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Global Strike Task Force

A Transforming Concept, Forged by Experience

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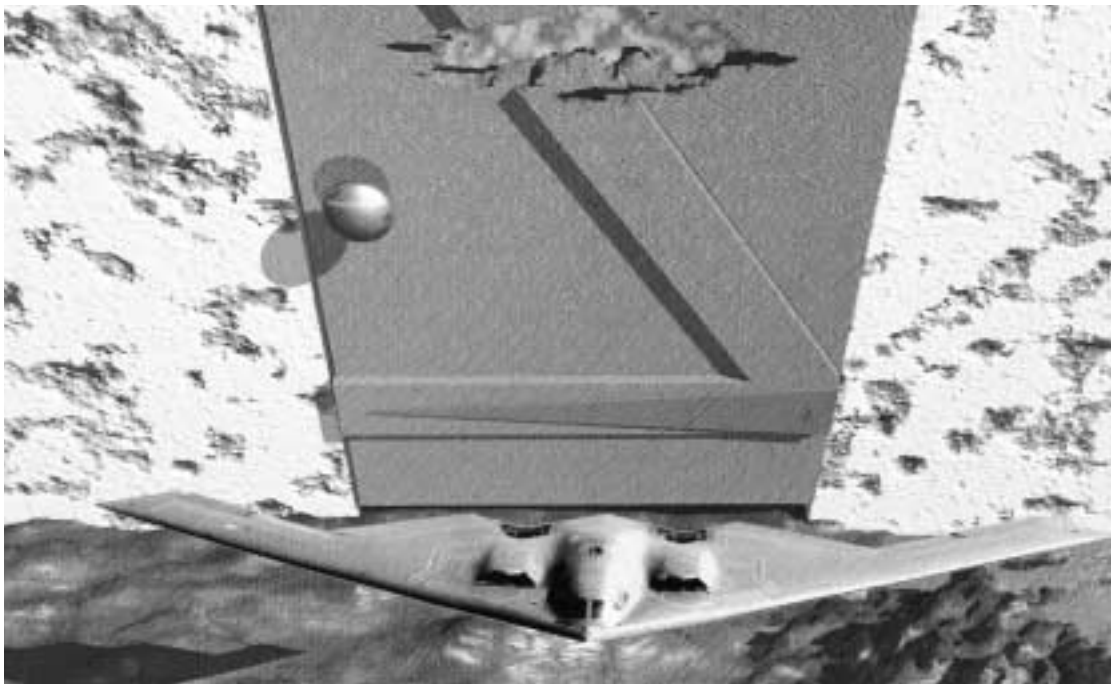
Editorial Abstract: Reviewing recent history and anticipating future needs, General Jumper calls for action to capitalize on technology with new operational concepts and a new organizational tool to fight more effectively in the future. Specifically, with the F-22, B-2, and a constellation of access-granting platforms, the Global Strike Task Force promises to complement the Air Expeditionary Force to create dominant, immediate, and sustained aerospace power.



HISTORY IS REPLETE with battles, campaigns, and wars that were lost because fundamental changes in the nature of warfare went unrecognized. The Maginot Line provides the backdrop for one such example. According to post–World War I French conventional wisdom, the defensive strength of barbed wire and trenches during the Great War suggested that a permanent system of trenches, fortifications, and barbed wire would be even more effective during the next war. This misinterpretation and overreaction led to a "permanent" defense system extending from Switzerland to the Ardennes in the north, and from the Alps to the Mediterranean in the south. In contrast, the German *Wehrmacht*, realizing that technological and industrial advances had altered the nature of warfare, synergistically exploited new weapons such as the

Panzer I and Junkers Ju-87 Stuka to develop a new concept of operations—the blitzkrieg.[1] Packaged in powerful, combined panzer-air armies, later called *Kampfgruppen* on the eastern front, *Wehrmacht* forces cut large swaths around the determined resistance and drove deep into enemy territory. Nations that had the means to defend themselves with tanks, aircraft, fortifications, and manpower clung to outmoded ideas of positional warfare while the *Wehrmacht* flew over or maneuvered around permanent defenses. The results were devastating and immediate. The German onslaught quickly moved through Poland and overwhelmed numerically and often technologically superior forces in the Low Countries and France.

