Air War Victorious: The Gulf War vs. Vietnam

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Much will be written about the coalition victory in the Gulf War. As air operations permitted a relatively painless, quick, and easy land campaign, we can be sure that the role of air power will be one of the center points in these accounts. The purpose of this article is to explore why the air war in the Gulf was successful by comparing and contrasting it with the air war in Vietnam. Although some of my colleagues insist such an effort is premature and better done by journalists because specific details about the Gulf War are missing and others may prove inaccurate, I believe the basic points will hold up even after more information becomes available. The central question is: Why and how, after so many promises and disappointments over the years, was air power so effective and successful? Specifically, how did coalition air forces succeed in the Gulf War after air power had failed in Vietnam?

Even before heavier-than-air machines took to the skies, novelists wrote about the decisive impact air power would have on warfare. World War I saw cities bombed and troops supported by aviation, but technology was too crude to reveal more than just a dim glimpse of the future. Air power held out the promise of avoiding the stalemate, frustration, and, most of all, the bloodshed of the western front, and its proponents were not shy in broadcasting its possibilities. World War II saw the major combatants make a large and costly effort in the air, but the results were mixed. Controversy still surrounds the strategic bombing of Germany and Japan, focusing on the questions of both morality and effectiveness. The case of tactical aviation was clearer; it seemed valuable, although not indispensable. The Korean War did not clarify the issue and airmen wrote off that experience as being atypical due to its

limited nature. The Vietnam War would prove even more murky in many respects, but especially in regard to the use of air power.

The Vietnam War

The Vietnam War indicated to many the limitations and futility of air power, for in general air power proved a grave disappointment. From the outset, it must be made clear that there were two parts to the air war over Vietnam: operations in the North and in the South. While the air campaign in the South was rather straightforward, supporting Allied ground troops, the situation in the North was more complex and much more controversial.

American decisionmakers did have an inkling of what they faced. In 1964 two war games were conducted at the highest level which foreshadowed much of what would happen. These indicated the problems of world and domestic public opinion, the constraints of the weather and terrain, and the specter of China. The war games also anticipated the difficulties of communicating diplomatic signals by bombing, how the war would escalate, and that an air war would yield little positive. More remarkably, the top military and civilian leaders were personally involved in these exercises, although their subsequent actions do not reflect the experience.[1] The military wanted a quick, massive air campaign against North Vietnam, a "quick squeeze"; instead, the civilians ordered a "slow squeeze."[2] Thus the United States gradually applied measured force in a controlled and considered manner. The purpose of the bombing was strictly political, to boost South Vietnamese morale, to deter and restrain the North by indicating the risk and cost of their continued aggression, and to demonstrate American determination.[3]

The Air Force and Navy bombing campaign against North Vietnam, code-named Rolling Thunder, began in early 1965 with high hopes; it ended as a clear failure three and one-half frustrating years later. Despite misgivings by the military, it was used as a political tool to try to force the North Vietnamese to bend to American will. Instead, the bombing helped fuel both world and domestic protests against American involvement in Vietnam. Why did the most powerful air forces in the world fail to break a fifth-rate military power?

The answer that military supporters emphasize is civilian interference. They point to restrictions on mission size, limitations on targeting,

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and numerous bombing halts as the causes for air power's defeat. Perhaps most telling, the air proponents speak with disgust of the gradualism that permitted the North Vietnamese to build up their defenses, disperse their resources, and adjust to the air assault. Gradualism also allowed the North to exploit the bombing in terms of politics and propaganda, to focus on civilian casualties and damage, and to stir up public pressure both within the United States and abroad against the bombing of North Vietnam specifically and against the war in general. These, along with the ambitious goal of breaking the enemy's will, were indeed factors in Rolling Thunder's failure. This explanation is correct as far as it goes, but it conveniently overlooks the military's part of the responsibility for air power's ineffectiveness.[4]

The military's contribution to defeat can be encapsulated by three Ts: technology, tactics, and targets. Most remarkable, American aircraft were ill-suited to fight an extended conventional air war. Few American strike aircraft could bomb in bad weather or at night. At the beginning of the conflict, the United States had only two such aircraft, the Navy and Marine A-6 and the Air Force's B-52. (Yes, the same aircraft used two decades later in the Gulf War!) While the A-6 saw extensive action over North Vietnam during Rolling Thunder, the B-52 was considered too valuable and too vulnerable for such duty. Thus the giant strategic bomber was used over South Vietnam to bomb tactical targets, while tactical aircraft were employed over North Vietnam to bomb strategic ones, just one more indication of the confusion of this war.

