# Passive Air and Missile Defense

## A Path to Capability Resiliency and Deterrence in Great Power Competition

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**Abstract**

This report explores the critical need for enhancing passive air and missile defense (AMD) capabilities to bolster U.S. military deterrence strategies against sophisticated air and missile threats below the nuclear threshold. With active defense measures and U.S. offensive capabilities proving costly and insufficient against peer adversary technology and capacity, this research advocates for a significant shift toward integrating passive defense into joint military operations. The report delves into various service-level operational concepts such as Distributed Maritime Operations, Multi-Domain Operations, and Agile Combat Employment, highlighting the need for mobility, dispersion, concealment, hardening, deception, and resiliency to degrade the enemy's ability to attack U.S. forces. Additionally, the paper addresses the strategic, operational, and logistical challenges in implementing passive AMD and proposes necessary changes in military training and operational planning. Through a comprehensive literature review and analysis, this paper underscores the importance of passive AMD in achieving credible, resilient deterrence in modern warfare environments and advocates for joint force collaboration and strategic investments in passive defense capabilities. To meet these objectives, leader development and the designation of a lead office for Passive Defense is essential.

Keywords*: Passive Air and Missile Defense, Joint Operations, Counterair, Integrated Air and Missile Defense (IAMD), Detection and Warning, Force Dispersion, Mobility, Military Deception, Decoys, Training and Warfighter Development, Distributed Maritime Operations (DMO), Expeditionary Advanced Base Operations (EABO), Agile Combat Employment (ACE), Multi-Domain Operations (MDO), International Defense Cooperation*

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## Preface

*"We cannot 'active defense' our way out of the problem sets.*
*We simply don't have the money, capability, and capacity."*

– Maj Gen Rick Evans, USAF, Deputy Commander USSTRATCOM**, as quoted by Jen Judson in *Should the DoD Shift Focus Toward Passive Missile Defense*? (2019)**

### A Story of Passive Defense Deterrence

General Secretary of the Chinese Communist Party (CCP) and Chairman of the Central Military Commission, Xi Jinping, forced himself to maintain composure as he anxiously awaited receipt of updated details outlined in the People's Liberation Army's (PLA) readiness report. Months into the report's development, President Xi Jinping knew that it spoke to an assessment of the PLA's preparedness to fulfill his strategic intent and confirm his legacy through the reunification of Taiwan with China. What President Xi Jinping read in the executive summary drove a physical reaction that frightened senior advisors as their minds raced over options that could happen next.

President Xi Jinping had confidence that substantial investments made over many years in long-range missile and other offensive strike capabilities afforded the Chinese military the advantage required to degrade and defeat United States (U.S.) and allied military forces if deployed for Taiwan's aid ("Missiles of China," 2021). With a combined complement of over 2,500 short, medium, and intermediate-range ballistic missiles and over 300 land attack cruise missiles, the PLA's conventional missile inventory overmatched the approximately 745 U.S. major ballistic missile defense systems interceptors fielded worldwide ("Military and Security Developments, 2023). Accordingly, the PLA held U.S., partner, and allied air, land, and sea Pacific theater operational locations at risk.

Consistent with the winning narrative of the PLA's missile superiority, President Xi Jinping had further expected to read specific space-based intelligence details in the readiness report to confirm a recommendation that conditions were favorable to initiate a military operation to take Taiwan by force. As one reference point, he understood that the December 2023 deployment of the Yaogan-41 Optical Imaging satellite into Geosynchronous Equatorial Orbit (GEO) to provide space superiority underpinned CCP's planning through a more comprehensive intelligence collection (Erwin, 2024). Positioned nearly 22,000 miles above the earth's surface, the Yaogan-41 boosted space-based imagery capabilities from a resolution of nearly 15 meters to approximately 2.5 meters, enabling an enhanced visual fidelity of U.S. and allied military forces, vessels, and aircraft positioned across vast areas of the Pacific. Another Chinese GEO-based satellite, the Ludi Tance-4, was outfitted with synthetic aperture radar (SAR) and could collect imagery even through clouds and darkness. When these two GEO satellites worked in tandem and in partnership with the other 290 intelligence, surveillance, and reconnaissance satellites and space sensors, creative analysts assigned to the PLA's Strategic Support Force reported a matured ability to optically observe, find, and track fifth generation aircraft and other advanced U.S. systems, even if a particular platform illuminated a stealthy radar signature (Sheetz, 2023). In prior meetings, PLA senior advisors praised their space systems as the means to change the archetype calculus that overcame the West's technological advantages ("Iran wants," 2016).

Consequently, the genesis of President Xi Jinping's physical reaction reflected that he was caught off guard by analyst comments, as outlined in the executive summary. The report called into question the PLA's readiness and most critical data points required to confirm that conditions were met for a potential invasion. More shocking was the finding that recent U.S. and ally passive defense measures paired with an expanding active defense infrastructure reduced

confidence in the PLA's understanding of U.S. plans and operational posturing as suspected U.S. joint military deception and decoy capabilities increased ambiguity and instilled significant concerns in the accuracy of intelligence collections. With an audible tone of frustration, President Xi Jinping finally stated he remained deterred from further military escalation against Taiwan, preaching continued patience to Central Military Commission Vice Chairman Zhang Youxia and others in his inner circle.

## Introduction

*The first law of war is to preserve ourselves and destroy the enemy.*

— Mao Tse-Tung
"On Protracted War" (May 1938). Selected Works, Vol. II, p. 156.

The introductory story illustrates that the ability to employ credible passive air and missile defense capabilities, paired with active defense capabilities, will be a critical enabler in the Department of Defense's (DOD)' ability to deter an adversary from military activities conducted in Great Power Competition that can lead to conflict. Consistent with the U.S. National Defense Strategy's identification of China as the pacing challenge, this paper routinely references the Chinese military as a peer adversary. As such, the paper examines how a strategy relying on active defense munitions or U.S. offensive strike capabilities and capacity is insufficient to address the current and emerging competitor and adversary overmatch of Chinese ballistic missiles compared to the worldwide U.S. interceptor inventory. Moreover, it outlines how such a counter air and missile defense strategy is cost-prohibitive in the context of the current interceptor acquisition process and the staffing resources required for combat employment, introducing risk to a credible deterrence force posture. As an alternative, increased focus on the utilization of passive defense measures affords U.S. senior decision-makers low-cost solutions to sustain operational advantages to deter military conflict through increased ambiguity and the survivability of friendly capabilities when aligned to a military deception operation, decoys are employed, and capabilities are dispersed in an operational construct enabled by redundant infrastructure.

