Areas	In-depth analysis of BMOAs are discussed below. This template is to determine an initial laydown of where pre-determined launch areas exist. Immediate assessment of the TBM threat can come from this step. For instance, if there is a TBM threat that can range the defended asset if fired from the southern edge of the country and therefore has been included in the threat analysis up to this point, may now be a candidate for removal from the enemy most likely course of action determination later in the AMD IPB process if the infrastructure to launch the TBM exists only in the northern edge of the country and therefore the TBM cannot range the defended assets based on current launch area restrictions.
Number of Warheads	Probably the most difficult step in the TBM analysis is to determine the number of warheads that the enemy possesses. This is often the most difficult step because this type of data is rarely available at the level of fidelity that the AMD analyst requires. Despite this limitation, all attempts should be made, with whatever actionable intelligence data is available, to determine the number (or a sufficient approximations) of warheads that the enemy may utilize during TBM operations, especially TBM types that are of particular concern to the AMD system, such as WMD.
Initial Launch and Reload Time (Maximum Rates of Fire)	• How long does it take to place the TBM platform into operations? • Once a launch is executed, can the launcher be reloaded? • How long does it take to reload? • Can it be accomplished in the field or does the launcher have to go back to a garrison location? • Are there opportunities for attack operations on TBM logistical support trains? These calculations will feed into several other AMD IPB calculations, to include the enemy COAs, BMOA sizes and locations, Attack Operations, etc.
AMD air missile defense BMOA ballistic missile operating area COA courses of action IPB intelligence preparation of the battlefield TBM tactical ballistic missile WMD weapons of mass destruction	

WARHEAD TYPES

4-15. Type of warheads does the enemy have in their inventory. Does the enemy have WMD Capable Warheads (i.e. Chemical, Biological, Radiological, and Nuclear (CBRN))? Sub munition Warheads? Maneuvering Re-entry Vehicles (MaRV), Multiple Re-entry Vehicles (MRV), multiple independently-targeted Re-entry Vehicles

(MiRV), Warheads with countermeasures (discussed below)? How does each one of the warhead types assessed affect the asset being defended? What is the commander's acceptable level of risk for impact from each warhead type? What is the AMD Systems capability versus each warhead? Later in the COA step, the planner will then determine what the likelihood that each warhead type will be utilized against the defended assets.

AMD COUNTERMEASURES

4-16. Capabilities that the TBM has to counter the AMD resources assigned to defend the asset. Categorizing the countermeasures is important for understanding the threat, enemy intent, and enemy capability, but more important is determining which of the countermeasure effects the assigned AMD systems, and what will this effect be.

Table 4-2. AMD countermeasures

AMD Countermeasures	*Characteristics*
Active Countermeasures	Countermeasures that are specifically designed to defeat the AMD system. These countermeasures must have an activation event somewhere along the TBM flight path, and must not be part of the organic design of the TBM or related to the actual flight of the TBM, but appear to only be utilized to defeat the AMD system. An example would be the release of decoys (fake re-entry vehicles), which can complicate the AMD system's ability to determine which object is the lethal object to engage, and can cause the AMD system to over-engage the threat (leading to missile wastage). However, if these decoys were intended to defeat an Infra-Red (IR) interceptor but the planned AMD system relies on RF energy for interceptor guidance, then this would probably not be relevant countermeasure, and would not be included in this AMD IPB.
Passive Countermeasures	Countermeasures that collaterally effect an AMD system through its operation or existence. For instance, if the adversary has a TBM that reorients in flight in order to improve the TBM accuracy, this may affect the AMD system's ability to engage that TBM, or may change the probability of hit formula (discussed above) in favor of the enemy. This would be an example of a countermeasure to AMD systems that is collateral the purpose that the TBM conducted a particular action or was configured a particular way.
Structured Attack	The ability of the adversary to conducted more advanced and synchronized launches. For instance, if the enemy can launch a large amount of TBMs at one time, can synchronize TBM launches to have a large amount of TBMs arrive at a designated target within a short period of time, or can launch at a target from a wide range of azimuths, these may all effect the capability of the AMD system to defend the asset and need to be taken into consideration
AMD air missile defense RF radio frequency	IPB intelligence preparation of the battlefield TBM tactical ballistic missile

BALLISTIC MISSILES OPERATING AREAS

4-17. Where can ballistic missiles be fired from? The BMOAs may be very limited in size and location, or may cover the entire enemy territory. The size and location of the enemy BMOAs must be as accurate as possible to allow for the determination of the AMD system effectiveness against this threat.

4-18. Which TBMs are assessed to be launched from the designated BMOAs? What usually feeds into the initial size of the BMOA is the assessed ability of the enemy to support a logistical train from the garrison location where the TBMs are stored to the locations where they are launched. For instance, the enemy country may be

500 miles wide, however the enemy is assessed to only have the ability to support the logistical train (i.e. trans loading cranes, fueling vehicles, survey equipment, etc.) necessary to launch a TBM for 50 miles from the missile garrison. This information would allow the analyst to limit the size and location of the BMOAs to 100 mile diameters around the location of each SSM garrison. Operational employment begins at the TBM garrison and storage depot. The TBM garrison is normally the peacetime location of the personnel, the brigade's launchers to include logistical and administrative effort required to maintain the TBM capability to fight, vehicle maintenance support, medical, mess, supply, etc., and any other Ground Support Equipment (GSE), and can vary significantly in composition. Most SSM garrisons include hardened storage bunkers or tunnels to house critical equipment, particularly launchers, and vehicle maintenance and small unit training areas. Normally, missile systems and warheads are not stored at the garrison (except for some training and emergency alert supplies), but maintained in storage depots. A typical storage depot includes hardened bunkers for separate airframe and warhead storage and assembly/checkout areas for routine and major maintenance, since very little missile maintenance occurs in the field.

4-19. Simple assessment of BMOA sizes based on logistical trains and intelligence assessments may not be refined enough information to allow for proper planning of the assigned AMD assets. This assessment may be insufficient because the enemy has the ability to project TBM forces throughout their entire country, or the enemy may have solid rocket technology that significantly reduces the logistical footprint (equipment requirement), or the AMD system may be predicted to have unacceptable capability against threat when using the simple assessment. For whatever the reason, it may be necessary to conduct a more refined analysis in the form of a Modified Combined Obstacle Overlay (MCOO) which results in most likely Forward Operating Areas (FOAs). The MCOO takes into account the factors of terrain, weather, MEL/TEL limitations, and anything else that may prevent launch from a particular area, in order to refine the size and location of the BMOAs. For instance, there may be a large BMOA that needs to be refined. Within the BMOA, further analysis may uncover mountainous areas, lakes, rivers, and depressions that are inaccessible to the TBM launcher, or may determine land gradients that exceed the capability of the launching station, etc. With this information, the areas that the TBM cannot launch from can be deducted from the overall BMOA area, and should result in smaller FOAs. Even if the AMD system is not over-saturated by the location of the simple BMOAs, analysis of FOAs can provide the AMD planner with a more specific threat location and attack azimuth, which could result in a more accurate defense design and improved system effectiveness. FOAs do come with the risk that the AMD system will not be configured to defend outside the FOA in the event that the enemy gains a capability to launch in what has been determined as an inaccessible area. This risk must be quantified by the planner and explained to the commander during appropriate MDMP briefings.

TBM HIDE SITE

4-20. The TBM hide site refers to MEL/TEL cover and concealment positions with the most important locations being those that support hiding pre- and post-MEL/TEL launches. Based on general operational practices, these sites are located within a few kilometers and several minutes travel time of a launch site. This pattern analysis helps to establish the current position of the MEL/TEL after a launch. Use analysis of wartime launch activity to revalidate or modify patterns and distance/time estimate. TBM forces also employ long-term hide sites that are at greater distances from the launch areas but usually within tens of kilometers from support areas. Routine MEL/TEL maintenance is probably performed at long-term hide sites. The discover and subsequent analysis of TBM hide-sites may assist in the further refinement of most likely FOAs and may feed into enemy courses of actions, effective rates of fire, and for attack operations decisions. See Appendix B for an example of a TBM Template

AIR BREATHING THREAT (ABT) TEMPLATE

4-21. For the ABT and subsequent templates, reference the discussions in the TBM section above with regards to the purpose, function, and output of threat templates and how they apply to the MDMP process, and future steps in the AMD IPB development, in order to better understand the requirements and use of the threat templates listed below. A common misassumption by the Army AMD analyst is that the Air Breathing threat (Fixed-wing aircraft and rotary wing), either cannot penetrate the battlespace deep enough to effect the defended asset, or that this threat is negated by friendly airborne platforms. Though these assumptions may be viable, a good AMD IPB includes considerations that go beyond the enemy most likely course of action and provide the commander with decision points and options for the creation of CCIRs and OPLAN branches and sequels. Another reason why the

ABT platform must be considered even if the ABT cannot penetrate the defended asset, is that the ABT platform may have the ability to carry ordnance that can affect the defended asset and cannot be negated with friendly airborne weapon system. Below is a list of some critical considerations for analysis of the ABT threat. This is not an all-inclusive list, but is intended to provide the planner/analysis with a solid starting point for analysis of the ABT threat from an AMD perspective. These templates will be utilized later in the MDMP and AMD IPB process to provide data for the decision on friendly courses of action. The ABT templates, along with all the other threats discussed previously and later, must be as thorough and complete as possible. Information from these templates will be used to determine which assets may or may not receive AMD defense resources based on the analyzed threat to each asset and will be used to define/quantify commander's risk.

ENEMY'S AIR-TO-GROUND ATTACK CAPABILITIES

4-22. Enemy's Capability to Coordinate Air-to-Ground Attacks – Does the enemy have the ability to conduct air-to-ground attacks? What will these attacks and attack profiles look like to the AMD operator? What Rules-of-Engagements (ROEs), Airspace Control Measures (ACMs), and other positive and/or procedural control methods should be implemented to provide a synergistic balance between the need to defend an asset against threat ABT platforms while ensuring to mitigate the risk of fratricide to the fullest extent possible.

ENEMY'S CAPABILITY TO COORDINATE AIR-TO-AIR ATTACKS

4-23. Though not immediately apparent, the adversary ability to conduct Air-to-Air attacks may lead to significant decisions on AMD system employment (for instance, an AMD asset may normally be employed in a TBM defense role primarily with only a contingency ABT engagement role. However if analysis determines that a certain enemy platform has a significant advantage against friendly airborne platforms, a decision may be made to utilize the AMD asset as the primary engagement platform for this particular ABT threat. The ability of the enemy to engage in air-to-air operations, may also lead to calculations of the likelihood of other airborne assets besides ABTs (i.e. CM) to penetrate friendly airborne assets while they are committed to intercept of the enemy ABT forces.

ENEMY'S CAPABILITIES FOR SUPPRESSION OF FRIENDLY AMD

4-24. What is the enemy's capability and demonstrated intent to suppress friendly AMD systems? These assessments will also feed into ROEs and positive and procedural controls intended to maintain AMD capability.

ENEMY'S AIRCRAFT FW AND RW PERFORMANCE

4-25. Analyze as in-depth as possible how the ABT threat will perform. Results of this analysis can lead to the Tactics, Techniques, and Procedures (TTPs) for the identification of hostile ABTs, determination of ABTs that are executing an attack profile, calculations of AMD effectiveness versus a particular ABT or ABT flight profile, etc.

Table 4-3. FW and RW Flight performance characteristics

FW/RW Flight Performance Characteristics	*Sample Template Questions/Comments*
Maximum, Minimum, Attack,and Cruising Speeds	• What are the assessed speeds that the ABT can or will travel at? • How will this effect AMD system classification, discrimination, and identification? • How will this affect the operations from the perspective of the AMD operator?
Maximum, Minimum, Attack, and Cruising Altitudes	• What are the assessed altitudes that the ABT can or will travel at? • How will this effect AMD system classification, discrimination, and identification? • How will this affect the operations from the perspective of the AMD operator?
Flight and Attack Profiles	• What will the aircraft look like (from an AMD weapon system perspective) when executing an attack profile? • Will this profile be identifiable by the operator or the AMD system? • Can this profile be used to better configure the weapon system and/or train provide the operator the necessary information to effectively defend the asset?
Maximum, Minimum, and Nominal Attack Ranges for Each Assigned Weapon	• At what distance can ABT ordnance be launched? This could be a very important template that demonstrates that an ABT, that would normally be determined as non-threatening due to range, is now a significant threat due to ordnance range and rate of fire. In a worst case scenario, the enemy may even have the ability to launch ordnance from outside the engagement range of the AMD system. These types of results from this analysis would lead the commander to have to consider other methods of defeating the ABT before it reaches ordnance launch capability or an accepted risk of engaging the ordnance before it hits the asset, instead of engaging the ordnance carrying platform.
Take Off, Landing, and Other Airfield Restrictions	• What restrictions does the ABT have for take-off, landing, storage, etc? Similar to determining FOAs, these limitations can help refine the Air Avenues of Approach for the assessed ABT threat.
Troop and Weapon Load Capacity	• Is the ABT capable of carrying troops (i.e. Special Operations Forces (SOF)? • What types of weapons does the ABT carry (i.e. Machine guns, Sabot Rounds, etc.)
Endurance and Range (Maximum and Combat Radius)	• How far can the ABT platform operate. This is usually expressed in Maximum range (one way mission where the aircraft is "ditched" upon completion of the attack mission, or landed in friendly territory) and combat radius (aircraft can be launched from enemy airfield, conduct mission, and return to enemy airfield). The initial analysis of enemy intent will assist in deciding which range is the most applicable to the AMD IPB. Initially the assessment is conducted without considerations for any refueling capability.
Enemy's ability to conduct Air-Refueling Operations	After the initial maximum or combat radius is determined for the ABT threat, then determine if the enemy has a refueling capability. • Where will refueling operations be conducted? • How long will it take? • How will the enemy protect the aircraft while refueling? • How much further will the refueling allow the aircraft to travel? • What effect will the increased aircraft range have on the defended assets?
Electronic and Other Countermeasures	List the capabilities that the aircraft has to execute countermeasures against both the AMD systems and the friendly airborne assets. As stated previously, actions that hinder friendly airborne assets may cause a shift in the primary mission of the AMD asset, and ABT countermeasures that effect the AMD systems, must be assessed for the severity of this effect, and what are the commander's options to mitigate this risk.
Aircraft Day, Night, Complex Terrain, and Adverse-weather Capability	• What environment can the ABT operate in? • Are there limitations in terrain, weather, time-of-day, that provide friendly forces times of opportunity for maintenance, attack operations, system readiness and configuration changes, etc.?
Ordnance Load	From the AMD IPB perspective, this goes beyond the machine guns and Line-of-Site weapons discussed in the previous steps, and takes into consideration longer distance armament like Cruise Missiles (CMs) and Anti-Radiation Missiles (ARMs), their effect on the AMD system and the assets the system is designated to defend, as well as the enemy rate of fire and stand-off distances with this type of ordnance.