Today, we stand on the brink of technological advances that can prompt a new concept of aerospace power employment. Stealth applied to bombers and maneuverable fighters, all-weather precision-guided munitions (PGM), and unmanned aerial vehicles (UAV) will allow us to maneuver over, around, and through—or to stand off outside advanced defensive systems and networks already available to potential adversaries. Even more startling advances in information technologies are enabling new dimensions of command and control (C^2), allowing horizontal integration of air and space intelligence, surveillance, and reconnaissance (ISR) platforms. With the application of valuable lessons from conflicts of the past decade, these technologies will provide the means to master persistent difficulties that continue to plague efficient planning and execution of aerospace power at the operational and tactical levels: time-critical targeting, all-weather precision, restrictive rules of engagement (ROE), collateral-damage control, and—perhaps most importantly—access issues. How well we capitalize on these advancements will depend largely on our ability to develop useful concepts of operations (CONOPS) that can deliver the right capabilities and produce profound effects in any scale of conflict. The Global Strike Task Force (GSTF) is just such a concept, one that springs from schooling of the past 10 years of conflict.

Present for Duty: Lessons of Warfare in the 1990s

The fall of Communism and the end of the cold war brought about sweeping changes in the way our nation and Air Force fight wars. Relatively stable international relations for over 50 years have given way to a long series of geographically localized crises—political, ethnic, or religious unrest; humanitarian disasters such as famine; outright regional military aggression; genocide on a horrific scale; and hurricanes, earthquakes, and other natural disasters. In many ways, the "small scale" contingency (SSC) has become our first priority—driving demand for force structure and personnel more than the strategy-based two-major-conflicts scenario. These SSCs often continue indefinitely and should not be considered a "lesser included case" of our strategy.

Regardless of the nature or location of the crisis, aerospace power has played a significant role. From 1990 to 1997, the US military conducted 45 SSCs—an average of one every nine weeks, as compared to *16 during the entire cold war.*[2] The US Air Force has been present for duty in all major conflicts of that defining decade, and we have learned in the classroom of combat.

Operation Desert Storm was a watershed event for the US Air Force. We advanced the role of the joint force air component commander (JFACC) into joint doctrine, demonstrated the power of stealth, and implemented unprecedented integration of space into air operations. There can be no doubt that aerospace power played a significant role in reversing the Iraqi occupation of Kuwait—our stated objective in that conflict.

As the scenario developed in the summer of 1990, political necessity aided by the universal condemnation of Iraq's aggression thrust the United States into the lead of a large ad hoc coalition of multinational forces. In some cases, our new coalition partners

were countries formerly considered neutral, if not hostile, to the US presence in Southwest Asia. The task was daunting as US Central Command leadership forged C^2 arrangements in ways never anticipated, much less trained for or exercised. Thus, the new-world "disorder" introduced new enemies, new partners, and "blue," "gray," and "red" weapons on our side against "red," "gray," and some "blue" weapons on the other side.

World opinion was against Iraq, but coalition reaction was, at best, restrained during the initial stages of the crisis. Only the clear threat to Saudi Arabian sovereignty, posed by an Iraqi buildup of forces on Kuwait's southern border and along the Saudi Arabian frontier, solidified resolve. The blatant threat—communicated in person by US Cabinet-level officials—quickly opened access for the United States and its allies to local bases for air, land, and sea forces—bases critical for sustained operations. This allowed coalition forces to prosecute over two thousand sorties a day during Desert Storm, sanctioned by the United Nations (UN).[3]

In that conflict, we also came face-to-face with frustrations of the "limited objective." One thousand hours of the air campaign, one hundred hours of air-land warfare, and many months of sanctions enforcement at sea drove the Iraqi military into full retreat. Today, many people still criticize the decision to terminate the ground war short of total victory, forgetting that the coalition's main objective was limited to evicting the Iraqis from Kuwait. At the time, the coalition was unwilling to press further.

