

The Future of the Bomber in an Air Superiority Role

Fighting an Adaptive, Complex Enemy in the Pacific

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Abstract

Since 2001, low-observable aircraft have grown in capabilities and numbers. Stealth has relied on the unique low-observable characteristics of the platforms coupled with tactics that take advantage of those characteristics. Air superiority will likely be localized in the future and grow wider while still devoting an allocation to “maintaining” that condition. Swarming, coupled with the saturation of enemy defenses, offers the best chance to pry open vertical windows of opportunity. Several operating initiatives must be perfected to ensure success like Agile Combat Employment and the ability of B-21s to remotely control unmanned aircraft. Joint All Domain Command and Control will be essential to reduce the kill chain. An attrition and quick-reaction bomber contingent must be a part of the daily apportionment, which has not happened in 30 years. Bombers have played a vital role in gaining air superiority—they will be more important when facing the tyranny of distance against a Pacific competitor.

A Tale of Two Flights: Ten Years of Evolving Airpower

When Desert Storm began 30 years ago, I was serving as a copilot on the B-52 Stratofortress and deployed to the tropical island of Guam. I arrived on the island about a week before Pres. George H. W. Bush commenced the campaign to liberate Kuwait. Ironically, one week prior, I completed a nuclear alert tour at Barksdale Air Force Base, Louisiana. On the first night of combat air operations, I flew a bomber from Guam to Diego Garcia that would serve as an attrition reserve for the anticipated losses the 4300 Provisional Bomb Wing expected on the first night. As I flew over the Pacific, formations of B-52s penetrated Iraqi air defenses. Flying close to the ground to evade Iraqi air defenses, these bombers dropped weapons on critical runways. There were no losses that night. After arriving at Diego Garcia, my crew entered the bombing line-up. Eleven times we took off in a three-ship bomber formation, flew to Iraq, dropped our full load of 45 gravity bombs on one target, and returned to the island. That was 1991.

Desert Storm showed the strategic effects airpower could generate and became the impetus for a decade-long investment in and advancement of airpower thought, technology, and training. On 8 October 2001, I flew another combat sortie at the beginning of an air operation. This time President Bush's son, Pres. George W. Bush, authorized an air campaign against Taliban targets in Afghanistan in response to the 9/11 terrorist attack. By this time, I had left the B-52 and transitioned to the B-2 Spirit. On this record-setting 44-hour flight, my stealth bomber now carried 16 Global Position System (GPS)-aided Joint Direct Attack Munitions (JDAM). Instead of one target, my bomber dropped multiple weapons on multiple targets with near precision. Much like the first night of Desert Storm, this night's attacks focused on Afghanistan's airfield and air operations. While the aircraft type and targets were similar, much had changed in the intervening years.

In the span of a decade, airpower application evolved in multiple areas, including technology, munitions, and the concept of operations. In Desert Storm, formations of multiple bombers attacked the same target; now one bomber serviced multiple targets per plane. The precision revolution reached a tipping point. Fewer than five percent of the weapons dropped in Iraq during the 1991 operation were precision. Following the war, the US Air Force (USAF) added the GPS-aided JDAM to its arsenal; precision weapons became a majority of the weapons employed during Operation Enduring Freedom (OEF). Whereas B-52s flew dangerously close to the earth in Desert Storm to evade enemy radar, in OEF, B-2 low-observable aircraft employed weapons from safer altitudes undetected by enemy radar. The Guidance, Apportionment, and Targeting (GAT) process pioneered in Desert Storm morphed into the Air Force's Joint Operations Planning Process for Air (JOPP-A) and its accompanying 72-hour air tasking order (ATO) cycle. One thing remained the same—the objective. Since the advent of airpower, air superiority has been the first objective in campaigns.

The USAF soon plans to field its newest bomber, the B-21 Raider. At the same time, advancements have made US weapons more precise, more effective, and more responsive. The objective remains unchanged—establish air superiority, then exploit that advantage in all surface domains to achieve the campaign's objective. The question unanswered is how the next generation bomber will help achieve air superiority in future combat environments. For 20 years, the USAF operated with air dominance over Iraq and Afghanistan, performing armed overwatch for US forces operating on the ground. Is the USAF prepared in thought, technology, and tactics to achieve air superiority in a nonpermissive environment? Desert Storm saw the construction of daily ATOs, which launched more than 1,200-plus sorties on their respective missions. After decades of scheduling overwatch in the Middle East with little concern for attrition, can the modern air operations center

craft a 1,000-plus-sortie ATO with the understanding that some may not return? These are all questions under consideration. The quest for air superiority begins as most operations do—with a theory of victory.