ABT air breathing threat — AMD air missile defense
FOA forward operating area — FW fixed wing
RW rotary wing

ENEMY THREAT CHARACTERISTICS

4-26. As with the TBM threat, an in-depth analysis of the ETC will assist the analyst in describing and encapsulating the ABT threat:

- Number of Aircraft – How many and what type is in the enemy inventory? Which ones are a threat to AMD systems and the defended asset?
- Number and Location of Airfields – Where are the airfields located? How does these locations effect the combat radius of the ABT as it applies to the defended assets? What opportunities exist for attack operations versus these airfields? Which airfields have the greatest impact on enemy operations and force projection capability.
- Number of Ordnance Available – How many of the Beyond-Line-of-Site (BLOS), or any other ordnance of concern, do they have in the enemy inventory
- Level of Enemy Combat Readiness and Sortie Generation Rate – A significant factor when analyzing an enemy that may have limited funding to sustain aircraft and train pilots would be considerations for aircraft operational readiness rates and pilot proficiency. This information will play a huge part in determining enemy COAs as well as commander's decision to accept an ABT risk based on anticipated non-availability of aircraft due to maintenance issues or inability of enemy to penetrate a layer of friendly airborne platforms due to vastly inferior pilot training. Once this has been determined, the analyst must also determine the enemy's sortie generation capability and the rate and density of this sortie generation throughout the anticipated length of the operation. See Appendix B for an example of an ABT Template

CM TEMPLATE

4-27. For the CM and subsequent templates, reference the discussions in the TBM section above with regards to the purpose, function, and output of threat templates and how they apply to the MDMP process, and future steps in the AMD IPB development, in order to better understand the requirements and use of the threat templates listed below. The most stressing characteristic of the CM is its ability to fly at very low altitudes, to be masked beyond terrain as it approaches the asset, and the relatively low RCS (discussed below) of the airframe. Determining these factors, and how they affect the AMD system will be paramount to developing the CM defense design plan. Below is a list of some critical considerations for analysis of the CM threat. This is not an all-inclusive list, but is intended to provide the planner/analysis with a solid starting point for analysis of the CM threat from an AMD perspective. These templates will be utilized later in the MDMP and AMD IPB process to provide data for the decision on friendly courses of action. The CM templates, along with all the other threats discussed previously and later, must be as thorough and complete as possible. Information from these templates will be used to determine which assets may or may not receive AMD defense resources based on the analyzed threat to each asset and will be used to define/quantify commander's risk.

CM FLIGHT PERFORMANCE

4-28. Analyze as in-depth as possible how the CM threat will perform. Results of this analysis can lead to the TTPs for the identification of hostile CMs as opposed to other ABT targets in the battlespace and for calculations of AMD effectiveness versus a particular CM or CM flight profile, etc.:

FLIGHT PROFILES/TRAJECTORIES

4-29. How does the CM traverse from launch to target? Does it fly a steady altitude? Does it conduct set maneuvers that may be able to be identified by the AMD system or operator? What is the anticipated detection range of this threat based on the radar horizon? Usually one of the most useful templates when defining the CM threat is a CM timeline that graphically and chronologically represents the life and battlespace of a CM from the time that it is detected at the radar horizon to the time that it impacts the asset. This template is important, because the low-flying CM will most likely be detected at much closer ranges than the AMD system normally detects targets, leading to compressed engagement timelines for both the AMD system and the operator to the Identification Authority (IDA) and Engagement Authority (EA). Terms like "shortened timeline" and "late detection", are non-quantifiable, and do not provide the commander with informed data from which to make a decision. The purpose of this template is to provide the commander with assessed chronological data on the CM engagement, from which the commander can assume risk, understand the risk, request gap filling AMD sensors and/or shooters, effort to shorten a lengthy engagement timeline, etc.

NAVIGATION TYPES AND CAPABILITIES

4-30. How is the CM guided from launch to impact? Can this information be used to develop identification TTPs? Can the guidance of the CM be negated by active or passive means?

MAXIMUM, MINIMUM, ATTACK, AND CRUISING SPEED

4-31. What are the assessed speeds that the CM can or will travel at? How will this effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator?

MAXIMUM, MINIMUM, AND CRUISING ALTITUDE

4-32. What are the assessed altitudes that the CM can or will travel at? How will this effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator?

MAXIMUM AND MINIMUM RANGE

4-33. How far can the CM travel? Will this limit its ability to fly outside of select AMD system coverage? Will this allow the CM to fly outside of the defense coverage and attack the asset from the rear? Can this be used to help identify the CM to the AMD operator? Which CMs can be eliminated from the threat assessment due to lack of range to reach the defended asset?

ACCURACY

4-34. Though often represented as a CEP, when used for a CM, it is not where the 50% of the CMs will hit, but a "plus-or-minus" factor on impact proximity. For instance, a CM with at CEP of 50 meters does not mean that only half of the launched CMs will hit within 50 meters of the aim point. A CM CEP of 50 meters means that the **all** CMs fired at that asset will hit within ± 50 meters of where it was aimed/guided by the enemy.

TARGET TYPES

4-35. To better understand the CM threat, the CMs are often categorized by the CMs typical target and how the CMs are launched (see table 4-4). These categories often cross lines, and it is not always necessary to try to completely categorize the CM, but the planner may find this useful to help eliminate CMs that cannot threaten the defended asset.

Table 4-4. CM target types

Target types	
Anti-Ship Cruise Missiles (ASCM)	Typically an ASCM has guidance systems that do not operate effectively over land and against land targets. Because of this, ASCMs are generally not utilized (at least not successfully) in a land attack role. In considerations for AMD IPB, the planner will want to determine enemy intent, the sophistication level of the ASCM guidance, and proximity of the defend asset to open water, possibly making the ASMC a viable threat against the defended asset.
Land-Attack Cruise Missiles (LACM)	Typically the most likely threat to the land based AMD asset. Further analysis will be needed for the flight characteristics of this threat, the detection capability of the system for this threat, the effectiveness of the AMD system against this threat, and how (and from where) this threat can be launched against the defended assets.
Coastal Defense Cruise Missiles (CDCM)	Like the ASCM, the CDCM generally contain less sophisticated guidance systems that are intended to attack large objects (ships) on open water. The CDCM is even less likely to be utilized in an atypical land attack role because the CDCM may be deployed on a fixed platform that faces the open water. This type of launcher configuration would make launching a CDCM against a land target highly unlikely if not impossible.
Launch Platforms	After the type of target that the CM is designed to attack is determined, the means by which the CM is launched must also be identified. The launching means of the CM may make an otherwise viable CM threat no longer capable, or the inverse. For instance, a LACM that may normally be considered a threat to the asset may no longer be a threat if it must be fired from an airborne platform, and previous analysis on the ABT threat has determined that that airborne platform is incapable of ingressing within ordnance launch range of the defended asset. On the inverse, an ASCM that was determined to be a non-threat to a defended asset located far away from the shoreline, may become a viable threat if it can be delivered from a land-based launcher toward the defended asset, which found to be located on very flat terrain with no significant terrain features within the Field-of-View (FOV) of the ASCM.
Air-Launched Cruise Missiles (ALCM)	CMs of any type that can be launched from an airborne platform. Many CMs can be launched from multiple platform types, so determing that a CM is an ALCM may be only the beginning of the launch platform analysis. What also must be determined is which airborne platform can launch this CM and how many of this CM type can it carry.
Ship-Launched Cruise Missiles (SLCM)	CMs of any type that can be launched from a ship platform. If analysis determines that a particular CM can only be launched from a ship platform, this may assist in eliminating this CM as a potential threat if it would not have the range to reach a land-based asset.
AMD air missile defense IPB intelligence preparation of the battlefield	CM cruise missile

LAND-LAUNCHED CMS (LLCM)

4-36. CMs of any type that can be launched from land platforms. These type of CMs is probably the most challenging to predict and defend against. A ship launched CM will generally come from one direction unless conducting a small island defense, thus making the CM more predictable in avenue of approach. An air launch CM will generally launch after the aircraft is already under track by an AMD sensor, making this CM more predictable and have a longer engagement timeline because decisions are being made about the airborne platform before the CM is launched. The land-launched CM can come from any angle, from any range, with absolutely no warning, and at altitudes that are generally lower than those used in the launch of ship or air launched CMs

COUNTERMEASURES

4-37. What if any countermeasures does the CM have? More than likely, these countermeasures are passive in nature such as Radar Absorbent Material (RAM) or Low-Observable design (aka Stealth). How will this effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator?

ENEMY THREAT CHARACTERISTICS

4-38. Similar to the TBM and ABT threats discussed above, an analysis needs to be conducted on how many CMs, with what payloads, and from what locations, can be expected to be utilized against the defended asset:

4-39. Number of CMs. Consider how may CMs, of what type, are in the enemy inventory?

LAUNCH LOCATIONS AND RESTRICTIONS

4-40. CMs typically have much less restrictions in launch locations than TBMs do. The analyst must still collect and determine any launch restrictions that can be utilized to possibly refine CM launch areas and allow for the development of a more effective defense design plan.

NUMBER AND TYPE OF WARHEADS AVAILABLE

4-41. As with the TBM warheads, it will be more likely that the analyst is able to determine the types of warheads that the enemy has in their inventory, and will only gain an approximation of how many of these warheads the enemy has available. One thing that can usually be safely assumed is that the enemy most likely course of action typically does not have to account for more warheads then there are delivery vehicles, unless it is assessed that the remaining CM warheads can be utilized in an otherwise unconventional method (i.e. retrofitted onto an ISR UAS, effectively creating an attack UAS).

MAXIMUM RATES OF FIRE

4-42. How quickly can CMs be launched from the platform? How may CMs can one platform launch? How many launch platforms does the enemy have? How quickly can the platform be reloaded for the next CM launch?

RADAR CROSS SECTION (RCS)

4-43. Though there are Low-Observable aircraft (aka Stealth) cruise missiles, even the typical CM is of concern to the AMD IPB analyst. Radar Cross Section (RCS) is basically a measurement of how much RF energy that is transmitted by the AMD sensor will reflect off of the target and back to the sensor for possible detection. The typical cruise missile is a small aerodynamic target with surfaces that do not generally align perpendicular to the AMD sensor during flight. Because of this, the CM will usually have what is considered a "low" RCS. Airframes with low RCS will be more difficult for an AMD sensor to detect, and therefore the previously established engagement timeline/chronology could be significantly lessened if the late detection due to radar horizon is reduced even further by late detections due to low RCS. A low observable CM compounds this problem even further. A low observable CM is specifically designed to have airframe surfaces that either reflect RF energy away from the AMD sensor or absorb the RF energy and inhibit its reflection or retransmission off of the CM. Either method causes the RCS of the CM to be even lower than the already low RCS of a typical CM. How will this effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator? See Appendix B for an example of a CM Template.

UNMANNED AIRCRAFT SYSTEM (UAS) TEMPLATE

4-44. Though considered an ABT in most threat communities, special attention is usually paid to the UAS by the AMD planner because of the small size, low cost, high proliferation, and Intelligence, Surveillance, and Reconnaissance (ISR), and/or attack capability of the UAS

UAS FLIGHT PERFORMANCE

4-45. Analyze as in-depth as possible how the UAS threat will perform. Results of this analysis can lead to the TTPs for the identification of hostile UASs as opposed to other ABT targets in the battlespace and for calculations of AMD effectiveness versus a particular UAS or UAS flight profile, etc.:

- Duration of Flight – Also known as endurance, can help determine flight and engagement timelines for the UAS threat.

- Flight Trajectories – How does the UAS get from launch point to operating area? Can these trajectories, speeds, path, behavior, etc., be utilized to assist in the classification and identification of the UAS threat?

COUNTERMEASURES

4-46. What if any countermeasures does the UAS have? More than likely, the UAS will not have any countermeasures besides its small size, which will result in a low RCS. By design, the UAS is intended to be very inexpensive and possibly even disposable after mission accomplishment. Because of this, and its inherent capability to traverse unnoticed among other aerial targets, the UAS will usually not have any added countermeasures that would only cause an increase in UAS weight (thus reducing UAS range), and increase in UAS cost (thus minimizing its disposable nature). How will any assessed countermeasures (including its small size) effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator?

ENEMY THREAT CHARACTERISTICS

4-47. Just like the TBM, ABT, and CM threats discussed above, an analysis needs to be conducted on how may UASs, with what payloads (attack or ISR), and from what locations, can be expected to be utilized against the defended asset:

- Number of UAS Platforms – How many UAS are in the enemy inventory?
- Launch Platform – How many launch platforms does the enemy have? Are there any shared platforms? Can this information be used to develop a defense against the UAS threat and to calculate the enemy COAs?
- Number and Type of Warheads or Anti-Radiation Seekers Available – Like with the CMs and TBMs, the quantity of warheads may have to be approximated to the quantity of attack UAS platforms, but the type of warheads needs to be determined as accurately as possible. If the enemy has radar homing capability, then it is also important to analyze the frequency bands that the enemy seekers are capable of targeting, and how may UAS are assessed to have this capability, and how will this capability be utilized by the adversary.
- Maximum UAS Sortie Generations – How may UAS can be utilized simultaneously? What is the rate of launch for subsequent UAS employments? How long can the adversary sustain continuous UAS operations?

RADAR CROSS SECTION (RCS)

4-48. Radar Cross Section (RCS) is basically a measurement of how much RF energy that is transmitted by the AMD sensor will reflect off of the target and back to the sensor for possible detection. A UAS is typically a very small target, and even though it may have reflective surfaces that do align perpendicularly to the AMD sensor at many points along the airframe, the very small physical size of the UAS airframe make the resulting RCS very low. Airframes with low RCS will be more difficult for an AMD sensor to detect, and therefore any previously established engagement timeline/chronology could be significantly lessened if the late detection due to radar horizon is reduced even further by late detections due to low RCS. See Appendix B for an example of a UAS Template.

ANTI-RADIATION MISSILE (ARM) TEMPLATE

4-49. This threat is of specific interest and concern to the AMD analyst because the ARM threat does not target the AMD's defended asset, it targets the AMD sensor that is efforting to perform the AMD defense of the designated asset. The uniqueness of this threat is both advantageous and detrimental to the AMD system. It is advantageous in that the AMD sensor only needs to defend a small area against the ARM (itself and any other sensor that it has been designated to defend) regardless of how large the defended asset may be, but also disadvantageous in that the AMD system has to expend interceptors and capability in a fight to defend itself with resources that could be made available for the overall asset defense if the ARM threat did not exist. (See table 4-5).