The services relied on other aircraft as their workhorses, the Navy on the A-4 and the Air Force on the F-105. The F-105 was particularly unsuited for attacks on North Vietnam. Its hydraulic system was unusually vulnerable, as was a fuel tank fitted in the fighter's bomb bay (an oxymoron if there ever was one). It is what the Air Force had, and what the Air Force used—at great cost.[5] Even more significant, despite the lessons of previous air wars and developments in technology, the airmen lacked two vital pieces of equipment: electronic countermeasures (ECM) and guided smart bombs. American airmen put their efforts and dollars into aircraft that demonstrated greater and greater performance, rather than into the offensive and defensive equipment they carried and delivered. Beginning in World War II air defense systems have depended on radar to detect and track hostile aircraft, as well as to control defending aircraft. In 1965, however, American combat aircraft, with the notable exception of the B-52 (which did not fly over North Vietnam), lacked electronic countermeasures. The situation with ordnance was even worse, if that is possible; for if the need for ECM was obvious in World War II, the need for greater accuracy for ordnance had been noted from the very outset of air warfare. Nevertheless, until well into the Vietnam War the airmen were using gravity bombs, just as they had in World War I—necessitating overflight of targets with the associated risk and inaccuracy that entailed. These choices,

In Vietnam, American air power was hampered by inadequacies in technology, tactics, and targets . . . .

That would change in the Gulf War.

made by professional airmen, account in large measure for the high cost and ineffectiveness of the bombing effort in the Vietnam air war.[6]

Initially the American airmen used tactics developed for nuclear war; they flew low and fast and were shot up by North Vietnamese antiaircraft fire. The flyers also found target identification and accuracy difficult using these tactics. The airmen quickly learned there is a considerable difference between a one-day war using nuclear weapons and a sustained conflict with unguided ordnance. Therefore the airmen shifted to medium-altitude operations (15,000-20,000 feet), which worked well until the communists introduced surface-to-air missiles (SAMs). Lacking anything more sophisticated, the airmen foiled the missiles by flying low (below 3000 feet), being alert, and maneuvering quickly. While these tactics largely nullified the SAMs, they also returned the airmen to the flak zone where multimillion-dollar aircraft manned by highly trained aircrews dueled with cheap guns crewed by peasants. Not until a year into the air war did the United States field anti-radar warning equipment, and not until later did anti-radar missiles and ECM jamming pods appear. Throughout the air war the North Vietnamese employed relatively cheap, numerous, but decidedly second-rate air defenses; they never received first-line Soviet equipment. Nevertheless, they not only downed significant numbers of American aircraft, they forced the airmen to operate large numbers of aircraft in less than optimum conditions.

The third big problem was targets, or, better put, lack of targets.[7] In the South, guerrillas provided few targets at best, and these usually fleeting. The airmen had real difficulty distinguishing the guerrillas from the civilians. This and accuracy problems led to unintentional bombing of civilians, a serious concern in any conflict, but especially in a guerrilla war where the cooperation of the people is vital. In the North there were few strategic targets—North Vietnam was clearly neither World War II Germany nor Japan, but a non-industrialized country that imported the bulk of its weapons. Unless the airmen attacked commercial ports by bombing or mining, bombed the populace directly, or hit the dikes that protected large areas, all of which risked

a response from the Chinese or the Soviets, there were no targets that would seriously hurt the North. The net result was an expensive and ineffective bombing campaign. In 1966 the Central Intelligence Agency reported that it cost almost ten dollars to inflict one dollar's worth of damage, and one 1967 study found that North Vietnam received four times as much economic and military aid as the American airmen destroyed.[8] Little wonder then that Rolling Thunder failed.

The air campaigns of 1972 were much different. Following a conventional North Vietnamese attack in early 1972, US air power attacked with a vengeance in an air campaign code-named Linebacker. As in Rolling Thunder, the airmen attacked tactical targets in the South and strategic targets in the North. In contrast to their earlier employment, however, this time they had targets in both locations. In the South, the North Vietnamese now used conventional forces equipped with tanks and artillery that were difficult to hide, required extensive logistics, and presented lucrative targets for aircraft. Perhaps as important, political overtures to both China and the Soviet Union allowed the United States to take bolder military action in the North with much less risk—for example, mining the North Vietnamese ports, which seriously cut imports. The airmen also had better weapons, including the all-weather, day-night F-111, but especially guided bombs that achieved accuracies of a few feet compared with accuracies of unguided bombs on the order of 100 to 200 feet.[9] Thus American air power, along with stiff South Vietnamese resistance, halted the offensive and inflicted considerable losses on the communists.

The December 1972 bombing offensive, Linebacker II, was also effective, but even more dramatic and controversial. A massive and fierce 11-day bombing operation against North Vietnam stunned onlookers, as well as the North Vietnamese. During this campaign American airmen delivered a staggering 20,000 tons of bombs that still caused relatively few civilian casualties—1623 dead according to the North Vietnamese. American casualties were also low (27 aircraft lost, 43 dead and missing, and 41 captured). At the offensive's conclusion, the communists returned to the peace table, American pride was assuaged, and the January 1973 peace treaty was signed, extricating America from the Vietnam War. (Little noted, especially by air power enthusiasts, is the fact that the final peace terms had essentially been agreed upon *before* the bombing, and that North Vietnam did not surrender.)[10]

Thus, the Vietnam War ended with this dramatic display of air power which allowed the airmen to believe they might have won the war had they been allowed to run it. To the rest of Americans, the public and Congress, it appeared that air power was an expensive, ineffective, and perhaps counterproductive weapon that cost more than it was worth. The reputation of air power was one of the casualties of the Vietnam War, another element of the Vietnam Syndrome.

