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In the coming decade, the United States and its allies will face both conventional and hybrid adversaries capable of preventing the establishment of new standing bases and the exploitation of existing ones as logistics hubs through their use of advanced precision weapons. To understand how best to address this challenge, we must study the future operating environment and possible threats across a range of enemy capability and lethality. Future expeditionary forces will need to modify their existing hardware to succeed against advanced A2/AD systems. Specifically, America's military must alter how it transports personnel, material, fire support, and medical care to and from the battlefield.

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TITLE: A PROBLEM OF CONNECTORS: THE CHALLENGE OF SUPPORTING
EXPEDITIONARY FORCES IN THE A2/AD ENVIRONMENT

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Executive Summary

Title: A PROBLEM OF CONNECTORS: THE CHALLENGE OF SUPPORTING EXPEDITIONARY FORCES IN THE A2/AD ENVIRONMENT

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Thesis: We must develop a new vision for supporting Expeditionary Advanced Base Operations (EABO) based on an assessment of probable risk and an understanding of the fundamental role of connectors.

Discussion: In the coming decade, the United States and its allies will face both conventional and hybrid adversaries capable of preventing the establishment of new standing bases and the exploitation of existing ones as logistics hubs through their use of advanced precision weapons. To understand how best to address this challenge, we must study the future operating environment and possible threats across a range of enemy capability and lethality. Future expeditionary forces will need to modify their existing hardware to succeed against advanced A2/AD systems. Specifically, America's military must alter how it transports personnel, material, fire support, and medical care to and from the battlefield. To aid in this action, the US military must field new and innovative connectors that improve survivability while leveraging the ability of their existing connectors to perform operations such as fire support and medical evacuation. These improved connectors will create communication lines reaching back to assets over the horizon and bring vital support to forward-deployed forces while providing supporting fire for maneuver and facilitating rapid casualty evacuation along with other forms of force protection.

Conclusion: Ultimately, if the United States does nothing to address these issues, it could easily find itself unable to operate effectively against potential adversaries throughout the world. With such measures, however, the range and flexibility of the US military may allow it to operate in denied environments including "places without bases," thereby carrying the fight to the enemy while minimizing risk to its own forces.

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Introduction

Over the past decade, the United States Department of Defense has expended considerable time and resources attempting to address the challenges posed by the advanced military defenses of our competitor nations. One primary concern both think tanks and military planners face is how to fight in an environment inundated with precision munitions arrayed to form interlocking defensive systems. Specifically, how do we get close enough to an enemy's threat systems to effect their destruction, and how do we support such operations without use of bases that, even if existing, may be rendered inoperable by these very same systems? This challenge lies at the heart of the problem of operating in "places without bases" in the modern era of precision-guided defensive weapons.

The solution depends on a closely integrated core set of rapidly mobile connectors, armed and equipped with counter-detection technologies and leveraged for their support of multiple warfighting functions. By applying the same key capabilities to logistics, maneuver, and force protection, the future expeditionary force can achieve maximum flexibility, speed and range, all vital traits in a distributed operations concept one might call "Hiding in Plain Sight." To understand the concept and its implications for logistics and support, one must first envision the future operating environment c. 2025-2030, and then re-examine the conduct of expeditionary and amphibious warfare. We then can develop a new vision for supporting such operations, based on an assessment of probable risk and an understanding of the fundamental role of connectors.

In the coming decade, the United States and its allies and partners will face both conventional and hybrid adversaries able to prevent the establishment of new standing bases or exploitation of existing ones as logistics hubs. They will also face the need to operate over the

horizon at ever-greater standoff distances. As we see with gray zone warfare, future threats might also entail use of non-state actors as local proxies by contiguous near-peer competitors, who target friendly forces while remaining protected behind a screen of anti-access / area denial (A2/AD) defenses. Again, countering and defeating such threats would require prolonged operations by friendly forces without secure access to local basing.

The United States Marine Corps has proposed meeting these challenges by exploiting the weaknesses in an enemy's defensive system through application of maneuver warfare and distributed operations, particularly in the form of Expeditionary Advanced Base Operations (EABO.)¹ By engaging the enemy with a large number of small, highly mobile units, the Marines would force him to prioritize low-value targets on which to expend precision munitions. As a result, battlefield survivability would improve for the Marines because these smaller units would be harder to identify and defeat. Once inside enemy defenses, the Marines could physically mass and disperse rapidly enough to prevent being targeted while creating and exploiting gaps and seams in the adversary's A2/AD systems.² Because individual weapons within these systems have lengthy production requirements, the enemy forces would likely exhaust their stockpiles and be unable to replace them quickly enough to avoid having many of their individual defensive nodes destroyed by the Marines.³ Eventually, the multiplicity of offensive targets presented to the opponent, combined with the challenge of identifying numerous hypermobile units, would confuse, and overwhelm the adversary's physical defensive network. The Marines could then use their own precision weapons to conduct counterstrikes on defensive nodes that would neutralize enemy defenses and undermine enemy morale.

Another option, particularly against hybrid threats such as non-state actors armed with A2/AD systems, would be to penetrate an enemy's defenses undetected and destroy their

defensive network from within using special operations forces (SOF). These missions would be similar to Operation Neptune Spear, where United States Special Operations Command (USSOCOM) used stealth technology to elude Pakistan's defensive radar systems and kill Osama bin Laden. Again, however, the key to success would be a method of operations that allows forward-deployed forces to be hyper-mobile, self-sustaining, and concealed for extended periods.

In "Hiding in Plain Sight," friendly forces confuse the enemy by coming at him from multiple directions in all domains, exploiting deceptive measures along with simultaneous cyber and information operations of a cognitive nature. By appearing to be nowhere yet everywhere, creating multiple false signals and presenting an array of forces of individually low value yet cumulatively massive effect, such methods lead to confusion on the part of the enemy. Obligated to target numerous highly mobile units in all domains while trying to discern the "signal within the noise," the enemy exposes his assets and expends his resources at a rapid pace, thus hastening the depletion and destruction of his own defensive systems. Such operations under such conditions, however, will challenge the US ability to support forward-operating friendly forces with extended logistical connectors. To prepare for operating in "places without bases" that lack the relative convenience of a mature theater and face the unaccustomed threat of long-range, precision munitions on land and at sea, the United States and its allies and partners must envision support and resupply for "Hiding in Plain Sight." In particular, the US military must devise a method of transporting and resupplying personnel that can defeat enemy threat systems or saturate their detection networks with enough false targets to substantially reduce attrition.

Such a use of maneuver warfare on the part of the United States and other friendly forces does not come without risk. The possibility of defeat in detail necessitates the ability to mass and

disperse physical forces rapidly at will, while the need for both high mobility and high lethality on the part of small forces on or within the envelope of enemy A2/AD systems presents challenges in terms of logistics and support. To develop the necessary systems for logistical and support functions, the US military will need to address three critical areas: lines of communication, fire support, and casualty evacuation. All three must occur within range of enemy precision-guided defensive systems, without becoming targets for attack. All three therefore entail the use of dispersed connectors that can minimize such risk while maximizing their own individual utility. To understand how best to meet this need, we must start by understanding the future operating environment and future possible and likely threats across a range of enemy capability and lethality. Future scenarios and historical case studies will point the way to an appropriate solution set, building on existing and emerging capabilities.

Future Threat Environment

In the future, population growth and resource scarcity will heighten the risk of conflict across the globe. Demographic shifts that produce increased turbulence in the littorals, along with youth bulges and coastal urbanization, will make the world's shorelines dynamic areas where conflict could erupt at a moment's notice. The rise of regional hegemony such as China and Russia, the proliferation of advanced precision weapons, and the consistent growth of transnational violent extremist organizations (VEOs) and transnational criminal organizations (TCOs) will add to instability and make addressing global challenges an even more daunting task.