Table 4-5. ARM template characteristics

Characteristics	*Sample Questions/Comment*
ARM Flight Performance	Analyze as in-depth as possible how the ARM threat will perform and be employed. Results of this analysis can lead to the Tactics, Techniques, and Procedures (TTPs) for the identification of hostile ARM targets in the battlespace and for calculations of AMD effectiveness versus a particular ARM or ARM flight profile, etc.
ARM Frequency Lock Capability	• Does the ARM have a Lock-On-Before-Launch (LOBL) capability? • How will this affect the AMD weapon systems ability to identify and engage the ARM carrier prior to ARM launch? • At what distances can this LOBL occur? • Is LOBL beyond the engagement range of the AMD system?
Flight Trajectories	• Can the ARM be identified by the profile that it traverses from launch to impact? • Can this information be utilized to develop methods to improve the AMD system ability to defend itself or another AMD sensor against this threat? • Are there profiles that are atypical of an ARM? • How will this affect the AMD system? • How will this affect the AMD operator?
ARM Attack Speeds	• What are the assessed speed that the ARM will travel at? • How will this effect AMD system classification, discrimination, and identification? • How will this affect the operations from the perspective of the AMD operator?
Maximum and Minimum Range	• What is the assessed maximum and minimum range of the ARM? • Do any of these ranges allow for the removal of an ARM platform as a viable threat?
Frequencies Targeted	ARMs cannot target all frequencies that may be on the AMD battlefield. Ensure that the frequency of the AMD sensors that are applicable to this AMD IPB are within the targeting frequency of the ARMs within the enemy's inventory. If the enemy has an ability to change ARM seeker heads during operations, then an analysis of the complexity, timeline, and logistical requirements to perform this action must be assessed in order to reveal opportunities for other AMD operations such as maintenance, battle damage assessment and repair (BDAR), attack operations, etc.
Launch Platforms	• How is the ARM delivered? Like CMs and UAS, the ARM can be launched from many platforms from almost any direction to the defended asset, making it absolutely critical to identify any launch limitation that can be used to refine the ARM launch platform and/or launch area. For instance, a particular ARM threat may need a sensor power level in order to lock on, that can only be obtained from a frontal perspective of the targeted sensor. This information can be utilized to refine the possible ARM launch areas to aircraft operating in front of the targeted AMD sensor.

AMD air missile defense
ARM anti-radiation missile
CM cruise missile
IPB intelligence preparation battlefield
UAS unmanned aircraft system

ENEMY THREAT CHARACTERISTICS

4-50. as with the threats discussed above, an analysis needs to be conducted on how may ARMs and how may ARM launching platforms can be expected to be utilized against AMD sensors on the battlefield:

- Number of ARMs – How may ARMs does the adversary have in the inventory?
- Maximum ARM Launches (i.e. Salvo, Shoot-Look-Shoot, Maximum Sustainable) – What is the rate of fire? Maximum quantity in one attack mission? How long can this be sustained? Which launch platforms have limitations that no longer make the ARM threat viable?

RADAR CROSS SECTION (RCS)

4-51. The ARM typically has much larger RCS measurements then a CM or UAS, due to the seeker that is housed in the front portion of the ARM. However, the ARM's RCS may still be lower than the average ABT, making it more difficult to detect and track while the AMD system is attempting to conduct self-defense engagements. How can the RCS of the ARM be utilized to increase the effectiveness of the AMD system? How can the RCS assist in the identification of the ARM as early as possible in the ARM flight path? See Appendix B for an example of an ARM Template.

ASYMMETRIC THREAT TEMPLATE

4-52. Any other threat to the AMD system or the designated asset from the perspective of Air and Missile Defense. Some examples are given below, but this template can be very expansive if the enemy is capable of employing systems (even the ones listed above) in an asymmetric role that is contrary to excepted doctrine or normal system capabilities.

SOME POSSIBLE NON-AERIAL/NON-TRADITIONAL THREATS

4-53. Special Operations Forces (SOF) – What is the risk to the AMD system from SOF or other ground forces? Is the site properly protected and hardened from a ground attack and small-arms fire? The AMD planner will typically not conduct ground defense and base security type analysis, because these analysis do not have a direct bearing on the function, employment, capability, etc., of the AMD system. However these factors cannot be completely ignored, and the AMD system cannot be planned for in a vacuum. The AMD planner must be cognizant of the ground threat, make sure the threat is addressed in the applicable ground defense planning forum, and bring to light any specific ground defense challenges that the AMD system may bring to the ground defense plan or requirement. For instance, it the AMD planner must deploy a communication relay, this may require additional and significant force protection since the relay will be most likely located outside of a protected military base.

CYBER ATTACK

4-54. More and more systems to include many AMD systems and the air pictures and situational displays that the AMD systems feed in to, rely on long-haul communication techniques (and often local infrastructure), to provide this capability. This presents a vulnerability to the AMD system of an attack across cyberspace or through whatever medium that these long-haul communications are established and maintained. Considerations should be taken into account as to the enemies capability to capitalize on such a vulnerability, what is the likelihood of such an attack, how this would affect the AMD system, for how long, and what mitigations can be put into effect to limit or negate the effects of an attempted cyber-attack on the AMD system.

UNCONVENTIONAL LAUNCH PLATFORMS

4-55. What other ways can the enemy deliver an assessed weapon other than the previously assessed, conventional, methods? Dirty bombs, surface-to-surface missile system (SCUD)-in-a-tub, etc.

4-56. See Appendix B for an example of an Asymmetric Template

LOITERING CAPABILITY AND TIME

4-57. How long can the UAS loiter (wait in a particular area to accomplish its mission)? This loiter can be for the purpose of taking photographs of an area (in the case of the ISR UAS) or to wait for an AMD sensor to begin radiating in order to home in on the radiation signature (in the event of an attack UAS)

Guidance

4-58. How is the UAS guided? Does it require a LOS connection to a control system? This may reduce its operational range and render a UAS that would normally be a threat based on the airframes kinematic range into a non-threat due to LOS limitation of the UAS control system. Does the UAS rely on GPS, waypoints, terrain comparison, or other methods to guide it to its intended mission area? If so, is there a way that this guidance can be interrupted/inhibited? Does the UAS have a Radiation Homing capability? Such a capability introduces an entirely new dynamic and problem set to the UAS defense design and will lead to considerations for weapon system emissions controls, which are usually only a planning factor for Anti-Radiation Missile (ARM) and Electronic Counter Measure (ECM) threats.

MAXIMUM, MINIMUM, ATTACK, AND CRUISING SPEED

4-59. What are the assessed speeds that the UAS can or will travel at? How will this effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator?

MAXIMUM, MINIMUM, AND CRUISING ALTITUDE

4-60. What are the assessed altitudes that the UAS can or will travel at? How will this effect AMD system classification, discrimination, and identification? How will this affect the operations from the perspective of the AMD operator?

MAXIMUM AND MINIMUM RANGE

4-61. What is the assessed maximum and minimum range of the UAS? Do any of these ranges allow for the removal of a UAS platform as a viable threat?

INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE (ISR) AND ATTACK CAPABILITY

4-62. What is the mission of the UAS? Though UAS can be used atypically (i.e. an ISR UAS can be flown into an AMD sensor in an attempt to cripple the sensor), the initial analysis is usually performed on the intended mission of the UAS. This will then feed to other steps of the MDMP process. For instance if the enemy only has ISR UAS, then the capability, endurance, range, etc. of the UAS may feed into the CVT analysis to populate the "probability of enemy surveillance" portion. However, if the enemy only has attack UAS, this may nullify the enemy surveillance portion of the CVT as an asset discriminator, but may create a requirement for specific ROEs intended to optimize identification and engagement of a UAS threats while mitigating the possibility of fratricide as much as possible.

LAUNCH PLATFORMS

4-63. Like CMs, the UAS can be launched from many platforms from almost any direction to the defended asset, making it absolutely critical to identify any launch limitation that can be used to refine the UAS launch platform and/or launch area.

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Chapter 5
Threat Courses of Action

ENEMY COURSE OF ACTION CATEGORIES

5-1. The MLCOA is the course of action that the enemy will most likely take based off of actionable intelligence that has been derived about the enemy and understanding of the enemies intent. For instance, the enemy may have the physical ability to launch 40 ballistic missiles against a single target, constantly over the course of a two day period. However, analysis of enemy intent may suggest that the enemy has determined four friendly assets that they intend to target, and that their attack duration plan is for a 7 day period. In this case, the MLCOA may be 40 ballistic missiles, divided into 4 targets, and spread across 7 days, even though the enemy is capable of conducting attacks at a higher volume or rate. The enemy MLCOA is typically the COA that the AMD planner will conduct the defense design analysis against. Multiple enemies or multiple enemy objectives, may necessitate the development of multiple MLCOAs. The inputs that assist in the development of the enemy COAs are listed below.

5-2. The enemy MDCOA is derived from the same inputs as the MLCOA, however is typically based off of a maximum physical capability without regard for enemy intent. Because of this, the MDCOA will usually deter significantly from the planned course of action. As an example, the enemy may have demonstrated an intent to attack multiple assets both defended and undefended by AMD weapon systems, over the course of 14 days, and has announced a non-chemical use policy unless the country regime is threatened. In an MLCOA, all these factors would be taken into account. In an MDCOA, the planner would consider the maximum volume attack that the enemy can physically conduct instead of the time period determined through enemy intent, would assume that all attacks will be aimed at assets that the AMD systems are defending, and would include utilizing chemical weapons. The purpose of the MDCOA is to provide the commander with an understanding of the enemy's full AMD attack capability. The difference between the MDCOA and MLCOA may serve as inputs to the Commander's Critical Information Requirements (CCIRs) and pre-planned decision points.

IDENTIFY AVAILABLE COAS

5-3. Many things must be considered when determining enemy MLCOA and MDCOA. Successful COA development requires an understanding of enemy doctrine, the current enemy situation, the likely enemy objectives, and an understanding the adversary's decision-making process. Initial assessment should take into account any enemy COA that could significantly influence the command's mission, even if current doctrine considers them infeasible or "suboptimum" under current conditions. Consider any indirect or "wildcard" COAs that the enemy Air and Missile force is capable of executing. Enemy COA assessment is an ongoing process that may need to be re-evaluated after an enemy activity or event is observed. To avoid surprise from an unanticipated COA, consider all possible explanations for the enemy activity in terms of possible changes to the assessed Air and Missile threat COAs.

5-4. Consider each COA subset independently to avoid forming biases that restrict the analysis and evaluation. Once subsets have been evaluated separately, combine them to eliminate redundancy and minor variations. Compare the consolidated list to Air and Missile threat capabilities (AMD IPB Chapter 4) to eliminate any non-executable COAs. Based on the capabilities assessed, select AMD models that will accomplish the likely AMD objectives. The effects of the battlefield (AMD IPB Chapter 3) influence their application as COAs. Typically terrain, weather, and other characteristics of the battlefield environment "offer" a limited set of COAs, encouraging some while discouraging others. Start with general COAs open to the adversary, such as "deploy to field," "maintain combat readiness in the field," and "multiple missile combat operations." Define each general COA further as a set of specific COAs by integrating the Air and Missile threat models from the description of the battlefield's effects. Finally, categorize assessed COAs as a most likely course of action (MLCOA) or a most dangerous course of action (MDCOA). For example, a general COA may be "single missile combat operations", taking into account the enemy inventory of SCUD B's, friendly assets, enemy threat launch areas (TLAs), and available warhead types. As an MDCOA, the COA would describe a maximum SCUD B volley capability, against

all defended assets, from all possible TLAs, with all possible warhead types. As an MLCOA, additional factors to consider are intent or desired end state and likely attack objectives, effects of the battlefield environment on operations, vulnerabilities or shortages in equipment or personnel, current force positioning, location of main and supporting efforts, enemy perception of friendly forces, and any other factor that is determined as capable of affecting the enemy's ability, will, or desire to conduct combat operations. Each identified COA should meet the following criteria.

SUITABILITY

5-5. An MLCOA must have the potential for accomplishing the enemy Air and Missile threat force's likely objective or desired end state. If the COA is successfully executed, will it accomplish the objective? An MDCOA will focus less on desired end state and more on the assumption that assets on the DAL will be attacked by the enemy utilizing a maximum possible attack volume.

FEASIBILITY

5-6. To determine the feasibility of a COA, consider the time and space, resources, and physical means required to successfully execute the COA. Force compositions or other factors might indicate the lack of means to accomplish likely enemy objectives. Consider all actions that could create the conditions needed for success before discounting the COA completely. For example, the adversary might conduct economy of force operations in some sectors in order to generate sufficient combat power for offensive operations in others. A lack of resources might force the enemy force to violate its own doctrine in order to accomplish its objective. Avoid surprise; consider any seemingly radical measure that may be taken to create the conditions for success. An MDCOA for feasibility would focus on the physical capability for the enemy to conduct Air and Missile operations within the limitations described, while the MLCOA would focus on the likelihood of the enemy to conduct Air and Missile operations within those same limitations.

ACCEPTABILITY

5-7. Consider the amount of risk the enemy would be willing to accept in adopting a given COA. Can the enemy afford the resource expenditure for an uncertain chance at success? This is a subjective judgment based on knowledge of the enemy's Air and Missile force, its doctrine, and available resources. Consider that the enemy may undertake an otherwise unfavorable COA, if they are the only means to accomplishing its objective. An MDCOA assessment will typically not take into account acceptability of a COA, since acceptability is based almost solely on enemy intent, and not on physical limitations.

UNIQUENESS

5-8. Each COA must be significantly different from the others or else consider it a variation rather than a distinct COA. Consider the following factors to determine if a COA is "significantly" different:

- Its effect on the friendly mission.
- Exposure of force assets and location.
- Employment concept and task organization.

Consistency with Doctrine

5-9. Each COA should be consistent with enemy Air and Missile employment doctrine. The evaluation of consistency is based on written doctrine and observations of the enemy forces past application of that doctrine. Check the intelligence database and templates for this information. Do not overlook possible enemy efforts to achieve surprise by deviating from known doctrine or using "wildcard" COAs.

AIR AND BALLISTIC MISSILE THREATS

5-10. Assess how the deployment pattern, disposition, training, and logistics factors affect the enemy's available courses of action. Describe the major operations, associated timelines, and options should an operation fail (branches), or subsequent operations should it succeed (sequels). Depict the Air and Missile force's preferred techniques of employment. This aids in mentally war gaming the operation's duration during enemy COA and situation analysis development. Analyzing the functions of an operation show how the enemy Air and Missile force normally conducts an operation. For example, while it is difficult to depict a large scale TBM operation, the time relationships between the various elements and their normal composition can easily be described in a time-event chart, narrative, or matrix format. The description addresses characteristic signatures, timelines and phases of the operation (operations, movement, and support), points where units transition from one formation to another, and how the different types of enemy Air and Missile threat equipment contribute to the operation's success. Analyze equipment in enough detail to allow for later identification of High Value Targets (HVTs) and High Priority Targets (HPTs). Since the target's value usually varies with its role in each phase of the operation, ensure that each phase is separately examined.

5-11. The description of the enemy Air and Missile force's techniques is developed from an evaluation of enemy doctrine and past or current operations. Include a description of the branches and sequels normally available to or preferred by the enemy force should the depicted operation succeed or fail. Examine the basic scheme of operations and for each, check how each type of equipment 'fits in' or provides support. Tag key events or positions on the analysis (that is, describe the enemy force's normal reaction to a friendly attack operation).

