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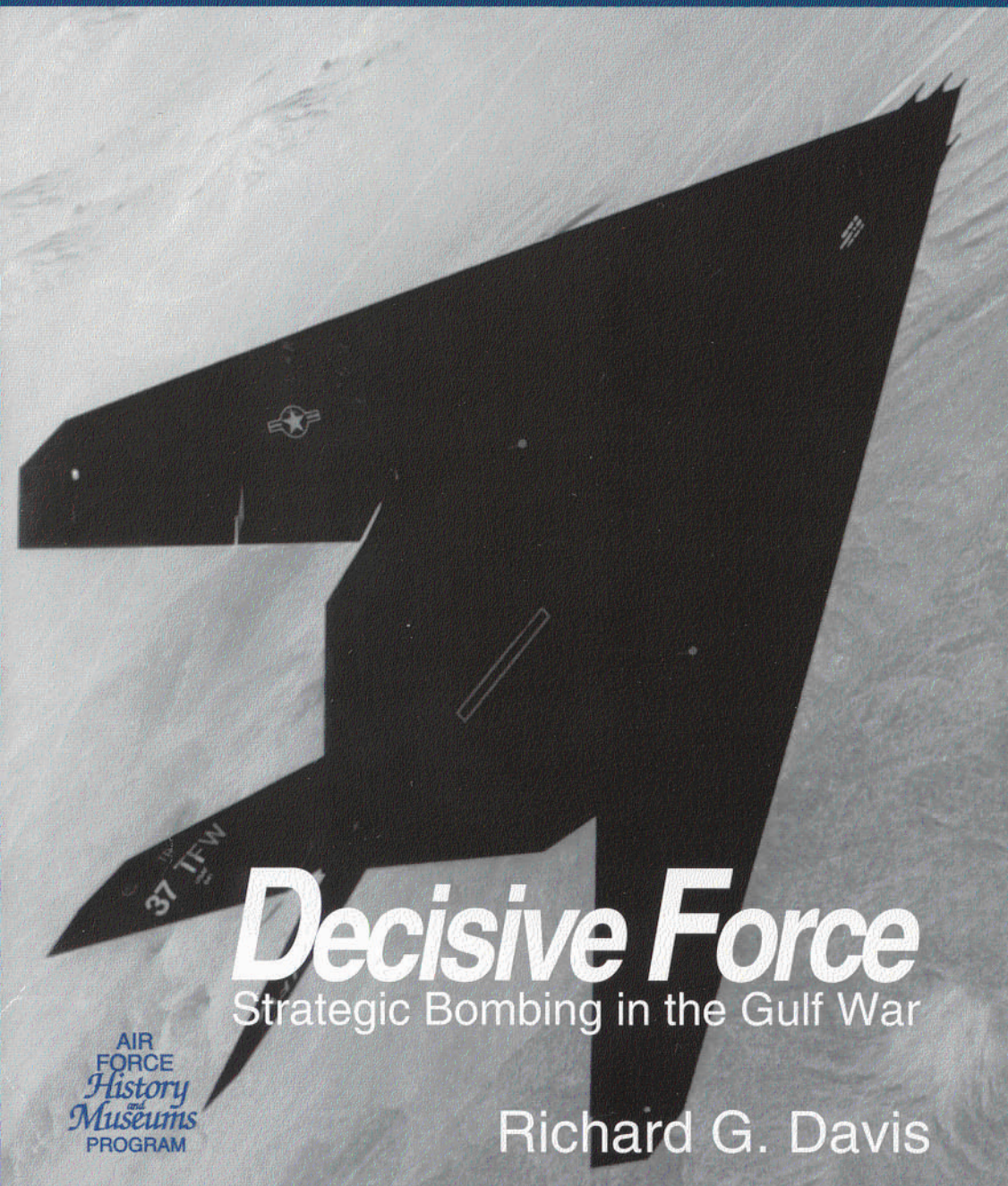

Decisive Force

Strategic Bombing in the Gulf War

Richard G. Davis

AIR FORCE History and Museums PROGRAM

The Cover: The Lockheed F–117A spectacularly proved the value of advanced stealth technology during its combat debut in the Gulf War.

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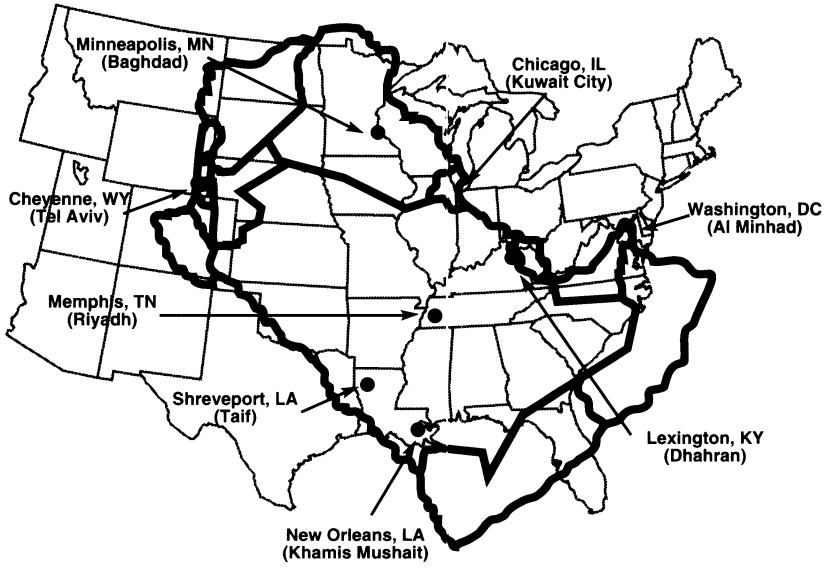
In the Persian Gulf War the U.S. Air Force (USAF) demonstrated that a new era in strategic bombing had begun. Air power could now destroy key portions of a country's military and economic infrastructure without resort to nuclear weapons and heavy bombers and with low losses to both the attacker and enemy civilians. This achievement rested on technology, which both increased bombing accuracy and decreased the effectiveness of enemy defenses, and the reexamination and reapplication of traditional strategic bombing theory by USAF planning officers. Alone of the world's air forces the USAF possessed a 2,000-pound bomb designed to penetrate many feet of hardened concrete and steel. Its use destroyed the most heavily protected and important Iraqi targets. American anti-radar missiles intimidated Iraqi radar operators, leaving middle and upper altitudes free for Coalition air operations. American stealth technology, in the form of the F–117A fighter gave the attacker virtual invulnerability while leaving the enemy defenseless. Behind this new technology lay the USAF planning officers, who laid out their offensive in a logical manner designed to minimize both friendly and enemy casualties while excising Iraq's military potential. The offensive, of course, did not achieve one hundred percent perfection, but it carried out its goals in a manner sure to make any future aggressor state hesitate to call such destruction down upon itself.

Relative Distances in the Area of the Operation



Strategic Air Power in Desert Storm

From January 17 to February 28, 1991, aircraft of the United States Air Force (USAF), United States Navy (USN), and United States Marine Corps (USMC), under the control of the United States Central Command (USCENTCOM)[1] as well as contingents of the air forces of eleven other western European and Arab countries,[2] all under the aegis of the United Nations (U.N.), systematically attacked and destroyed targets inside Iraq and Iraqi armed forces occupying Kuwait. The air attack was the international community's response to Iraq's occupation of Kuwait, a small oil-rich Kingdom at the western end of the Persian Gulf, on August 2, 1990, and its obdurate refusal to abandon its conquest. The air war against Iraq consisted of two separate campaigns distinguished by different sets of targets. In the campaign in the Kuwaiti Theater of Operations (KTO),[3] Coalition air forces had three objectives; suppression of Iraqi air defenses in the KTO; preparation of the battlefield for a planned Coalition ground attack (by striking Iraqi ground forces and interdicting Iraqi supply lines), and support of Coalition ground force operations with tactical airlift and aerial firepower.

The second air campaign, the strategic bombardment of Iraq, struck at twelve sets of strategic targets. It sought to disrupt Iraq's air defense system, destroy its nuclear, biological and chemical weapons' research, production, and storage; demolish its offensive strategic weapon systems (short-range ballistic missiles [Scuds] and bombers); cripple its oil production and electrical industries; impair its war industry; and nullify its communications system. In addition, USAF planners hoped to "incapacitate" Saddam Hussein's regime. This objective had the readily apparent, but unstated, goal of creating a set of conditions within Iraq conducive to the overthrow of its political leadership. This work focuses on the use of strategic air power—on Coalition air operations devoted to the strategic bombardment of Iraq. It does not address directly the large-scale and deadly tactical air operations in the KTO, which consumed seventy-five percent of the total Coalition air effort.

The USAF supplied the largest air contingent employed in the Gulf War—approximately 807 aircraft—and conducted the bulk of strategic air operations. USAF technological trends and doctrinal thought in the twenty preceding years culminated in this short, but precise and destructive, strategic bombing campaign. Some technical developments had proceeded openly, such as advances in navigation made possible by signals from satellites of the Global Positioning Sys-

tem (GPS); others, such as electronic combat devices and precision guided munitions (PGM), proceeded in secret; while some, such as stealth flight technology hatched and matured out of public sight in the so-called super-secret "black world." During this period the USAF also began to look at its strategic war-fighting doctrine in an effort to adapt to changing circumstances and technology.

Post Vietnam Changes in Technology and Doctrine

Operations LINEBACKER I and II, conducted by the USAF over North Vietnam from May to October 1972 and in December 1972, served as harbingers of things to come and as a "last hurrah" for the old order of strategic bombardment. In LINEBACKER I, launched to counter North Vietnam's massive ground offensive into the Republic of South Vietnam's northernmost provinces, USAF fighter-bombers made the first sustained use of precision guided munitions. Employing electro-optically guided bombs and laser-guided bombs, they were known generically as guided bomb units (GBUs) and struck key bridges and other pin-point targets. For example, on May 10, 12, and 13, 1972, precision guided munitions "dropped"[4] seven bridges, including both the infamous Paul Doumer and the Thanh Hoa (dubbed, not without reason, "the bridge that would never go down"). Heavy air defenses had frustrated conventional attacks on the two bridges for five years and had taken a heavy toll of attackers. Between April 6 and June 30, 1972, precision guided munitions-equipped F–4Cs of the 8th Tactical Fighter Wing, Ubon, Royal Thai Air Force Base, destroyed 106 bridges, including some previously off-limits spans near the Chinese border. The dropping of numerous bridges in rapid succession interrupted North Vietnamese logistics, and, by denying alternate routes, overtaxed repair capabilities.

The USAF was slow to address the doctrinal implications of this new level of bombing accuracy. It did not equip the major portion of its combat aircraft procured between 1972 and 1990 (the F–15C, F–16, and A–10 series) with guided-bomb unit-delivery capability.[5] The service did upgrade its precision guided munitions technology by further developing its initial delivery system, Paveway I. Paveway II (GBUs–10, 12, and 16) featured improved guidance and structural features and folding wings (strike aircraft could carry more of them) and became operational in the mid 1970s. Paveway III (GBUs–22, 24, and 27) went into service in the mid-1980s and had improved maneuverability, an auto-pilot, a laser scanner for target location, and low-level

launch capability. By mid-1990 the USAF's entire precision guided munitions-capable fleet consisted of only 125 to 135 fighter bombers: 64 swing-wing F–111Fs, 56 stealth F–117As, and a handful of F–4Es. Twenty-four more F–15E "Strike Eagles" would replace the F–4Es and come on line as precision guided munitions-capable aircraft by the end of 1990.

While many nations and the other U.S. armed services possessed precision guided munitions by 1990, the USAF alone possessed air-delivered precision guided munitions with a "hard target" penetrating capacity.[6] By May 1988 the large BLU–109/B (I–2000) "bomb live unit" penetrating bomb had completed much of its initial operational tests and evaluations, both in an unguided version (intended for F–16s) and in guided versions for precision guided munitions-capable aircraft. The streamlined 2,000-pound bomb's ballistic and handling characteristics were similar to the standard U.S. Mk–84 blast and fragmentation bomb, which simplified employment to the field. But it had a body of high-strength forged steel, thick bomb walls that encased 550 pounds of Tritonal explosive filler, and a tail-mounted, delayed-action fuse. Striking with a high kinetic impact at the proper angle, it could penetrate hardened concrete, rubble, and other filler. (The I–2000 penetrator also came in Paveway II variants for the F–111F as well as the F–117A, designated GBU–24 and 27 respectively.) When joined to a guided delivery system the BLU–109/I–2000 offered a weapon system of awesome lethality, overwhelming leverage, and surgical precision. Like the Belgians at the fortress of Eben Emael in May 1940, the Iraqis in January 1991 would find hardened concrete woefully insufficient against a foe's ingenuity and unconventionality.

If LINEBACKER I pointed to the future, LINEBACKER II sent a somewhat mixed signal to the analyst. LINEBACKER II intended not only to deny valuable matériel and safe areas to the enemy, but also to force him back to the peace table by employing large-scale B–52 strikes on key targets primarily in the Hanoi-Haiphong areas. With approximately 200 B–52Ds and Gs available at Andersen Air Force Base, Guam, and U-Tapao, Royal Thai Air Force Base, the USAF launched eleven days of massed heavy bomber raids of 60 to 129 aircraft, using radar bombsights and conventional iron bombs. From December 18 to 29, 1972, American bombers blasted over thirty-four targets, including marshalling yards, storage and warehouse facilities, fabrication plants, and airfields with 500- and 750-pound bombs. They flew 729 sorties, dropped 15,237 tons of bombs, and lost 15 B–52s for a loss rate of two percent. Because of the B–52D's enormous bomblift,

up to thirty tons, the amount of high explosives delivered in a 25-plane raid compared favorably with the typical 750- to 1,000-plane raids by B–17s of the Eighth Air Force in World War II. The LINEBACKER II missions with single formations of aircraft occupying over seventy miles of airspace marked the end of massed heavy bomber formations. By the end of the 1960s not even the United States, much less any other power, could afford to build and maintain large numbers of heavy, multi-engine bombers. The USAF's strategic bomber inventory steadily declined from 624 B–52s and FB–111s in 1973 to 266 B–1s, B–2s and B–52s in 1993.

During LINEBACKER II more supporting combat aircraft were devoted to a raid than attacking bombers. In a raid of thirty B–52s on Haiphong on December 22, 1972, sixty-five other aircraft provided crucial support. These included: USN EB–66s and EA–6Bs that furnished electronic countermeasures; F–105 Iron Hands (the famed "Wild Weasels") that suppressed surface-to-air missile (SAM) defenses; F–4 Hunter/Killers that struck anti-aircraft artillery (AAA); and numerous other F–4s that provided close escort, counter-MiG combat air patrol, chaff, and chaff escort. During World War II the Eighth Air Force required one fighter escort for two bombers. However, the complexity, layering, and integration of modern electronic/missile/gun/aircraft air defenses have reversed that ratio and more than justified the expenses of a modern air defense system.

On one LINEBACKER mission, that of December 22, 1972, thirty bombers exposed ninety-five supporting aircraft to enemy counterair measures. Such mass bombings would be rare in future. Requiring so many support aircraft, they were too large to adequately defend. Attacking aircraft, to meet the complex demands imposed by the multifaceted air defenses they were facing, were subsequently divided into different specialities or roles and then combined into "packages" tailored against specific threats within the expected target area. After the war in southeast Asia the USAF continued to develop strike packages in its overall target planning methodology. The Gulf War planners made heavy use of force packaging, but the revolution of precision attack had introduced a new twist—smaller packages of strikers going to multiple aim points in the same area, rather than a single large package going to a single aim point.

Achieving invisibility to the foe has been the stuff of legend for thousands of years. More recently it has become the goal of aviation technology. From 1940 to the mid-1970s aerial opponents sought to jam, spoof, or destroy radar with electronic countermeasures—by dis-

pensing various configurations of chaff (metallic coated streamers dropped in bundles from aircraft to deceive and mislead enemy radar), and by developing anti-radiation missiles to home in on and destroy emitters. These measures proved subject to countermeasures, interfered with one's own electronic equipment, and were seldom broad enough to blind every specific threat. The U.S. experience in Vietnam and the Israeli experience in the October 1973 War with ever more complex air defenses, however, stimulated interest in a passive response to the problem—air vehicles that presented little or no radar cross section from any angle and that minimized heat signature to foil infrared detection. In late 1978 the Lockheed Aircraft Corporation and the USAF began development of a stealth combat aircraft, the first designed on the basis of its radar cross section (RCS) instead of aerodynamic or flight performance requirements.[7] The resultant F–117A entered the active USAF inventory in 1983.

In November 1988 the USAF brought the F–117A stealth fighter (known as the Nighthawk) out of the black world and introduced its distinctive appearance, but not its sophisticated technology, to public view. It had first flown back in June 1981, and the service took delivery of the last of fifty-nine aircraft in June 1990. Given the aircraft's technical potential against enemy air defenses and its effectiveness as a bombing platform, the USAF received a bargain whose cost was comparable with conventional (non-stealthy) alternatives. In 1991 dollars the total F–117 program cost a relatively modest $8.2 billion overall, with a unit flyaway cost (airframe, engines [installed], electronics, ordnance, and armament) of $52.5 million. The F–111F "Aardvark" had a unit flyaway cost of 10.9 million in 1973 dollars (roughly equal to 45 million in 1991 dollars), but it required a supporting package of electronic jamming aircraft and air defense suppression aircraft to reach its target. The F–117, except for flight refueling, needed no other aerial support, thus saving the high costs of fuel, weapons, refueling, maintenance, escort aircraft, and personnel. To minimize financial risk and expense and to speed the new aircraft's development, Lockheed used parts from F–18s and F–16s and adapted existing attack, computer, and electronics systems. The F–16's fly-by-wire digital flight control system proved particularly beneficial in controlling the dynamically unstable F–117, and computer modeling at levels far exceeding those available to previous designers greatly assisted its development.

Stealth technology evolved during World War II with the British Mosquito light bomber, whose plywood construction gave it a low radar return, and with later models of the German U-Boat Schnorkle,[8]

Gulf War Aircraft

TOP: Boeing's aged but still impressive B–52G Stratofortress was the most feared Gulf War attacker according to Iraqi prisoner-of-war interrogation reports.

BOTTOM: The Lockheed F–117A Stealth Fighter, representing only 2.5 percent of all Coalition attack aircraft, struck over 30 percent of all strategic targets on the first day of the war alone. Its ability to penetrate and incapacitate hardened enemy targets was formidable. The product of super-secret advanced technolgy, its faceted angular surface and "vee" tail helped to reduce its radar return dramatically.

TOP: The Boeing E–3 Sentry AWACS proved critical to Coalition air success.

CENTER: The General Dynamics F–111 Aardvark was a superb precision attacker.

BOTTOM: The McDonnell-Douglas F–15E Strike Eagle was the most successful conventional attacker in the Gulf War, capable of tank hunting, deep interdicting, and, most spectacularly, Scud busting.

which were relatively small and coated with radar absorbent material. Stealth technology uses surface shaping to eliminate direct returns, minimize dwell, and produce deceptive returns. It employs radar absorbent materials to reduce its radar cross section. RCS has no direct relationship to the aircraft's physical cross section. Although not intended to make an aircraft invisible, stealth technology makes an aircraft difficult to detect and virtually impossible to track and engage. Stealth works against all types of radars. A powerful ground search radar may get a weakened return, but less powerful SAM and AAA tracking radars or airborne fighter/interceptor radars will not produce an image suitable for lock-on of their weapons; they are thus unable to engage stealth aircraft. The F–117, to reduce the chance of visual sighting, attacks only at night. With "eyeball" tracking eliminated, only a very lucky random shot will bring one down. Stealth aircraft, which can operate in areas closed to other attacking planes, directly threaten high value targets. Like Great Britain in 1905 and 1906 when it introduced the first all-big-gun battleship, H.M.S. *Dreadnought*, the USAF had scored a unique technological triumph with the F–117A of dramatic political, military, and even economic impact. Just as the *Dreadnought* rendered obsolete the battle fleets of Britain's enemies, stealth nullified the standing air defenses of the Soviet Union and other states. The tremendous Soviet investment in comprehensive and redundant radar warning networks and air defenses now required enormous upgrading with a technology to counter stealth, if such could be developed, and at a staggering cost.

Other newly deployed technological devices, from Earth-orbiting satellites to secure facsimile (FAX) machines, aided air operations in matters both great and small. Space-based systems proved invaluable in the Gulf War. Satellites of the Defense Support System, originally designed to warn of a Soviet ballistic missile attack against the United States, scanned Iraq for the exhaust glow from Scud short range ballistic missile (SRBM) launches. The Navstar GPS satellite network revolutionized air and surface navigation. Hand-held receivers and other, more accurate, receivers in aircraft, vehicles, ships, and weapons allowed Coalition forces to locate their positions to within fifty feet instead of eight miles with older ground-based navigation systems. Low orbiting satellites of the Defense Meteorological Support Program and their civil counterparts operated by the National Oceanographic and Atmospheric Administration provided accurate weather updates in as little as ninety minutes, sometimes allowing near real time[9] retargeting of missions. The Defense Communications Satellite System provided

thousands of secure circuits and carried a major percentage of all intertheater and intratheater communications, while intelligence satellites, including the commercial LANDSAT system, identified enemy surface dispositions. The secure FAX and telephone systems of the U.S. military concealed information from the enemy and allowed unprecedented direct access between lower echelon staffs in the United States and the theater of operations.

U.S. military war planners, however, had not fully assimilated the import of these changes in aeronautical, munitions, and satellite technology. In fact, deployment planning, not integrated warfighting, dominated the attention of both the staffs of the U.S. Combined Theater Commanders in Chief (CINCs) and those of their subordinate service component commanders. In the USAF Air Staff, some general officers reacted against this focus on deployment and against what they felt was too great a departure from theories of independent air power. In particular, they feared that the U.S. Army's Air-Land Battle concept, to which the USAF's Tactical Air Command (TAC) subscribed, would tie air power too closely to ground battle developments and deny it the necessary freedom of action for interdiction and strategic bombing. In 1988 Lieutenant General Michael J. Dugan, Deputy Chief of Plans and Operations, and Major General Charles G. Boyd, Director of Plans, established a Deputy Directorate for Warfighting Concepts within the Air Staff Directorate of Plans. They placed in charge an advocate of independent air operations, Colonel John A. Warden, III, and encouraged him to refine and disseminate ideas on the independent uses and functions of air power. Within a year the Deputy Directorate acquired the CHECKMATE Division, which specialized in the analysis of conflicts between Soviet and U.S. alliances.[10]

A student of military history, Colonel Warden read widely and deeply. He wrote an influential book, *The Air Campaign: Planning for Combat*, expressing his ideas of the dominance of air warfare. In keeping with his charter and sheltered by his superiors, Warden encouraged other officers to join him in considering and promoting innovative ideas about air power's role in modern warfare. Moreover, he encouraged free-wheeling discussion and, refreshingly, tolerated dissent. He and the like-minded air officers that formed around him believed that air planners should first determine the enemy's centers of gravity, that is, those characteristics, capabilities, or locations from which he derives his freedom of action, physical strength, or will to fight. The air planners identified these centers of gravity by analyzing the enemy's strength and situation, and then locating the critical vulnerabilities

(centers) that, when attacked, would most unbalance him. Centers of gravity might not always equate to specific target systems as several target systems might hold certain critical vulnerabilities in common. The Warden group designated the primary center of gravity in any conflict as the enemy's leadership—its survival, its continued resistance, and its control of military forces or other elements of national power. Many other considerations—weather, air defenses, or overall military situation—affected an air campaign. The air planners evaluated them as well as the forces at an enemy's disposal, then devised the best means for employing USAF assets coherently and cohesively.