The South Pacific, specifically the South China Sea, is usually the first region that comes to mind in discussions of where the United States military might face an advanced A2/AD defense. Starting with the Paracel Islands in 1974, China's People's Liberation Army (PLA) has

maintained a military presence in the South China Sea for the past forty-three years.⁴ China has formally claimed sovereignty over the region since 1949, when its nationalist government established the nine-dash line and the Communist government subsequently adopted it; however, until recently, the People's Republic of China (PRC) did not possess the military strength necessary to back its claims.⁵ Today, the Chinese government's land reclamation efforts are bolstering its ability to control the South China Sea, and its presence there could eventually influence global commerce. China's presence in the region could eventually influence both global access to local manufacturers, who constitute key nodes in the supply chain of most high tech industries, including the defense industrial base, and local manufacturers' access to the global common. In either sense, the potential threat is not only to national defense but also to the global economy.

Many of China's neighbors are also concerned about the militarization of Woody Island and Fiery Cross Reef, and the anticipated development of Scarborough Shoal. Additionally, over the past fifteen years, China has made advancements in its defensive military capabilities. Currently, the PLA can simultaneously target and strike US bases and navigation satellites in the region with its DF-26 Intermediate-Range Ballistic Missile (IRBM) and DN-2 Anti-Satellite Missile Systems.⁶ Moreover, the PLA is improving weapons such as the HQ-9 (125-nm range) Surface-To-Air Missiles (SAMs), DF-21 Anti-Ship Missiles (ASMs) (1,100-nm range), DF-16 ASMs (620–990-nm range), and Cloud Shadow stealth Unmanned Aerial Systems (UAS) to aid in the protection of the various territories it claims throughout the South China Sea.⁷ China is reported to have a significant number of these weapon systems available and is working feverishly to create more of them as tensions mount throughout Asia.⁸

Considering the quantity and capability of these weapon systems, it is reasonable to assume that shooting down all precision weapons would be largely ineffective because of the high ammunition cost and technological challenges associated with that approach. In reality, we will require a large number of small, independently mobile units to evade or defeat our adversaries. With that requirement in mind, and given that its own core mission is amphibious assault, the United States Marine Corps seems the logical choice for this task. Amphibious assault in the 21st century, A2/AD environment, however, will look quite different from its precursors.

Another scenario where the US military may encounter advanced defensive weapons systems is when dealing with hybrid threats. It is becoming increasingly common worldwide for non-state actors to possess weapons that were once held only by advanced nations. A recent example of this type of weapons proliferation occurred in October 2016, when the *USS Mason* was forced to fire two Standard Missile-2s and an Evolved Seasparrow Missile to intercept antiship cruise missiles that were launched by Iranian-backed Houthi rebels in Yemen.⁹ Another example is Lebanese Hezbollah's 2006 attack on the *INS Hanit* with a C-802 Chinese antiship missile, also provided by Iran.

In addition, TCOs have demonstrated the ability to exploit cutting-edge technology in innovative ways. Examples of this include the use of semisubmersible vessels that can avoid radar detection by remaining just below the ocean's surface and the use of UAS for narcotics and weapons transport.¹⁰ The possibility of state-sponsored and non-state actor terrorists and criminals supporting each other in opportunistic fashion, however fleeting, and adopting each other's methods presents the prospect of a terror-criminal nexus that, in ten years' time or so, may possess daunting defensive and offensive capabilities.

As technology proliferates, it will likely become easier for hybrid adversaries to degrade the United States' ability to operate in what were once considered low- or medium-threat environments. One area in which the spread of weapons may significantly affect US ability to operate with impunity is the continent of Africa. As of 2016, roughly 27 percent of Africa's fifty-four nations were experiencing internal conflict.¹¹ Moreover, African countries host numerous VEOs such as al-Qaeda, al-Qaeda in the Islamic Maghreb (AQIM), the Islamic State of Iraq and Levant (ISIL), Boko Haram, and al-Shabaab.¹² Many of these groups are connected to rogue-state benefactors, such as Iran, who could easily provide them with modern A2/AD systems. Such systems are hard to detect and destroy when not surrounded by conventional military infrastructure and VEOs will probably relocate these systems frequently to avoid targeting. Africa's inherent instability, combined with rogue states' willingness to arm VEOs, will create an environment where the United States may face A2/AD systems during future African crisis response operations.

Africa's geography will also compound the challenges associated with finding and destroying threats. The continent is made up of over 2.2 million square miles of jungle, 3.8 million square miles of desert, forty-eight separate mountain ranges, and 18,950 miles of coastline.¹³ At present, North and West Africa experience the most terrorist activity; however, the continent's porous borders allow members of VEOs and their weapons to move easily among nations, thus complicating their engagement by American forces.

If these hypothetical weapons can be identified, the simplest method of destroying them would likely be a drone or fighter aircraft strike. However, in many cases, such an action would not be appropriate. For example, if an African VEO possessed a significant number of surface-to-air weapon systems, the threat would likely be prohibitive for many non-stealth aircraft.

Moreover, even with today's advanced technology, it is challenging to obtain a complete picture of what is happening on the ground. Hybrid adversaries will likely use areas of high population density to hide precision weapons and limit the US military's ability to target and destroy these threats. By using only aviation-delivered ordnance, if an adversary's defensive weapons are concealed in highly populated areas, the US military increases the risk of incurring civilian casualties—a consequence of war that is increasingly unacceptable to the American public. The danger will grow with the increase in urbanization, particularly in the littorals, that is central to many current forecasts of the future operating environment c. 2025-2030.¹⁴

One way to mitigate these issues is to use small, highly trained units such as SOF to destroy threats. By capitalizing on the capabilities of USSOCOM, such as its rotary-wing stealth technology, the advantage of enemies that possess radar-based A2/AD systems is greatly diminished. In addition, having personnel on the ground to aid in cueing for strike missions will at least partially reduce the likelihood of inadvertent collateral damage from air strikes. The requirement for support of such forces under anticipated circumstances, however, presents an increasingly difficult challenge.

Regardless of which threat scenario the US military faces, one thing is clear: future expeditionary forces will need to modify their existing hardware to succeed against advanced A2/AD systems, specifically by using platforms that transport personnel, material, fire support, and medical care to and from the battlefield safely and effectively. The following diagram illustrates one concept for integrating a variety of such platforms, also known as "connectors," in future expeditionary and amphibious warfare. The goal in constructing any future expeditionary force is to provide a wide range of functions and capabilities by means of a small, integrated set of platforms. Together, as indicated by the overlap, three proposed sets of connectors constitute

the basic architecture of such a force, pertaining to the warfighting functions of Logistics, Maneuver and Force Protection. Fundamentally, these connectors create lines of communication, reaching back to assets over the horizon and bringing vital support to forward deployed forces, while also providing supporting fires for maneuver and facilitating rapid evacuation of casualties along with other forms of force protection.