5-12. Define the composition and strength of the air and missile defense force and define the information system used to control those units. These systems and organizational structures are analyzed on the national, operational, and tactical level. The organizational structure delineates the flow of control for peacetime and crisis/wartime. Since most countries control TBMs as strategic assets, the line of control begins at the highest level of execution authority in the country and extends to the lowest missile battery. If known, note key individuals' names, unit designators, skip echelon communication, unit composition, etc.

TBM ATTACK OBJECTIVES

5-13. Consider political and military factors, TBM weapons system and warhead capabilities, and intelligence available to the TBM force to guide target selection when analyzing enemy attack objectives. AMD IPB Battlespace Effects summarized the important factors impacting the achievability of TBM attack objectives and assists in systematically addressing the important issues impacting TBM employment. Available intelligence rarely supports stating TBM objectives as facts, so qualify assumptions with standard confidence levels (confirmed, probable, etc.).

TBM TACTICS

5-14. Developing a detailed assessment of the TBM force's tactical operations concept is a critical factor in separating the individual activities within the battlefield. TBM tactics are centered on doctrine and begins with the missile garrison and the missile/warhead storage depot (fixed infrastructure). It illustrates the multi-axes movement to the deployment area where operations are geographically dispersed. Dispersing versus centralizing operations enhances TBM survivability at the force, brigade, and battalion level. Basic TBM tactics takes into consideration the following functions:

- Mission Control
- Storage
- Missiles, warheads, propellants.
- Missile transporter loading and fueling at the FOL.
- TEL loading, TEL hide, launch site setup, launch operations, and fire control.
- Support and services, security/defense.
- Movement and transportation and engineering support (optional).

5-15. Breaking down TBM operations helps in understanding TBM dispositions. A deployed TBM force is typically brigade-sized and spread out into battalion-sized deployment areas. Functions are normally redundant within the battalion-sized deployment areas in order to minimize concentration of units, scatter the vehicle movement pattern and increase the effectiveness of camouflage, cover and concealment measures.

5-16. TBM forces, in line with operational doctrine, will typically disperse throughout the battlefield to enhance survivability and effectiveness. The variation would show functions centralized in one location. For example, some countries will centralize some missile support functions (storage, trans loading, refueling, etc.) in large underground facilities (UGFs). This tactic significantly reduces the number of vehicles deployed in the battlefield, but gives attack forces a greater opportunity to significantly disrupt operations if the centralized location is successfully identified and attacked. Examine existing historical exercise data and focus on the employment of support assets as well as the launcher. Support asset exercise and training indicate a TBM force's preference toward either field dispersed or centralized operations. Terrain and infrastructure analysis also indicate battlefield suitability for the enemy. A generic TBM tactics model can serve as a starting point for other missile systems, such as solid propellant systems, that eliminates the need for propellant storage and fueling functions.

TIME-PHASED FACTORS

5-17. Analyze the time-phased factors of the TBM operation. Develop timelines for all TBM operational phases in order to correlate the time and distance factors for TBM functions being executed on the battlefield. The TBM force's objectives impact the TBM time-phased factors. Important TBM time-phased factors are:

- Time-of-day considerations.
- Missile launch and arrival timelines.
- Execution timelines for specific operations.

5-18. Definition of these 3 elements requires detailed analysis of the adversary's doctrinal and technical capabilities. To examine time-phased execution, time-event charts and time-pattern analysis charts are useful techniques. Time-event charts, depict the sequential flow of the steps needed to execute a specific operation and are constructed for any level of execution. For instance, a time-event chart shows the broad sequential steps a TBM force takes to deploy from garrison. For a much more specific operation, such as a missile setup and launch, the sequential steps would be much more detailed. The purpose of defining steps to this level of detail is to have a technical understanding of the operational requirements that drive the timelines. This understanding will support estimating minimum timelines, pacing events, and potential areas where changes to or omission of specific steps could impact timelines and/or performance. The second technique, a time pattern analysis chart, supports specific operation scheduling and timing analysis, such as the pattern associated with missile launch history. It is an analysis tool to estimate when specific operations need to occur in order to meet the pattern of observed launch activity and can be utilized in the "predictive analysis" process to better determine the most likely times for enemy ballistic missile attacks.

DOCTRINAL ANALYSIS

5-19. Doctrinal analysis illustrate the enemy air and missile force's deployment pattern and disposition when not constrained by battlefield environmental effects. They are an analysis of enemy air and missile force dispositions for a particular type of standard operation and are constructed through an analysis of the intelligence database and an evaluation of the adversary's past operations. To conduct the doctrinal analysis, determine how the air and missile threat force organizes for combat and how it deploys and employs its units and various air and missile threat assets. Observe patterns in task force organization, timing, distances, relative locations, groupings, and use of the terrain or weather. Focus on major elements as well as individual HVTs. Conduct a comprehensive analysis of air and missile force capabilities (organization, equipment, techniques, and the temporal and spatial factors) by breaking the capabilities down into the following components:

- Composition - Identification and organization of air and missile units.
- Disposition - Physical location of air and missile units.
- Strength - Unit description in terms of personnel, weapons and equipment.
- Tactics - Force and unit level tactical doctrine.
- Training - Individual and unit level.
- Logistics - Supplies and LOCs.
- Combat Effectiveness - Abilities and fighting quality of a unit.
- Information System - Unit network, equipment, and personnel makeup and array.
- Miscellaneous Data - Additional intelligence

5-20. Identify and evaluate all available databases and published defense intelligence reference documents, and directly interface with national intelligence organizations throughout the process. Doctrinal analysis integrates a mixture of adversary representations for both the force and unit level combined with descriptive text (that is a force level coordinated attack plan is expanded by a template subset of individual air and missile threat units deployed throughout the battlefield). Tailor doctrinal analysis to the type of friendly AMD mission being pursued. Analysis for an active defense mission focus on potential and likely air and missile employment areas, likely air and missile threat targets, raid size, maximum and minimum number of missiles or aircraft per target, types of warheads, aircraft armament, and so forth. Analysis for an attack operation mission focus on an adversary's air and missile threat unit marshalling areas, likely TBM launch areas, TELs, and mission control facilities supporting enemy air and missile threat operations.

5-21. Once deployed, continually update the doctrine analysis with the latest intelligence from responsible intelligence producing organizations like DIA (Defense Intelligence Agency), MSIC (Missile and Space Intelligence Center), NASIC (National Air and Space Intelligence Center), and National Ground Intelligence Center (NGIC).

EVALUATE AND PRIORITIZE SPECIFIC COAS

5-22. The resulting set of COAs depicts the full set of options available to the enemy air and missile force. Though it is not possible to predict with complete accuracy which of the COAs the adversary will employ, the commander and staff will need to develop a plan that targets one of the COAs (the designated MLCOA), while still allowing for contingency options if the adversary chooses another COA. Additional COAs other than the MLCOA must be evaluated and prioritized according to its likely adoption by the enemy force. An initial prioritized list allows the staff to plan for possible friendly COAs, decision points, and the commander’s CCIRs. Even after the commander selects a friendly COA, the enemy COAs must be continuously reordered according to the situation and any changes in the adversary’s actions, doctrine, policy, or perception of friendly forces.

5-23. In developing enemy COAs for Air and Missile Defense IPB, focus on the types of COAs the enemy command may execute based on the adversary’s predicted targeting strategy, terrain, and weapons limitations. Specific details on enemy launch areas, targets, attack structure, flight azimuths, etc., allow adjustment of friendly AMD radar systems or can facilitate attack operations during “SCUD hunting” missions. Focus COA development on those data elements that provide the highest leverage for AMD commanders. To prioritize each enemy COA:

- Analyze each to identify its strengths and weaknesses, centers of gravity, decisive points and risk factor.
- Evaluate how well each meets the criteria of suitability, feasibility, acceptability, uniqueness and consistency with doctrine.
- Evaluate how well each takes advantage of the battlefield environment.
- Consider that the enemy force may choose the second or third “best” COA while attempting a deception operation portraying acceptance of the “best” COA.
- Analyze recent enemy activity to determine if there are indications that a specific COA is being adopted. Do current dispositions favor one COA over others?

5-24. Expand each COA in the amount of detail that planning time allows. Once the complete set of enemy COAs has been identified, evaluated, and prioritized, develop each COA with as much detail as the situation requires and time allows. Develop each in the order of its priority and the commander's guidance. Each COA should answer the following 5 questions:

- WHAT (the type of operation [that is, deploy, attack, or maintain])?
- WHEN (the time the action will begin [state this in term of the earliest time that the enemy Air and Missile threat force can adopt the COA under consideration])?
- WHERE (the COA sectors, zones, direction of attack, and objectives)?
- HOW (the method [that is, dispositions, location of main effort, the scheme of maneuver, and how it will be supported] the enemy uses to employ its assets)?
- WHY (the enemy objective or end state)?

5-25. Time permitting, the final product should consist of a comprehensive, detailed set of AMD COAs, describing the situation and the COA options.

SITUATION ANALYSIS

5-26. Situation is an analysis of the expected enemy dispositions should a particular COA be adopted. Several analysis may have to be conducted for each predicted stage of enemy operations and represent different "snapshots in time" and typically start with the enemy force's initial array of forces. They depict points where the enemy air and missile threat forces might adopt branches or sequels to its main COA, places where the enemy forces may be especially vulnerable, or other key points in the battlefield (that is, initial contact or Air and Missile operations aimed against specific friendly forces). Use situation analysis to support staff war gaming and to develop event templates and event matrices.

5-27. Conduct the situation analysis by combining the current operation under consideration, the enemy doctrine assessment, the available enemy Air and Missile Defense forces, and the battlefield environment's effects on operations. Use this integrated assessment technique to form a complete situational analysis. There will be many possible outcomes of this integrated analysis, so consider the situation from the enemy commander's point of view when selecting from among them.

5-28. The situation analysis is a checkpoint to ensure that all the major assets have been accounted for, and that none have been inadvertently duplicated. This ensures that the template reflects the main effort identified for this COA. Compare the depicted dispositions to the known enemy doctrine, checking for consistency. Always consider the enemy's desire to present an ambiguous situation and achieve surprise. Include as much detail as the time and situation warrant. For example, if the enemy force is conducting multiple missile combat operations, identify the operations' likely launch areas, likely assets of enemy attack, hide sites, and trans loading areas. Visualize how the enemy force transitions from its current positions to those depicted in the analysis and consider its scheme of maneuver through the COA's success or failure. Identify points where forces will transition from one formation to another, potential hide sites, etc. After working though the scheme of maneuver, determine how each of the enemy's Air and Missile threat systems "fits in" and supports the operation.

5-29. The command level and type of operation have a direct bearing on the detail that goes into each situation analysis. At strategic levels, situation analysis might focus on the shift of enemy Air and Missile forces from garrison to field deployment, as well as political and economic developments that may indicate an adversary's intent to use these forces. Named Areas of Interest (NAIs) highlighting these actions can sometimes encompass large regions. At operational levels, the situation analysis might focus on groups of Air and Missile threat vehicles, operating areas, and Lines of Communication (LOCs). Operational NAIs may be large operating areas or logistical support areas. At tactical levels, the focus may be on individual vehicles in Air and Missile threat dispositions. These NAIs are often "pinpoint" locations such as garrison storage locations, runways, road junctions, or small unit battle positions. Tailor the situation analysis to the factors that are important to the commander or mission area. For example, if the important factor to the current AMD mission is missile launchers, then the situation analysis should focus on missile launchers, should show only the location, quantity, and movement routes of these launchers, and this analysis would be used in the development of the enemy COAs that focuses on the employment of enemy missile launchers.

5-30. Depicting enemy movement by evaluating time and space factors develops time phase lines (TPLs). TPLs are used to depict the expected progress of the operation and are based on the enemy doctrinal rates of movement, with some modification. Evaluate and compare actual database movement rates with written doctrine. Consider battlefield environmental effects on mobility by using terrain analysis systems, such as generic area limitation environment (GALE). The developed timeline could indicate spacing between the various elements as well as the time each element is expected within each NAI.

DESCRIPTION OF THE COA AND OPTIONS

5-31. Describe enemy Air and Missile threat activities and systems depicted in the situation analysis either in text form or with a detailed "synchronization matrix." Address timelines to include the earliest time the enemy force COA can be executed, phases associated with the COA, and probable enemy command decisions made during and after COA execution. Use the enemy COA depiction and timeline to support staff war gaming and to develop event template and supporting indicators. As the enemy force approaches friendly decision points (DP), record each decision and its timeline into the enemy COA depiction. DPs are points in space and time where the commander anticipates making a decision concerning the specific friendly COA. These decisions are usually triggered by specific threat force activity and are normally associated with one or more NAIs. This is the basis for developing AMD branches or sequels, if they are needed to support friendly planning. Record any decision criterion that is associated with a DP.

IDENTIFY INITIAL COLLECTION REQUIREMENTS

5-32. After identifying the set of potential enemy COAs, determine which one will be adopted. Initial collection requirements aid in this identification. To identify these requirements, predict specific areas and activities that when observed will confirm which COA the enemy force has chosen. NAIs are the areas, routes, and points where key events are expected to occur. NAIs can be:

- Large areas, such as brigade or battalion field operating areas; often referred to as "SCUD boxes" or "Air and Missile threat operating areas."
- Normal or focused areas, such as terrain, over which expected units are expected to move and suitable field operating areas (that is, launch and hide sites).
- Contiguous routes, such as roads or waterways.
- Point locations, such as road intersections and fixed facilities.

5-33. NAIs are typically hierarchical in nature. A large area NAI may include many area, contiguous and point NAIs. Contiguous NAIs, such as roads, may contain point NAIs, such as road intersections. Indicators are the activities that identify the selected COA.

THE EVENT MATRIX

5-34. The differences between the NAIs, indicators, and COA phases of operations form the basis of the event matrix. The event matrix is a guide for collection, reconnaissance, and surveillance planning. It aids in determining which COA the enemy force has adopted by showing where to collect the information. Since single enemy event templates may not be practical, considerable cooperation amongst all the friendly AMD intelligence elements within a multiservice AMD environment is needed. One method is to produce multiple even matrices at the strategic, operational, and tactical levels and for the AMD operation they are supporting (that is, active defense, passive defense, and attack operations). Evaluate each COA to identify its associated NAIs. It is important to mentally war-game the execution of the COA and note places where activity must occur if that COA is adopted. Pay particular attention to times and places that specific enemy Air and Missile threat assets enter or use areas, so that they can be easily acquired and engaged. These areas evolve into NAIs and together with the correct use of DPs and timelines can support targeting. Allow enough time from the verification of an NAI activity and the decision to target to asset identification and strike mission. Consider those places the AMD force expects to take certain actions or make certain decisions. An NAI can be a specific point, a route, or an area and can match obvious natural terrain features or arbitrary features, such as engagement areas. Make NAIs large enough to encompass the activity that indicates the enemy COA. Compare and contrast COA associated NAIs and indicators with each other and identify any differences. Place emphasis on the differences that most reliably confirm or deny the adoption of a COA. The initial event matrix should focus only on identifying which of the predicted COAs

the enemy force has adopted. Later, it will be updated and refined to support friendly decisions identified during staff war gaming.