The Gulf War

If military and civilian decisionmakers can be faulted for not employing the lessons of World War II and Korea in Vietnam, the same cannot be said of their performance in the Gulf War. Just as the leaders during Vietnam had the benefit of war games they did not heed, in 1990 they had the benefit of a lost war and the experience of the 1972 bombing campaigns which they read loud and clear. In many ways the Gulf War resembled the Linebacker operations of 1972, certainly contrasting with Rolling Thunder.

Air operations in the Gulf War opened on 17 January 1991 with sharp if not killing blows to Iraqi air defense and command centers. These attacks were delivered by a combined assault utilizing new technology: Army and Air Force helicopters and Air Force stealth bombers using laser-designated ordnance, and Navy Tomahawk cruise missiles employing advanced guidance systems. The assault delivered ordnance with amazing precision without suffering aircrew losses, paving the way for the more vulnerable, less accurate, conventional aircraft. The coalition air forces enjoyed air superiority from the onset of the war, nullifying Iraqi air defenses to obtain air supremacy. Coalition control of the air was demonstrated by the Iraqi air force's reluctance to fight, total air-to-air claims of 41:0 in the coalition airmen's favor, and the flight to Iran of over 100 Iraqi aircraft.[11] Unlike the Vietnam experience, our airmen utterly overwhelmed the air defenses and thus faced no effective air opposition and little effective ground-based antiaircraft opposition from Iraqi defenders much better armed than the Vietnamese had been.

The coalition airmen proceeded to bomb and destroy most of their targets in Iraq with limited losses. In all, the coalition flew 112,000 combat and support sorties, dropped 88,500 tons of bombs, and lost 48 aircraft in combat.[12] This was a far cry from one prewar estimate of 0.5 percent loss per sortie for the first 10 to 20 days given by a retired Air Force general to Congress and the Air Force Chief of Staff's expectations that the US Air Force would lose four or five aircraft a day.[13]

Despite a well-publicized comment by a United Nations' undersecretary that the coalition bombed Iraq back to a pre-industrial age, and similar statements made by Iraqi officials, that does not seem to be the case. Western reporters saw no serious damage to civilian areas.[14] According to an early report from the Iraqi government, civilians deaths from the bombing numbered about 1600, about the same figure as in Linebacker II, while a later Iraqi government report estimated 7000 civilian deaths. The head of the Iraqi Red Crescent told an American anti-war figure that 6000 Iraqi civilians had been killed by bombs, while Greenpeace put civilian deaths between 5000 and 15,000.[15] If the correct figure falls within this range, it is remarkably low compared to the amount of ordnance dropped and the casualties in other wars. And in view of the negative impact of civilian casualties on both American

and international public opinion, as proved by the Vietnam War, the Iraqis had no motive to understate the death totals.

The ground offensive began on 24 February and lasted a mere 100 hours. The coalition discovered that the Iraqi ground forces had neither the will nor the capacity to mount a determined resistance, for air power in 1000 hours had done its job well. As a result of the aerial offensive and the land envelopment of the Iraqi flank, coalition ground forces suffered few losses as they liberated Kuwait and badly battered the Iraqi military.

Thus, in several ways, air power played a major role in this victory. The coalition air forces gained and maintained air superiority, nullifying a large and well-equipped air force (350 or so aircraft, reputedly the world's sixth largest), which included top-of-the-line aircraft such as MiG-29s and Mirage F1s. The coalition airmen also defeated an extensive air defense system which deployed 700 SAM launchers and 6000 flak guns.[16] One important consequence of air supremacy was that the coalition had adequate reconnaissance, while the Iraqis essentially had none. This permitted the coalition to deceive the Iraqis and successfully conduct a daring "end run." The air war fatally weakened Iraqi ground forces both physically and psychologically so that they crumbled before the coalition ground assault. The Iraqi army, known for its high morale and capabilities in defensive positions, was pounded by an unprecedented weight of accurate ordnance and as a result offered practically no resistance, surrendered in droves, and inflicted few casualties on the coalition armies. Coalition air and ground casualties were astonishingly low. During the entire war 192 coalition troops lost their lives in combat.[17] (Only the British, while attacking airfields from low level, suffered heavy losses, losing six of the 42 Tornado aircraft they deployed to the Gulf, all but one in combat.[18]) Iraqi losses remain unknown, although the most common figure published is 100,000 Iraqi military dead. This figure appears inflated considering historical casualty precedents for a dug-in force of some half a million soldiers. As already noted, civilian deaths also appear low.[19] The key point was that the war accomplished its stated goal: the liberation of Kuwait.

Most problems the airmen encountered did not prove to be excessively difficult when compared with those of other conflicts. First and most serious was the weather, the nemesis of airmen in war and peace. The worst weather seen in the region in 14 years, twice as bad as forecast, forced 40 percent of the missions in the first ten days to return with their bombs and thus set the air campaign back by at least one week.[20] Although the coalition air forces possessed more bad-weather and night capability than US airmen had in Vietnam, the bulk of the air forces nevertheless were capable of only daytime visual strikes. Of all the new wonder weapons, only the cruise missile could operate independent of the weather, for the other guided weapons required good visibility.

