Operationalizing Air-Sea Battle in the Pacific

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Opposing a great power is a means of asserting one's own power, and several countries aspire to be great powers regionally if not globally. One expression of power is the ability to deny access or disrupt operations, and many countries seek to

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strengthen their antiaccess/area-denial (A2/AD) capabilities as a means of asserting regional control and influence. Take the People's Republic of China (PRC) for example. An emerging superpower at the turn of the century, the PRC published a white paper titled "China's National Defense in 2000" in October of the same year. This document set the tone for the PRC's strategy of attaining great-power status, built upon a foundation of the "Five Principles of Peaceful Coexistence," robust economic development, and military strength.[1] Since 2000 the PRC's unprecedented economic growth and prosperity have allowed it to invest heavily in military modernization. Today the PRC's military forces are exponentially more capable than they were at the turn of the century.[2] In its 2010 white paper on national defense, the PRC says that it "will never seek hegemony," that it "opposes hegemony and power politics in any form," and that it "pursues a national defense policy which is defensive in nature."[3] However, its recent territorial claims and aggressive actions in the South China Sea represent an expansionist view of "self" that threatens regional security. More importantly, to assert these claims, the PRC has built a robust, power-projecting A2/AD capability that could be brought to bear against the United States, its allies, and its partners. Largely due to the PRC's actions in recent years and current military capability, A2/AD has emerged as a national concern, especially when it threatens to deny the global commons or upset regional security.[4] In June 2012, strategic guidance specifically tasked the US military to project power despite A2/AD.[5] To deal with the A2/AD problem, the US Department of Defense (DOD) has turned to Air-Sea Battle (ASB), putting concepts into practice.[6]

This article examines how United States Pacific Air Forces (PACAF) is working through United States Pacific Command (PACOM) to evolve ASB concepts into doctrine and operational action as a counter to A2/AD practices and as a means of prevailing in the face of informationized warfare. PACAF's actions not only deal with a potential A2/AD threat from the PRC but also safeguard unimpeded military operations across the spectrum of domains according to international laws and customs in order to preserve the national security interests of the United States,

its allies, and its partners. First, the article offers background information, focusing on the initial development of ASB concepts and their pervasive effects on the DOD. Second, it examines historical examples of A2/AD operations, showcasing lessons learned and demonstrating how they have shaped ASB concepts, PACOM operational considerations, and current PACOM operations. Next, the article dissects five key mission sets in which ASB is beginning to make a difference in the Asia-Pacific, including intelligence, surveillance, and reconnaissance (ISR); long-distance communications; logistics/sustainment; tactical networking; and command and control (C2). Finally, it addresses three tangible benefits of ASB, including better collaboration among the services, a framework for mitigating the looming A2/AD threat, and stronger international partnerships for collective security.

In light of these benefits, PACOM has taken steps to operationalize ASB so that it successfully takes root in the Asia-Pacific area of responsibility (AOR). The United States is not a guest in the Asia-Pacific theater; it is a Pacific nation with states, territories, and allies that depend on it for continued prosperity, security, and protection. To that end, ASB is PACOM's framework to counter any attempt to deny the United States the ability to pursue its interests, gain and maintain access, protect its allies and partners, and conduct military operations regardless of the domain.

The History of Air-Sea Battle

The history of ASB is brief but momentous. A series of significant improvements in the PRC's A2/AD capability during the first decade of the twenty-first century did not go unnoticed, prompting the DOD to action. In July 2009, the secretary of defense directed the Air Force and the Navy to study options for preserving US and allied access to the "global commons"—those areas of air, sea, space, and cyberspace shared by all nations and used for commerce, transportation, and communications. In 2010 the Center for Strategic and Budgetary Assessments (CSBA) published *AirSea Battle: A Point-of-Departure Operational*

Concept, which presents ASB as a strategic alternative to passively accepting A2/AD capabilities pursued by the PRC.[7] The CSBA authors proposed countering A2/AD primarily through tight integration of Air Force and Navy operations in the Western Pacific theater of operations.[8] Their ideas gained immediate momentum.

The CSBA's ASB paper led to establishment of the Air-Sea Battle Office in the Pentagon, which has taken point on maturing the ASB concept into operational action. In May 2013, the office published *Air-Sea Battle: Service Collaboration to Address Anti-Access and Area Denial Challenges* (version 9), building upon the concepts presented by the CSBA. The office's ASB paper evolves the original ASB concept as a counter not only to the PRC's A2/AD capabilities but also to anyone who threatens to deny the United States and its allies access and the ability to maneuver or operate in the global commons.[9]

ASB is a modern combined-arms (joint warfare) concept that takes into account the prevailing geographical domains in the Asia-Pacific—air and sea along with the domains of space and cyber.[10] Since the US Air Force and Navy are the primary services operating in the air and sea domains, the original ASB concept emphasized tight Air Force and Navy integration to operate successfully in an A2/AD environment. Because of the name, some people mistakenly believe that the ASB concept excludes the US Army and Marine Corps.[11] In fact, numerous Army and Marine missions lend themselves to ASB, including logistical supply, security, special operations, and even ground combat, if required.[12] Just as the Navy and Marines had important roles in the operational practice of AirLand Battle, so do the Army and Marines play a significant part in the operational practice of ASB.[13] Today, all service components in PACOM actively incorporate elements of ASB into their complementary strategies.

The Problem of Antiaccess and Area Denial

Let us take a moment to define antiaccess and area denial. On the one hand, A2 is "action intended to slow deployment of friendly forces into a theater or cause forces to operate from distances farther from the locus of conflict than they would otherwise prefer. A2 affects *movement* to a theater" (emphasis in original).[14] On the other hand, AD is "action intended to impede friendly operations within areas where an adversary cannot or will not prevent access. AD affects *maneuver within* a theater" (emphasis in original).[15] Denying an enemy access and the ability to maneuver is nothing new in warfare. The weapons now, however, are more precise and have longer ranges than at any other point in history, so the A2/AD environment is larger and more lethal than in the past. With technology rapidly evolving and readily available, a country with the means can more easily develop or acquire the weapon systems necessary to build an A2/AD architecture and capability.

