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Air War College

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Back to the Future:
Airpower in Future Conflict

by

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A Research Report Submitted to the Faculty

in

Fulfillment of the Curriculum

Requirement

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Maxwell Air Force Base, Alabama

8 April 1994

Back to the Future:
Airpower in Future Conflict

"You may fly over a land forever; you may bomb it, atomize it, and wipe it clean of life - but if you desire to defend it, protect it, and keep it for civilization, you must do this on the ground, the way the Roman Legions did: by putting your soldiers in the mud."

T. R. Fehrenbach
This Kind of War: A Study in Unpreparedness

This oft-quoted favorite of army personnel begs an update. The implication is that soldiers must stand in the mud *in enemy territory*. If occupation and exploitation of enemy territory were vital to winning a war, Fehrenbach's statement could be said to have some validity. However, putting soldiers in the mud in enemy territory is not requisite to winning war. Not since the Spanish-American War has the US conquered and then retained enemy territory gained. The US always withdraws at the conclusion of hostilities, usually quickly — sometimes belatedly. That is the nature of the culture. Americans covet no other lands and rush to get their fighting soldiers home as soon as possible. What is important is protecting American interests around the globe and quickly applying military force — that is, winning war — when needed. Conquering and holding land to "...defend it, protect it, and keep it for civilization..." is of little value to the American public or political leaders. Accepting Fehrenbach's assertions assumes the US will fight two dimensional, sequential battles as the Roman Legions did, which discounts the third dimension of warfare, airpower, as being ineffective. By virtue of the third dimension, this paper proposes that future warfare is winnable without "putting soldiers in the mud" in enemy territory.

The Persian Gulf War was the latest example of the United States fighting a war only to quickly withdraw forces and turn the enemy territory gained back to the forces from whom it was won. "As in war at sea, the focus [in the future] will be not so much in seizing territory as on destroying enemy combat forces."[1]

The ideal application of military power in pursuit of national strategy is one that is cost effective in its use of the treasury and, more importantly, its use of soldiers. Airpower possesses the potential to defeat the enemy in the most cost effective manner so that, if required, the army can "stand on" and then withdraw from enemy territory with minimal losses.

Among the armed forces, airpower reached dominance late in the Vietnam War as precision guided munitions (PGMs) were used to destroy enemy forces with minimum ground or sea power involvement. But, long before Vietnam, airpower approached dominance. Following World War II, the Strategic Bombing Survey stated that allied airpower was decisive in the war in Western Europe. Regarding the Pacific Theater, the report said, "For the future, it is important fully to grasp the fact that enemy planes enjoying control of the sky over one's head can be as disastrous to one's country as it's occupation by physical invasion."[2] Control of the air is critical to winning wars as was proven in Western Europe. "When the Germans lost the battle for the air, they lost the war."[3]

The lack of precision guided weapons hindered airpower's effectiveness in World War II. In particular, interdiction of enemy lines of communication

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[1] Mazarr, Michael J., Don M. Snider, and James A. Blackwell, Jr. *Desert Storm: The Gulf War and What We Learned*. Boulder, CO: Westview Press, 1993, p. 98.

[2] Hallion, Richard P. Storm over Iraq: Air Power and the Gulf War. Washington, DC: Smithsonian Institution Press, 1992, p. 12.

[3] Barlow. Maj Jason B. "Strategic Paralysis: An Air Power Strategy for the Present" *Airpower Journal*, Winter 1993, p. 7.

(LOCs) and industrial capacity required massive numbers of aircraft and produced limited results. World War II-era airpower produced the best results in theaters where targets were relative easy to locate and, once found, could not hide. Naval targets proved to be especially vulnerable to airpower. Ground targets would be spared for several years until technology made them easier to locate and hit.[4]

Airpower came to dominate warfare late in the Vietnam War. The combination of Wild Weasel tactics to suppress surface-to-air missiles and Laser Guided Bombs (LGBs) gave America the capability to precisely destroy targets, such as the troublesome Thanh Hoa bridge, which had previously seemed invulnerable. But for the ineptitude of political leaders, military force could have brought the Vietnamese to their knees with airpower at the forefront. Airpower was used in Vietnam to send messages to the North Vietnamese rather than win the war. Airpower was squandered and thus it's capability was perceived by military experts as ineffective. "So, air power was misused in Vietnam, with that misuse often clouding results attributed to the limits *of* air power when they really stemmed from limits *on* air power."[5] Because of the inappropriate application of airpower in Vietnam and earlier engagements, it was still believed to be incapable of dominating war. As a result, airpower was inappropriately applied during subsequent conflicts until Desert Storm. Airpower long held *potential* dominance of the battlefield. Desert Storm displayed that dominance.

