Winter Selections

- **Gulf War Analysis**
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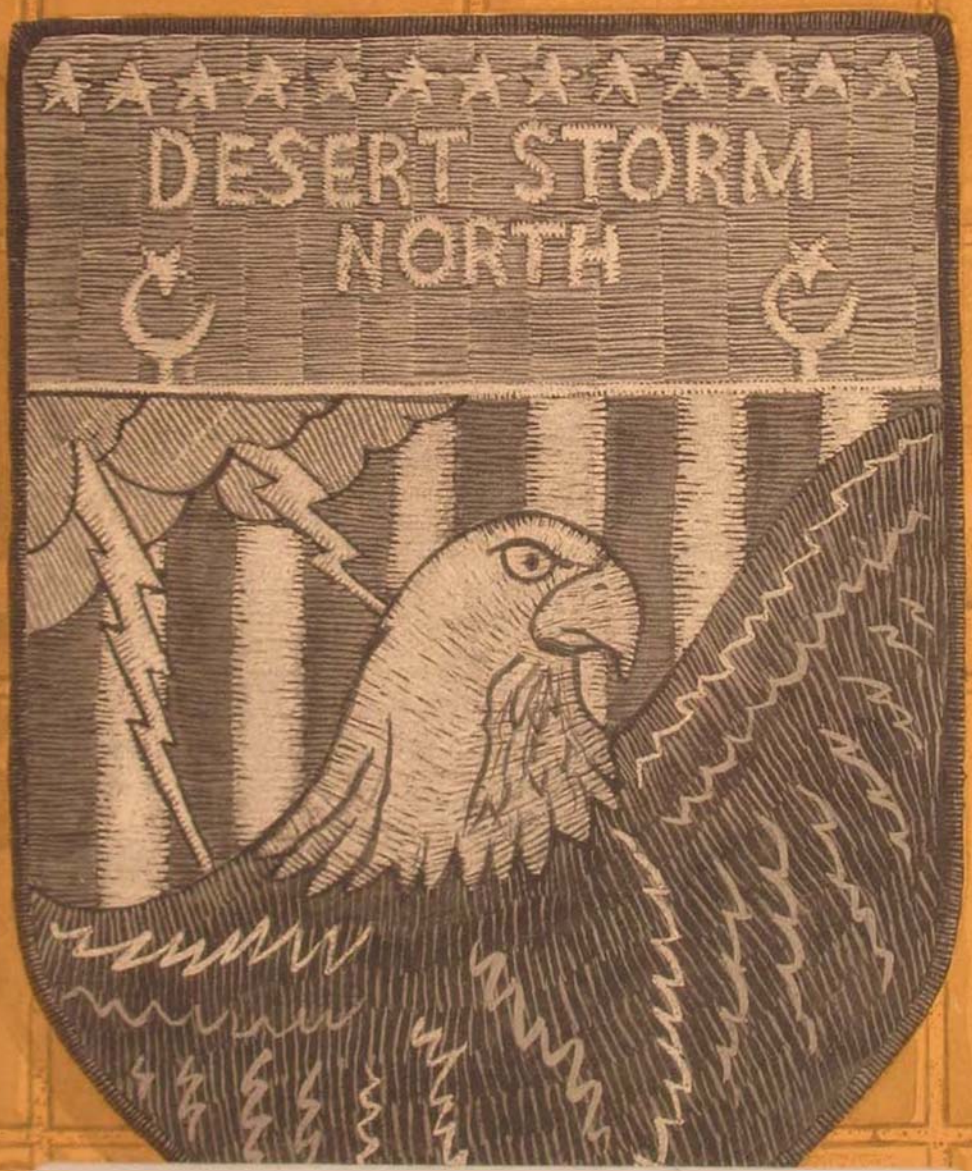

ASSOCIATE EDITOR
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EDITORIAL

The Confidence of Quality

SELF-PRESERVATION is a basic human instinct. Not only is it the reason that people band together into groups, it also is the reason they compete with each other. At the basic level, cooperation between group members promotes each person's sense of self-preservation and well-being. But people's instincts to advance their own cause may at times take higher priority than the group's need for cooperation. This attitude sets the stage for contention, competition, and hostility. Such self-centeredness can emerge if people feel that they have "lost" if someone else "wins" something they did not. For example, when the boss recognizes certain workers, a coworker may resent their good fortune and feel left out. With this outlook, life begins to be played as a zero-sum game.

The traditional "management by results" theory led to judging the worth of organizations by their conformance to arbitrary standards or their attainment of imposed goals or quotas. Experience shows that this theory brings out that old self-preservation instinct and saps much of the group's energy because people begin to look out for themselves and feel shortchanged if someone else gets a pat on the back.

A better way of thinking indicates that a team approach is much more effective in accomplishing the real purpose of an organization, which is to perform its mission with excellence and assure the long-term well-being of its members. This approach, called total quality leadership, invites people into the decision-making process and focuses the organization's energies on performance. It requires studying the mission and the way it is accomplished, building excellence into every aspect of the organization, and—through teamwork—improving the quality of mission accomplishment.

For the team approach to work, there must be an atmosphere of cooperation wherein the members feel confident, appreciated, and essential to their group's success. They must see that there is plenty of recognition, satisfaction, and praise for everyone. In such an environment, the achievements of any member would be a reflection on the entire group's quality.

Military organizations are beginning to appreciate the potential of total quality leadership. But implementation will take time. Several roadblocks are in the path—especially in the context of a reduction in the military force structure. Selective Early Retirement Boards, talk of reductions in force, and other uncertainties tend to encourage self-preservation rather than the confidence that is needed for teamwork. Once the force trimming is over, however, the path should be much clearer.

If the concepts of total quality leadership are to take hold, we need fundamental, institutional changes and a reassessment of the ways we have traditionally operated. One target for evaluation is the "up-or-out" system, which is essentially geared toward management by results. We must ask whether this system stimulates the instinct for self-preservation or whether it produces a mind-set that encourages quality and teamwork. The bottom-line question is, Does it nurture careerism, or does it increase military excellence in defense of the nation? RBC

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Letters to the editor are encouraged. All correspondence should be addressed to the Editor, Airpower Journal, Walker Hall, Bldg. 1400, Maxwell AFB AL 36112-5532. We reserve the right to edit the material for overall length.

AIR BASE SURVIVAL AND AIRCRAFT DISPERSAL

Captains Bahm and Polasek's otherwise informative article, "Tactical Aircraft and Airfield Recovery" (Summer 1991), states that "between the Korean War and the Vietnam War, the Air Force again neglected the critical role of runways and air bases." Since many Air Force leaders in that era had learned something about combat airfields in World War II, this neglect was not quite total.

During the late 1950s, United States Air Forces in Europe (USAFE) and the Strategic Air Command's air divisions in the European theater completed one of the greatest peacetime construction efforts in military history. From a mere dozen or so mostly noncombat airfields at the start of the decade, the Air Force built an extensive network of more than 40 active main operating bases stretching from England to Morocco to Turkey. Only a rapidly shrinking remnant of these remains today.

Although the USSR's conventional capabilities were not yet much of a threat to most of these installations in the 1950s, USAFE's leadership did not ignore the danger posed by new Soviet nuclear weapons. As part of the nuclear war-fighting doctrine of those days, Lt Gen William H. Tunner, CINCUSAFE, implemented an ambitious dispersal program for NATO's Central Region in 1954 that went well beyond the criteria recently established by Supreme Headquarters Allied Powers in Europe (SHAPE).

USAFE's plan envisioned an extensive network of dispersed operating bases, landing areas, and parking areas (including "hideaway bases" and autobahn strips) that would leave no more than eight aircraft at each site when on alert. Associated with this concept was a wide range of infrastructure survivability measures, such as hardened shelters and most of the passive defense techniques rediscovered in the 1980s, including inflatable dummy aircraft and radar reflectors.

At first USAFE made rapid progress toward this goal, at least in Germany while occupation deutsche marks were available, but Washington did not follow through on funding. By 1957 the program had bogged down. The dispersed operating bases soon degenerated into standby bases, several of which were reopened in France with great difficulty during the Berlin Crisis of 1961.

Another somewhat bizarre basing concept of the late 1950s and early 1960s was the zero-length launch (ZEL) program, which generated considerable planning in USAFE and NATO as well as a number of spectacular tests at Edwards AFB, California. The ZEL program would have strapped rockets to fighter-bombers for instant takeoff from mobile trailers or special hardened shelters—much like ground-launched cruise missiles. Their mission would have been the same: preplanned nuclear strikes.

Details on these and many other related topics may be found in my historical study, *USAF Aircraft Basing in Europe, North Africa, and the Middle East, 1945–1980* (April 1981), which is available at the Air University Library and many Air Force history offices.

As addressed in the companion article by Maj Jeffrey C. Prater, "VSTOL and Power Projection: A Leap in Faith" (Summer 1991), the Air Force stubbornly resisted the development and acquisition of aircraft designed for true dispersal, such as the Harrier. As reasons, it has consistently cited performance limitations of the aircraft and the logistical inefficiencies of scattering support resources. Now, in an era of shrinking defense budgets, it may be too late to obtain a close air support aircraft capable of deploying with the troops.

The main reason for the Air Force's traditional aversion to VSTOL combat aircraft has probably been more cultural than technical. Few people, whether aircrews or support personnel, join the US Air Force so they can live

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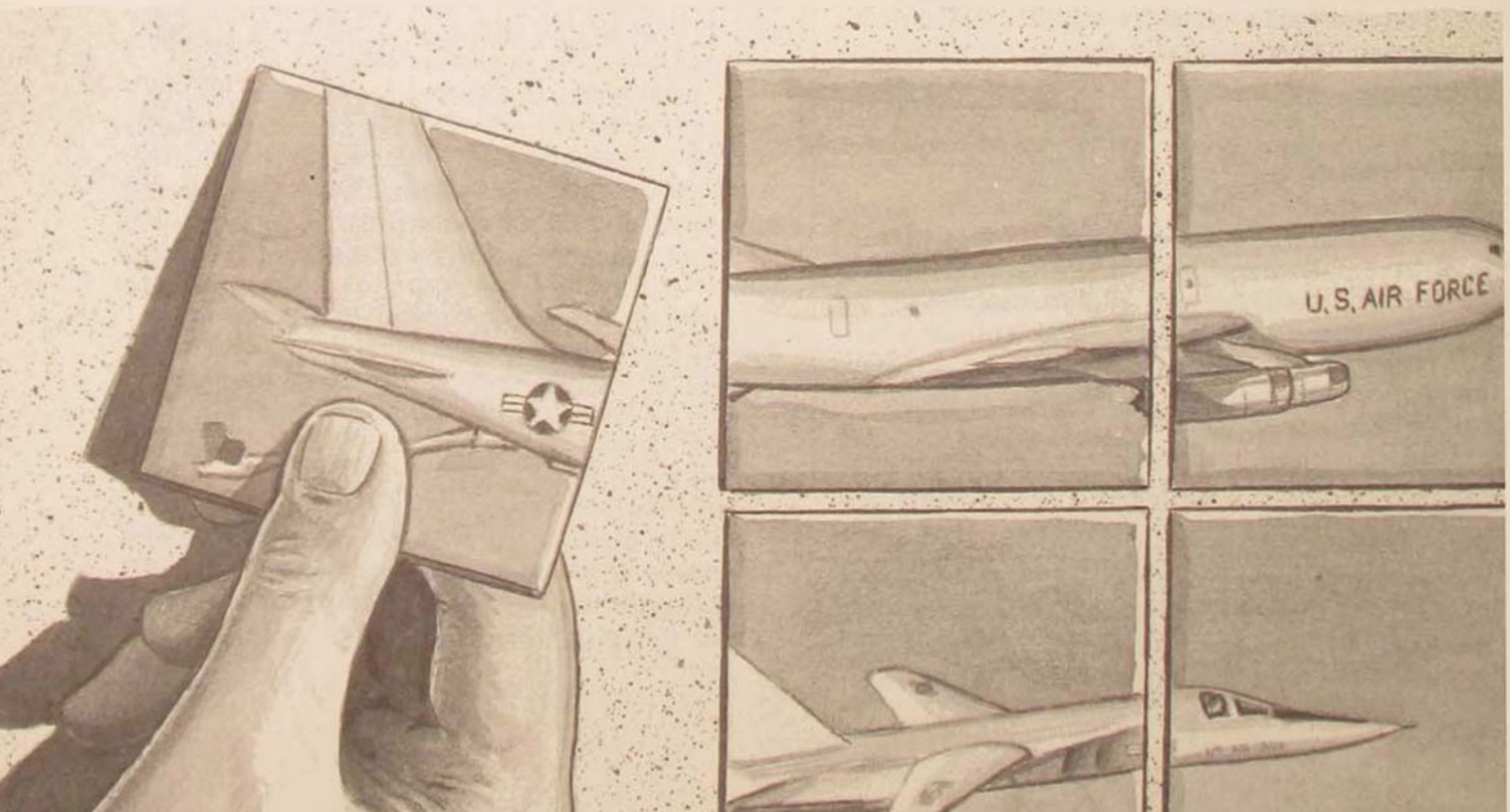
THE COMPOSITE WING IN COMBAT