Warden's planners strove to continue in the tradition of the original Air War Plans Division of the Air Staff of 1941, which devised AWPD/1, the blueprint for American strategic air operations in World War II.[11] They accepted the time-honored principle of securing air superiority[12] as the first mission of any air campaign. Next, they accepted the concept of employing force packages as a requirement in mission planning. However, they took issue with USAF planning and targeting orthodoxy. In the past, traditional mission planners sought to achieve a specified level of destruction, expressed in percentages (usually, one hundred percent), for any given target. Target work sheets, photographic imagery and interpretation, and force packaging had revolved around the assignment of sufficient weapons to achieve a desired percentage-level of destruction. Colonel Warden insisted that partial destruction might achieve the desired result; moreover, total destruction might exceed what is desired or even needed. The advent of guided munitions with their tiny circular error probables (CEPs) reinforced his conviction. He argued for missions planned in combinations and designed to produce a desired effect on the enemy. Leveling an atomic research facility might have fewer adverse effects on the enemy's will to fight than a series of more limited, but precise, attacks on his leadership's command and control (C^2) bunkers. Emphasis on effect had wider implications. It encouraged air planners, first, to concentrate not just on discrete targets but to consider the tactical, operational, and strategic points within a center of gravity; next, to search for interconnections between target systems; and, finally, to seek the means of achieving larger political objectives through innovation. One need not target a complex of buildings when one could target a single office in a specific building.

In August 1988 Colonel Warden circulated a paper in the Air Staff that graphically codified his targeting and strategic ideas. He indicated the relative importance of the strategic targets contained within

Gulf War Planners

TOP: Lieutenant General Charles A. Horner, Commander, Central Air Forces (CENTAF).

CENTER: Chief Gulf War planner, Colonel John A. Warden, III, took Clausewitzian ideas on identifying an enemy's "centers of gravity" and applied them brilliantly.

BOTTOM: In Saudi Arabia, former members of Colonel Warden's planning group honored the Air Force's first doctrinal goal—the achievement of of air superiority. They fine-tuned "force packaging" and advocated bombing for "effect," not necessarily for "destruction."

a nation in an arrangement of five concentric rings that resembled an archery target. Each ring contained specific strategic target sets ranked by the effect their loss would have. The innermost ring, or bull's-eye, contained a nation's leadership and its connections, such as communications, propaganda media, organs of internal control, etc., to the population and armed forces. The ring adjacent to the bull's-eye contained a nation's key production centers, such as energy, advanced research facilities, and bottleneck industries. The third ring from the center encompassed a nation's infrastructure, such as its transportation systems. A nation's population constituted the fourth ring. In considering population as a target, Warden did not propose to inflict physical damage, but rather to conduct psychological operations that would break morale or lower support for the war and the ruling regime. A fifth outermost ring contained the most difficult and costly targets to destroy—a nation's military forces in the field. Although the air offensive had to penetrate the hard outer fifth ring to reach the softer interior rings, any sustained attack on targets in the fifth ring would most likely consume aerial resources which could more effectively be used elsewhere.

The ordering of the five rings delineated their relative vulnerability to attack. The outermost ring of fielded military forces consisted of numerous dispersed targets, all of which had the capacity to shoot back (many targets, costly to destroy), while the fourth ring of population presented an extremely diffuse target, both physically and psychologically. The destruction of even a minor portion of a nation's population contravened U.S. national policy and entailed adverse domestic and international political repercussions (many targets, costly to influence). The third ring, infrastructure, offered a large number of targets of differing degrees of difficulty. Individually they might be vulnerable, but in total, although they could yield significant results, they would also consume a great deal of effort (many targets, good return). The second ring offered a far more vulnerable target. The hitting of a few vital spots in key plants could disrupt entire sectors of an enemy's war economy and his ability to continue fighting (few targets, high return). Finally, an attacker would find enemy leadership the most important and vulnerable target of all. Theoretically, the knocking out of a handful of super-hardened bunkers could "behead" a nation in a single raid (very few and difficult targets, very high return). CHECKMATE adopted this model, which Colonel Warden continued to refine in the following months.

The Kuwait Crisis, U.S. Deployment, and War Plans

The Emirate of Kuwait, a small Sunni Islamic Arab monarchy, lies at the northwestern edge of the Persian Gulf. Topographically it is part of the desert covering much of the Arabian Peninsula. Because the emirate sits astride a pool of thirteen and one-half percent of the world's known supply of petroleum, in 1990 its 2.1 million inhabitants (many of whom were imported laborers) had the highest per capita standard of living in the world. Its armed forces consisted of 20,300 troops, 245 tanks, and 35 combat aircraft. Its much larger and more conservative southern neighbor, also a Sunni Arab monarchy, Saudi Arabia, possesses another twenty-five percent of the world's known petroleum reserves. The Saudi population of 15 million supported armed forces three and one-half times the size of Kuwait's. To Kuwait's north and west lies its most powerful neighbor, the Republic of Iraq, a single-party Arab socialist state ruled autocratically by its strongman and President for Life, Saddam Hussein. Iraq, with a population of 18.8 million, fielded armed forces outnumbering Kuwait's by fifty-to-one in manpower, twenty-five-to-one in tanks, and twenty-to-one in combat aircraft. The Islamic Republic of Iran, with a population in 1990 of 55.6 million and a civil government dominated by conservative Muslim Shiite clerics, lies across the Persian Gulf to the east.

By the summer of 1990, following a bitter, protracted, and ultimately victorious, war against Iran, Hussein's regime desperately needed hard currency. At the same time, the price of oil, Iraq's only marketable cash commodity, continued to fall. In July, Hussein accused Kuwait of exceeding its Organization of Petroleum Exporting Countries (OPEC) production quota and demanded that it forgive an estimated Iraqi war debt of ten billion dollars. Kuwait, through pride, miscalculation, or simple refusal to submit to blackmail, refused to accede to any of Hussein's threats. At the OPEC meeting of July 26, 1990, the states of Saudi Arabia, Kuwait and the OPEC majority voted a target oil price of twenty-one dollars per barrel, sixteen percent less than the twenty-five dollars per barrel advocated by Iraq. Thwarted by OPEC and the other gulf states, and unwilling to cut his grandiose military, social, and nation-building expenses, Hussein dispensed with bluster and resorted to action. He had not anticipated that anyone, least of all the world's so-called superpowers, would oppose him. Months earlier, on February 12, 1990, he had informed U.S. Diplomat John Kelly, the Assistant Secretary of State for Near East and South Asian Affairs, that the Soviets were "finished as [a] world power." On July

25, in a remark later repeated in media broadcasts, he told U.S. Ambassador to Iraq, April Glaspie, that the United States could "not accept 10,000 dead in a single battle, as Iraq had done." The British and the French, meanwhile, competed with one another to sell advanced weapons, such as the Exocet anti-ship missile-carrying F–1 Mirage fighter and state-of-the-art technology to Hussein up until the crisis broke. In addition to being isolated, Kuwait, because of its relatively tightfisted monetary policies and abuse of contract laborers, was unpopular in the Arab world.

On August 2, 1990, in a single day of violent *blitzkrieg*, Iraqi armed forces overran and occupied Kuwait. Within the week Iraq annexed Kuwait as a new province. These moves brought Hussein direct control of twenty percent of the world's oil reserves and placed his armed forces directly across the border from the eastern province of Saudi Arabia, which contained most of that country's oil reserves. The prospect of greatly altered international oil production and distribution arrangements likely to follow fixed the world's attention immediately on the Persian Gulf.

Before August 1990 the United States had followed a conciliatory policy toward Iraq, hoping, as President Bush observed, to draw that country "into the family of nations." The U.S. government guaranteed agricultural purchases which made Iraq one of the principal buyers of American grains, and it granted to Iraq hundreds of export licenses for so-called "dual use" manufactured items. The nature of these goods, for example, high quality machine tools, allowed the receiving country to employ them for either military or civilian purposes. During the Iran-Iraq war in the 1980s, the Reagan Administration had shared detailed imagery and intelligence with Iraq, some of it almost "real-time." This information aided Iraq's military efforts, but also enabled its military leaders to deduce sensitive U.S. intelligence capabilities and adopt countermeasures, such as emphasizing land-line communications by laying fiber optic cables and concealing projects from imaging satellites. The sharing of at least some forms of U.S. intelligence continued until at least May 29, 1990. At the end of the Iran-Iraq War in July 1988, the United States shifted its attention from Iraq to other crises; with finite intelligence resources, it concentrated on other pressing situations, such as the internal crisis within the Soviet Union and events in eastern Europe. This rational allocation of priorities had unforeseen consequences. A conciliatory policy toward Iraq, the compromise of intelligence capabilities, and the shortage of up-to-date intelligence on the Persian Gulf area combined to handicap subsequent

vital U.S. efforts. From the start of the crisis to the conclusion of the Persian Gulf War, the United States found itself with insufficient intelligence and Bomb Damage Assessment (BDA). In some activities, such as nuclear weapons manufacturing and research, the United States never realized the extent of Iraq's technical progress until after the cessation of hostilities.

The United States, nonetheless, reacted immediately to Hussein's invasion of Kuwait. On August 2, 1990, President George H. W. Bush froze Iraqi assets in the United States. That day the President also met with the Chairman of the Joint Chiefs of Staff (CJCS), General Colin E. Powell, USA, and with General H. Norman Schwarzkopf, USA, Commander in Chief, U.S. Central Command (CINCCENTCOM), and told them he would consider an attack on Saudi Arabia by Iraq a *casus belli*. Two days later President Bush and civilian and military leaders met and agreed to send troops to Saudi Arabia, if it requested them, and a delegation led by Secretary of Defense Richard B. Cheney. The next day, August 5, 1990, President Bush publicly stated U.S. objectives in the crisis:

> 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; and
>
> Safety and protection of the lives of American citizens abroad.

These uncompromising U.S. objectives reassured the nations of the Persian Gulf and guaranteed a full-scale confrontation with Iraq. On August 6 the U.S. delegation met with the Saudi Arabian King, Fahd ibn Al Aziz, who agreed to accept U.S. troops on Saudi soil. President Bush ordered their deployment to begin at once.

By August 8, 1990, USAF McDonnell-Douglas F–15C Eagle fighters and Boeing E–3B Sentry AWACS aircraft landed in Saudi Arabia. General Schwarzkopf assigned Lieutenant General Charles A. Horner,[13] USAF, to the Saudi capital, Riyadh, designating him CENTCOM Forward. Horner was given the responsibility of receiving U.S. forces arriving in Saudi Arabia, while Schwarzkopf returned to the United States and the even more complicated task of overseeing the deployment. Although CENTCOM had drafted deployment plans for the Persian Gulf and was creating a hasty plan for defensive opera-

tions, the President wanted more flexibility for a wider range of responses. Therefore, General Schwarzkopf was ordered by Secretary Cheney to devise a plan for an offensive option in case Saddam Hussein engaged in further aggression or began killing hostages; but his CENTCOM and component staffs, almost overwhelmed with deployment and defensive planning, lacked the resources to create one. On August 8, with General Powell's permission, Schwarzkopf approached the USAF Air Staff in the Pentagon directly, asking for a retaliation plan directed against strategic targets in Iraq and ready for execution by the end of August. He spoke to the USAF Vice Chief of Staff, General John M. Loh, who accepted the task and, in turn, asked Colonel Warden and his deputy directorate to prepare the air-war plan.

The plan naturally reflected the ideas of the Warden group. On August 10 Warden briefed the initial version of it to Schwarzkopf, who approved it, as did Powell the next day. The President learned of the plan on August 15. On August 17 Warden returned to CENTCOM Headquarters at MacDill Air Force Base, Florida, with a final version and a rudimentary operations order. He called the plan INSTANT THUNDER to emphasize its difference from ROLLING THUNDER, the interminable and constrained bombing campaign over North Vietnam. INSTANT THUNDER had a clear concept of operations: "conduct powerful and focused attacks on strategic centers of gravity in Iraq over a short period of time (days not weeks)." It rested on four objectives:

> Target Hussein's regime, not the Iraqi people.
>
> Minimize civilian casualties and collateral damage.[14]
>
> Minimize American and allied losses.
>
> Pit U.S. strengths against Iraqi weaknesses.

The plan employed the five rings and within them identified ten target sets. Under government leadership, the primary center of gravity in Iraq, it struck at two target sets: first, at Hussein's regime to "incapacitate" it, and, second, at military and civil command, control, and communications (C^3) to isolate decisionmakers and slow the transmission of orders. In targeting Hussein, not his people, the planners would have liked to physically eliminate him, an outcome considered unlikely. Instead, they expected to create a set of conditions leading to his overthrow. Initially, however, they had boldly stated their goal as eliminating Saddam Hussein himself. That objective they modified upon learning that U.S. policy forbade the direct targeting of heads of state. In national production, INSTANT THUNDER identified electricity

as its third target set; oil (internal distribution and storage, not production and export capability) as its fourth target set; nuclear, biological, and chemical (NBC) research, development, and production facilities (including airfields with chemical-capable aircraft) as its fifth target set; and military research, production, and storage (including mobile short-range ballistic missile launchers) as its sixth target set. Because the air planners worked with a limited attack force in the area of "infrastructure" they confined themselves to making Iraq's railroads their seventh target set. A single-track rail line between Baghdad (Iraq's capital in the center of the country) and Basra (Iraq's second largest city, near the Persian Gulf and Kuwait) carried most of the freight between the two cities and supplied Iraqi forces in Kuwait. As for Iraq's people, INSTANT THUNDER only called for psychological operations against them and foreign workers. Against the outermost ring, Iraqi fielded forces, INSTANT THUNDER made the strategic integrated air defense system its eighth target set. In addition, the plan included Iraq's only naval facility, Umm Qasr on the Persian Gulf and associated antishipping missile sites, as its ninth target set and seven airfields with modern interceptor aircraft as its tenth target set. The air planners selected the final two target sets to protect Coalition air and naval forces. Among the ten sets, INSTANT THUNDER required Coalition air forces to bomb eighty-four targets and fly a total of 4,200 attack sorties in six days. The air plan stressed the use of precision guided munitions and "bombing for effect." The planners expected the impact of this bombing to devastate Iraq's war effort.

The ordering of INSTANT THUNDER's target sets resulted from the Air Staff's recommendations of August 17, 1990, for assigning targeting priorities against Iraq. The target priorities assigned in this process were the ones desired, but were not permanently fixed, that is, the tenth target set did not necessarily have, and was not necessarily expected to hold, the tenth priority throughout the campaign. Some targets by their nature might fall into more than one ring. For example, an enemy's integrated air defense system (interceptors, SAMS, AAA, and air defense command and control facilities) has large components in the fifth ring—fielded forces—although its command and control system center of gravity lies in the first ring, leadership. The overarching operational consideration in any sustained air campaign is obtaining air superiority with immediate attacks on the opponent's air defense system. However, few target priorities remain absolutely constant throughout a campaign. A high-priority target rendered ineffective and thus low-priority after initial attacks may become high-priority again if

it must be restruck because it has been repaired or resuscitated. The five rings, as conceived of by Warden, were a guide for air campaign planners, not a straight jacket for the conduct of actual air operations. Once hostilities began, political and military realities could and did change the order of targeting.

Warden himself predicted that an aerial attack would lead to a change in the political regime, eliminate Iraq's strategic offense and defense capability, disrupt its internal economy (while leaving its ability to export oil intact), and enable the nations of the Persian Gulf to deal effectively with its residual forces. Like many air planners before him, Warden set ambitious goals. Still, his plan rested on two major unproven assumptions. Given prewar U.S. intelligence, was it built on a firm foundation of targeting information? And could an intense strategic bombing blitz change the regime of a police state?

By the start of the war in January 1991, strategic air planners had added two more target sets to INSTANT THUNDER's descendants and modified a third. At Cheney's and Schwarzkopf's direction, the *Republican Guard* was added in late August 1990. The *Republican Guard*, a praetorian force politically loyal to Saddam Hussein much as the SS had been loyal to Adolf Hitler, served as a prop for the regime. Theoretically, its weakening would ease the path to power for Regular Iraqi Army or other plotters who opposed the regime or for Kurdish and Shiite opposition groups. The *Republican Guard* also formed the most militarily effective portion of all Iraqi ground forces. It had first call on quality personnel, received the most modern weapons available, and had the most thorough training. During the Iran-Iraq War it performed as a strategic reserve used to seal and drive back Iranian breakthroughs, and it led the victorious Iraqi counteroffensives into Iran that ended the conflict. In August 1990, by then a force grown to two armored, one mechanized, and four infantry divisions, and one special forces division, it spearheaded Iraq's invasion of Kuwait and apparently stood poised to invade Saudi Arabia. The immobilization of or severe damage to the *Republican Guard* with tactical air power would greatly hamper the ability of Iraqi ground forces to conduct offensive operations, a prime concern to Coalition leaders in August 1990. Likewise, air attacks could limit its capacity to counter Coalition ground attacks when and if Kuwait were liberated physically. The *Republican Guard*'s political function and its military potential made it a prime target for both strategic and tactical air operations.

By late August 1990 the strategic air planners added fifty-four major highway and road bridges between Baghdad and Basra to the

railroads as an eleventh target set. New intelligence, unavailable at INSTANT THUNDER's inception, had revealed the target system's vulnerability to air assault. Also, by November 1990, in-theater planners had separated Scud ballistic missile production, research, and mobile and fixed launchers from overall Iraqi military research and production and established it as yet a twelfth target set.

General Schwarzkopf fully endorsed INSTANT THUNDER on August 17, 1990, and sent Colonel Warden to Riyadh to brief Lieutenant General Horner. Horner rejected the plan's "airpower alone" aspects, but he accepted its target list and selected three key members of Warden's team to compose a small and highly secret Central Air Forces (CENTAF) Special Planning Group.[15] This group, in the process of completing an offensive air campaign plan ready for execution by September 15, 1990, became known as The "Black Hole" when other members of CENTAF's staff observed that resources, personnel, and intelligence all seemed to go into the Special Planning Group, but never seemed to come out again—activity not unlike that which occurs in a collapsed neutron star.[16] In late August 1990 Horner appointed Brigadier General Buster C. Glosson, USAF, to head the Special Planning Group. One of Glosson's first moves was to augment the Special Planning Group to twenty officers, adding one experienced weapons officer from each USAF combat wing in Saudi Arabia to act as a subject matter specialist. For the next five months, in response to new intelligence and to the growing number of Coalition aircraft available, the Special Planning Group expanded its target list. The group, too, increased in size with the addition of Strategic Air Command (SAC) refueling experts, USN and USMC representatives, and, on September 19, 1990, British Royal Air Force (RAF) planners.

If Lieutenant General Horner rejected the form, he kept the substance of INSTANT THUNDER. Although he co-opted the Warden group into a planning process under his own control, he did not fundamentally change its campaign plan. At his prodding, the term INSTANT THUNDER and overt traces of the group disappeared from briefings. By September 2, 1990, INSTANT THUNDER had transmogrified into CENTAF "Offensive Campaign-Phase I." But the targets and the philosophy that identified them remained in place. They formed the core of subsequent offensive planning, which continued to emphasize leadership; electrical, nuclear, biological, and chemical facilities; and the other targets sets derived from the five rings. Glosson himself became a convert to the principles of INSTANT THUNDER, largely owing to the inclusion of one of Warden's key planners, Lieutenant Colonel David

A. Deptula, USAF. The strategic air planners, who remained separate from CENTAF's staff in part because of the high security classification of their work, also maintained a close and continuing relationship with CHECKMATE in the Pentagon before and during the war, exchanging information frequently. When Generals Powell and Schwarzkopf received the initial version of CENTAF's "Offensive Campaign-Phase I," on September 13, 1990, they decided that whenever hostilities broke out, even in the event of an Iraqi offensive, they would implement it rather than respond with a defensive air plan. By mid-September CENTAF's offensive campaign had already become the first part of a much larger combined and joint theater campaign prepared by CENTCOM's staff.

Warden intended INSTANT THUNDER to be a "stand alone" warstopper; Schwarzkopf saw it merely as the first phase of his integrated air-ground campaign to liberate Kuwait. As early as August 25, 1990, he had presented a four-phased offensive plan to Cheney and Powell:

> Phase I: Strategic Air Campaign Against Iraq
>
> Phase II: Air Campaign Against Iraqi Air Forces in Kuwait
>
> Phase III: Ground Combat Power Attrition to Neutralize the *Republican Guard* and Isolate the Kuwaiti Battlefield
>
> Phase IV: Ground Attack to Eject Iraqi Forces from Kuwait

Air power alone would accomplish the first three phases. Ground and air power working together would execute the last phase. By mid-September Horner also assigned Phase II and some Phase III planning to the Black Hole Special Planning Group under Glosson. Detailed ground and air planning for Phase IV did not begin until mid November 1990, after President Bush authorized the doubling of American forces in the theater, including the U.S. Army's mechanized VII Corps, transferred from Germany. For practical purposes, the addition of more aircraft allowed CENTAF to merge the first three phases and execute them simultaneously instead of sequentially, with situational changes made in the level of effort among them. The initial air assault would include attacks on targets belonging to each of the first three phases. As the ground assault approached, the effort taken from Phase I and devoted to Phase III would grow. The *Republican Guard* had figured prominently in the air planning for both Phase I, the strategic air campaign, and for Phase III, the preparation of the battlefield. (The *Re-*

publican Guard by November 1990 had withdrawn from forward positions on the Kuwait-Saudi Arabia border to reserve positions along both sides of the Iraq-Kuwait border, where it assumed its traditional counteroffensive role.) In mid December 1990 the Special Planning Group was combined with CENTAF Director of Operations tactical air planners and the officers who prepared the Air Tasking Order (ATO) to form the CENTAF Directorate of Campaign Plans, led by Brigadier General Glosson in Riyadh. Within that directorate, on the eve of the Gulf War in mid-January 1991, direction for bombing the *Republican Guard* in the field shifted from the strategic planners to the KTO targeteers.[17]

Meanwhile, U.S. aircraft flowed into the region, increasing the number of aircraft available to deliver precision guided munitions by almost 150 percent. Altogether, they gave CENTAF 700 Air Force combat aircraft. These included 93 percent of the USAF's precision delivery-capable aircraft inventory and 63 percent of its laser-guided bombs. Offshore, USN carriers had 62 A–6Es, all guided-bomb unit-capable, on their flight decks, although that service faced a serious shortage of "smart" munitions. Indeed, during the war, the USAF would drop or launch 90 percent of all precision air-to-ground munitions. By January 15, 1991, it had deployed over 200 air-to-air in-flight refueling tankers—the single most important aircraft type in the theater. Without in-flight refueling, most of the aircraft flown in the strategic air campaign would have been unable to reach their targets and return. Likewise, no less than 70 percent of the USN's strike flights[18] needed land-based USAF tanker support to complete their missions.

The Special Planning Group worked at CENTAF Headquarters, which was located in the Royal Saudi Air Force Headquarters Building in downtown Riyadh. Once the war started they guided operations. In another section of the headquarters, officers aided by computer software compiled a daily ATO.[19] CENTAF transmitted appropriate portions of the ATO to USAF wings, USN carrier battle groups, and air organizations of the Coalition allies. Although the USN withheld some aircraft from the tasking order for fleet defense flights and the USMC withheld some for organic ground support, as a rule no allied aircraft overflew Saudi Arabia, Kuwait, or Iraq without the tasking order's authorization. The ATO was the crucial enabler of air operations. However, it did not conceptualize air operations. That function belonged to the Black Hole Special Planning Group in Riyadh.