Accordingly, this paper argues that to deter adversary air and missile attacks and reduce the effectiveness of an attack below the nuclear threshold, the U.S. requires advancements in

policies, capabilities, and execution of passive air and missile defense to develop credible, resilient deterrence and to integrate U.S. air and missile defense strategy and execution across the strategic and tactical levels of warfighting. It is along this thread that this paper will discuss an overview of passive air and missile defense, the applicable policies and doctrine, the challenges encountered limiting the effectiveness of passive defenses, and the opportunities available to senior leaders to increase the prioritization of employing passive defense capabilities through the joint force to deter aggression and protect the U.S. homeland. Recommendations include leader development and the designation of a Passive Defense lead for the DoD to enable resource requirements, operational employment across the competition spectrum, logistical redundancy or hardening, and use of decoys to include retired or excess equipment to rapidly create low-cost decoy solutions to provide credible joint military deception operations that increase tactical survivability for U.S. or allied and partner forces. Examples of equipment that could be repurposed immediately and at low cost to provide a visual, radar, and radio-frequency signature includes command and control equipment and radios, air surveillance radars such as the AN/TPS-75, or legacy air defense systems such as the MIM-23 HAWK.

The research is bound by two primary and one secondary research questions.

- Primary: What are the ways and means by which passive defenses can support the desired ends of deterrence?
- Primary: What changes should be made to training, exercises, and warfighter development to ensure that passive defense is executed at the operational and strategic levels of command?
- Secondary: How can the U.S. best improve passive defenses in the homelands to achieve credible, resilient contested power projection?

To scope the research, the team excluded two areas: nuclear conflict and the detection and warning element of passive AMD. The detection and warning element of passive AMD already

has significant ongoing investment, advocacy, and programs of record, and the complexities of nuclear conflict demand a separate study.

**Passive Air and Missile Defense Policies**

Throughout this paper, the term Passive Air and Missile Defense (AMD) will be used as defined in U.S. Joint Doctrine and respective service (i.e., Army, Air Force) doctrine publications and field manuals in relation to how it fits into counterair and Joint Integrated Air and Missile Defense (IAMD), see Figure 1.

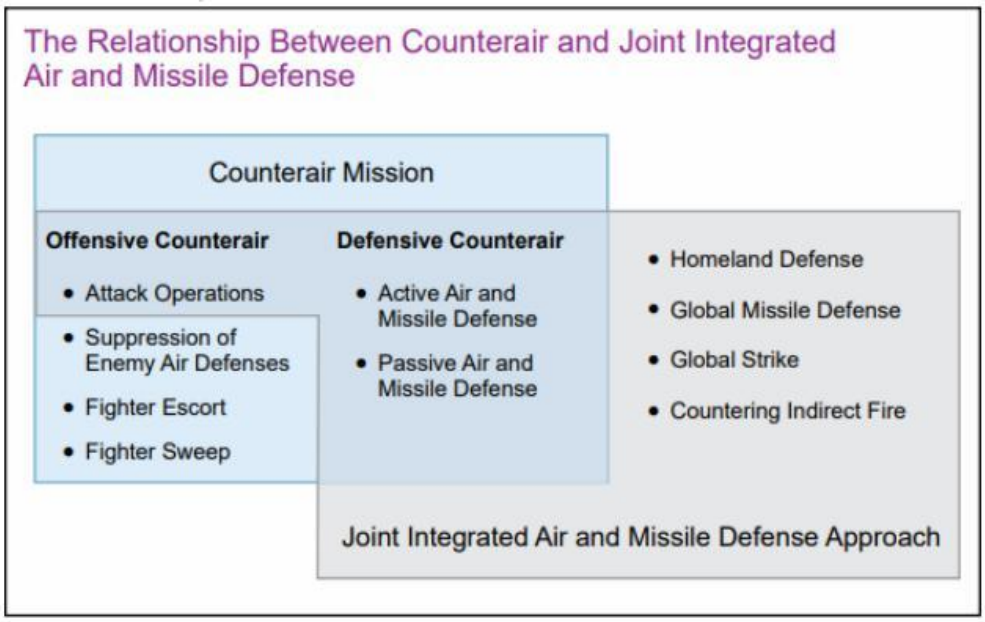


Figure 1. The Relationship Between Counterair and Joint Integrated Air and Missile Defense "("Counterair Operations [AFDP 3-01"]," 2023, p. 7)

In Air Force Doctrine Publication 3-01, Countering Air and Missile Threats, "Passive AMD includes all measures, other than active AMD, taken to minimize the effectiveness of hostile air and missile threats against friendly forces and assets" (2023, p. 6). Active AMD includes direct actions to destroy, reduce, or nullify air and missile threats. Examples include surface-to-air missile systems, defensive counter-air fighters, electromagnetic warfare, directed energy, antiaircraft artillery, and other weapons or capabilities. Passive AMD, according to the

AFDP 3-01, includes the following: “detection and warning; chemical, biological, radiological, and nuclear defenses; camouflage, concealment, and deception; hardening, reconstitution, dispersion, redundancy, [and] mobility” (2023, pp. 6-7).

## Literature Review

The research team began this project cognizant of ongoing military events involving Russia and Ukraine, where air and missile threats are routinely countered through both active and passive defense measures. This perspective helped inform the literature review. Passive AMD is already a doctrinally recognized operational element of U.S. counter-air operations and joint Integrated Air and Missile Defense (IAMD). There is broad recognition, including in the National Defense Strategy, that purchasing defensive ordnance and weapon systems to counter all air and missile threats is unrealistic and prohibitively costly (Department of Defense [DOD], 2022). Accordingly, investments in cost-effective AMD measures are appropriate given the expansion of air and missile threats.

In its 2023 Annual Report to Congress, the DOD highlighted China’s investments in capabilities designed to challenge U.S. active AMD measures and U.S. attack operations capabilities. China is modernizing its missile forces and fielding and dispersing a wide variety of rocket and missile forces, ensuring thousands of short and medium-range ballistic missiles are available for a theater fight, as well as hundreds of cruise missiles, intermediate-range ballistic missiles, and intercontinental ballistic missiles. The report also highlights that China may be developing conventionally armed intercontinental ballistic missiles capable of targeting Hawaii, Alaska, and the continental U.S. These developments compound with China’s development of a robust and redundant integrated air defense system, which in turn seeks to delay or reduce the effectiveness of attack operations in support of counter-air operations. China is also fielding a modern navy and anti-ship ballistic missiles capable of holding at-risk naval strike power (“To

receive testimony," 2023). These capabilities complement one another to challenge the attack operations and active AMD elements of U.S. counter-air operations and joint IAMD. In an environment where China can credibly outnumber active defense systems and range deep logistical targets with its offensive weapons while defending its offensive weapons from U.S. strikes, passive AMD becomes increasingly essential to enhancing capability resiliency and deterrence in Great Power Competition.