BRIG GEN LEE A. DOWNER, USAF

ON 17 JANUARY 1991, day one of Operation Desert Storm, the Turkish government quietly granted border-crossing approval for offensive operations against Iraq. A cadre staff of the 7440th Composite Wing (provisional) had already planned, organized, and coordinated a series of options that ultimately allowed the flawless launch of a 20-ship package from Incirlik Air Base, Turkey, within a few short hours of that historic decision. This first combat mission occurred in the midst of the arrival of over half of the newly formed wing's initial forces, equipment, and personnel. The successful opening actions—as Desert Storm raged—were a tribute to the readiness of the units from US Air Forces Europe (USAFE) that received the call.

How the Wing Got Started

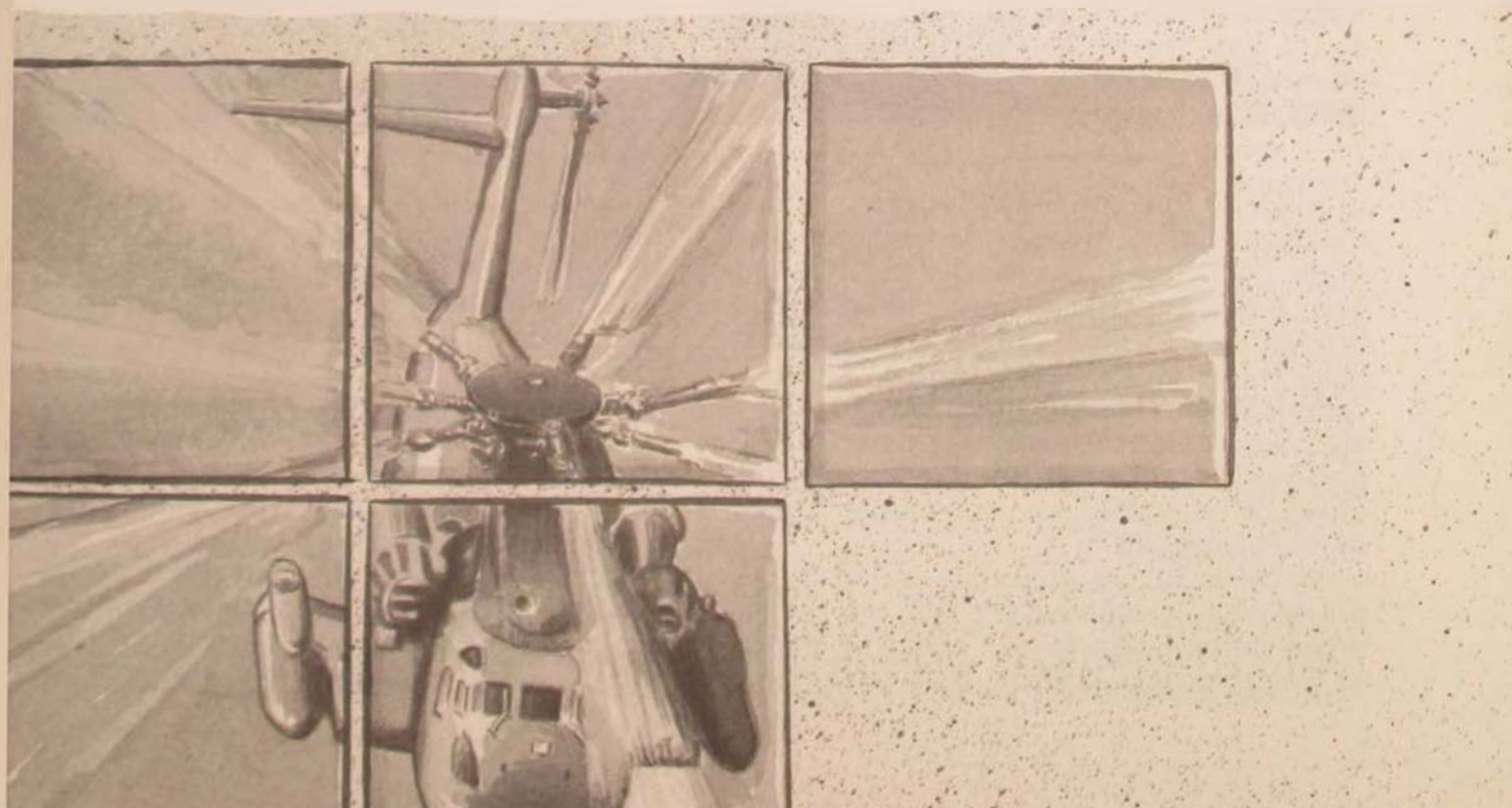
This unique organization originated during the first few weeks after Iraq's invasion of Kuwait on 2 August 1990 when a handful of young officers in the 52d Tactical Fighter Wing at Spangdahlem Air Base, Germany, developed a concept to base electronic combat support in Turkey to support the forces preparing in the Gulf. They wanted to complicate the Iraqi defense problem by diverting the enemy's attention and resources should war commence. The proposal picked up steam as it

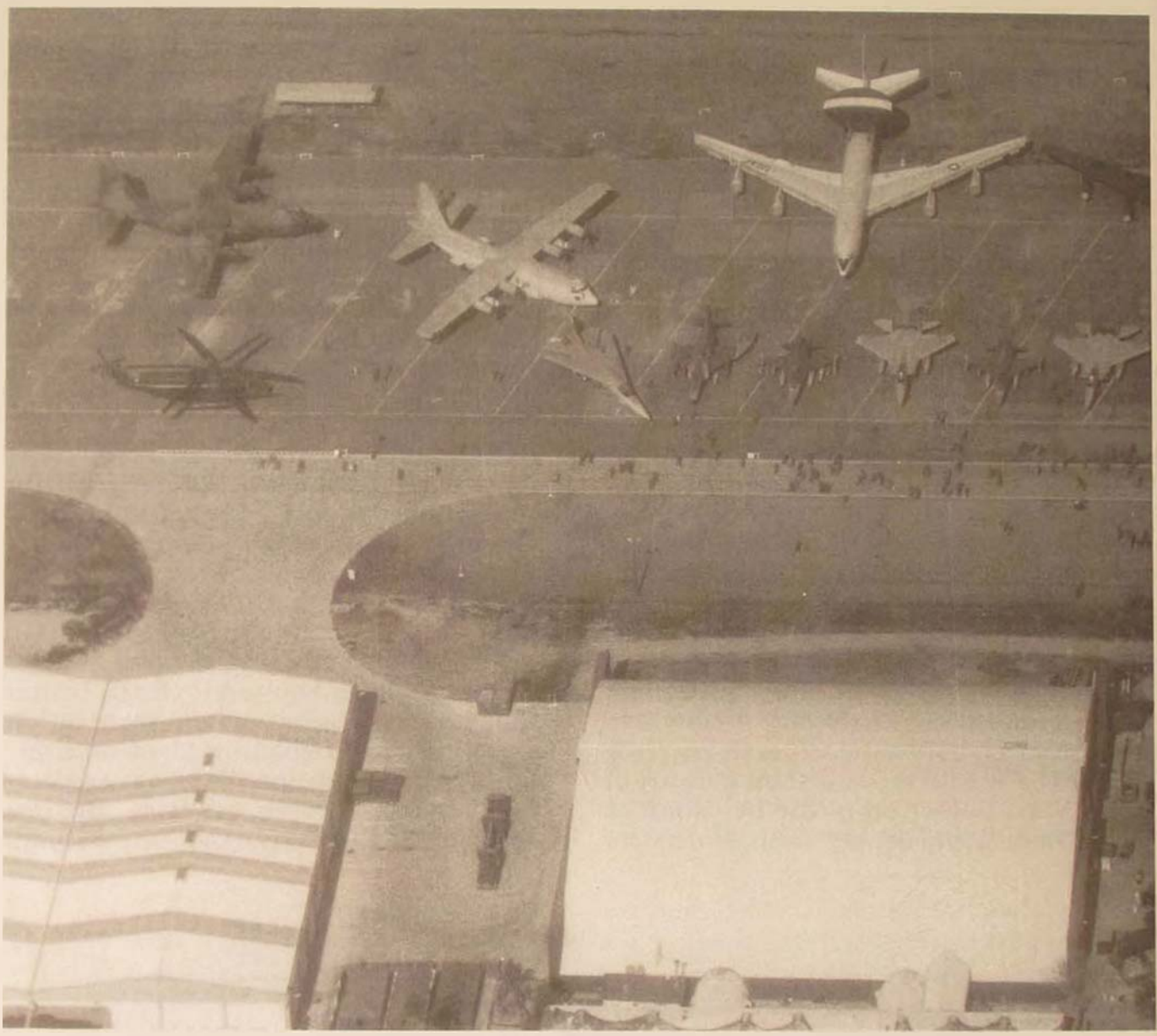


moved through channels, ending up at Headquarters United States European Command (USEUCOM) where it was approved and forwarded to the Joint Chiefs of Staff (JCS). While the JCS staffing and political approval process was under way, USEUCOM began forming a joint task force (JTF), later named JTF Proven Force. As the details and force options of this JTF solidified, USAFE began to form the unit that would provide the air component—a composite wing whose commander would also serve as the Air Force forces commander. USEUCOM commander Gen John R. Galvin and Gen Norman Schwarzkopf agreed that the JTF and its Air Force forces commander would be under the operational control of USEUCOM but that all operations would be under the tactical control of US Air Forces, Central Command (CENTAF).

To man the unit, I was given the opportunity to start with a blank sheet of paper, as well as access to all of the personnel resources of USAFE. My objective was to surround myself with superstars, clear obstacles for them, and then get out of their way. Selection of the key staff—a vice-commander; deputy commanders for operations, maintenance, and resources; and the combat support group's commander—was the priority task, one that would affect the entire operation. Between those key colonels and the home-station wing commanders of deploying squadrons, we sought out recommendations for the best group of company- and field-grade officers in the command to fill the key billets. The superstar approach worked especially well, giving us the intellectual and technical horsepower to meet the inevitable challenges.