The United States believes that A2/AD capabilities challenge and threaten both its own ability and that of allied forces to reach contested areas and operate effectively there.[16] The PRC's A2/AD systems and architectures are designed to "make US power projection increasingly risky . . . and prohibitively costly."[17] Even short of armed conflict, A2/AD seeks to challenge the United States' ability to operate across the global commons in all domains. Since freedom of action in international waters and airspace is an enduring national interest, along with the defense of our allies, countering A2/AD is a strategic imperative for the United States. US support for the defense of our treaty allies depends on our ability to reach the objective and operate there effectively. Just as the United States needed a credible way to reinforce the North Atlantic Treaty Organization (NATO) during the Cold War, so does it require a similar deterrence to reinforce our treaty allies in the Pacific.

Technology, Domain Dominance, and Information Superiority

History reveals an important truth regarding the character of war: three game changers often translate into an overwhelming asymmetric strategic advantage and eventual victory—superior technology, domain dominance, and information superiority. Time and again, from the campaigns of Alexander the Great to the second Gulf War, asymmetric advantages in these areas win wars. Therefore, to gain and sustain strategic advantage, a country must pursue and realize asymmetric advantages in technology, domain dominance, and information superiority while simultaneously denying the adversary the ability to do the same.

The character of war has been changed by asymmetric technological advantages on numerous occasions throughout history, and the lesson learned is the same—every technological advantage is eventually countered. One of the most significant and decisive changes in warfare was the introduction of gunpowder. When Charles VIII of France moved his army into Italy in 1494, cannons dramatically altered the calculus.[18] Fortifications that had withstood sieges lasting months were now overwhelmed within hours.[19] However, fortress designs soon adapted to contend with cannon fire, and Italian fortification families began building bastion defenses with angular, lower, and thicker walls. These new designs mitigated the effectiveness of cannon fire and eroded its advantage. This example illustrates the race between enhancing one's own technological advantages while countering an adversary's. Today, the race continues between better weapons and corresponding counters.

Blocking access on the two-dimensional battlefields of the past was fairly straightforward. The ancient city of Troy relied upon its impenetrable walls to keep out the invading Greek army. The Romans constructed the "limes" on the Rhine and Danube, as well as Hadrian's Wall in Britain and fortifications in Syria.[20] These were designed to defend the empire on the periphery while the majority of Roman cities were unfortified. In China the Great Wall reached a length of nearly 4,000 miles in an attempt to protect the more "civilized" regions of China from warring

tribes and nomadic marauders such as the Mongols.[21] Prior to World War II, France constructed the Maginot Line at a cost of over seven billion francs to deny the German army access to France.[22] Some of these A2 attempts were successful, and some were not. New domains add dimensions to the battlefield.

Domains can be described as the environment in which conflict occurs. History shows that those who dominate the domains generally win the battle, if not the war. For most of history, wars were fought on land or at sea. About 100 years ago, the invention of powered flight expanded conflict to the air; the submarine, to the subsurface. More recently, the domains of space and cyber came into play. Those who adapt quickly and dominate domains generally gain an advantage.

For example, the German blitzkrieg owes much of its success to the simultaneous exploitation of the air and ground domains. In this example, the Luftwaffe worked in direct concert with ground forces using radio communication with devastating effectiveness.[23] The Germans were also quick to adapt to subsurface warfare and were notorious in their use of submarines to attrite Allied forces.

In another example, the United States—an early airpower pioneer—learned full well the advantages of air and sea dominance in World War II. After the war, the United States made it a priority to build and sustain the world's premier air force and navy, relying primarily on technological superiority to gain an asymmetric advantage and to maintain domain dominance. Because of our heavy investments in airpower and sea control, the United States has enjoyed air superiority and control of the sea for a generation. During much of that time, our dominance of these domains was so unrivaled that early air superiority and control of the sea were often planning assumptions.

The United States was also a pioneer in space and cyber, having more space-based systems and satellites than any other country by far.[24] Further, as the Internet came into being, the cyber domain was born in the United States, along with tech companies like Google, Microsoft, Apple, and Facebook, which dominate the cyber landscape. Space and

cyber are ripe with cutting-edge technology that affords additional asymmetric advantages to the United States and its allies.

Arguably, as much as technology and the new domains have shaped the character of war, the way people process and use information has also had a massive impact, particularly the sheer amount of automated information available on demand. Since the end of the Cold War, advances in electronics have led to increasing automation in the generation, movement, and interpretation of information. Previously, information was processed by people, and communication consisted of exchange of information between individuals and groups. Today, global information is automated and instantly available, and the military is a massive generator and consumer of information. In fact, information is the foundation on which entire domains (space and cyber) are built.[25] Most people equate information with the cyber domain, but in reality, information superiority involves operations that span all domains. However, it is fair to say that most of the information collected across the domains is ultimately synthesized and automated within the cyber domain. Accordingly, information superiority plays a key role in the ASB concept.[26]

Cross-Domain Integration: "Moneyball" for the Department of Defense

Despite decades of technological advantage and domain dominance, particularly in air, sea, space, and cyber, gaps in the US technological advantage and domain dominance are narrowing. In some cases, US capability has even been rivalled or surpassed.[27] Technology is expensive, and the United States has seen increasingly limited returns on its investments in military technology. For example, the F-22 and F-35 were plagued by cost overruns and fielding delays that raised the price per unit so high that the services were forced to purchase fewer units than they wanted. Faced with a decade of costly wars, conflicting national priorities, and budget cuts, the DOD must find other ways to gain and maintain military advantage and domain dominance; it must

be smarter with the limited resources it has. Think of the movie *Moneyball,* in which the manager of the Oakland Athletics built a World-Series-caliber team on a budget. Similarly, the DOD must find ways to create more synergy from the manner in which it combines and employs arms. ASB does exactly that, relying heavily upon cross-domain integration.