After September 15, 1990, the Special Planning Group constantly updated the strategic air campaign plan, almost always because a deci-

U.S. Military Aircraft in CENTCOM (1 Sep 1990-1 Feb 1991)

Service	Aircraft*	Type	1 Sep	1 Oct	1 Nov	1 Dec	1 Jan	1 Feb
USAF	F-15C	Fighter	70	72	72	72	96	96
	F-4G	Wild Weasel	24	36	36	36	48	49
	F-16	Fighter Attack	106	120	120	120	168	212
	A-10	Attack	72	96	96	96	120	144
	AC-130	Gunship	0	5	5	4	4	2
	F-117A	**Bomber**	**18**	**18**	**18**	**18**	**36**	**42**
	F-15E	**Fighter Attack**	**24**	**23**	**24**	**24**	**46**	**48**
	F-111F	**Bomber**	**18**	**32**	**32**	**52**	**64**	**64**
	B-52	Bomber	20	20	20	20	20	36
	RF-4C	Recon	6	6	6	6	6	18
	JSTARS	Srvl & Cntrl	0	0	0	0	2	2
	E-3A	Srvl & Cntrl	6	6	6	6	7	11
	EF-111	EW	10	14	14	14	19	18
	KC-10	Tanker	0	6	6	6	6	30
	KC-135	Tanker	79	93	114	115	164	194
	C-130	Airlift	70	95	96	96	96	149
	EC-130E	ABCCC	6	6	6	6	6	6
USN	F-14	Fighter	56	76	76	76	76	109
	F/A-18	Fighter Attck	58	58	58	88	88	89
	A-7E	Fighter Attack	0	24	24	24	24	24
	A-6E	**Bomber**	**35**	**48**	**48**	**62**	**62**	**96**
	E-2C	Srvl & Cntrl	12	17	17	21	21	29
	EA-6B	EW	12	17	17	21	21	27
	KA-6D	Tanker	8	12	12	16	16	16
	S-3A/B	Recon	23	31	31	31	31	43
USMC	F/A-18	Fighter Attack	48	48	48	48	72	78
	AV-8B	Fighter Attack	40	60	60	60	81	84
	OV-10	Srvl & Cntrl	0	8	8	8	8	19
	EA-6	EW	12	12	12	12	12	12
	A-6E	**Bomber**	**9**	**10**	**10**	**10**	**20**	**20**
	KC-130	Tanker	6	8	8	8	12	12

*Aircraft in bold print could deliver laser-guided bombs using self-designation.

sion in Baghdad or Washington might mandate execution in a few hours. Additional Coalition forces and new target intelligence accounted for most of the changes. More force meant that more known targets could be attacked. New intelligence meant new targets. CENTAF's offensive campaign had a list of almost 300 targets by January 16, 1991, with an additional 300 potential targets under consideration. To maximize surprise and mission coordination and to ensure that significant targets—air defenses, leadership, communications, electricity, and nuclear, biological, and chemical—were struck as soon as possible, the Special Planning Group carefully scripted the air campaign's sorties of the first two days and part of the third. Lieutenant General Horner reasoned that changing circumstances would invalidate any further detailed advance planning.

The Special Planning Group consolidated its targeting recommendations and guidance into the air campaign's key internal planning document—the daily Master Attack Plan.[20] "It consisted of the sequence of attacks for a twenty-four-hour period and included the time on target, target number, target description, number and type of weapon systems and supporting systems for each attack package." Once the conflict began, the daily Master Attack Plan, once approved by Brigadier General Glosson, became the outline for the officers preparing the daily Air Tasking Order. As the official DoD report on the conflict affirmed, the master plan "drove the process," the basis for all other daily air attack and mission planning.

Lieutenant Colonel Deptula, on loan from the Secretary of the Air Force's staff group, an author of INSTANT THUNDER, and the chief strategic air planner in the Special Planning Group, prepared the daily Master Attack Plan.[21] It allowed him to maintain, subject to his superiors' approval, much of the strategic philosophy (the centers of gravity, the five target rings, the decisiveness of air power, etc.) that underlay INSTANT THUNDER not only within CENTAF's "Offensive Campaign-Phase I," but within the daily execution of the strategic bombing campaign against Iraq proper. As he continually laid out reiterations of executable plans across the width and breadth of Iraq in the months before the war, he developed a greater understanding of the spatial, temporal, and technological relationships between targets and identified Iraqi air defenses. Simultaneous and carefully sequenced strikes in different locations, he realized, could have synergistic effects that increased the shock and destruction to the enemy and protected the attacker. (The Iraqis would be unable to concentrate their defenses on any one mission.) Such strikes would, when incorporated into CEN-

TAF's "Offensive Campaign-Phase I" and carried out with precision guided munitions, force packaging, and stealth technology, give air power a preeminent role in the conflict.

But Deptula's concept of "simultaneity and careful sequencing of attacks" in some instances had the effect of seemingly blurring target priorities and making the conduct of the strategic air campaign appear unfocused. For instance, an attack on a Scud solid-propellant production plant in central Iraq, planned for 0700 might be preceded by attacks against airfields in southern and western Iraq at 0645 and a communications center in eastern Iraq at 0655. These attacks, to the uninitiated, would not necessarily appear related and might even seem haphazard, for they fell in multiple target sets. But, by distracting and spreading Iraqi air defenses, they decreased the losses of Coalition pilots and aircraft[22] and increased the chances of a successful attack on the primary target. In this case, as in most executed air campaigns, the realities of planning for combat forced compromises in targeting priorities. The Special Planning Group finalized the first day's plans only a week before the war.

The overall air plan had to be ready to execute at all times. Moreover, once the air campaign began, Deptula, Glosson, and other air officers feared that Hussein might quit at the first blow, or, more likely, that the U.N. might impose a cease fire, or that some other political decision might end the campaign in as little as a week's time. Because the air campaign might be short-lived, the Black Hole planners selected a broad variety of target systems for attack as soon as possible rather than one target system at a time. It seemed better to inflict *some* damage on *many* target systems/centers of gravity than to attack two or three and leave the rest untouched. This approach reflected Warden's belief in bombing for effect and not always for destruction and in the systemic disruption that ripples through an enemy's economy and society from bombing multiple centers of gravity. Consequently, to broaden the initial and following attacks as much as possible, Deptula prepared a plan that spread strike forces widely and employed the minimum number of weapons on the maximum number of targets. He placed a premium on first smashing highly leveraged targets (centers of gravity whose destruction would have the widest effect on as many target systems as possible).

In mid-December 1990, to streamline and coordinate planning for the looming air offensive, Lieutenant General Horner reorganized CENTAF's air planning. He combined the strategic air Special Planning Group with CENTAF's defensive/tactical air planners to form the

Guidance, Apportionment, and Tasking Division (GAT), in a newly created Directorate of Campaign Plans. From that time onward the Special Planning Group became the Iraqi Target Cell, responsible for the strategic air campaign, and CENTAF's tactical planners became the KTO Cell, responsible for tactical air planning and targeting in the theater. The Iraqi Target Cell designated its strategic targets individually. It had approximately 600, but could only apportion 250 to 300 sorties a day among them after January 29, 1991. Before that point, strategic sorties had numbered more than 600 a day. This planning approach lent itself particularly well to the anticipated campaign against bridges, which overlapped both Iraq proper and the Kuwaiti Theater of Operations. Thus, the Iraqi Target Cell held responsibility for planning all bridge attacks that, historically, had been interdiction targets.

The Coalition military leadership's concentration of the air effort on Iraqi ground forces and related targets in the KTO meant that during three-fourths of the conflict, the KTO Cell planned over eighty percent of all Coalition air operations. The KTO Cell had numerous air resources, but it faced a seemingly endless number of potential targets. In theory, each individual artillery piece and armored fighting vehicle in each of the forty-three Iraqi divisions in the theater, not to mention infantry concentrations and the many supply dumps and vehicles in the Iraqi logistics network, could be a separate aiming point. Consequently, KTO Cell tactical air planners adopted an entirely different targeting approach than did their colleagues in the Iraqi Cell. They did not usually designate individual targets. Such an attempt would have overwhelmed planning capacity and the Air Tasking Order system. Instead, the KTO Cell employed force on force. It sent packages of tactical strike and support aircraft to attack designated "kill boxes." These were grids, thirty miles on a side, divided into quadrants and laid out over a standard map of Kuwait and southeastern Iraq. Unless otherwise directed by an airborne controller or changing circumstances, each day a strike aircraft would hit all targets of opportunity within its designated "kill box." A single quadrant comprised an area almost equaling the size of New York City. These devastating and ubiquitous operations accomplished both the aerial interdiction of Iraqi supply and the destruction of Iraqi military equipment and personnel. Obviously, this approach lent itself to attacks on the *Republican Guard*, for which the KTO tactical air planners had responsibility throughout the conflict. The KTO Cell gave the results of its planning to Lieutenant Colonel Deptula, head of the Iraqi Cell, who incorporated them into the daily Master Attack Plan.

Strategic Targets Level of Effort

Strategic Target Sets	Strategic Combat Sorties Flown	Percentages of Strategic Effort Including *Republican Guard*	Percentages of Strategic Effort Excluding *Republican Guard*
Electrical Power	215	1	2
Naval	247	2	2
Leadership	429	2	3
Air Defense	436	2	3
Oil	518	3	4
C^3	601	3	5
Railroads/Bridges	712	4	6
Nucl/Biol/Chem	902	5	7
Military Support	2,756	15	22
Scuds	2,767	15	22
Air Fields	3,047	17	24
Republican Guard	5,646	31	
Total Strategic Sorties	18,276		
Strategic Effort as a Percentage of Total Coalition Air Combat		36	24

When Lieutenant General Horner added the CENTAF staff division in charge of preparing the daily Air Tasking Order and the Airborne Command Element/Current Operations Division to the Directorate of Campaign Planning in mid December 1990, he consolidated the training, the defensive, and (eventually) the offensive ATO into a single function. This allowed the air planners to fly on AWACS aircraft, monitor plan execution, and modify future work in light of actual operational feedback. Horner placed the directorate under Brigadier General Glosson and designated him to command the 14th Air Division (Provisional), composed of all USAF tactical fighter wings in the theater. Thus, the officer in charge of plans also had direct control of the largest single force of Coalition strike aircraft.

The four-month shakedown period before the end of 1990 gave Coalition forces the opportunity to fine-tune their training. It also revealed a flaw that would plague the war effort throughout. CENTAF-IN, CENTAF Headquarter's intelligence organization (and to a lesser extent CENTCOM Headquarter's own intelligence organization) often failed to supply the Special Planning Group and the operations officers in USAF combat wings in the field with timely and accurate target materials.[23] Neither the Black Hole nor the F–117A-equipped 37th Tactical Fighter Wing (TFW) ever established smooth, cordial working arrangements with CENTAF intelligence before the war. Officers in flying units complained that CENTAF intelligence failed to meet their specialized requirements for planning and targeting materials.

For their part, CENTAF intelligence officers, complaining that the units failed to follow "standard procedures," tried to beat the system by establishing "work-around" links directly with non-official contacts in the United States, such as CHECKMATE. The Special Planning Group (later the Iraqi Target Cell), of course, had a voracious and immediate appetite for almost every item of intelligence on Iraq to develop the first phase of the air campaign. CENTAF intelligence, however, had only begun to collect material in the spring of 1990 and at no time before the war did requests from the Special Planning Group, routed through CENTCOM intelligence, receive the highest priority at either the Central Intelligence Agency (CIA) or the Defense Intelligence Agency (DIA).

The problems of timeliness and interpretation of intelligence, especially Bomb Damage Assessment,[24] became far more acute during the war and created a mutual aura of distrust and bitterness between CENTAF intelligence and its customers. Before, and even more directly during, the war, air planners and officers in the air combat wings

bypassed CENTAF intelligence by developing an unofficial "back channel" network among themselves for the rapid daily exchange of video tape recordings of air strikes and bomb damage.[25] Moreover, they established direct (if informal) links with the DIA and CHECKMATE in Washington, D.C. CHECKMATE arranged informal representation in DIA BDA cells, with the CIA and with other intelligence agencies in Washington. They cast a wide net for information, even bringing in numerous outside consultants, including the former ambassador to Iraq, April Glaspie, in an attempt to learn all they could about Iraq and its potential vulnerabilities. Their broad range of reliable information and expertise in offensive planning allowed them to serve as an intelligence fusion center for the Black Hole. The shortage of timely and accurate BDA that informed the air planners on what to retarget threatened to cripple the strategic bombing campaign and force a "hit or miss" planning approach. This difficulty revealed a damning two-way lack of prewar communications between intelligence and operations, although, in fairness, the lack of hard and current data (causing the intense hurry to discover it once the crisis broke in August 1990) was also a natural outgrowth of the shift of American intelligence assets away from the Persian Gulf during the summer of 1988 following the close of the Iran-Iraq War. Fortunately, the system functioned well enough to not impede either the strategic or tactical air campaigns.

The Persian Gulf Conflict

On January 16, 1991, the USAF had stationed in Saudi Arabia approximately one-quarter (700) of its combat aircraft, including ninety percent of its precision bomb-droppers—46 F–15Es (over half with LANTIRN[26] targeting pods), 64 F–111Fs with Pave Tack pods,[27] and 36 (soon to be 42) F–117As all capable of precision guided munitions delivery. These aircraft formed the heart and soul of the strategic air campaign against Iraq. The USAF supplied another 450 support aircraft. The USN and USMC supplied 724 more, approximately 400 of them on carriers in or on their way to the theater. Arab allies contributed 490, while NATO Coalition members chipped in 146. The bulk of these 2,096 combat aircraft shared experienced pilots, technological advantages, and sophisticated weapons that far outclassed those of the enemy.

Iraq had purchased an air force and subordinate air defense force designed both to overawe, and defend it from, its neighbors. The air

force performed reasonably well in the Iran-Iraq War, but its ultra-cautious tactics and reluctance to press home any attacks demonstrated its aversion to suffering casualties. Iraq apparently regarded air power as something better preserved for future intimidation than expended in combat for immediate gain. The Iraqi Air Force in 1991, the sixth largest in the world, had 24 main operating bases, 30 dispersal bases, 750 to 800 fixed-wing combat-capable aircraft, and 200 support aircraft. Combat planes included 265 ground-attack aircraft (some capable of chemical weapons delivery), 405 fighter-interceptors, and 130 combat-capable trainer aircraft.

The aging short-ranged Soviet-designed MiG–21 made up 204 of Iraq's 405 interceptors. It lacked modern avionics and carried an antiquated Soviet air-to-air missile, the Vietnam-era heat-seeking AA–2 Atoll. It had little utility beyond point defense. More capable Soviet-built MiG–23s and 25s (the latter having an early generation look-down shoot-down weapon system) made up an additional 99 aircraft. Finally, the Iraqis had 35 MiG–29s, with modern lookdown-shoot-down capability, and 65 French-built Mirage F–1Es, aircraft roughly comparable with U.S. F–4 Phantoms, the mainstays of the USN and USAF forces deployed in Vietnam in the 1960s and 1970s. But all of these aircraft consisted of less capable export versions than the supplying nation's frontline counterparts. Iraq further sabotaged itself by insisting that pilot transition training to the MiG–29s take place within its own borders rather than in the Soviet Union. The MiG–29 pilots had not begun to master their machines when war erupted. Although the F–1E pilots were given mixed reviews by their French instructors, they were the best in the Iraqi Air Force, and Israeli Air Force analysts urged the Coalition not to dismiss them lightly. Iraqi doctrine emphasized point, not area, defense and the use of fighters over anti-aircraft artillery (AAA) and surface-to-air missiles (SAMS). Finally, some suppliers compromised Iraq's inventory by turning over their equipment specifications to Coalition intelligence organizations. Altogether, the Iraqi Air Force possessed inferior aircraft and inferior pilots, all in inferior numbers, with weapon systems that were an open book to their opponents.

The Iraqi air defense system suffered similar defects. Most of its French and Soviet radars were no longer top-of-the-line, and equipment performance (and countermeasures) were known to the Coalition. The five month *Sitzkrieg* had permitted Iraqi technicians to reorient the air defense system from east-west to north-south. Iraq possessed approximately 970 AAA sites with 7,000 AAA pieces (4,000 of

them 23-mm or less), most without radar direction, and 16,000 SAMS (not counting shoulder held and other missiles in the hands of Iraqi ground forces), many concentrated in the Baghdad area. Altogether, Baghdad was twice as heavily defended as the most heavily defended eastern European target at the height of the Cold War and seven times as heavily defended as Hanoi at the height of LINEBACKER II. From the outset of the war until its end, the SAM threat—particularly hand-held weapons—denied low altitudes to attackers. The Iraqi air defense system optimized AAA to defend altitudes of up to 10,000 feet and employed missiles beyond that limit. It relied on aging, yet still dangerous, export versions of Soviet surface-to-air missiles such as SA–2s and 3s, more modern Soviet missiles, such as the SA–6 and SA–8, and the low-altitude French Roland for strategic air defense.

Defects in Iraq's air defense command and control system added to its military shortcomings. The Iraqi-designed Kari system,[28] built after Israel's air raid on Iraq's nuclear reactor in 1981, exhibited a flaw typical of many items built for its dictator—overcentralization. Kari divided the country into four defense sectors, with Kuwait added as a fifth. Each Sector Operations Center (SOC) reported to the national Air Defense Operations Center in Baghdad and was reported to by two to five subsidiary Intercept Operations Centers (IOCs). Each IOC had several early warning radar posts reporting to it. Information flowed from the Intercept centers to the Sector centers and thence to Baghdad, but information did not flow laterally to other sector headquarters. Iraq designed the system to repel its worst case threats—regional enemies, Iran, Israel, or Saudi Arabia—and the system was well thought out to do it. Faced with a threat far greater than anticipated, it simply could not handle the sheer number of Coalition aircraft. The Sector or Interceptor Operations Centers made the decision as to what weapon system would engage intruders—SAMS or fighter-interceptors. U.S. intelligence judged Iraqi pilots to be inordinately dependent on Ground Control Intercept information received from Kari and probably incapable of managing an aerial intercept on their own (although in fact some did so on the opening night of the war after Kari shut down). SAM and AAA batteries used information from Kari to avoid turning on their own fire control radars until the last possible moment, which helped them negate or diminish allied countermeasures. In the prewar period the Coalition detected a daily average of 1,300 to 1,700 individual SAM/AAA and Early Warning radar emitters.

The trench fighting of the Iran-Iraq War from 1980 to 1988 left among Iraq's military leaders a preference for fixed defenses—not just

in the field, but in strategic points as well. Much like the French Army before World War II, the Iraqi Army suffered from a "Maginot Line" complex, which led it to rely on a few more inches of concrete and steel rather than mobility. This made good sense in the face of regional threats; and indeed, many in the U.S. defense establishment in the fall of 1990 argued that Iraqi forces would have to be dug out of Kuwait foxhole-by-foxhole. Iraq's enormous number of hardened concrete facilities made it the most highly protected target base in the world. The array could conceivably withstand even tactical nuclear weapons. But because of the USAF's monopoly on hard target-penetrating precision guided munitions, facilities hardened to withstand blast overpressures proved vulnerable to the scalpel-like lancing of laser-guided bombs. Almost all of Iraq's air defense command and control facilities rested within massive concrete structures whose distinctive configurations easily identified them to Coalition pilots. The Iraqi Air Force hid its aircraft in 594 hardened shelters and its crews in many more.

General Schwarzkopf, scant hours before the outbreak of hostilities, issued the initial operations order (CENTCOM OPORD 91-001) for the upcoming campaign. He restated the Coalition's key military objectives as follows:

> 1. Attack Iraq's political-military and leadership and C^2.
>
> 2. Gain and maintain air supremacy.
>
> 3. Sever Iraq's supply lines.
>
> 4. Destroy known nuclear, biological, and chemical production, storage, and delivery capabilities.
>
> 5. Destroy *Republican Guard* forces in the Kuwaiti Theater of Operations.
>
> 6. Liberate Kuwait City with Arab forces.

The strategic air campaign against Iraq would play a direct role in all but the last of the general's objectives; Coalition air forces pursued five specific objectives related to those of the theater commander:

> 1. Gain and maintain air supremacy to permit unhindered air and ground operations.
>
> 2. Isolate and incapacitate Iraq's regime.
>
> 3. Destroy Iraq's known nuclear biological and chemical warfare capability

4. Eliminate Iraq's offensive military capability by destroying key military production, infrastructure, and power capabilities.

5. Render Iraq's army and its mechanized equipment in Kuwait ineffective, causing its collapse.

The strategic air campaign against Iraq, which had principal responsibility for each of the first four specific air objectives, applied the twelve strategic target sets developed by the Warden group and the CENTAF Special Planning Group within the broader contexts of President Bush's announced political objectives, the theater commander's overall military objectives, and the specified air objectives.

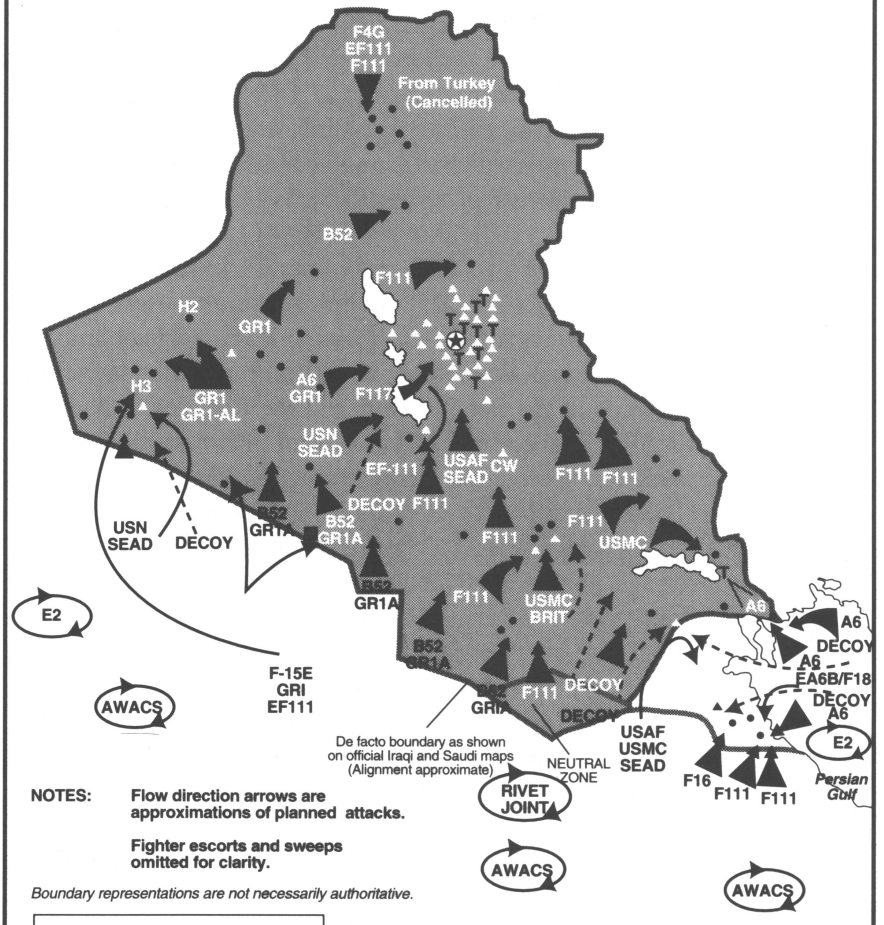
The Initial Attacks

On the evening of January 16 and 17 at air bases throughout the Arabian Peninsula, U.S. air and ground crews approached the night's mission with special care and anticipation. Unless Coalition leaders had a last minute change of mind, the largest multi-nation combat air operation since the invasion of Normandy would begin in a few short hours. This time the crew chiefs, armaments specialists, and electronics technicians took even more care in their duties. This time pilots would be flying into battle, not into practice.[29] They would be absolutely dependent on the guns and missiles, chaff and flair ejectors, radar and communications systems of myriad and complicated aircraft to function perfectly. In wing meetings with their planning officers they fleshed out the details of the latest Air Tasking Order, plotted ingress and egress routes, made attack approaches clear to all, and digested intelligence updates. This time, too, they paid special attention to survival kits, sidearms, water bottles, and last letters home. Each shared in some fashion an anticipation of possible death and the accompanying rush of adrenaline and sweaty palms. Despite their high level of professional training, most USAF pilots in the Persian Gulf were about to embark on their first combat mission.