Less than four years later, however, Saddam Hussein was again rattling his saber. In late 1994, he moved two armored divisions toward the border of Kuwait. Although this initially looked like a repeat of Desert Storm, Operation Vigilant Warrior played out much differently. Again, with coalition support, the United States deployed more than 275 combat aircraft to the region. The United Nations Security Council passed a resolution condemning the aggression and demanded that Iraq withdraw its forces.

However, the similarities to Desert Storm ended there. This time, the presence of additional combat forces was enough to make the Iraqi dictator "blink." As the first US-based aircraft arrived to reinforce aircraft already present in the Gulf and the United States redirected a carrier battle group into the area, the Iraqis beat a swift retreat, less than one month after the start of the crisis. The threat to sovereignty dissolved, once again, as the coalition demonstrated willingness to engage and sustain whatever operations were necessary to avoid a repeat of August 1990.[4]

Another test of US resolve occurred in 1996, with the Iraqi seizure of Irbil, a city in northern Iraq populated mainly by Kurds. This action was a clear violation of United Nations Security Council Resolution 688, which prohibited Iraqi repression of disenfranchised Kurds in the north and of Shi'ites in the south. In response, President Clinton expanded the southern no-fly zone. Although Britain supported our actions, the rest of the coalition did not, in part due to threatening rhetoric from Baghdad. The United States chose to act unilaterally, virtually ruling out any participation from Operation Southern Watch air forces. Our coalition partners did not agree with the US asymmetrical strategy of bombing targets in southern Iraq in retribution for Iraqi actions against the Kurds in northern Iraq.

Nonetheless, the United States launched a coordinated attack on 3 September, comprised of cruise missiles from the Navy's Task Force 50 and two B-52 bombers launched from Barksdale Air Force Base, Louisiana. These bombers flew the longest bombing mission in history to complete the task, flying over 14,000 miles and refueling three times. This strike and a second launched from Task Force 50 the following day clearly demonstrated US resolve. The bulk of the Iraqi forces stood down and returned to garrison within weeks.[5] Other periodic "behavior modification" operations have kept Iraqi aggression in check throughout the 1990s.

US commitments in Europe over the last decade also depended heavily on aerospace

power. Operation Deliberate Force, the 11-day bombing campaign in 1995, was a reprisal against the Bosnian Serbs for their attacks on UN-designated "safe areas." Much like the other operations discussed earlier, the UN called for and sanctioned this nine-nation coalition effort. In the thirty-five-hundred sorties flown, over 70 percent of the munitions dropped were PGMs.[6] Ultimately, Deliberate Force was one of a number of crucial steps taken to bring the warring parties to the negotiating table, and it culminated with the signing of the Dayton Peace Accords. Initially, dual-key approval chains, one to the UN and one to the North Atlantic Treaty Organization (NATO), made target planning and approval difficult.[7] Although this cumbersome arrangement later improved, it demonstrated how political concerns can impact operations down to the tactical level. There would be more of this.

Aerospace power faced another difficult test in the Balkans in 1999. Seeking to end Serbian violence and genocide in Kosovo, NATO launched Operation Allied Force in March 1999 after the breakdown of peace negotiations in Rambouillet, France, between Serbian leaders and Kosovar Albanians. The world watched as the Serb army, under cover of the negotiations, first massed at the border and then invaded Kosovo, joining the Yugoslav interior forces, which had already started the genocide. Regular Serb forces occupied Kosovo down to the village level, eventually displacing over 750,000 refugees.[8] Of the classic phases of war—deter, deploy, halt, build up, engage, and reconstitute—we virtually jumped to the engagement phase. Although the NATO Alliance for 50 years had planned and trained to defend its borders against invasion, now the first fully coordinated, Alliance-wide military action ever was to be on the offensive and beyond NATO borders. The 19 members of the Alliance did agree to take action, but consensus was fragile in the beginning. While political leadership anticipated that three or four days of bombing would be sufficient to convince Serbian president Slobodan Milosevic to invite NATO peacekeepers into Kosovo, the requirement for sustained operations was quickly evident. Airpower got the call to conduct what amounted to a counterattack from the air. As hundreds of thousands of refugees poured across the borders of neighboring countries, they told their stories of the Serbs' wanton killing. In April 1999, the Washington NATO Summit yielded a stronger consensus among the allies that led to more intense action against the Serbs. The air operation continued for 78 days from over 25 bases and multiple axes of attack, ending with Milosevic's agreement to allow NATO forces into Kosovo.