Second, the Scud, an inaccurate ballistic missile long obsolete, proved to have great political and psychological impact, even though it had no direct military effect. Live television coverage, fear of Iraqi chemical and atomic warheads, and the possibility of Israeli reaction gave the Scuds elevated drama and importance. As a result, considerable air power was drained off to counter the Scuds, about three times what planners had calculated, perhaps as much as one week's effort. The coalition airmen underestimated both the Scud's influence and the problems of nullifying it. While air power reduced Scud launches from five a day during the first ten days of the war to one a day for the remainder, and Patriot missiles were able to destroy many of the incoming missiles in front of television cameras, air power was unable to completely neutralize the mobile missiles.[21]

A third problem area was fratricide, coalition air attacks on friendly forces. No aircraft were downed, a credit to the excellent command and control system based on the AWACS (Airborne Warning and Command System) aircraft, as well as the discipline of the coalition aviators. This is especially impressive in view of some estimates that in the first week of a full-scale war over Europe, fratricide would account for 40 percent of NATO and 80 percent of communist air losses. However, US airmen hit US troops nine times, killing 11, and British troops once, killing nine.[22]

A fourth problem was assessing damage—BDA (battle damage assessment) in the terminology of the day. Just as coalition weapons could kill at ranges which exceeded positive identification of the targets, coalition intelligence could not accurately gauge the damage to distant targets that were hit. This resulted in some targets being unnecessarily hit twice, while others were hit but not put out of action.[23]

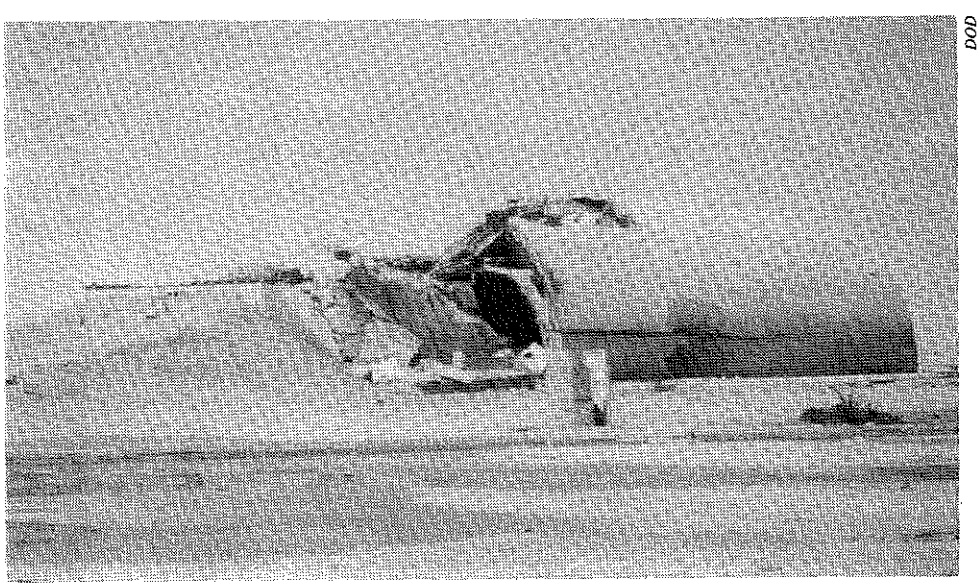
Finally, there were two instances of large numbers of civilian casualties. On 13 February US bombs hit a bunker and killed over 400 civilians. Americans claim that it was a command and control center; Iraqis insist it was an air raid shelter. Whatever the truth of the matter, the incident was widely publicized, causing great consternation throughout the world. As a consequence, US airmen curtailed bombing Baghdad after 16 February. A second incident also involved a guided bomb, this time an errant British weapon aimed at the Falucha Bridge that instead hit a marketplace, killing 140 civilians.[24]

Differences Between the Vietnam and Gulf Air Wars: Lessons

What then, are the principal factors that account for failure in the war in Vietnam and success in the Gulf? Although there are many similarities between the Gulf War and the Linebacker operations, there are certainly many contrasts, just as the two Linebacker operations differ from Rolling Thunder. In my view the most striking differences between the overall air war against Vietnam and the air war against Iraq are as follows:

• *A Clear and Limited Purpose.* The Gulf War had as its stated purpose the ouster of Iraqi forces from Kuwait. Unlike the vague goals in Vietnam and fuzzy notions of Rolling Thunder, but similar to the specific purposes of Linebacker I, the Gulf War had a specific goal that was explicitly stated, and which the military, the world, and, most significantly, American public opinion, could both understand and support. This clear purpose better mated political ends and military means than was the case in the Vietnam experience. Most important, these purposes could be achieved. In war, air power is primarily a military tool, not a political one. In addition, airmen have difficulty correctly gauging their weaponry's military, psychological, and political impact, since air power is a blunt, crude weapon. Seeing and using air power as a military, not a political, tool allowed decisionmakers to avoid the trap of hopes and promises. The only question was whether the coalition had the political will and military might to force the Iraqis to withdraw from Kuwait if they did not do so from diplomatic suasion alone.