At 0230L (L = Baghdad Time) January 17, 1991, thirty minutes before H-Hour (H-30),[30] at a time of night when Iraqi radar operators were at a physiological and psychological low, ten F–117As dropped the booms of their tankers near the Saudi Arabia-Iraq border, "went stealthy," and headed for key air defense, command, and communications targets within Iraq, including Baghdad. At the same time, Task Force NORMANDY—nine Army AH–64 Apache gunships led by three

The First Wave (Planned) 0239 (L) - 0525 (L)

(First Two Hours and Forty Six Minutes)



Air Force MH–53J Pave Low Pathfinders—hedgehopped across the Saudi Arabia-Iraq border, attacking two Iraqi early warning sites at 0239L (H-21) 400 miles west of Kuwait City, in a welter of rocket and cannon fire. At least one of the two stations got off a warning. AAA fire immediately filled the air over Baghdad even though no aircraft had been overhead. The Black Hole, now designated the Iraqi Cell, had designed the attacks to punch an opening through Iraq's air defenses to conceal the entrance of three EF–111A electronic warfare aircraft meant to assist the F–117s nearing Baghdad[31] and nineteen F–15E fighter-bombers headed for fixed short-range ballistic missile or Scud sites in western Iraq. The execution of the CENTAF's "Offensive Plan-Phase I," the strategic air campaign against Iraq, had begun.

For the Air Force, the war had commenced hours before in the United States with the takeoff of seven B–52Gs bound for Iraq. The big bombers left from Barksdale Air Force Base, Louisiana, at 0735 (EST) on January 16 to begin a 14,000-mile round-trip flight, carrying air launched cruise missiles (ALCMs) on their first combat test. Meanwhile, the first attack wave of F–117A and F–15E fighter-bombers based in Saudi Arabia and Tomahawk land attack missiles launched from U.S. Navy ships in the Persian Gulf and the Red Sea,[32] had the task of disrupting the Kari command and control network, hitting permanent Scud launchers directed at Israel, damaging land line communications, and halting the flow of electricity into Baghdad. Southwest of Baghdad, the three EF–111As flew in through the gap blown in Iraqi radar coverage and headed for their stations south of Baghdad. The F–15Es, flying very low, also flew in through the gap and continued west to strike close over the fixed Scud launchers within range of Israel. At 0305L (H+5) they delivered their weapons, Mk–20 Rockeyes (munitions canisters containing 247 bomblets) with deadly accuracy. The air planners, assuming that when the first bomb fell on Iraq Saddam Hussein would order Scud launches toward Israel, scheduled the mission to thwart his action.

A few minutes earlier, at 0251L (H-9) an F–117A Nighthawk dropped two GBU–27s on the Nukhayb sector air defense center; then, at 0300L (H-Hour), two F–117As dropped the first bombs on Baghdad when they attacked communications targets, including the so-called "AT&T building," which U.S. intelligence fingered as a node for sixty percent of Iraq's military land line communications capacity. Its loss would disrupt Baghdad's air defenses, which relied heavily on land lines. One of the aircraft also struck North Taji Military Facility # 1, reputedly a shelter for high-level Iraqi officials, but its bomb failed to

penetrate the bunker. At 0305L (H+5) five more F–117As bombed the sleeping quarters of the Abu Guryahb Presidential Palace (the possible quarters of Hussein and the wartime home of the Iraqi General Staff), restruck the AT&T building, and hit the Baghdad Sector Operations Center at Al Taji, just north of Baghdad.

On the heels of the F–117As, between 0306L and 0311L (H+6 to H+11), U.S. Navy Tomahawk land attack missiles hit the National Baath Party Headquarters and the Presidential Office Complex, known as the Republican Palace. The air planners hoped that visible damage to these structures would demonstrate that the Coalition was not after the people of Baghdad; it was after the regime and the files and equipment housed within a key organ of its sinister internal security. The Republican Palace was not only a psychological target but the administrative nerve center of Hussein's personal government. It included several large office buildings and facilities for the *Republican Guard.* Additional Tomahawk missiles, worth $1.1 million apiece, landed atop all six electrical plants supplying Baghdad, and their warheads reputedly dispensed spools of carbon fibers that festooned powerlines and transformer yards to cause massive short circuits and countless automatic shutdowns.

The electrical attacks proved extremely effective. By 0310L (H+10) CNN (Cable News Network) reported that Baghdad had completely lost commercial power. Few, if any, electrons flowed through Iraq for the remainder of the six-week war. The loss of electricity shut down the capital's water treatment plants and led to a public health crisis from raw sewage dumped in the Tigris River. It further disrupted the commercially-dependent Kari system, forcing its defenders to resort to backup generators. Fluctuating output, the air planners knew, would play hob with sensitive electronic equipment and computers. The loss of electricity further hampered daily governmental functions and literally put Iraq's leaders "in the dark." In the following week, Tomahawk land attack missiles and Coalition aircraft reduced every major city in Iraq to the same unhappy situation. At 0330L (H+30) twenty Tomahawk missiles crashed into the Scud assembly plant at Al Taji, a mammoth, centralized logistical facility with maintenance, overhaul, construction, research, and assembly facilities for every military item in inventory; now, at least, Iraq could not assemble any more Scuds. Coalition aircraft would return to Al Taji repeatedly throughout the war while striking other key production and support targets.

After the F–117s and cruise missiles came conventional aircraft. From 0355L to 0420L (H+55 to H+120) large numbers of USAF,

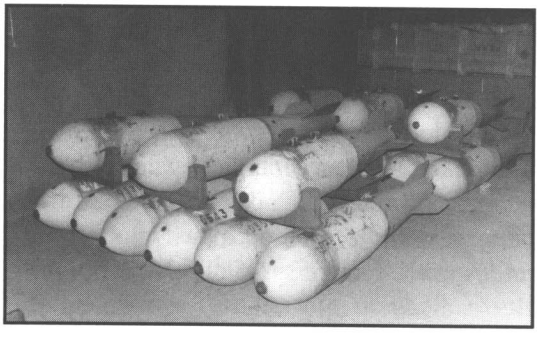
USN, USMC, RSAF, and RAF aircraft smashed Iraqi air defenses and fields from H-3, an airfield located in western Iraq, to Ahmed Al Jaber, an airfield in occupied Kuwait. Two packages of aircraft, one a USN package from the Red Sea carriers and the other a USAF package from the south pointed directly toward Baghdad. These "gorilla" packages were intended to seem threatening enough to force the Iraqis to hurl their air resources in defense. Air Force ground-launched BQM–34 and Navy air-launched TALD pilotless decoys mimicked the radar return of conventional aircraft to further arouse Iraqi radar operators, many already confused by the absence of central control from Kari. They responded by turning on their equipment. Finally, radar-jamming aircraft radiated blanketing electronic emissions that drove Iraqi radar operators to go to full power in an attempt to break through the interference. Then, the two incoming Coalition flights revealed their true nature and pounced in a shrewd and devastating ruse.

Instead of bomb-carrying fighter-bombers, they were radar-killing electronic warriors carrying AGM–88 high-speed anti-radiation missiles (HARMS) designed to home in on SAM and AAA radar. USAF F–4G Wild Weasels alone expended dozens of HARMS in twenty minutes, while USN/USMC F/A–18s fired one-hundred for the night. HARMS filled the air over Baghdad, the site of over one-half of Iraq's SAM and AAA batteries. Foolishly, the Iraqis did not turn off their radars, even when the HARMS fireballed in their midst; as one USAF flight leader averred, "the emitters came on and stayed on for the entire flight of the missiles." This deadly surprise not only destroyed many Iraqi radars, it also terrified their operators. For the rest of the war, they showed great reluctance to use radar and often chose to launch their SAMs with optical or even no guidance. The initial HARM attack and the F–117 bombings of the Kari system left Iraq's integrated air defense system shattered, opening up the country so completely that, within days, Coalition air-to-air tankers regularly operated in Iraqi airspace. Other non-stealthy aircraft, meanwhile, pummeled Iraqi airfields. At 0400L B–52s from Diego Garcia, flying at less than four hundred feet and behind the cover of the ongoing HARM mission, made shallow penetrations into Iraq to strike forward airfields and runways that might service enemy aircraft waiting to strike at high value Coalition aircraft, such as the Airborne Warning and Control System (AWACS), or deliver chemical weapons on Coalition troops. The B–52s carried CBU–89s and a special 1,000-pound bomb and delayed-fuse combination borrowed from the RAF. Not to be outdone, RAF Tornadoes dispensed JP–233 runway denial muni-

Gulf War Weapons

TOP: A GBU–10 laser-guided bomb being loaded onto an F–111 prior to a "tank plinking" mission.

CENTER: A spent Scud booster being inspected by Coalition troops after it impacted in Saudia Arabia.



BOTTOM: R–400 nerve agent-filled aerial bombs such as these found by U.S. inspectors after the war were a part of Iraq's store of thousands of weapons, many damaged and leaking, containing lethal chemicals.

tions that cratered the paving at Al Taqqadum, Iraq's largest air base, while Saudi Tornadoes attacked Shaibah in Iraq, a few miles north of Kuwait.

This sudden, overwhelming aerial onslaught against Iraq vividly illustrates the changed roles of USAF tactical and strategic aircraft. The large eight-engine B–52G, once the queen of the strategic nuclear bomber fleet, made shallow, low-level conventional assaults against weakly defended *tactical* targets while preceded by waves of friendly aircraft deflecting attention away from them. Light, single place, twin-engine fighter-bombers had flown into the teeth of enemy defenses against *strategic* targets. Late 20th century offensive and defensive technology had dramatically redefined the "strategic bomber."

F–117A Nighthawks returned to Baghdad at 0420L, January 17, 1991. They blasted the Kari Interceptor Operations Center at Al Taqqadum airfield, the Baghdad area Kari Sector Operations Center at Taji; North Taji Military Related Facility #2, and the new Iraqi Air Force Headquarters complex. Bad weather prevented a strike on Baghdad's primary TV transmitter, the leveling of which would have separated Hussein's propaganda machine from any audience still retaining electrical power.

Seven F–117As attacked bunkers holding possible biological warfare material in central Iraq in the last strike of the night. This material required distinctively configured refrigerated bunkers for stability and safety. Air Planners had debated not only how but even whether to breach these bunkers at all. The likely release of their contents—anthrax and other toxins—might create horrific conditions over a highly populated area or contaminate the Tigris and Euphrates Rivers. Not until late December 1990 did President Bush authorize strikes on biological warfare bunkers. The United States decided to attack an hour before dawn, the day's low ebb for wind, just before maximum exposure to sunlight.[33] First, F–117As would make precision strikes to crack the bunkers open. Then F–111Fs carrying CBU–87s and 89s would make additional passes to ignite fires and mine the area to prevent salvage. The mission, at 0500L on the morning of January 17, demonstrated once again that Clausewitz's concept of "friction" applies to any military operation, as do Murphy's Laws. The F–117As, followed by sixteen F–111Fs, attacked thirteen biological warfare bunkers. But late night fog, a common January occurrence near the Euphrates River, obscured the targets and prevented many pilots from dropping their bombs or identifying their targets. Of all of the bombs

carried into Iraq against that target on that night, almost eighty percent would not be dropped because of bad weather.

In sum, the first night's Coalition air attack severed Baghdad from the national power grid, disrupted and heavily damaged key elements of the national air defense network, cut a significant percentage of the state's land line communications system, suppressed some Iraqi airfields, and struck the Scud assembly and launching complexes. After that one aerial action, Iraq's military establishment was on the ropes, mortally wounded, albeit still twitching.

A few hours later, at 0830L on January 17, 1991, the first B–52G air launched cruise missiles fired in combat exploded in Iraq. The missiles struck targets in northern Iraq, out of range of Coalition strike aircraft based in Saudi Arabia, and other targets near Baghdad. These B–52s, from Barksdale Air Force Base, Louisiana, completed the longest combat mission ever flown (over thirty-five hours) and demonstrated that the USAF could respond forcefully within hours to any crisis anywhere, underscoring its claim to "Global Reach-Global Power."

Intense preplanned aerial attacks against strategic targets continued for the next two days. Still later on the morning of January 17, 1991, U.S. aircraft struck the oil refinery at Samawah, halfway between Baghdad and Basra, inaugurating a series of attacks against refineries and oil storage centers. Their goal was to eventually limit fuel to both the civilian and military sectors of Iraq's economy. These attacks damaged the portion of the industry supplying fuel directly to the economy—refineries and oil storage facilities. They spared the oil extraction and export facilities that would permit Iraq to maintain itself and pay reparations after the war. Their cutting of the enemy military establishment's oil supply would severely curtail its mobility, deny civilians fuel for heating and cooking, halt internal transport and distribution, and heighten popular dissatisfaction with the regime.

With the execution of Phase I (the Strategic Air Offensive Against Iraq) of General Schwarzkopf's overall war plan well underway, Coalition air power simultaneously executed Phase II (the Suppression of Iraqi Air Defenses in Kuwait) and Phase III (the Preparation of the Battlefield) at daylight on January 17, 1991. The three phases ran concurrently thenceforward while Schwarzkopf directed shifts of emphasis or effort among them. A–10As destroyed radar stations in southern Iraq and Kuwait in pinpoint attacks during the day, while B–52G bombers began a round-the-clock attack on *Republican Guard* targets. Lieutenant General Horner had promised Schwarzkopf that the big bombers would hit the *Republican Guard*

every three hours for the remainder of the war. The B–52Gs, dropping iron bombs from medium and higher altitudes, proved better employed against large diffuse targets, such as dug-in military units, logistics dumps, and spread-out industrial complexes, than against individual air defense operations centers and assembly plants.[34]

B–52s were employed almost exclusively against ground support targets in Kuwait.[35] Sixty-eight launched 1,175 strikes against Iraqi ground troops while forty-two F–117s launched only forty-nine. In fact, CENTCOM ground commanders from General Schwarzkopf on down so valued the B–52's strikes against those particular targets that they routinely opposed any suggestion from air planners to employ them outside Kuwait. After the war, Iraqi troops in debriefings revealed that of all of the Coalition aircraft sent against them they feared the B–52s more because of the concussions of their ordnance falling on or near adjacent units than because of actual damage they inflicted. No more than a dozen B–52s with approximately 400 tons of bombs were ever sent into even deepest Iraq, where they compiled impressive performance figures in over 1,600 sorties. Although they made up only three percent of the Coalition's total combat aircraft, they delivered thirty percent of the total tonnage of air munitions (72,000 bombs or cluster bomb units totaling 27,000 tons of munitions), most from high altitude using radar ground mapping for target acquisition. Because of their long flights from the United States, Diego Garcia, Spain, and England, they also consumed twenty-five percent of the theater's air-to-air tanker fuel off-loadings and tied up forty percent of the USAF's most modern tankers. Nonetheless, only 4,000 tons of the bombs (less than one in six) dropped by B–52s during the war were released over targets that the Black Hole designated as "strategic." The B–52s going into Iraq also required the same large packages of supporting aircraft as did those that participated in LINEBACKER II against the Hanoi-Haiphong area of North Vietnam. In contrast, F–117A Nighthawks flew 1,296 sorties (two percent of all attack sorties) against strategic targets, yet they struck forty percent. Only F–117s hit targets in downtown Baghdad. In addition, they delivered more than 3,000 tons of precision guided munitions, placing eighty percent on target, while exposing no support aircraft to enemy fire.

Since the middle of the "Great War" in 1916, aircraft designed to bomb strategic targets (high-value targets usually located deep within the enemy's heartland) had to carry the weight of bomb loads, fuel, and defensive systems to the target and then return to base. The only aircraft possessing the requisite payload, range, and survivability was

the heavy multi-engine bomber. For the next seventy-five years the heavy bomber and strategic bombing became synonymous. All of this changed in the first two months of 1991. The USAF carried strategic bombing aircraft on its books in the Gulf War, primarily the F–117A, the F–111F and the F–15E, as "fighter-bombers," aircraft of fighter size[36] with the principal mission of bombing enemy targets rather than dog-fighting. These fighter-bombers employed new technologies to meet classical strategic specifications. Air-to-air refueling extended their range and reduced the weight of their required fuel load.[37] Precision guided munitions multiplied the effectiveness of their bombload by increasing the amount of high explosives delivered exactly on target. An aircraft with few bombs and precise weapons could equal the effectiveness of a large aircraft with many "dumb" or conventional iron bombs. Precision guided munitions eliminated the need to carpet a target area to ensure one or two hits. Indeed, as Gulf War strike records showed, *a single* F–117 with *two* laser-guided bombs could achieve the same destruction that in World War II required *108* B–17s with *648* bombs. Those changes also enabled both the F–111F and the F–15E to hit all but the most heavily defended strategic targets. Cloaked by stealth, the radical F–117A could strike *any* target. The twin-engine strike aircraft thus replaced the traditional heavy bomber as the "strategic bomber" of choice.[38]

At random intervals throughout the first and second days more Tomahawk missiles roiled the pot and strained enemy nerves, hitting power plants, oil pumping stations, and the Ministry of Defense in Baghdad. The second night, on January 17 and 18, 1991, F–117As hit more air defense operations centers and targets in the Baghdad area—the two modified IL–76 Iraqi AWACS aircraft, Iraqi Air Force Headquarters, Taji Command Bunker #2, the Ministry of Defense Computer Center, Iraqi Intelligence Service Headquarters, and a VIP bunker and possible location of Saddam Hussein and other leaders. Also on the second night, January 17 and 18, 1991, two B–52Gs conducted a low-level raid on Al Sahra Undergraduate Pilot Training Airfield north of Baghdad. It housed the Iraqi Air Force Academy, within sight and sound of the city of Tikrit, Saddam's home town and base of the clan which supplied the bulk of his political support.

That same evening Marine air and USAF F–15Es began attacks on highway bridges in the Basra area using conventional bombs. Iraq's second city, Basra, located near the Persian Gulf, served as a major supply and reinforcement terminus for the Iraqi Army in Kuwait. The "bridge busting campaign" sought to isolate Iraqi forces in Kuwait

from their logistics bases; and, more important, prevent Iraqi ground forces, especially the *Republican Guard*, from retreating from the theater. Generals Schwarzkopf and Powell wanted the *Republican Guard* fixed in place, vulnerable to subsequent air and ground operations. Soon, Coalition aircraft went after rail bridges as well, since Iraq possessed only a single-track line between Baghdad and Basra. But in these and later attacks they failed because their aircraft had no precision guided munitions. U.S. and RAF aircraft that did were soon diverted to the task. By February 6 the Air Staff informed Secretary Cheney that Coalition bombing had destroyed twenty-two of twenty-four critical highway bridges, a feat unparalleled in air power annals and one made possible entirely by precision guided munitions. As in LINEBACKER I, the destruction of so many key bridges in such a short time choked the logistics system supplying Iraqi troops in Kuwait. Coalition aircraft revisited the bridges whenever necessary and by the end of the war had "dropped" forty-one of fifty-four rail and highway bridges between Baghdad and Basra, as well as thirty-two pontoon bridges built as replacements.

At the same time, on the night of January 17 and 18, 1991, a Joint Task Force Proven Force, consisting of approximately 100 USAF aircraft, none precision guided munitions-capable,[39] began operations from the Republic of Turkey. These aircraft remained under the operational control of the U.S. European Command (USEUCOM), but General Schwarzkopf held tactical control. Striking from the northwest, they placed all of Iraq in reach of Coalition air power.[40] Attacks duing the daylight hours of January 18, 1991, continued the assault on Iraq's air defense system (after forty-eight hours of aerial attacks the number of active enemy SAM and early warning radars detected operating by Coalition forces declined by almost ninety percent, from 1,700 per day to 200). Other attacks continued against Iraqi air base runways and facilities, blasted chemical and biological warfare bunkers, and further damaged communications. Tomahawk land attack missiles rained down on the Ministry of Defense, power plants, refineries, and the Abu Guryahb Presidential Grounds. But bad weather now intervened. On the night of January 18 and 19 it completely disrupted two F–117A attacks on Baghdad and the nearby nuclear facilities at Tuwaitha.

Altogether, in the first two days, Coalition air attackers struck 169 of 298 potential strategic targets, rendered Irag's air defenses ineffective (allowing CENTAF to order all strike aircraft to operate with relative impunity at medium and high altitudes),[41] drove the Iraqi Air Force from the skies (its night sorties ceased on the night of January 18

and 19, 1991), established air superiority, shut down Iraq's electrical grid, and began to dry up the internal reserves of one of the world's largest petroleum producers. Coalition aircraft erased fifty years of Iraqi development in as many hours. However, by January 19, 1991, because of weaknesses in prewar intelligence estimates, significant Iraqi biological and chemical warfare and short-range ballistic missile capabilities remained. Furthermore, Iraqi troops in Kuwait had not yet suffered significant damage. Their time would come soon enough.

The Strategic Air Campaign Concluded

On days one and two of the war the Coalition devoted approximately 2,400 combat sorties to strategic targets in Iraq. From this peak the total dropped daily. By day five, January 21, 1991, Coalition aircraft flew 550 strategic sorties. By day nine, January 25, 1991, the number of tactical combat missions directed against Iraqi forces in Kuwait and in direct support in southern Iraq equaled the strategic sortie total. By day thirteen, January 29, 1991, the number of sorties directed at strategic targets within Iraq had shrunk to 250 per day. Of those, Coalition air forces expended approximately 75 per day on Scud-related targets while sorties against tactical targets had increased to 800 per day and continued to rise. This strategic total did not include approximately 100 daily sorties flown from Turkey. Sorties directed toward Kuwait averaged more than 1,200 per day. For the last two-thirds of the Gulf War the Coalition conducted the strategic air campaign at a minimum level.

Not unexpectedly Iraq's Scud ballistic missiles forcefully intruded into Coalition military and political calculations. Beginning on the night of January 17 and 18, 1991, a volley of seven ballistic missiles exploded in the nearby state of Israel. Attacking this neutral power with the cynical purpose of provoking a Pavlovian military retaliation, Hussein hoped to exploit the decades-long history of mutual antipathy between the Jewish nation and its Arab neighbors. Using an Israeli counterstrike as a wedge to split some or all of the Coalition's Arab member states from the rest of the alliance, he would thereby disrupt or even end the Coalition's attacks. Whatever the validity of that calculation, Coalition leaders could take no chances, especially when their intelligence services credited Iraq with chemical warheads for its Scuds. For the first time U.S. combat units (Army Patriot anti-tactical ballistic missile batteries) arrived on Israeli soil, set up, and subsequently fired, Patriot missiles at incoming Scuds. The Coalition's

stationing of U.S. armed forces within the state of Israel and using them against Arab forces set a precedent that few in the Middle East failed to notice—when called upon, the United States would physically defend the Jewish state. Three days after the first Scud attack, January 21, 1991, high U.S. officials, such as Deputy Secretary of State Lawrence S. Eagleburger, and CENTAF second in command, Major General Thomas R. Olsen, had hurried to Tel Aviv, where they confirmed their impression that Israel was preparing to fight back. Its obvious military preparations, of course, increased apprehensions among U.S. leaders that it might counterattack and possibly fracture the Coalition. Nervousness in Washington translated into a doubled insistence by senior U.S. commanders in Riyadh that the USAF suppress the Scuds. Both the demand for this aerial action and the change in priorities, Lieutenant General Horner subsequently stated, caused him his greatest anxiety of the conflict.

In light of the urgency lent by this political complication to the air campaign, the Coalition (much to the frustration of the Black Hole planners) diverted scarce air resources from other strategic targets to attack Scud manufacturing facilities and search out and destroy mobile Scud launchers. Hardly ever has one nation expended such effort to prevent another from acting against its own best interest. By January 25, 1991, the overall rate of Iraqi missile launches declined from a peak of ten (and an average of four) to just one a day. Scuds launched toward Saudi Arabia did not create the same political problems, but the threat of their chemical warheads, which never materialized, created much consternation. Altogether, CENTAF devoted fifteen percent of its strategic air effort against Scud manufacturing, assembly, storage, and launchers, with a high of 200 sorties on January 21, 1991. It further held a squadron of F–15Es and LANTIRN-equipped F–16s on anti-Scud alert at all times. This counter-Scud effort represented a significant diversion of force. The strategic air campaign was already much attenuated by the increasing concentration of the Coalition on tactical operations against Iraqi ground forces and related targets in the Kuwaiti Theater of Operations in preparation for the ground offensive. If Iraq forced a diversion of Coalition aerial resources, Coalition leaders thwarted its main goal. Israel stayed out of the war and did not exercise its right of retaliation. The Coalition remained intact while international contempt for Hussein grew.