Building the composite force was a bit tougher. The most modern or most capable systems were already serving in Southwest Asia, offering a range of solid capabilities but not all that were desired to meet the potential JTF objectives. Some forces that played an important role in our mission were already present for duty at Incirlik. As Operation Desert Shield began, a training detachment of F-111Es based at Royal Air Force Base Upper Heyford, United Kingdom, but operating from Incirlik, was given orders to remain in place until further notice. Additionally, a squadron of F-16s from Torrejon Air Base, Spain—deployed for a NATO exercise—was held





Aircraft and personnel of Joint Task Force (JTF) Proven Force, Incirlik Air Base, Turkey, March 1991. Proven Force eliminated any illusion of safety that the Iraqi leadership may have had about northern Iraq.

in place to join the F-111Es. Later, when President George Bush added more forces to the US Central Command area, 10 F-15s from Bitburg Air Base, Germany, and four Strategic Air Command KC-135 tankers from Dyess AFB, Texas, joined the base complement. The four organizations operated on a peacetime training detachment philosophy, retaining their home-station chain of command for leadership, direction, and support.

As these future elements of the composite wing operated at Incirlik, the wing's organization began to take shape on paper at Headquarters USAFE. The first tasks included placing all the forces at Incirlik under one commander, developing an organization that could task and control forces from several major commands, and preparing to grow as the situation dictated. The challenges of deployment and the possibility of combat were two items in a long list of obstacles to be addressed. At this point, combat seemed remote, since major

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political and diplomatic hurdles still had to be overcome. A cadre element deployed in late December 1990 and early January 1991 to begin planning and preparation. The 39th Tactical Group, Incirlik's peacetime organization, worked hard to open as many options as possible, pending a decision to increase forces.

Secretary of State James Baker's visit to President Turgut Ozal of Turkey on 12 January 1991 set many wheels in motion, allowing the bulk of the 7440th Composite Wing staff to deploy. The possibility of substantial force increases at Incirlik now became a reality—the forces that had already been identified were immediately given a JCS warning order to deploy. They received execution orders on 16 January and deployed the next day—day one of Desert Storm. As yet, the deployment order did not include approval for combat operations, but the order itself was a major step toward that end. We remained skeptical but did not diminish our massive effort to prepare for every eventuality. With the crushing initial blows of the air war already in full swing, 24 F-4G Wild Weasels, six EF-111s, four additional F-111Es, 14 additional F-15s, eight additional KC-135s, three E-3Bs, and three EC-130s launched for Incirlik from bases around Europe. Finally—approximately midday—with aircraft, people, and equipment landing every few minutes, the 7440th received word that the government of Turkey had approved US unilateral offensive operations from Incirlik Air Base as soon as the Turkish General Staff could provide implementing instructions.

Since early January 1991, we had been closely linked with CENTAF, which had given the wing a series of targets and times that would mesh the day-one and day-two attacks in northern Iraq with those from CENTAF, taking various potential force mixes into account. In the event Wild Weasels for surface-to-air missile suppression or F-15s for counterair and other electronic combat support were not available, we had built an option to attack less heavily defended targets. Sensing that border-crossing authority was imminent and understanding that offensive operations should be demonstrated as soon as practical, we narrowed our focus to a night attack on four early-warning sites relatively close to the border. CENTAF agreed. With acceptable risk, the F-111s could ingress Iraqi airspace at low altitude, attack assigned targets, and return with limited support. The takeoff at 2350 Zulu (Greenwich mean time) on 17 January 1991 came only a few hours after the awaited implementing directive from the Turkish General Staff, but with the detailed planning, coordination, and solid training base of all participants, the mis-

F-16 pilots of the 7440th Composite Wing (provisional) in a preflight briefing at the squadron operations center at Incirlik AB. Handpicked commanders planned the mission, picked the routes, and briefed all participants about three hours before launch time.

sion went like clockwork. USAFE and the 7440th were in the war.

Organization

Organization of the wing was traditional. My experience as a wing commander made the organization of the deputy commanders easy to deal with. Superficially, the organization was identical to that of a regular wing—in actuality, however, it was significantly different.

The deputy commander for operations led 10 organizations of varying sizes. Additionally, he supervised intelligence and led a control center with two directorates—current operations and combat plans.

The deputy commander for maintenance subsumed the Incirlik-based consolidated aircraft maintenance squadron (CAMS) and provided guidance to the eight tactical aircraft maintenance units, each of which continued to report directly to its operational squadron commander. The big aircraft (KC-135s and E-3Bs) combined maintenance under one organization with a command relationship similar to that of the aircraft maintenance units. The maintenance operations center and the quality assurance, statistical analysis, maintenance scheduling, and ammunition units were all part of the CAMS. To improve the span of control and provide visible flightline leadership with the authority to prioritize tasks and equipment, the deputy commander adjusted the organization after

a few weeks. That is, he created the equivalents of an aircraft generation squadron commander and equipment maintenance squadron/component repair squadron combined commander. Since the aircraft maintenance units reported directly to their operational commanders, these new positions were more like flightline coordinators than commanders, but the troops understood their purpose and better flight-line results were immediate. Operational squadron commanders understood the relationship, since it was very similar to the standard used in peacetime weapons training detachments throughout the command.

The deputy commander for resources owned transportation, supply, and budget. His biggest challenge was unifying the supply systems for the various units in the wing. The three squadrons that had deployed to Incirlik prior to the war were well established on the Incirlik supply computer, but it took several weeks to include the subsequent units. Eventually, even the E-3Bs from Tactical Air Command were managed from a single computer, providing excellent visibility into problem areas in mission capability parts for all aircraft.

The combat support group continued its normal functions, augmented to support the 5,500 additional people who were eventually based at Incirlik. The group also provided support for 550 people at Batman, an austere Turkish air base 300 miles east of Incirlik where special forces and combat search and rescue forces were located.

Command and Control

The command relationship that CENTAF tailored to Proven Force allowed us considerable flexibility in mission execution. Although the 7440th did not receive a true mission type order, our instructions came close to that. We were told to destroy the war-fighting capability of northern Iraq and were given a target list—developed and approved by CENTAF—but we had the latitude to develop a campaign that would best attack those targets. As the Proven Force staff became experienced with the northern one-third of Iraq, we began to nominate other targets for CENTAF approval. The 7440th combat plans function, in coordination with the JTF Proven Force staff, developed a campaign to attack the targets provided and approved by CENTAF in a prioritized manner that minimized risks to attackers yet ensured maximum target destruction.

Two people were key to the operation—the chief of combat plans and the mission commander. The former assisted JTF/J3 (Operations) in developing the campaign plan, consolidated the daily operations concept, and produced the air tasking order (ATO). The initial inputs came from CENTAF as target lists, sometimes with CENTAF priorities or other special instructions attached. JTF/J3 then wrote a daily operations order, which finalized the JTF commander's priorities. From this order, combat planners then coordinated with maintenance, resources, tactical squadrons, and off-station supporting units (such as the RC-135s at Hellenikon Air Base, Greece) to propose an operations concept to the composite wing's director of operations. Operations tempo, deception plans, weaponeering, package composition, and limitations—if any—were essential ingredients at this point. When approved, the plan was transformed into an ATO. Approximately 28 hours elapsed from the beginning of the cycle to the start of the execution day—beginning at 0001 Zulu. Throughout Operation Desert Storm, the wing flew two to three packages per day—two during the day and one at night. Efforts to remain unpredictable and to sustain the maintenance health of the wing drove the changing tempo. Since the efforts of thousands of people were affected by the ATO, creating this document was a critical process.

Mission Planning and Execution

Once the ATO was published, the mission commander—one per package—took

over. Selected from officers in the attacking squadron, the mission commander was one of a small number of the unit's most experienced flight leaders—typically a squadron commander, operations officer, or flight commander. Some of the mission commanders were graduates of fighter weapons instructor courses, and some had attended NATO's tactical leadership program. In addition, the many missions that they led or participated in during various flag exercises at Nellis AFB, Nevada, or Cold Lake, Canada, provided perfect training and allowed these leaders to successfully accomplish the critical task of mission commander from day one. Mission commanders put the package plan together, picked the route or routes to the target, assigned specific duties to the supporting forces, and briefed all the participants—usually three hours prior to package-launch time. The overall task required a flight plan, launch plan, tanker plan, and tactics and backup plans—a considerable work load that required delegation of effort and constant attention. At the end of the mission, one of the most important tasks given to this busy officer was the mass debrief. This session, involving all participants in the package, was always rich with incisive observations and no-holds-barred critiques of every aspect of the mission. The vast amount of information that we learned from Proven Force operations can be attributed in large measure to this critical event.

As mission commanders became experienced in the process, it became obvious that they needed some nonflying help. Thus, mission monitors were created to assist the mission commanders and relieve them of some of their tasks. A monitor (a captain or major with extensive operational experience) was assigned to each package and stayed with it from creation of the ATO to final reporting of mission

The night Wild Weasel mission was probably the most challenging mission early in the war, pitting F-4s and F-16s against unseen electronic threats. Additional investments in advanced night-fighting technology will help integrate all players in this increasingly critical environment.

results. This officer ensured that the priorities in the daily operations order were clearly understood, attended the mass brief, briefed the wing commander on the entire package, followed the progress of the mission in the wing operations center, attended the mass debriefing, and made sure that all reporting was completed. Most importantly, the mission monitor provided the commander and chief of combat plans with direct feedback on the specific successes and failures of each package as part of a constant correction process. Without a doubt, the six mission monitors of the 7440th made a major contribution to the mission.

Results

The composite wing's accomplishments are impressive. We were tasked to open a second front, prevent Saddam Hussein from creating a sanctuary in the north, and prevent his defenses from concentrating on the south. In the months of intense planning between August 1990 and the beginning of the war, CENTAF had not counted on Turkish approval for offensive support to Desert Storm. As the air offensive plan developed, it was necessary to convince the Iraqis that no target in the country was safe from coalition attack; therefore, aircraft based in Saudi Arabia were tasked to attack a number of strategic targets in northern Iraq. To continue this operation, however, would have diverted coalition efforts from and diluted their effect on the Kuwaiti theater of operations and other important southern targets. From an operational standpoint, the trip north was no trivial matter. The distance from Taif, Saudi Arabia, to northern Iraq is 900 nautical miles versus 400 from Incirlik. Furthermore, attacks from Saudi Arabia would require increases in tankers and would run the risk of not having the necessary E-3, Wild Weasel, and Compass Call support. Proven Force joined all the coalition forces in phase one of Desert Storm, but when forces in the south made the transition from strategic operations to isolation and preparation of the battlefield and finally to the ground campaign, Proven Force stayed in the strategic phase. We were too far from the Kuwaiti theater to contend with a battlefield situation. Our lack of precision-guided and hard-structure munitions dictated a different tactical plan than that prosecuted by CENTAF. The Proven Force campaign ensured that specified nuclear, chemical, biological, and missile production facilities were systematically destroyed and that over 100 other key command-and-control, war-production, and airfield targets were seriously damaged. But most of all, Proven Force eliminated any pretensions to safety that the Iraqi leadership may have had for the north.

Observations

Given this background, the key question remains, Does the composite wing work in combat? The answer is obvious: Absolutely, with no reservations. I will not discuss dollar or manpower costs, specific aircraft, munitions, or quality of people, since each is a separate success story that needs more telling. Rather, I will answer the question by commenting on various observations that have come to light as a result of the 7440th's experience. The story would be incomplete without mentioning the positive things that allowed us to organize and operate with virtually no preparation. Any lesson learned from the wing, however, must be tempered by certain unique circumstances. For example, not all bases have Incirlik's facilities and space. Looking to the future, I also comment below on a number of matters that would enhance our ability to do this again or that would need more work to ensure success in the next contingency.