In many ways, we relearned the lessons of Desert Storm during Allied Force; however, this time the fighting was not conducted by a cold war Air Force but by one that was lighter, leaner, and expeditionary. We also conducted both information and aerospace operations in urban and mountainous environments, rather than across a vast expanse of desert, to which the success of Desert Storm was so often attributed. Aircrews employed precision-guided weapons against 70 percent of the targets, and there were only 20 cases of collateral damage from the 28,000 weapons employed.[9] Moreover, this conflict was by no means a "cakewalk"—as the Serbs launched more than seven hundred surface-to-air missiles (SAM) at Alliance aircrews, with only two aircraft and no lives lost to enemy action.

These five operations have taught a number of lessons about warfare in the 1990s. They portend the future nature of warfare and provide a basis for the GSTF concept. First, we can fully expect to fight jointly alongside partners and allies. UN approval and sanction of major action is a probable prerequisite. In addition, although we will not do battle alone, success will highly depend upon our technological prowess. For example, US planes flew 79 percent of the ISR sorties and dropped nearly 80 percent of the PGMs used during Allied Force.[10] Indeed, the technological gap between US and allied forces within NATO is well documented.[11]

Second, our experience confirms that we should never start a limited operation if the

The F-22's capabilities give it 12 times more survivable airspace than that enjoyed by the F-15.

enemy can turn it into a sustained conflict. Allied Force was initially planned as a three-to-four-day operation, but it ultimately took 78 days to complete. We have learned that 24-hour, seven-day-a-week (24/7) persistence is required for large-scale sustained operations—that is, those involving more than three hundred to five hundred sorties a day over an extended period.[12]

Third, restrictive ROE, high-level political involvement in the targeting process, and public demand for low collateral damage are here to stay. In fact, our adversaries count on it. The Iraqis in 1991 and, more recently, the Serbs during Allied Force played upon the international distaste for civilian casualties and used politically sensitive structures such as hospitals, churches, mosques, cultural antiquities, and residential neighborhoods to "morally harden" their tanks, weapons, and even aircraft. Americans have come to expect their armed forces to limit not only civilian casualties, but also military casualties on both sides. While an expectation of zero casualties is unrealistic, we cannot allow an enemy to gain a military advantage from our concern about casualties.

Fourth, we must recognize lessons from the military annals of Belgrade and Baghdad. Our enemies have taken notes too. They have found that fighting the United States does not require a "win." Their objective simply could be not to lose. Shooting down a single aircraft or sinking a single ship may be enough to turn the tide of public opinion, regardless of the raw numbers on the scoreboard. They try to acquire "silver bullets"—antiaccess threat systems such as advanced tactical ballistic missiles, cruise missiles, aircraft, and double-digit SAMs they believe will allow them to leverage casualty aversion and our reluctance to put Americans in harm's way.

Last, the issue of access assurance is another lesson from the 1990s, and some consider it the key factor in the near future. In general, access has been granted to US and allied warplanes during the past decade, particularly when a host's sovereignty or vital interests are at stake. But restrictions to access, both physical and political, will always impact operations, and no service is immune to the problem. For example, during Allied Force, the French did not permit B-52s laden with conventional air-launched cruise missiles to transit French airspace, forcing them to fly a circuitous twenty-six-hundred-mile route around Spain to complete their mission. Even our fighter aircraft had to contend with long distances to the target area, such as the one-way distances to Kosovo of eighteen hundred and thirteen hundred miles from RAF Lakenheath and Spangdahlem Air Bases, respectively.[13] Nonetheless, Allied Force taught us that employment from great distances is possible when conducting sustained operations and that forward basing need not be a major limitation.