**Challenges with Employing Passive AMD Measures**

There are disparities in tactical, operational, and strategic level AMD doctrine. At the tactical level, doctrine and field manuals acknowledge the importance of passive AMD. The Army highlights the importance of passive AMD in its operations field manual, Field Manual (FM) 3-0, explicitly highlighting the risk to sustainment, command and control, and other critical enablers that may be less redundant or less resilient than front-line combat forces. Passive AMD is also an essential component of defending and controlling key terrain and island terrain (Department of the Army [DOA], 2022). In air defense-specific manuals, such as FM 3-01, there is clear emphasis on passive AMD, advising the commander on protection (Department of the Army [DOA], 2020). There is similar verbiage throughout the joint force, and drills on redundancy, reconstitution, and mobility are standard requirements for certification and combat readiness validation of tactical units.

However, passive AMD receives limited attention at the strategic and operational levels. For example, in the official repository of DOD doctrine, the Joint Electronic Library Plus, "passive defense" was found in only 13 of 71 publications, a total of 30 paragraphs, with only a few substantive references (Joint Chiefs of Staff [JCS], 2024). From the joint library, "Passive defense" and its derivatives provide limited guidance, especially at the strategic and operational

levels of war. While there is no direct correlation between frequency of use and actual value, the lack of attention "passive defense" receives in joint and service doctrine provides an indicator.

Coupled with the limited application at the operational and strategic levels is a need for more clarity in integrating passive AMD across combatant commands, the joint force, and the whole of government. Passive AMD and deterrence by denial are discussed in the missile defense review, but more in the context that only expensive interceptors will kinetically defeat some threats rather than giving clear guidance on investment or postures to pursue passive defenses (DOD, 2022). General Glen VanHerck, the previous Commander of North American Aerospace Defense Command (NORAD) and United States Northern Command (USNORTHCOM), also championed denial and deception to preserve infrastructure and forces during testimony on DOD missile defense activities in the review of the defense authorization request for the fiscal year 2024 and the future year's defense program ("To receive testimony," 2023). Studies of logistical resilience also found challenges to redundancy, resiliency, and hardening of a logistical infrastructure underpinned by non-DOD contractors and companies.

In the air and maritime domain, RAND studies highlight an understanding that the dispersal of basing, long-range weapons and aerial platforms provide a form of dispersal and mobility in response to PRC air and missile threats in the Pacific (Leftwich et al, 2022). The U.S. armed services are all working through operational concepts and updated doctrine that requires passive defenses. The U.S. Air Force highlights the importance of passive defenses in its Agile Combat Employment (ACE) Concept (Department of the Air Force [DAF], 2022; Moer et al, 2022). The Navy's Distributed Maritime Operations (DMO) operating concept (O'Rourke, 2024), Marine Corps' Expeditionary Advanced Base Operations operating (EABO) concept (Department of the Navy [DON], 2023), and Army's Multi-Domain Operations (MDO) doctrine

(Department of the Army [DOA], 2021) emphasize dispersal, mobility, and other passive defense measures in the face of adversaries who have increasing ability to detect and target the joint force. In these operational and strategic studies, there is room to advance the relationship between passive air defenses forward and for infrastructure to support contested power projection.

One of the challenges in advocating for passive AMD investment is that much of the terrain is shared based on the roles and responsibilities of the various combatant commands and stakeholders. The combatant commanders are responsible for employing forces and creating plans under U.S. Code Title 10 (Armed Forces, 1986), including joint IAMD planning and its passive AMD subset. However, these roles are challenging to resource and need clear policy guidance. For example, the United States Northern Command (USNORTHCOM) is responsible for defending the homeland. However, within the USNORTHCOM Area of Responsibility (AOR) are critical infrastructure and forces that may not be DOD assets or are assigned to other combatant commands, such as national assets, force projection infrastructure, or forces retained by the services. The complex command relationships contribute to the Passive AMD challenges in planning, resourcing, and action at the operational and strategic level, needing clear policy guidance.

Another consideration is that passive defense tactics, techniques, and procedures (TTPs) are well-proven on past battlefields but were rarely needed by U.S. troops in recent years. In conflicts before the 1990s, tactical forces were skilled in camouflage, concealment, hardening, dispersion, and other elements of passive defense. For them, their very survival was often dependent on employing passive defenses. However, decades of uncontested air superiority in Iraq and Afghanistan have marginalized the perceived value of passive defense TTPs. Against

violent extremist organizations, American forces convincingly suppressed air and missile threats. As a result, passive defense has become an afterthought in today's mission planning, exercises, or combat operations (Mills et al., 2020). Based on the broad experiences of this research team and many colleagues, passive defense capabilities are now regularly confined to secondary or tertiary considerations.

Investment in other elements of joint IAMD, including active defense and attack operations, remains a significant portion of the defense budget. Air and missile defense programs, missile defense munitions, and key munitions for attack operations against enemy air and missile threats exceeded $45 billion in the FY24 budget, not counting the cost of personnel, operations, maintenance, and acquisition costs of the weapon systems for units that fire those munitions (Under Secretary of Defense [Comptroller], 2023). While the defense budget includes numerous active defense systems and weapon systems that support attack operations, such as aircraft, ships, and missiles, there is less evidence found in the literature review for the acquisition of high-fidelity decoys, building redundant power projection infrastructure, or hardening existing sites by comparison. The notable exception is in early warning and detection system investment and the networks to support them, which is why the research team scoped early warning and detection out of the research questions. Despite these identified challenges, a spectrum of options are available for senior defense officials to prioritize passive defense measures and boost deterrence, including some that may be implemented at low cost, such as procurement of decoys, and others like logistical infrastructure hardening and redundancy that would require more sizable time and investment.