As proposed by ASB, cross-domain integration is similar to the integration of various components in land warfare during its evolution. Prior to the advent of firearms, military forces consisted of infantry and cavalry. With the introduction of gunpowder, artillery was added to the order of battle. Armies had to adapt and change their two-component approach into a three-component approach. Armies that integrated artillery, infantry, and cavalry more seamlessly than their opponents usually gained a synergistic advantage. King Gustav Adolph of Sweden pioneered modern combined arms during the Thirty Years' War of the early 1600s, innovatively integrating the whole of his army to create strengths and mitigate weaknesses for each part. The king formed an interdependent system of infantry, cavalry, and artillery that supported and enhanced each other's effectiveness. To this day, King Gustav Adolph is regarded as one of the most brilliant military commanders of all time. As military technology evolved throughout the centuries, so did land warfare. Eventually, armies learned to integrate aviation and mechanized units into their combined operations, along with cavalry, infantry, and artillery. It is easy to see how land warfare and the evolution of combined arms are notable models in the successful integration of new and different components—the same principles apply across domains.

Close integration across or between domains is called cross-domain integration. It seeks to produce synergistic effects by integrating different warfighting elements—in this case, across domains. At its core, cross-domain integration is a form of combined arms, akin to joint warfare. It is the same concept King Gustav Adolf used to integrate the Swedish Army 500 years ago. It is the same concept Napoleon used to integrate his armies in Europe and secure his empire. It is the same concept ex-

pounded by Luftwaffe general Erhard Milch to integrate his air and ground forces in World War II. Milch said that "the dive bombers will form a flying artillery, directed to work with ground forces through good radio communications. . . . Tanks and planes will be [at the commander's disposition]."[28] It is also the concept the Marine Corps uses to integrate its forces as a Marine air-ground task force. ASB borrows the concepts of combined arms and cross-domain integration to meet the demands of information automation.

Achieving Synergy in Five Key Mission Sets

The goal of ASB is to seize and sustain the initiative in the air, sea, space, and cyber domains, primarily by exploiting decisive advantages in training, integration, and information superiority.[29] Since realizing that goal requires the services to work in concert, it follows that the mission sets which span across domains (services) could be either the greatest strength or the most vulnerable weakness. ASB's success hinges on the effectiveness of service collaboration and synergy, particularly in five mission sets: ISR; long-distance communications; logistics/sustainment; tactical networking; and C2. Collectively, these sets hold the greatest potential for advances in cross-domain integration due to the automation of information. However, they are neither all inclusive nor discrete. A broad examination of cross-domain integration in each of these mission sets reveals considerable overlap between and among them.

Intelligence, Surveillance, and Reconnaissance

ISR assets collect the brunt of information, and reliable data contributes to information superiority. Consequently, we must preserve the quality of our information by protecting our ISR assets while simultaneously degrading the quality of the enemy's and exploiting or destroying his assets. In fact, countering ISR is the centerpiece of the operational concept presented in the 2010 CSBA paper, mentioned

above.[30] ASB seeks to ensure the quality of our information while degrading or denying the enemy's and thus blind him to the "real" battlefield or lure him to act on bad information.

The automation of information does not mitigate—and can even exacerbate—the age-old problem of garbage in / garbage out. Denying targeting and providing false targeting data will degrade the ability of precision ballistic missiles to strike air forces. However, a blinding campaign by itself will likely be insufficient. Although large-scale attacks against multiple air bases will rapidly deplete a ballistic missile inventory, low-level harassing fire can also disrupt operations at fixed facilities—and can do so more cheaply.[31] Therefore, airpower must adopt maneuver warfare and become more unpredictable.

This lesson seems obvious, but over the last several decades, US airpower has become synonymous with large, fixed main operating bases. These Clausewitzian centers of gravity are a source of strength in many respects but also present a vulnerability that potential enemies could exploit. For example, anyone who has studied American warfare knows that the United States executes a document of timed-phased force and deployment data in response to a contingency. If that document is overly predictable or limited to a select few main operating bases, enemies with a robust artillery or missile capability may inflict crippling damage before we fly our first combat sortie. Why would they watch us build up our forces, knowing attack is imminent, when they can attrite our forces before we even bring them to bear? The 7 December 1941 attack on Pearl Harbor teaches us the danger of putting all of our eggs in one basket, as well as the value of a preemptive strike against a predictable enemy. It's easy to see how incorporating unpredictability and maneuver into the basing scheme while executing a blinding campaign on the information warfare front will help us gain and preserve the airpower initiative in contested environments. This is just one example of how ASB concepts—creating uncertainty by being more unpredictable, maximizing maneuver, and confusing the adversary with bad information—can thwart the effectiveness of A2/AD in practice.

The Navy's inherent mobility gives it an immediate advantage because it is difficult to find, target, and neutralize moving aircraft bases and power-projection platforms. Recognizing the advantages gained by rapid aircraft maneuver and unpredictability, PACAF is following suit, exercising these principles with initiatives like the Rapid Raptor program, among others.[32] To protect assets that cannot maneuver quickly, airfields themselves must employ passive and active means to confuse the enemy and survive attack. Our integrated air and missile defense (IAMD) systems must work in concert to concentrate limited fires on the highest-priority threats, synergistically fusing systems and capabilities from all services as well as our allies. Accordingly, PACAF is working to shore up its IAMD capability and has a line of operation dedicated to the task. To date, PACOM has realized significant gains in IAMD.