IDENTIFY TARGET NOMINATIONS

5-35. After identifying potential enemy COAs and establishing initial collection requirements, identify as many targets as possible for attack operations. To identify High Value Targets (HVTs), predict specific points, areas, equipment, and activities which, when observed from established collection requirements, reveal enemy targets for attack operations. The result is an HVT nomination list and an event matrix. Develop the event matrix using the same guidelines as those for identification of initial collection requirements but with focus on HVTs. The completed event matrix aid in target planning for attack operations. Certain HVTs are nominated during the command staff war gaming process to become High Priority Targets (HPTs) and make their engagement an integral part of the friendly COA under consideration. HVT graphic and targeting materials may also be required. The AMD IPB process produced a number of graphics, textual descriptions, and imagery products, some of which are used within target folders. Package and give these and any updated products to the target planners as some targets may not have target folders built or may have only partial target folders.

Appendix A

AMD IPD INTELLIGENCE ASSESSMENTS

INTELLIGENCE CONFIDENCE ASSESSMENTS

A-1. AMD IPB development distinguishes between what is known with confidence (recommended confidence scale below) and what are untested assumptions. Intelligence can be an observed fact or a conclusion based on facts of such certainty that it is considered to be knowledge. It can also be conclusions and estimates deduced from incomplete sets of facts or from potentially related facts. Make and maintain these distinctions when creating AMD IPB templates. The commander may decide on courses of actions based on whether the intelligence utilized in the COA development is "fact" or assumption, its confidence level, and the particular logic used to develop the intelligence estimate.

A-2. Adapt an internal methodology for tracking the reliability and credibility of AMD IPB intelligence analysis and conclusions, and for presenting consistent and uniform information to decision makers. The intelligence community uses 3 methodologies, which can be used independently or in conjunction with each other, to assess information validity. The 3 methodology scales are *confidence level*, *source reliability, and information credibility*. The latter 2 are typically used with Human Intelligence (HUMINT) information but are equally applicable to many other types of information.

- Confidence-Level Scale:
  - HIGH PROBABILITY (CONFIRMED) = > 95 percent.
  - PROBABLE = 75 – 95 percent.
  - LIKELY = 50 – 74 percent.
  - LOW PROBABILITY (UNLIKELY) = 5 – 49 percent.
  - VERY LOW PROBABILITY (VERY UNLIKELY or DOUBTFUL) = < 5 percent.
- Source Reliability Scale:
  - A = COMPLETELY RELIABLE.
  - B = USUALLY RELIABLE.
  - C = FAIRLY RELIABLE.
  - D = NOT USUALLY RELIABLE.
  - E = UNRELIABLE.
  - F = RELIABILITY CANNOT BE ASCERTAINED.
- Information Credibility Scale:
  - 1 = SEVERAL CONFIRMATIONS.
  - 2 = PROBABLY TRUE.
  - 3 = POSSIBLY TRUE.
  - 4 = DOUBTFUL.
  - 5 = IMPROBABLE.
  - 6 = CREDIBILITY CANNOT BE ASCERTAINED.

ALL SOURCE APPROACH

A-3. The intelligence community divides sources into several distinct categories; each with a unique contribution to the AMD IPB process. They are Imagery Intelligence (IMINT), Signals Intelligence (SIGINT), Human Intelligence (HUMINT), Measurement and Signature Intelligence (MASINT), Geospatial Intelligence (GEOINT), Open Source Intelligence (OSINT), Technical Intelligence (TECHINT), and Counterintelligence (CI).

A-4. Evaluate, correlate, and integrate all relevant information and intelligence from all sources into AMD IPB products to present the most complete, accurate, and objective views possible. Using and having access to all information and intelligence sources is essential to understanding the operational environment, because single-source intelligence analysis may lead to incomplete assessments. Use of the all-source concept and methodology reduces the risks of deception, and all-source collection and analysis help to identify and frustrate an adversary's deception and denial attempts. All-source intelligence fusion begins with collection and production planning. Each source can provide useful information and cues for other source collection and exploitation.

CLASSIFICATION OF SOURCES

A-5. The all-source approach stresses using all available intelligence to include sources classified up to and including Top Secret (TS)/Sensitive Compartmented Information (SCI). Generally, most AMD IPB relevant source reports are classified at the SECRET//NOFORN (Not Releasable to Foreign Nationals), but there may be important information that must remain at the TS/SCI level. In these instances, separate AMD IPB products might have to be created to allow for continued MDMP and COA planning for personnel with the proper clearance and need-to-know.

INTELLIGENCE PRODUCTS

A-6. Once the analyst evaluates his or her hypotheses, the intelligence product can be created. Intelligence products can range from written reports to oral presentations to video intelligence products. To create the best product, the analyst should understand the relationship between the analyst's and the consumer's organization. The analyst needs to create the reporting medium that will best fit the needs of the consumer. See Table A-1 on page A-3.

Table A-1. Intelligence Products

Indications and Warning (I&W)	***Current intelligence reports from theater assets, theater I&W support, and correlation of force movements in the joint operations area (JOA). National level provides tip-off and warnings of imminent or hostile activity.***
Current Intelligence	Military and political events of interest from Joint Intelligence Operations Center (JIOC), Joint Intelligence Support Element (JISE), and national sources. Counterintelligence on current foreign intelligence activities. Reports on joint force operations. Summaries and briefings by JIOC, JISE, and national organizations. Open-source intelligence in the JOA.
General Military Intelligence	Tailored to specific mission: Political, economic, and social aspects of countries in the JOA. Information on organization, operations, and capabilities of foreign military forces in the JOA. Counterintelligence on foreign intelligence capabilities and activities, as well as terrorism, which impacts the force protection mission. Formats: Military Capabilities Assessment, Military-Related Subject Assessment, Adversary Course of Action Estimate, Foreign Intelligence Threat Assessment.
Target Intelligence	Target systems analyses. Electronic target folders containing target materials describing characteristics of selected targets. Target lists. Combat assessment products.
Scientific and Technical Intelligence	Adversary weapon system capabilities and vulnerabilities. Medical capabilities and health services available in the JOA. Potential collateral effects from attacking weapons of mass destruction sites.
Counter-Intelligence	Counterintelligence analyzes the threats posed by foreign intelligence and security services and the intelligence activities of non-state actors.
Estimative Intelligence	Estimates provide forecasts on how a situation may develop and the implications for planning and executing military operations.

INTELLIGENCE COLLECTION MANAGEMENT

A-7. Collection management for the AMD IPB planner, is the process of determining the priority of each AMD intelligence requirement in order to ensure that the most important/relevant intelligence data is collected first. There are many ways to acquire needed information from the intelligence community for AMD planning and operational use. These range from Secret Internet Protocol Network (SIPRNET) sites that are maintained by the intelligence agency to attachment of intelligence personnel to the AMD unit in order to provide instantaneous and time sensitive intelligence information to the AMD commander. Successful collection managers are aware of AMD IPB objectives, information needs (quality, quantity, frequency, etc.), and the constraints and limitations imposed on the AMD IPB process. Collection managers must notify intelligence agency as soon as possible of any changes to the intelligence requirements.

INFORMATION EXCHANGE REQUIREMENTS

A-8. In the same method that Information Exchange Requirements (IERs) are utilized by a Joint Interface Control Officer (JICO) to establish Tactical Data Links (TDL), the AMD planner should establish IERs with the intelligence agency. Typical IERs contain the basic exchange requirements that are utilized later to develop materiel and non-materiel solutions to providing the required information within the required amount of time to the AMD unit. See table A-2 for an example of an intelligence IER

Table A-2. Intelligence Information Exchange Requirements (IER)

Rationale	*Event/Action*	*Description*	*Intelligence Agency*	*Receiving Unit*	*Format*	*Timeliness*	*Class*
UJTL 6.1 M10	AMD Detection of Threatening TBM	Confirmation of Launch Point of Threatening TBM	Missile and Space Intelligence Agency (MSIC)	AAMDC G2	J3.0 – Launch Point Determination Message (Digital)	Immediate	SECRET

AMD air missile defense TBM tactical ballistic missile
UJTL universal joint task list

INTELLIGENCE COLLECTION REQUIREMENTS

A-9. When developing the collection requirements for the intelligence agency, always state intelligence requests clearly and include precise parameters (desired and minimum required). Parameters include requirements, suspense dates, frequency of coverage, resolution/level of information, and other intelligence or platform specific requirements.

TIME CRITICAL REQUIREMENTS

A-10. AMD operational missions and/or mission areas may require intelligence information or updates in real-time. In these mission areas, the timeliness required is "upon recognition." (Example: For successful execution of the Attack Operations mission area, the location for a TBM Transporter Erector Launcher (TEL) that recently launched a missile would be a time critical requirement to support "SCUD hunting" [destroying enemy TELs before they can either leave the area, hide, or launch another TBM]).

ROUTINE REQUIREMENTS

A-11. Requester needs in 24 hours or more. It supports routine combat operations and is addressed through the collections process (Example: Predictive analysis after the first few days of the enemy aerial offensive for assessment of the approved AMD IPB and for other operational and logistical considerations, such as readiness postures of AMD units or best windows of opportunity for scheduled maintenance actions).

STANDING REQUIREMENTS

A-12. Usually established before a contingency arises and provides a baseline for the intelligence problem set (Example: Digital Terrain and Elevation Data (DTED) utilized during AMD planning to conduct sensor coverage analysis.

FREQUENCY

A-13. Establish collection frequency requirements based on the effect each type of intelligence report has on the AMD planning or operation. Frequency requirements may be real-time (as in the Attack Operations example) or upon mission completion (for operational Battle Damage Assessment (BDA)).

Appendix B

AMD IPB TEMPLATES

TEMPLATES

B-1. Templates are basic graphical supplements to AMD IPB analysis and may best communicate the intelligence picture. They assist but do not replace in-depth battlefield analysis and the intelligence estimate, which are the basis for intelligence and operational planning. Currency in the template is maintained through graphic renewal or update. The majority of IPB analysis is done manually, a time and manpower intensive process. Exploit any automated graphical analysis tools and displays if they are available. Automated tools are particularly useful when dealing with time-critical/time-sensitive targets (TCT)/ (TST). Prioritize template production to produce the graphics that are most beneficial to the command first. AMD IPB templates should be distributed to subordinate units when feasible. This maximizes unit efficiency and permits subordinate units to expand on higher level AMD IPB products or produce others unique to their unit mission.

B-2. Templates are normally graphical illustrations but can be in a matrix, tabular, textual, or other format. Templates provide a visualization of the intelligence databases and have numerous purposes and functions. Terrain and weather factor overlays; for example, depict the effects of terrain and weather on potential AMD COAs. Templates graphically depict AMD force capabilities; AMD force characteristics (that is, force dispositions, weapons, and equipment) predict probable AMD force COAs and confirm or refute predictions. Templates need to be dynamic and continuously updated to maintain a current assessment of the AMD force status. The AMD IPB process normally produces some of the following template types (not all templates may apply to all AMD missions, and often templates are merged together when they contain similar data/information):

- Objectives Summary
- Air and Missile Defense Area of Operation and AOI
- Air and Missile Defense IPB Checklist
- Terrain Analysis
- Threat Platforms

ESTABLISH A CONSISTENT FORMAT FOR ALL TEMPLATES

B-3. The particular format is not as important as consistency. The format depends greatly on what type of information is required by the commander, the AMD planner, or necessary to be compliant with automation tools. Once the best format is determined, consistency in format should be maintained to avoid confusion when distributing, when war gaming, and when making updates or changes.

AMD OBJECTIVES SUMMARY

B-4. Figure B-1 is a sample template for an AMD IPB Objectives Summary. Use it to analyze the commander's intent in order to encapsulate the requirements for an AMD IPB, and to ensure that the AMD IPB effort is properly focused on the relevant and necessary intelligence information. For instance, an AMD weapon system may be capable of engaging Tactical Ballistic Missiles (TBM) and CM. However the AMD commander's intent may have only been to defend Asset "X" against TBMs. Failure to take commander's intent into account may result in the AMD planner spending large amounts of time researching and gathering intelligence data on enemy CMs, and even recommending a weapon system configuration that allows a defense against CMs at the risk of reduced TBM defense. If Commander's intent had been properly analyzed, the priority of effort would have been to the TBM defense, with only cursory intelligence gathered on the enemy CM capability in order to provide the commander with an understanding of the risk of the enemy CM threat, and possible options for branches or sequels to the primary Operational Plan (OPLAN). See Table B-1.

Table B-1. Objectives Summary Template

Objective
Obtain Operations Order (or Similar Document) to Conduct AMD IPB Analysis
Analysis Commander's (Organic, 1-Up, and 2-Up) End state or Intent
Extract AMD Tactical Tasks to Proceed with AMD IPB
Determine if JFC Critical Asset List (CAL) has Been Created and Prioritized
Determine if the Asset Criticality, Vulnerability, and Threat (CVT) Analysis has Been Conducted
Determine if the Defended Asset List (DAL) Been Created and Prioritized
Assess the Availability of Required Intelligence Data
Identify Required Intelligence Gaps
Determine AMD Assets Types and Quantities Available for Tasking
AMD air missile defense IPB intelligence preparation of the battlefield JFC joint force commander

AMD IPB CHECKLIST

B-5. Table B-2 is a template for a suggested IPB checklist. Use it to quickly organize the AMD IPB process and determine the detail required. This checklist aids in identifying the depth of coverage needed to support current AMD IPB data requirements and analysis. Break each sub-step out further as required for the situation. Prioritize them using a simple 1-2-3-priority scheme or a more complex one if desired. Defining the Criticality can assist in determining which portions of the AMD IPB are most critical to the execution of the commander's mission and which ones may be able to be deferred or omitted if time does not allow. Various levels of detail may be required to accomplish the current AMD mission. It may be helpful to assign a level of detail required (i.e. 1, 2, or 3) in order to limit the AMD planner from over (or under) researching any particular intelligence area. Lastly, in order to utilize this checklist as an IPB tracker, the Status column can be used to keep track of each IPB step. Use of simple terms like Red, Amber, or Green, should be sufficient to track general progress of the AMD IPB process. Use the checklist to identify any recurring requirements, assign the necessary level of detail, determine current status, and to define the AMD IPB elements required for the current command mission. By initially skimming the checklist and then reevaluating the requirements based on available time and resources, the entire AMD IPB process is more effectively balanced. Use the checklist as a guideline for all the steps and as intelligence requirements are filled; use it to monitor and maintain their status. The checklist is not meant to be comprehensive. It is a basis for starting, guiding, and tracking the AMD IPB process and starting the collection process. See Table B-2 on page B-3.