The Persian Gulf War set the stage for future conflict. It confirmed the dominance of airpower in warfare. Some may argue that the Gulf War was unique, may never be repeated, and therefore is of limited value in the

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[4] Mazarr, p. 10.
[5] Ibid, p. 19.

study of warfare. More likely, the Gulf War is the new standard on which all future warfare will be patterned, whether fought in the desert or the tropics. Undoubtedly, different terrain and weather will impact the techniques used to employ armed forces in war, but future military operations will be guided by and governed by the lessons of Desert Storm. In short, airpower wielded by coalition air forces, armies, and navies won the Persian Gulf War and, if employed in a similar manner, airpower will win the next conflict. Ignoring the airpower lessons of Desert Storm will result in greater casualties among land forces, a longer, more expensive conflict, and potentially, defeat.

Definition of Airpower

Airpower, as referred to in this paper, doesn't mean only Air Force aircraft. Saying airpower won the Gulf War is not the same as saying the US Air Force won the war. Rather, attack and lift helicopters from US and allied armies, fighter/attack aircraft and helicopters from US and allied navies, airlift and combat aircraft from US and allied air forces, and cruise missiles and unmanned airborne vehicles from all US services synergistically produced a war-winning force. In fact, US Army airpower struck the first blow in Desert Storm as USAF Pave Low helicopters led Apaches to a predawn raid on Iraqi air defense assets. Airpower, then, is defined as all aircraft, manned and unmanned, used to destroy, delay, deny, or disrupt enemy war-making and war-controlling capability.

This paper will examine the characteristics of airpower, as applied in the Persian Gulf War, which caused it to exceed the expectations of military experts. Additionally, this paper will conclude that airpower reached maturity in the Gulf War and will be the key in future conflicts to winning

with minimum losses. Finally, it will argue that airpower is best used as the primary arm with supporting action by army and navy forces.

The Need for Technological Advancement

The years between the world wars witnessed the emergence of several airpower advocates, the most prominent of which were Giulio Douhet, Hugh Trenchard, and General William "Billy" Mitchell. In general, these airpower pioneers advocated defeat of an enemy through airpower directed against "vital centers" and against the national will and ability to continue the war, which included civilian populations. In Desert Storm, attacks against the civilian population and religious and archaeological sites were not only morally and politically unacceptable, they were specifically avoided.[6] Additionally, other than Scud missile manufacturing and chemical producing facilities, Iraq didn't have a substantial industrial base supplying the war effort. Nonetheless, any nation that has the capacity to threaten US interests in a significant way has to present strategic vulnerabilities.[7] The Desert Storm planners validated the concepts of Trenchard, Mitchell and Douhet by choosing targets that were appropriate to the overall coalition objectives and the technology available, were accessible to airpower, and would cripple the centralized command and control system of the Iraqi leadership - the "vital centers."

The goal in warfare is to cause a behavioral change in an enemy's conduct. Normally, the enemy must be subdued and convinced to accept friendly terms. Locating the critical enemy targets (centers of gravity) and

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[6] Department of Defense. *Conduct of the Persian Gulf War: Final Report to Congress*. Washington, DC: US Government Printing Office, April 1992, p. 132.

[7] Major General Charles Link, Air War College Briefing, Nov 1993.

delivering munitions to destroy them can force the enemy into an untenable position from which one can extract the desired behavior. When employing airpower, according to Colonel John Warden, military objectives to subdue the enemy could be the destruction of some or all of an enemy's forces, an enemy's economy, or the enemy's will to resist.[8] A force that can achieve the objectives with the least risk and expense and greatest chance of success dominates the battle. Airpower always inherently possessed the capability to dominate the battlefield, but for technology (or in the case of Vietnam, misuse). During General Mitchell's heyday, aircraft speed was such that the accuracy of gravity bombs was good. But, as aircraft speed increased and enemy defenses improved, the accuracy of gravity bombs suffered. Both locating the enemy and accurately delivering a weapon were degraded by high speed and the need to maneuver so as to avoid threats.

Technological improvements in munitions and delivery systems began to tame the inaccuracies of high speed airpower. Technology, thanks to research in precision guided munitions during the Vietnam years and the military budget of the Reagan administration, caught up with airpower in the Gulf War. The technology needed was that required for precise weapon guidance. With precise guidance, a single munition caused the same damage as many unguided munitions and a single aircraft was targeted against multiple targets instead of many aircraft against a single target as is required with "dumb" bombs to insure the same probability of kill. Without that technology, many bombers carrying many bombs making many raids were required in World War II to destroy or damage a target. Had PGMs been available in World War II, the power of each bomber would

[8] Hallion, p. 116.

have been increased many fold. It was the systematic reduction of the circular error probable (CEP) from the 3000 feet of World War II to the ten feet of Desert Storm's PGMs that transformed airpower into a war-winning force.[9]

> In 1943, after a raid on Pilsen, Bomber Command planners were delighted to find that 95 percent of the bombs had hit within three miles of the aiming point. In 1991, approximately 85 percent of smart bombs hit within 10 feet of their aiming points. The difference is the difference between the axe and the scalpel.[10]

Without technological improvements in weapon accuracy, General Mitchell's predictions for the dominance of airpower were unattainable. Despite his overstatement of inter-war airpower's capability, his vision of airpower's potential was keen. Technology and proper application permitted attainment of airpower's potential.