• *The New Technology Works.* American dependence on high-tech weapons, with their great cost and their perceived failure to win in Vietnam, was a formidable obstacle US forces had to negotiate. Well-publicized scandals had left many with the impression that the American military had procured equipment that was overdesigned and overpriced, but, most of all, would not work. The Gulf War reversed this perception. Indeed, the weapons did work: A-10 ground support aircraft, Patriot anti-ballistic missiles, Apache attack helicopters, Tomahawk cruise missiles, electronic countermeasures, guided bombs and missiles, AWACS and Joint STARS radar command and



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Smart weapons, such as cruise missiles and guided bombs, achieved impressive accuracy in the Gulf War. A laser-guided bomb hit this Iraqi aircraft shelter.

control aircraft, and F-117 stealth aircraft worked exceedingly well. The success of the war and amazing television images drove this home to the world. Smart weapons (cruise missiles and guided bombs) achieved impressive accuracy that minimized unintended damage and permitted effective military damage with much less effort. This accuracy, along with stealth technology and ECM superiority, significantly lowered friendly casualties. Minimal friendly and civilian casualties muted criticism of the air campaign.

• *Targets.* Unlike the situation in Vietnam, targets were not a big problem in the Gulf War. As is typical in a conventional conflict, targets were abundant; thus firepower could be applied in massive doses, in contrast to the situation in a guerrilla war. In addition, the desert terrain gave the enemy essentially no natural protection. Only the weather concealed Iraqi targets, and for but a brief time. There appear to have been only two restrictions on targets during this war: prohibition of attacks on Iraq's population and their leader, Saddam Hussein. The latter restriction may have been more nominal than practical in view of reports of efforts to destroy Iraqi command bunkers, hunting Hussein's mobile headquarters, and the development and use (belated as it was) of a bunker-buster bomb that could destroy deep, hardened command and control centers.[25]

• *Synergism with Land Forces.* Coalition ground forces served as more than just a deterrent to further Iraqi aggression and a defender of coalition airfields. The Iraqi army was deployed forward to defend their ill-gotten gains from coalition ground forces. The great density of Iraqi troop dispositions, the open terrain, and coalition air superiority in reconnaissance and attack aviation left the Iraqi army easy prey for coalition air power. The parallel with the success of Linebacker I is striking. It should be noted, however, that the Iraqis did not surrender to coalition air power any more than did the North Vietnamese. It still required someone on the ground to occupy the terrain, to plant the flag, before victory could be declared.[26]

• *Concentrated Attacks.* The five-month buildup gave the coalition airmen time to plan and position their forces to make full use of their capabilities. Once military operations began, the coalition air forces hit with full speed and force, capitalizing on advantages of surprise, shock, technology, and mass. There were no bombing pauses and there was no bargaining. In contrast with the gradualism that governed Rolling Thunder, coalition air forces never allowed the Iraqi defenders time to adjust to the air offensive either militarily (directly) or politically to rally world or US public opinion against the air war.

• *Centralized Control.* One of the debilitating problems in the Vietnam War was the diverse command structure over allied air power. Not only did the Army, Air Force, Navy, Marine, and South Vietnamese air force answer to different commanders, the air war in the South was run by a headquarters

in South Vietnam, the air war in the North by the respective services, and the B-52s by Strategic Air Command. In the Gulf War there was a single commander who monitored and controlled the dozen or so different air forces with modern technology, using satellites and AWACS. In view of the number of different services and countries involved, and the 3000 sorties they flew each day, this was a necessary, although difficult, task. Rigid air control and air space management allowed success.[27]

- *Universal Political Support.* During the Vietnam War, the United States was divided at home and had few allies abroad; during the Gulf War we were supported not only by the American public, but by most of the world. Clearly the major powers—and critically the Soviet Union—were behind the war effort. While Japan and Germany pledged economic support, the other Western powers rallied behind the war effort with military forces as well as with words and money. The United Nations as a body explicitly endorsed and actively supported the war. Not only was Iraq deprived of political support, it was unable to get either military or economic supply.
- *The Role of the Press.* During the war with Iraq, the information flow bolstered the coalition cause. The military effectively used censorship, pool reports, and limited access to diminish negative or critical press coverage. More positively, and more apparent, skillful military briefers employed televised press conferences to get the military's story directly and effectively across to the public. Much of the public held the press responsible for the defeat in Vietnam, and many were critical of press conduct in general during that war. But with respect to the Gulf situation, the American public believed in the war and thus were much more supportive of the military view of "freedom of the press" and "the right to know" than of the press's view. As one writer put it: "It was a stunning reversal of [press and military] roles from Vietnam, where the press called the military credibility into question."[28]

Though we can't count the type of enemy leadership among our lessons—after all we don't pick the leaders of our foes—a noteworthy coalition advantage was certainly the Iraqi leader. Saddam Hussein's bungled and televised moves involving hostages and small children, as well as his ecological terrorism, created worldwide scorn and revulsion. He was a hard enemy to love, plainly a villain, unlike Vietnam's Ho Chi Minh, who was often pictured as a grandfatherly old man. Saddam Hussein was thus unable to rally support outside of Iraqis, Arab radicals, and Palestinians.