## Ways

*The spot where we intend to fight must not be made known; for then the enemy will have to prepare against a possible attack at several different points, and his forces being thus distributed in many directions, the numbers we shall have to face at any given point will be proportionately few.*

– Sun Tzu, On the Art of War (Chap. 6, para. 16)

In his famous translation of Sun Tzu's "On the Art of War," military historian Lionel Giles tied this idea to General Ulysses Grant's victories in the U.S. Civil War, stating, "while his opponents were kept fully employed wondering what he was going to do, *he* was thinking most of what he was going to do himself" (Sun Tzu, 1910, p. 16). The core tenets of passive AMD—detection and warning, dispersal, deception, camouflage, concealment, hardening, reconstitution, and mobility—not only formulate a comprehensive defense posture that mitigates the risk of detection and engagement by adversaries but are essential to operational plans. Fortunately, the adoption of Distributed Maritime Operations (DMO), Multi-Domain Operations (MDO), Expeditionary Advanced Base Operations (EABO), and Agile Combat Employment (ACE) by each of the U.S. military services seem to acknowledge the threat missile to interceptor imbalance in the Indo-Pacific Theater. Their implementation will face challenges, and while these ideas integrate dispersal, mobility, detection, and warning, they could benefit by expanding their use of passive AMD.

Distributed Maritime Operations is the Navy's warfighting concept for fighting at the operational level of war. DMO is a new way of fighting against a peer advisory, namely China, which has a credible capability of targeting Navy ships with missiles with a capacity to outpace the Navy's ability to present a credible missile defense. (O'Rourke, 2024). DMO utilizes dispersion, maneuver, and concealment as the means of defense for Navy fleets. Operating over in small numbers, while managing their radio signatures, naval forces will maneuver to offensive

firing positions while evading enemy missiles. (O'Rourke, 2024) By dispersing into smaller groups, vice previous concepts of concentrated battle groups, DMO both casts a larger net of missile defense sensors and minimizes the impact of individual missile raids on the fleet (e.g. a single ship versus multiple losses in a battle group of an aircraft carrier and escort ships) (O'Rourke, 2024).

The Marine 'Corps concept of EABO goes hand in hand with DMO and is designed to project power through agile and mobile forward-operating bases. These bases, established in strategic locations, often remote, austere, or both, enable rapid response and sustainment of operations in areas that might otherwise be beyond the reach of traditional force structures. EABO is particularly relevant in the Pacific Island chains, where control over vital maritime routes and strategic positions can dictate the success of broader operational objectives. The concept emphasizes the importance of dispersal and redundancy by providing a greater number of critical logistics nodes in unconventional and expeditionary locations (DON, 2023).

Agile Combat Employment (ACE), an Air Force concept, aims to increase the survivability and effectiveness of air power through dynamic force employment. ACE involves the dispersal of aircraft and support personnel across a wider array of bases and operating locations, thereby complicating the enemy's targeting solution. This approach enhances the operational flexibility of air forces and ensures that they can continue to provide air superiority in contested environments (DAF, 2022).

On the other hand, the Army's doctrine of MDO underscores the integration of efforts across all domains—land, air, maritime, space, and cyberspace—to deliver a synchronized and cohesive response to threats. MDO seeks to exploit the synergies of combined arms operations, enhancing the ability of the U.S. military to project power and sustain operations in contested

environments. The doctrine's core lies in its aim to outmaneuver adversaries through a dynamic and flexible operational approach, ensuring that U.S. forces can achieve superiority in all domains of warfare. MDO's strategic focus on integration and synergy aligns with passive AMD principles, particularly in utilizing a comprehensive sensor network to enhance early warning and detection (DOA, 2021).

Key to the success of all four operational ideas is the requirement for ample and credible dispersed bases and resilient supporting logistic chains. These requirements pose significant challenges to the above operational concepts. Overcoming these challenges will require committed leadership, informed policy, innovative warfighters, and greater investment in passive defense capabilities.

**Basing Challenges**

To disperse in the ways prescribed by these operational ideas, the U.S. will need access to a multitude of bases, ports, and airfields, both existing and new, throughout the Indo-Pacific. In cases where the U.S. already has access to or owns the base outright, infrastructure improvements are likely required. For these cases, the U.S. should also investigate the most recent National Defense Authorization Act (NDAA) for base realignment and closure (BRAC) policy. The closing of bases through BRAC must align with the theater posture for the Indo-Pacific. Maintaining outside the continental U.S. (OCONUS) bases at a low cost and with minimal readiness and a skeleton crew could have outsized effects on enemy target planning. A study on OCONUS BRAC should ensure that U.S. basing meets the needs of these new operating concepts (Rehberg & Chang, 2022).

New basing, port, and airfield access in the Indo-Pacific will require the support of host nations. These nations will weigh the serious political costs and benefits of having U.S. forces in

their countries and operating in their critical ports and airfields. Any inroads and improvements to host nation infrastructure paid for and built by the U.S. could be rendered moot by the political whims of host nation governments. Leadership that is not sympathetic to U.S. causes could quickly expel American forces or slow DOD initiatives. With that said, even small efforts to improve host nation ports and airfields could significantly impact enemy target planning. For these reasons, the U.S. should seek periodic access to facilities throughout the Indo-Pacific that could serve as viable ports, airfields, and bases in times of crisis or combat. Acquiring permission for U.S. personnel to visit these facilities, conduct inspections, make improvements, and pre-position critical war reserve material could be much more palatable to these host nations than the placement of active defense systems (Pettyjohn, 2022). These existing or new locations will require static passive defenses such as hardening, camouflage, and decoys for their protection and to complicate enemy targeting. Dispersal of ships, aircraft, fuel, munitions, and other equipment is essential (Lynch et al., 2023).

**Logistical Challenges**

While the dispersal of ships, aircraft, and ground forces will complicate enemy targeting, support requirements will become the limiting constraint. Extensive modeling and simulation by the RAND Corporation on ACE found robust passive defense the most cost-effective way to defend air bases. Further, this RAND modeling reduced combat sortie generation via ACE at an air base to aircraft, maintenance personnel, fuel, and an operational runway. Loss of any one of those four items will significantly inhibit sortie generation. To that end, ACE will require specialized logistic chains that will also require defenses. As dispersal increases, sustainment for the lines of communication will also require significant investment (Lynch et al., 2023). As envisioned, MDO will face similar challenges and need an “increase in the ratio between combat,

support, and protection assets" (Quinn, 2023, para. 24). It is noted that tactical-level support units, including forward support companies and brigade support battalions, will be required to adapt to the distribution and mobility requirements of MDO. These support units will, in turn, require hardened communications and air defense (Quinn, 2023).