Evolving Theory on Attaining Air Superiority

Italian airpower theorist Giulio Douhet was among the first to recognize the importance “command of the air” provided. Douhet defined *command of the air* as “to be in a position to prevent the enemy from flying while retaining the ability to fly oneself.”¹ The nation that achieved this position, Douhet theorized, would emerge victorious in war.² The opposite of this condition would mean defeat, and, according to Douhet, “acceptance of whatever terms the victor is pleased to impose.”³ To attain air superiority, the Italian theorist believed in the viability of bombers. These aircraft would penetrate the enemy’s defenses and “break the eggs in the nest.”⁴ Striking aircraft before they took flight, he argued, was the most effective application of airpower. Once aircraft were airborne, they become more elusive to find and destroy. Douhet’s theory relied on one decisive bomber attack that would obliterate the enemy’s force on the ground yielding command of the air.

Douhet wrote while airpower was still in its infancy—before advanced concepts like radar and antiaircraft artillery (AAA) became prominent in a nation’s defense against attack from the air. Writing on the eve of World War II, British strategist and theorist, J. C. Slessor, offered a slightly nuanced approach to air superiority that paralleled some of Douhet’s ideas. Slessor argued that air superiority “enables its possessor to conduct operations against an enemy and at the same time deprive the enemy of the ability to interfere effectively by use of his own forces.”⁵ For the British theorist, however, air superiority was not a permanent state—something to be achieved in one attack. Air superiority must not only be attained; it had to be maintained. Specifically, Slessor said, “Air superiority is not a definite condition to be achieved once and for all.”⁶ Having achieved command of the air, the nation still had to devote a portion of the force constantly to the maintenance of the condition.

Slessor believed that attaining command of the air would be a joint venture. He argued that “air superiority is obtained by the combined action of bomber and fighter aircraft.”⁷ Although the effort required fighters and bombers, Slessor’s role for the bomber remained consistent with Douhet’s vision. Slessor proposed bombers attacking enemy forces on the ground, aerodromes (airfields), bases, aircraft depots, and technical establishments.⁸ Fighters, on the other hand, would seek and destroy the enemy’s forces in the air, which he theorized would be over the enemy’s airfields or close to approaching bombers of the attacking nation.

After World War II, thinking on strategic airpower took a brief hiatus. Decades of fighting proxy wars in Korea and Vietnam tended to focus the application of airpower on coordination with ground forces fighting insurgencies. While attending National War College, Col John Warden, USAF, authored a paper that would eventually become his first book, *The Air Campaign*. Echoing those who had written before, Warden defined *air superiority* as having “sufficient control of the air to make air attacks on the enemy without serious opposition and, on the other hand, to be free from the danger of serious enemy air incursions.”⁹ Decades removed from Douhet’s initial proclamations, Warden drew a thread of continuity through two World Wars and the proxy wars of the Cold War concluding that “no country has won a war in the face of enemy air superiority . . . no state has lost a war while it maintained air superiority.”¹⁰ Different from previous theorists, Warden offered the idea of air supremacy—a condition above air superiority. The concept Warden defined as “the ability to operate air forces anywhere without opposition.”¹¹ Having air superiority meant a nation could attain its objective without prohibitive interference from the enemy; air supremacy gave a nation the ability to operate from the air with impunity.

Warden’s scheme for achieving air superiority differed from his theoretical predecessors. Whereas Douhet and Slessor both had roles for specific aircraft, Warden’s approach was not platform specific. Instead, Warden’s system focused on the target—all that mattered was that the platform delivered the desired effect. He arranged his target sets in five concentric rings with target types in the middle having more strategic payoff than targets in the outer ring (much like a bullseye). Leadership and command-and-control (C2) targets had the most value. From there, the rings expanded to organic essentials (electricity, petroleum), infrastructure, population, and fielded military (the least payoff).¹² In such an approach, command centers that orchestrate the moves in an integrated air defense system (IADS) would have more payoff than the individual systems that fire on approaching aircraft. Oil would have a better payoff than runways. This model served as the genesis for the air operations plan in Desert Storm.