National and Military Objectives

It is revealing to investigate the objectives of the Gulf War in order to capture the contribution of airpower. The national objectives in Desert Storm were clear. Coalition forces, operating under United Nations resolutions 660-678 were directed to achieve:

- Immediate, complete, and unconditional withdrawal of all Iraqi forces from Kuwait;
- Restoration of Kuwait's legitimate government;
- Security and stability of Saudi Arabia and the Persian Gulf;
- Safety and protection of the lives of American citizens abroad.[11]

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[9] Schultz, Richard H., Jr. and Robert L. Pfaltzgraff, Jr. *The Future of Air Power in the Aftermath of the Gulf War*. Maxwell Air Force Base, AL: Air University Press, July 1992, p. 28.
[10] Hallion, p. 264.
[11] *Conduct of the Persian Gulf War*, p. 22.

Because the national objectives were clear, the military objectives were equally clear. The US military objectives were to:

- Attack Iraqi political-military leadership and C^2;
- Gain and maintain air superiority;
- Sever Iraqi supply lines;
- Destroy known nuclear, biological, and chemical (NBC) production, storage, and delivery capabilities;
- Destroy Republican Guard forces in the KTO;
- Liberate Kuwait City.[12]

Airpower was capable of accomplishing all of the military objectives, including the liberation of Kuwait City. For example, if Iraqi forces were ninety percent destroyed and Baghdad were further crippled by airpower, Saddam Hussein could have been convinced to evacuate Kuwait.[13]

> The air campaign completely devastated Iraq's Army. Despite the outcome of World War II, before Vietnam, some still believed that air power could be enough to win wars. This theory was discredited in that war, but it must be considered again. Indeed, for the first time in history, air power was the major determinant in a large-scale war between two formidable forces with field deployed armies. Had the ground war been delayed and the air war continued, the deadly air strikes would have decimated Iraq's Army. This view will be argued at length by military strategists and historians in the future and is not meant to lessen the significant contributions of Coalition ground and naval forces. However, the inescapable conclusion is that air power virtually brought Iraq to its knees, and the air

[12] Ibid, p. 97

[13] An exception to this statement arises from the revelation that the senior Iraqi leaders at the ceasefire meeting were unaware of the number of Iraqi soldiers held by coalition forces and the location of their own forward lines (see Hallion, p. 240). An argument could be made that the leaders, ignorant of the actual situation, would refuse to capitulate. That ignorance was probably born of poor communications caused by coalition air attacks. In any case, I believe the war could have ended with an air campaign. Admittedly, it would have taken several weeks for the Iraqi leaders to realize they no longer possessed an army to lead.

war showed that air power may be enough to win some conflicts.[14]

However, destroying 90 percent of Iraq's military power would have consumed more PGMs than were available and probably would have been portrayed in the media as a ruthless and unnecessary action. As was done, the best way to liberate Kuwait City was to advance ground power into the city to solidify the victory. The only question was the timing of the ground power advance so as to minimize casualties. At 366, the number of US casualties for Desert Storm was exceptionally low. It might have been even lower if land forces had been delayed longer or, better yet, if Iraq had capitulated without engaging land forces at all.

As a subset of the military objectives, airpower was tasked to:

- Isolate and incapacitate the Iraqi regime;
- Gain and maintain air supremacy to permit unhindered air and ground operations;
- Eliminate Iraq's offensive military capability by destroying key military production, infrastructure, and power capabilities;
- Destroy Iraq's known NBC warfare capability;
- Render the Iraqi army and its mechanized equipment in Kuwait ineffective, causing its collapse.[15]

Note how well the airpower objectives match the overall military objectives. Essentially, airpower was tasked to accomplish most of the military objectives. With some caveats, airpower accomplished it's assigned military objectives. While Iraq's military capability was not eliminated, it was severely degraded. Iraq's military production consisted mainly of surface-to-surface missile manufacturing. That capability was damaged, although

[14] Watson, Bruce W., Bruce George, Peter Tsouras, and B.L. Cyr. *Military Lessons of the Gulf War*, London, Greenhill Books: 1993, p.77.
[15] *Conduct of the Persian Gulf War*, p. 100.

not eliminated. The infrastructure and power capabilities were eliminated for the duration of the war, which was an acceptable degradation. Long term destruction of infrastructure and power output was not in the best interests of the coalition or post-war Iraq.