Another logistics-related challenge is the lack of redundant capabilities to address chokepoints and potential single or limited points of failure in U.S. infrastructure. These limitations significantly challenge the DOD's ability to execute sustained operations against a peer adversary. Chokepoints, such as critical DOD port infrastructure, persist, spurred by the pursuit for increased efficiencies driven by private industry profit models. However, to be more resilient and adhere to passive AMD planning guidance, they require redundant alternatives, validation, hardening, or other defenses (Tussing et al., 2022). Exercising contingency and alternate logistical infrastructure validates contingency plans as well as demonstrates to a potential adversary the difficulty of achieving their objectives through limited attacks on critical logistical infrastructure. While there are alternatives if critical munitions ports such as Military Ocean Terminals Concord or Sunny Point were lost to hostile action, the use of airlift for logistic movement is expensive and resource-constrained, and many of the alternative seaports remain untested in the actual shipment of munitions (Tussing et al., 2022).

**Other Passive Measures**

The lack of integration of the above operational concepts with other passive measures such as deception, decoys, camouflage, concealment, hardening, and reconstitution must be addressed. Dispersal and mobility strategies enhance survivability and complicate enemy targeting; however, the extensive geographical scope of the Pacific theater limits the practicality of constant mobility and dispersal. Eventually, aircraft need to land, ships need to refuel or

rearm, and land forces need to pause. Military deception operational plans mask operations and conceal which bases will be used to stage, launch, and recover while enhancing the viability of the dispersed locations. Decoys, camouflage, and concealment must be incorporated into the defense of static assets, hubs, and bases that support DMO, ACE, and MDO. U.S. forces can significantly complicate enemy targeting by creating false targets, masking the signature of assets, and blending with the environment (Rehberg & Chang, 2022).

Especially in the environment of Great Power Competition, military deception is essential, as Sun Tzu counseled, "all warfare is based on deception" (Sun Tzu, 1910, Chap. 1, para. 18). Battle-tested and doctrinally sound, the "Deception Maxims" from the Central Intelligence Agency, Office of Research and Development is derived from "game theory, historical evidence, social science, and decision analysis theory" (Department of the Army [DOA], 2019 pp. 1-8). Unfortunately, a discernable application gap exists between Military Deception (Joint Chiefs of Staff [JCS], 2017) and passive AMD across the joint force. The 2017 Military Deception publication needs to be updated using the lens of Great Power Competition to align with emerging passive defense (JCS, 2017). Building the doctrinal linkage and application between Passive AMD and Military Deception will empower warfighters to increase uncertainty, amplify risk, and reduce decision-making confidence for the enemy.

To address the aforementioned logistical challenges, hardening and reconstitution involve fortifying structures and systems against attacks and ensuring they can remain operational post-engagement. Plans must specifically focus on resilient power supplies and medical facilities so forces can withstand and quickly recover from strikes and maintain operational continuity despite sustained enemy actions. Hardening is arguably the costliest passive defense and will require the most foresight in planning. Analysis of this issue has called for selective hardening

based on the expected threat and criticality of the protected asset. This view would manifest as hardened command posts, fuel facilities, and ammo magazines capable of surviving multiple missile attacks. At the same time, expeditionary hardened shelters could protect fighter aircraft or mobile forces from minor drone attacks. Hardening could provide viable defense on existing bases and alleviate dispersal requirements (Pettyjohn, 2022; Rehberg & Chang, 2022). This process requires leaders to decide on plans for asset hardening well before conflict. The joint force will be better postured for air and missile defense by making these planning decisions now ahead of conflict.

**Planning and Preparedness**

For passive AMD measures to be effective, they must be strategically integrated into a multi-layered defense architecture. Service-level operating concepts (e.g., DMO, EABO, ACE) and Army doctrine (MDO) must be coordinated in planning and clearly understood, fully integrated, and synergistically employed to maximize military deception and achieve unity of effort. Such an integrated approach ensures that even if one defensive layer is compromised, others can still function to protect critical assets and maintain operational capabilities. A significant aspect of effective passive AMD is the training and preparedness of personnel to ensure forces are well prepared to implement and maintain passive defensive strategies, from operating decoys to executing rapid repair tasks. Investment in regular, realistic training exercises enhances the ability of forces to utilize these measures under combat conditions. Moreover, prepared personnel can innovate and adapt to changing battlefield conditions, optimizing available defensive resources.

Preparedness starts with having decoy equipment capable of deceiving the enemy. Decoys are generally categorized into two types. One is designed to fool enemy observers and

surveillance equipment. An inflatable vehicle is an example of this kind of decoy. A second category of decoy is typically associated with aircraft and submarines. It is built to "spoof" the acquisition systems of interceptor weapons, such as missiles and torpedoes intended to divert a guided projectile from the target.


Figure 2. Employment of Decoy Aircraft and Vehicles in China
('Bhat, 2020, follows para. 11)

A U.S. Army war simulation conducted in the 1980s found that units equipped with decoys, a passive defense tool, were more efficient. They lost 18.3 percent fewer vehicles and destroyed 4.5 percent more adversary vehicles. Due to observations associated with reactions to the decoys, they also saw a 28 percent improvement in their ability to detect an adversary's movements (Hemez, 2021). A Chinese defense strategist from the PLA Academy of Military Sciences assessed the employment of decoys when paired with authentic military equipment in a ratio of 1:1 correlated to a 40 percent increase in survivable combat power (Jensen, 2020). Decoys employed must be realistic enough to mislead an adversary's sensor capabilities. In the

war between Russia and Ukraine, simple Russian decoys have included painting fighter jet silhouettes on an airfield's tarmac. While these decoys may mislead "one-way" attack drones that employ optical cameras to detect the outline of aircraft, they are ineffective against space-based systems, as they do not cast a shadow as a real airplane would (Epstein, 2024).

The results of these studies and findings are further reinforced through historical case studies. One lesson can be found in Germany's campaign to destroy the Royal Air Force and win control of air over southern England and the English Channel to set conditions for Operation Seelowe (Sealion), which was the planned invasion of the English homeland ("Operation Sealion," 2022). As part of the German effort, the Luftwaffe dedicated targeting strikes against airfields in the Battle of Britain. As part of the defense of the airbase strategy, the Royal Air Force built decoy bases at locations close to their primary operating airfields. The use of decoys started with configuring lamps to suggest airfield markers, and the decoy initiative matured into placing damaged airplanes along the lamp-lit decoy fields so German battle damage assessments would observe and report what appeared to be successful attacks (Hatch, 2015). After failing to achieve their operational goals, the Germans ceased operations and did not execute Operation Sealion. In sum, the Germans targeted dummy airfields with more than 440 missions and approximately 430 bomb missions targeting operational airfields (Halliday, 1987).