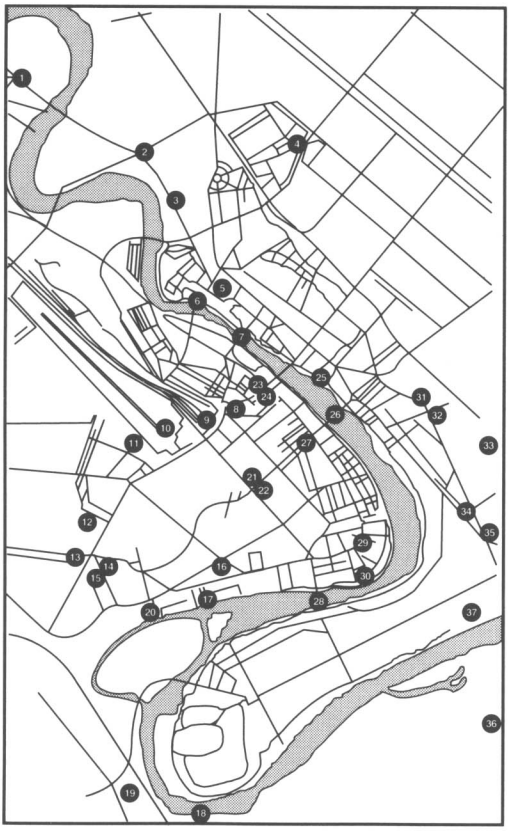
On day five of the war, January 22, 1991, CENTAF discontinued the suppression of airfields and switched to the sending of penetrating GBU–10 and GBU–24 precision guided munitions against the hard-

Downtown Baghdad

(First Twenty-four hours of the war)

1. *Directorate of Military Intelligence*
2. *5, 8, 13, 34. Telephone switching station.*
3. *Ministry of Defense National Computer Complex*
4. *Electrical transfer station*
6. *Ministry of Defense HQ*
7. *Ashudad highway bridge*
9. *Railroad yard*
10. *Muthena airfield (military section)*
11. *New Iraq Air Force HQ*
12. *Iraqi Intelligence Service HQ*
14. *Secret Police complex*
15. *Army storage depot*
16. *Republican Guard HQ*
17. *New Presidential Palace*
18. *Electrical power station*
19. *SRBM assembly factors (Scud)*
20. *Baath party HQ*
21. *Government Conference center*
22. *Ministry of Industry and Military Production*
23. *Ministry of Propaganda*
24. *TV Transmitter*
25, 31. *Communication relay station*
26. *Jumhuriya highway bridge*
27. *Government Control Center South*
28. *Karada highway bridge (14th July bridge)*
29. *Presidential Palace Command Center*
30. *Presidential Palace Command Bunker*
32. *Secret Police HQ*
33. *Iraqi Intelligence Service Regional HQ*
35. *National Air Defense Operations Center*
36. *Ad Dawrah oil refinery*
37. *Electrical power plant*

During the first twenty-four hours of the war, coalition aircraft struck critical targets in Saddam's capital and elsewhere. Weeks of fighting remained, but the initial attack was so overwhelming that Iraq was unable to mount a coherent military response thereafter. First day targets in Baghdad are numbered on the map.



ened aircraft shelters concealing the bulk of the Iraqi Air Force. This was intended to prevent an Iraqi "Air Tet" or, more appropriate, an "Operation Bodenplatte"-like response (a last-gasp effort near the end of World War II, when the Luftwaffe lashed out at allied airfields in northern Europe on January 1, 1945). Swing-wing F–111Fs, which could carry four laser-guided bombs to the F117As two, served as principal airfield-busters. F–117s continued to fly against Baghdad and other more heavily defended targets where their stealth features were critical to success. For three days the Iraqi Air Force stayed under ground instead of over it, its entombed airplanes, one after another, dissolving into fireballs. It mounted not a single fighter sortie on January 25, 1991, as if standing down to assess what was happening. By the end of the war the Coalition had destroyed or severely damaged 375 of Iraq's 594 hardened air shelters and the majority of its hardened maintenance hangers (double-size hardened air shelters). Their loss cost Iraq vital spare parts, specialized ground equipment, and unique shop equipment and would greatly delay its reconstitution of a fully operative air force.

For the Iraqi Air Force and Saddam Hussein, if confronting Coalition air forces aloft meant certain destruction, so did staying in protective holes. Only the option of escape remained. As early as January 21, 1991, Iraq had sent twenty-five large aircraft, including fourteen looted from Kuwait, to Iran, ostensibly its mortal enemy. Iraq's other neutral neighbor, Jordan, apparently refused to accept them. In any case, routing the aircraft east to Iran moved them away from Coalition air operations while directing them west to Jordan put them squarely in the path of American F–15Cs protecting those operations. On January 26, 1991, first-line Iraqi combat planes began to flee to Iran. By January 28, 1991, nearly eighty aircraft rested on Iranian airfields; more than forty additional aircraft, avoiding barrier air patrols hastily established by the Coalition, arrived by February 10, 1991. Iran was the big winner in this affair. If Iraq somehow won the war or gained a political stalemate, Iran gained its favor (for what that was worth). If Iraq lost the war, then Iran gained its air force. Subsequently, the hard currency-starved Soviet Union and its successor states were easily persuaded to sign maintenance and training contracts for Iran's new Soviet-made inventory. (France proved less helpful concerning the F–1s.) The 148 interned Iraqi aircraft included the following squadron-size blocks: twenty-four Mirage F–1 interceptors, twenty-four Sukhoi Su–24 Fencer strike aircraft, and forty Sukhoi Su–22 Fitter–H fighter-bombers.

At the end of eleven days, on January 27, 1991, CENTAF declared that it held *air supremacy*, as distinguished from the *air superiority* it had seized in the first moments of the war. This announcement confirmed the on-going shift of the three-quarters or more of the Coalition air effort to the tactical bombing of Iraqi ground force targets in Kuwait. With a rump effort of approximately 175 daily strategic sorties, CENTAF's strategic planners attempted to keep up the pressure. They could direct about 100 PGM-capable USAF aircraft, plus some USN A–6s,[42] and a few RAF Buccaneers equipped with Pave Spike target designators. The Buccaneers would "buddy lase" for RAF Tornadoes until the Tornadoes received their own British-made thermal imaging laser designation pods (TIALD). As the strategic air campaign progressed, support of the ground effort and Scud diversion siphoned off more and more of these aircraft. A squadron of F–15Es (twenty-four aircraft) was assigned to Scud targets and Scud alert; a second was assigned to "tank plinking."[43] By February 5, 1991, two-thirds of the F–111Fs were committed against targets in Kuwait. By January 25, 1991, to recoup from lost strategic sorties, CENTAF required the F–117A wing to begin flying three missions each night. Six additional F–117A Nighthawks arrived from the United States to complement their activity.

During the second week of the strategic air campaign CENTAF began to bomb not just for *effect* (which initial planning had emphasized) but for *destruction* (to follow up the initial disruption). Squadron-size or larger missions of precision guided munitions aircraft struck the Tuwiatha Nuclear Center, the Latifaya Solid Propellant Plant, chemical warfare bunkers, and hardened air shelters. Single or paired aircraft repeatedly attacked TV and radio transmitters throughout Iraq, while other single aircraft wrecked telephone exchanges in the lesser cities and "deafened" the Iraqi National Security Agency. The last scheduled attacks on electrical generating facilities against nine smaller facilities occurred in this period.

From February 6 to February 14, 1991, Coalition air forces pummeled twenty-four Iraqi airfields; numerous chemical warfare bunkers; eleven chemical research, production, and development targets; sixteen oil targets (including ten storage facilities); and fifty-three separate communications targets. After the F–117As smashed SAM sites, the B–52Gs based in Diego Garcia[44] began to hit the Taji Logistics Center, especially the armored fighting vehicle and missile repair facilities. The large Iraqi military industrial support complex received numerous blows. On the night of February 11 and 12, 1991, F–117As

began intensively reattacking strategic Iraqi leadership targets in and around Baghdad. The first wave hit the Iraqi Intelligence Service Headquarters, the Ministry of Information (an organ of internal control), and the large complex that formed Baath Party Headquarters. The second wave struck the Ministry of Defense, the Abu Guryahb Presidential C^3 Bunker, and the Ministry of Information. Aircraft of the first wave over Baghdad on the night of February 12 and 13, 1991, unloaded their weapons on Iraqi Air Force Headquarters, the Ministry of Defense, the Taji Governmental Command Bunker, and the Baghdad Conference Center, a prestige project built to host a meeting of nonaligned nations. They also bombed the International TV and press buildings employed for propaganda broadcasts, Baghdad Director of Military Intelligence Headquarters, Baath Party Headquarters, and Iraqi Intelligence Service Headquarters. Wave three kept up the pressure, assailing two Baghdad bridges spanning the Tigris River, Baghdad Baath Party Headquarters, Iraqi Intelligence Service Headquarters, Baghdad Director of General Security Headquarters, Baghdad Director of Military Intelligence Headquarters, Baghdad Presidential Residence and Bunker, Camp Taji Presidential Retreat (one of Hussein's favorite residences), and the Al Firdos District communications bunker. In five waves during these two nights, ninety percent of the bombs struck their primary targets.

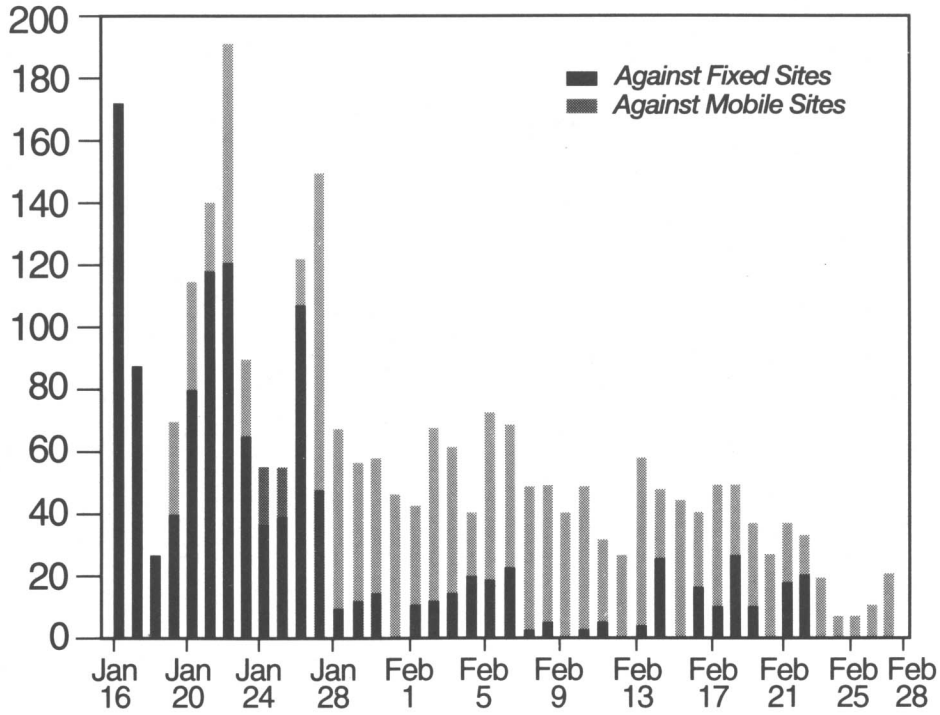
The attack on the Al Firdos District bunker would prove to be the most controversial raid of the war. Two F–117As dropped one bomb each on the bunker; one clipped the outside of the facility; the other penetrated the bunker and exploded inside, killing up to three hundred Iraqi civilians who had taken shelter on its upper floor.[45] Earlier in the month, air planners had received information that the bunker had been "activated" and that its communications capabilities were being used by senior Iraqi military officials. That made the bunker, previously off-limits, a probable communications or intelligence headquarters[46] and a legitimate target of war. After some deliberation, air planners added it to the list of important leadership targets. If the bomb had hit the bunker's fuel tanks as intended, no one would have survived. Water from ruptured internal water tanks, however, flooded the basement floor where intelligence activities took place. The real impact was political and public. Coverage of the incident by the international press and comments by a spokeswoman from the Ministry of Information ignited a firestorm of criticism of the Coalition bombing campaign throughout the world. U.S. leaders feared that another such incident might undermine both international and U.S. domestic support for the war at a time

when Coalition forces clearly had the overwhelming advantage. General Schwarzkopf, on instructions from General Powell in Washington, informed CENTAF that it could no longer strike any targets in Baghdad, including the Tigris river bridges, without his explicit permission. This order amounted to a mini-bombing halt on the Iraqi leadership and its internal instruments of control; CENTAF abruptly cancelled the air planners' highest-priority strikes. From February 13 to the night of February 22 and 23, 1991, Baghdad was "off limits," but Coalition raids on nuclear, biological, chemical, Scud, and military support targets at the city's periphery continued to shake up its inhabitants.

From February 15 to 23, 1991, as the furor over the Al Firdos bunker bombing simmered, the strategic air campaign pressed on, striking targets throughout Iraq including seventeen airfields (to suppress the Iraqi Air Force) seventeen nuclear and chemical targets, thirty-one military support facilities, fourteen C^3 facilities, thirteen highway bridges, and mobile Scud launching sites. On the night of February 22 and 23, 1991, F–117As returned to Baghdad, striking leadership targets, Special Operations Headquarters, and some intelligence headquarters to aid the imminent ground operation.[47] The next night, when Coalition ground forces began an almost unopposed advance into Kuwait and southern Iraq, simultaneous strategic air missions, in one of the worst periods of bad weather during the war, struck Iraqi airfields housing ground attack and chemical-capable aircraft near the front and remaining highway bridges. With targets in Baghdad approved, F–117As attacked the bomb assembly plant, chemical warfare bunkers, and the Iskandariyah Ammunition Plant, to the south of the city. Seven bombs hit Baghdad Special Security Headquarters and three hit Iraqi Baghdad Regional Intelligence Service Headquarters. On the next night F–117As released their laser-guided bombs over the guard facilities of the Abu Guryahb Presidential Complex, the Baghdad Special Security Services, and military support targets.

On the night of February 25 and 26, 1991, for the only time during the campaign bad weather completely halted F–117A operations. In the final two nights of the war, the strategic air campaign continued to strike leadership targets and important industrial facilities. To increase the pressure on Baghdad, the air planners sent the F–111Es from Turkey on missions to the south to hit the Taji complex on both nights. On the night of February 26 and 27, 1991, the 37th Tactical Fighter Wing launched sixty-three F–117A Nighthawk sorties with forty-three weapons for Baath Party Headquarters in Baghdad, fifteen for two of Hussein's residences in Baghdad, and six for his home in

Sorties Against Scuds



Tikrit. As the Iraqi Army in Kuwait was in total disarray, the air planners hoped that this and other strikes at the symbols of Hussein's power would supply the final push to what they suspected must be an already tottering regime. Other F–117As targeted important industrial facilities. Bad weather prevented the release of all but twelve weapons and only two fell on leadership targets. On the last night of the war, a wave of twenty-one F–117As headed straight for Baghdad. At least eighteen of them hit Baath Party Headquarters once. A second wave of ten aircraft attacked the Alteena Nuclear Center, a site associated with the Al Musayyib Missile Research, Development, and Production Complex. The center was the construction and assembly facility for Iraqi's atomic bomb project. Fourteen of eighteen bombs hit their primary target. General Schwarzkopf cancelled the night's third wave and suspended further air operations.

One of CENTAF's last strategic missions employed a new laser-guided weapon, Guided Bomb Unit–28, that was literally hot off the assembly line. Just before the cease fire, two F–111Fs of the 48th Tactical Fighter Wing each carried a single GBU–28 to Command Leadership Bunker #2 at Al Taji. The specially developed bombs, machined from the barrels of surplus Army 8-inch (203-mm) howitzers, tested and deployed in a mere seventeen days, weighed 4,700 pounds each. They arrived from the United States still hot from the molten high explosive mixture poured into them just before their departure, and went straight from transport to strike aircraft. They remained warm to the touch as the F–111s taxied out. The Al Taji command bunker had successfully withstood repeated attacks with BLU–109 penetrators from the first night of hostilities onward. This night, one GBU–28 missed, but the second scored a direct hit, with debris and smoke spewing from the command bunker's entrances, a sure sign of penetration and destruction. The strategic air campaign thus ended, the Nighthawks and Aardvarks proved to the Baath Regime that it had no place to hide.

Analysis

At the end of any strategic bombing campaign three fundamental questions must be answered. Did it expend its efforts on targets vital to the enemy's conduct of the war? Did it select targets vulnerable to friendly air action? Did it contribute decisively to the overall success of air, ground, and sea operations and to achieving national political objectives? With respect to the Gulf War, the quick answer to all of

these questions is "yes." But it is profitable to examine each in greater detail to learn what succeeded and what failed.

The "Core" Strategic Target Sets

In the Gulf War the "core" strategic target sets,[48] those target sets most vital to maintaining military capability, consisted of Iraq's:

1. National Leadership
2. Military and civil command, control, and communications
3. Electric power generation
4. Oil refineries, distribution, and storage
5. Nuclear, biological, and chemical weapons research, development, and production
6. Military support (research and development, production, and storage of conventional armaments)
7. Scud ballistic missiles

To incapacitate Hussein's regime[49] the strategic air campaign targeted Iraqi leadership and command, control, and communications targets. From January 16 to February 28, 1991, the number of leadership targets grew from 33 to 44, while the number of command and control targets grew from 56 to 146. The later target set grew in order to shut down alternate means of civil and military communications. In the past half-century the speed and flow of information exchanged between a modern military establishment and its leadership has greatly expanded. Restricting an enemy's information flow delays his reaction time and causes him to fall behind an attacker's actions until he is knocked out. The inclusion for the first time of these target sets in a strategic air attack stemmed directly from the ideas of the Warden group. The promise of the total incapacitation of the regime and the severing of its communications with the forces in Kuwait depended on what proved to be inadequate intelligence. Thus, some important communications means remained unknown until a few days before the war, some were too closely associated with targets declared off-limits, some were more damage-resistant than realized, and some were difficult targets for precision guided munitions. Even so, the damage inflicted on them was debilitating and must be counted effective.

Other than images of damage and destruction, such as those in the well-known strike footage of the Iraqi Air Force Headquarters

building and the news footage of the minaret-shaped microwave tower of the Al Karakh telephone exchange building, little solid data is available to connect the bombing of leadership or command and control facilities with specific consequences. The bombing of primary facilities forced the Iraqi leadership to resort to far less secure means of communicating, a circumstance welcomed by Coalition forces, especially during the 100-hour ground war. Prisoner accounts were replete with examples of Iraqi units dependent for information on messages delivered by bicycle or motorcycle. The bombing of security and intelligence ministries assuredly disrupted their operations, causing a decline in productivity, a loss of files, and some loss of control by the regime over the people—as evidenced immediately after the war in the eruptions of widespread and unprecedented dissent by Iraqi citizens and the Shiite and Kurdish rebellions.[50] To be sure, the visit of Soviet Special Envoy Yevgeny Primakov to Saddam Hussein in Baghdad from February 12 to 14, 1991, only highlighted Hussein's severe communications problems; Primakov brought Soviet satellite imagery that showed to a surprised Iraqi President the full extent of the damage Coalition air strikes had inflicted. From that point onward,[51] using Soviet good offices, Hussein began actively to seek a way out of his predicament.

Precision guided munitions had proved ideal for attacking government buildings and communications centers. Even so, as the war progressed, the air planners realized that they had selected targets that were more illusive and redundant than they had suspected. Fiber optics networks and computerized switching systems were difficult targets to eliminate completely. Some of the networks ran along the Baghdad-Tigris bridges. Stealth bomber strikes cut the spans on two bridges, but criticism by media reporters who thought only in terms of their own road access, coupled with the Al Firdos Bunker aftermath, led Washington[52] to place the remaining bridges off limits in mid-February. The leadership and communications sites placed off-limits in Baghdad were the only target systems subjected to detailed approval and review by higher authorities—Generals Schwarzkopf and Powell—among others. Their review prevented the full execution of any attack on these systems. The INSTANT THUNDER planners in their integrated campaign to undermine the regime had hoped also to employ psychological warfare, which should have been effective against such a highly centralized state, to separate Saddam Hussein from his people; However, they were stymied and denied a possibly devastating follow-up punch to aerial attacks on leadership and communications facilities by competitive bureaucracies among U.S. intelligence agencies unable to agree on

methods and tactics and by Coalition host nations on the Arabian Peninsula who feared that possible destabilization could not be confined solely to Iraq.

Although Hussein's regime did not fall, it possessed only a minimal ability to communicate with its forces in Kuwait and its organs of control in other areas. The disappointment of Coalition air planners reflected overly ambitious goals applied in circumstances beyond their control. In any case, aerial attacks against leadership and communications facilities served an important purpose. They caused the regime untold inconveniences, forced the expenditure of valuable spares and repair effort, and heavily damaged essential government buildings.

Iraq's twenty-five major electrical plants made up a compact and highly leveraged target system. The loss of their services would force the Iraqis to use back-up generators and thus would vastly complicate military operations. Coalition air attacks by both manned strike aircraft and Tomahawk land attack missiles shut down southern and central Iraqi power grids within hours, demonstrating that matching an appropriate weapon to a vulnerable target produces outstanding results. In January 1991 Iraq was a potential major oil producer, controlling ten percent of the world's oil production and twenty percent of its known reserves. Three large refineries produced ninety percent of Iraq's refined petroleum products; Tomahawk land attack missiles hit the distillation towers of two of those refineries in the first two days of the war. Aircraft equipped for both PGM and non-PGM also conducted extensive raids—500 sorties delivered 1,200 tons of bombs on twenty-eight different refineries. By conflict's end, refined petroleum production had effectively ended. In ten days, Iraq's oil refinery capacity was shattered. Ironically, the fact that the war was so short and Iraqi forces so static worked against the effectiveness of Coalition oil strikes to hinder Iraqi movement. The Iraqi military establishment had considerable refined petroleum stocks throughout its logistics system and supply dumps, thanks to prewar preparations. Given these stocks and the absence of any significant Iraqi air and ground force activity until the last moment, when Coalition air power forced them to move in the face of certain destruction, the oil campaign had little measurable impact on the outcome of the war. The war's speedy conclusion could not, of course be foreseen, and military prudence dictated the implementation of a campaign against a target system that, in the long run, completely controlled Iraqi mobility.

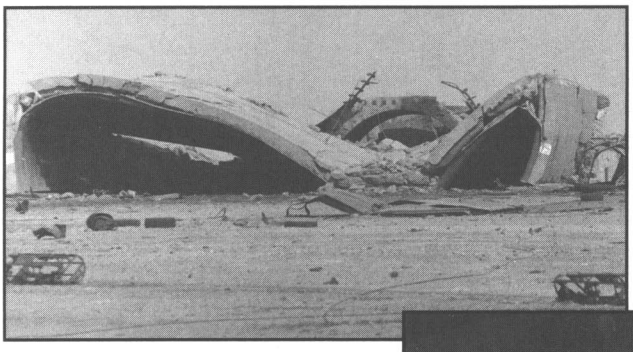
The air planners had hoped that the Iraqi people, suffering from the lack of power and fuel for heat, hot water, cooking fuel, private

automobile fuel, and labor-saving electric appliances would become further alienated from their government and overthrow it. Their frustration and anger over intensifying deprivation in everyday life, in addition to traditional grievances, certainly helped to spark Shiite and Kurdish mutinies. But the air planners underestimated the stake of Saddam Hussein's Sunni followers in the status quo and the strength of Iraq's internal security and its ability to bank or deflect from the regime the fires of popular dissatisfaction. This underestimation of the hold of a police state on its thralls was not unique to USAF planners. Outside observers also underestimated the hold of both the Nazi and Soviet states on their people prior to World War II. One might also suggest that the fall of the Soviet Union in the late 1980s resulted more from the recognition of economic failure among the regime's ruling elite than from the push of the people from below. As to the strength of internal security, the continued survival of the KGB and its successors provides an object lesson in their durability and strength. Although the combined bombing of leadership, communications, and control centers seriously crippled it, Hussein's regime managed to survive.