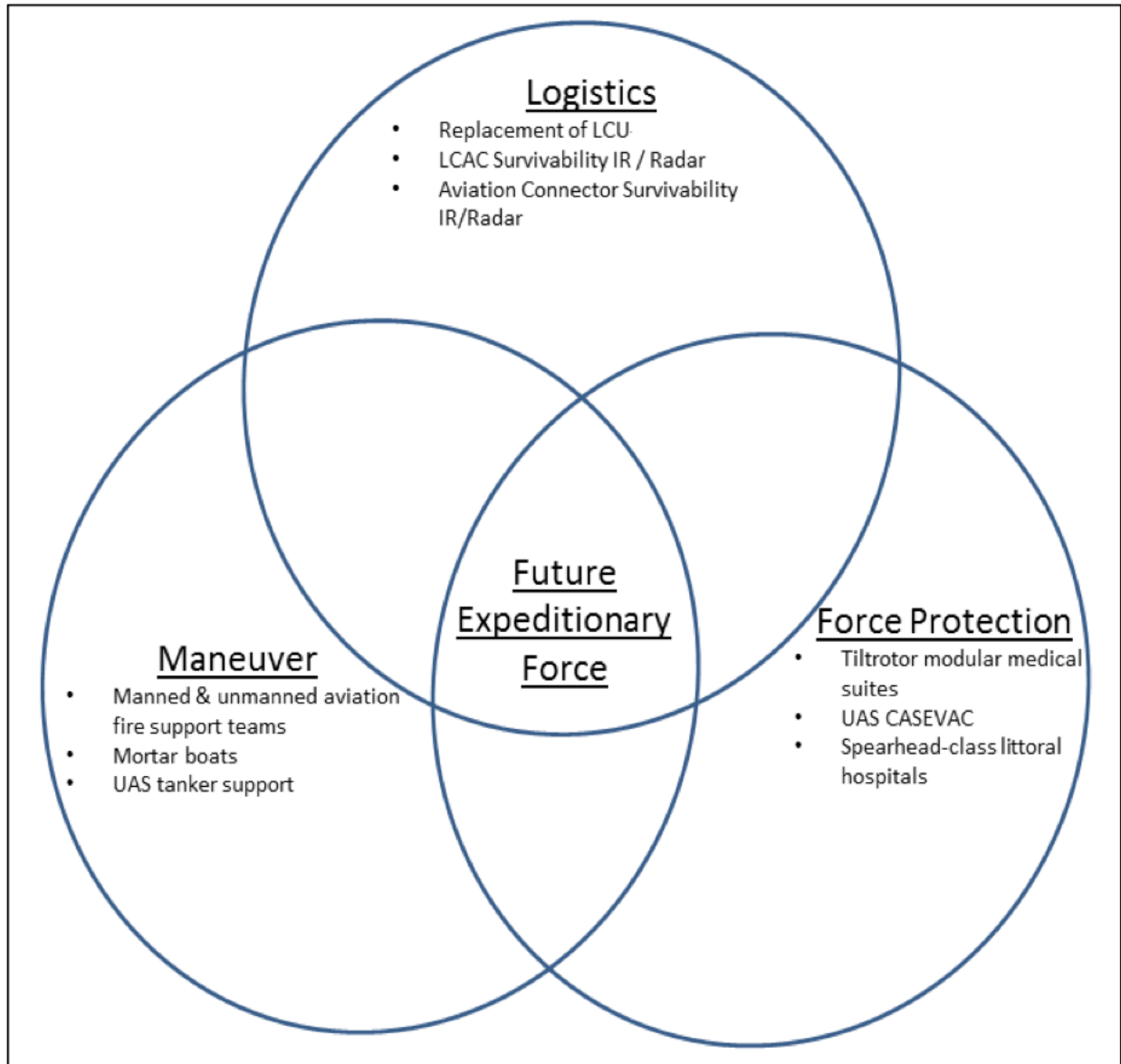


Figure 1: Future Expeditionary Force Capabilities

By leveraging existing and emerging technologies, the US military can address shortfalls in its ability to conduct expeditionary warfare in the future operating environment. Three areas where such shortfalls exist are lines of communication, fire support, and medical evacuation. Figure 2 provides a graphical representation of these problem areas and depicts individual line items that are possible solutions. A further review of these areas will provide insight into why and how the US military should modify its use of connectors for future operations.

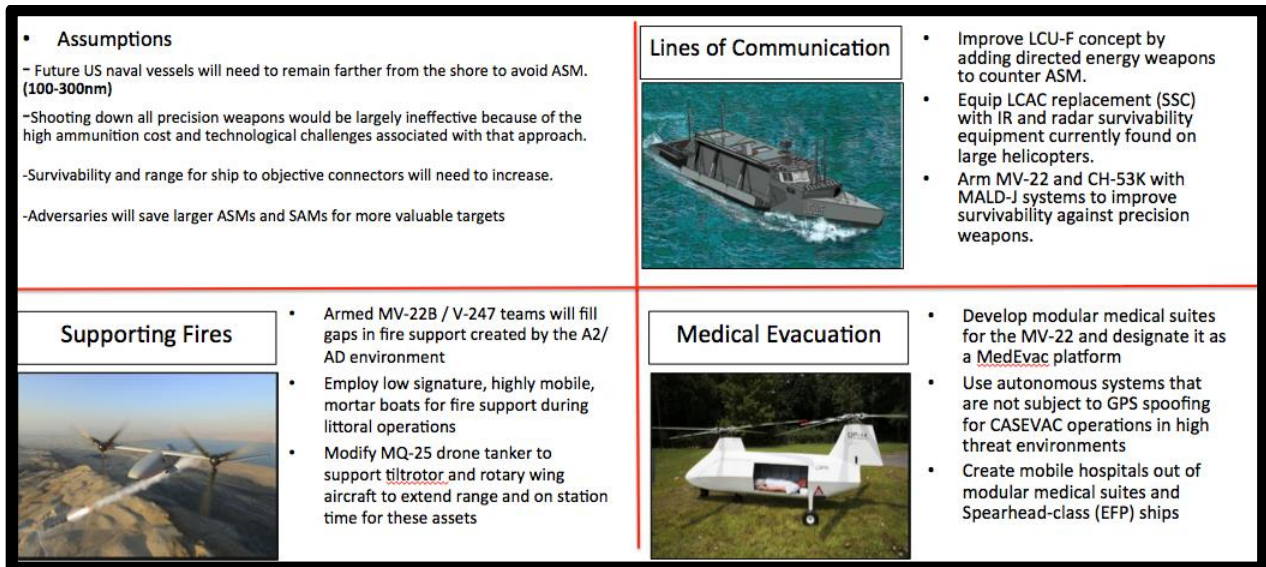


Figure 2: Proposed Improvements to Connector Capability¹⁵

Logistics: Creating Survivable Lines of Communication

History shows that tactics win battles, but logistics win wars. Numerous military operations ranging from the US Navy’s Pacific-island-hopping campaign during World War II to the multi-sided interventions in the Angolan Civil War have demonstrated this phenomenon. In Angola, the tempo at which Cuba and the Soviet Union moved material into the country was a determining factor in the eventual defeat of South Africa. Similarly, during World War II, the US military’s ability to successfully transport and distribute materiel in the Pacific provided the

necessary resources to continue the push toward mainland Japan and facilitated victory for the Allied powers.

In the China scenario, using the US Navy and Marine Corps to neutralize a large, complicated littoral defense appears to be a viable option, but one that will only work if the sea services address survivability shortfalls in ship-to-shore connectors. In 2016, the Center for Strategic and Budgetary Assessment (CSBA) released a study stating that the majority of anti-ship missile systems have ranges of less than 300 nm.¹⁶ The CSBA review of these systems was highly accurate considering that among the nineteen most proliferated land-based missile systems in the Pacific, only two can travel more than 250 nm in search of targets.¹⁷ Furthermore, eighteen of the nineteen most prominent missiles in the Pacific had ranges less than 125 nm.¹⁸ Regrettably, the range of adversary ASMs is consistently trending higher. The study also proposed that our adversaries would save their limited long-distance missiles for larger naval vessels. If this supposition holds true, it is reasonable to assume that most large, expensive naval ships would be safer if they remain farther out at sea. However, this sanctuary would only be provided for ships facing land-based precision weapons.

If we accept this line of reasoning, the key to survivability in most amphibious operations would be increasing the distance between the US Navy's ships and the shoreline. The US Navy and Marine Corps currently have four platforms, either fielded or in production, with the ability to carry large numbers of troops and heavy equipment long distances from ship to shore: the Landing Craft Utility (LCU), Landing Craft Air Cushion (LCAC), the MV-22B Osprey, and the CH-53K King Stallion. The CSBA mentions three of these systems as possible ship-to-shore connectors; however, in their current state, none of them would be completely effective.