Why the Composite Wing Worked So Well

The composite training undergone by the wing's personnel contributed to the successful completion of their mission. The

key leaders in each of the 10 squadrons of the wing had all participated in at least one flag-type exercise. Squadron commanders, therefore, easily adapted to the organization. Most importantly, selected mission commanders were typically experienced in flag exercises and, in some cases, were graduates of NATO's tactical leadership programs and USAF fighter weapons instructor courses. The ease with which the operators made the transition from peacetime to wartime operations is surely a tribute to our entire training investment. All aircrew members (the wing had over 450) felt ready to do their jobs when the war started. This is not to say that they did not desire more information or ask questions, but that they felt confident because of the training they had received. The extensive planning, exercising, integration, and training done between August 1990 and January 1991 by units based in the south were not available to the 7440th. Instead, the years of training and exercises that were common to all the squadrons allowed the composite wing to enter the fight on the run from day one of the conflict. Was everything perfect? No. The basics were there, but much was done to improve the initial integration of all this combat power.

Evaluation and Inspection. Tactical evaluations, operational readiness inspections, and other readiness exercises have created a solid foundation of training in both units and individuals. Squadrons, command-and-control functions, and quick-response teams went directly to work. The breakout of combat gear, running checklists, work-center activations, and dispersal of critical assets occurred with virtually no direction and without a hitch. The beginning of Desert Storm at Incirlik appeared to be no different than the start of hundreds of exercises that had kicked off over the last 10 years. The battle staff only had to clear a few obstacles and concentrate on the details of the "real-world" tasking. The tens of thousands of hours of hard work and the (sometimes reluctant) participation in evaluation and exercises paid off handsomely.

Mission-Planning Systems. The money invested in advanced intelligence and mission-planning systems is proving to be well spent. State-of-the-technology equipment such as Sentinal Byte, Intratheater Intelligence Communications (IINCOM) network, Constant Source, Mission Support System II, and Identification of Command and Control Operations Nodes (ICON) performed with excellent reliability. Although all operators were not familiar with this equipment, it was so user friendly that they learned to use it without difficulty. The growth potential in these systems for intelligence data management, threat and target analysis, mission planning, and campaign planning will keep operational intelligence people busy for some time to come. We must continue to stay on the leading edge of this exciting technology. This type of system must be organic to any wing and must be used in peacetime training as much as possible.

Incirlik Air Base. Operating from an established main base designed for combat operations made a substantial difference in our ability to posture, receive forces, and conduct combat operations. Parking areas, dual-access loops for hardened shelters, robust fuel storage and distribution systems, and an extensive NATO infrastructure of hardened facilities made our effort easier than it would have been had we deployed to a bare base. This experience suggests that there are significant advantages to using collocated operating bases in Europe or in other areas of the world.

Turkish Air Force Support. Rapid decisions on airspace control procedures, generous offers of facilities, increased security forces, and air defense of the air base were all vital contributions to the success of Proven Force. The courageous decision by the government of Turkey to allow offensive operations from Incirlik was one of the diplomatic highlights of the war.

Areas That Need More Attention and Work

Much is left to do to bring the concept of the composite wing to maturity. The chal-

lenges we overcame in one way or another illustrate the most obvious needs and are worth brief comment. These translate into observations to analyze for potential lessons learned. We will learn many lessons from this war, and most of them are mirrored in the experience of Proven Force. I mention only those lessons that bear upon the composite wing.

Night Operations. We need to get serious about conducting composite activities—not just individual training—at night. Further, the night should not be reserved just for attack fighters, but should include supporting aircraft as well. The most challenging activity early in the war may have been the night Wild Weasel mission. F-4s and F-16s were flying tactical formation in moonless skies and dueling with unseen electronic threats, all the while trying to keep from becoming totally disoriented. In addition, AGM-88s (high-speed antiradiation missiles—HARM) streaking through the night sky were enough to evoke a few surprised knee-jerk reactions from the rest of the players in the package. Until every one of the crews understood what each of the other aircraft types brought into the fight and how they affected the mission, each night brought a few new surprises. Clearly, aircraft with state-of-the-art night capabilities did significantly better, but we must continue to invest the time and dollars to integrate all players in this increasingly critical environment.

Day and Night Operations. The aircrew ratio (i.e., the number of squadron aircrews to the number of assigned aircraft)

Personnel from the 52d Tactical Fighter Wing, Spangdahlem AB, Germany, attached to the 7440th Composite Wing, watch their F-16s taxi into takeoff position at the Incirlik AB flight line. Despite its ad hoc creation, the joint task force was able to operate smoothly, especially as its members gained experience under combat conditions.

was augmented to allow some squadrons to more efficiently engage in 24-hour operations. Although all units may not be tasked for 24-hour operations, those that are may require extra aircrews. Typically, supporting missions cause the problems—if night bombing is required, then Wild Weasels, F-15s, and tankers may be crucial to success. Even though this is a tough issue for peacetime costs and aircrew proficiency, we might well achieve surge increases in aircrew ratio through innovative means that would be well worth the additive costs. The maintenance work force had few problems adjusting to the 24-hour operation since current technology made certain that reliable, easily maintained aircraft could fly virtually any sortie rate for some period of time. The limiting factor during Desert Storm was the number of aircrews.

Tasking and Targeting. Significant portions of peacetime flying training should be tasked via the ATO. We should do this, not to prove that the squadrons can break out the ATO and read it, but to guarantee that the process of building, integrating, and coordinating the order is an ingrained part of the training and quick execution of the combat plans function. The mechanism should be in place to facilitate the immediate transition to contingency or wartime operations.

In addition, training must be integrated. For example, to be considered effective, much of an F-15 pilot's training should include work with E-3s and electronic combat aircraft. Further, an attack pilot's training should include the use of E-3s, F-15s, and Wild Weasels to ensure that training sorties are integrated. The planning, communications, mutual support, and execution should be routine events in all of the training and exercising for the composite wing.

Campaign Planning. The entire team—intelligence, combat plans, current operations, weapons, resources, and maintenance—must practice solving problems to be sure that the wing can flow smoothly into wartime planning and operations. There are endless variations on this concept, but just reacting to current events would be a start. A team with a basic fighter or bomber background should be prepared to handle scenarios of at least moderate difficulty only a few hours after tasking, and a wing commander should expect a well-trained team to develop an initial target list within a few days. Continuous analysis and research will refine and improve the product, assuming that time is available.

Intelligence. We still have work to do here. Without a doubt, the aircrews and planners received a great variety of materials, analyses, and data. Because of the work done in the theater-level production centers and technical squadrons that routinely support USAFE's central region mission, the streamlined wing intelligence staff at Incirlik obtained information and imagery filtered for Proven Force operations. In addition, the intelligence communications systems proved invaluable in efficiently moving much of the data from the production center to the wing, but the aircrews were still dissatisfied with the imagery that they received to plan and fly their missions. Much of the imagery they had at the start of the war did not allow the desired level of detail for planning difficult targets, mobile targets, or targets in areas where accidentally inflicting collateral damage was a distinct possibility. In addition, wing-level planners lacked bomb-damage assessment imagery. Some targets were successfully struck—and attacked again; others needed to be reattacked before engaging other targets of lower priority. Aircrews and planners also felt that electronic orders of battle did not sufficiently reflect their current experience. To some degree, this problem has roots in our peacetime training. Aircrews, planners, and especially commanders need to task their intelligence staff properly. Asking the right question can be an enlightening experience. Some of the problem would be easily solved with additional focus and a rejuvenated concern

with the "customers' needs," not just their stated requirements.

Imagery. A dedicated and flexible source of imagery for the use of aircrews and planners is critical to the successful and efficient tasking of fighters and bombers that employ precision weapons. The imagery must be compatible with the sensor used to attack the target. That is, if the sensor is a visual, digital, or video system, then photographs are important. If it is radar, then one needs radar imagery. In addition, commanders and planners need damage assessment imagery for campaign planning and execution.

Air Base Defense. As tactical ballistic missiles become available and proliferate, air defense—specifically, air base defense—becomes a critical problem for the deployed commander. Air defense missiles provide the only active deterrence or counter to the threat from tactical ballistic missiles. A composite wing that is relatively close to an adversary's border and that operates from a base with limited hardened shelters for fighters and open ramps for larger aircraft would be vulnerable to even a modest attack. An active air base defense would allow the wing's limited air superiority aircraft to perform offensive rather than defensive counterair. Support from dedicated, rapidly deployable Army air defense assets that trained and evolved with the composite wing would ease the active defense problem. By the same token, engineers need to develop a mobile sheltering system to meet the passive aspects of this issue.

Two-level Maintenance. Although the 7440th was not a pure two-level organization or part of a controlled test of that organizational scheme, most of its intermediate support came from home wings. Military Airlift Command's channel and specially managed theater airlift supported engine repair and the repair of avionics "black boxes." This concept kept most of the wing's aircraft flying well in excess of rates characteristic of peacetime training and ensured that the aircraft were always available to meet taskings. In fact, the wing enjoyed a 99.4 percent rate of scheduling effectiveness over the 42 days of Desert Storm.

Although the supply of spare parts was a success story, the timely delivery of those parts is a challenge that must be addressed for the sake of future composite wings. Two-level maintenance puts an increased burden on the transportation system. Broken parts should be shipped efficiently to the repair facility or home base, and repaired parts should be sent back quickly to meet the wing's new requests.

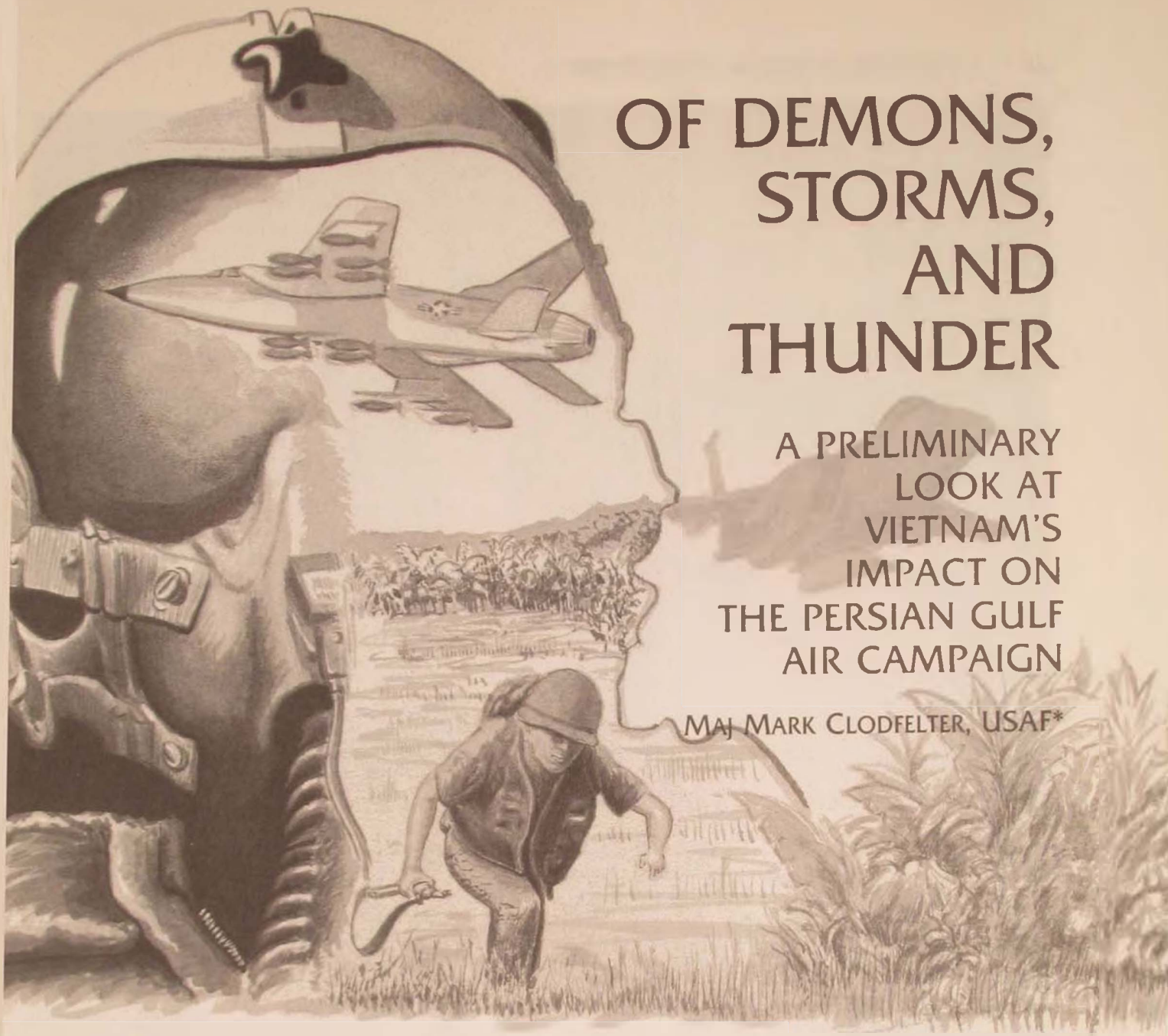
A composite wing includes flexible, mobile forces that integrate a number of reinforcing capabilities. These forces should be able to operate with some degree of autonomy for a short time while heavier or single-aircraft-type wings mobilize and deploy. Thus, the organization should be as light as possible without sacrificing combat capability. A small contingent of dedicated—although not necessarily assigned—tactical airlift aircraft, however, could improve efforts to resupply parts and make a vital difference in the wing's ability to face all challenges.