Table B-2. AMD IPB Checklist

Item #	*Checklist Item*	*Priority (1,2,3)*	*Criticality (H/M/L)*	*Detail (1,2,3)*	*Status (G/A/R)*	*Notes*
1	Define the Operational Environment	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
1.1	Analyze the Commander's Mission and Intent in Relation to Air and Missile Defense	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
1.2	Identify the Air and Missile Defense Area of Operation	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
1.3	Identify the Air and Missile Defense Area of Interest	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
1.4	Evaluate Existing Databases and Identify Intelligence Gaps	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
1.5	Initiate Collection of Information Required to Complete IPB	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2	Describe the Environmental Effects on Operations	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.1	Observation and Fields of Fire	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.2	Air Avenues of Approach	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.3	Key Terrain	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.4	Obstacles	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.5	Cover and Concealment	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.6	Surface Materials and Configuration	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.7	EM Spectrum	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.8	Transportation and LOC Infrastructure	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.9	Urban Areas	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.10	Cross-Country Mobility	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
2.11	Weather Effects	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3	Evaluate the Threat	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.1	Tactical Ballistic Missile (TBM)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.1.1	Ballistic Missile Performance	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.1.2	Enemy Threat characteristics	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.1.3	Warhead Types	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.1.4	Ballistic Missile Operating Areas (BMOAs)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.2	Air Breathing Threat (ABT)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.2.1	Air-to-Ground Capability	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.2.2	Air-to-Air Capability	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.2.3	Suppression of Friendly AMD Capability	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.2.4	Fixed-Wing (FW) Flight Performance	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?

Table B-2. AMD IPB Checklist (continued)

Item #	*Checklist Item (continued)*	*Priority (1,2,3)*	*Criticality (H/M/L)*	*Detail (1,2,3)*	*Status (G/A/R)*	*Notes*
3.2.5	Rotary-Wing (RW) Flight Performance	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.2.6	Enemy Threat characteristics	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.3	Cruise Missile (CM)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.3.1	CM Flight Performance	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.3.2	Countermeasures	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.3.3	Enemy Threat characteristics	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.3.4	Radar Cross Section (RCS)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.4	Unmanned Aircraft System (UAS)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.4.1	UAS Flight Performance	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.4.2	Countermeasures	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.4.3	Enemy Threat characteristics	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.4.4	Radar Cross Section (RCS)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.5	Anti-Radiation Missile (ARM)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.5.1	ARM Flight Performance	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.5.2	Enemy Threat characteristics	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.5.3	Radar Cross Section (RCS)	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
3.6	Asymmetric Threat	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
4	Determine Threat Courses of Action	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
4.1	Enemy Most Dangerous Course of Action	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?
4.2	Enemy Most Likely Course of Action	1,2, 3	H, M, L	1,2, 3	G, A, R	Any Notes?

AMD air missile defense
ARM anti-radaiation missile
IPB intelligence preparation of the battlefield
LOC lines of communication

AMD AREA OF OPERATION (AMD AO)

B-6. Figure B-1 is a sample template for an AMD AO. This is a notional example to demonstrate a graphical representation of AMD capability to the AMD Commander. Remember, the purpose of the AMD AO is to demonstrate weapons system capability in a manner that provides the commander a better understanding of the battlespace from an air and electronic-centric perspective. In the figure B-1 example, the AMD planner has decided to represent the instrumented maximum range of each radar as the AMD AO. The planner could have also utilized any available cueing ranges, or possibly shorter ranges representing radar line of site issues. However, knowing that an "Early Warning" template would most likely demonstrate external sensor additions to the organic air picture, or that a "CM" template would most likely demonstrate any radar line of site considerations, instrumented range was chosen for this initial template. Though this template seems rudimentary, it actually is providing the commander with situational awareness of many aspects of the AMD battlespace in a single picture. For instance, the commander can see where the AMD assets are situated in the friendly country (units marked 1 through 3 in Republic of Utopia), where the enemy BMOAs are located with respect to the friendly country and the AMD units (TLA's 1 through 4, located in Ruritania and Xenia), and how well each BMOA is covered within the AMD units' field of view (both in azimuth and in range). The AMD AO can be expanded to whatever detail is necessary to provide the commander a complete understanding of the Air and Missile Defense Area of Operation. For example, Figure B-2 provides an example of a more complex AMD AO that shows Missile engagement envelopes, external cueing capabilities, radar dead zones, and anticipated threat detection. The complexity of the AMD AO is mission dependent and will vary as applicable, however the planner must ensure that the template does not become so complex that it is no longer a useful situational awareness tool. In this case, the planner may consider splitting the template into separate ones in order to simplify them as necessary

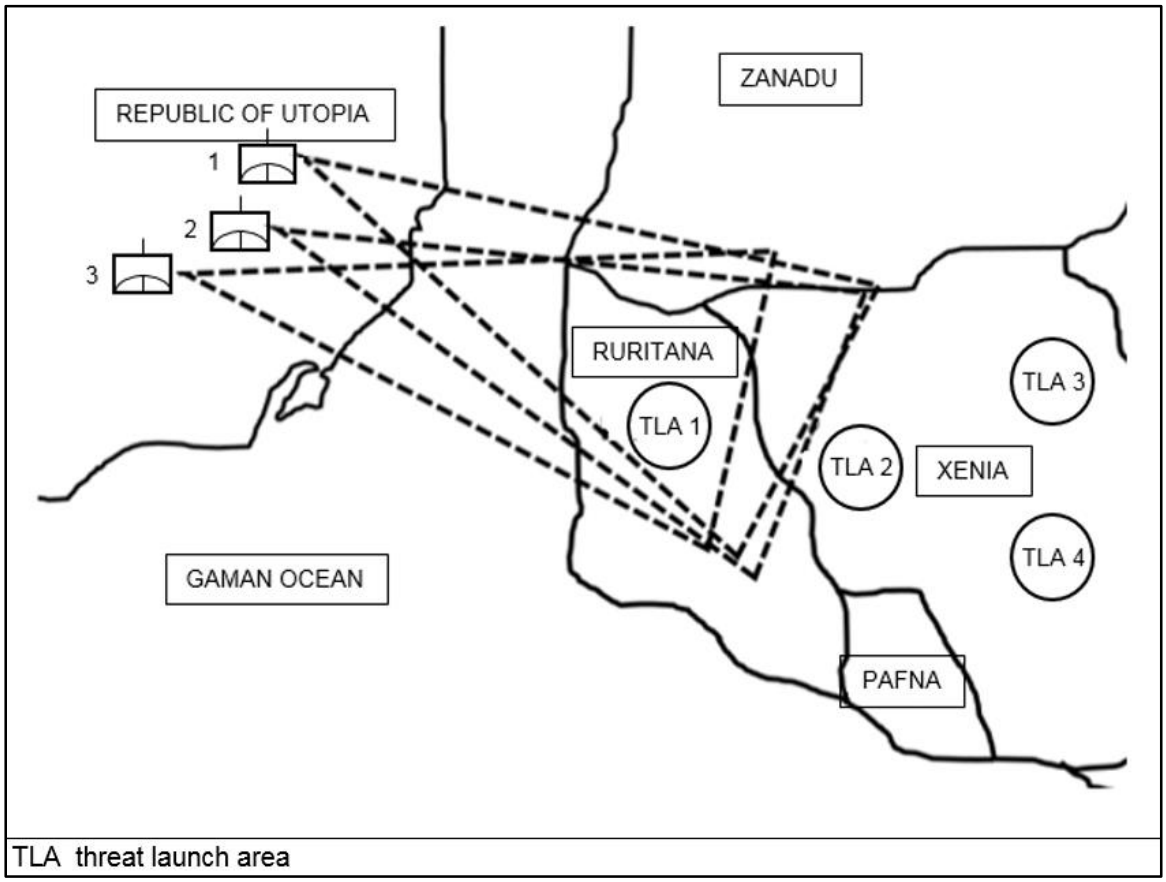


Figure B-1. AMD AO Template (Simple)

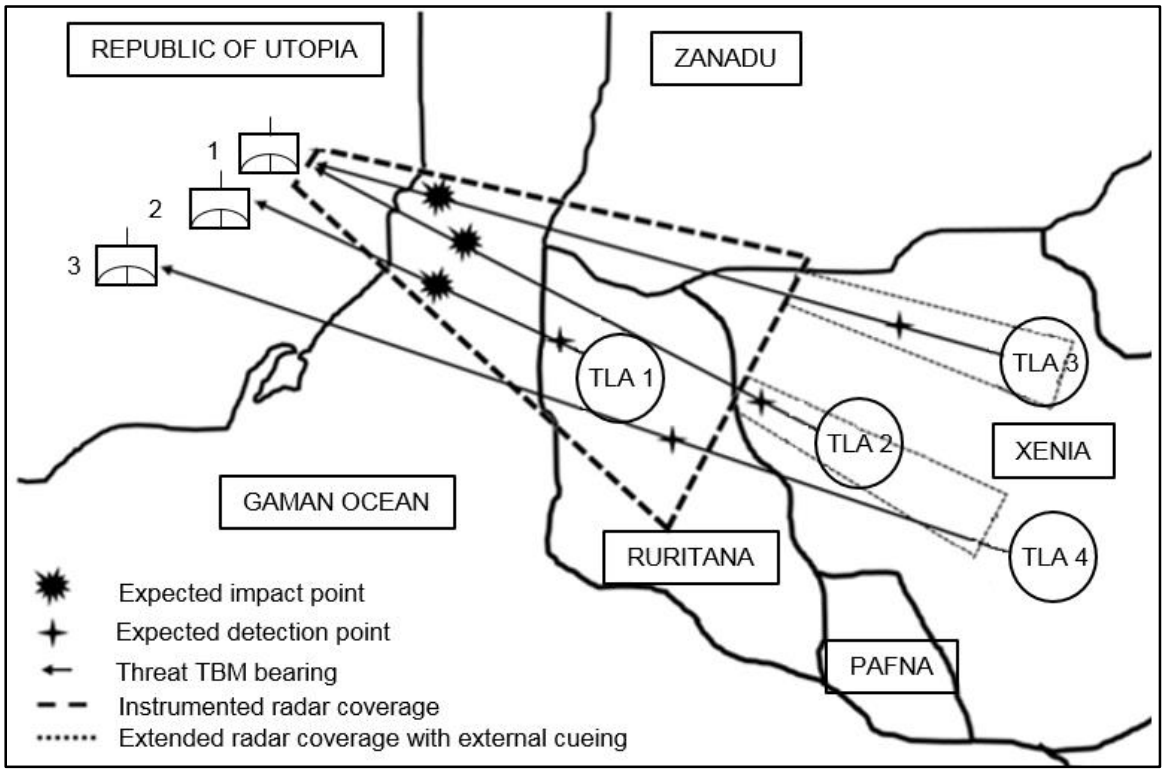


Figure B-2. AMD AO Template (Complex)

AMD AOI

B-7. Figure B-3 is a sample template for an AMD AOI. This is usually a simple template, and can often be combined with the AMD AO template (especially if various areas are represented in color). The AMD AOI is typically divided into at least three categories; Friendly Areas (areas where friendly forces exist who have a direct capability of influencing the particular AMD mission), Hostile Areas (areas where active hostile offensive and defensive aerial operations are expected to occur), and Hostile Support Areas (areas where active hostile aerial operations are not expected, however these areas may be contributing to the overall AMD mission through other passive or non-aerial means such as providing food, funding, supplies, technology, freedom of maneuver, etc. to a designated Hostile country. In color AMD AOI templates, Friendly Areas are typically colored in green, Hostile Areas are in red, and Hostile Support is in yellow. Neutral Areas (surrounding countries that are not expected to influence the AMD mission for either Friendly or Hostile forces) are typically left uncolored. In the black-and-white example of AMD AOI in Figure B-5, variable fill textures are utilized to represent each AMD AOI category mentioned above. In the AMD AOI example of Figure B-3, the countries with dots (Utopia and unnamed country in South-East) are Friendly, the countries in brick (Zanadu and Pafna) are Hostile Supporters, the countries in checkered (Ruritana and Xenia) are Hostile, and the country with no texture (unnamed country to East) is Neutral.

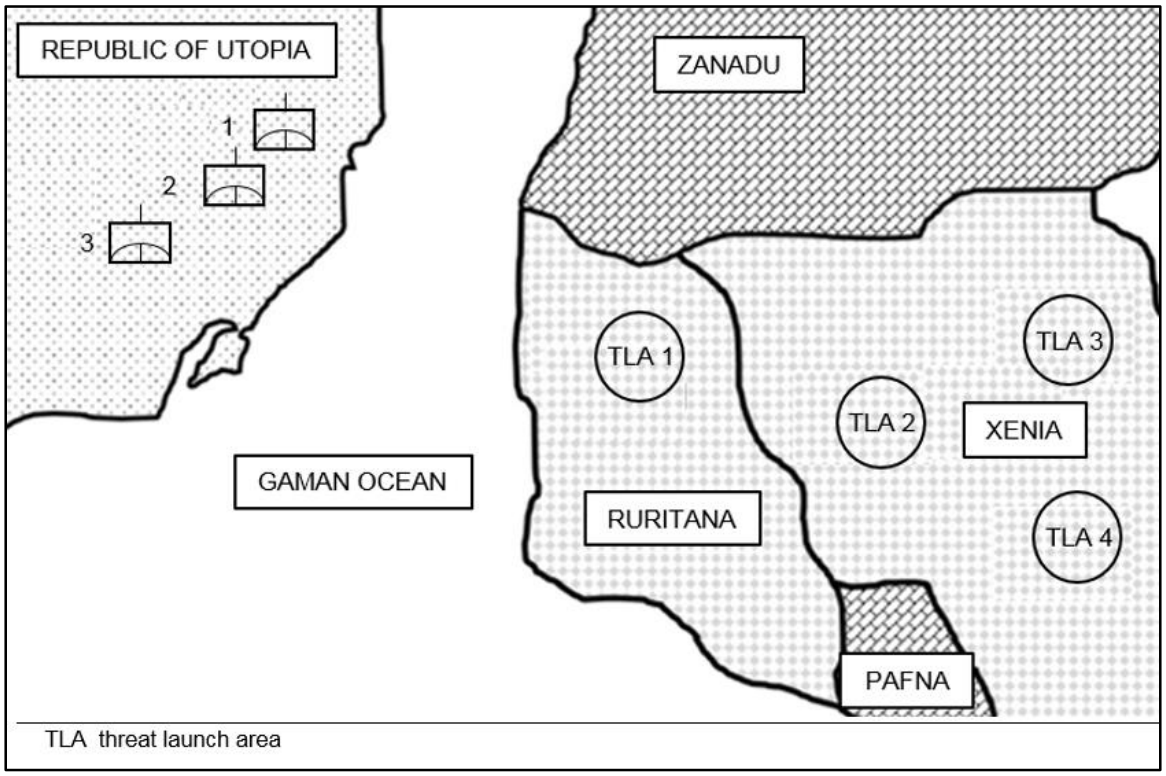


Figure B-3. AMD AOI Template

ENVIRONMENTAL EFFECTS TEMPLATE

B-8. The following figures are examples of Environmental Effects template. Figure B-4 is a simple Observation/Field of Fire template that graphically represents radar dead zones, radar maximum ranges, and maximum weapon attack depth. This information provides the commander an understanding of the effects of the limitations of RF energy to the AMD mission. For instance, TBM launches from TLA 4 cannot be observed with any of the sensors that are defending the assigned assets, and therefore the amount of radar detection, discrimination, and eventually weapon system engagement may be more limited than a TLA from which the weapon system can observe the TBM since the time it was launched. Maximum attack depth information can be utilized to determine the maximum stand-off distance that the given AMD assets are capable of maintaining, and the radar minimum ranges show where all engagements must be concluded before the radar is no longer capable of tracking the inbound threat.