Another area of limited success was the destruction of Iraq's nuclear-biological-chemical warfare capability. The planners in the Black Hole targeted chemical production facilities and fixed Scud launch sites, but overlooked the mobile launchers as a viable threat. That decision was a reasonable one given the limited threat posed by the Scuds and the greater importance of other targets. United Nations Special Commission teams discovered huge post-war stocks of chemical weapons. "Even though air attacks against Iraq's chemical-warfare capabilities fell well short of destroying them completely, it by no means follows that these attacks were militarily futile or served no purpose."[16]

Air Doctrine

Since the Goldwater-Nichols Department of Defense Reorganization Act of 1986, air doctrine is tailored to support the unified combatant commands. Under the act, unified commanders are responsible for employment of forces and the various services provide combat-ready troops and equipment. The "ownership" of airpower is a somewhat sensitive issue across the services and thus, air doctrine was impacted by Goldwater-Nichols.

Joint air operations in the gulf war became the norm instead of the exception. The air tasking order (ATO), previously unused by services other

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[16] US Air Force. *Department of Military Studies Gulf War Air Power Survey Summary Report*, Maxwell AFB, AL: Air War College, pp. 43, 81, and 119.

than the Air Force, became the joint method of coordinating and tasking airpower.[17] The most notable change to joint air operations was the use of a single air component commander who was responsible for "planning, coordination, allocation, and tasking based on the joint force commander's apportionment decision."[18] The concept of a single commander having overarching control of airpower, but not the service components that provided it, was new to both US military and combined operations. It worked, but it worked only because the enemy was unwilling to fight and the coalition had more airpower assets than was expected. Had coalition forces faced a more formidable foe, the assignment of air assets to the Joint Forces Air Component Commander (JFACC) might have encountered significant resistance. The issue of operational control of joint and coalition airpower begs resolution before the next use of US military force.

Air doctrine was also impacted by the heavy integration of Air Force Reserve and Air National Guard units into the war. The reserve and guard units fleshed out the active duty forces to the point that operating without them would have been difficult, if not impossible. A lack of guard and reserve components would have dramatically changed the effectiveness of airpower. In particular, airlift and air refueling units provided the capability to move combat units anywhere rapidly. The unsung heros of coalition success in the Gulf War were the air refueling units. The war, as fought, was impossible to execute without air refueling capability. Air refueling will continue to be the linchpin of "Global Reach - Global Power" until a new fuel or propulsion unit is

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[17] Winnefeld, James A. and Dana J. Johnson. "Unity of Control: Joint Air Operations in the Gulf." *Joint Force Quarterly*, Summer 1993, p. 91.

[18] Department of Defense, *Joint Doctrine for Theater Counterair Operations*, Joint Pub 3001.2.

devised. Reserve and guard units will continue to serve as that mainstay of airpower necessary to mass enough forces to defeat the enemy.

Airpower doctrine today is less focused on strategic bombardment versus tactical bombardment. Given the global reach of aircraft (due to air refueling) and the impact of precision weapons delivery (one munition does the work of many), all combat aircraft have the ability to project power globally. General McPeak, USAF Chief of Staff, says "the difference between the tactical and strategic is very fuzzy....Strategic and tactical no longer mean nuclear and conventional; they no longer mean short versus long range; they no longer have much to do with payload....So I no longer know what the division between tactical and strategic is."[19] The USAF's composite wing concept provides the options necessary for the US to quickly apply military power anywhere in the world. A composite wing is a strategic weapon yet uses what were previously considered tactical aircraft. Thus, strategic and tactical bombardment are blurred into a single entity that is defined more by the type target, enemy defenses, weapon system capability, and desired outcome.

Airpower not only psychologically and physically immobilized the Iraqi military forces during Desert Storm, it was well on its way toward totally destroying it. Through sustained, focused targeting, the Iraqi Air Force and air defense system were neutralized. Three hundred seventy five of five hundred ninety four hardened aircraft shelters were destroyed, some with aircraft still inside. Iraq suffered 35 air-to-air aircraft losses and an

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[19] Gen Merrill A. McPeak, Air Force Chief of Staff, address to the Air Force Association Tactical Air Warfare Symposium, Orlando, FL, 31 January 1991.

estimated additional 227 aircraft destroyed on the ground.[20] Destruction of Iraqi armor varied from ten percent to one hundred percent of various divisions. Given more time, ninety percent of all frontline Iraqi armor and one hundred percent of aircraft shelters could have been destroyed. If airpower had continued devastating the Iraqi forces at the same pace for another three weeks instead of initiating ground action, Iraq probably would have capitulated.[21] Even without a surrender, Iraqi military forces would have been further reduced and the ground war would have been even lower intensity thus producing fewer friendly casualties.