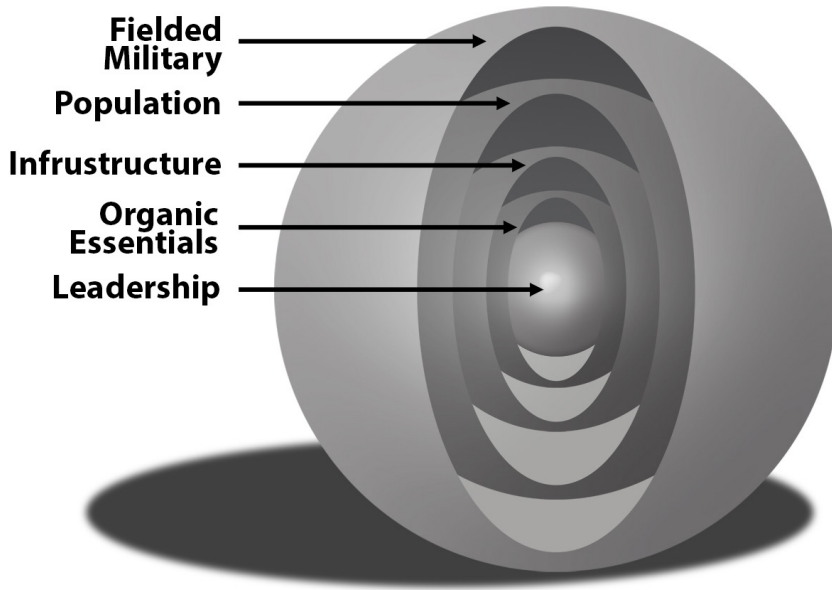


Figure 1. Warden's Five Rings

Desert Storm proved the utility of the nation's investment in stealth and precision weapons. As in every war, not everything went as planned, and friction reared its ugly head. When Iraq's president Saddam Hussein lit his oil wells on fire, the smoke prevented the USAF from employing laser-guided bombs. Following the conflict, the USAF began an acquisition program to field an all-weather precision capability. The result was the JDAM program. Additionally, the USAF soon added a stealth bomber to its arsenal, in addition to the proven F-117 stealth fighter. Besides technology, thinking about targeting evolved as well.

Following Desert Storm, Warden published a more developed theory on targeting the nation-state. He viewed the state as a system and postulated that modern airpower, which was growing in precision capability, had the ability to induce strategic paralysis. Drawing on his study of J. F. C. Fuller, who theorized the concept during the interwar years, Warden claimed airpower could target multiple nodes in the enemy's system rendering it incapable of acting. *Strategic paralysis* relied on simultaneously attacking multiple critical targets that would render the adversary incapable of directing forces. The growth in precision capability meant the USAF was going through a paradigm change from planes per target to targets per plane. Warden's thinking introduced the notion of *parallel warfare*, which meant that aircraft, unencumbered by geography, could strike targets on multiple rings in the same mission. Warden's theory assumed a highly organized state. In *The Starfish and the Spider*, Ori Brafman and Rod Beckstrom categorize various

types of organizations. Those organizations with a hierarchical command structure and a known figurehead are *spider organizations*.¹³ Targeting the head, much like that of the spider, would leave the rest of the organization paralyzed. Warden's theory works best with spider organizations.

David Deptula, who worked under Warden and served as a daily architect of the Desert Storm air campaign, put forward the concept of rapid decisive operations (RDO) using an effect-based operations (EBO) targeting scheme. RDO relied on less mass but greater rapidity, which increased precision weapons in the air made possible.¹⁴ Like Warden before him, Deptula argued that the target and the desired effect should be the focus in the application of airpower—he was agnostic as to the platform selected. Combining a target-based system and parallel warfare would yield “control over the set of systems relied on by an adversary for power and influence.”¹⁵ Furthermore, the increase in precision weapons meant the need for fewer aircraft in the target area. Deptula argued that stealth and precision redefined the need for “mass” in achieving air superiority.¹⁶ Parallel attack, EBO, and swiftness in the attack could yield air superiority on an unprecedented timeline.

Thinking on how to achieve air superiority advanced and evolved as the technology did. Douhet recognized the importance air superiority, or command of the air, would provide the nation that attained it. Slessor brought forward the idea that air superiority is not an end state but rather something that must be constantly maintained. While Douhet never thought airpower would achieve a level of precision greater than artillery, the Gulf War and subsequent air campaigns highlighted the multiplicative value of precision weapons. As Warden and Deptula noted, parallel attacks against an organized enemy system could induce strategic paralysis leading to air superiority, which would enable further operations against an adversary state. This was the theory; what was the reality?