The Gulf War Was Unique

Clearly the air war in the Gulf—indeed, the entire war—was fought differently from the Vietnam War. Those distilling the lessons of this conflict should thus bear in mind its uniqueness, because like all historical events, future circumstances will never be exactly the same. Several aspects of the

Gulf War differentiate it from the Vietnam War and indeed from most of the limited-war scenarios now being gamed.[29]

• This was a conventional war more akin to World War II than to Vietnam, clearly not a guerrilla war or low-intensity conflict. The United States has proven it can win the former; the latter is in doubt. Our next opponent may not play to our strength.

• The terrain favored the use of air power. Jungles, mountains, or highly populated areas would not be as easy for air operations as the desert.

• The location, despite its distance from the United States, favored our victory. We not only had bases in the area, we also had considerable equipment in place.[30]

• The enemy played into our hands. Saddam Hussein was not only a clear-cut villain who could marshal little international support; in addition, he gave us time to build up both political and military power to wage this war. What if instead the Iraqis had rapidly rolled into Saudi Arabia? Future opponents will be aware of why and how Saddam Hussein's actions turned to folly and may not repeat his mistakes.

• The political environment made success possible. Out of political will and leadership came skillful diplomacy which found a world ready to act. Most of all, the end of the Cold War made the diplomatic landscape entirely different from anything seen since World War II. We have only to contrast the diplomatic climate of the Korean War with that of the Gulf War to see the clear difference brought by the end of the Cold War.

• Finally, the US military had the size, technology, and trained personnel to win this outstanding victory. The military drawdown will certainly erode this military capacity, the only question being to what extent. It would be fanciful to expect a smaller, less endowed American military to win comparable future conflicts as quickly, easily, and cheaply as it won the Gulf War.

In sum we must be mindful of the past so we do not repeat old mistakes, but in minding the past we must recognize that the future will not be a straight-line extension of it. The stakes are too high to neglect either what went right or what went wrong.

NOTES

1. Joint War Games Agency, JCS, "Final Report: Sigma I-64"; Joint War Games Agency, JCS, "Final Report: Sigma II-64," Lyndon B. Johnson Library, Agency File.

2. *The Pentagon Papers, The Senator Gravel Edition* (Boston: Beacon, 1975), III, 115.

3. *Pentagon Papers*, III, 269. The most recent study of the Vietnam air war is Earl Tilford, *Setup* (Maxwell Air Force Base, Ala.: Air University Press, 1991).

4. See Kenneth P. Werrell, "Linebacker II," *Air University Review*, (January-March 1987), 49-50.

5. *Pentagon Papers*, III, 294-95; David Halberstam, *The Best and the Brightest* (New York: Random House, 1972), pp. 367-68; Lou Nordeen, *Air Warfare in the Missile Age* (Washington: Smithsonian Institution Press, 1985), pp. 15, 18.

6. Werrell, p. 50.

7. The military also bears considerable responsibility on the issue of targets. If the gradual campaign with its numerous restrictions and worthless targets was so bad, why didn't any top leaders resign? The stock answer is that if a leader resigns someone else will be appointed in his place, nothing will be gained, and an officer's career will be needlessly sacrificed. Interview, Admiral Thomas Moorer and author, 21 December 1988. There may have been one serious consideration by the Joint Chiefs of Staff to resign in mass over this issue in 1967, but nothing came of it. Mark Perry, *Four Stars* (Boston: Houghton Mifflin, 1989), pp. 163-66.

8. *Pentagon Papers*, IV, 62, 115-19, 136, 168, 222-26; Headquarters PACAF, "Linebacker: Overview of the First 120 Days," 1973, p. 6, USAF Historical Research Agency; "Summary of Responses to NSSM-1," *Congressional Record*, 92d Cong., 2d sess., 1972, pt. 1, 13:16773.

9. John Morrocco, "U.S. Tactics Exploit Advances In Avionics, Air-to-Surface Weapons," *Aviation Week and Space Technology*, 18 February 1991, p. 52.

10. Werrell, pp. 51-59; Mark Clodfelter, "By Other Means: An Analysis of Linebacker Bombing Campaigns as Instruments of National Policy," master's thesis, University of Nebraska, 1983, p. 77; Mark Clodfelter, *The Limits of Air Power: The American Bombing of North Vietnam* (New York: The Free Press, 1989). At present, the latter is the standard text on the subject.

11. Jeffrey Lenorovitz, "Allied Air Supremacy Keeps Air-to-Air Engagements Limited," *Aviation Week and Space Technology*, 18 February 1991, p. 45; "Allies Shoot Down 42 Iraqi Aircraft, 81 Others Destroyed on Ground," *Aviation Week and Space Technology*, 11 March 1991, p. 22; John Morrocco, "War Will Reshape Doctrine, But Lessons Are Limited," *Aviation Week and Space Technology*, 22 April 1991, pp. 42, 43; Rueben Johnson, "Higher Marks for Soviet Missiles," *Air Force Magazine*, August 1991, p. 63; DOD, "Conduct of the Persian Gulf Conflict: An Interim Report to Congress," July 1991, pp. 1-1, 4-2. This probably includes two Iraqi aircraft downed by a Saudi pilot. Norman Friedman, *Desert Victory* (Annapolis, Md.: Naval Institute Press, 1991), pp. 357-60.