Some people claim that our ability to gain access to the theater and provide the air superiority America takes for granted is now in jeopardy. Advanced aircraft such as the Su-35 and Su-37, used in conjunction with evermore capable SAMs such as the SA-10 and SA-12, support such arguments. These are not future threats. More than 10 countries own these systems today, and several more have plans to purchase one or more systems within the next year.[14] The longer weapon range, sophisticated fire control, and advanced countermeasures of these systems, even in small numbers, present a formidable barrier to our fleet of aging aircraft. Stealth, electronic countermeasures, and high-altitude attack profiles decrease our vulnerability significantly, but the full benefit is realized only when we add supersonic speeds to the mix.

Theater ballistic missiles tipped with chemical, biological, nuclear, and conventional warheads threaten vast tracts of land and significant resources. They hinder our ability to operate land forces and could restrict basing for our air forces. It is important to note, however, that we continued to conduct sustained land-based operations in the face of Scud missile attacks during Desert Storm (and have spent decades investing and training in nuclear, biological, and chemical defense equipment; in other words, we have prepared ourselves for this scenario). But future beddown of forces faces even more threats. All forces are susceptible to access challenges. Antiship cruise missiles, ultraquiet diesel submarines, and sophisticated sea mines can restrict maritime access required to engage fully from the sea or to disembark significant land forces.

Clearly, there are significant challenges for aerospace power now and in the future. Advanced threats erode US technological superiority and push our current airframes to the limit of their capability. Political and physical constraints, along with long-range enemy missile threats, limit access to theater basing and force operations over extended distances. Restrictive ROE and other conditions of caution test the limits of precision weaponry. Although we desire quick results, sustainability and persistence to see the job through to completion are "must haves," while unnecessary human loss must always be kept to an absolute minimum. Finally, joint, interoperable, and seamless command, control, and communications with our allies and coalition partners are critical elements for success.

We have plans, capabilities, and CONOPS to address many of these challenges. Perhaps the most significant of the challenges—the lack of access assurance—now has a solution: the GSTF, a concept that maximizes existing and emerging joint capabilities and enables us to meet our nation's toughest near-term challenges. GSTF empowers us to overcome range barriers by providing the means to rapidly roll back adversary threats. Once this is done, we can then provide the traditional 24/7 battlefield persistence America has come to expect: air superiority over friendly forces, interdiction, and close air support (CAS)—all enhanced by evolving technologies that will enable time-critical targeting.

Kicking Down the Door: The Global Strike Task Force

GSTF will be the US Air Force's contribution to the nation's kick-down-the-door force. It will better meet the needs of commanders in chief (CINC) by leveraging our current and near-future capabilities to overcome the challenges our experience has identified and the threat to theater access. GSTF will rapidly establish air dominance and subsequently guarantee that joint aerospace, land, and sea forces will enjoy freedom from attack and freedom to attack. It will combine stealth and advanced weapons with a horizontally integrated command, control, intelligence, surveillance, and reconnaissance (C^2ISR) constellation that provides lethal joint battlespace capability. The C^2ISR constellation will team space assets, UAVs, and a consolidated wide-body platform that transforms data into decision-quality data for a CINC and the engaged component commanders. GSTF will be a rapid-reaction force employed within the Air Expeditionary Force (AEF) construct and

timeline while maintaining interoperability with joint, coalition, and allied assets. It will initially leverage the mass and standoff of our bomber fleet and ISR platforms, protected by the F-22, to strike targets inhibiting our ability to gain access.

The CONOPS: F-22s and B-2s kick down the door, taking out high-value assets, while information operations target key nodes and the ABL targets ballistic missiles—clearing the way for follow-on forces.