ASB's success also depends upon ISR's integration across multiple domains and the exploitation of automated information capabilities across the spectrum of operations. The CSBA's ASB concept envisioned airborne ISR networks competing in a "scouting battle" to identify and strike adversary targets.[33] The CSBA paper implies that a significant portion of an airborne ISR network will consist of remotely piloted vehicles, but most of them will need to be autonomous to operate in the degraded communications environment that we anticipate. This is exactly what the automation of information provides. Both collaborative unmanned systems and heterogeneous collaborative control are technologies already under development.[34] Using these technologies, unmanned systems could execute as interactive teams to detect, identify, and record intelligence that can be relayed when communications are reestablished. These systems are vulnerable to antiair weapons; however, "relatively cheap drones with advanced sensors and imaging capabilities" are commercially available and can have military application.[35] These systems can be launched from multiple domains (land, sea surface, subsurface, air) to overcome limitations in range. At less than $1,000 each, these systems would force an adversary to engage with kinetic-kill interceptors—a cost-imposing strategy. Providing timely data, however, calls for a long-haul communications capability.

Long-Distance Communications

The DOD's ASB concept also demands robust, long-distance communications systems that can deal with intermittent outages. With the automation of information, the systems used to transmit that information can be considered information logistics. As described in the CSBA's ASB concept, the electromagnetic spectrum will likely be contested, and "dominating the EW [electronic warfare] competition as early as possible would be critical to winning the scouting battle and eventually prevailing in the conflict."[36] Until we do, not only will communication likely be challenged, but our radars, radios, data links, Global Positioning System, and other electromagnetic-dependent systems will probably suffer major degradation. Notably, the authors compare this competition to that between Germany and the Allies during the strategic bombing campaigns of World War II.[37] Robust, long-distance communication can aid in surviving and prevailing in a challenging electronic warfare environment by leveraging assets geographically removed from the immediate fight.

Logistics/Sustainment

Logistics and sustainment of forces have always presented a difficult problem, but with automated information and new technologies, ASB looks to turn this problem into an opportunity. Since the start of organized warfare, military forces have needed to meet on a battlefield (battlespace) and resource themselves. This was an issue secondary only to combat itself.[38] Alexander the Great owed much of his success to a brilliantly planned and executed logistics and sustainment campaign. In a potential future conflict, US forces will face considerable limitations because of ordnance constraints, quickly exhausting peacetime inventories of precision standoff munitions in a high-intensity conflict.[39] During the first year of World War I, the combatants literally ran out of artillery ammunition. Large, centralized logistics stockpiles are vulnerable to attack by precision missiles, and centralized databases are vulnerable to kinetic and nonkinetic disruption. To further

complicate logistics, some plausible rivals maintain sizable and highly capable submarine fleets. Given its robust fleet of cargo, scout, and attack helicopters, Army aviation can make a substantial contribution to logistical supply. Trade-offs exist between logistics and ISR. For example, dispersing air assets and making base infrastructure maneuverable would disrupt the adversary's ISR picture, but it also complicates logistics.

In 1942 Gen George Kenney faced a similar situation in New Guinea. He stopped building large, centralized logistics bases and emphasized pushing supplies forward to units at the front, regardless of inventory.[40] Kenney also directed that requisitions be filled at once by the lowest command level and, whenever possible, that critical parts be flown in and delivered.[41] In light of the automation of information, a similar solution lies in a more diffuse logistics command structure that allows suppliers and combat forces alike to exercise initiative. The example from the business world is known as platform economics. Platforms are defined as "a published standard that lets others connect to it, together with a governance model, which is the rules of who gets what."[42] A civilian example—Uber—is an app-based system that matches taxi riders with drivers. In military terms, commander's intent provides the governance model. Future standards, now in development, will allow the exchange of several supply classes across domains based on requirements and priorities. Mobile collaboration technologies, like the one described above, will permit a diffuse supply chain to identify the most effective supply path across domains. For example, fuels can be delivered to an air base via ship-to-shore pipeline. Emphasizing interchangeability of components in future procurement will allow these concepts to expand to other areas. The addition of flexibility and resiliency through information automation and the leveraging of new technologies will make logistics and sustainment a powerful ASB force multiplier and help overcome an adversary's attempts to deny access and disrupt operations.

Tactical Networking

Although considerable overlap exists between tactical networking and communications in general, the former focuses on the digital data links between different platforms. The original CSBA operational concept touches on this requirement in its recommendation for joint data links and data structures, but the operational concept does not envision the employment of those systems.[43]

The concept of the "combat cloud," introduced by Gen Michael Hostage, former commander of Air Combat Command, is a good representation of the Air Force component to tactical networking. Under this concept, older fighters "extend the network of linked systems providing reinforcing fires" while modern fifth-generation fighters function "as the core nodes shaping distributed joint capabilities."[44] However, reinforcing fires are not limited to fighters or Air Force assets. Bombers provide significantly larger munitions loads than fighters, especially low-observable fighters without external stores. Similarly, autonomous sensors offer additional inputs to the combat cloud. Semiautonomous "small, cooperative, tactical UAVs [unmanned aerial vehicles] for EW" supply additional capability.[45] Finally, in areas where a potential attacker's approach is constrained, sea- and surface-based systems give additional mass to reinforcing fires. The key lies in attaining cross-domain integration.

The defense of naval assets from cruise missile threats serves as an example of how cross-domain integration can be leveraged. Large barrages of cruise missiles pose a significant A2/AD problem.[46] Using terminal guidance, cruise missiles are capable of hitting ships at sea, making them particularly vulnerable. Limited magazine depth also constrains the ability of ships to counter mass salvos. Airpower, however, can concentrate rapidly and counter mass attacks on naval forces. Although kinetic-kill weapons are not cost effective against ballistic missiles, cost-effective kinetic-kill weapons against cruise missiles are feasible.[47] To produce the needed concentration, large aircraft such as

bombers and transports should carry them. Tactical networks linking semiautonomous weapons provide the necessary sorting of targets.