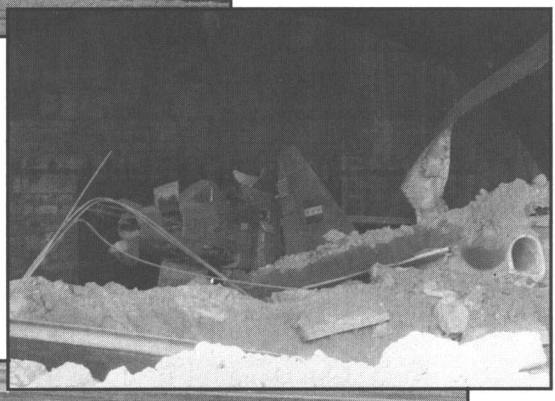
The air planners had sought to limit any damage to power and fuel target systems to facilitate eventual and speedy repairs.[53] To stop the electricity from flowing into Iraq's national power grid, Coalition aircraft did not have to bomb the generating plants into rubble. Rather, they had merely to stop operations for a few weeks or months, when the actual fighting would take place. To encourage eventual oil exports they avoided bombing oil fields or leveling refineries à la Ploesti or Balikpapan in World War II. The air planners, naturally, took umbrage in the immediate post-war period when the Iraqi government and international visitors exaggerated the public health and economic consequences of the damage inflicted on the electrical power and oil systems. In fact, despite a continuing international embargo and non-cooperation from Saddam Hussein's regime, Iraq recovered much of its electrical generating capacity by mid-1992. By October 1992 it was actually once again *exporting* finished petroleum products. The bombing of these targets, located outside city areas, resulted in little collateral damage and represented an almost perfect example of Warden's theories of bombing for *effect*, not for *destruction*.

The Coalition went after Hussein's nuclear, biological, and chemical weapons research, development, and production because they were key to his efforts to destabilize the Persian Gulf region. They formed part of the original INSTANT THUNDER plan, which promised to "destroy," that is, obliterate, them. That plan, however, was based

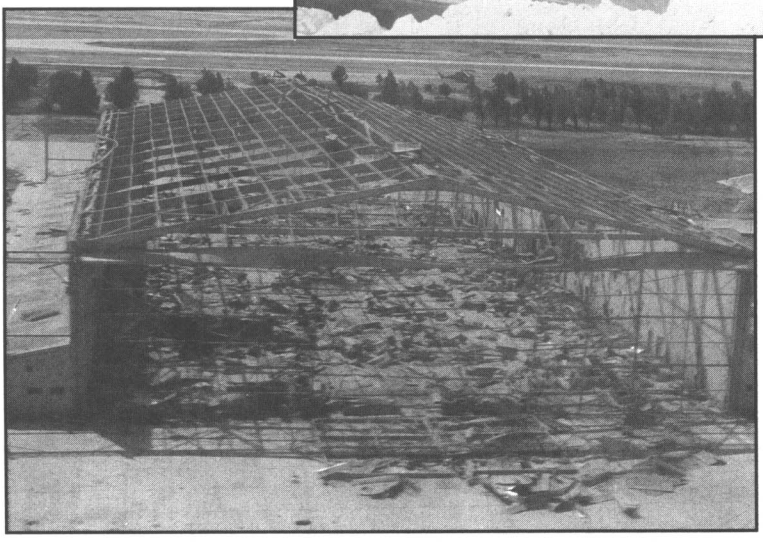
Gulf War Results



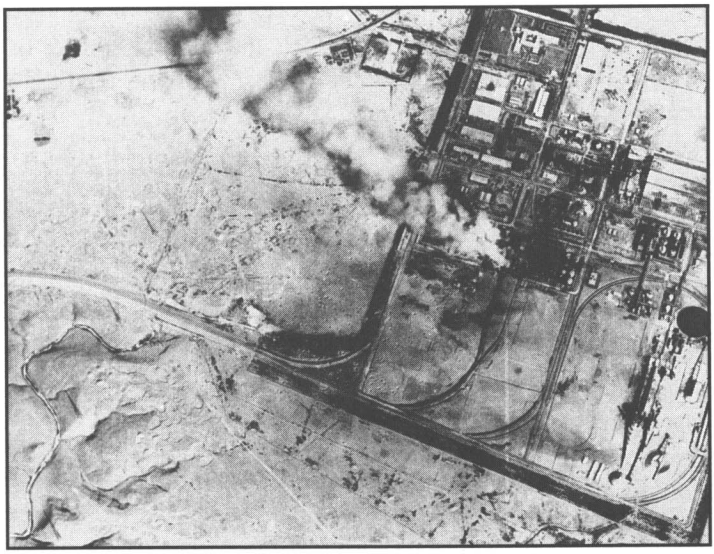
TOP: Tab-Vee aircraft shelter at Jalibah Air Base, Iraq, destroyed by precision air attack.



CENTER: Destroyed Iraqi Sukhoi Su–25 Frogfoot ground-attack aircraft in a shattered shelter at Talil Air Base, Iraq.

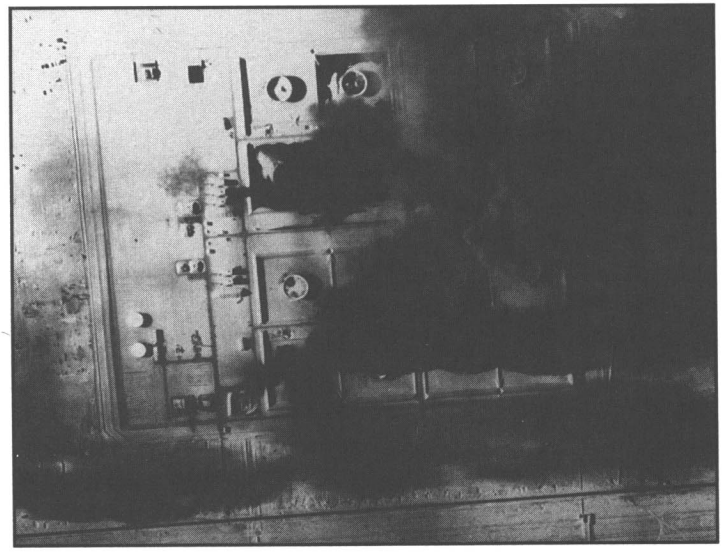


BOTTOM: A Matter of Interpretation—a target at Talil Air Base, Iraq, categorized as "moderately" damaged by intelligence analysts. The air planners considered it destroyed.



TOP: The Al Qaim superphosphate fertilizer plant showing Coalition bomb damage.

BOTTOM: The burning oil tanks of the Al Basrah petroleum refinery after being hit by Coaltion bombs.



on limited intelligence and intended for execution in late August 1990. Although more intelligence did become available, Iraq gained five months to take countermeasures, such as moving or more thoroughly hiding its programs. Thus, by January 16, 1991, the earlier promise of "destruction"[54] of these targets had become more a planning goal than a realistic objective. Iraq's nuclear, biological, and chemical capabilities proved surprisingly diverse. After the 1981 Israeli air raid on its reactor complex at Tuwaitha, just south of Baghdad, Iraq dispersed and duplicated all of the important segments of its nuclear program. Before the Gulf War began, it removed all fissionable materials, equipment, and documentation from that location and dispersed or buried them. Thus, U.S. intelligence failed to locate and identify the bulk of Iraq's nuclear effort. The air planners on January 16, 1991, carried only two nuclear targets: Tuwaitha and the Al Qaim uranium mine near Syria. The list grew to eight (five destroyed and two damaged) by war's end. The facilities the air planners knew about, the USAF struck hard. By October 1991, U.N. inspection teams had uncovered twenty-one nuclear weapons-related facilities. A lack of adequate intelligence, not a lack of capability, hindered the aerial destruction of Iraq's nuclear program. The Coalition air effort and forced dispersion delayed Iraq's atomic bomb project to an unknown extent, but certainly by many months. Unquestionably, the postwar air blockade enabled the U.N. to dismantle many if not most of Iraq's weapons of mass destruction and supporting programs.

Attacks on Iraq's chemical and biological production and research fared better than those on its nuclear effort. The Coalition destroyed or heavily damaged seventy-five percent of Iraq's known chemical warfare research and production and almost all of its known biological production. Nonetheless, in addition to facilities it concealed or those that had escaped Coalition intelligence, Iraq had a fair-sized pharmaceutical industry that on relatively short notice could convert to enough chemical warfare production to threaten its neighbors. As for weapons, U.N. inspectors located over 150,000 chemical artillery shells but found no evidence of biological types. The strategic bombing campaign also delayed the reconstitution of this target system for an indeterminate time, certainly many months, if not years. The air planners' promise to "destroy" Iraqi chemical and biological capabilities was like its promise to "destroy" Iraqi nuclear capabilities, beyond their capability to deliver.

Altogether, nuclear, biological, and chemical targets accounted for only seven percent of the strategic air campaign's total sorties. Per-

haps, not surprisingly, little evidence exists to show that the strategic air planners received pressure from higher authorities to increase their efforts against any of these systems. Those higher authorities worked with the same intelligence limitations that the air planners did, and, like them, could not realize until after the war that Iraqi nuclear, biological, and chemical complexes were far more sophisticated than they had supposed.

The Coalition's inability to strike such weapons from Hussein's hand raises a problem of disturbing magnitude for international political and military leaders alike. Such weapons are all-or-nothing propositions. If a potential enemy retains just a handful, or the ability to produce them quickly, he is in almost as good a political, diplomatic, and military position as he would be if he had dozens or hundreds. But unless his land is thoroughly searched (and 100 percent accurate intelligence is at last acquired), his inventory can never be completely determined. In fact, the Gulf War demonstrated that even the most sensitive components can be relocated at will. The lesson is as ominous now as it has been since 1945—any nation wishing to expend the resources can acquire and maintain atomic and other terror weapons. Ultimately, without a basic change in the philosophy of a nation's ruling class, such as occurred in West Germany and Japan after World War II, physical destruction is not enough. Military power alone cannot remove the desire for these weapons from a leader's psyche or remove the knowledge of them from the scientists who create them.

Today, more than ever, intelligence is necessary to the successful conclusion of any military campaign. In the Gulf War it was adequate, indeed better than in most wars, but certainly far from perfect. The United States' decision to devote only minimal national intelligence priorities to Iraq and its nuclear, chemical, and biological arsenals before August 1990 to some extent crippled targeting and campaign planning throughout the war.

The strategic air campaign planners went after Iraq's massive military storage and production network to reduce Hussein's ability to field and sustain his armed forces. Twenty-two percent (2,756) of the strategic air campaign's total sorties and probably even more of its total bomb tonnage went into this target system to more or less equal the number of sorties expended on Scuds (2,767). Coalition aircraft destroyed or heavily damaged many physical plants and equipment too bulky to move. A DoD assessment affirmed that "at least thirty percent of Iraq's conventional weapons production capability which made small arms, artillery, small- and large-caliber ammunition, electronic

and optical systems and repaired armored vehicles was damaged or destroyed." The disruption of specific key maintenance and manufacturing, specialty metallurgy, and aircraft engine repair sites probably affected overall Iraqi arms production more significantly than the direct loss of thirty percent of production capability. Nonetheless, given its size, diffusion, lack of high priority, and the shortness of the war, the target system in the main survived, although not in any state to resume prewar production rates.

The Scud diversion likely saved this large, easily located target system from even more danger, as did the concentration of air effort on Iraqi ground forces in the Kuwaiti Theater of Operations. A greater use of non-precision B–52s and F–16s and fewer precision sorties directed to "tank plinking" would have inflicted far greater harm on military stores and production facilities, but it would have also inflicted greater collateral damage. What must not be forgotten is that the strategic air campaign damaged this target system to such an extent that it was unrepairable without the help of the outside world. Air power had the capacity to virtually destroy it, but only with more resources than those committed to the strategic air campaign, given the unanticipated requirements of the "Great Scud Hunt" and the frontline strikes in support of General Schwarzkopf's two corps commanders.

The air planners targeted Scud missile support facilities, communications and testing centers, and launchers to protect Coalition forces and to procure stability in the Persian Gulf region. In targeting the Scuds directly they prevented Hussein from using them against Israel to provoke its retaliation and break up the Coalition.[55] The anti-Scud effort eventually consumed twenty-two percent (2,767) of all strategic air campaign sorties, an amount equal to that expended by the Coalition on the rest of Iraq's conventional military manufacturing combined. Here again, Coalition bombing heavily damaged almost all known production and research facilities, but subsequent U.N. inspections revealed that the Iraqis had removed most production equipment, components, and documents before the start of the air campaign. The DoD Final Report ruefully stated that "actual damage to Scud production and storage facilities is less than previously thought."

The attack on Scud mobile launchers failed to destroy any significant number. The Iraqis never employed the exposed fixed launchers, although Coalition bombs expended on them prevented their future use. By the end of August 1990 the Iraqis had dispersed their mobile launchers to areas within range of Israel and Saudi Arabia, where they continued to operate until the end of the war. Mobile launchers

proved difficult for strike aircraft to locate for, within only ten minutes, they could move more than five miles from their firing sites completely off-road. To mislead Coalition aircraft Iraq employed numerous high and low quality decoys, some indistinguishable from actual launchers at more than twenty-five yards. Launcher crews practiced extreme electronic emissions control and night time light discipline, and they streamlined Soviet procedures to shave launch time from hours to minutes. They also received launching instructions from landlines and couriers, which were impossible for Coalition electronic intelligence to intercept. In late 1990 USAF exploitation flights against a borrowed launcher and crew revealed that U.S. strike aircraft had difficulty visually or electronically acquiring launchers during the day and even more difficulty at night. Iraqi mobile Scuds were a mismatch of available weapons to selected targets, and they could not be located readily with existing air technology. The Coalition was able to make use of special operations forces such as the British SAS and American Delta to physically locate them, fix them with laser designators, and illuminate them for laser-guided weapons. As of early February 1991, after Coalition air forces had already expended more than half of their total effort against the Scuds, there were no confirmed kills of mobile launchers, although postwar special operations force accounts suggest otherwise. Nevertheless, any successes air attacks may have scored against the Scuds serve to illustrate the general relative immunity of mobile Scud ballistic missiles at the time of the Gulf War. After the war U.N. inspectors oversaw the destruction of the nineteen mobile launchers and several decoys which Iraq admitted it still possessed.

The Coalition's anti-Scud air effort should not be seen as a dead loss to the overall war effort. It kept the rate of Scud firings, which averaged approximately one per day, to levels tolerable to both Israel and Saudi Arabia. Israeli counterattacks might have given Saddam Hussein his one chance to end the war on favorable terms. But the comparatively successful Scuds presented a troubling new challenge for air power—they were relatively cheap to purchase or produce, very easy to hide, and accurate enough to inflict great, if indiscriminate, damage with nuclear, biological, and chemical warheads. Scuds confront modern air forces with many of the problems peculiar to guerilla warfare. Militarily, the anti-Scud air effort was a successful strategic diversion imposed by Iraq on the Coalition. Strategic sorties expended on those missiles might have damaged targets of much more lasting significance. However, in both political and diplomatic terms for Iraq the Scuds failed. They neither drove Saudi Arabia from the conflict nor

dragged Israel into it, and the negative publicity they generated further alienated Hussein's regime from the world community.

The "core" target sets constituted the centerpiece of the strategic air campaign against Iraq in the Gulf War. They were the objects of sixty-five percent of the strategic air campaign, a total of 8,188 sorties. They were of vital importance to Iraq's war effort, and their vulnerability to air attack varied. The attack on Iraq's leadership and command, control, and communications assets produced significant, if mixed, results. It failed to depose Hussein, tainting for some the rest of what was, undeniably, an extraordinary air campaign. Air power undoubtedly succeeded in forcing Hussein to accede to the wishes of the Coalition, whether he wanted to or not. Its secondary results greatly complicated his ability to prosecute the war and provide important and encouraging lessons for future strategic air operations.

In sum, the attacks on oil and especially electrical targets were highly successful, producing immediate and damaging results. They validated the Warden group's methodology of searching for centers of gravity and bombing for effect. The attacks on nuclear, chemical, and biological targets were effective against known targets and inflicted significant delay on Iraqi weapons programs, but they did not destroy them in their entirety because of intelligence shortfalls.

Although the strikes on Iraq's military support structure caused serious delays in production and in the full reconstitution of its armed forces, they did not entirely destroy its capabilities. Of course, the delay in and of itself benefitted Iraq's neighbors, who have, since the end of thr war, launched aggressive acquisition and training programs to prepare their defenses against a renascent Saddam Hussein or his successor. Overall, the striking of support structures suggests that it is far less economical to bomb the many diffuse factories that produce arms directly for the military establishment than it is to disrupt the power sources and transportation nets that feed them.

Finally, the Scud targeting system illustrates the intimate link between military and political power. When considered alone, the anti-Scud effort was a disappointment that raises disturbing problems for future air power campaigns. However, when considered in the light of Clausewitz's belief that warfare is an extension of state politics, the anti-Scud effort justified the military resources invested in it for it kept Israel neutral. It demonstrated yet again, that at the strategic level, almost every target system involves both a political and a military calculus. In this instance the political objective was paramount and the assault on the target system, therefore, was, ironically, successful.

Self-Defense Targets

The achievement of air superiority and the protection of friendly bases and forces are vital for a successful strategic air campaign. To guarantee those prerequisites Coalition air forces attacked three Iraqi strategic target sets capable of harming Coalition air and naval forces or of protecting the "core" strategic targets:

1. The Iraqi integrated air defense system (IADS)
2. The Iraqi Air Force
3. The Iraqi Navy, and its associated port facilities and anti-shipping missiles

The Coalition directed twenty-nine percent of its strategic air effort to the suppression or destruction of these three vital target sets. All three proved extremely vulnerable to Coalition air action.

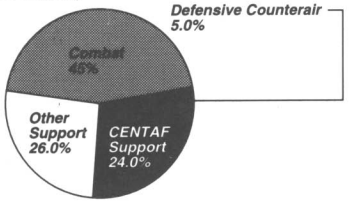
CENTAF air planners directed the first air actions against Iraq's integrated strategic air defense system. Coalition aircraft with anti-radiation missiles intimidated Iraqi SAM and AAA radar operators, who hesitated to operate their equipment lest their signal lock-on attract a destructive, beam-riding response. Because of the anti-IADS strikes, within minutes of the start of hostilities on the night of January 17, 1991, Coalition aircraft could operate with impunity at high and medium altitudes. From that date, Coalition aircraft took losses primarily at low altitudes during the last weeks of the war, delivering attacks on Iraqi ground forces to pave the way for Coalition ground operations and to supply close air support when the liberation of Kuwait began on February 24, 1991. (Iraqi ground units, especially the *Republican Guard*, had ample anti-aircraft artillery and numerous shoulder-held surface-to-air missiles to create a dangerous ground environment.) In brief, the speedy destruction of Iraq's integrated air defense network allowed the Coalition freedom of the air. It was a success for the strategic air campaign and set the tone for the rest of the war.

Iraq's airfields and the aircraft they housed absorbed twenty-four percent (3,047) of the strategic air campaign's total sorties. Initial Coalition air attacks concentrated on runway denial and then switched to hardened air and maintenance shelters. These attacks destroyed or forced out of the country nearly one-half of the Iraqi Air Force and damaged its essential support facilities and equipment. The remainder of the Iraqi Air Force would suffer from spare parts, maintenance, and training problems until it could regain access to the international arms market. Until then it possessed a limited ability to suppress internal re-

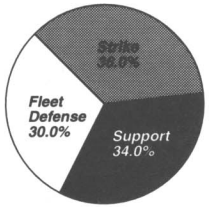
Shares of US Air Sorties

D-Day to Cease Fire

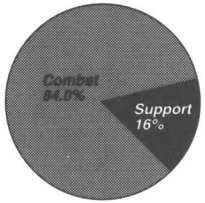
CENTAF Sorties *(Total 65,318)*



NAVCENT Sorties *(Total 17,160)*

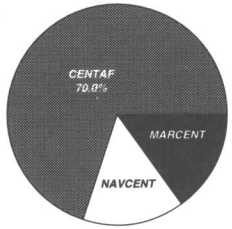


MARCENT Sorties *(Total 10,207)*

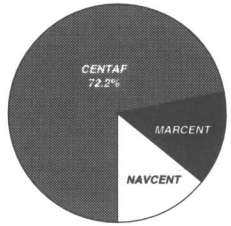


US Aerial Munitions Expended

Gravity Bombs

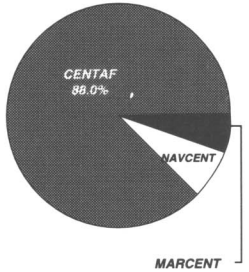


Total Numbers: 210,800 Bombs

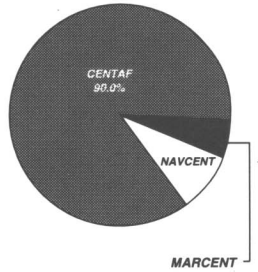


Total Tonnage: 84,200 Tons

Precision-Guided Munitions



Total Number: 15,500 PGMs



Total Tonnage: 7,400 Tons

volts, but not to threaten neighboring states. Given the Coalition air forces' lopsided advantages in quality and quantity of men and matériel, the destruction of the Iraqi Air Force was but a question of time and blood and how much the Coalition wished to sacrifice. In fact, the Coalition lost only a single F/A–18 and pilot to a look-down shoot-down MiG–25, and only a handful of both to ground fire or SAMs over enemy airfields. It achieved air superiority the moment the first F–15C crossed into Iraq's airspace and total air supremacy soon thereafter. The USAF had trained for counterair operations and its use of precision guided munitions denied Iraq a secure sanctuary. The Coalition's air campaign achieved success sooner even than its planners anticipated. It ranks with the 1967 Six Day War as the quickest seizure of air supremacy in military aviation history.

The U.S. Navy, relying heavily on its air arm, overwhelmed the Iraqi Navy. The only target environment offering less concealment for enemy forces from air power than the desert is the water's surface. Naval aircraft and helicopters destroyed 11 of 13 anti-ship missile boats, destroyed or damaged 143 of 165 Iraqi combatant vessels, eliminated 3 of 7 shore-based anti-ship missile sites, and heavily damaged Iraq's 2 naval facilities. This, plus the absence of any air threat, allowed the Coalition to bring its U.S. aircraft carriers closer to Iraq, easing the air refueling workload that hampered naval aviation operations.[56] The elimination of the Iraqi Navy also increased the effectiveness of a major Coalition deception—the threat of a U.S. Marine Corps amphibious invasion near Kuwait City. This target system absorbed two percent (247 sorties) of the total strategic effort.

The attack on Iraqi air defenses was by far the most successful part of the strategic air campaign. U.S. intelligence could easily locate massive support facilities—hardened air operations centers, airfields, and naval ports that could hardly be dismantled, dispersed, or buried. Enemy SAMS and AAA without central control rapidly lost effectiveness, as did aircraft and ships separated from their permanent bases.