The concept hinges on precision weapons and stealth capabilities inherent in the B-2 and F-22. The latter's unparalleled combination of stealth with supercruise will reduce threat rings, allowing it to establish air dominance and deliver its PGMs deep inside enemy territory. Simultaneously, our bomber fleets will provide the "heavy lifting." A few B-2s, enabled by F-22s and in conjunction with standoff platforms such as the B-52, will target the enemy's antiaccess weapons, launch sites, and C^2, rolling back his warfighting capability, just as we have done with air defense networks in recent conflicts. These assets will provide substantial firepower where and when we need it most—against our adversary's antiaccess threats in the early days of a conflict. So how does the GSTF come together?

Prior to any conflict, preparation is key. The team of GSTF assets, aligned within an AEF, will be on call and ready for immediate tasking to hot spots around the globe. As in any emerging crisis, the first requirements call for ISR platforms. Today, this means Rivet Joint; the airborne warning and control system; the joint surveillance, target attack radar system; space-based systems; and other platforms to collect order-of-battle data sufficient to refine target lists. In the future, this phase will take advantage of platforms that integrate and dialog at the machine level. One wide-body commercial platform using modern, tunable antennas will perform most of the surveillance, reconnaissance, and C^2 functions that currently require the specialized platforms listed above. When teamed with UAVs, such as Global Hawk, and mechanized to interact directly with space platforms, the power of machine-level integration will close the seams that currently delay our ability to precisely locate and identify critical targets. These are key steps in the kill chain, and we have learned that a more efficient kill chain is crucial to combat success.

The development of predictive-analysis tools will expand the power of integrated ISR. Horizontally integrated ISR, combined with these predictive tools, will build the concept of intelligence preparation of the battlefield into an emerging concept called predictive battle-space awareness (PBA). Such awareness includes baseline reconnaissance of the battle space; terrain delimitation; focused surveillance; cataloged analyses of movement patterns; knowledge of enemy tactics, intentions, and disposition; as well as course-of-action analysis. This concept should allow a shift of ISR platform utilization from collection, used for pure discovery, to targeting those events that our predictive power leads us to anticipate. We are aiming for a forensic-level understanding of the battle space in all four dimensions. PBA will allow us to anticipate the right move rather than simply react to enemy moves. PBA is essential to the GSTF.

The first aircraft to deploy will be the ISR wide-body platforms that will operate beyond enemy airspace, their eyes and ears extended by UAVs if necessary and their protection provided by stealthy F-22s. Machine-level coordination with space-based platforms will fill gaps in the airborne platforms' coverage, and reachback will provide the analysis necessary to complete PBA for targeting the enemy's integrated defenses and his means to attack

bases, ports, and other facilities required for friendly access. Capitalizing on our decade of lessons learned, targeting will entail more than a target name, a black-and-white photograph, and mensurated coordinates. Desired mean point of impact (DMPI) analysis of second- and third-order effects, ROE target confirmation, and collateral-damage assessment will be part of a process completed and transmitted to ingressing manned and unmanned shooters in near real time, if necessary.

Once suitably prepared through PBA, the GSTF will be ready to go to war. With our C^2ISR constellation in operation, air-refueled B-2s flying from the continental United States or rear bases beyond the enemy's reach, in concert with standoff weapons such as sea- and air-launched cruise missiles, will deliver the first blows to shore defenses, integrated air defenses, ballistic-missile launch sites, and chemical and biological storage facilities.

The F-22 is key to expanding the B-2's stealth advantages beyond moonless-night-only operations; indeed, 24-hour stealth will be possible. F-22s will pave the way for the B-2 and other bombers by providing initial local air superiority through the traditional "sweep" role and through air-to-ground targeting of the enemy's air defense network. Some F-22s, which are also compatible with the winged miniature munitions, will attack up to eight targets per sortie, further hindering the adversary's ability to defend his airspace.

The shock effect of this B-2/F-22 "one-two" punch will be unprecedented. In the first 24 hours of Desert Storm, after six months of buildup, we launched 1,223 strike sorties, hitting 203 targets. Stealth assets accounted for 40 sorties and 61 targets.[15] With GSTF, four B-2s and 48 F-22s carrying miniature munitions can strike 380 targets in only 52 sorties. Surging the same assets will more than double the target destruction—an exponential increase over our 1991 results.[16] Our success during Allied Force is similarly eclipsed by the GSTF concept.