Compared to the Air War Plans Division-1 document of World War II, the targets selected by the Black Hole planners were almost identical — the notable exception being the degree to which the national leadership and the telecommunications were targeted. What was different in Desert Storm was the focus on obtaining functional effect rather than simply destruction of target sets. Rendering a capability impotent was considered as useful as destroying the supporting infrastructure. "Functional effects thinking led planners to assign fewer aircraft and fewer bombs to many targets, which in turn meant that they could attack more targets simultaneously rather than a few repeatedly and in depth."[22] Air doctrine took on new joint and coalition dimensions in the Gulf War and guided US and coalition airpower to a new standard of performance — a standard that must be met, and exceeded, in the next conflict.

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[20] McPeak, DoD News Briefing, 20 and 21 Jan 1991 as cited in *Military Lessons of the Gulf War*, p. 70.
[21] Schultz, p. 30.
[22] *Department of Military Studies Gulf War Air Power Survey Summary Report*, p. 241.

Unity of Command

Unity of command came closer to reality in the gulf war than any earlier US conflict. With the exception of a small portion of Marine aircraft in the Kuwait Theater of Operations and some Navy aircraft dedicated to fleet defense, coalition airpower was planned and controlled by the JFACC, General Horner.[23]

All planning during the conflict was conceived in the "Black Hole" in the JFACC headquarters under the direction of General Glosson. Targeting was accomplished at CENTCOM by the Joint Targeting Coordination Board. Joint cooperation and unity of command of air assets reached a new high in the Gulf War.

The most impressive aspect of the unity of command experienced in Desert Storm was the integration of allied air forces into the overall air campaign. Traditionally, air operations involving allied forces experienced difficulty conducting combined operations due to language barriers, diverse equipment, and contrasting air doctrine. Even when using the same equipment and operating side by side in Europe, US and German Air Forces traditionally did not practice combined operations. The Gulf War was a refreshing exception to tradition. Allied airpower was effectively integrated into the air campaign and tasked in the daily air tasking order.

Air Superiority/Air Supremacy

Air superiority is primary in any conflict. Fighting a war on your own terms requires air superiority. Without it flexibility in execution diminishes. The initial strike packages of Desert Storm were large,

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[23] Interview with LtC John Woods, USMC, 5 October 1993.

cumbersome groups of different aircraft types working together to destroy a target. The packages required numerous support assets such as Airborne Warning and Control System (AWACS), electronic warfare (EW), and escort because of the uncertainty of of air superiority. Such large strike packages of aircraft are inherently inflexible. Due to the uncertainty of air superiority, flexibility took second place to mass. The Gulf War:

> "...reaffirmed the importance of gaining and holdi air superiority: with air superiority, a military force can un ke the "Hail Mary" play; without air superiority, it is stuc a traffic jam outside Kuwait City and the Highway of Death."[24]

In the gulf war, the coalition gained air superiority in the first hours of the war and enjoyed air supremacy after the tenth day of the war.[25] The Iraqi Air Force was virtually dismantled. Hussein held his valuable air assets for some later "use" and thus made them targets instead of weapons. Iraqi aircraft were hidden in hardened aircraft shelters until coalition aircraft began systematically destroying the shelters. The aircraft were then moved to civilian areas and religious shrines that were protected from coalition attack. Some aircraft were flown to Iran to avoid destruction. These protective actions and the destruction of other aircraft resulted in impotence in the Iraqi Air Force and air supremacy for the coalition.

No country is "...immune from the kind of destruction that afflicted Iraq once it lost control of the skies, and attack aircraft carrying precision weapons were free to hammer it."[26] Air supremacy permitted the freedom of movement necessary for the timely and unchallenged placement of munitions and denied the enemy use of the air to observe and attack

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[24] Hallion, p.243.
[25] *Conduct of the Persian Gulf War*, p. 164
[26] Hallion, p. 266.

coalition elements. Air superiority, ideally air supremacy, is requisite to winning, and equally requisite to minimizing losses. The opportunity to fully exploit the flexibility of airpower belongs to the side that controls the air.

Application of Technology

Airpower reached its potential in this war primarily because of the application of technology. There were a number of technological improvements that synergistically came together in Desert Storm to create an impressive display of power. Technology such as Airborne Warning and Control System (AWACS), Joint Surveillance Target Attack Radar System (JSTARS), HARM antiradiation missiles, and infrared sighting systems all contributed tremendously to success, but three technologies stood out among the rest; stealth/low observables, precision guided munitions, and the global positioning system.