Backtesting the Theory

The last three air campaigns by the USAF—Desert Storm, Allied Force, and Enduring Freedom—offer insights into the validity of the above theoretical approach to achieving air superiority. While Operation Iraqi Freedom is technically the last major air campaign conducted by the USAF, a decade of Southern and Northern Watch had already shaped the battlefield and provided partial air superiority prior to the launch of major operations. Therefore, it could not be offered a true validation of the theory above. What follows is a brief discussion of these campaigns. It is not an exhaustive discussion of the campaign but rather offered to highlight the strength of the opponent, the size of the force arrayed by the US coalition, the role of strategic bombers in the respective campaign, the effectiveness of precision weapons, and the time necessary to achieve air superiority.

Operation Desert Storm

Operation Desert Storm, aimed at liberating Kuwait from Iraqi control, began with a focused air campaign on 17 January 1991. The first objective was to secure air superiority. On the first night, low-level B-52s attacked Iraqi runways, taxiways, and aircraft shelters. At the same time, the F-117s, the only stealth aircraft in operational service, hit 22 leadership and command targets in downtown Baghdad using precision weapons. Simultaneously, six B-52s from Barksdale AFB launched multiple standoff weapons, which were the conventional version of the air-launch cruise missile (CALCM) toward electric generation facilities. Additional sea-based standoff munitions, the Tomahawk Land Attack Missile (TLAM) focused on the Iraqi IADS. Fighters based in nearby Saudi Arabia attacked known surface-to-air missile (SAM) locations as well as airfields along the Iraq–Saudi Arabia border. Accompanying the strike aircraft were 100 fighters that flew offensive counterair (OCA) and suppression of enemy defense (SEAD)¹⁷ missions to carve a path for striking aircraft. In all, 1,300 sorties flew in the first night, attacking more targets than all of Eighth Air Force hit from 1942 to 1943.¹⁸

Prior to the war, Iraq boasted an integrated air defense composed of 16,000 SAM systems and 7,000 AAA pieces.¹⁹ What the system relied on, however, was centralized control. According to Lt Gen Buster Glosson, USAF, the director of the campaign plan, the first night's objective was to disrupt that control within the first 24 hours.²⁰ The USAF achieved that objective 16 hours early. Coalition forces gained air superiority within a week and shifted their weight of effort to attacking individual aircraft that remained on the ground. Within 36 days, airpower set the condition for the final phase of the campaign—a land invasion to liberate Kuwait. A hundred days later, the war was over. In the postwar assessment, stealth and precision accounted for only two percent of the total sorties flown but attacked 43 percent of the planned targets.²¹ As the war drew to a close, Hussein lit his oil wells on fire, limiting the USAF's ability to employ laser-guided weapons. Following the war, the USAF began an acquisition program to field an all-weather precision capability. The precision revolution had started.

Operation Allied Force

By 1999, the USAF had two new capabilities in its arsenal. First, the B-2 Spirit, the first stealth bomber, with considerably more payload capacity than the F-117 (16 bombs to 2 bombs), had begun operations. Second, the USAF fielded its first all-weather precision capability—the GPS-aided JDAM. Both would be called upon as the USAF began actions against the Federal Republic of Yugoslavia and its leader Slobodan Milošević.

Yugoslavian air defenses relied heavily on former Soviet systems. The country possessed three SA-2 battalions, 16 SA-3 battalions, and five SA-6 regiments.²² In addition to this, the country had numerous man-portable infrared shoulder-fired systems (MANPADS) and 1,850 AAA pieces. Furthermore, Yugoslavian operators gained knowledge from the Iraqis about US tactics used in Desert Storm.²³ More than Iraq, Yugoslavia set up a defense in-depth operated by a very professional corps. Some noted that Pentagon planners on the eve of operations “estimated before opening night that NATO could lose as many as 10 aircraft in the initial wave of strikes.”²⁴ The political context of the operation presented several challenges as well. The objective of Operation Allied Force (OAF) was to put pressure on Milošević to force him to cease ethnic cleansing in Kosovo and return him to the bargaining table. While the first objective of the campaign, as in any campaign, was to establish air superiority, there were operating limits placed on attacking air forces. For example, attacking forces had to stay above a hard deck of 15,000 feet to prevent the loss of an aircraft to AAA fire or MANPADS.²⁵ Furthermore, planners did not expect a long campaign; so, a limited number of aircraft were initially committed to the operation.