One possibility to aid in moving from ship to shore would be to replace or modify the US Navy's existing surface connectors to make them more survivable. Presently, the US Navy relies on the LCUs and LCACs, both of which are capable of moving large numbers of troops and amounts of equipment, but are becoming increasingly irrelevant for operations against opponents with advanced ASM. Most modern ASM can receive long-range radar guidance in combination with infrared homing to aid in close-range target identification. The current LCU was first fielded in the late 1950s, produces a large radar signature compared to modern alternative vessels, and provides no infrared signature reduction. The LCAC is nearly thirty years old, but presents the same risks as the LCU to its occupants. Not only do these vessels make for easy targets, they have no means of actively defending themselves against incoming missiles. Moreover, the US Navy's Amphibious Ready Groups carry only three of these connectors when they are deployed. If a single LCAC were destroyed, it would result in a 33 percent reduction in LCAC lift capacity. For any amphibious assault against a modern competitor nation to succeed, the US Navy will need to address these shortcomings by upgrading to vessels with the ability to operate undetected or at least equipping existing vessels to defend themselves.

The Landing Craft Utility Folding (LCU-F) presents a potential solution to the LCUs shortfalls. This concept ship combines a 1500-nm range with a lower radar signature and the ability to defend itself when necessary.¹⁹ Although the LCU-F concept has multiple anti-aircraft weapons on board, such as fourth-generation infrared missiles and a 20-mm Vulcan cannon, it is not currently designed to take down incoming missiles.²⁰ However, as directed-energy weapons technology progresses, the ship's proposed Vulcan cannon and missiles might be augmented or replaced with an updated Laser Weapon System (LaWS) and Phalanx Close-In Weapon System (CIWS) radar similar to the one currently used on the *USS Ponce*.²¹ This would provide the

LCU-F with a potentially inexhaustible amount of ordnance for engaging ASMs and complement its already impressive suite of proposed armaments.

Other readily available systems to help defend the LCU-F while operating within the engagement envelope of medium-range ASMs include the SLQ-32 (V) and RIM-116 Rolling Airframe Missile System (RAM). The SLQ-32 (V) system provides missile detection and radar jamming, and it can be linked to the MK-36 decoy launching system to deploy chaff and infrared missile decoys.²² The RAM system provides over-the-horizon missile intercept and the ability to change its vector mid-flight.²³ Drawbacks to both existing systems are size and the need for additional electrical power to operate them. Both the SLQ-32 and RAM systems were designed to function on much larger vessels than the LCU-F and would likely need to be scaled down before they could be added to the ship's arsenal.

Additional advantages of the LCU-F include a lower radar signature, extended range, and an extremely low draft. It is important to note that the LCU-F is not a stealth vessel, but because of its closed decks and its ability to sit lower in the water, it provides a measurable level of signature reduction. In combination with this feature, the 1500-nm range of the LCU-F allows it to travel far enough from the Expeditionary Strike Group to prevent vulnerable ships such as the Landing Helicopter Dock (LHD) from being destroyed by medium-range ASM. The draft on the LCU-F has been improved to just over 4.5 feet, which will permit faster offloads on shallow beaches and limit exposure time during one of the most defenseless periods of the ship-to-shore movement process.²⁴

As for the LCAC, its replacement is already being fielded with the Textron Ship-To-Shore Connector (SSC). Regrettably, the SSC is not the great improvement on the LCAC many had hoped for, and it provides only an 11 percent greater range than its predecessor does.

Assuming that the SSC has a similar range as the existing LCAC—roughly 200 nm with a payload—it will provide the LHD from which it is deployed a moderate level of standoff from many land-based ASMs. Although this standoff provides some benefit for the LHD, it means the hovercraft could travel up to six hours without any defensive capabilities against precision munitions.

At minimum, the US Navy should outfit the SSC with updated radar warning receivers (RWRs) and infrared detection systems similar to those used on large rotary-wing aircraft. Considering that the SSC is projected to cost approximately \$47 million per unit, and counter-missile survivability systems are used on aircraft costing much less, investing in them makes sense.²⁵ These systems could include the APR-39 RWR and AN/AAQ-24, both of which provide radar and infrared threat detection. Other survivability equipment might include directional infrared countermeasures (DIRCM) and ALE-47 countermeasures dispensing systems, which can defeat incoming missiles by using small directed-energy lasers and decoys. Even if all of these systems were procured for the SSC, the price would likely be less than \$2.5 million per hovercraft before installation costs.²⁶

Moreover, the SSC could capitalize on ground-based air-defense directed-energy lasers and radars the US Navy is developing for use on Humvees. Again, modification by product developers would be required on some systems to equip them to destroy missiles, but much of the research and development related to tracking moving targets has already been accomplished.

In addition to the changes that will be necessary to make surface connectors more effective against ASMs, it will be essential for the US Marine Corps to augment the SAM defenses on the MV-22B and the CH-53K. Both aircraft boast impressive radar and infrared missile defense systems, including the APR-39, the AAR-47, the ALE-47, and, on some aircraft,

the DIRCM. Although effective, these missile defense suites are limited. Considering the high number of SAMs likely present in any coastal defense, it is probable that aircraft would run out of chaff or infrared decoys while on this type of mission. Once these decoys are exhausted, aircraft can only detect and maneuver to avoid threatening missiles, which, regrettably, significantly reduces their ability to defeat them.

One possible solution to the limited number of aircraft decoys would be to ensure that all platforms participating in ship-to-shore movements where modern SAMs are present install DIRCM. Additionally, all airframes should be able to defeat radar threats without chaff. The Marine Corps could do this by outfitting them with the AMD-160 miniature air-launched decoy-jammer (MALD-J), a small, self-propelled decoy jammer that can travel up to 500 nm and jam threat radars before entry into an objective area.²⁷ Weighing less than 300 lb. per system, both the MV-22B and the CH-53K could carry multiple MALD-Js. These jammers could leverage the intelligence, surveillance, and reconnaissance (ISR) feeds of UAS to locate and jam existing radars. The MALD-J also creates its own radar signature, thus complicating an enemy's targeting solutions and making it harder for a SAM operator to choose which target to attack. The MALD-J is currently used on multiple fixed-wing aircraft, including the B-52 Stratofortress, F-16 Eagle, and various UAS.²⁸ At the current asking price of \$322,000 per system, this may seem like a fiscally prohibitive endeavor, but systems manufacturers are working to reduce future unit costs.²⁹

Regardless of which approach the US military takes, unless it addresses the lack of survivability in existing ship-to-shore connectors, it is unlikely that an assault against an advanced defense could be conducted without the loss of large numbers of vulnerable platforms. Furthermore, if these existing connectors survive the first wave of defenses, their ability to

resupply would be significantly challenged. Ultimately, the US military needs to review connector survivability before embarking on this type of operation.

Maneuver: Providing Supporting Fires in the A2/AD Environment

For centuries, the relationship between fire support and maneuver has been a critical part of military tactics. In many conflicts, such as the Battle of An Loc during the Vietnam War, supporting fire was the determining factor in victory. In the spring of 1972, AH-1J helicopters, AC-119 Stingers, and AC-130 gunships successfully destroyed multiple Russian-supplied T-54 tanks near the capital of the Binh Phuoc province.³⁰ The destruction of these heavy weapons provided the Republic of Vietnam's 5th Army Division the freedom to maneuver and aided in the defeat of Vietcong and North Vietnamese Army forces. Conversely, in the summer of 2005, USSOCOM's Operation Red Wings lacked reliable communication and persistent fire support.³¹ These shortfalls adversely affected the mission and caused an unnecessary loss of life.