A second example of cross-domain integration is antisubmarine warfare. Finding submarines is difficult, and modern conventional submarines with air-independent propulsion are particularly hard to find.[48] However, antiship cruise missiles launched by submarines do not travel far before breaking the water. A network of autonomous sensors in potential submarine launch areas can detect a launch, send the information to a relevant command center (or core node, as described above), and direct an antisubmarine warfare asset to prosecute the target.

Command and Control

One aspect of C2—distributed control—is the process (or the how) of transitioning control authority from one entity to another. Distributed control does not delegate command authorities or command responsibilities from the combined force air component commander (CFACC) or a subordinate commander to another. Over the last two decades, the CFACC has increasingly centralized the C2 of airpower assets. The development of air and space operations centers (AOC) has greatly enhanced the efficiency of airpower and the delivery of effects on the battlefield. Centralization has allowed US air forces to take full advantage of the greater efficiencies of information technology, which increases the speed of the decision cycle.[49] However, centralized control requires the operational commander to have "complete, actual, precise and reliable information," which is neither practical nor feasible in a highly contested, robust operational environment.[50] Further, too much centralization violates a fundamental Air Force tenet learned and reinforced over numerous wars—that is, of course, "centralized control, decentralized execution."[51] The tendency for overcentralization also creates a potential vulnerability if the control mechanisms (communications, data links, etc.) are disrupted or if the central control facility is degraded or destroyed.

Distributed control mitigates risk associated with overcentralization, empowers lower-echelon commanders, and increases flexibility. One solution is to organize bases or carrier battle groups into clusters under a single commander, based on the ability to reach back to the AOC and provide forward C2. The services have numerous assets available to enable forward C2, including the E-3 Airborne Warning and Control System, E-2 Hawkeye, E-8 Joint Surveillance Target Attack Radar System, RC-135 Rivet Joint, control and reporting centers, Aegis cruisers, and others. Ultimately, layers of distributed control lead to enhanced survivability and flexibility, leaving the enemy unable to render our fielded forces crippled with a single, decisive blow.

ASB in practice usually entails either domain-centric or task-centric approaches to command. Each has strengths and weaknesses, and each lends itself to a different command structure. Normally, the mission determines that structure, but in a degraded environment, bandwidth should drive it. In areas where disruption is minimal, a domain-centric approach is most efficient, allowing fielded forces to collaborate and leverage resources like the AOC and national assets to better orchestrate the fight. Where disruption is greatest, a task-centric approach is more efficient, allowing local commanders to execute according to the commander's intent, even in the absence of centralized control. Both approaches harness the spirit of the concept of mission command as articulated by Gen Martin Dempsey, chairman of the Joint Chiefs of Staff.[52]

Addition of the space and cyber domains warrants other command considerations. Space and cyber are distinct, but distributing communications across the two domains requires unity of effort. Therefore, we should consider establishing an information warfare commander as a domain-centric command for the space and cyber domains. This individual would be responsible for the long-haul communications systems. Second, a platform-based, diffused logistics system implies that a logistics component commander may have to execute such a platform construct. Finally, cross-domain integration demands the presence of a robust

subject-matter expert, and each headquarters should incorporate from every domain such experts capable of articulating the commander's intent into operational action at lower echelons.

Distributed control can be effectively exercised only within specific types of organizations. Experience in top-down, centralized hierarchies will prove detrimental to officers asked to operate in a fluid, dynamic combat environment. Instead, effective war fighters in an automated information environment must be well versed in dealing with multiple, conflicting sources of information. This is precisely the environment presented by today's open exchange of information on the Internet. In addition, organizational culture must support the delegation of responsibility to subordinates. What then does ASB have to offer war fighters to improve cross-domain integration?

The Benefits of Air-Sea Battle in the Asia-Pacific

In the Asia-Pacific, ASB tangibly benefits war fighters in three areas. First, it facilitates better collaboration among the services. To date, ASB has resulted in a theater forum that translates into persistent relationships, technological advantages, and improved overall cross-domain integration. The services benefit not only from improved collaboration and synergy but also from easier access to shared and emerging technology, which they can leverage into strategic asymmetric advantages. Second, ASB offers the services a framework for defeating a looming A2/AD threat. Training, exercising, and operating within that framework gives war fighters the experience and ability to confidently execute the mission, even in uncertain operational and information environments. Finally, ASB spurs the services to strengthen international partnerships in the name of collective security. Through strong, vigorous relationships, PACOM forces may gain and sustain access, preserve a high degree of unfettered operations, and call upon the force-multiplying architectures and capabilities of close allies, partners, and friends as needed. Let us explore each of these benefits a bit more in depth.

Collaboration

ASB provides better collaboration among the services and between the services and the technology sector. It offers an avenue for war fighters, planners, and analysts to discuss, initiate, and develop new and better ways to work together. Before the 1986 Goldwater-Nichols Department of Defense Reorganization Act initiated reforms, "joint" meant deconfliction and compromise—everyone gave up something for the sake of moving ahead. The prevailing mentality was "I will stay out of your way; you stay out of mine." During the intervening years, innovations such as AirLand Battle moved "joint" into the realm of cooperation or partnering. The new mantra became "We have to play together, so let's play together nicely." Given today's budget-stressed environment, together with the speed and dexterity of potential adversaries, "joint" must mean collaboration and teamwork. Collaboration entails mutual trust, mutual investment, shared responsibility, collective accountability, and communal benefit. Another synonym for collaboration is "preintegration." According to the March 2014 *Air-Sea Battle Newsletter*, "At its core, the ASB concept seeks to develop a 'pre-integrated' joint force built from habitual relationships, with interoperable and complementary cross-domain capabilities." In short, ASB will guide joint forces into a collaborative model of teamwork. The idea of cross-domain synergy is just that: air, space, sea, land, and cyber all working to support each other to achieve the desired effects.