Command-and-Control Connectivity. Like air defense, communications are rarely dedicated to peacetime units. However, a unit that is expected to enter the fight on the run must understand the basic connectivity it has with other units—whether at the deployed location or dispersed—and with its tasking headquarters, wherever it may reside. Discovering and solving communications limitations during the heat of battle will lead to inefficient or burdensome systems that limit the unit's combat potential.

Conclusion

The 7440th Composite Wing's achievements are now a part of history. The efforts to get the wing into the war are a special success story that should be told in more detail in the future. As is usually the case, once the decision to go was made, the suc-

cess of the effort was up to the people who were tasked to make it work. Their accomplishments clearly show that they assumed the challenge with a great deal of enthusiasm and skill. They knew their jobs, did not hesitate to make decisions, and kept improving the operation as they became seasoned and experienced. Since the future of the composite wing concept is in the hands and minds of Air Force people, I am not worried. There are no fundamental reasons why the concept will not succeed. As we look to a smaller Air Force that will be tasked with responding to a wider range of conflict in the context of Secretary of the Air Force Donald B. Rice's vision of "Global Reach—Global Power," the composite wing will prove to be a most important capability. □



OF DEMONS, STORMS, AND THUNDER

A PRELIMINARY LOOK AT VIETNAM'S IMPACT ON THE PERSIAN GULF AIR CAMPAIGN

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AT A PENTAGON briefing on 15 March 1991, Air Force Chief of Staff Gen Merrill A. McPeak summed up his service's role in the recently concluded Persian Gulf war: "This is the first time in history that a field army has been defeated by air power."[1] General McPeak could indeed take a large measure of satisfaction from the Air Force's performance in the war. In less than 40 days, a devastating display of aerial might had mauled Saddam Hussein's military machine, enabling a "hundred-hour blitzkrieg" to oust Iraqi forces from Kuwait.

President George Bush proclaimed that the totality of the triumph erased the

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During the Vietnam War, the Air Force paid a high price to achieve little against a highly resourceful enemy. From 1964 to 1973, the service lost more than 600 fixed-wing aircraft over North Vietnam. Here, F-100 pilots return from an early Rolling Thunder mission in the spring of 1965.

stigma of an American defeat 16 years earlier in the jungles of Southeast Asia. After announcing a cease-fire, he declared, "By God, we've kicked the Vietnam syndrome once and for all."[2] Bush had emphatically insisted that a war in the Persian Gulf would not be another Vietnam, and the specter of that debacle guided American military leaders, air commanders in particular, as they girded themselves for combat in the Middle East.

The Southeast Asian backdrop profoundly affected both the planning for and the conduct of the air campaign against Iraq. Yet to say that Operation Desert Storm's remarkably decisive air war exorcised the demons that had plagued the bombing campaigns against North Vietnam would be premature. Although the efforts to apply the perceived lessons of Vietnam contributed greatly to air power's success against Iraq, the unique circumstances of the Persian Gulf war were equally significant in making air power a decisive weapon. Moreover, an analysis of Vietnam's impact on the Desert Storm air war reveals that a few ghosts from Southeast Asia continued to haunt—and leaves the suspicion that in dispatching demons from Vietnam, the Air Force may have generated a phantom from the desert.

Against the North Vietnamese, the Air Force paid a steep price to accomplish meager results against a highly resourceful enemy. From 1964 to 1973, the service lost 617 fixed-wing aircraft over North Vietnam.[3] The United States also suffered economic costs from bombing that far exceeded those inflicted on the enemy. In early 1967, the Central Intelligence Agency estimated that rendering $1.00's worth of

bomb damage on North Vietnam cost American taxpayers $9.60.[4] North Vietnam's gross national product actually *increased* during the bombing, as Ho Chi Minh skillfully played off the Chinese against the Soviet Union to secure a vast amount of military and economic support from each.[5]

Few American civilian or military leaders had envisaged such dismal results when planning the air campaign eventually labeled Operation Rolling Thunder. President Lyndon Johnson's characterization of North Vietnam as a "raggedy ass little fourth rate country" typified the substance if not the style of most American views of the enemy.[6] Dean Rusk, Johnson's secretary of state, remembered, "I thought the North Vietnamese would reach a point, like the Chinese and North Koreans in Korea, and Stalin during the Berlin airlift, when they would finally give in."[7] Adm U. S. Grant Sharp, commander of Pacific Command and the individual charged with the operational conduct of Rolling Thunder, initially shared Rusk's faith that limited air attacks would pay dividends. In early April 1965, one month after the sustained bombing of North Vietnam began, he notified the Joint Chiefs that "the damage inflicted by these attacks on LOCs [lines of communication] and military installations in North Vietnam will cause a diminution of the support being rendered to the Viet Cong.... Manpower and supplies will undoubtedly have to be diverted toward recovery and rebuilding processes."[8]

Convinced that the Viet Cong insurgency in South Vietnam could not continue without large doses of support from the North and that the threat of aerial destruction would persuade Ho Chi Minh to abandon that assistance, American civilian and military chiefs embarked upon this country's longest bombing campaign. They subconsciously assigned their enemy Western values and translated a guerrilla war into a conventional conflict that they could better understand, only to discover that a preponderance of firepower could not overcome firmly entrenched tenacity. Not until the spring of 1972 did air power have a telling impact on the course of the war, and that impact was largely fortuitous. Hanoi's decision to mount a large-scale conventional invasion of the South, President Richard Nixon's détente with the Soviet Union and China, and Nixon's willingness to exit South Vietnam without a total victory for the South Vietnamese all combined to create conditions that favored bombing for limited ends.

The stark differences between the nature of the war during Johnson's Rolling Thunder (1965–68) and during Nixon's 1972 Linebacker air offensives have gone unnoticed by many of the war's air commanders, who contend that a Linebacker-like assault against North Vietnam in early 1965 would have achieved victory in short order.[9] This assertion, however, ignores that Nixon's notion of "victory" differed from that of his predecessor. Johnson sought an independent, stable, non-Communist South Vietnam, capable of standing alone against future aggression. He also wanted to achieve that aim without undue cost to the United States. In particular, he did not want to run the risk of war with China or the Soviet Union over Vietnam, nor would he permit Vietnam to eclipse his Great Society programs. Thus, the rapid aerial destruction of North Vietnam's war-making capability, which air commanders estimated they could achieve in 16 days,[10] was not a viable option.

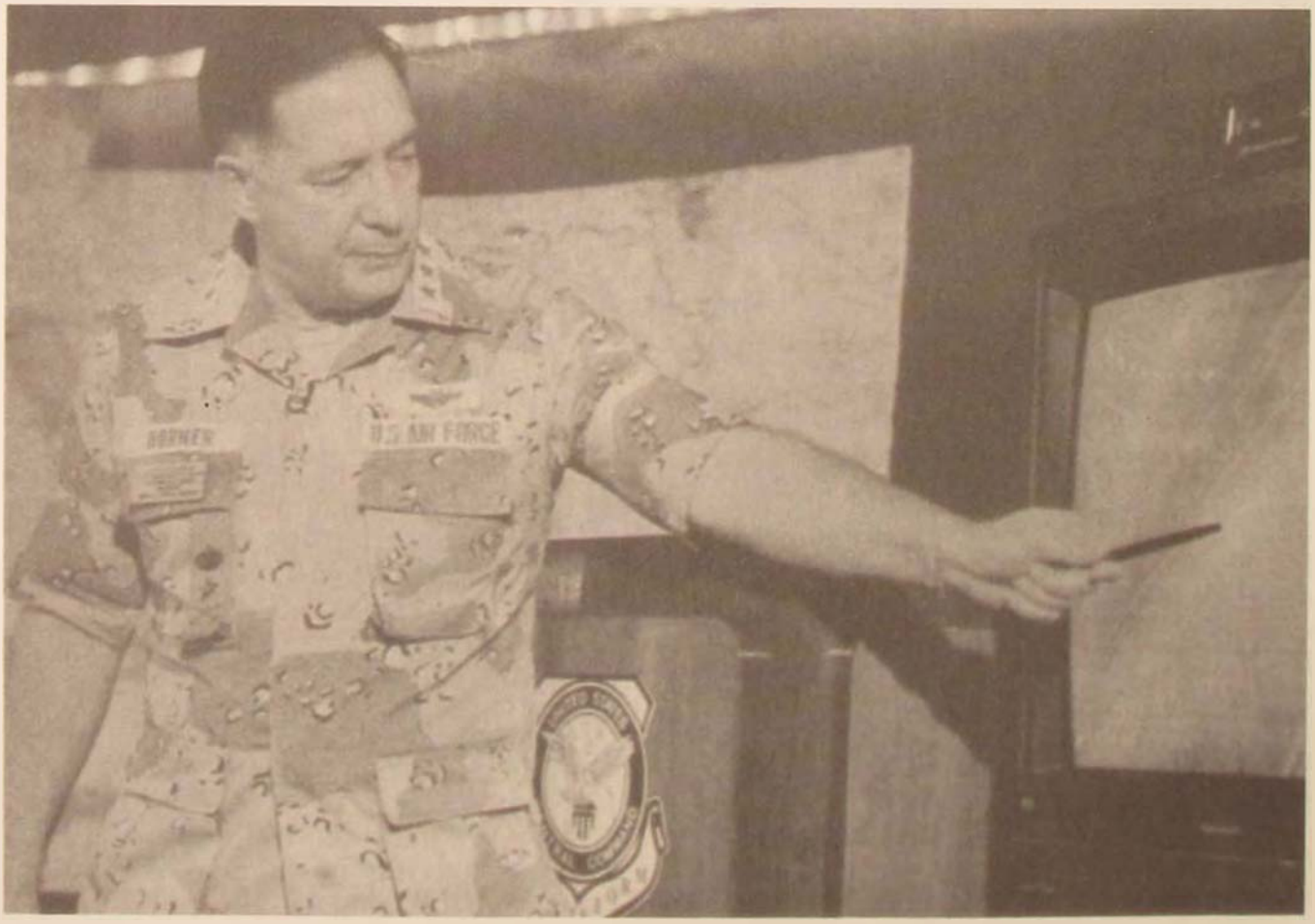
Moreover, destroying North Vietnam's capacity to fight was no guarantee that the insurgency in South Vietnam would stop. During the entire Johnson presidency, the vast bulk of the Communist army in South Vietnam consisted of Viet Cong units who fought, along with their North Vietnamese allies, an average of one day a month.[11] This infrequent combat produced a requirement for such a small amount of external supplies that *no* amount of bombing with conventional ordnance could have prevented their arrival. Nor did the Viet Cong need—or want—a large amount of North Vietnamese direction. As Larry Cable has convincingly shown in *Unholy Grail*, the Viet Cong sought to *minimize*

Northern influence in the National Liberation Front throughout the war.[12] In short, eliminating North Vietnam from the war in 1965 would likely have accomplished little towards achieving a stable, independent South. By the time that removing the North *would* have made a difference—after the 1968 Tet offensive—the American public had lost its stomach for the war and the goal had changed to "peace with honor."