Combat operations started on 24 March 1999 with the launching of long-range standoff munitions. CALCMs launched from B-52s and sea-based TLAMs hit hardened enemy structures and power generation. Standoff munition attacks were followed up by fixed-wing, stealth fighter, and B-2 stealth bombers strikes against C2 targets as well as SAM batteries. Additionally, air strikes targeted airfields in Serbia and Kosovo. Of the 400 sorties flown the first night, only 120 were strike sorties attacking 40 targets in the theater of operations. Five airfields, army garrisons, C2, and supply depots constituted most of the target sets.²⁶ Yugoslavian operators learned from the Iraqis about US SEAD operations and adapted their procedures to counter expected tactics. While coalition forces managed to shoot down two Mig-29s over Serbia, SAM operators managed to down a F-117 on the third night of the operation. The limited and restrictive nature of the operation, European cloudy weather that hampered laser-guided bomb employment, and Serbian reactive, adaptive SAM operators prevented the coalition from achieving its objectives on the proposed timeline. In fact, “It took 12 days to hit the same number of targets as the Desert Storm Coalition hit in the first 12 hours.”²⁷ B-2s, initially planned for only the first few nights of the operation, used only six aircraft to provide continuous bombing when European cloud cover prevented other platforms from employing laser-guided bombers. Eventually, coalition air forces established air superiority over the former Yugoslavian state, but it took as long as Desert Storm—even though the operation had more precision, more stealth, and fewer targets than in Iraq.

Operation Enduring Freedom

OEF began weeks after the 9/11 attacks, when terrorists brought down the World Trade Center. The purpose of the operation was to remove from power the Taliban, which had provided a safe haven to Osama bin Laden and his al-Qaeda organization. The Taliban had air defense systems (SA-3 and AAA) but hardly presented an “integrated” air defense system. Four airfields staged the nearly 50 fighters the Taliban had in its arsenal, but intelligence estimated that fewer than 40 pilots could fly them.²⁸

Combat air operations began on 7 October 2001. Similar to previous operations, standoff munitions, TLAMS, were the opening salvo and targeted fixed leadership and C2 sites. Sea-based fighters and land-based bombers from Diego Garcia (B-52 and B-1) attacked Taliban and al-Qaeda training camps. Meanwhile, two B-2s penetrated deep into Afghanistan airspace, targeting Taliban airfields and radars and using the aircraft’s synthetic aperture radar (SAR) to find and destroy the Taliban’s air force. B-2s would conduct similar operations the following two nights, including a record setting 44-hour mission, ensuring the coalition had air superiority in short order. From there, the Diego Garcia-based bombers continued the fight against the Taliban that eventually led to the overthrow of the regime. Air operations would eventually transition into overwatch as ground operations continued.

Summary

A few threads can be drawn through the above recent operations that provide validity to airpower theories and targeting strategies. First, air superiority remains the number-one priority of the USAF. Without air superiority, an operation or nation cannot succeed. OEF was a threshold moment where precision weapons became a majority of the weapons employed. This technological milestone enables ideas like EBO and the achievement of strategic paralysis. Whereas Desert Storm saw formations of B-52s attacking a single airfield, Afghanistan witnessed B-2s striking multiple airfields in a single mission. OAF showed what happens when an adversary studies and learns from US enemies. Despite firing numerous anti-radiation missiles, coalition forces rarely hit any active radars because the operators understood US tactics. Furthermore, the United States lost a stealth asset to a radar guided missile—a result of the enemy adapting faster than the coalition. Finally, and this cannot go without notice, since 1991 the USAF has not had to mount an air offensive with more than 1,000 aircraft nor combat an opponent that can field more than 1,000 aircraft over 20-plus airfields.

Table 1. Comparison of Desert Storm, Allied Force, and Enduring Freedom (created from sources above)

Campaign	Enemy Aircraft	Enemy Airfields	Coalition Aircraft	Percent Precision Weapons	Strategic Bomber Platforms	Day to Air Superiority
Desert Storm	750+	24+	2,800+	9%	B-52	7
Allied Force	238+	4+	Initially 400 (120 strike) grew to 1,000+	35%	B-52, B-1, and B-2	7+
Enduring Freedom	50	4	400+	70%	B-52, B-1, and B-2	3 max

Future Operating Environment

Looking at the history of airpower theory development and the execution of airpower in past campaigns offers insight into the future fight for air superiority. It also offers an idea of the role bombers will play in attaining air superiority. Before delving into the role bombers will likely play going forward, it is necessary to define the future operating environment. During his address to the Air Force Association Convention in Orlando, Florida, Secretary of the Air Force Frank Kendall said that, despite Russia's aggressive action in Ukraine, China remains the pacing threat.²⁹ Looking at the Chinese threat, coupled with the past, yields an idea of how the future will unfold.