B-9. Figure B-5 is a sample Air Avenues of Approach (AAA) template to represent the most likely approach of enemy aerial threats. In a complex AMD defense, there may need to be several templates to dictate various attack platforms, such as CMs, Fixed-Wing Aircraft, and Tactical Ballistic Missiles, in order to keep the template from becoming too convoluted. The templates may also have to include terrain data and any other information necessary to explain canalization points, and reasons why the enemy may be limited to certain AAA. Figure B-7 shows a simple AAA for enemy TBM attacks. Even a very simple AAA template can provide critical planning information. For instance, a weapons system may have a certain allowable attack angle. Analysis of the enemy Air Avenue of Approach can provide the information necessary to determine if the expected approach angles of enemy aerial threats exceeds the weapons systems maximum attack angle.

B-10. Figure B-6 is a sample Key Terrain template to represent important terrain that the change of control may directly affect the AMD defense design. In the Figure B-8 example, the AMD planner identified 3 areas as Key Terrain. Key Terrain 1 is TLA 1. It was determined to be Key Terrain, because if friendly forces could seize it early, TBM Type 1 would no longer be a threat for the remainder of the conflict. Key Terrain 2 is the Sea Port of Debarkation (SPOD), from which all supplies for the effort on the Republic of Utopia (ROU) are currently delivered. The last Key Terrain is the Straight of Gaman. If the enemy were to gain control of this straight, the North-East portion of the ROU would be completely cut off from live-sustaining supplies.

B-11. Figure B-7 is a sample Obstacles template to represent significant obstacles that assist or hinder AMD defense. In the Figure B-7 example, the AMD planner identified natural and manmade obstacles such as mountains, and tall buildings that could have a direct effect to the AMD mission. These effects can vary from limiting radar line-of-site, canalizing enemy AAA, providing additional cover to AMD assets, or providing elevated positions from which enemy can conduct asymmetric attacks against AMD assets (such as Advanced Electronic Counter Measures (AECM) attacks).

B-12. Additional templates can be created as necessary to understand the effects of the environment on the AMD mission. These templates may be graphical or list format depending on the type of information that is being provided. For instance, an Electromagnetic Spectrum (EM) template (when required) might show graphically all the radiating sensors, the direction of radiation, the areas of overlapping radiation, radiation hazard zones, and possibly a listing of the deconflicted radiation frequencies, while a Weather template may be better represented by listing all anticipated weather conditions and highlighting the ones that may directly affect AMD systems or Soldiers (such as extreme high/low temperatures, winds, rain, etc.)

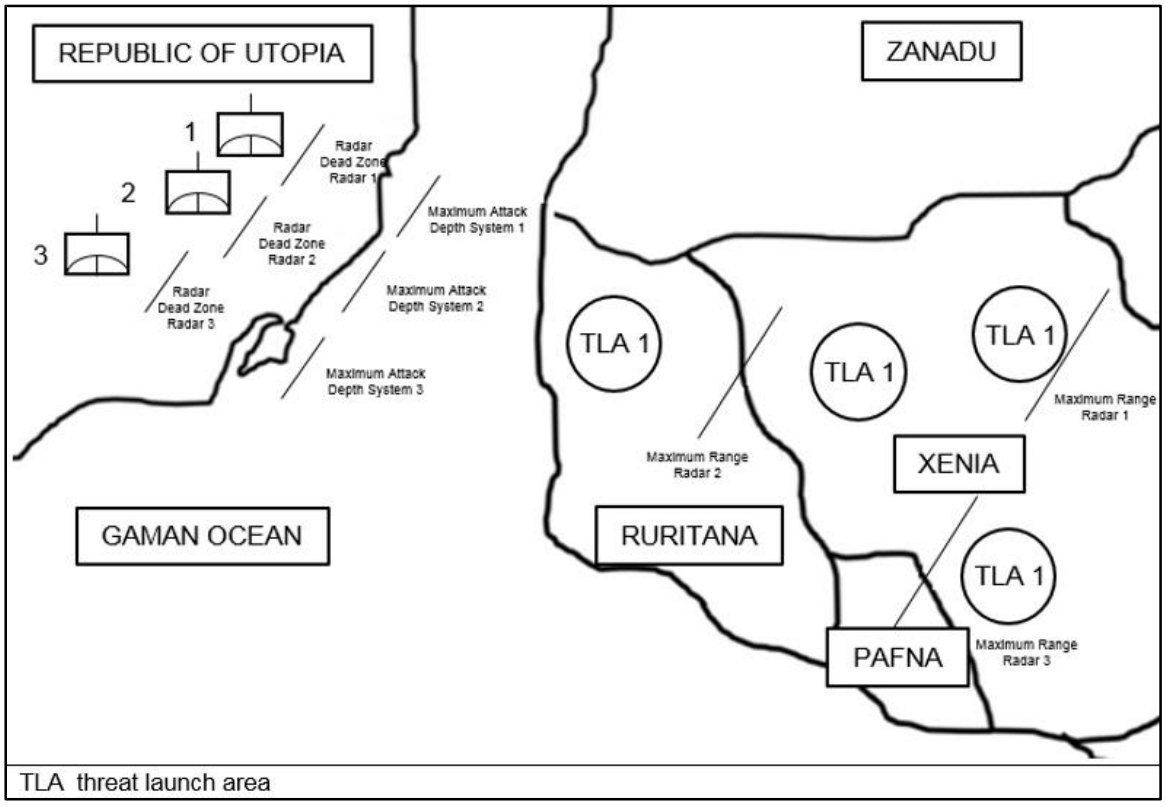


Figure B-4 Observation/Field of Fire Template

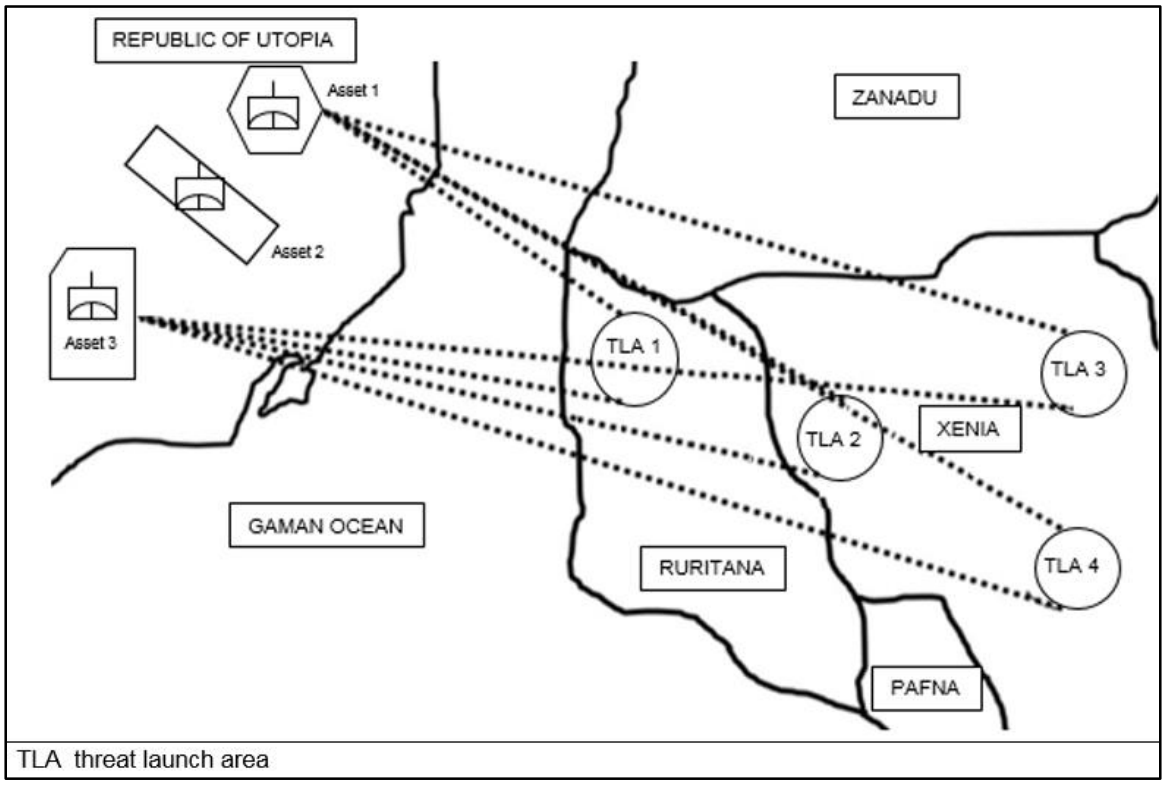


Figure B-5 Air Avenue of Approach

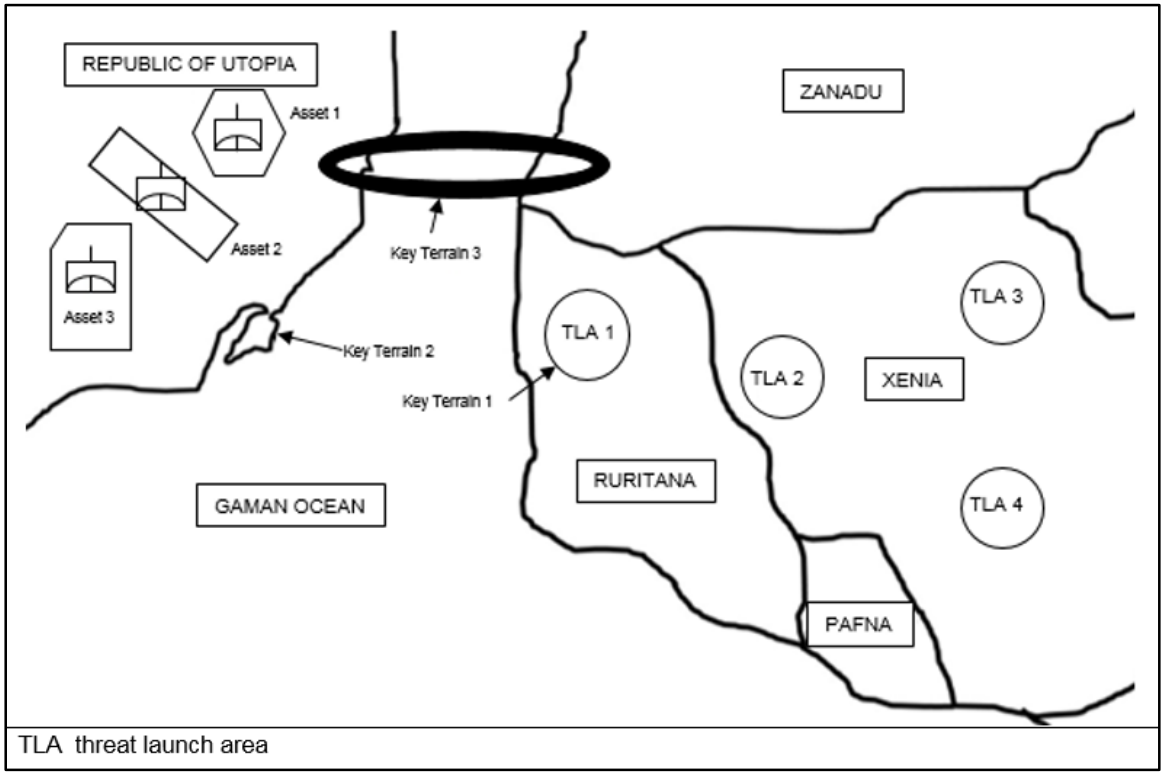


Figure B-6 Key Terrain

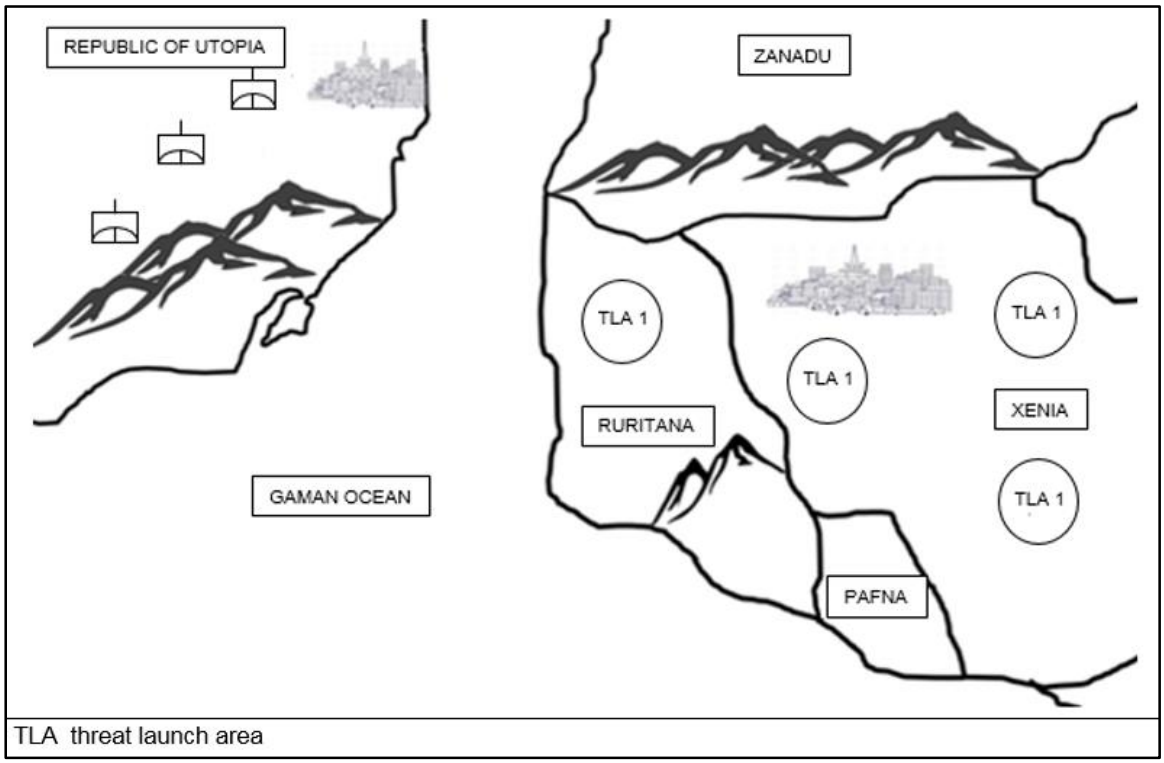


Figure B-7 Obstacles

TBM TEMPLATE

B-13. Figure B-8 is a sample TBM template. For a complex AMD defense design, the TBM Template may be several documents that are in several different formats. The templates will most likely contain an enemy threat characteristics representing each TBM type, quantities, launchers, Circular Error Probable (CEP), rate of fire, and any other information deemed necessary for the conduct of AMD planning. Another common template is the range-ring template that is demonstrated below. In the simple example of Figure B-8, the enemy is assessed to have two TBM types. The maximum ranges for each type are then plotted on a map from each BMOA predicted to contain that TBM type, to the assets (Asset 1 through 3 below) that the AMD unit is responsible for defending. The template below may seem rudimentary, but a lot of information can be initially ascertained from the information provided. For instance, only TLA1 can range any of the defended assets with TBM type 1, yet TBM type 1 is located in each of the TLAs, TLA 1 does not contain TBM type 2, TLA 2 can range all defended assets with TBM type 2, TLA 3 can only range Asset 1 with TBM type 2, and TLA 4 can only range the edge of Asset 1 with TBM type 2. This information can be utilized to make decisions on Indications and Warnings (I&W) requirements (i.e. Commander may need to know when TBM type 2 launchers are moved into TLA 2 or TLA 1, thus increasing the potential enemy rate of fire, increasing number of assets at risk against TBM type 2, or showing change in enemy intent/plan), or can be utilized to make decisions on attack operations (i.e. attack all TBM Type 1 launchers in TLA 1, thus negating the requirement to configure the weapons system for defense against TBM Type 1 and TBM Type 2 simultaneously, allowing for a more optimized defense against TBM type 2), etc.