Although preintegration of hardware and weapon systems is an important aspect of collaboration, habitual interaction between service planners and action officers leads to true collaboration. ASB seeks to bridge the gap among planners, operators, and leaders so they work in concert. Providing opportunities to train, execute, think, and reflect on how to better execute the mission is just as important as supporting each other's mission. To further the idea of collaboration and habitual relationships, the staffs at PACAF and the Pacific Fleet (PACFLT) held talks on 17 December 2013. Their purpose was to identify key areas of interest where PACAF and PACFLT forces could support each other

and practice ASB. One of the outgrowths of the talks was creation of the Pacific Air-Sea Coordination Element (PASCE) (pronounced "Pace"). Residing on the island of Oahu, Hawaii, the PASCE, by charter, is a fully staffed focal point for all matters pertaining to ASB in the PACOM AOR. The PASCE has a cadre of local subject-matter experts well versed in ASB concepts, and its creation marks a big step in realizing a persistent, collaborative effort between PACFLT and PACAF and in incorporating ASB into everyday theater operations.

Led and cochaired by the PACAF chief of staff and the PACFLT deputy commander, the PASCE will serve as the catalyst for implementing ASB in PACOM, building and strengthening ties across PACOM components, improving our war-fighting capabilities, and supporting joint war fighters. Members of both the AOC at PACAF and the maritime operations center at PACFLT, as well as PACAF and PACFLT subject-matter experts, will make up the bulk of the PASCE cadre. This is not just a Navy and Air Force endeavor; representatives from US Army Pacific, Marine Forces Pacific, Special Operations Command of the Pacific, and PACOM are also part of the PASCE. Additionally, PACFLT's Center of Naval Analyses and PACAF's Research and Development liaisons are members of the PASCE. Their role is to lend academic rigor to ideas and concepts coming from PASCE associates. Finally, the PASCE forms the nucleus of the cross-domain coordination elements between the air and maritime components. PACOM is wholly committed to ASB, and the PASCE is the primary collaboration element. Through the PASCE, the services are forming habitual relationships, and preintegration is becoming a reality.

Framework

ASB provides the services with a second tangible benefit—the framework for defeating a looming A2/AD threat through exercise integration and joint training. In the Pacific, Exercise Valiant Shield predates the ASB concept, but it has practiced ASB-like concepts since its inception in 2006. The first Valiant Shield exercise, held in June of that year, involved 22,000 personnel, 280 aircraft, and 30 ships, including the

USS *Kitty Hawk*, USS *Abraham Lincoln*, and USS *Ronald Reagan* carriers. Conducted by Joint Task Force 519, it was the largest military exercise held by the United States in Pacific waters since the Vietnam War. One of the better organizational practices that proved valuable at Valiant Shield '06 was the joint force air component commander (JFACC) construct. For this particular exercise, the JFACC was an Air Force lieutenant general (three-star), and the deputy JFACC was a Navy rear admiral (two-star). Their chiefs of staff were O-6s from the opposite services. This arrangement made for seamless integration of airpower during the exercise operation. Valiant Shield continues to this day, and ASB concepts such as seamless service integration and cross-domain integration remain the heart and soul of this massive joint exercise. The level of joint integration has improved greatly over the past 10 years, along with cross-domain awareness in PACOM's action officers. In fact, many current leaders and senior planners are veterans of earlier Valiant Shield exercises and have brought their experience to the planning table. They also owe their high level of cross-domain awareness to experience gained from ASB-influenced events such as this exercise.

A high level of cross-domain awareness fosters intellectual innovation. From lessons learned in exercises such as Valiant Shield, ASB practitioners are building a repository of knowledge and developing a cadre of planners who can solve problems in innovative and collaborative ways; nevertheless, as Harry Summers points out, "we must remember that we are not very good at predicting the future."[53] Accordingly, the PASCE and other ASB subject-matter experts are not focused on examining a singular problem set but on maintaining a broader perspective regarding current, evolving, and perceived problem sets. Think of the PASCE as a college where ASB is the curriculum. The goal is not to find a specific answer but to develop operators who can think through and solve complex problems with many possible solutions using an array of tools from a diverse skill set. Further, these ASB subject-matter experts can teach others to do the same. The PASCE seeks to improve the command abilities of future US military leaders by exposing them to truly integrated joint operations at each and every level of

their career development. Rather than conduct joint exercises in the past flavor of "deconfliction," a new cadre of action officers and planners is (pre)integrated from the start of their careers. As the Pacific grows in economic and commercial importance, it is incumbent upon leaders and planners to analyze current and emerging issues before a crisis develops, properly synthesize the information, and derive the preferred solution. The Pacific military operational environment is one of the most complex and challenging in the world, and any good planner worth his or her salt knows the operational environment intimately. Such is the case at the PASCE.

International Engagements and Relationships

Lastly, ASB in the Pacific also involves international engagement and strengthening relationships. It can be said that Europe is a landscape while East Asia is a vast seascape, and that difference makes the cultivation of relationships problematic.[54] Nevertheless, the PASCE wishes to include our allies and partners in the Asia-Pacific. Several key allies have liaison officers already residing in Hawaii. Many of them will be invited to participate in the recurring PASCE events to further collaborative planning and execution. AirLand Battle was not a US-only initiative but an outgrowth of the NATO alliance. The Gulf wars were truly a coalition effort, and today's wars are almost always fought with coalition partners. Even without a NATO-like structure in the Pacific, we may leverage certain habitual relationships to advance ASB goals. As the PASCE matures, it will include representatives from the militaries of South Korea, Japan, and Australia. Much collaborative work has been gained over the last decade from US and allied experiences in the Middle East—take for an example of this growth the realm of close air support (CAS), a highly integrated mission relying on collaborative planning and execution of the joint force. CAS effectiveness grew through innovation and collaboration. Previously, CAS was quite scripted; preferably, the pilots themselves visualized the target directly. However, as technology progressed, CAS missions began relying almost exclusively on Global Positioning System–aided weapons delivery.