"Mixed" Target Sets

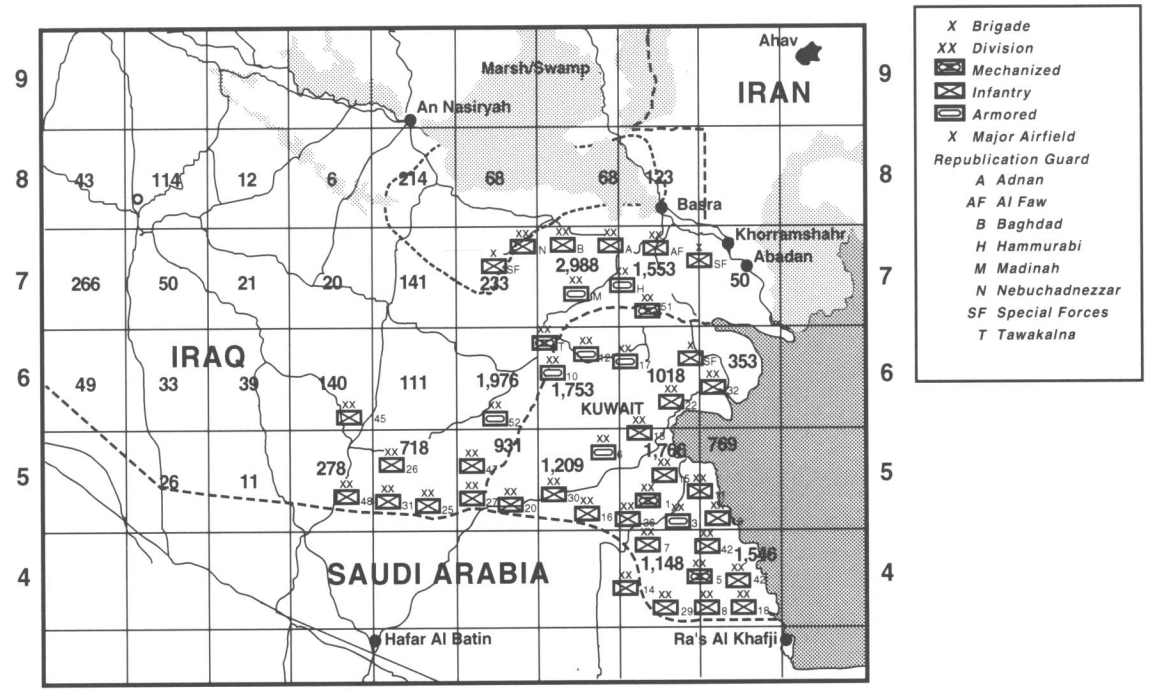
The last two target systems of the strategic air campaign—rail and highway bridges and the *Republican Guard*—shared political and strictly military considerations belonging to the tactical air campaign conducted by the Coalition in the Kuwaiti Theater of Operations and to the strategic air campaign against Iraq. The bombing of bridges for the purposes of interdicting Iraq's lines of communication[57] into Ku-

wait, thereby depriving Iraqi forces there of the necessary means to fight, was strictly a military objective. But the destroying of bridges to prevent the escape from Kuwait of Iraqi ground forces, particularly the *Republican Guard*, involved both military and political considerations. The strategic air campaign expended six percent of its effort against bridges,[58] a vital target system (but less vital than anticipated by air planners) to Iraq's war effort. As evident from historical experience, bridges were highly resistant to the effects of "dumb" bombs, but shockingly vulnerable to precision guided munitions. The strategic air campaign destroyed or heavily damaged three-fourths of the major bridges between Baghdad and Basra, including all nine railroad bridges whose single-track railroad carried most of the Iraqi Army's and *Republican Guard*'s heavy equipment being moved for other than tactical or battlefield operations. The complete loss of Iraq's rail capacity *out* of the Kuwaiti Theater of Operations inhibited the speedy retreat of its armored and mechanized units. The elimination of rail transport constricted Iraq's supply lines to Az Zubayr, the supply head for Iraqi troops in Kuwait, on the Iraq-Kuwait border. The loss of bridges reduced truck traffic to Az Zubayr down the four-lane superhighway and rail traffic down the temporary line which linked the town to Kuwait City and points west and south. The resupply of the occupation forces in Kuwait dropped to a small fraction of its prewar level and proved unable to meet Iraq's needs for sustaining either offensive *or* defensive operations.

Bridge bombing also produced traffic jams vulnerable to Coalition air power and increased wear and tear on Iraq's motor transport fleet, which was forced to travel greater distances over alternate routes. In response, the Iraqis built numerous pontoon bridges (of much lesser capacity than the permanent bridges they replaced) and other workaround solutions, such as earthen causeways. But in the precision weapons era, Coalition air power easily countered these historically useful defensive measures by destroying many of them and mounting frequent "river reconnaissance" patrols to disrupt other Iraqi efforts. Thus, as in LINEBACKER I, precision guided munitions inflicted the greatest damage to bridges, accounting for forty-five percent of all munitions expended against them. In this instance, the strategic air campaign achieved an ideal match between a weapon's capability and its target system.

Anticipating the interdiction campaign, Iraqi forces in Kuwait attempted to offset the effect of Coalition air power's severe constriction of their lines of communication by stockpiling large amounts of sup-

Strikes Targeted by Kill Box (17 Jan-28 Feb 1991)



plies and materials in the months between their invasion of Kuwait in August 1990 and mid-January 1991. In fact, the vast physical extent of the numerous revetted and highly dispersed Iraqi supply dumps, so discouraged Coalition tactical air planners that they "never attempted a coherent campaign to interdict the flow of supplies into the theater." Iraqi forces in Kuwait had consumed only a fraction of the stores available before the ground offensive began on February 24, 1991. But overwhelming Coalition air presence over the front denied them mobility and prevented them from using the stores they had so carefully hoarded. Thus, some frontline forces were virtually on the brink of starvation even though prewar stockpiles were ostensibly "easily within reach." Why was this so? The Coalition tactical air campaign in Kuwait succeeded in greatly complicating Iraq's supply distribution from its dumps in Kuwait to its unit logistics centers and troops in the field by targeting supply convoys and even individual trucks. Although the Iraqis had adequate supplies in Kuwait, they could not get them to the front where some units had few or no deliveries of rations and water after the air offensive began. This interference with Iraqi supply distributions resulted more from the pattern of Coalition tactical air attacks than from a consistent assault on the supply system. Coalition aircraft operating in their assigned "kill boxes" routinely struck at any moving target (supply, fuel, and water trucks are more vulnerable to enemy fire than armored fighting vehicles) or at any target in the open (the Iraqis did not routinely park their trucks in revetments). Reports from Iraqi prisoners-of-war clearly reveal that Coalition tactical air power caused serious logistical difficulties for front-line forces. If the ground war had lasted much longer their resupply incapacity would have fatally handicapped them.

General Schwarzkopf's Operations Order of January 17, 1991, reflecting his instructions from Secretary Cheney, identified the *Republican Guard* as an "Iraqi center of gravity," that is, a target essential to Iraq's conduct of the war and to the survival of Hussein's regime. The DoD Final Report claimed that thirty-one percent (5,646) of all *strategic air campaign* sorties flew against these units. Although the number of strategic sorties expended on the *Republican Guard* is "official," it is most misleading in two ways. The inclusion of all Coalition air sorties flown against the *Republican Guard* in the summary count for strategic target sets (it is the largest number of sorties flown against any of the twelve strategic target sets) overstates by one-third the overall size and level of the strategic effort compared with both the Coalition air effort in Kuwait and the overall Coalition air effort.[59]

Second, at war's end, a higher percentage of *Republican Guard* units and their heavy equipment avoided destruction in Kuwait than any other part of the Iraqi army.[60] Placing "all sorties" flown against the *Republican Guard* against the strategic air campaign appears to place the blame, if any, for failure to destroy the *Republican Guard* on the strategic air campaign alone. It also capriciously absolves tactical air power, Coalition ground forces, and U.S. military and political decisionmakers of their responsibility to destroy Saddam Hussein's political lifeguards.

The fact that much of the *Republican Guard* survived the war intact has prompted controversial and heated debate that has already generated revisionist interpretations. The survival of the *Republican Guard* recalls the successful German and Italian evacuation from Sicily in August 1943 (which took place in the face of overwhelming allied land, sea, and air superiority), and, to some degree, the escape of German forces after the near-disaster of the Falaise Gap in 1944. Like that of the Germans at Falaise, the survival of the *Republican Guard* rested as much on a complicated series of decisions taken by Coalition ground commanders and political leaders as it did on Iraqi initiatives.[61] Hussein committed eight divisions of the *Republican Guard* to Kuwait.[62] The three heavy divisions, the Tawakalna (We Trust in God) Mechanized Division, and the Hammurabi and Madinah Armored Divisions held second-echelon or strategic reserve positions on the Kuwait-Iraq border. Traditionally, after an operation (such as the invasion of Kuwait) the *Republican Guard* was withrdrawn from the front to rest, rehabilitate, and retrain for future operations. Because it performed internal security functions it had to preserve its fighting ability at all times. The southern and westernmost, as well as the most powerful of the three divisions was the Tawakalna, covering the Wadi Al Batin, where the Iraqis anticipated a major Coalition ground attack. Its placement also gave it the potential to swing westward to confront a Coalition flanking attack (the actual Coalition maneuver). It was the most militarily threatening of the *Republican Guard* divisions. Consequently, it received the heaviest aerial bombardment. The Madinah Division had dug in and dispersed where the Kuwait-Iraq border began to curve to the south, while the Hammurabi Division stood on the border midway between the Persian Gulf and the Madinah Division.

When Coalition commanders referred to the *Republican Guard* they invariably meant these three units. The three "kill boxes" containing the heavy *Republican Guard* divisions and parts or all of eight out of twelve of the Regular Iraqi Army heavy divisions ranked as the top

three boxes in numbers of Coalition air strikes and absorbed almost one-third of the total fixed-wing strike sorties allotted to the Kuwaiti Theater of Operations. Prior to the start of the ground war *Republican Guard* heavy divisions had lost by the most conservative estimates at least twenty-four percent of their armored fighting vehicles to air attacks. By the end of the war, the Iraqi Army deployed in the KTO had suffered the loss of approximately seventy-six percent of its tanks, fifty-five percent of its armored personnel carriers, and ninety percent of its artillery, while the *Republican Guard* heavy divisions had suffered only a fifty percent loss in the same categories. (On G-day, the beginning of the ground operation, CENTCOM accepted that air attack had already caused a forty percent loss of tanks, forty percent of artillery, and thirty percent of other armored vehicles in the KTO. Subsequent analysis indicated true figures on the order of sixty percent of tanks, sixty percent of artillery, and forty percent of other armored vehicles).

Several factors account for lighter losses among the *Republican Guard* heavy divisions. One was the desert itself. Many analysts have remarked that its open spaces served Coalition air power well by making enemy concealment more difficult. But it also gave the defenders an advantage by absorbing and muffling the high explosive effects and concussion of bombs and shells—unlike more compact soils, which spread blasts and fragments over wide areas.[63] It thus reduced secondary bomb damage and direct hit accuracy. The *Republican Guard*'s geographical position in the Iraqi theater, fifty or more miles removed from the front line, enabled it to exit or avoid combat without having to abandon its vehicles to Coalition ground forces. The Tawakalna Division, the closest *Republican Guard* division to the front suffered the heaviest losses. The heavy divisions' geographical position also put them closer to the excellent Iraqi combat engineering corps, which apparently constructed more bomb-proof revetments for the *Republican Guard* heavy divisions' equipment than for other Iraqi formations closer to the front. Moreover, their distance from the front line relieved them of having to deploy themselves into relatively tight tactical defensive positions to repel immediate Coalition ground attacks. Instead, they could disperse their formations over a much wider area, taking advantage of the blast protection of the sand, which further attenuated the effect of tactical bombing done largely with non-precision "dumb" ordnance. This extra protection made them a more difficult target. Their distance from the front also increased the logistical effort needed to mount an air package against them, while their heavier air defenses

made it more costly for Coalition aircraft to approach them.[64] The Coalition's policy of avoiding casualties also contributed to the *Republican Guard*'s survival. CENTAF limited its A–10As to shallower penentrations at higher altitudes after losing two to ground air defenses in *Republican Guard* areas on February 15, 1991. At the same time, at the insistence of Coalition ground force corps commanders, General Schwarzkopf concentrated tactical air efforts on Iraqi front line divisions and lessened those against the *Republican Guard.*

During the Coalition ground assault, the U.S. Army VII Corps caught up with the Tawakalna Division, which apparently served as a rear guard, and inflicted severe casualties. The VII Corps also encountered elements of the Madinah Division (which suffered nearly a fifty percent loss of equipment from all Coalition ground and air action) retreating into an assembly of Iraqi forces near the Basra pocket. The Hammurabi Division (which sustained a twenty-five percent loss of equipment to all Coalition action) was already there. Unlike the desert, the Basra pocket contained a large city, suburbs, and numerous farming villages. Imagery shows that the *Republican Guard* and other Iraqi ground forces were well aware of the Coalition's policy of limiting collateral damage and took advantage of it to huddle as close as possible to civilian structures. This situation in the pocket and bad weather lowered bombing accuracy and frustrated Coalition air forces. The close proximity of Coalition ground forces heightened the chance of losses to friendly fire and required careful identification of ground targets. Finally, General Schwarzkopf placed Iraqi territory near the border of Iran off-limits to avoid airspace incursions and unnecessary international incidents. Nonetheless, by the last day of the war, Coalition air power had managed to damage or destroy every bridge out of the pocket. On February 28, 1991, both the Hammurabi and Madinah Divisions had reached Iraqi-controlled territory in the area.

The tale of the *Republican Guard* infantry[65] and special forces divisions is quickly told. They occupied positions at least ten to fifteen miles behind the *Republican Guard* heavy divisions in an arch stretching from An Nasiriyah to the Persian Gulf. They were, of all of the Iraqi ground forces in the Kuwaiti Theater of Operations, closest to the escape routes over the Euphrates River and Basra bridges and farthest from Coalition ground and air forces. They not only occupied reserve positions but blocked the retreat of individual Iraqi deserters and all other Iraqi ground forces. These units, far as they were from potential ground battle areas, offered little military threat to Coalition ground operations. They also received far less tactical air bombardment than

Republican Guard and Regular Iraqi Army heavy divisions. If they moved forward they faced heavy Coalition units while on the march or within hastily prepared defensive positions, which offered little protection. These units made no attempt to engage Coalition ground forces. By the end of the first twenty-four hours of the ground war three of them had left the theater. The remaining two either left the theater soon afterwards or retreated to the relative safety of the Basra pocket. Although not unscathed by Coalition air operations, they probably suffered, all told, only light casualties; the number is unknown. Assisted by troops remaining in Iraq and other relatively intact units escaping from the theater, they would prove decisive in suppressing later Kurdish and Shiite uprisings.[66]

The theater commander directed air and ground forces against the *Republican Guard* because he identified it as a "center of gravity." However, he overemphasized its military threat to Coalition ground operations and underemphasized its political function to maintain Hussein's regime. Concentrating the ground and air forces on the three *Republican Guard* heavy divisions, he wisely made little effort against the *Republican Guard* infantry, which was militarily insignificant and a difficult target for both air and ground operations. The *Republican Guard* ground forces in practice and actuality were not, and could not be, a "strategic target" system. The survival of the *Republican Guard* should not be used to discredit strategic bombing as a method of waging war. After all, tactical air attacks on other Iraqi ground forces and, especially, vehicles, were so successful as to obviate any need for a traditional casualty-heavy ground war. The Gulf War was, in fact, most remarkable because no armored battle occurred equivalent to an El Alamein, or Kursk, or Mortain, or even a 1973 Arab-Israeli War in the Sinai. Air power, attriting more than sixty percent of Iraq's tanks, eliminated the need for a punishing force-on-force battle.

When compared with earlier strategic air campaigns, that of the Gulf War had a final and significant achievement: it avoided inflicting large numbers of civilian and military casualties. Although an initial (later disavowed) DIA estimate reported 100,000 dead and 300,000 wounded in Kuwait, more than all Iraqi forces there, by 1993 the figure of Iraqi military casualties had shrunk from 700 to 2,000 dead and 3,000 to 7,000 wounded. John G. Heidenrich determined the latter figures, basing his analysis on the absence of mass Iraqi graves in Kuwait and mammoth field hospitals with Iraqi wounded, and the small number of wounded Iraqi prisoners. He argued convincingly that few wounded meant even fewer dead. He placed the number of Iraqi civil-

ian dead at less than 1,000. Both figures testify to the extent to which Coalition air strikes concentrated on equipment rather than people and to the care the Coalition took to avoid collateral damage.

Conclusion

Overall, the planners who put together the strategic air campaign against Iraq could take justifiable satisfaction in the results. The swift, devastating attacks against the Iraqi air defense network; the Iraqi Air Force; and communications, electrical power, and transportation targets set the stage for the rapid and overwhelming destruction of a nation that had, on the eve of the war, a very large and reasonably proficient military force and a record of inflicting punishing losses on an attacker. In any case, Iraq had no hope of denying the Coalition an ultimate military victory; after the first night's aerial blitz its ability to defend itself began to precipitously decline. The war reaffirmed the most important lesson of air power—without air superiority, a nation loses its ability to exercise its prerogatives. The success of the air campaign against emplaced and fielded Iraqi forces and the Iraqi Navy demonstrated that in the air power era, two-dimensional surface forces are held hostage by three-dimensional aerial forces. The war also confirmed the important interrelationship between tankers and airlift, and airlift/tanker/strike aircraft and precision munitions. In particular, the highly controversial stealth fighter, the F–117A, proved its overhelming value, ending a debate on its relative merits that had raged throughout the 1980s. The war emphasized that high-technology systems with precision munitions can offset those that are more numerous and less-sophisticated. It highlighted the advances in surface-to-air missile systems and AAA that have essentially made the low-altitude environment "off limits" to conventional strike aircraft and have forced a resurgence of interest in greater-distance stand-off attacks with autonomous or near-autonomous precision munitions. In the air campaign, the greatest disappointment was perhaps the "Great Scud Hunt," but, even here, air presence reduced Scud launches from a peak of ten to one or less per day. Scud-like systems will require greater attention in future as ballistic rockets and cruise missiles proliferate.

The strategic air campaign against Iraq did not achieve every goal of the CHECKMATE and CENTAF Special Planning Groups—particularly the collapse of Hussein's regime. But, to echo Robert Burns' aphorism, "a man's reach should exceed his grasp, or what's a Heaven

for?" It certainly fulfilled the theater commander's expectations of what air power should do and it played a crucial role in fulfilling President George Bush's political objectives. (After the war, speaking at the Air Force Academy, Bush declared: "Gulf Lesson One is the value of air power.") Those who fault the strategic air campaign in the Gulf War because it failed to achieve one hundred percent success argue for perfection. What can be said now is this: the *strategic* air campaign against Iraq was *a* decisive factor in Iraq's defeat. But, more important, when joined to the *tactical* air effort—the element which consumed almost seventy-five percent of the total air effort—strategic and tactical air power together constituted *the* decisive factor in the Coalition's quick and almost bloodless victory in the Persian Gulf War.

Notes

[1]The U.S. Central Command (USCENTCOM) was a unified command established and designated by the President under a single commander. It consisted of elements drawn from two or more U.S. military services and corresponded to the World War II-era Theater of Operations. USCENTCOM's geographical Area of Responsibility (AOR) in 1990 covered a broad region comprising much of the Muslim world. Within its purview fell the following nations: Egypt, Sudan, Ethiopia, Kenya, Somalia, Djibouti, the two Yemens, Oman, Saudi Arabia, the United Arab Emirates, Bahrain, Qatar, Kuwait, Jordan, Iraq, Iraq, Afghanistan, and Pakistan. It also included the Red Sea, the Persian Gulf, the Gulf of Aden, and the Gulf of Oman. U.S. Air Force (USAF) aircraft that took part in the Gulf War air campaign but flew from bases in Turkey, Spain, and Great Britain, belonged to another unified command, the U.S. European Command (USEUCOM). B–52 bombers that flew from the island of Diego Garcia, a British possession in the Indian Ocean, belonged to the U.S. Strategic Air Command (SAC). Diego Garcia lay in the U.S. Pacific Command (USPACOM) AOR.

[2]The following countries, all members of the International Coalition taking arms against Iraq, contributed combat aircraft to the War in the Persian Gulf: the United States, the United Kingdom, France, Italy, Canada, Saudi Arabia, the United Arab Emirates, Egypt, Oman, Kuwait, Bahrain, and Qatar.

[3]The Kuwaiti Theater of Operations (KTO) was only a portion of the overall Coalition-Iraqi battlefield. It was defined as the area north of the Saudi Arabia-Iraq border; south of the thirty-first degree north latitude line; west of the Persian Gulf and of the Iran-Iraq border, and east of the forty-fifth degree east longitude line. This area included Kuwait and southeastern Iraq, including the major Iraqi city of Basra, and stretched approximately from the Iraqi city of As Samawah on the west to the Persian Gulf and from Saudi Arabia to the Iraqi city of An Nasiriyah in the north. It contained most of the elite *Republican Guard* and a large portion of the Regular Iraqi armed forces (for a combined total of forty-three under-strength divisions). Most of the operations of the strategic air campaign against Iraq occurred outside the KTO, while all Coalition tactical air operations took place within it.

[4]These attacks characteristically left bridge spans all or partially severed from their supports and resting in the water. They appeared as if they had "dropped" into the water. USAF pilots quickly made note of this and service slang began to refer to bridges as "dropped" rather than destroyed. It is a more accurate term in that a permanent bridge is not "destroyed" unless its concrete abutments and piers are demolished.

[5]The F–16 and the A–10 can deliver a Maverick air-to-ground missile (AGM). It is precision guided, designed for an anti-armor role, and achieved excellent results in attacks on Iraqi tanks and armored personnel carriers. The Maverick does not have the penetration, weight, and amount of high-explosives required for strategic bombing.

[6]The British Royal Air Force (RAF) possessed the JP–233 airfield-denial munitions, which dispensed weapons capable of penetrating hardened concrete runways. It was not designed for use against structures. A hardened structure is an individual building or facility sheathed in several feet of specially-hardened steel-reinforced concrete, often covered with several feet of rubble and earth. Earth fill, hardened concrete, and sheet steel plate may alternate in covering a single "super hardened" facility. A conventional high explosive bomb will either explode on contact or only dig a slight

hole in a hardened structure before exploding. It essentially does no damage beyond obliterating aerials and other "soft" protrusions from the target. Penetrating munitions burrow through several feet of hardening to explode inside the target.

[7]Lockheed had amassed considerable experience in this field. In the late 1950s and 1960s, designers of the A–12 Oxcart and SR–71 Blackbird strategic reconnaissance aircraft gave considerable attention to the reduction of their radar return. In the 1970s Lockheed built the experimental Have Blue stealth technology demonstrator, the first aircraft designed and built when stealth characteristics were paramount. Have Blue, a milestone in its own right, furnished a valuable data base for the later F–117A.

[8]The Schnorkle was a captive buoy with an air hose attached. It allowed a submarine to stay below the surface to avoid detection and still use its air breathing diesel engines and conserve or recharge its electric drives. Use of the more powerful diesel engines doubled a submarine's speed. However, improved radar permitted the allies to locate even the Schnorkle. The Germans countered with radar-absorbent material.

[9]"Near real time" in military parlance accounts for the delay between the occurrence of an event and the receipt of data about it at some other location by automated data processing and display. "Real time" signifies essentially no delay between the occurrence of an event and receipt of data elsewhere except for that of transmitting electromagnetic energy. Definitions are found in *The Official Dictionary of Military Terms* (JCS Pub 1), compiled by the Joint Chiefs of Staff (Cambridge, Mass: Hemisphere Publishing Corp, 1988)

[10]During the Gulf War CHECKMATE, located in the Pentagon sub-basement, became the short hand reference for all Deputy Directorate of Warfighting Concepts. The deputy directorate funneled most of its communications to the Special Planning Group (the "Black Hole") in Riyadh through CHECKMATE.

[11]During the Gulf War members of the deputy directorate went so far as to put a plaque on the door of the CHECKMATE office stating simply "Air War Plans Division."

[12]*The Official Dictionary of Military Terms* (JCS Pub 1), compiled by the Joint Chiefs of Staff (Cambridge, Mass: Hemisphere Publishing Corp, 1988) defines air superiority as "that degree of dominance in the airbattle of one force over the other which permits the conduct of operations by the former and its related land, sea, and air forces at a given time and place without prohibitive interference by the opposing force." Air supremacy is defined as "that degree of air superiority wherein the opposing air force is incapable of effective interference."