People's Republic of China

When the Department of Defense (DOD) assessed the Chinese military in 2000 per Congressional request, the department concluded that China was an archaic military. Fast forward 21 years and the Chinese have caught up. The 2021 report to Congress on the Chinese military emphasized how the People's Republic of China (PRC) continues modernize and grow capabilities that will enable it to "fight and win wars . . . against a strong enemy."³⁰ While the PRC certainly has grown more overt in its military actions, the country retains a defensive posture. "Active Defense" remains the stated national defense strategy of the PRC. Under this strategy, the PRC is not simply defending territory but fielding offensive capabilities as well. While the strategy seeks to defend PRC interests, it also reserves the right to employ overwhelming force, if necessary, when forcefully challenged. As the Chinese themselves say, "we will not attack unless attacked, but we will surely counterattack if attacked."³¹

The increase in PRC offensive capability has resulted in the People's Liberation Army Air Force (PLAAF) fielding the third-largest air force in the world. Currently, the PLAAF has more than 2,800 aircraft, of which 2,250 are combat coded.³² Within the 2,250 combat aircraft, 1,800 are fighters, and within that number

800 are assessed to be fourth-generation fighters.³³ Added to the fighter force, the PLAAF fields the H-6 air-refueling capable H06 bomber that now forms the third leg of the service's recently announced strategic nuclear triad. The vast area of the PRC is a strategic asset of its own. The great expanse of China also allows the country to disperse its air force through a network of airfields. Some estimates claim the PLAAF currently operates out of as many as 70 military airfields.³⁴

In addition to a network of airfields and a large fighter force, the PRC relies on a "robust and redundant" IADS system to protect its shores. Within 300 nm of the coast, the PRC operates early warning radars, fighters, and a variety of SAM systems to warn of an impending attack.³⁵ China's encroachment into the South China Sea (SCS) has allowed Beijing to extend its radar coverage by placing radars and defensive system on PRC outposts in the SCS. In addition to the PRC's highly capable CSA-9 SAM system, the country fields considerable Russian-made capabilities as well in the SA-10, SA-20 (S-300), and the SA-21 (S-400). The array of these systems in an integrated fashion would present a challenge the USAF has not previously faced. The table below compares the PRC's capabilities to previous American adversaries.

Table 2. Comparison of Desert Storm, Allied Force, and Enduring Freedom to the PRC

Campaign	Enemy Aircraft	Enemy Airfields	Coalition Aircraft	Percent Precision Weapons	Strategic Bomber Platforms	Day to Air Superiority
Desert Storm	750+	24+	2,800+	9%	B-52	7
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Enduring Freedom	50	4	400+	70%	B-52, B-1, and B-2	3 max
PRC (PLAAF)	2,250	70+	Unknown	90%+	B-52, B-21	Unknown

Future Bomber Concepts of Operation

The PRC threat picture offers an unprecedented challenge for the USAF. Air superiority has been, is, and will be the number-one priority should conflict occur between the United States and China. Without air superiority, the probability of success declines exponentially. Air superiority, as highlighted by Douhet, Slessor, and Warden, is a condition where one side in a conflict can achieve its objective in the air without prohibitive interference from the other side. Achieving air superiority will not be an end to itself. As Slessor argued, it is a condition that will require the constant allocation of resources. Although NATO forces managed to gain air superiority, High-speed Anti-Radiation Missile shooters still had to accompany strike aircraft to ensure mission success.

In 2017, RAND conducted a study that looked at US requirements to gain and maintain air superiority in either a “defense of Taiwan” or a “SCS—Spratly Island” conflict.³⁶ At the time, China had 700 fourth-generation fighters, today it has 800. RAND’s assessment was that it would take at least 30 (72 aircraft) wings for the Taiwan scenario and 10 (72 aircraft) wings in the Spratly scenario to defeat Chinese aggression in the air.³⁷ Most of this assessment pitted US and coalition fighters against Chinese fighters.