Such disparity between political goals and military objectives did not exist in the Persian Gulf, and the clear-cut nature of our announced aims heightened the possibility that air power could be a decisive instrument in a war against Iraq. In his 16 January 1991 announcement of hostilities, President Bush reaffirmed that the Iraqis must immediately and unconditionally withdraw from Kuwait, allowing the emir's government to return; they must fully accept the United Nations resolutions; and they must release all prisoners of war, third-country nationals, and the remains of those who died in Iraqi hands.[13] Bush also stated that American bombs were not aimed at Iraqi civilians, whom he urged to overthrow Saddam Hussein, although the president later acknowledged that Saddam himself was not a specific target.[14]

With very few exceptions, President Bush and Secretary of Defense Dick Cheney left the choice of targets to the military[15]—a notable difference from the "Tuesday lunch approach" of target selection employed by President Johnson during the Vietnam War. The unprecedented United Nations mandate permitted Bush to

Lt Gen Charles A. Horner, air component commander of Operation Desert Storm, briefs the press corps on the air war against Iraq (below). His chief air planner, Brig Gen Buster Glosson, related, "Chuck [Horner] and I remember flying in Vietnam with less than a full load of weapons. You can bet we were not going to let that happen again."



apply air power with minimal restraints; he did not have to worry about Soviet or Chinese intervention as had Johnson. Yet, like Nixon, Bush had to consider the potentially fragile nature of support from the American public, especially given the instantaneous reporting capability of television news agencies. The trauma of Vietnam suggested to him and his advisers that the American home front would not tolerate a conflict that was lengthy, bloody, or less than decisive.

Once the war started, an additional motive argued strongly for swiftly applying massive doses of American military power—Saddam Hussein's attack on Israel with Scud missiles. To avoid an expanded conflict that threatened the fabric of the coalition, Bush had to persuade the Israelis that he could eliminate the Iraqi menace to the Jewish state. An intensive air offensive offered him the means to do so. On the other hand, an air campaign devoting significant attention to Scud sites reduced the number of aircraft available to attack Iraq's key strategic targets, increasing the time needed to destroy them.[16]

Throughout the planning for the Desert Storm air campaign, American military and civilian leaders alike were conscious of Vietnam ghosts lurking in the background. "I measure everything in my life from Vietnam," observed Gen H. Norman Schwarzkopf, the commander in chief of Central Command, who served two tours of duty in Southeast Asia.[17] President Bush noted in his war message on 16 January 1991: "I've told the American people

Unlike President Johnson's "Tuesday lunch approach" to target selection during the Vietnam War, President Bush and Secretary of Defense Cheney, with very few exceptions, left the choice of targets to the military. Below, chairman of the Joint Chiefs of Staff, Gen Colin L. Powell, briefs Desert Storm reconnaissance photographs to the president in February 1991.

OFFICIAL WHITE HOUSE PHOTOGRAPH: SUSAN BIDDLE

The erratic intensity of Rolling Thunder differed from the continuous air campaign of Desert Storm, which did not give the enemy time to catch its breath.

before that this will not be another Vietnam and I repeat this here tonight. Our troops will have the best possible support in the entire world, and they will not be asked to fight with one hand tied behind their back."[18] Air Force Lt Gen Charles A. Horner, Desert Storm's air component commander, received full authority to direct virtually all air elements—Air Force, Army, Navy, Marine, and allied—as he saw fit. No analogous position had existed in Vietnam. There, the individual services waged autonomous air wars over the South, rarely coordinating with the South Vietnamese air force. Over the North, the inability to gauge the precise effects of bombing on the enemy war effort yielded another method of measuring results—sortie count. Competition developed between the US Air Force and Navy for the highest daily sortie total, leading to missions with reduced ordnance to raise the count.[19] Both Horner and his chief air planner, Brig Gen Buster C. Glosson, had fought in Southeast Asia, and the experience colored their judgments regarding Desert Storm. "Chuck [Horner] and I remember flying in Vietnam with less than a full load of weapons," Glosson recounted. "You can bet we were not going to let *that* happen again."[20]

In trying to avoid the perceived mistakes of Vietnam, air commanders sought to destroy Iraq's war-fighting capability and will to fight. Those two objectives had been goals of Rolling Thunder, as well as of American air campaigns in World War II and Korea. Air chiefs had believed that by attacking vital economic centers they could destroy an enemy's war-making capacity, which would in turn produce the loss of social cohesion and the will to resist. The logic proved flawed for Rolling Thunder. The multitude of political, military, and operational restrictions on bombing, multiplied by the guerrilla nature of the ground war in the South, emasculated the air campaign, enabling North Vietnamese leaders to use it to create popular support for the war at a minimum cost. During Linebacker I and II, the logic proved more suitable to the unique conditions that then existed. The relaxation of political controls, resulting from Nixon's détente; the development of precision-guided munitions; and the conventional nature of the 1972 North Vietnamese offensive, which required massive logistical backing and was exceedingly vulnerable to air power, all helped to make Nixon's bombing more effective than Johnson's.

Neither Rolling Thunder nor the two Linebacker operations aimed to kill enemy civilians, but air commanders did target civilian *morale* after attacks directed exclusively against the North's war-making capability failed to produce decisive results. This action meshed well with the conduct of past American air campaigns; air leaders in World War II and Korea had also resorted to attacks against civilian will after discovering that bombing aimed specifically at war-making capability did not yield quick victory.[21] During Rolling Thunder, attacks against morale occurred in early 1967 in concert with raids on North Vietnamese electric power facilities and industry, and the entire Linebacker II campaign targeted Northern resolve.[22] In both cases, air commanders bombed military facilities close to population centers (*not* the civilian populace) or structures such as electric power plants that were deemed essential to both the Communist war effort and the normal functioning of North Vietnamese society.

Against Iraq, airmen broke with tradition and designed an air offensive that targeted war-making capacity and enemy morale from the start. The rationale for the approach rested on two key considerations affected by the Vietnam experience: the perception of the enemy's "center of gravity" and the technological prowess of American air power.

In his nineteenth-century magnum opus *On War*, the Prussian military theorist Carl von Clausewitz defined "center of gravity" as "the hub of all power and movement, on which everything depends ... the point against which all our energies should be directed."[23] Air Force colonel John Warden focused on this concept in his own book, *The Air Campaign: Planning for Combat*, arguing that the center-of-gravity notion should guide target selection in offensive air operations.[24] A Pentagon staff officer and fighter pilot, Warden had flown 211 missions as a forward air controller in Vietnam, and his views significantly influenced the concept of air operations used in Desert Storm.[25]

Colonel Warden contended that an enemy nation's center of gravity consisted of five concentric, strategic rings. The center ring, the essence of an enemy's war effort, was its leadership. Surrounding this core was a second ring containing key production facilities such as oil and electricity. Next came a third ring of infrastructure consisting primarily of the means of transportation and communication. The civilian populace made up the fourth ring. While noting that air power should not be used to target an enemy population directly, Colonel Warden also maintained, "It's important that people [in the enemy nation] understand that a war is going on, and they put some pressure on their leadership to stop the war."[26] Surrounding the band of population was a fifth ring of fielded military forces. Warden insisted that fielded forces should not be the initial focal point of an air campaign, because those forces served only to shield the crux of an enemy's war effort, the internal rings, which contained the vital targets.[27]

In Rolling Thunder, air commanders had concentrated on severing North Vietnamese direction and support of the Viet Cong insurgency by attacking targets in the second, third, and ultimately fourth rings. The effort failed because of the nature of the war; North Vietnamese support and direction were not essential to the Viet Cong's war-making capacity. Colonel Warden observed, "Air [power] is of marginal value in a fight against self-sustaining guerrillas who merge with the population."[28] During the Linebacker campaigns, however, attacks against essentially the same targets as in Rolling Thunder paid dividends. The 1968 Tet offensive had decimated the Viet Cong, and Hanoi's 1972 Easter invasion consisted of 12 North Vietnamese Army divisions backed by large numbers of tanks and heavy artillery. Linebacker, along with the aerial mining of Northern ports and massive doses of close air support in South Vietnam, wrecked Hanoi's capacity to wage offensive warfare and contributed to the willingness of North Vietnamese leaders to negotiate a peace ending American involvement in the war.

XVIII AIRBORNE CORPS PHOTOGRAPH

Saddam Hussein chose not to launch air attacks on coalition bases and ports but instead grounded his air force in shelters. Once those shelters became vulnerable to precision weapons, many of his aircraft flew to Iran to sit out the war. Above, the remains of an Iraqi Su-25 Frogfoot, apparently destroyed by coalition forces before it ever got airborne and, right, a destroyed hanger containing Iraqi helicopters.

Air planners noted the similarity between Iraq's predicament following the invasion of Kuwait and North Vietnam's after the Easter offensive. Both nations possessed armies waging conventional war and sporting large amounts of Soviet equipment that needed heavy logistical support. Blockades limited the amount of imports available to the two countries. Yet planners noted that Iraq was even more vulnerable than North Vietnam to an aerial assault against the first, second, third, and fourth rings of Warden's model. Whereas a six-man Politburo led North Vietnam in 1972, Saddam Hussein was a monolithic force in Iraq whose approval was required in tactical as well as strategic decision making. The bulk of the North Vietnamese populace lived as rice farmers in the Red River Delta, while 70 percent of the Iraqi population lived in cities.[29] Iraq was also relatively industrialized, containing numerous modern oil refineries and the associated benefits of an oil glut, such as sophisticated transportation and communication facilities.[30] North Vietnam had to import all of its petroleum needs, boasted a single steel mill and one cement factory, and had only one railroad that ran the length of the country.

The North Vietnamese, however, possessed a key advantage that Iraq lacked—a unified populace. The fractured ethnic and religious backgrounds of the Iraqi people made Saddam Hussein more dependent than ever on the means of communication to exercise control, and ties to the army and his secret police were the primary methods of exercising that authority. Iraq's transportation and communication facilities were also more vulnerable than those of North Vietnam, which the Linebacker

offensives had wrecked. By 1972 the North Vietnamese had constructed an oil pipeline through Cambodia and Laos to South Vietnam,[31] and the dense, triple canopy foliage obscured the redundant multitude of roadways and paths merging to form the Ho Chi Minh Trail. The barren environment of the Iraqi desert stood in stark contrast to the Southeast Asian jungles. The vital road and rail links to Iraqi troops in Kuwait could not be concealed, nor could vehicles traveling on them be hidden.