Air refueling ensures that we can sustain and, if necessary, employ GSTF over long ranges, while airborne laser (ABL) aircraft provide force protection as part of a layered theater ballistic missile defense system. F-22 will be the guarantor of air dominance for all friendly forces.

Thus, with F-22s and B-2s, the GSTF will contribute to the joint team's capability to overcome enemy attempts to deny access. Joined with other standoff and special-operations capability, GSTF will provide a capacity to systematically destroy hundreds of targets, roll back enemy defenses, and clear the way for follow-on forces. Additionally, bombers will orbit in combat air patrols, awaiting tasking for fixed and time-critical targets located and identified by our C^2ISR constellation. Small, armed UAVs, present throughout, will provide a single hunter-killer platform for finding and killing threats in the highest-risk areas. Sustained AEF airpower, including the Joint Strike Fighter (JSF) and, subsequently, nonstealthy fighters with precision-attack capability, will roll into the fight as the antiaccess threat diminishes, beddown locations open, and survivability increases.

Furthermore, the GSTF will fit naturally into the AEF construct and timeline. Follow-on AEF forces will quickly join GSTF assets embedded in the AEF. Low-density, high-demand assets will continue to support operations during their eligibility window.

These persistent operations will include other fighters, such as the JSF in the air-to-ground and suppression-of-enemy-air-defenses roles, to provide continuous presence over the battlefield. The presence they offer is necessary to sustain full-spectrum joint and combined operations, such as the targeting of time-critical mobile targets and CAS. Therefore, the GSTF complements and improves the AEF construct by providing maximum shock during the first stages of the battle.

Although parts of the GSTF concept could be executed with today's force structure, it will achieve full potential only by leveraging new technology. Therefore, we must direct scarce modernization funds toward improvements that maximize GSTF capability. Miniature munitions will maximize the effectiveness of our bomber and fighter platforms and

validate the concept of "targets per sortie"—one that is already reaping benefits for the United States.[17] Advanced weapons will also enhance our effect on targets that are deeply buried as well as mobile target sets. To ensure survivability, we must implement improvements in self-protection for all our combat air forces. Furthermore, space-based assets and UAVs must integrate with our next consolidated C^2ISR platform to break down bottlenecks and even barriers in the kill chain. By integrating today's stovepiped platforms into a common platform, we will garner the benefits of a reduced overseas footprint. More importantly, we will improve information flow by rapidly conducting machine-level conversations to refine the myriad of information that is not currently fused. This is critical to closing seams in the kill chain.

Combat experience has also inspired major changes to our C^2 processes. The potential contribution of PBA to our target-destruction capability is lost without the C^2 to orchestrate the campaign, and the air-operations-center weapon system provides the C^2 foundation. It will serve as the focal point for decision-quality information, allowing an airman to effectively command aerospace power in support of a joint force commander. The decision-quality information on the JFACC's data wall will be void of stovepiped barriers—the information, not the source, is key. This will allow rapid response and the inherent flexibility of GSTF aerospace power to deviate from any plan with minimal impact.

Conclusion

Our experience in conflicts over the past decade has revealed the changing nature of warfare. The reliance on coalitions and allies, stringent ROE, concern about casualties, need for sustained air operations, and access issues are a few of the factors that now shape the application of American military power. Sophisticated new weapons available to our potential enemies further complicate our task. The GSTF operationalizes many of the lessons learned in combat in the 1990s. Decades ago the Luftwaffe demonstrated to the world the cost of failing to honor change.

The GSTF provides the nation a new capability—one that maximizes current systems and technologies and leverages their potential through innovative CONOPS. In sum, GSTF is a rapid-reaction, leading-edge, power-projection concept that will deliver massive around-the-clock firepower. It will mass effects early, from longer ranges, and with more precision than our current capabilities and methods of employment; it will give adversaries pause to quit and virtually guarantee air dominance for our CINCs. In sum, GSTF is an elegant and effective near-term solution to meet the challenges facing America. □

Notes

1. Actually, blitzkrieg tactics were introduced in earlier forms with German Pioneer forces during the spring offensives of World War I in an attempt to break the four-year stalemate. See James S. Corum, *The Roots of Blitzkrieg: Hans von Seeckt and the German Military Reform* (Lawrence, Kans.: University Press of Kansas, 1992).