During Operation Red Wings, a small group of US Navy Sea, Air, and Land (SEALs) were tasked with performing reconnaissance in Afghanistan's Kunar province to aid in the disruption of anti-coalition militia activity. The team became stranded in the mountainous landscape, losing the ability to communicate effectively or receive supporting fire, and local Taliban fighters subsequently overran them. The results of these gaps in support were the deaths of nineteen American service members, including three US Navy SEALs, the loss of one CH-47 aircraft, and an unsuccessful mission. In the future, effective and reliable supporting fires will be critical to the success of any operation against modern adversaries.

Today, technological improvements in enemy defensive weapons create an even greater challenge for the US military when attempting to provide fire support. Modern adversaries now possess cutting-edge weapons that allow them to target and destroy many of America's existing

close air support (CAS) platforms. Along with this, when conducting littoral operations, deck cycles limit on-station time for all CAS aircraft launched from ships. In general, aircraft carrier flight operations last only twelve hours but can be extended when conducting surge operations to provide support for longer periods; however, surge periods are normally limited to only a few days.

Land-based, fixed-wing aircraft with stealth capabilities and conventional aircraft equipped with radar jamming systems can potentially deliver support, but these assets are extremely limited in number.³² Moreover, advanced adversaries will likely possess modern air forces that can keep fixed-wing aircraft engaged in air-to-air combat for extended periods. This extended engagement siphons away valuable assets that could otherwise be performing CAS for ground personnel. Additionally, land-based supporting aircraft also need continuous air-to-air refueling, thus requiring vulnerable tanker platforms to transit near areas inundated with contemporary, long-range surface-to-air missiles.

The other available option for providing fire support to maneuver units would be the use of artillery or tactical precision missiles. Unfortunately, continuously transporting large, conventional artillery pieces or moving tactical precision missiles sites could become a cumbersome process that increases logistical complexity and results in a less maneuverable force. Considering the necessity of rapid maneuverability when facing adversaries armed with advanced precision munitions, legacy methods of providing supporting fire may not be ideal on modern battlefields.

Military leaders will need to field reliable and cost-effective alternatives to make up for the limited number of manned stealth aircraft and the logistical strain of moving large, conventional fire support systems. To do this, the US Navy and Marine Corps should use

connectors that are already transporting personnel and equipment from ship to shore. By leveraging existing connectors, the Marine Corps can substantially improve the fire support provided to ground forces.

Currently, the most reasonable connector for this task is the MV-22B. With over 250 of these aircraft in the Marine Corps inventory, the MV-22B is widely available, and, as previously mentioned, it is one of only four connectors with the range to keep large ships safe from most ASMs.³³ The high number of available MV-22Bs would facilitate support of multiple small ground units, thus providing larger units with the ability to disperse forces across a greater area. This improved dispersion would make enemies' targeting more complicated and increase their ammunition expenditures because they would need more precision weapons for multiple targets.

Moreover, the US military already has plans to weaponize the MV-22B by 2030. Although a negligible amount of troop-carrying capacity will be lost in doing this, the benefit of having a tiltrotor with heavy weapons will outweigh the loss. These updated aircraft will likely be equipped with heavy, direct-fire weapons similar to the M230 chain gun used on the AH-64 Apache helicopter. They will also have the ability to launch precision-guided munitions such as AGM-176 Griffin missiles and Advanced Precision Kill Weapon System rockets.³⁴ After conducting troop insertions, these heavily armed MV-22Bs could rearm and refuel on US Navy amphibious ships, then travel back to objective areas to provide fire support. To prevent gaps in fire support coverage as the aircraft travel to and from ships, another option would be designating individual MV-22Bs during mission planning that would function solely as escort platforms. However, this option would reduce troop-movement capacity throughout the mission. Assuming these heavily armed MV-22Bs will need to transit at least 300 nm from the ship to the objective area, they will be able to provide up to three hours of support to ground troops.³⁵

However, to do so, the aircraft would need auxiliary fuel cells installed. These aircraft will likely face radar and infrared surface-to-air missile threats combined with mobile Air Defense Artillery and will undoubtedly require DIRCM and MALD-J to aid in survivability while they are operating in contested areas.³⁶ By using MV-22Bs for CAS, the US military could complement the existing support provided by fixed-wing aircraft, giving fixed-wing platforms the opportunity to focus on airborne threats and the destruction of high-end A2/AD systems.

Another unexplored option for providing fire support in the littorals is the use of mortar boats. Deploying multiple small, highly maneuverable mortar boats from larger ships like LHDs expeditionary forces could compensate for the loss of conventional naval surface fire caused by ASMs. One promising vessel already in production is Finland's Patria new mortar (NEMO). The NEMO is a 47-foot long by 12-foot wide vessel designed to produce a low radar signature and operate at speeds up to 45 knots.³⁷ The boat's primary weapons system is a fully automated, gyro-stabilized, breach-loading 120 mm mortar turret with a ten-round-per-minute rate of fire and a range of nearly 5.5 nm.³⁸ Additionally, the NEMO can use its multiple round simultaneous impact feature to hit five different targets accurately while on the move.

Along with the advantages provided by the NEMO's primary weapons system, it is also highly maneuverable. Similar to the LCU-F concept, the NEMO is equipped with multiple internal water jets powered by two Rolls-Royce 525 kw marine diesel engines. These jets allow it to operate in less than 3 feet of water, further facilitating its notable maneuverability. The main drawback of the NEMO is its limited range.³⁹ With a range of 200 nm, the NEMO will need auxiliary fuel cells to increase its range or receive fuel en route from other vessels to improve survivability for larger ships.⁴⁰ Another possibility for extending the NEMO's range would be to launch it from the LCU-F. This would require the NEMO to be launched from a davit and

brought back onboard by winches. Regardless, all of these range-extending options are relatively easy to accomplish and could be planned prior to missions.

Along with capitalizing on existing connectors and small, boat-based artillery for fire support, incorporating unmanned aerial systems (UAS) into CAS operations will also be necessary. Although the use of UAS for CAS is not a new idea, doing so in a remote, highly contested, A2/AD environment will create an additional level of complexity that will need to be taken into account. Potential candidates for these types of missions include the MQ-9 Reaper, V-247 Tiltrotor drone, and MQ-25 Stingray unmanned carrier aviation air system (UCAAS). These unmanned systems would be ideal for SOF operations in high-threat areas that require extended airborne loiter times or conventional force engagements in which manned CAS aircraft are in short supply.

As of 2015, 163 MQ-9 Reapers had been produced at a cost of \$16 million per unit, which is far less expensive than most tactical aircraft.⁴¹ The MQ-9 can provide up to fourteen hours of loiter time in an objective area and carry a myriad of armaments, including Paveway II laser-guided bombs, AMG-114 Hellfire II air-to-ground missiles, and AIM-9 air-to-air Sidewinder missiles.⁴² However, in an A2/AD environment, the most beneficial weapon the MQ-9 could carry would be the MALD and MALD-J systems.⁴³ Similar to the MV-22B, by carrying these decoy and jamming systems, the MQ-9 could safely transit through areas with modern radar SAMs; however, the Reaper currently has the ability to target and destroy these systems without putting aircrew at risk. Unfortunately, the MQ-9 is not designed to be launched from a ship and lacks the ability to air refuel. These drawbacks limit the aircraft's employment range to roughly 1000 nm and require the US military to secure runways for all MQ-9 operations.⁴⁴

To provide UAS support when basing is not available, US forces will need to field systems similar to the V-247 and MQ-25. The V-247 is a conceptual tiltrotor UAS with the ability to launch from a ship, remain on-station for 11 hours, air refuel, and carry a 13,000-lb.⁴⁵ combination of fuel, armaments, and sensors. The new tiltrotor UAS would offer the same benefits as the MQ-9 Reaper, including the ability to jam enemy radar and destroy SAM sites, but because of the V-247's ability to conduct air refueling, it could also provide up to twenty-four hours of on-station time to ground forces.⁴⁶ Although the manufacturer has not yet released the cost for the V-247 system, it will probably be comparable to other Group 5 UAS.