The combination of these factors—an urban populace accustomed to many of the conveniences of twentieth century industrialization and splintered in its support for the government, a dictator who depended on ties to his army and his police force to stay in power, an army that waged conventional war, and an almost complete isolation by the international community—made Iraq an ideal target for a strategic air campaign that simultaneously attacked war-making capacity and the will to resist.

An essential facet of General Horner's ability to attack Iraq's capability and will with devastating effect was another legacy of Vietnam—the widespread use of precision guided munitions. The United States had first employed "smart" bombs in Southeast Asia in late 1967, but it was during Linebacker I that the ordnance achieved significant results. On 10 May 1972, 32 Air Force F-4 Phantoms dropped 29 electro-optically and laser-guided bombs on Hanoi's key span across the Red River, the Paul Doumer Bridge.[32] The bridge collapsed the next day. On 12 May, Phantoms from the Air Force's 8th Tactical Fighter Wing used smart bombs to wreck the defiant symbol of North Vietnam that had remained standing throughout the three and one-half years of Rolling Thunder—the infamous "Dragon's Jaw" bridge at Thanh Hoa.

XVIII AIRBORNE CORPS PHOTOGRAPH

After the Vietnam War, the accuracy of precision guided munitions improved dramatically. Modern laser, electro-optical, and infrared targeting systems used against Iraq enabled Air Force pilots to bomb within one to two feet of a target even at night.[33] The combination of precision guided munitions with another technological wonder—the F-117A stealth fighter—made the dream of an invulnerable precision bombing capability a reality. "Desert Storm was ... a vindication of the old concept of precision bombing," commented former Air Force Chief of Staff Gen Michael Dugan. "The technology finally caught up with the doctrine."[34] F-117As destroyed an estimated 95 percent of all key targets in Baghdad, and on one occasion a fighter guided a bomb through an air shaft in the roof of the Iraqi air defense headquarters.[35] The ability to achieve such amazing accuracy from unseen locations against military targets in densely populated areas permitted American air commanders to attack the will of a populace in a manner previously thought impossible. General Horner stated that he scheduled the middle-of-the-night raids against targets in Baghdad to remind Iraqis that a war was being fought and that Saddam was incapable of containing it, as well as to destroy the command and control network of the Iraqi military.[36] Given that Iraq was already vulnerable to air power, the merger of stealth and precision guided munitions had a devastating impact on the Iraqi war effort. A captured senior Iraqi officer termed the air campaign shocking, and listed its precision as a key reason for its impact. Many of his comrades shared his conviction.[37]

To guarantee that the air power had a maximum effect on the Iraqis, American military leaders, including General Schwarzkopf and the chairman of the Joint Chiefs of Staff, Army general Colin L. Powell, called for a massive, nonstop air campaign. Air planners initially dubbed the air offensive "Instant Thunder"—a conscious effort to eliminate any vestige of the gradual approach to bombing that had plagued Lyndon Johnson's air war against North Vietnam. General Horner also designed the air campaign to give the Iraqis no time to catch their breath. Rolling Thunder's bombing pauses had provided the North Vietnamese the chance to repair damage and move supplies in safety, and American commanders during Desert Storm intended to deny Iraq the same opportunity. "The air part of the campaign will last until the whole campaign is over," General Powell declared during the war's first week.[38]

American military leaders were further determined not to underestimate Saddam Hussein's military machine. In contrast to the disdainful American attitude towards Ho Chi Minh's army following its victory over the French in the First Indochina War, Schwarzkopf and his lieutenants entered the Persian Gulf gravely concerned about Iraq's combat capability. With a population one third the size of Iran's, Iraq had fought off repeated Iranian advances in the bitter 1980–88 war and ultimately prevailed. In that conflict, Saddam Hussein used chemical weapons against Iranian troops and Iraq's Kurdish minority. After achieving complete air superiority, his air force provided over 200 close air support sorties a day in late 1982 and early 1983, when Iranian ground assaults threatened to score a major breakthrough, and then turned to attacking Iranian cities.[39] By the war's conclusion, Saddam possessed a million-man army backed by more than 5,500 tanks and an air force of more than 500 aircraft.[40] Moreover, in 1990 Iraq reportedly owned the largest supply of chemical weapons in the third world, had developed the means to produce them, and had improved its ballistic missile force through modifications to its Soviet Scuds.[41]

To wreck Saddam's war-making capability, Horner attacked Iraq's vital components in methodical fashion. Memories of Southeast Asia produced the "nuts and bolts" of the Desert Storm air campaign—the air tasking order (ATO). Horner designated targets for all coalition air forces, as well as for the Navy's Tomahawk missiles, on a single air tasking order that often ran

700 pages a day and listed the sorties scheduled during a 24-hour span.[42] Lt Gen Jimmie V. Adams, then Air Force deputy chief of staff for plans and operations,* observed: "We've got nine services singing off the same sheet of music—we didn't do that in Vietnam. There's one ATO for everyone who flies over Saudi Arabia."[43]

The air campaign itself was a multiphased effort. The first phase, scheduled to last seven to 10 days, targeted Iraq's command and control facilities; airfields; Scud missile sites; nuclear, chemical, and biological warfare plants; and other war-making industries. Many of those targets were located in Iraqi cities, which guaranteed that the populace could not ignore the air campaign while precision guided munitions kept civilian losses to a minimum. Phase 2 consisted of destroying enemy air defenses to permit allied air forces to fly unhindered over Kuwait. Phase 3 targeted supply lines, Iraqi troops in Kuwait, and the Republican Guard. Originally projected to occur in successive increments totaling about 30 days,[44] the three phases actually transpired simultaneously because of the abundance of coalition aircraft available. Phase 4, the final phase, focused on providing allied troops with air support once the ground offensive began. By that time, however, air power had substantially wrecked both Iraqi capability and will to resist. Saddam's command and control facilities were in shambles, and he could not resupply his battered army, whose units in Kuwait and along its border had suffered 50 percent attrition.[45] The Iraqi army had become an eggshell that cracked once it was tapped by advancing allied ground forces. David Hackworth, a Vietnam infantryman-turned-journalist, accompanied American troops into Kuwait and concluded, "Air power did a most impressive job and virtually won this war by itself."[46]

While the Vietnam legacy contributed enormously to air power's success in Desert Storm, one demon from Southeast Asia threatened to cast its evil eye on the air campaign. That ogre was the same Air Force mind-set that had been present on the eve of Rolling Thunder—a war-fighting doctrine geared to the policy of containment and stressing potential combat with the Soviet Union. Before the active involvement of the United States in Vietnam, this focus had led to the conviction that adequate preparation for "general war" with the Soviets would suffice to win any limited war. The 1959 edition of the Air Force's basic doctrinal manual, which guided the service through the initial stages of planning for Rolling Thunder, stated: "The best preparation for limited war is proper preparation for general war. The latter is the more important since there can be no guarantee that a limited war would not spread into general conflict."[47] Unfortunately, the guerrilla war waged by the North Vietnamese and the Viet Cong did not suit the mold, and Rolling Thunder was doomed to failure from the start.

A similar doctrinal void existed on the eve of Desert Storm. The unexpected end of the cold war had left the Air Force with a basic doctrinal manual, dated 13 August 1984, little changed in substance from that of 1959. The belief of many air commanders in Southeast Asia that Linebacker II had single-handedly achieved the 1973 Paris Peace Agreement served to vindicate the pre-Vietnam doctrine emphasizing a potential war with the Soviets. As a result, Air Force planning following Vietnam had focused on fighting the Soviets where they were considered to be the greatest threat—Europe. Planners envisioned Strategic Air Command's bombers and missiles overflying the battle area to accomplish the independent mission of strategic bombing against the Soviet homeland with nuclear weapons. Meanwhile, Air Force fighters would support the ground defense of the continent.

Tactical Air Command helped the Army design its AirLand Battle doctrine that outlined those fighters' specific tasks.[48] In tying bombers to the strategic nuclear mis-

*Now a four-star general and commander in chief of Pacific Air Forces (PACAF)

sion and fighters to the mission of tactical air support, air planners neglected provisions for an independent air campaign using conventional weapons against a non-Soviet enemy. "The doctrinal paradigm since the 1950s has been an Air Force that separated strategic and tactical applications of air power institutionally, organizationally, intellectually, and culturally," noted Maj Gen Robert M. Alexander, the Air Force's director of plans, deputy chief of staff for plans and operations. "There was a need for an offensive conventional independent air campaign plan against Iraq. However, there was no provision in the paradigm."[49]

Doctrinal semantics contributed to the Air Force's difficulty in designing an independent air campaign against Iraq. Strategic Air Command had long equated "strategic" with "nuclear."[50] This emphasis on the nuclear mission resulted in B-52 crews arriving for duty during the Vietnam War "with only the barest introduction to conventional tactics" and using modified nuclear bombing procedures against enemy targets.[51] Yet with the exception of Linebacker II, the giant bombers' primary mission in Southeast Asia was battlefield interdiction or close air support. Meanwhile, fighter aircraft conducted most of the strategic missions—those aimed at North Vietnamese war-making potential rather than their deployed armed forces—during Rolling Thunder and Linebacker I. Despite the example of Southeast Asia, the perceived Soviet threat after Vietnam caused SAC's primary focus to return to the nuclear mission, while TAC, viewing its main role as assisting ground forces on the battlefield, focused on the AirLand Battle. TAC thus shunned planning for "strategic conventional" operations, even though, in terms of precisely delivering ordnance against such targets as factories or electric power stations, the capability of TAC's fighters had far outstripped that of SAC's bombers.

Rather than devising a makeshift air campaign against Iraq from strategies designed for war with the Soviets, air chiefs kept the Vietnam demon at bay by improvising. "There were no formalized procedures for the approval of the planning and execution of the conventional strike," General Alexander stated. "In response to this requirement, the Air Force headed an ad hoc joint working group under the auspices of the Joint Staff and provided the broad conceptual planning that was necessary."[52] Colonel Warden directed this diverse assembly, which comprised 30 to 40 officers from the Air Force, Army, Navy, and Marines. Relying on many of the ideas articulated in his book, he developed a concept of operations emphasizing a conventional, strategic air assault as the fundamental underpinning of an air campaign. Generals Horner and Glosson took Warden's conceptual design, modified it to suit their views, and then hammered out the specifics of the Desert Storm air offensive.[53]

Many observers of the operation, however, have failed to note the emphasis placed on the air campaign's first phase—and that the phase 1 attacks were key to destroying Iraq's war-making capability. Instead, they focus on phases 3 and 4 of the air assault (which occurred simultaneously with phase 1), contending that Desert Storm vindicated AirLand Battle doctrine.[54] Yet air planners in the aftermath of Vietnam had envisioned AirLand Battle as a *tactical* concept to counter a Soviet thrust into Western Europe. The doctrine proved adaptable to guide an air offensive aimed at Iraqi forces in Kuwait and on the Kuwaiti border. AirLand Battle did not, however, provide for a *strategic* application of air power against the war-making capability and will to resist of an enemy nation. For that conceptual design, the Air Force had to rely on happenstance—and fortunately turned to a colonel with profound insight who was serving on the Air Staff when Iraq invaded Kuwait.

In contrast to air commanders after Vietnam, air leaders after Desert Storm must avoid the temptation to conclude that the air doctrine with which they entered the war was appropriate for it. Despite the spectacular success of the Desert Storm air

campaign, the Gulf war offers no blueprint guaranteeing a successful application of air power in the future. Linebacker II had helped achieve Nixon's goals in December 1972 because of unique circumstances, but many air chiefs ignored the changed nature of both the Vietnam War and American objectives in it to argue that such bombing would have achieved decisive results during Rolling Thunder. The situation in Iraq 19 years after Nixon's Christmas bombing was also unique, and its uniqueness related directly to the magnitude of success achieved by air power. The combination of a fragmented, semi-industrialized, third-world enemy waging conventional war with Soviet equipment in a desert environment and being led by an international pariah who personally made all key military decisions and relied on an intricate command and control network for their implementation is unlikely to recur.