Stealth technology met its first true combat test and emerged as a dramatic enhancement to airpower. Stealth permitted penetration deep into enemy territory and delivery of precision guided munitions in a relatively safe manner. It permitted the coalition to take the war deep into enemy territory, cripple the command infrastructure, and work on strategic targets from the inside-out. The F-117 hit the most heavily defended targets in populated areas without the support of other air assets such as electronic combat or fighter support. No F-117s were shot down or damaged. Furthermore, F-117s hit 40 percent of theater strategic targets

while flying only 2 percent of Gulf War sorties.[27] Stealth proved its worth in Desert Storm.

The PGMs that were used in the Gulf War were laser guided bombs, TOW and Hellfire missiles, AC-130 Gunships, and Maverick missiles. The main benefit of using PGMs was the increased probability of a kill, greater confidence in confirmation of battle damage assessment (BDA), optimization of targeting, economy of use, and significant reduction of collateral damage. The probability of kill with PGMs increases tremendously in comparison to conventional unguided gravity bombs. For example, PGMs dropped by F-117s struck the desired aimpoint within 10 feet 79 percent of the time.[28] The accuracy of "dumb" bombs was considerably worse than normal due to the requirement to release at high altitude which further enhanced the magnitude of PGM accuracy. The capability for accurate BDA at the tactical level increased in Desert Storm as damage was assessed (in fact, shown to the world in briefings to the media) using video tapes from aircraft delivering PGMs. A benefit of reliable BDA was optimization of targeting. If a target was certain to have been hit as determined from PGM video, sorties were retargeted. PGMs thus reduced the danger to pilots by avoiding nonproductive incursions into enemy territory. While an LGB which costs $10,000 each may not sound economical, using one LGB to kill one T-72 tank, which sells for $1.5 million and could potentially destroy a $5 million Abrams tank, makes it very economical.[29] Destroying higher value targets such as command centers produced even greater economy. The reduction in collateral damage

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[27] Ibid, p. 174.
[28] Hallion, p. 177.
[29] Bodner, Major Michael J. and Major William W Bruner III. "Tank Plinking". *Air Force Magazine*, October 1993, p. 31.

afforded by PGMs is reflected in the relatively few Iraqi civilian deaths. Post -war reports indicate Iraq suffered less than 2300 civilian deaths during the entire war.[30] Compared with the thousands of civilian deaths in some single air raids during World War II, PGMs helped produce the most humane war in modern history. Additionally, the reduction of collateral damage and civilian deaths virtually eliminated the international furor that erupts when such actions occur. In an indirect way, PGMs also reduced the number of enemy soldiers killed by demonstrating to the soldiers that they were unsafe when occupying their vehicles. Many soldiers abandoned their defensive positions which undoubtedly spared their lives. The use of PGMs was a key reason why airpower was dominant in the Gulf War.

A less touted, but very important technology that established a new standard during the war was the Global Positioning System (GPS). In the featureless vastness of a desert environment, navigation can be difficult. Modern military aircraft are usually equipped with inertial navigation systems (INS), but they are prone to drift, especially during the long hours of flight required to reach the target areas in Iraq. A common saying among fighter pilots is "You can't hit the target if you can't find it." GPS provided surprising accuracy (to ground units as well as aircraft) that allowed aircraft to navigate to and attack within feet of a target. In one example, a F-16 pilot was relayed GPS coordinates from the GPS backpack of special forces troops surrounded by 200 Iraqis. He was able to fly directly to the trapped soldiers and scare away the Iraqis.[31] Access to GPS

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[30] Arkin, Lt Col William briefing to GWAPS personnel on 31 October 1991 as cited in the *Department of Military Studies Gulf War Air Power Survey Report*. Maxwell AFB, AL: Air War College, p. 75.

[31] Coyne, James P. *Airpower in the Gulf*. Arlington, VA: Aerospace Education Foundation, 1992, p. 122.

is vital for allied forces in future conflicts and a method to deny GPS to enemy forces is equally critical.[32]

Vital Support Role of Army and Navy Forces

Without the dimension of power provided by the presence of ground and naval forces, airpower's effectiveness would have been limited. Winning a war requires the integration of all arms working in concert, each arm doing its part to achieve the national objectives. Desert Storm firmly established jointness as the best way to win.

The US Navy quickly provided a credible sea-borne force to the area shortly after Iraq's invasion of Kuwait. During the war, their Tomahawk missiles hit heavily defended, high value targets during the day and in poor weather without risking a pilot. Their suppression of enemy air defenses (SEAD) capability made up for a significant Air Force deficiency. And US Marine Corps feints and deceptions along the coast of Kuwait held down 10 Iraqi divisions that otherwise could have engaged ground forces farther north.