The most effective method of operation for the V-247 would be to pair it with the MV-22 for ISR and CAS. By creating a manned and unmanned tiltrotor CAS team, survivability would be substantially improved during littoral operations in high-threat environments. The V-247 could launch from LHDs ahead of the armed MV-22s and other connectors to provide a real-time assessment of the conditions within an objective area. If A2/AD systems are identified by the V-247, it could jam or destroy them, thus reducing the threat for follow-on forces. Once the objective area is reasonably secure, armed MV-22s could partner with the V-247 to provide sustained support for ground personnel until the operation is complete.

To facilitate around-the-clock strike operations, the US military will also need to invest in the MQ-25 Stingray and ensure that it is compatible with both the aircraft carrier and LHD. The MQ-25 UAS is a carrier-based, air-to-air refuel aircraft that can take off from a ship, support tactical strike aircraft, and conduct limited ISR.⁴⁷ At present, the system is being designed for use on aircraft carriers, but it could be modified to take off and land from amphibious ships such as the LHD. The fielding of this system would not only improve loiter time for CAS aircraft but

would also allow strike platforms to travel farther from their ships, thus reducing the likelihood of losing a vessel to ASMs.

Moreover, if design engineers build the MQ-25 to operate at low airspeeds, it could also be used to provide helicopter air-to-air refueling. This enhancement would aid special operations forces by providing CAS, which would allow them to strike targets hundreds of miles inland, by launching MQ-25s from an aircraft carrier or amphibious ship. The ability to refuel helicopters would be a key advantage for conducting operations in remote areas, such as Africa, where the lack of basing infrastructure would likely restrict land-based operations. If an SOF unit used an MH-X stealth helicopter with air refuel capability, they could receive fuel until they are within radar range of A2/AD systems and then break away to travel the last 200 to 300 nm undetected. Most importantly, using the MQ-25 to conduct helicopter air-to-air refueling would reduce the need for vulnerable tanking platforms to travel thousands of miles for high-risk missions in remote areas.

Delivering accurate and timely fire support has always been a critical aspect of warfighting; however, with the proliferation of advanced defensive weapons, doing so is becoming increasingly challenging. Using MV-22Bs, mortar boats, and Group 5 UAS is just one set of options to supplement fire provided by traditional fixed-wing platforms. Irrespective of what weapons systems it chooses, to guarantee that SOF and expeditionary maneuver forces are properly reinforced, the US military will need to quickly research creative ideas and oversee their implementation. Otherwise, it will likely face a future battlefield in which the supply of supporting fire is dramatically outpaced by demand.

Force Protection: MedEvac in the A2/AD Environment

Since the days of the American Revolution, the US military has possessed some capacity to remove wounded soldiers from the battlefield and provide them with medical treatment. Throughout the American Civil War and World War I, the US military removed injured personnel by hand or with the aid of horses. In World War II, it used short takeoff and landing aircraft like the Piper J-3.⁴⁸ By the time America entered the Vietnam War, many casualty evacuations occurred via helicopter by professionals who specialized in aeromedical evacuation.

Since Vietnam, the US military has continued to improve its ability to evacuate injured personnel and now possesses numerous aviation units solely dedicated to the removal and treatment of injured service members. Currently, two distinct types of removal from the battlefield exist: medical evacuation (MedEvac) and casualty evacuation (CASEVAC). MedEvac is conducted by dedicated medical vehicles as defined by the Geneva Convention of August 12, 1949.⁴⁹ In contrast, CASEVAC can be accomplished by any platform on the battlefield and is not subject to the same Geneva Convention protections.⁵⁰

The ultimate goal of any MedEvac or CASEVAC operation is to transport critically injured personnel to a treatment facility within the golden hour, which is defined as the one-hour period immediately following a traumatic injury during which, if treated, a patient has the highest probability of survival.⁵¹ The main problem associated with removing injured personnel in an A2/AD environment is similar to that of providing reliable lines of communication or fire support: quite simply, it is the tyranny of distance.

Unless land bases are near the wounded service member's point of injury, medical transport platforms need a substantial flight radius to provide US naval vessels sanctuary from ASMs. Presently, the US military has a limited number of air-refuel capable MedEvac aircraft with flight radiuses of greater than 300 nm. The aircraft that meet this criterion are helicopters,

that will struggle to recover patients within the golden hour as the distance between US Navy ships and the shoreline increases because of ASM. To correct this deficiency, the US military has multiple options.

Its first option is using the only aircraft in America's inventory capable of transiting 300 nm in one hour and landing at a wounded service member's point of injury; again, the MV-22B is the singular platform capable of performing this task. Nonetheless, the MV-22B does have its drawbacks. Because the MV-22B is considered a CASEVAC platform, it lacks the noncombatant protections afforded to MedEvac aircraft under the Geneva Convention.⁵² This means that any MV-22B performing CASEVAC could be shot down as a combatant aircraft even if it was only removing the wounded from the battlefield. Along with this drawback, for the MV-22B to make it from the point of injury to a naval vessel capable of performing advanced treatment, the aircraft would need to be waiting nearby when it receives a call for evacuation. A potential answer to these shortcomings would be for the Department of Defense to grant the MV-22 MedEvac status and identify crews within each squadron to pilot designated MedEvac aircraft. By doing this, the MV-22B could loiter near objective areas with reduced risk of being shot down by enemy fire. An additional benefit would be that designated MedEvac personnel could receive specialized training related to aeromedical physiology and the impact of flight on wounded personnel.

Other methods of improving patient survivability with the MV-22B include expediting the development of battlefield surgical units (BSUs) and creating modular medical suites to perform immediate care within the aircraft. The use of BSUs is an existing concept that calls for medical personnel and their equipment to travel onboard MV-22Bs and provide care after landing.⁵³ BSUs consist of an emergency room physician, physician's assistant, emergency

nurse, and a field medical technician; these personnel could perform emergency medical care from a tent near the patient's point of injury.⁵⁴ One drawback to this approach is the need for a moderately low threat area in which to land and set up the medical site.

An additional option for expediting medical treatment is the creation of modular medical suites for the MV-22B that allow physicians to conduct in-flight medical care. Similar to BSUs, modular medical suites are staffed with a physician, critical care nurse, respiratory therapist, and an array of other nurses and technicians.⁵⁵ A Transfair Modular MedEvac system has already been developed for Lockheed Martin's C-130 aircraft and provides patient monitoring, ventilation, infusion, suction, and medical imaging.⁵⁶ Developing these medical units for the MV-22B would offer a safe area for the performance of medical care and sophisticated stabilization equipment to increase the probability of patient survival. An added benefit of modular medical suites would be the ability to start care at or near the patient's point of injury. If equipped with this type of system, the MV-22B could fly directly into an objective area and extract the wounded, treating them while en route to a more advanced medical facility.