12. Friedman, pp. 353-60; Barbara Opall, "Desert Storm Lifts U.S. Air Power Role," *Defense News*, 15 April 1991, pp. 18, 36; Morrocco, "War Will Reshape Doctrine," p. 43; DOD, "Conduct of the Persian Gulf Conflict," p. 4-5.

13. By day number nine the coalition had flown 17,500 sorties and lost 17 aircraft in combat, not 88 that 0.5 percent would have yielded. "Desert Storm Gulf Victory," *World Airpower Journal*, 6 (Summer 1991), 27; US Navy Office of Information, *Navy Talking Points*, Winter 1991, "Desert Storm Chronology," 25 January; Morrocco, "War Will Reshape Doctrine," p. 43.

14. Nora Boustany, "Iraq Charges High Civilian Toll in Air Raids," *The Washington Post*, 7 February 1991, p. A1; Nora Boustany, "Baghdad is a Ghost Town, Departing Reporters Say," *The Washington Post*, 19 January 1991, pp. A1, A21; Paul Lewis, "Effects of War Begin to Fade in Iraq," *The New York Times*, Week in Review, 12 May 1991, p. 2; Paul Lewis, "Dollars Can Still Get You Scotch and Waterford Crystal in Baghdad," *The New York Times*, 12 May 1991, p. 6. The coalition claims that the Iraqis faked damage to a mosque in Basra. John Lancaster, "Tape on Errant Bomb Highlights the PR War Over Civilian Casualties," *The Washington Post*, 18 February 1991, p. A34.

15. "Greenpeace Count Puts Dead from War in Gulf at 200,000," *The New York Times*, 30 May 1991, p. A6; Ramsey Clark, "A War Crime," *Nation*, 11 March 1991, p. 309; "Fighting Numbers," *U.S. News and World Report*, 11 March 1991, p. 74; Caryle Murphy, "Iraqi Death Toll Remains Clouded," *The Washington Post*, 23 June 1991, p. A17; Werrell, p. 59.

16. DOD, "Conduct of the Persian Gulf Conflict," p. 2-4; Barbara Opall, "McPeak Says Iraqi Air Force in Ruins," *Defense News*, 18 March 1991, p. 36; Edward Kolcum, "Gulf War Reinforces Value of U.S. Stealth Technologies," *Aviation Week and Space Technology*, 18 February 1991, p. 40; John Morrocco, "Allies Attack Iraqi Targets, Scuds Strike Israeli Cities," *Aviation Week and Space Technology*, 21 January 1991, p. 22.

17. DOD, "Conduct of the Persian Gulf Conflict," p. 27-1. Of the 148 Americans killed in combat, 28 died in a single Scud hit on an American barracks, and 35 others from "friendly fire." "Pentagon Again Raises Total of G.I. Deaths by G.I. Fire," *The New York Times*, 14 August 1991, p. A7; DOD, "Conduct of the Persian Gulf Conflict," p. 27-1; John Cushman, "Military Experts See a Death Toll of 25,000 to 50,000 Iraqi Troops," *The New York Times*, 1 March 1991, pp. 1, 11; "Casualties of Mideast Wars," *Los Angeles Times*, 8 March 1991, p. 7; Paul Mann, "Mammoth Air/Ground Assault Defeats Iraq in Gulf War," *Aviation Week and Space Technology*, 4 March 1991, p. 22; Walter Mossberg and David Rogers, "Iraqi Troops Deaths Totaled At Least 100,000 U.S. Says," *The Wall Street Journal*, 22 March 1991, p. 10.

18. "United Kingdom Takes Key Role in Attacks Against Iraqi Targets," *Aviation Week and Space Technology*, 18 February 1991, p. 47; Friedman, p. 400.

19. Saudi sources estimated 85,000 to 100,000 Iraqi military dead; Congressman Les Aspin estimates 65,000; military historian Trevor DePuy puts the figure between 33,000 and 50,000. One source, however,

states that the US military believes the figure to be between 100,000 and 200,000, and the environmental group Greenpeace estimates that 100,000 to 120,000 Iraqi troops died. "Greenpeace Count"; Cushman, pp. 1, 11; Mossberg and Rogers. On this dispute but supporting lower numbers of Iraqi dead, see Patrick Tyler, "Iraq's War Toll Estimated By U.S.," *The New York Times*, 5 June 1991, p. A5; "How Many Iraqi Soldiers Died?" *Time*, 17 June 1991, p. 26; Anthony Cordesman, "Rushing to Judgment on the Gulf War," *Armed Forces Journal International*, June 1991, pp. 66, 68, 70; Murphy; James Dunnigan and Austin Bay, *From Shield to Storm* (New York: Morrow, 1992), pp. 374-76. For civilian casualties see Murphy; Clark; "Greenpeace Count"; Dunnigan and Bay, p. 180; and "Fighting Numbers."