The strategic bombers’ role in the air superiority fight is still as Douhet outlined—“to break the eggs in the nest.”³⁸ Fixed and mobile targets on the ground fit well with the bomber’s capacity and capability. Today’s eggs form a diverse collection of targets. Bombers can penetrate the enemy’s air defenses while targeting C2 nodes, enemy radars, airfields, and even the individual aircraft themselves. This penetration capability was proven under fire. Despite the prognostications of Saddam Hussein, the Iraqi IADS could not prevent the penetration of F-117 stealth assets and low-level B-52s. B-2s avoided Soviet SA-3s over the skies of Yugoslavia and Afghanistan. However, it should be noted that low-observable aircraft are not invisible to radar. In fact, making current and future stealth aircraft capable of evading radar requires a combination of low-observable design and tactics. When an aircraft is said to be *stealthy*, what that term really means is the combination of low-observable technology and intricate planning that maximizes the aircraft’s capabilities against an enemy radar’s vulnerabilities to take advantage of a platform’s management of the electromagnetic spectrum. The B-52 became primarily a standoff platform as IADS capability outpaced the bomber’s ability to evade advanced radar systems. Technological advancements in the S-300/400 SAM could negate the penetration capability of the B-2. In the coming decade, the USAF’s main penetrating bomber will be the B-21 Raider.

Most of the capabilities of the B-21 Raider remain classified. What is known has mostly come from USAF press releases and open-source reporting. Northrup Grumman has six B-21s under construction, and the USAF expects a rollout of the platform in 2022. Ellsworth AFB, South Dakota, will initially house the B-21, and construction on support facilities for the new bomber should be completed by 2024. The payload capacity remains classified, but the USAF expects to buy 100 to 200 of these platforms in the coming decade.³⁹ Given what is known about the bomber, coupled with airpower theory and previous campaigns, it is possible to postulate how this bomber would be used in a conflict with the PRC.

It Starts with the Objective

For 20 years, the USAF enjoyed air supremacy over Iraq and Afghanistan. Should there be conflict with an adaptive peer adversary, achieving air superiority will re-

quire seizing the initiative and exploiting it, because it may be fleeting. A future operation will likely begin as have the three previous operations, with a salvo of long-range standoff munitions. Since OEF, the CALCM has been replaced by the Joint Air-to-Surface Standoff Missile (JASSM), which is a low-observable conventional cruise missile. Bomber-launched JASSMs would likely be synchronized with sea-based TLAM strikes. Such strikes should follow the tactic of “swarming saturation.” As put forward by John Arquilla, *swarming* is the notion of attacking the enemy from all sides.⁴⁰ Updated for today’s environment, that concept can include numerous attacks in multiple domains (air, space, and cyber). Saturation will need to couple swarming; the Chinese SAM systems protecting its critical vulnerabilities will have to be overwhelmed with munitions to make sure the SAM system expends all its munition on incoming targets, opening a window of vulnerability.

On my OEF mission, 70 percent of the targets changed from takeoff to entering Afghanistan airspace. Luckily, crossing the Pacific and Indian Oceans provided ample time to reconfigure target files and alter mission timing. Fighting a reactive, adaptive enemy will not afford future aircrews such luxury. Upon assuming his position as Chief of Staff of the Air Force, Gen Charles “CQ” Brown published his guidance, “Accelerate, Change, or Lose.”⁴¹ In the document, General Brown warns that is the USAF cannot adapt fast enough it threatens to lose future conflicts. Joint All Domain Command and Control (JADC2) attempts to connect all joint sensors in a networked framework. Without getting into particulars, JADC2 leverages artificial intelligence, cloud technology, and networked systems to provide “man-on-the-loop” management of dynamic targeting to compress the kill chain. If the Chinese employ tactics similar to the former Yugoslavian republic (turning SAM systems on and off to complicate adversaries’ ability to find and fix them), there will be limited time to find and fix Chinese IADS nodes. In addition to pre-planned cruise missile shooters, the air planning staff needs to position standoff reserve bombers ready to launch on dynamic targeting within minutes. The addition of planned hypersonics to the bomber fleet could further reduce response time to target fleeting targets.