The army served as the anvil against which airpower hammered the enemy. Enemy ground forces were fixed in position by the coalition army which created the opportunity for airpower to methodically destroy them. Initiation of the ground campaign, while perhaps premature, was important to secure the victory by moving into Iraqi territory and eliminating the last vestiges of resistance, but the primary importance of land forces in Desert Storm was in forcing the enemy to assume a fixed position from which they could be readily attacked by airpower.

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[32] Schultz, p. 242.

Attempting to meet the needs of US national security without any one of the three military components would certainly be ill advised, if not futile. Closer integration of actions and joint application of power is the future of US military operations.

Implications for the Future

It's easy, but incorrect, to state that airpower can singlehandedly win the next conflict. Joint application of all military branches, each doing its part in its area of speciality, is required to fight and win a war. But, some wars, for one reason or another, cause one branch to be the decisive one. "The air campaign virtually won the war in that it so devastated Iraq that the ground campaign was over in hours."[33]

Air operations put at risk fewer numbers of coalition soldiers than large-scale ground operations. As was shown in Desert Storm, it is valid to say that airpower can so devastate an enemy as to minimize friendly casualties and permit ground operations to quickly secure the victory against demoralized, defeated forces. In the Gulf War, airpower was far and away the decisive force - so dominant as to make the introduction of army and marine ground troops a relative "cakewalk."[34]

Coalition airpower fought continuously for 1036 hours during the Persian Gulf war. The ground campaign required only 100 hours because the Iraqis had no fight left in them. According to a captured Iraqi officer, his army collapsed because of "the airplanes".[35] There were numerous reports of frontline troops being out of food and water due to LOCs being

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[33] Watson, p. 216.
[34] Schultz, p. 19.
[35] Ibid, p. 13.

cut by air interdiction.[36] Coalition ground troops encountered only isolated pockets of resistance and those were quickly dispatched. Despite prewar estimates of between 20,000 and 30,000 coalition casualties, there were only 200 coalition troops killed and 2000 wounded during the war. Any casualties is unfortunate, but anyone who has even a cursory knowledge of warmaking will confirm that these few casualties are amazingly low considering the original estimate of the enemy threat. The low casualty rate is a direct result of the appropriate application of airpower.

The US established a new precedent during the Gulf War for friendly casualties. The American public, ignorant of the complexities and fog of war, will expect an equally low number of casualties in the next conflict. The US military will benefit during the next conflict if they would make known to the American public that the low casualty rate in the Gulf War was due to the capability of airpower. During the next conflict, if airpower is unable to attrit the enemy to an equivalent degree before ground power engagement due to limits or restrictions on its use, then the casualty rate is guaranteed to be higher. If the casualty rate is high, congress and the American public will put pressure on the Department of Defense and the political leadership to lower the casualty rate or withdraw from action. If the public understands the reasons for higher casualties, they are more likely to accept it.

The geographic setting of the Gulf War was almost ideal for airpower application. A war fought in the tropics will present a different set of obstacles for airpower.[37] We must look to solving the problems of applying

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[36] Mazarr, p. 131
[37] Schultz, p. 21.

airpower in the more difficult setting of a jungle with the accompanying weather factors. Airpower technology will be a key factor in fighting and winning a war in such an environment.

One such technological solution is the inertially guided weapon (IGW). An IGW, much like LGBs, would combine an inexpensive dumb bomb with an accurate, inexpensive guidance package consisting of an inertial guidance system, a GPS receiver, and steerable fins for maneuvering. Target latitude and longitude information inserted into the guidance system, either airborne or before takeoff, would guide the weapon to it's target. GPS would refine the accuracy of the inertial system. The advantage of IGWs over LGBs would be the addition of an all weather capability. The disadvantages include reduced accuracy in relation to LGBs, removal of the man-in-the-loop once the weapon is released, and dependance on another source for BDA when weather obscures the target or standoff employment is used by releasing the weapon at long range. The Gulf War was fought day and night, but airpower was somewhat restricted during poor weather conditions. IGWs would subject the enemy to attack in daytime, night, and poor weather. Such a capability is necessary if the next war is to be as successful as Desert Storm.

A possible scenario for the next US-involved conflict where weather would be a significant factor is a defense of the South Korean peninsula. In a North Korean invasion scenario, halting invading forces before losing strategic centers of gravity such as Seoul must be a high priority. A North Korean invasion will feature numerous armored vehicles. An allied capability must be available to rapidly destroy many vehicles simultaneously. "Tank plinking" kill rates will be insufficient to halt an invading force quickly enough to protect vital assets. An airpower solution,

IGWs paired with dispensers of smart submunitions such as sensor fuzed weapons (SFWs), would provide day, night, and all weather, armor-stopping capability.