20. DOD, "Conduct of the Persian Gulf Conflict," p. 4-6; Opall, "McPeak Says Iraqi Air Force in Ruins"; Morrocco, "War Will Reshape Doctrine," p. 42; Eric Schmitt, "Clouds Reported to Delay Bombing," *The New York Times*, 9 February 1991, p. 1; Eric Schmitt and Michael Gordon, "Unforeseen Problems Forced Allies to Improvise Tactics," *The New York Times*, 10 March 1991, p. 1.

21. DOD, "Conduct of the Persian Gulf Conflict," p. 4-4. In view of the Scud's small warhead and inaccuracy, the Patriot defense may have caused more damage. One report indicated that uncontested Scuds caused 30 percent of the damage and 60 percent of the casualties as those intercepted by the Patriots. Another account asserts that the Patriot's performance was not demonstrated in the war as the Scuds disintegrated upon reentry into the atmosphere due to Iraqi modifications. But clearly there were political and psychological reasons for the Patriot defense. David Hughes, "Success of Patriot System Shapes Debate on Future Antimissile Weapons," *Aviation Week and Space Technology*, 22 April 1991, p. 90; Kosta Tsipis, "A Weapon Without a Purpose," *Technology Review*, November/December 1991, p. 54. However, see Cordesman, p. 72, on how these accounts may not be fair to the Patriot system. Friedman, p. 194; Morrocco, "War Will Reshape Doctrine." The most lethal Iraqi response to the coalition was a Scud that destroyed an American barracks on 25 February and killed 28 Americans, including three women. Hughes.

22. There was one incident of friendlies firing on aircraft. In all, "friendly fire" accounted for 35 of the 148 Americans killed in the war, 72 of the 467 wounded, and 27 of the 35 tanks and armored vehicles destroyed or damaged. "Pentagon Increases Figure on Casualties From American Fire," *The New York Times*, 14 August 1991, p. A8; Patrick Tyler, "Pentagon Rethinking Techniques To Prevent Attacks on Own Tanks," *The New York Times*, 15 August 1991, p. A10; "Pentagon Again Raises Total of G.I. Deaths"; Norman Friedman, "The Air Campaign," *U.S. Naval Institute Proceedings*, April 1991, p. 49; DOD News Briefing, 15 March 1991, General Merrill McPeak, p. 9; Schmitt and Gordon, "Unforeseen Problems," p. 16; Richard Mackenzie, "A Conversation With Chuck Horner," *Air Force Magazine*, June 1991, p. 63.

23. Friedman, pp. 186, 253; Eric Schmitt, "Pentagon Cites Some Gulf War Lessons," *The New York Times*, 17 July 1991, p. A3.

24. DOD, "Conduct of the Persian Gulf Conflict," p. 24-1; Lewis, "Effects of War"; Patrick Tyler, "U.S. Stands Firm on Bomb Attack and Says Investigation Is Closed," *The New York Times*, 15 February 1991, p. 1.

25. In the remarkably short time of 17 days, the United States built and fielded a guided bomb capable of penetrating 100 feet of earth or 20 feet of concrete. Two were dropped on Iraqi command centers in the last days of the war. John Morrocco and David Fulghum, "USAF Developed 4,700-lb. Bomb in Crash Program to Attack Iraqi Military Leaders in Hardened Bunkers," *Aviation Week and Space Technology*, 6 May 1991, p. 67. Also see Patrick Sloyan, "Air Force Hunted Motor Home In War's 'get Saddam' Mission," *The Washington Post*, 23 June 1991, p. A16.

26. One highly placed Air Force officer believes that another two weeks of bombing would have prompted Iraqi surrender; a senior fellow at the Brookings Institution is quoted as saying that the ground war "was largely irrelevant"; and a retired Marine Corps general stated, "I think that in essence air power did win the war, in the sense that by the time the ground attack began the Iraqis were through, psychologically beaten." "The Voice of Experience," *Sea Power*, September 1991, p. 12. Others are more cautious. Former Air Force Chief of Staff Larry Welch insists that air power cannot win a land battle alone. Opall, "Desert Storm," pp. 18, 36. The current Air Force Chief of Staff, Merrill McPeak, hedged his bets. In a mid-March press conference he stated that "all the services made a very important contribution" but it is "my private conviction . . . that this is the first time in history that a field army has been defeated by air power." Barton Gellman, "U.S. Bombs Missed 70% of Time," *The Washington Post*, 16 March 1991, p. 1. See note 12.

27. Friedman, p. 49; Kolcum, p. 40; Eric Schmitt and Michael Gordon, "A Lot of Hurdles on the Way to Winning the War," *The New York Times*, 24 March 1991, p. 18; Bill Sweetman, "Learning Lessons of 'Desert Storm,'" *Janes' Defence Weekly*, 9 March 1991, p. 329.

28. Mary Mander, "Media's New War Role," *Christian Science Monitor*, 15 March 1991, p. 19.

29. On this issue see Morrocco, "War Will Reshape Doctrine," p. 38, and Daniel P. Bolger, "The Ghosts of Omdurman," *Parameters*, 21 (Autumn 1991), 28-39.

30. The US Air Force had one billion dollars' worth of equipment in Saudi Arabia. Mackenzie, p. 58.