In addition to using the MV-22B for medical evacuation, employing UAS for patient transport is becoming a realistic option for the A2/AD environment. Recently, Dragonfly Pictures Incorporated (DPI) developed a UAS capable of recovering wounded personnel completely autonomously. The DP-14 Hawk is a tandem rotor, vertical takeoff and landing drone designed specifically for medical evacuation.⁵⁷ The DP-14 uses three-dimensional laser scanning combined with digital terrain data to fly non-line-of-sight, low-altitude profiles.⁵⁸ Because of its laser scanning capability, the DP-14 can operate effectively even in areas with poor GPS connectivity. More important, it can fly at less than 50 feet above ground-level and use ground

clutter to avoid radar detection.⁵⁹ With a payload capacity of 430 lbs. and a landing site accuracy of 9 feet, the DP-14 would easily be able to conduct single-patient evacuations.⁶⁰

The only potential drawback to the DP-14 is its flight endurance. Although the system is designed to fly at speeds up to 120 mph, its recommended cruise speed is 85 mph.⁶¹ Furthermore, payload weight affects the amount of time the system can remain airborne. This means that as patients get heavier, the DP-14's range decreases. For the DP-14 to carry a 200-lb. Marine and 100 lbs. of medical equipment, its range would be limited to approximately 100 nm.⁶²

The DP14's flight endurance limitations will require a launch and recovery vessel to remain within 100 nm of any littoral objective area. The *Spearhead*-class expeditionary fast transport (EFP) would be an effective solution for intermediate launch and recovery. The EFP is a 337 ft. by 93 ft. catamaran with a speed of 43 kt and the ability to conduct aviation operations.⁶³ At \$180 million per vessel, the EFP is one of the least expensive large ships in the US Navy's inventory.⁶⁴ Based on the EFPs size and the minimum takeoff and landing requirements for the DP-14, the ship could hold up to a dozen systems and conduct a launch or recovery every five minutes.⁶⁵ If necessary, the EFP could move closer to a littoral objective area to reduce transit times and increase patients' chances of survival.

To improve the EFPs survivability while operating within the engagement range of precision ASM, the US Navy will need to upgrade its armaments. At present, the EFP only has gun mounts for four M2.50-caliber machine guns.⁶⁶ If the vessel is used for these types of medical operations, survivability equipment and counter-missile systems similar to those suggested for the LCU-F and LCAC will be necessary.

An additional benefit to using the EFP for aeromedical operations is its capacity to function as a treatment facility. The EFP has 20,000 sq. ft. of empty cargo space that could easily be filled with modular medical suites like those designed for aviation use.⁶⁷ Although these units would require additional electrical power, they would not require any structural modifications to the vessel. Furthermore, if properly staffed with physicians and medical support personnel, the ship could provide patients with a level of care equal to or greater than what is found at battalion aid stations. Once patients are stabilized, they could be transported by helicopter to a larger ship or taken via tiltrotor aircraft to a land-based hospital for follow-up care.

The transport and treatment of wounded personnel has continually evolved since the earliest days of American warfare. Throughout the past two and a half centuries, medical evacuation has progressed from the horse to the helicopter; however, to remain relevant on the modern battlefield, the US military needs to advance its medical evacuation capabilities. In the future, threats will require connectors like the MV-22B, DF-14, and EFP to reduce the amount of time from injury to treatment and improve patients' odds of survival.

Conclusion

The dangers posed by modern adversaries armed with precision munitions could limit America's future ability to operate around the globe. Whether it is the high-end threat presented by China in the Pacific or the growing number of hybrid adversaries throughout the Middle East and Africa, the proliferation of advanced A2/AD systems is becoming a matter of great concern. To address these challenges, the US military will need to improve how it operates and to provide its personnel with the ability to function effectively in these new environments.

Specifically, the United States will need to improve ship-to-shore and land-based connectors to facilitate the movement of materiel, supporting fire, and medical evacuation. One

simple solution is to make logistics platforms more durable by providing them with the necessary equipment to counter precision weapons. Combined with this initiative, the US military will also need to provide ground forces with expanded options for fire support because of the constraints that modern adversaries will place on conventional methods. In addition to these proposals, changes to the conduct of medical evacuation will be necessary to account for the increased standoff distances created by modern weapons. Ultimately, if nothing is done to address these issues, the United States could easily find itself unable to operate effectively against potential adversaries throughout the world. With such measures, however, the range and flexibility of the US military may allow it to operate in denied environments, including “places without bases,” while “hiding in plain sight,” thereby carrying the fight to the enemy while minimizing risk to its own forces.

APPENDIX A

HISTORICAL CASE STUDY OF THE ANGOLAN CIVIL WAR

The Angolan Civil War provides an excellent example of how external actors can control the flow of resources and change the outcome of a war. Major global powers such as the United States, China, and the Soviet Union all influenced Angola's warring factions and because of Cold War geopolitics, lesser powers such as Cuba and South Africa became principal participants in the conflict. The contributions of these outside entities resulted in multiple dynamic military battles fought with advanced weaponry and modern logistics during the Angolan Civil War. Because of this outside intervention, weapons proliferation, military logistics, and battlefield training improved for the Cubans and diminished over time for the South African Defense Force and its Angolan partners. Ultimately, a combination of external interference and logistical challenges led to the failure of South Africa's intervention and the success of Cuba's internationalist policy efforts.

Origins of the Angolan Civil War

Angola's civil war immediately followed the countries' thirteen-year war for independence from Portugal that concluded in 1974. Within Angola, three groups sought power after the Angolan War of Independence, The People's Movement for the Liberation of Angola (MPLA), the National Liberation Front of Angola (FNLA), and the National Union for the Total Independence of Angola (UNITA). These organizations represented separate social groups within the country, and all had a direct interest in securing power. Interestingly, these organizations battled Portugal together for Angola's independence, and in some cases even fought alongside one another. However, ideological and tribal differences among these factions prevented them from working together after the Angolan War of Independence.

The MPLA contained mainly members of the Ambundu tribe and originally emerged from the Angola Communist Party in 1956. With deep ties to the Soviet Union and Cuba, the MPLA planned to create a pro-communist government in Angola that mirrored Cuba's regime.⁶⁸ The FNLA, and UNITA were guerilla separatist groups founded in 1954 and 1966 respectively. The FNLA was comprised of the Bakongo tribe and supported ethnopolitical social policies.⁶⁹ UNITA was made up of the Ovimbundu people and supported moderate socialism.⁷⁰ These groups received both material and advisory support from the United States and China during the Angolan Civil War. Each benefactor had its own reasons for supporting the FNLA and UNITA. For the United States, supporting these groups helped to counterbalance the expansion of Soviet influence on the African continent.⁷¹ For China, it helped demonstrate that the Soviet Union was not the only communist power capable of supporting budding leftist movements.

Much like the tribal factions participating in the war, South Africa and Cuba also had compelling reasons to enter the conflict. South African involvement in the Angolan Civil War is believed to have occurred for two reasons. First, South Africa wanted to improve its relationship

with the United States by covertly supporting the Angolan anticommunist factions.⁷² This relationship, while also covert, would have provided South Africa's Apartheid government with a much-needed ally during a period when the West shunned it.⁷³ Second, South Africa feared the expansion of communist ideology within the region. Although South Africa's involvement in the conflict was meaningful, Cuba's participation in the war was undoubtedly the most important. For Cuba, intervention was a matter of supporting its allies in the MPLA and a natural progression of its internationalist foreign policy.⁷⁴ Furthermore, Cuba felt confident that if it deployed military forces it would receive support from the Soviet Union and therefore was not as concerned as South Africa with overextending its resources in Angola.⁷⁵

The first significant fighting of the Angolan Civil War began in July of 1975 when MPLA forces took control of the Angolan capital city of Luanda and forced out the members of the FNLA and UNITA. With the MPLAs control of the country growing rapidly, South Africa launched Operation Savannah in October of 1975 to stem the group's expansion into Angola's southern border area.