Later, technologies such as the remote operational video enhanced receiver (ROVER) kits further refined and expanded CAS to make it a true twenty-first-century mission. ASB will evolve similarly. As hardware improves and war fighters innovate, newer methods of collaboration will ensue. Through leveraging international partnerships, ASB is enabling the US rebalance to the Pacific.

The changes in military operations presented by rapid developments in information technologies are significant but not unprecedented. Militaries have responded to profound alterations in technology in the past. Moreover, the United States has had significant experience in incorporating information technology during the past decade of conflict. By focusing on those areas where the impact is greatest, the United States can leverage that experience to learn to operate in environments where ISR, communications, and logistics are contested. That process requires strengthening ties among the services and building the necessary doctrine and training to implement the changes necessary to adapt to this new environment. Success in these areas will develop an organizational culture that favors cross-domain integration.

Conclusion

PACOM's proactive approach to ASB will enable the United States to gain and preserve access to the global commons in the Asia-Pacific AOR. It will ultimately defeat any attempt to limit US military access or deny military operations to areas where we currently operate and have vital security interests. It will allow the services to strengthen relationships with each other and with our allies as we leverage the full gauntlet of collective capabilities in the practice of shared security interests. Finally, it will enable continued asymmetric technological advantages, domain dominance, and information superiority for the foreseeable future. A Pacific nation, the United States is in the region to stay. It is in everyone's best interests to preserve the peace and to promote regional stability and continued shared prosperity. However, if anyone challenges the right of the United States as well as its allies and partners

to operate freely within the Asia-Pacific AOR according to international law and conventions, or if anyone tests the resolve of US commitment to our allies, then PACOM is poised to respond in kind, using ASB as a framework for mission success. In the Asia-Pacific, there is no doubt that Air-Sea Battle is both "the now" and "the future" of PACOM operations and A2/AD counterwarfare. ✪

Notes

1. The "Five Principles of Peaceful Coexistence" were articulated in the Panchsheel Treaty between China and India in 1954. The principles include mutual respect for each other's territorial integrity and sovereignty, mutual nonaggression, mutual noninterference in each other's internal affairs, equality and cooperation for mutual benefit, and peaceful coexistence. Of note, the PRC considers Taiwan part of China while also asserting claims in the South China Sea. Accordingly, it follows that the PRC considers as violations of these principles the United States' support of Taiwan, the stationing of US forces in neighboring countries like Japan and South Korea, the fact that the United States doesn't recognize the PRC's claims in the South China Sea, and other forms of US "interference" in the region. "China's National Defense in 2000," Embassy of the People's Republic of China in the Republic of Estonia, 20 May 2004, secs. 1, 2, and 5, http://www.chinaembassy.ee/eng/ztlm/zfbps/t112926.htm.

2. The PRC has a massive arsenal of cruise missiles and theater ballistic missiles; it has replaced third-generation fighters with very capable fourth-generation fighters; and it has fielded layers of upgraded and double-digit surface-to-air missile systems and antiaircraft artillery on its eastern perimeter. The PRC also has fifth-generation fighters in development, along with a number of other game-changing technologies like hypersonic missiles and cyber capabilities. For a better understanding of China's current and emerging A2/AD capabilities, see Michael Pillsbury, ed., *Chinese Views of Future Warfare* (Washington, DC: National Defense University Press, 1997).

3. "China's National Defense in 2010" (Beijing: Information Office of the State Council of the People's Republic of China, 13 March 2011), [6, 8, 5], http://www.nti.org/media/pdfs/1_1a.pdf?_=1316627912.

4. Established by international treaty in 1982, the United Nations Convention on the Law of the Sea (UNCLOS) establishes economic zones and territorial rights and responsibilities. The United States abides by the UNCLOS for the most part but has not ratified the treaty, objecting to part 11, which it believes undermines American economic and security interests. The PRC ratified the UNCLOS treaty in 1996 but has since altered its territorial claims with the infamous "nine-dash line."

5. Department of Defense, *Sustaining U.S. Global Leadership: Priorities for 21st Century Defense* (Washington, DC: Department of Defense, January 2012), 8, http://www.defense.gov/news/defense_strategic_guidance.pdf.

6. The Air-Sea Battle Office identifies the problem as follows: "Adversary capabilities to deny access and areas to U.S. forces are becoming increasingly advanced and adaptive. These A2/AD capabilities challenge U.S. freedom of action by causing U.S. forces to operate with higher levels of risk and at greater distance from areas of interest. U.S. forces must maintain freedom of action by shaping the A2/AD environment to enable concurrent or follow-on operations." Air-Sea Battle Office, *Air-Sea Battle: Service Collaboration to Address Anti-Access and Area Denial Challenges* (Washington, DC: Air-Sea Battle Office, Department of Defense, May 2013), 3, http://www.defense.gov/pubs/ASB-ConceptImplementation-Summary-May-2013.pdf.

7. Jan Van Tol et al., *AirSea Battle: A Point of Departure Operational Concept* (Washington, DC: Center for Strategic and Budgetary Assessments, 2010), ix–xii.

8. Ibid., xiv.

9. Air-Sea Battle Office, *Air-Sea Battle: Service Collaboration*, 2–4.

10. "We have titled this concept 'AirSea Battle,' in recognition that this theater of operations is dominated by naval and air forces, and the domains of space and cyberspace." Van Tol et al., *AirSea Battle: A Point of Departure*, ix.