Another important technological development necessary for efficient operations in the next war is a capability to provide real-time identification and assignment of targets for airborne combat aircraft through a secure, non-voice medium — C^4I that can concentrate airpower where needed. Aircraft loitering near the target area with a weapons load of IGWs could quickly respond to JSTARS or forward air controller requests to hit fleeting targets. This role may even be feasible for UAVs. All possibilities must be examined in order to provide the best possible military option for achieving national strategies. The USAF, as the primary purveyor of airpower, must continually integrate new technology and adjust doctrine so as to accommodate the upcoming changes to warfare.

Conclusion

Systems and capabilities currently under development will increase the effectiveness of airpower. The C-17 provides unprecedented lift and delivery capability. The B-2 will provide penetration ability with a heavy load of PGMs to strike three or four times as many targets as weapons systems used in Desert Storm. Improvements in guided weapons, such as GPS or inertially-guided bombs and sensor fused weapons, will improve accuracy and lethality while reducing collateral damage. Airpower will become increasingly important in future conflicts because of its rapid strategic mobility and precise lethality.

Predictably, Iraq arranged their forces for a frontal assault as the Soviets had taught them. Thus, our years of preparation to fight the Soviet war

machine paid dividends as coalition air forces methodically dismantled the Iraqi military. If history repeats itself, the US will engage in major conflict again by 2020. The next war may be entirely different from the Gulf War - or the Vietnam and Korean wars for that matter - therefore, it is imperative that US war planners take into account who and where we will fight and which of our own forces can best defeat the enemy. However, in any conflict, airpower will likely be the dominate force as air superiority, strategic attack, and interdiction establish the enemy's defeat even before ground power is applied.

"Global reach, global power" is truly an appropriate vision for the Air Force as quick, decisive airpower can be applied anywhere in the world making it well suited for responding to rapidly developing regional conflicts. We must continue to develop and improve airpower to meet the US global strategy. Desert Storm is the beacon for the conduct of future conflict and in the words of General Merrill McPeak, it may be "the last ancient war."[38]

The primary influence of the Gulf War on national policy making and strategy is the realization that, contrary to past perceptions, airpower can; 1) significantly reduce casualties in conflict, 2) ease the load on ground forces by creating a clean up operation rather than a bloody fight, 3) accomplish political goals through military means at minimum cost, 4) reduce international criticism by fighting a humane war and reducing civilian suffering, and 5) potentially achieve political objectives (that is, win a war) autonomously. If we need to hold territory with troops only

[38] McPeak, General Merrill A. Presentation at the Air Mobility Command Dining In on 12 June 1993. In General McPeak's presentation, he noted that the Russians called Desert Storm "the first modern war." Gen McPeak suggested that Desert Storm was ancient in that it was conducted traditionally, as wars have been for centuries. Perhaps, he said, the next conflict will not involve the straightforward employment of conventional forces and the Air Force (indeed, the US) should prepare for non-traditional conflicts in the future.

temporarily or not at all, which is the most likely scenario, then airpower is the best choice of power projection. If we need to rapidly project decisive power worldwide, then airpower is the best choice. It's inspiring success in the Gulf War will burden airpower with greater responsibility for the success of American policy in future conflicts.

> In short, there is no logical reason for continuing to believe that war can be decided only by the clash of surface forces. We may now view such an engagement only as a last resort—and a desperate one at that. As in Desert Storm, the ultimate objective should be victory without a land battle or, at the least, one that minimizes friendly casualties.[39]

The application of force in warfare and airpower's ability to affect the outcome has increased. Not only can it arrive quickly where needed, it has become far more accurate and lethal in conventional operations. The capabilities of airpower are rapidly improving and it has the potential to destroy enemy forces at a war-winning rate while simultaneously destroying those strategic targets that are the "vital centers" of the enemy's command and war-fighting infrastructure.

Looking to the future, the US is shifting it's military strategy from the cold war Soviet threat to threats to vital US interests posed by regional powers. A strategy focused on regional threats will impose new requirements on US military forces. The ongoing reductions in the US military structure and defense budget will directly affect the ability of US forces to execute the strategy. The changing world environment is creating additional pressure to further reduce US forces and defense spending, therefore, decisionmakers must understand the capability of each military

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[39] Meilinger, Col Phillip S. "Towards a New Airpower Lexicon or Interdiction: An Idea Whose Time has Finally Gone?" *Airpower Journal*, Summer 1993, p. 43.

branch to contribute to the new strategy, both singly and jointly. Upcoming budget debates and defense cuts will undoubtedly pare the military to those assets most capable of influencing the outcome of a conflict in a manner favorable to US interests. While it is clear that joint/combined military forces will be needed to achieve US national military strategy in an uncertain future environment, airpower will likely provide the greatest return on investment. According to Clausewitz, military power is a continuation of political power through other means. Airpower is the most powerful political-military tool for American leaders and policymakers. The political leadership would be foolish to ignore airpower's "coming of age."

Billy Mitchell is watching - and smiling.

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