South Africa's Operation Savannah

Operation Savannah was a covert military operation that used Bushmen, the FNLA, UNITA, retired Portuguese Flechas, and South African army officers to intervene in the Angolan Civil War. The United States Central Intelligence Agency (CIA) supported the operation, providing military training and assistance to the FNLA, UNITA, and the South African Defense Force (SADF).⁷⁶ From August to October 1975, the United States supplied anti-MPLA forces with their first arms shipments. The weapons consisted of two planeloads of small arms delivered directly into Angola on C5 and C141 aircraft.⁷⁷ At the same time, China also supported

the FNLA / UNITA with weapons and trainers funneled into Angola from surrounding countries.⁷⁸

On October 14, 1975, South Africa began Operation Savannah. Four independent fighting groups code-named Task Force Zulu, Foxbat, Orange, and X-Ray departed from northern Namibia with the goal of converging on the MPLAs stronghold in Luanda from the south and east.⁷⁹ The FNLA was already applying pressure on Luanda from the north, so these actions would trap the MPLA against Angola's western coast. Task Force Zulu swept through the southwestern part of the country and encountered little resistance until it reached the coastal city of Benguela, where it engaged MPLA forces to gain control of Angola's western railway line.⁸⁰ Simultaneously, Foxbat, Orange, and X-Ray moved from east to west over 200 miles, dislodging MPLA forces from the cities of Luso and Huambo.⁸¹ By mid-November 1975, the SADF and UNITA had regained control of southern Angola and were within 100 miles of the MPLA headquarters in Luanda.⁸²

South Africa's early victories during Operation Savannah were largely attributable to the support and training that taskforce fighters and the FNLA received from the CIA and retired Portuguese Flechas.⁸³ This assistance provided them with much-needed tactical expertise and the weaponry necessary to defeat the less-skilled MPLA fighters. The achievements of the SADF and UNITA during the initial phase of Operation Savannah were also a product of the creativity and willpower necessary to overcome material shortfalls.⁸⁴ According to Lieutenant-General Miguel Junior in his 2015 book *Angola: the Failure of Operation Savannah*, "One of South Africa's main challenges during Operation Savannah was logistical in nature."⁸⁵ Furthermore, in April of 1976, South Africa's internal analysis of the conflict concluded that logistics were Operation Savannah's least satisfactory aspect.⁸⁶ Ultimately, two issues created the majority of

logistical problems for South Africa's Defense Force in Angola: poor lines of communication and lack of material depth.

During the early stages of Operation Savannah, the task force's problems receiving ammunition for their 144mm artillery pieces and replacement parts for Eland armored cars placed a significant strain on different units' ability to operate.⁸⁷ The reason for these parts and ammunition shortages was poor lines of communication among the different unit locations in Angola and the main supply facility 200 miles away in the Namibian city of Grootfontein.⁸⁸ These logistical issues were exacerbated by the fact that many of Angola's roads were not trafficable and when parts and ammunition did move, they did not move fast enough to be effective.⁸⁹ From October 14 to November 23, taskforce units managed to overcome these challenges and defeat the struggling MPLA forces. However, South Africa's success was about to stagnate because of the introduction of modern weaponry by the Soviet Union and Cuba's intervention in the conflict.

Cuba's Operation Carlota

Cuba conducted Operation Carlota because of its twenty-year relationship with the MPLA and a desire to uphold its internationalist agenda. Furthermore, by 1975 Cuba had a long-established record of interfering in African affairs. One example of this was Ernesto "Che" Guevara's operations in the Congo during the mid-1960s. Unlike South Africa's Operation Savannah, Operation Carlota received the full support of the Cuban government and thus the full logistical and political support of both the Cubans and the Soviets. From March to October of 1975, the Soviet Union provided the MPLA with twenty-seven shiploads and thirty-four cargo aircraft loads of modern weapons.⁹⁰ The USSR persuaded Portugal and other countries in the region to allow these shipments by conducting secret meetings and applying political pressure.⁹¹

The weapons allowed the MPLA to resist the FNLA and UNITA but were insufficient to stop the South African taskforce units' advances in the fall of 1975.⁹² By November of 1975, the MPLA was near defeat and in dire need of Cuban support.⁹³

The first significant Cuban involvement in the Angolan Civil War occurred on August 21, 1975, when 480 volunteers arrived and established four training camps for the MPLA.⁹⁴ Three Cuban ships carrying vehicles and supplies for 5,300 fighters followed these volunteers.⁹⁵ Although these trainers and supplies were beneficial, they were not enough to hold back the advancing forces from SADF taskforce units or the FNLA. On November 7, 1975, Fidel Castro initiated Operation Carlota, in an effort to bolster the struggling MPLA. The first wave of Cuban personnel included a 652-man special forces group that arrived via commercial aircraft on the evening of November 7th.⁹⁶ This group of fighters would help halt the FNLA's southern advance three days later, which caused an immediate shift in Operation Savannah's momentum and provided the MPLA with the time they needed to receive additional Cuban reinforcements.⁹⁷ The MPLA successfully ambushed Task Force Foxbat by using BM-21 mobile rocket launchers delivered by the Soviet Union and employing the tactical training provided by Cuba.⁹⁸ The MPLA successfully ambushed Task Force Foxbat by using BM-21 mobile rocket launchers delivered by the Soviet Union and employing the tactical training provided by Cuba.⁹⁹ SADF losses were significant, amounting to sixty killed, forty wounded, and eight armored vehicles rendered useless. SADF losses were significant, amounting to sixty killed, forty wounded, and eight armored vehicles rendered useless. Although this loss was not a crippling blow to the SADF taskforce units, it alerted them to the fact that victory was not assured now that Cuba was involved.¹⁰⁰

From November 1975 to March 1976, Cuba conducted a remarkable logistical feat. During this four-month period, Cuban cargo ship crews conducted non-stop 11,000-mile trips across the Atlantic in outdated vessels modified to carry passengers and cargo many times greater than their capacity.¹⁰¹ Along with this, Cuban pilots dangerously overloaded their aging Britannia aircraft with Cuban personnel and Soviet munitions while making 101 trips from Cuba to Angola.¹⁰² By the end of March 1976, Cuba's logistical efforts resulted in the transport of 25,000 personnel, hundreds of Soviet T-34 tanks, BM-21 mobile rocket launchers, and B-10 recoilless rifles.¹⁰³ These weapons, combined with Cuban training, provided the MPLA with sixteen organized infantry battalions, twenty-five mortar batteries, and numerous anti-aircraft gun emplacements during the winter of 1975–76.¹⁰⁴

Turning Point in the War

By mid-December 1975, Cuban support of the MPLA had already placed the MPLA on equal footing with the SADF taskforce units, and, on December 18, the MPLA captured four white South Africans. The capture of these white troops exposed the SADF's covert operation in Angola to the South African people and served as a significant political blow.¹⁰⁵ Shortly following the exposure of Operation Savannah, the South African government experienced another setback. Fearing a repeat of what occurred in Vietnam, later that month Senator Dick Clark of Indiana introduced an amendment prohibiting all CIA support of operations in Angola.¹⁰⁶ Congress passed the bill into law within a matter of weeks, and South Africa lost its biggest external ally in the conflict.

Intense fighting continued in Angola during early January as South Africa and Cuba fought for control of the country. Unfortunately for the SADF and UNITA, by this time they were severely outmatched by the MPLA and Cuban forces, who now possessed modern Soviet

equipment. By mid-January 1976, the SADF taskforce units were being pushed back to the Namibian border. On January 23, 1976, the OAU voted to recognize the MPLA as the legitimate government of Angola.¹⁰⁷ This recognition gave South Africa little recourse but to remove its forces, and, by March 27, 1976, the SADF and UNITA had withdrawn to Namibia and the FLNA had been defeated in the north.¹⁰⁸

In conclusion, the participation of external actors in the Angolan Civil War had a profound effect on how the war was fought. For South Africa, UNITA, and the FNLA, assistance from the United States and China, combined with a willingness to fight while poorly equipped, facilitated early victories that they could not maintain. For Cuba and the MPLA, Soviet support and Cuba's superior logistical infrastructure rapidly reversed early losses. Ultimately, the actions of external entities greatly influenced the distribution of arms, logistical lines of communication, and tactical training throughout the Angolan Civil War and were the determining factor in the conflict's outcome.

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