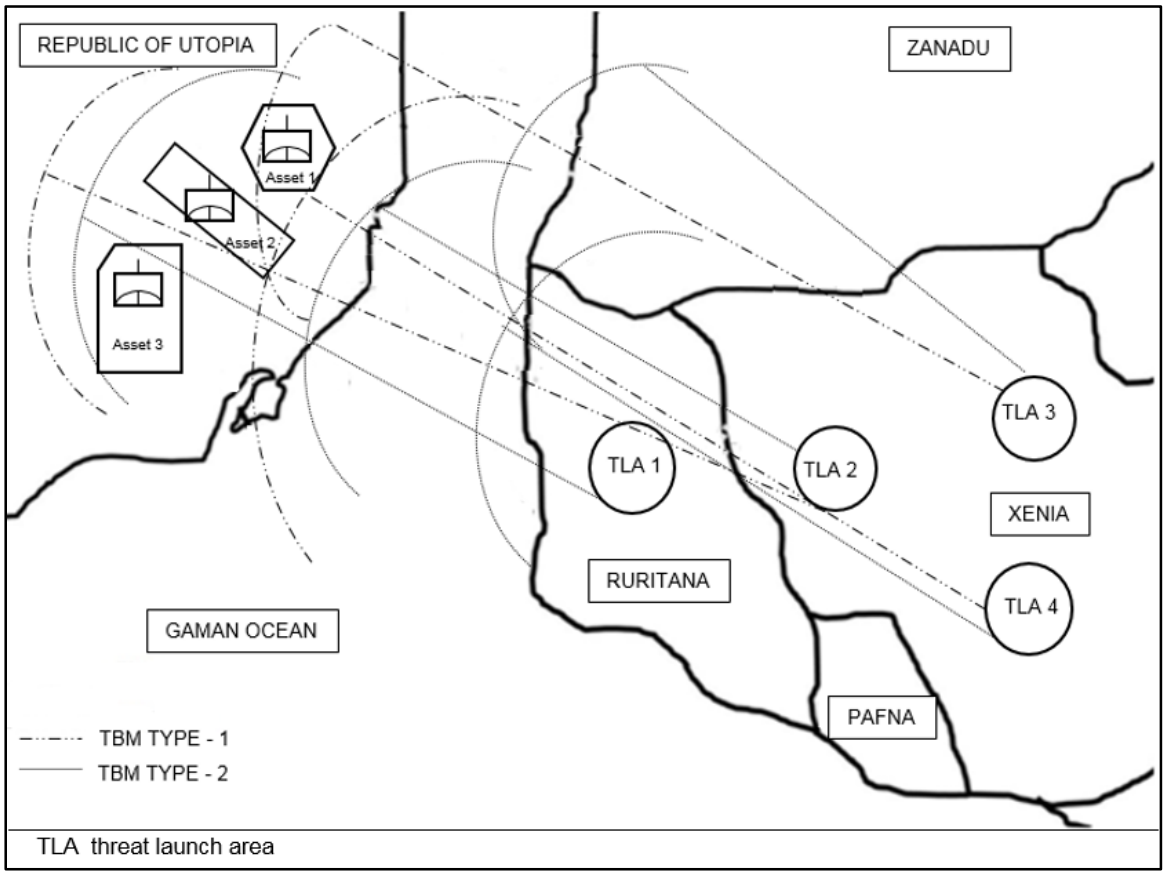


Figure B-8. TBM Template

ARM TEMPLATE

B-14. Figure B-9 is a sample of another enemy threat template, the Anti-Radiation Missile (ARM). Templates can be created as necessary for every weapon platform that the enemy possesses, and that are discussed in this manual. These templates may be a combined template for similar platforms (such as Fixed-Wing, Rotary-Wind, and/or CMs), or some platforms may not require a separate template because they are already included in a previous template (i.e. CM capability may already be covered by the Obstacles template, or the AAA template). Figure B-9 shows an example of an ARM template. This template's simple example provides critical information on where ABTs carrying ARMs are assessed to be launched from (Air Base 1 [AB 1]), what the ABT's combat radius is, what refuel capability it has, and finally whether ARMs can range the AMD sensors that are defending the designated assets.

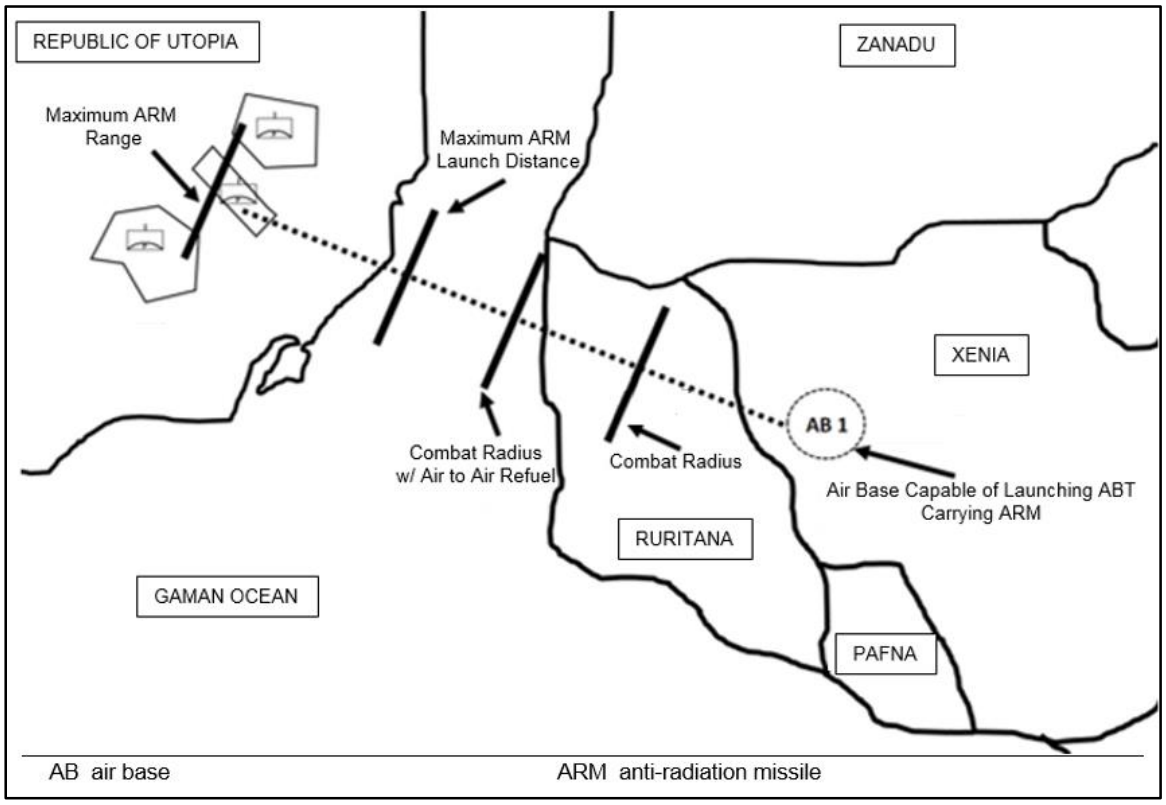


Figure B-9 ARM Template

Glossary

AAA	air avenues of approach
AAMDC	Army Air and Missile Defense Command
ABT	air breathing threat
ADA	air defense artillery
AMD	Air Missile Defense
AMD AO	Air Missile Defense Area of Operations
AO	area of operations
AOI	area of interest
AOR	area of responsibility
ARM	anti radiation missile
ATP	army techniques publication
ASCM	antiship cruise missile
BMC4I	Battle Management Command, Control, Communications, Computers, and Intellegence
BMOA	ballistic missile operating area
CAL	critical asset list
CBRN	chemical, biological, radiological, and nuclear
CBRNE	chemical, biological, radiological, and nuclear equipment
CCM	cross-country mobility
CEP	circular error probable
CM	cruise missile
COA	course of action
CVT	critcality, vunerability, and threat
DA	Department of the Army
DAL	defended asset list
EA	engagement authority
ECCM	electronic counter-countermeasures
ECM	electronic countermeasures
ETC	enemy threat characteristics
EW	electronic warfare
FM	field manual
FOA	forward operating area
FOUO	for official use only
FW	fixed wing
HVT	high value target
IPB	intelligence preparation of the battlefield
ISR	intelligence, surveillance, and reconnaissance
JFC	joint force commander
LACM	land attack cruise missile
LOS	line-of-sight
M/IRBM	medium/intermediate range ballistic missile
MDCOA	most dangerous course of action
MEL	mobile erector launcher
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, civil considerations

MLCOA	most likely course of action
NAI	named area of interest
OPLAN	operations plan
OPORD	operation order
RFI	request for information
RW	rotary wing
SCUD	surface-to-surface missile system
SIPRNET	Secret Internet Protocol Network
SRBM	short-range ballistic missile
SSM	surface-to-surface missile
TC	threat characteristics
TBM	tactical ballistic missile
TEL	transporter erector launcher
TTP	tactics, techniques, and procedures
UAS	unmanned aircraft systems
US	United States
USA	United States Army
WMD	weapons of mass destruction

SECTION II-TERMS

Areas of Interest

(DOD) A guide for collection planning that depicts the named areas of interest where activity, or its lack of activity, will indicate which course of action the adversary has adopted. See also activity; area of interest; collection planning; course of action. (JP 3-0)

Areas of Operations

(DOD) An operational area defined by the joint force commander for land and maritime forces that should be large enough to accomplish their missions and protect their forces. Also called AO. See also area of responsibility; joint operations area; joint special operations area. (JP 3-0)

Battle Damage Assessment

(DOD) The estimate of damage composed of physical and functional damage assessment, as well as target system assessment, resulting from the application of lethal or nonlethal military force. Also called BDA. See also combat assessment. (JP 3-0)

Branch

(DOD) The contingency options built into the base plan used for changing the mission, orientation, or direction of movement of a force to aid success of the operation based on anticipated events, opportunities, or disruptions caused by enemy actions and reactions. (JP 5-0)

Course of Action

(DOD) A product of the course-of-action development step of the joint operation planning process. (JP 5-0)

Decision Point

(DOD) A point in space and time when the commander or staff anticipates making a key decision concerning a specific course of action. See also course of action; decision support template; target area of interest. (JP 5-0)

Decision Support Template

(DOD) A combined intelligence and operations graphic based on the results of wargaming that depicts decision points, timelines associated with movement of forces and the flow of the operation, and other key items of information required to execute a specific friendly course of action. Also called DST. See also course of action; decision point. (JP 2-01.3)

End of Evening Nautical Twilight

(DOD) The point in time when the sun has dropped 12 degrees below the western horizon, and is the instant of last available daylight for the visual control of limited military operations. (JP 2-01.3)

Event Matrix

(DOD) A cross-referenced description of the indicators and activity expected to occur in each named area of interest. See also activity; area of interest; indicator. (JP 2-01.3)

Event Template

(DOD) A guide for collection planning that depicts the named areas of interest where activity, or its lack of activity, will indicate which course of action the adversary has adopted. See also activity; area of interest; collection planning; course of action. (JP 2-01.3)

High-Payoff Target

(DOD) A target whose loss to the enemy will significantly contribute to the success of the friendly course of action (JP 3-60)

High-Value Target

(DOD) A target the enemy commander requires for the successful completion of the mission. (JP 3-60)

Information Requirement

(Army) Any information element the commander and staff require to successfully conduct operations. (ADRP 6-0)

Intelligence Preparation of the Battlefield

(Army) 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)

Intelligence Requirement

(DOD) A requirement for intelligence to fill a gap in the command's knowledge or understanding of the operational environment or threat forces. (JP 2-0)

Latest Time Information of Value

(Army) The time by which an intelligence organization or staff must deliver information to the requester in order to provide decisionmakers with timely intelligence. This must include the time anticipated for processing and disseminating that information as well as for making the decision. (ATP 2-01)

Line of Contact

(Army) A general trace delineating the locations where friendly and enemy forces are engaged. (FM 3-90-1)

Modified Combined Obstacle Overlay

(DOD) A joint intelligence preparation of the operational environment product used to portray the militarily significant aspects of the operational environment, such as obstacles restricting military movement, key geography, and military objectives. (JP 2-01.3)

Named Area of Interest

(DOD) A 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 adversary courses of action. (JP 2-01.3)

Operational Area

(DOD) An overarching term encompassing more descriptive terms (such as area of responsibility and joint operations area) for geographic areas in which military operations are conducted. (JP 3-0)

Operational Environment

(DOD) 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)

Priority Intelligence Requirement

(DOD) An intelligence requirement, stated as a priority for intelligence support, that the commander and staff need to understand the adversary or other aspects of the operational environment (JP 2-01)

Reconnaissance

(DOD) A mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or adversary, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. (JP 2-0)

Sequel

(DOD) The subsequent major operation or phase based on the possible outcomes (success, stalemate, or defeat) of the current major operation or phase. (JP 5-0)

Situation Template

(DOD) A depiction of assumed adversary dispositions, based on that adversary's preferred method of operations and the impact of the operational environment if the adversary should adopt a particular course of action. (JP 2-01.3)

Surveillance

(DOD) The systematic observation of aerospace, surface, or subsurface areas, places, persons, or things, by visual, aural, electronic, photographic, or other means. (JP 3-0)

Target Area of Interest

(DOD) The geographical area where high-value targets can be acquired and engaged by friendly forces (JP 2-01.3)

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31 March 2016

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