The success of decoy airfields during the Battle of Britain highlights opportunities for joint military deception operations utilizing a false narrative in support of U.S. and allied operational and tactical deployments. Furthermore, realizing the operational benefits of decoys and deceptive measures, the following section discusses what the U.S. and allied nations can do now using available passive defensive tactics as part of the theater campaign strategy employing

operations, investments, and activities focused on deterring future PLA military escalation intended to reunify Taiwan with China by force.

## Means

*"War is merely the continuation of politics by other means."*

-Carl Von Clausewitz
"On War" (1976, p. 87)

As diverse as the "ways" to wage war, equally diverse are the "means." In Great Power Competition and the necessity to deceive and outsmart the enemy drive innovation. In this dynamic wrestle for advantage, military deception (MILDEC) operations, with their associated tools and technologies, remain a cornerstone of military strategy (e.g., "All warfare is based on deception" [Sun Tzu, 1910, Chap. 1, para. 18]). In today's modern era, electronic signatures can be intercepted, and platform type and locations can be identified through the electronic spectrum, SAR, acoustically, and optically from space, air, sea, and ground-based sensors. A decoy capability could be positioned at deceptive locations not used in operational planning in order present the visual and electronic characteristics of an operational platform, such as the F-35 or F-22, while also confusing optical sensors like those on the Yaogan-41 satellite. Broadcasting the electronic airways in conjunction with observable decoy platforms set across an area of operation with what appeared to be swarms of fighter jets, vessels, or other defense capabilities would further confuse C4ISR capabilities, complicate adversary targeting, and promote survivability. Moreover, decoys disguise friendly forces' actual size, disposition, and intent (Atkinson, 1993, p. 332).

A framework for this passive defense measure could include constructing or procuring fielded vessels and aircraft subsequently placed to account for PLA sensor capabilities. Several U.S. and trusted partner nation companies already produce decoys available to support deception operations. For example, *Raytheon* has the Miniature Air-Launched Decoy (MALD), which is a "low-cost, expendable, air-launched craft that deceives the most advanced enemy integrated air

defense systems while keeping pilots and aircraft out of harm's way" (Raytheon, 2024, para. 1). The Czech company *Inflatech* produces more than 30 different inflatable decoys of military equipment, including aircraft, missiles, and rocket systems (Inflatable tanks, 2023). Manufacturing company *i2kDefense* has a customizable inflatable F-22 jet decoy with a proven history of successful deception during exercise employment (Inflatable military aircraft, 2023).

Decoys could be augmented by a network of systems and other deployable tools capable of emitting the electronic signatures of more advanced and valuable platforms. In doing so, the deceptive capabilities would camouflage the authentic equipment and systems and confuse intelligence collection platforms, complicating adversary targeting and increasing survivability. Moreover, it would conceal operational locations, ensuring they remain unknown to adversaries such as the PLA so the assets can be directed against targets. The following diagram shows how such a joint military deception operation was conceived during the Gulf War, leveraging decoys.

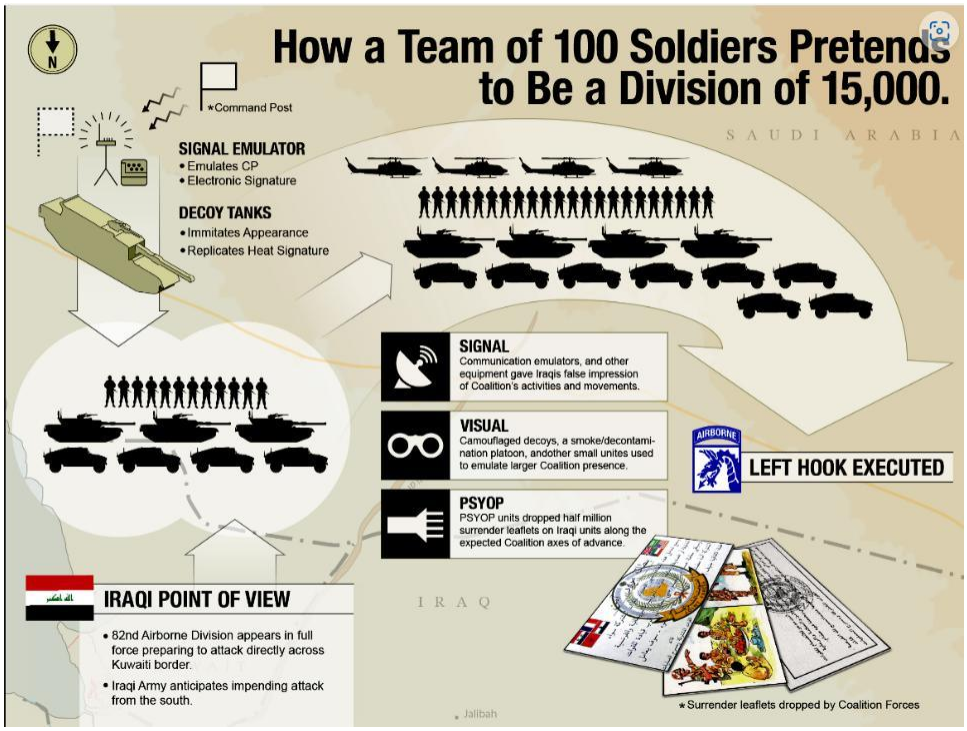


Figure 3. Operational employment of a deception plan during Desert Storm (Wright, 2018, follows para. 26)

In a threat environment where the U.S. and allied militaries are outmatched by the volume of PLA missiles and other offensive strike capabilities, military leaders informed on the benefits of passive defensive measures remain vital to future successful military operations.

## Recommendations

"*Everything rises and falls on leadership*."

-John C. Maxwell
"The 360 Degree Leader" (2011, p. 106)

Becoming more effective and efficient in developing and employing passive defense begins with leadership. To make significant progress, strategic-level leaders must be committed to delivering the policies, capabilities, and resources needed. By prioritizing increased investment in passive AMD, the Department of Defense can more effectively detect, deter, deny, and defeat attacks on the homeland of the U.S. and friendly forces abroad. The **LEAD Model** in Figure 4 provides a valuable framework for advancing joint warfighter effectiveness in the passive AMD arena. In the model, "lead, empower, adapt and deploy" are not sequential but relate through a dynamic and interactive continuous improvement process.