2. "Named Military Operations, 1989–1999," comp. Francis M. Doyle (Fort Monroe, Va.: Technical Library, 1999).

3. A grand total of 118,661 sorties were flown in support of Operation Desert Storm by all participants, for an average of 2,697 sorties per day. Thomas A. Keaney and Eliot A. Cohen, *Gulf War Air Power Survey,* vol. 5, *A Statistical Compendium and Chronology* (Washington, D.C.: Department of the Air Force, 1993), 251.

4. Maj W. Eric Herr, "Operation Vigilant Warrior: Conventional Deterrence Theory, Doctrine, and Practice" (thesis, School of Advanced Airpower Studies, June 1996), 24.

5. *Operation Desert Strike,* on-line, Internet, 12 January 2001, available from http://www.fas.org/man/dod-101/ops/desert_strike. htm.

6. Of the 1,026 bombs and missiles expended during Operation Deliberate Force, 708 were PGMs. Col Robert C. Owen, "The Balkans Air Campaign Study: Part 2," *Airpower Journal* 11, no. 3 (Fall 1997): 12.

7. Col Robert C. Owen, "The Balkans Air Campaign Study: Part 1," *Airpower Journal* 11, no. 2 (Summer 1997): 15.

8. Headquarters USAF, *The One Year Report of the Air War over Serbia: Aerospace Power in Operation Allied Force,* vol. 1 (Washington, D.C.: Department of the Air Force, October 2000), 50.

9. Aircraft flew 38,000 sorties, with an overall collateral-damage rate of .0005. Ibid., 513.

10. A total of over eighty-five-hundred PGMs were employed, with almost seven thousand dropped by US assets. Ibid., 504.

11. William S. Cohen and Henry H. Shelton, *Kosovo/Operation Allied Force After-Action Report: Report to Congress* (Washington, D.C.: Department of Defense, 31 January 2000), 24.

12. *Persistence* refers to 24/7 enduring air operations such as Operation Southern Watch. The three hundred to five hundred sorties per day included all combat and combat-support sorties.

13. Distances are measured on a straight line to a point in the center of Kosovo.

14. *Jane's Land-Based Air Defence*, 13th ed. (Alexandria, Va.: Jane's Information Group, Inc., 2000), 140.

15. F-117 aircraft flew 40 sorties and are credited with 61 strikes on day one of Operation Desert Storm. *The Gulf War Air Power Survey* defines a strike as "the delivery of a weapon or weapons against a specific target." In this example, the words *strike* and *target* are synonymous. Keaney and Cohen, 351, 421–37.

16. Surging can be accomplished either by increasing the number of bomb-dropping sorties or by shifting the focus of the F-22s to their multirole, air-to-ground capability.

17. Advanced munitions allow nearly one DMPI-per-bomb destruction or the ability to effectively destroy mobile targets or targets with imprecise locations. An example is the sensor-fused weapon.

Aerospace Power
Chronicles

As we enter 2001, we are striving to publish current, timely, and thought-provoking articles on-line. For example, one of our first offerings is "A Sea of Peace or a Theater of War: Dealing with the Inevitable Conflict in Space," by Lt Col John E. Hyten, who addresses issues regarding future conflict in space. He emphasizes that such conflict is inevitable, complicated, and unresolvable by either the Air Force or the military alone: "Dealing with future space conflicts and defining the future of this nation in space are national issues requiring involved leadership and integrated efforts from throughout the federal government."

Another article, equally intriguing, details the completion of a theater missile defense (TMD) reorganization by Combined Forces Command and US Forces Korea. In "Organizing for Success: Theater Missile Defense in Korea," Col Dale C. Eikmeier explains that this innovative solution to a serious war-fighting challenge grew from a problem shared by many of the geographical CINCs and may become a model for other theater-level TMD organizations.

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