11. "This is not to say that neither the Army nor the Marine Corps have a role to play in AirSea Battle. For comparison, even though the AirLand Battle concept was primarily an Army and Air Force effort, the Navy also had a role to play in securing the sea lines of communication across the Atlantic Ocean and preparing for what was called the Outer Air Battle with Soviet air forces. Likewise, the Marines had contingency plans to reinforce Norwegian forces to preclude a Soviet move in Scandinavia to turn NATO's northern flank. Similarly, as the core features of AirSea Battle are established, they will likely have significant implications for the two ground Services." Ibid., 11n21.

12. In World War II, the Army and Marines were essential to the success of the island-hopping campaign conceptualized by General MacArthur and Admiral Nimitz. The broad strategy of that campaign was to capture and secure islands that would accommodate airfields. After taking an island, the United States could base fighters and bombers there and secure a forward presence and project airpower. The islands were captured in sequence as a means of eventually bombing Japan and winning the war.

13. Case in point: Exercise Valiant Shield, PACOM's biannual ASB concept operational exercise, included over 18,000 participants representing every service.

14. Air-Sea Battle Office, *Air-Sea Battle: Service Collaboration*, 2.

15. Ibid.

16. Ibid.

17. Van Tol et al., *AirSea Battle: A Point of Departure*, ix.

18. Robert L. O'Connell, *Of Arms and Men: A History of War, Weapons, and Aggression* (New York: Oxford University Press, 1989), 108.

19. John Keegan, *A History of Warfare* (New York: Alfred A. Knopf, 1993), 321.

20. Ibid., 146.

21. Ibid., 148. The wall was so extensive because movement of the Chinese frontier was based on the extent of cultivation. During dryer periods, populations within the wall could become nomadic, negating the protection of that section of the wall.

22. O'Connell, *Of Arms and Men*, 279.

23. Keegan, *History of Warfare*, 370.

24. The Union of Concerned Scientists Satellite Database reports 512 United States satellites as of 31 July 2014. The next runners-up are Russia and China with 135 and 166 satellites, respectively. "UCS Satellite Database," Union of Concerned Scientists, 31 July 2014, http://www.ucsusa.org/nuclear_weapons_and_global_security/solutions/space-weapons/ucs-satellite-database.html#.VDXgTXkcTxg.

25. Keegan, *History of Warfare,* 324.

26. Information superiority is the unconstrained access to, control, and exploitation of reliable information while denying the same to the adversary.

27. For a bit of irony, readers can google "China's cyber capability" and read some of the reputable articles produced by that search.

28. Keegan, *History of Warfare,* 370.

29. Van Tol et al., *AirSea Battle: A Point of Departure,* 67–68.

30. Ibid., 56.

31. Ibid., 57.

32. SSgt Blake Mize, "Rapid Raptor: Getting Fighters to the Fight," Pacific Air Forces, 20 February 2014, http://www.pacaf.af.mil/news/story.asp?id=123400928.

33. Van Tol et al., *AirSea Battle: A Point of Departure,* 61.

34. "Unmanned Systems," Georgia Tech Research Institute, accessed 20 November 2014, http://www.gtri.gatech.edu/atas/unmanned-systems.

35. Chris Anderson, "Agricultural Drones," *MIT Technology Review* 117, no. 3 (May/June 2014): 58.

36. Van Tol et al., *AirSea Battle: A Point of Departure,* 62.

37. Ibid., 62n98.

38. Keegan, *History of Warfare,* 301.

39. Van Tol et al., *AirSea Battle: A Point of Departure,* 45–46.

40. George C. Kenney, *General Kenney Reports: A Personal History of the Pacific War* (Washington, DC: Office of Air Force History, 1987), 79.

41. Ibid., 56.

42. Antonio Regalado, "The Economics of the Internet of Things," *MIT Technology Review,* 20 May 2014, http://www.technologyreview.com/news/527361/the-economics-of-the-internet-of-things/. See, for example, the tech magazine *Uber Technology Review.*

43. Van Tol et al., *AirSea Battle: A Point of Departure,* 88.

44. Robbin Laird, "The Next Phase of Air Power: Crafting and Enabling the Aerospace Combat Cloud," Second Line of Defense, accessed 20 November 2014, http://www.sldinfo.com/the-next-phase-of-air-power-crafting-and-enabling-the-aerospace-combat-cloud/.

45. "Unmanned Systems."

46. Dennis M. Gormley, Andrew S. Erickson, and Jingdong Yuan, *A Low-Visibility Force Multiplier: Assessing China's Cruise Missile Ambitions* (Washington, DC: National Defense University Press for the Center for the Study of Chinese Military Affairs, 2014), 43–44, http://ndupress.ndu.edu/Portals/68/Documents/Books/force-multiplier.pdf.

47. Van Tol et al., *AirSea Battle: A Point of Departure,* 36.

48. Ibid., 26.

49. Milan N. Vego, *Operational Warfare* (Newport, RI: Naval War College, September 2000), X-19.

50. Ibid.

51. Curtis E. LeMay Center for Doctrine Development and Education, *Volume I, Basic Doctrine*, 14 October 2011, 34, https://doctrine.af.mil/download.jsp?filename=Volume-1-Basic-Doctrine.pdf.

52. Gen Martin E. Dempsey, "Mission Command White Paper" (Washington, DC: Joint Chiefs of Staff, 3 April 2012), http://www.dtic.mil/doctrine/concepts/white_papers/cjcs_wp_missioncommand.pdf.

53. Harry G. Summers Jr., *On Strategy: A Critical Analysis of the Vietnam War* (Novato, CA: Presidio Press, 1982), 184.

54. Robert D. Kaplan, *Asia's Cauldron: The South China Sea and the End of a Stable Pacific* (New York: Random House, [2014]), 5–6.

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