Figure 4. The LEAD Model for passive AMD – Lead, Empower, Adapt, Deploy

**Lead**

Depicted at the apex of the LEAD Model, leadership is vital to achieving capability resiliency and increased deterrence through passive air and missile defense. Leaders inspire vision, champion the cause, and establish priorities. Leadership may come in different forms and from various places within an organization. However, in National Defense, the responsibilities of commanders are critical to mission success. Joint Publication 3-01, Countering Air and Missile Threats, states, "Commanders at all levels are responsible for planning and executing appropriate passive AMD measures" (Joint Chiefs of Staff [JCS], 2012, p. V-19). To significantly advance the Defense Department's effectiveness in passive AMD, commanders and senior leaders on the Joint Staff, Commandant Commands, and the Services must fully embrace the strategic value passive defensive capabilities can provide. Senior strategic level leaders set the policies, approve the war plans, sign the operational orders, and issue the command directives needed to implement sustained change across the DOD. They also set programmatic guidance, rank resources, and approve budgets. The defense budget is a direct reflection of the department's top priorities. Significant advancements in developing and employing passive AMD capabilities require commitment, advocacy, and funding from strategic-level leaders.

Leaders at the operational level of war must also advocate for increased investment in passive defense. Operational leaders are crucial to advancing and fielding passive capabilities and technologies. To increase effectiveness in the passive arena, these leaders must provide clear commander's intent through mission-type orders to subordinate echelon commanders and warfighters. Operational leadership is also needed to promote the tactics, techniques, and procedures to improve the employment of emerging passive AMD weapon systems. The staffs

across the operational commands are instrumental in codifying improvements in the requirements documents, policies, and publications that drive progress within the department.

As previously noted, the department's depth of experience and application in passive AMD are limited at the strategic or operational levels. The emergence of the PRC's advanced and sophisticated weapon systems has changed the threat calculus. In today's complex operating environment, leaders from all echelons of command need to ensure their formations become better at confusing the enemy, deterring, and withstanding their attacks. For example, over the past two years following Russia's invasion of Ukraine, analysts repeatedly championed the effectiveness of passive AMD. Passive AMD measures such as mobility, camouflage, and deception contributed to the success and survivability of Ukraine's ground-based air defenses (Galamison & Peterson, 2023). Ukraine executed mobility, dispersion, and concealment to defend critical assets. Russia began to change to targeting Ukraine's critical infrastructure in response, with some success mitigated by Ukraine's surviving air defense assets (Bronk et al., 2022). This utilization of passive AMD likely helped Ukraine withstand the initial air and missile attacks. However, as the war continues, there continues to be a struggle between Ukraine's infrastructure resilience and passive defense capabilities versus Russia's ability to generate offensive air and missile strikes.

As illustrated in the "LEAD" model, leadership is critical to increasing the investment and emphasis on passive AMD to see positive effects like those experienced in Ukraine. To defend the U.S. homeland more effectively against air and missile threats, the U.S. must have leaders at the strategic, operational, and tactical levels of war who understand the value proposition offered by passive defense. In addition, leaders must champion and deliver the

passive systems, capabilities, policies, doctrine, and guidance to empower their formations to out-compete the enemy.

**Empower**

America competes against a technologically advanced Chinese military, fighting "unrestricted warfare" across all domains and environments (Lehmkuhl, 2023). The emerging threats associated with the PLA's rapid growth and the aggressive tactics employed by the CCP call for today's warfighters to "think, act, and operate differently" ("U.S. Indo-Pacific command posture," 2022, p. 2). Soldiers, sailors, marines, airmen, and guardians must be ready to compete across all domains to increase America's options while reducing the CCP's capabilities. New weapon systems and technologies are vital, but the warfighters employing them are even more critical. Commanders are responsible for educating, training, and developing the joint force to have a Great Power Competition-focused mindset, adept at deceiving the enemy, and able to operate independently and synergistically alongside joint and coalition partners (Joint Chiefs of Staff [JCS], 2023). Warriors must be able to do more than shoot, move, and communicate. They need to expand their capacity to think critically (educate), overcome adversity (train), and execute effectively as joint teams (develop) to defend U.S. interests.

Beyond updated strategic guidance, TTPs, and innovative technologies, the DOD needs to transform how the joint force educates, trains, and develops warfighters to face modern threats. Commanders must empower today's warriors to defeat peer adversaries in volatile, uncertain, complex, and ambiguous environments. An agile and distributed joint force must be able to execute with limited direction, connectivity, or support from higher headquarters. Armed with mission-type orders and shared consciousness, they must use both active and passive

warfighting capabilities to complicate enemy targeting, withstand adversarial blows, and ultimately defeat the opponent.

America's greatest strength on the battlefield is the people who volunteer to serve in the profession of arms. Their character, knowledge, skills, and abilities are critical to maintaining a competitive advantage and winning in war. There must be deliberate passive defense education, training, and development to transform the military to defeat today's threats. The foundational level of officer commissioning and enlisted basic training is the place to begin, continuing across the full spectrum of training, education, and warfighter development. Throughout this process, Great Power Competition must be a primary focus, with passive AMD and military deception as crucial components.

**Adapt**

*"Adapt or perish, now as ever, is nature's inexorable imperative."*

-H. G. Wells, "Mind at the End of Its Tether" (1945, p. 12)

Returning to Figure 4, the LEAD Model, **leaders** drive continuous improvement by establishing policies, priorities, and resources. Commanders must then ensure they **empower** their formations with education, training, and development to employ passive AMD effectively. Leaders and empowered warfighters must continuously learn and **adapt** to maintain their advantage and stay ahead of the enemy's moves. Adapting includes assessing readiness, identifying gaps, developing plans, and innovating to elevate performance. Learning, growing, improving, and adapting faster and better than the adversary are critical to keeping them off balance, deterring their aggression, and ideally "breaking the enemy's resistance without fighting." (Sun Tzu, 1910, p.29).

Strategic leaders and commanders have a multitude of exercises and wargames to assess and strengthen readiness. To improve passive defense, senior-level leaders and commanders across all echelons must include passive AMD in exercises, inspections, and readiness assessments to gather actionable data, identify gaps, and improve results. Concerning the application of passive measures, commanders need to understand the assumptions, constraints, challenges, and other applicable factors better to adapt and improve in this critical arena.