Once long-range weapons have opened a window of opportunity, B-21 bombers must exploit the vertical breach to induce strategic paralysis. As stealth is the combination of low-observable capabilities couples with tactics, the Raider fleet will still need force support to maximize its ability to penetrate. Upon taking office, Secretary Kendell outlined his seven operational imperatives.⁴² Several of those imperatives affect this mission set. Placing unmanned aircraft on various locations other than traditional bases would complicate China’s targeting ability. These dispersed drones could help achieve the concept of Agile Combat Employment (ACE).⁴³ Once launched, the drones could rendezvous with US-based air-

borne B-21s that have traversed the tyranny of distance. This airborne manned-unmanned teaming would mean that instead of 20, 30, or even 40 B-21s penetrating enemy airspace, the enemy would see five times that amount.⁴⁴

Much like previous air campaigns, B-21s should use their full complement of precision weapons to target airfields, fuel storage, command nodes, and individual aircraft. In OEF, B-2s had the ability to carry 2,000lb-class or greater precision munitions. In the 20 years since, the USAF has developed a greater array of precision weapons, including a 500lb JDAM (GBU-38) and a Small Diameter Bomb (SDB) with a 250lb warhead. These developments allow planners to employ EBO with more finesse. Since bombers can now attack multiple targets per plane and conduct parallel warfare, formations of B-21s should plan to saturate air defenses and strike critical C2 nodes to paralyze the enemy (make the enemy incapable of coordinating a response). The PRC's Active Defense relies on the its forces' ability to coordinate a retaliatory response. Crippling C2 hampers a critical component of the PRC's defense strategy. Air superiority will likely begin in a localized concentric circle and slowly expand with follow-on strikes. A portion of the striking force (approximately 10 percent) will have to remain in a ready-reserve airborne status to prosecute mobile targets using small-diameter bombs (SDB) and or hypersonics launched from B-52s/B-21s. This requirement will likely have to be met with decreasing effort but ever present to "maintain air superiority."

One thing future planners will need to consider is a strategic reserve. On the first night of Desert Storm, reserve aircraft were Diego Garcia bound in anticipation of projected losses before the first bombs dropped in Iraq. The USAF cannot get lured into a false sense of security given the success of the past three campaigns. Attrition will likely be a factor in a coming fight with a peer competitor. This leads to an even greater consideration of planning—the size of ATO for a given day. In Desert Storm, ATOs grew to 1,000–1,200 sorties a day. Can the United States replicate that level of effort today—not just from an execution perspective but also from a planning and control perspective? Besides perfecting the tactics once the B-21 gains initial operating capability (IOC), the USAF must practice planning, building, and executing a 1,000-sorties-a-day ATO that assigns bombers to a standoff mission, an "on-call" standoff mission, a penetrating mission, a mobile, dynamic targeting mission, as well as attrition reserve bombers. This requires more than just planners planning; it is a synergistic effort between operations, maintenance, and intelligence.

Conclusion

In the decade between my combat bomber flights, technology, tactics, thinking, and airpower application grew rapidly. While technology has advanced, two decades

of the USAF enjoying air dominance has allowed ideas on the fight for air superiority and the role of bombers in that fight to atrophy. Bombers have played a role in air superiority dating all the way back to the development of airpower theory. The unique characteristic of bombers—payload capacity, persistence, and range—make it the ideal aircraft for breaking the eggs in the nest. Over the past three air campaigns, the USAF has opened with standoff attack on fixed targets followed by bombers attacking multiple targets sets to establish air superiority. OAF showed what happens when an enemy learns from previous operations. It took almost two weeks to strike as many targets as were serviced on the first day of Desert Storm. Enemy persistence made NATO and the United States devote aircraft to the maintenance of air superiority each night. China has had decades to observe US air operations, which means tactics will need to outpace the adversary's ability to adapt.

Since 2001, low-observable aircraft have grown in capabilities and numbers. Stealth has relied on the unique low-observable characteristics of the platforms coupled with tactics that take advantage of those characteristics. Air superiority will likely be localized in the future and grow wider while still devoting an allocation to “maintaining” that condition. Swarming, coupled with the saturation of enemy defenses, offers the best chance to pry open vertical windows of opportunity. Several operating initiatives must be perfected to ensure success like ACE and the ability of B-21s to remotely control unmanned aircraft. JADC2 will be essential to reduce the kill chain. An attrition and quick-reaction bomber contingent must be a part of the daily apportionment, which has not happened in 30 years. Bombers have played a vital role in gaining air superiority—they will be more important when facing the tyranny of distance against a Pacific competitor. ✪

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Notes

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