[13]In addition to his temporary assignment as CENTCOM Forward, Lieutenant General Horner simultaneously held several other positions. As a USAF General he commanded the U.S. Ninth (Tactical) Air Force (a command composed entirely of USAF units). When the Ninth Air Force acted as part of CENTCOM Horner became the Air Component Commander (ACC) and the Commanding General, Central Command Air Forces (CENTAF), which included all USAF units (the Ninth Air Force plus reinforcements) save USAF Special Operations Forces units, in the CENTCOM area of responsibility. General Schwarzkopf also appointed Horner the Joint Force Air Component Commander (JFACC), with the duties of planning, coordinating, allocating, and tasking theater-wide air operations (including U.S. Marine Corps (USMC) and U.S. Navy (USN) aviation and all aircraft belonging to Coalition air forces committed to the defense of Saudi Arabia) in accordance with the Commander in Chief, U.S. Central Command's (Schwarzkopf's) apportionment decisions. Horner's duties

as JFACC also made him the Airspace Control Authority (ACA) and Air Defense Commander (ADC), which in practice gave him control over all Coalition and Iraqi airspace. He had the last word in controlling flight paths, preventing excessive airspace congestion, and coordinating flights with air defenses. Any flying had to be cleared with the JFACC. One way or another Horner had the dominant air power voice in the in-theater U.S. and Coalition command structures.

[14]The USAF defined "collateral damage" as "the damage to surrounding resources, either military or non-military, as a result of actions or strikes specifically against enemy forces or military facilities." See *Air Force Manual 11-1*, Air Force Glossary of Standardized Terms, HQ, USAF, 1989.

[15]The secrecy met Schwarzkopf's wishes that U.S. offensive planning activities be tightly guarded.

[16]As with many a *nom d'guerre* there is some dispute as to how the Black Hole got its name. The major alternative explanation revolves around the physical space occupied by the Special Planning Group after a reorganization moved it from an office adjacent to Lieutenant General Horner's office to a room in the basement of the RSAF Headquarters Building in Riyadh, soon referred to as the Black Hole.

[17]This was neither a formal change of task nor one called for by doctrine or philosophy. Rather, it acknowledged the fact that the *Republican Guard*'s physical location in the Kuwaiti Theater of Operations placed it beneath air space controlled by the tactical, not strategic, planners.

[18]The USN's F/A-18C had an unrefueled strike range of 160 miles, while the A-6E had a 390-mile strike range. Strike range is the distance an aircraft can fly to a target, attack it, and return. (For example the F/A-18C can attack targets up to 160 miles away and return to base for a total unrefueled flight of up to 320 miles.) Strike range includes fuel consumed in tactical or evasive maneuvers to and from the target, in carrying weapons, in forming up, and in waiting to land. An aircraft's designed range may far exceed its actual strike range. If an F/A-18C flew a shuttle mission, not normally done in the Gulf War, it could take off from Base A, attack a target, and land at Base B as long as its total unrefueled elapsed flight totaled no more than 320 miles (160 miles x 2). The maximum distance an aircraft can travel in a straight line, without refueling is its radius; approximately twice the distance of its designed combat range.

[19]The Air Tasking Order (ATO), known to Vietnam-era USAF veterans as the FRAG Order, scheduled and coordinated all daily Coalition air activity over Iraq and Saudi Arabia. It did not cover USN fleet defense sorties. For each individual sortie it supplied call signs, deconfliction of air space, coordination with friendly air defenses, electronic warfare, suppression of enemy air defenses (SEAD), and combat search and rescue (CSAR). It also provided target assignments (sometimes even specific weapons) and escort and tanker rendezvous. A single ATO, when completed, filled a computer printout the size of a telephone book. The ATO controlled all flights over Saudi Arabia and most over Iraq (USAF aircraft flying out of Turkey compiled their own ATO, but CENTAF assigned their targets) and in theory one could not fly without specific authorization by the ATO. The ATO was a powerful tool in the hands of JFACC, Lieutenant General Horner.

[20]The Master Attack Plan reflected targeting strategy, changing priorities of the CENTCOM Commander in Chief (CINC) and higher authorities, combat and political developments, the latest intelligence from multiple sources, weather, threat, and the

availability and suitability of attack assets. It attempted to match the most appropriate weapon and/or delivery system, given current circumstances, with a target. Unlike the Air Tasking Order, the Master Attack Plan was relatively concise. The first day's (January 17, 1990) Master Attack Plan, the only one to include two nights (January 16 and 17 and 17 and 18 and the day of the 17th), consisted of only twenty-one pages.

[21]Sometimes a military planner such as Lieutenantt Colonel Deptula occupied important positions with more control over actions than his rank might suggest. Historic examples of other field grade planning officers with seemingly disproportionate influence include Colonel Max Hoffman, Imperial German Army, plans officer for Generals Hindenburg and Ludendorf from 1914 to 1917; Commander Minoru Genda, Imperial Japanese Navy, who planned the Pearl Harbor attack; and U.S. Army Air Forces (USAAF) officers, Lieutenant Colonels Harold L. George and Kenneth N. Walker, Major Haywood S. Hansell, and Captain Lawrence S. Kuter, who created Air War Plans Division Plan No. 1 (AWPD/1) in nine days (August 1941). AWPD/1 served as the early blueprint of the USAAF's wartime expansion and employment.

[22]Before and during the conflict, Lieutenant General Horner and Brigadier General Glosson stressed to air planners and air wing commanders alike that minimizing Coalition losses came before any other consideration. (See, Interview (S/NF), Major General Buster C. Glosson, Director of Legislative Affairs, USAF Air Staff, with Richard G. Davis, Perry D. Jamieson, and Diane T. Putney at Bolling Air Force Base, Washington, D.C., December 11, 1991.)

[23]The Department of Defense in 1989 defined target materials as "graphic, textual, tabular, or other presentations of target intelligence primarily designed to support operations against designated targets by one or more weapon systems. Target materials are suitable for training, planning, executing, and evaluating such operations." The Black Hole also had difficulty obtaining target folders for specific targets and information about Iraqi air defenses through CENTAF intelligence channels.

[24]Bomb Damage Assessment (BDA) assays the effects of all air attacks (bombs, rockets, and strafing) on a target. The prime source of BDA is photographic intelligence from various means of collection such as satellite imagery, reconnaissance aircraft, and strike aircraft gun cameras or video tape recorders. All aircraft capable of designating for laser-guided bombs have video tape recorders. As one would expect, poor weather over a target can seriously degrade or delay BDA.

[25]The F–15E, the F–111F, and the F–117A, all designated to participate in the strategic offensive air campaign, carried video tape recorders.

[26]Low-Altitude Navigation and Targeting Infrared for Night (LANTIRN) is a two-pod electronics system that increases aircraft capability in night flying. The navigation pod, which equips the F–15Es and some F–16s, allows for precise nighttime location and navigation. The targeting pod, just coming into service in mid-1990, gave a self-designating precision guided munitions (PGM) capability to its carrying aircraft. There were too few targeting pods for both the F–15E and F–16, thus all available pods were reserved for the more capable F–15Es.

[27]Pave Tack was a belly-mounted laser and infrared (IR) sensor system that allowed the F–111Fs to self-designate for their own laser-guided bombs.

[28]The French, who built the system, named it "Kari"—Iraq spelled backwards—in French.

[29]Throughout the war, the USAF provided its units in-theater with excellent combat logistics and support. A reliable local airlift composed of C–141 and C–130 transports carried vital spare parts from logistics facilities in the United States and distributed them to the field, permitting ground crews to turn around F–15Es in twenty-two minutes.

[30]Local Baghdad Time, not Zulu (Greenwich Mean Time), is used here, as it was by the strategic planners. H-Hour was originally set for 0300 Baghdad time, but in the many modifications of the plan pre-H-Hour attacks were added. It seemed easier to leave them pre-H-Hour than to rearrange the times for all of the other units, at least one of which could be counted on not to get it right at the worst possible time. Washington, D.C., on Eastern Standard Time was seven hours behind Baghdad time.

[31]This electronic assistance for the attacking F–117As was unique in the campaign. The F–117 wing, over objections of the Iraqi Target Cell, insisted on EF–111A support for this one attack, which was to be the first and only attack against the all-up, undegraded defenses of Baghdad. At no other time in the conflict did the F–117s request or receive dedicated electronic warfare support for a mission. On occasion, of course, they gained some benefit from electronic warfare aircraft supporting other force packages operating in their proximity.

[32]The Tomahawk land attack missile (TLAM), a USN ship-launched cruise missile containing stealth design elements, featured inertial digital precision guidance and could carry either a single warhead or a warhead capable of dispensing multiple sub-munitions. It did not mount a penetrating or hard-target-killing warhead.

[33]Horner and Glosson had received expert advice that Anthrax would decompose rapidly when exposed to sunlight.

[34]A Strategic Air Command briefing, circa 1991, claimed the following circular error probables for SAC bombers: less than 300' for offensive avionics systems (radar bomb sights and supporting systems) and less than 100' using the Global Positioning System (GPS). These statistics do not state if the figures apply to the B–52 or the much more modern B–1 or both. Nor do these figures indicate at what altitude the bombs were dropped. High-altitude drops, such as the majority of those employed in the Gulf War, are inherently less accurate than low-altitude delivery. Even with GPS, B–52-dropped iron bombs were an order of magnitude less accurate than precision guided munitions. (See "Bomber Capabilities: Precision and Mass" slide from Briefing "Strategic Air Command," ca 1991, in SAC Historian's Office, Historians Working Files for FY 1991 Annual History.) Bombing computer software or personnel training problems (such as those caused in switching from low- to high-altitude attacks) might further affect bombing accuracy and introduce additional errors in bomb delivery. A shortage of Bomb Damage Assessment data might compound any delivery problems by allowing missions to repeat mistakes until told to make corrections.

[35]SAC figures indicate that B–52s in the Gulf War flew eighty-five percent of their sorties against Iraqi ground units or ground support targets and only fifteen percent against strategic targets. The *Republican Guard* alone absorbed thirty-seven percent of B–52 sorties. A fact-filled but distorted picture of the B–52's performance in the war is presented on pp. 675–676 of *Conduct of the Gulf War* (unclassified), DoD:

> B–52s flew 954 air interdiction sorties against strategic targets (industrial facilities, C^3 facilities, nuclear/chemical/biological facilities, and short-range ballistic missiles), interdiction targets including *Republican*

Guard units as well as fixed installations such as petroleum, oil, and lubricant storage facilities, and railroads.

B–52Gs flew 527 BAI (Battlefield Air Interdiction) sorties striking armor, mechanized, and infantry units with a variety of general purpose and cluster bomb munitions.

Including *Republican Guard* armor, mechanized, and infantry units, not to mention Iraqi ground forces logistics dumps (fixed installations) in the "strategic" category stands the traditional definition of strategic targets on its head. If those targets are placed, where they should be, in the BAI or ground support categories one will quickly arrive at the 15/85 percent ratio of strategic to tactical targets already noted. It would appear that the authors of *Conduct of the Gulf War*, were loath to admit to the B–52's overwhelming *tactical* role.

[36]The F–117A, F–111F, and the F–15E have the following respective takeoff weights (aircraft, gas, bombs, missiles, and crew) of 52,500; 100,000; and 73,000 pounds. The B–29 (the largest World War II operational bomber) and the B–52G had takeoff weights of 140,000 and 488,000 pounds respectively.

[37]Within a few days of the war's opening, unarmed USAF tanker aircraft began to cross into Iraq to fuel aircraft for deep missions or to support aircraft in trouble. By the end of the conflict, tanker refueling operations over Iraq had become routine.

[38]In the unlikely event of a full-scale nuclear exchange with Russia, China, or the Ukraine, and whatever the role of intercontinental ballistic missiles, U.S. nuclear-capable bombers (B–52s and B–1s) might bomb targets deep within those countries and return. Such nuclear missions likely would suffer heavy casualties and could not be sustained for any lengthy period. But the hydrogen bomb is both the ultimate area-bombing attack and the ultimate smart weapon. Even if it misses by a few hundred feet, one device is almost guaranteed to deliver more than enough destructive energy on the aiming point (and everything else in the surrounding area).

[39]These aircraft consisted of F–15Cs, F–16s, F–4Gs, and F–111Es, plus electronic and tanker support aircraft. At the end of the war on February 25, four F–4Es of the 3d Tactical Fighter Wing (three fully mission-capable) joined the task force. These precision capable F–4Es from the Philippines flew only two unsuccessful sorties. (Trip Rpt [S], Major General G. B. Harrison, JTF Proven Force, AF Center for Studies and Analysis, March 7, 1991, in GWAPS files; information cited is unclassified.) Initially, to reduce coordination and the chances of fratricide (engagement of friendly aircraft by friendly aircraft) JTF Proven Force confined its operations to above the thirty-fifth parallel, while planes based in Saudi Arabia operated below that line. CENTAF air planners supplied JTF Proven Force's targets, but did not include them in CENTAF daily Air Tasking Orders. JTF Proven Force operated somewhat autonomously, but remained handicapped by its lack of precision guided munitions-capable aircraft. Lack of precision aircraft either forced precision guided munitions aircraft from Saudi Arabia to undertake difficult missions to northern Iraq or left some important targets not attacked. (The Turkish Air Force did not participate in operations against Iraq.)

[40]The Turkish government, in part because of confusion within its military General Staff, did not grant permission for USAF air strikes against Iraq from Turkish territory until after the start of Coalition operations from Saudi Arabia.

[41]B–52s, for example, began to conduct strikes from 31,000 feet and above. All F–15Es, F–16s, and F–111Fs switched to medium and high altitudes. The change in

altitudes saved allied lives by placing attacking aircraft beyond the effective range of low-level Iraqi anti-aircraft artillery (AAA) It further increased the effect of bad weather in that more clouds cause mission cancellations at 10,000 feet and above than at 2,500 feet. Higher altitudes requiring higher releases also adversely affect bombing accuracy. The longer the distance a bomb must travel the greater the magnification of any errors. Lack of high-altitude training for crews and delays in reprogramming on-board aircraft bomb-aiming software to compensate for the new height variables also contributed to bombing inaccuracies. In the first ten days. (See *Conduct of the Gulf War*, p. 169.)

[42]As of February 1, 1991, the USN had 96 A–6Es on board carriers in the Arabian Gulf and Red Sea, while the USMC had twenty A–6s at Shaik Isa. During the war A–6s flew 2,617 strikes of all types, including 307 precision strikes. The USN expended 149 precision guided munitions strikes against the Iraqi ground order of battle (tanks) and thirty-nine against naval targets, leaving 119 strikes (an average of 3 a day) against all other targets. (See GWAPS, Vol. V, *Statistics*, Table 187 "Strikes by AIF Categories," p. 436, and Table 193 "PGM Strikes by AIF Categories," p. 532. The tables are unclassified.) Throughout the war, naval aviation forces labored under shortages of precision weapons, insufficient ship-based tankers and electronic warfare aircraft, and the inability to do more than sequential (as opposed to simultaneous) carrier strike packages.

[43]"Tank-plinking," a term coined by USAF pilots, described the act of targeting individual Iraqi tanks, usually under cover in revetments or bunkers, with 500-pound GBU–12 laser-guided laser bombs. The bombs would locate a tank by its thermal signature and subsequently illuminate it with a laser for destruction. Armor adherents took great umbrage at the term, which of course ensured its widespread use among aviators!

[44]In this period the majority of B–52Gs based in Diego Garcia continued to strike Iraqi ground targets in Kuwait. The B–52Gs based in the Gulf region were also directed almost exclusively at Iraqi ground targets in Kuwait and southern Iraq.

[45]The Al Firdos District Bunker was enclosed by high fences topped with barbed wire and clearly marked as closed to the general public. Apparently, the civilian occupants of the facility were family members of high ranking Iraqi government officials or intelligence personnel working on the lower floors.

[46]Baghdad contained twenty-five bunkers similar to the Al Firdos District Bunker. Before the war these structures, given the Iraqi proclivity of placing many important functions in hardened facilities, had confused the Special Planning Group. The bunkers appeared to be more than just ordinary bomb shelters; they seemed to have military purposes, and the Iraqis had painted them in camouflage colors. The air planners had carried them on their prewar target lists and asked U.S. intelligence about them shortly before hostilities began. Intelligence would not confirm any designation for these structures beyond that of civilian bomb shelter. Therefore, the air planners, in accordance with U.S. policy, placed them off-limits to bombing.

[47]Cheney may have personally requested White House approval for the resumption of the bombing of Baghdad.

[48]I borrowed the term "core" from GWAPS, Vol. II, *Effects*, p. 269. The chief authors of that volume, Barry D. Watts and Thomas A. Keaney, use it to define what they consider "the eight 'strategic' target categories that were perceived by those who

planned and executed the Desert Storm air campaign as constituting the core of Iraq's current and future military power." However, I have deleted one of their eight categories, "Rail and Highway Bridges," from the "core" and placed it into what I designate the "mixed" target category. Since much of Iraq's political status in the region rested on its powerful military capabilities, an attack on those capabilities can be constituted as an attack on its political position in the region as well.

[49]Warden expected that leadership bombing would result in Saddam Hussein's elimination or overthrow. Most others, including some of his own planners, thought not, but they did not deny that Saddam Hussein's overthrow would be a welcome and positive result of it. In September 1990 the Black Hole proposed to "decapitate the Saddam Regime." (See Slide 17, Brigadier General Glosson's Brief to the CJSC, September 13, 1990, information cited is unclassified.) When Glosson briefed President Bush on October 11, 1990, he stated that the strategic air campaign would destroy the Iraqi leadership's command and communications network and disrupt its ability to communicate with the Iraqi people. Glosson also received the impression the President did not want to go on the record as targeting Saddam Hussein.

[50]Because these rebellions were untimed and uncoordinated, after the Coalition-Iraqi cease fire of March 3, 1991, Saddam Hussein was able to crush them separately. Apparently, the leaders of the uprisings delayed action in hopes that the Coalition would destroy Hussein's regime for them. Had the rebels taken action during hostilities and appealed for Coalition aid at that point, they might have had a better chance against him. They would have had a good claim to Coalition aid and Coalition forces would have continued to tie up the bulk of the Iraqi armed forces. A scenario of this sort would have made the bombing of leadership and command and control facilities a clear success. Instead, the Coalition appears to have left itself open to the same charge leveled against the western nations in the aftermath of the Hungarian revolution of 1956—that it egged the rebels on with no intention of aiding them.

[51]The bombing of the Al Firdos Bunker, which took place during Primakov's visit, may also have affected Saddam Hussein's calculations.

[52]The origin of the Baghdad target holds is a problem requiring further investigation. General Schwarzkopf placed the Baghdad bridges off-limits in early February. After the bombing of the Al Firdos Bunker on February 13, Lieutenant General Horner had to obtain Schwarzkopf's approval for any targets in downtown Baghdad. In turn, Schwarzkopf discussed the targets with General Powell in Washington before granting his permission. Powell seems to have imposed this restriction by his own authority, but there is some evidence that the target hold may have come from the White House. Secretary Cheney apparently went there to get the bombing hold removed on February 21, 1991. See (S/NF/WN/NC) GWAPS, II, *Operations*, pp. 249–251.

[53]The air planners assumed that Saddam Hussein would have fallen and that there would be few or no import restrictions on the new regime. By making oil and electricity unavailable during the war but speedily available to the new regime, the air planners hoped to a strengthen Hussein's successors in the eyes of the Iraqi people.

[54]The author discussed the use of the word "destroy" in relation to Iraqi nuclear, biological, and chemical (NBC) capabilities with members of CHECKMATE and the Black Hole. They intended to eliminate all NBC capability, not just to damage it.

[55]The Iraqis possessed an inventory of several hundred missiles, several fixed launchers (simple rails on a concrete pad) and probably no more than twenty-five to

forty mobile launchers. The Iraqi Scud had a range of approximately 437 miles, a 500-pound warhead, and circular-error-probablility of 2,000 meters.

[56]USN aircraft burned a less volatile aviation fuel than did USAF aircraft and could be refueled only with the "probe and drogue" instead of the flying boom, all of which demanded specialized aerial tanker assistance.

[57]Lines of communications are all the routes—land, water, and air—which connect an operating military force with a base of operations and along which supplies and military forces move.

[58]I have categorized all bridge sorties, even the fifty-five percent conducted by F–16s, F/A–18s and other non-precision bombing aircraft under the strategic air campaign. The aircraft serving as the bombing platform, such as a B–17 during World War II or an F–15E today, does not define whether a target is strategic or tactical, for aircraft can do (and in the Gulf War *did*) both.Target sets can be both, like the "mixed" targets sets of the Gulf War. Bridges are strategic in this case because the physical targeting and planning was handled by CENTAF strategic air planners; many of the targets lay outside the Kuwaiti Theater of Operations; and because the political objective of destroying the *Republican Guard* may have been of more practical significance than merely constricting Iraqi supply lines.

[59]The *Gulf War Air Power Survey* (GWAPS), paid for by the USAF but considered by Eliot Cohen and its authors to be an "independent" study (similar to the United States Strategic Bombing Survey [USSBS] and much less widely circulated than the unclassified DoD *Title V Final Report*), defines the term "strike" as the delivery of a weapon against a specific target instead of sorties. According to CENTAF strategic air planners' Master Target List target categories the survey records only 33 out of 9,731 total strategic strikes against *Republican Guard* targets (the least of any target category). It also notes that the strategic campaign flew only 9,731 out of a total of 41,309 Coalition strikes—twenty-four percent of the Coalition air effort. (See GWAPS, Vol V, *A Statistical Compendium* [S/NF/ WNINTEL/NC)], p. 535, Table 195, "Strikes by Master Target List Categories." The table is unclassified.)

[60]Some of these surviving *Republican Guard* units that escaped through Basra as well as other *Republican Guard* formations which were never committed in Kuwait were held in Baghdad during the war (to provide security for Hussein's Regime), proved instrumental in suppressing the post-war Shiite and Kurdish insurrections.

[61]This relatively unsatisfactory outcome did not result from any weakness of air power, but rather was a product of a decision insisted on by U.S. Army corps commanders and concurred in by General Schwarzkopf. It gave to the front line Iraqi divisions higher air priority than the *Republican Guard*. It derived from unclearly defined campaign objectives. (For DoD's breakdown of campaign results by target system see *Conduct of the Gulf War*, pp. 149–159.) At the end of the war, the U.S. Army refused to allow Coalition aircraft to attack the fleeing *Republican Guard*; and the VII Corps proved unable to halt its retreat into Iraq.

[62]Two to four independent *Republican Guard* brigades and some lesser units remained deep in Iraq, where they performed internal security duties as, for example, the only troops allowed to garrison Baghdad.

[63]Conversely, correctly timed airbursts and proximity fused shells or bombs can be very effective in the desert because their blasts are still spread over wide areas. The

defender thus has more difficulty preparing shelters with adequate overhead covering in the absence of proper, easily available local building materials.

[64]Regular Army Iraqi division air defense elements had a few Soviet SA–2s or 3s (with a maximum altitude of 25,000 meters), a few more modern SA–9s (limited to an effective maximum altitude of only 4,500 meters), and some shoulder launched surface-to-air missiles. *Republican Guard* division air defense elements possessed more plentiful numbers of the more modern Soviet SA–6s (with a maximum effective altitude of 10,000 to 15,000 meters) and SA–13s (with a maximum effective altitude of 5,500 meters), as well as more modern SA–16 shoulder-launched missiles. All Iraqi heavy divisions had plentiful AAA.

[65]U.S. intelligence sources differed as to the exact number of *Republican Guard* infantry divisions in the theater and variously place it at two, three, or four divisions. GWAPS uses the high figure. I see no reason to disagree. GWAPS places the infantry divisions, from west to east within the Kuwaiti Theater of Operations, as follows: Nebuchadnezzar, Baghdad, Adnan, and Al Faw. The Special Forces Division appears to have stationed one brigade at each end of this line.

[66]The lightly armed, haphazardly organized and trained, and internationally isolated rebels would stand little chance of sustained resistance against Iraqi Army units, let alone the *Republican Guard*. The Iraqis also had large stockpiles of second-line armored and other equipment, notably around Tikrit, that they used to re-equip their forces. Thus they could readily field repatriated prisoners or units that had escaped with their personnel but had abandoned their equipment.

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