Innovation is also critical to adapting and improving passive defense in the era of Great Power Competition. Valuable partners in the innovation space include the department's defense innovation organizations: Defense Innovation Unit, Joint Rapid Acquisition Cell, National Security Innovation Network, Air Force's AFWERX, and Army Applications Laboratory, among others. Additionally, the DOD should work with academia, industry, think tanks, professional military education institutions, Weapons and Tactics Conferences (WEPTACs), and other organizations to develop passive defense capabilities and strategies to complicate, confuse, and defeat the enemy. Innovation in passive AMD propels the growth needed to increase all domain awareness for friendly forces while obscuring it for enemies.

**Deploy**

Leaders with empowered warfighters, adapting and innovating faster than the enemy, must also accelerate the "deployment" of passive defense capabilities. From the LEAD Model, "deploy" includes implementing solutions, operationalizing passive defense, and sustainment to achieve strategic objectives and tactical effects on the battlefield. To "deploy" is to implement the products, work, and solutions produced throughout the "Lead," "Empower," and "Adapt" phases of the model. The model presents a simple framework for action that can be useful in various applications. Applying the model toward passive AMD provides a path to capability

resiliency and deterrence in Great Power Competition. Sustaining DOD's advancement in passive AMD capabilities requires committed leaders and empowered warfighters willing to adapt and proactively deploy emerging capabilities to deter adversaries from aggressive action against U.S. interests.

Ultimately, these informed leaders must employ operational art[1], incorporating passive AMD measures. One recommendation for consideration to address the Chinese missile overmatch experienced today is a low-cost joint military deception operation using repurposed retired systems that could confound targeting and provide a radar, visual, or radio frequency signature. Examples could include disused command and control radios or unused air surveillance or air and missile defense equipment, such as legacy AN/TPS-75 air surveillance radars, legacy aircraft, or legacy air defense systems, such as the mobile MIM-23 HAWK medium-range surface-to-air missile system, some of which are currently stored in U.S. weapons depots. Approximately 40,000 HAWK missiles were produced during the system's lifecycle, and both operational and non-functioning weapons (decoys) could be paired at real or deceptive DMO, EABO, and ACE locations, combined with a promising low-cost acoustic sensor network like that successfully employed in Ukraine targeting Russian missiles and drones ("HAWK," n.d.). In doing so, the concept could enhance a passive defense posture across multiple domains to further complicate an adversary's targeting and decision calculus intended to deter military action. Additional study into such an approach at the appropriate classification level is needed to assess the viability of such a potential concept using retired munitions.

[1] Joint doctrine defines Opera□onal Art as the employment of military forces to atain strategic and/or opera□onal objec□ves through design, organiza□on, integra□on, and conduct of campaigns, major opera□ons, and batles. (Piat, 1999, pg. 5).

## Conclusion

"*The history of failure in war can almost always be summed up in two words: 'Too late.' Too late in comprehending the deadly purpose of a potential enemy; too late in realizing the mortal danger; too late in preparedness; too late in uniting all possible forces for resistance; too late in standing with one's friends."*

-General Douglas MacArthur, "Prelude to Victory" (Reston, 1942, p.64)

To avoid being "Too Late," leaders in the Department of Defense need to accelerate passive defense research and development to field cost-effective capabilities **now**. The National Defense Strategy's top priority is to "defend the homeland, paced to the growing multi-domain threat posed by the PRC" (DOD, 2022, p. 7). Improved passive AMD is critical to strengthening capabilities in this "no-fail" homeland defense mission. This paper has underscored the strategic importance of passive air and missile defense (AMD) as a crucial component of modern military deterrence. It has revealed the limitations of relying solely on active defense and offensive strategies, highlighting the cost-effectiveness and strategic advantage of integrating passive measures into U.S. defense postures. The discussion has spanned several operational concepts, illustrating how mobility, dispersion, and redundancy are fundamental to enhancing the resilience of military forces against advanced threats. However, significant gaps and challenges still need to be addressed in doctrine, infrastructure, and joint force execution that require ongoing attention and innovation. Resourcing active defense measures to compete with Chinese offensive missile capabilities is cost-prohibitive. To overcome identified challenges, informed leaders at all echelons must prioritize investments and operational constructs that leverage the lost-cost benefits of passive AMD. Designating a lead for Passive Defense is an essential initial step towards addressing current challenges, and the U.S. Army Space and Missile Defense Command, which also serves as the Joint Functional Component Command for Integrated

Missile Defense, seems to be the natural placement for this designation as the command has some of the appropriate authorities to assume this role for the Joint Force.

**Recommendations for Further Research**

1. **Integration of Passive AMD with Emerging Technologies:**
   - Future studies should explore how new technologies such as artificial intelligence, machine learning, and cyber capabilities can be harnessed to enhance passive defense measures. Research could focus on automated threat detection systems, AI-driven logistical support, and cyber resilience strategies complementing traditional passive AMD.

2. **Economic Analysis of Passive Defense Investments:**
   - Comprehensive economic analyses are needed to evaluate the cost-benefit ratios of passive versus active defense strategies. This research should include the lifecycle costs of passive AMD systems, comparing them to the operational and maintenance costs associated with active defense measures.

3. **Case Studies on Historical and Contemporary Use of Passive AMD:**
   - Detailed case studies of passive AMD in historical conflicts (such as the Cold War) and current scenarios (like the conflict in Ukraine) could provide valuable insights into the effectiveness of these strategies. These studies could help refine current doctrines and training programs.

4. **Cross-domain Synergies and Joint Operations:**
   - Further research is required to assess the integration of passive AMD across different domains (e.g., land, air, sea, space, and cyber). Studies could focus on developing interoperable systems that leverage passive defense measures across the domains to create a cohesive and unified defense strategy.

5. **Policy and Doctrine Development:**
   - With passive AMD receiving limited doctrinal attention, research should aim to influence policy-making by demonstrating the strategic value of passive defenses. This process could involve developing new doctrines or revising existing ones to incorporate passive AMD more prominently.

6. **International Collaboration and Coalition Defense:**
   - Research could focus on the benefits and challenges of collaborative passive defense measures among U.S. allies and partners, particularly in regions like the Indo-Pacific.

7. **Training and Warfighter Development:**
   - Research could evaluate the effectiveness of current training protocols and propose new strategies to ensure that warfighters are proficient in implementing passive defense measures.

By addressing these areas, future research can significantly contribute to developing a robust, integrated, and strategically sound passive AMD framework that enhances national security in full acknowledgement of the threats experienced during Great Power Competition.

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