Nor is it likely that the United States will soon confront a commander as inept as Saddam. He granted the allied coalition five and a half months to refine planning and marshal forces, allowing its units to undergo extensive training in desert warfare. During that span (and throughout the war), his commanders suffered from a lack of intelligence data, while Generals Schwarzkopf and Horner received enormous quantities of information from satellites, reconnaissance aircraft, and remotely piloted vehicles.[55]

Saddam also failed to take any significant military action that might have affected the course of the war. Shunning an advance into Saudi Arabia after overrunning Kuwait, which would have de-

"The air part of the campaign will last until the whole campaign is over," declared General Powell shortly after the start of Operation Desert Storm. Here, General Powell and Col John M. McBroom, then commander of the 1st Tactical Fighter Wing from Langley AFB, Virginia, discuss the air war at a base in Saudi Arabia.

nied coalition forces key staging areas, he did not seriously threaten the allied bases once the war began. "All you have to do is stand in Dhahran and look at the huge amounts of equipment we were bringing in there," General Schwarzkopf remarked. "If they [the Iraqis] had launched a persistent chemical attack that had denied the port of Dammam to us, obviously this would have been a major setback."[56] The American commander further noted that an attack by Iraqi aircraft on Riyadh Air Base in Saudi Arabia could have caused tremendous damage. Saddam, however, chose to ground his air force in hardened shelters. Once those shelters proved vulnerable to American bombs, much of the remainder of his air force fled to Iran.

In the final analysis, Iraq's vulnerability to General Horner's air offensive could have stemmed as much from Saddam's attempt to apply the perceived lessons of Vietnam as it did from efforts by American civilian and military leaders to exorcise Southeast Asian ghosts. The Iraqi president believed that Vietnam permanently sapped American will to fight a long war abroad. "Yours is a society which cannot accept 10,000 dead in one battle," he told American ambassador April Glaspie before attacking Kuwait.[57] He likely thought that five months of waiting would cause the American public to reconsider the merits of combat, and that the high casualties he expected to inflict once war began would have the same impact on American will to fight as had the bloody 1968 Tet offensive. Apparently to goad General Schwarzkopf into a premature ground attack, Saddam lobbed Scuds at Israel and Saudi Arabia, launched assaults into Saudi Arabia (Khafji was one example), and dumped Kuwaiti oil into the Persian Gulf. These ventures failed to have a major impact on the war because of allied air power, a capability that Saddam dismissed from the start of the crisis. "The United States relies on the Air Force," he declared on 30 August 1990, "and the Air Force has never been the decisive factor in a battle in the history of wars."[58] Desert Storm proved otherwise.

Saddam Hussein was no Ho Chi Minh, and the next enemy is unlikely to be a Saddam Hussein. The relaxation of superpower tensions makes it probable that there will be a next enemy—sooner rather than later. The bipolar world of the cold war tended to restrain regional conflicts, as the Soviet Union and the United States could use their leverage to keep client states in line. Now, however, uncertainty prevails on the world stage. Secretary of the Air Force Donald B. Rice highlighted this instability in the foreword to his white paper, "Global Reach—Global Power," published a little over a month before Saddam's invasion of Kuwait. He noted: "Extraordinary international developments over the last few years have created the potential for a significantly different security environment as we approach the beginning of the twenty-first century. These changes demand fresh thinking about the role of military forces."[59]

Given the changing world scene, the Air Force needs a doctrine underscoring the flexible nature of air power. Air University's Center for Aerospace Doctrine, Research, and Education (AUCADRE) is currently putting the finishing touches on a new version of Air Force Manual 1-1 that will go far towards eliminating much of the dogma of the 1984 edition. In particular, the manual notes that no universal formula exists for the proper application of air power and that strategic operations are defined by their objective rather than by the weapon system used, type of munitions, or location of the target. General McPeak's call for composite air wings that combine fighters and bombers should also help eliminate the largely artificial distinction suggested by the titles *Strategic* and *Tactical* Air Commands.

The magnificent melding of technology, sophisticated planning, adroit leadership, and highly trained, courageous personnel in Desert Storm bodes well for the service's ability to respond to future contingencies. For over half a century, Air Force leaders have maintained that air power could be the decisive element in war, and Desert Storm has finally vindi-

cated the claim. More importantly, however, air power again demonstrated that it is—above all else—a *flexible* instrument of national policy. If used inflexibly (as in Rolling Thunder), its application can be disastrous, but if unshackled from dogma and applied with imagination and creativity (as during Desert Storm), it may be a decisive force.

Despite forthcoming cuts in both manpower and funding, the Air Force of the future can continue to play a significant role in American military operations by focusing on flexibility as the fundamental underpinning of service doctrine. The key to applying air power successfully is melding the appropriate amount of force to national objectives, which may or may not call for the Air Force to play the decisive role in combat. Now is an ideal time for the service to come to grips with its past by exorcising completely the demons of Vietnam. Yet in burying those phantoms, we must avoid creating a new spectre that judges success or failure in future wars according to whether or not the Air Force was the most decisive factor. Given both a different foe and different circumstances from those encountered in the Gulf war, the quest for air power's decisiveness may prove as bedeviled as Rolling Thunder. □

Notes

1. Quoted in Julie Bird, "McPeak: 'Brilliant ... air deception,'" *Air Force Times*, 25 March 1991, 8. Actually, air power had destroyed armies in both world wars. In a 1918 precursor of Desert Storm's air offensive, British general Edmund Allenby's five Royal Air Force squadrons wrecked two Turkish divisions in a narrow defile after the planes had previously destroyed the central Turkish telephone exchange and Turkish army headquarters. Twenty-six years later, during Lt Gen George Patton's dramatic dash across France, air power again destroyed an army. German major general Eric Elster surrendered 20,000 troops on 16 September 1944 as a direct result of the punishment inflicted by the fighters of Brig Gen Otto P. Weyland's XIX Tactical Air Command. Weyland was requested to attend the surrender ceremony. See Robin Higham, *Air Power: A Concise History* (New York: St Martin's Press, 1972), 41–43, and Wesley Frank Craven and James Lea Cate, *The Army Air Forces in World War II*, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945* (Chicago: University of Chicago Press, 1951; New Imprint, Washington, D.C.: Office of Air Force History, 1983), 265–66.

2. Quoted in Stanley W. Cloud, "Exorcising an Old Demon," *Time*, 11 March 1991, 52.

3. Michael M. McCrea, "US Navy, Marine Corps, and Air Force Fixed-Wing Aircraft Losses and Damage in Southeast Asia (1962–1973)," Center for Naval Analyses study, August 1976, 6–28.

4. *The Pentagon Papers: The Defense Department History of United States Decisionmaking on Vietnam*, Senator Gravel edition, vol. 4 (Boston: Beacon Press, 1971), 136.

5. By January 1968, Hanoi had received almost $600 million in economic aid and $1 billion in military assistance. See Jason Summer's study, "Summary and Conclusions," 30 August 1966, *Pentagon Papers*, Gravel edition, vol. 4: 116; and Department of Defense Systems Analysis report, January 1968, *Pentagon Papers*, Gravel edition, vol. 4: 225–26.

6. Quoted in George C. Herring, *"Cold Blood": LBJ's Conduct of Limited War in Vietnam*, The Harmon Memorial Lectures in Military History, no. 33 (Colorado Springs, Colo.: United States Air Force Academy, 1990), 2.

7. Interview of Dean Rusk by the author, Athens, Georgia, 15 July 1985.

8. Message, 040304Z April 1965, CINCPAC to JCS, in *Commander-in-Chief, PACOM, Outgoing Messages, 22 January–28 June 1965*, K712.1623-2, USAF Historical Research Center (USAFHRC), Maxwell AFB, Ala.

9. Air Force generals Curtis LeMay and William Momyer, and Adm U. S. Grant Sharp, among others, have argued that intensive bombing of North Vietnam could have proved decisive in Vietnam in 1965.

10. Senate, Committee on Armed Services, Preparedness Investigating Subcommittee, *Air War Against North Vietnam*, 90th Cong., 1st sess., pt. 3, 22–23 August 1967, 212.

11. Headquarters USAF, *Analysis of Effectiveness of Interdiction in Southeast Asia, Second Progress Report*, May 1966, 7, K168.187-21, USAFHRC; Senate, *Air War Against North Vietnam*, 25 August 1967, pt. 4, 299.

12. Larry Cable, *Unholy Grail: The US and the Wars in Vietnam, 1965–1968* (London: Routledge & Kegan Paul (UK), 1991).

13. George Bush, "Address to the Nation Announcing Allied Military Action in the Persian Gulf," 16 January 1991, in *Weekly Compilation of Presidential Documents*, 21 January 1991, 51.

14. "The President's News Conference on the Persian Gulf Conflict," 18 January 1991, in ibid., 56.

15. Two targets that Cheney eliminated from the target list were a huge statue of Saddam Hussein and the Iraqi war memorial, both in Baghdad. See Tom Mathews, "The Secret History of the War," *Newsweek*, 18 March 1991, 30.

16. The hunt for Scuds ultimately diverted about 1,500 sorties originally designated for other strategic targets and increased the time required to finish the strategic campaign by three to five days. See Michael Dugan, "The Air War," *US News & World Report*, 11 February 1991, 30.

17. Quoted in "General admits Vietnam body counts were lies," *Detroit News*, 11 March 1991, 6.

18. Bush, 51.

19. Lt Gen Joseph H. Moore, oral history interview by Maj Samuel E. Riddlebarger and Lt Col Valentino Castellina, 22 November 1969, 17–18, K239.0512-241, USAFHRC; Lt Col William H. Greenhalgh, interview with author, Maxwell Air Force Base, Alabama, 17 May 1985; John Morrocco, *Thunder from Above*, vol. 9 (Vietnam Experience Series) (Boston: Boston Publishing Company, 1984), 125.

20. Quoted in Mathews, 29.

21. Mark A. Clodfelter, *The Limits of Air Power: The Amer-*

ican Bombing of North Vietnam (New York: Free Press, 1989). This assertion is discussed at length in chapter 1.

22. Ibid., 100–107; 177–85.

23. Carl von Clausewitz, *On War*, trans. and ed. Michael Howard and Peter Paret (Princeton: Princeton University Press, 1976), 595–96.

24. John A. Warden III, *The Air Campaign: Planning for Combat* (Washington, D.C.: National Defense University Press, 1988). Warden first discusses "centers of gravity" on pages 9–11 and refers to the concept throughout the book.

25. Richard Saltus, "Air Force says it might have won the war in 2 more weeks," *The Boston Globe*, 5 April 1991, 10. Lt Gen John B. Conaway, chief of the Air Force's National Guard Bureau, noted at the 3 April 1991 Conference on the Air Force at Boston's Tufts University that Colonel Warden was "one of the key individuals who put together the air campaign for Desert Storm."

26. John A. Warden III, "Airpower Employment in the Future World" (Paper presented at the Tufts University Conference on the Air Force, 3 April 1991).

27. Ibid.

28. Warden, *The Air Campaign*, 147.

29. Phebe Marr, *The Modern History of Iraq* (Boulder, Colo.: Westview Press, 1985), 270.

30. Ibid., 130, 248–58; David Segal, "The Iran-Iraq War: A Military Analysis," *Foreign Affairs* 66, no. 5 (Summer 1988): 952.

31. Headquarters PACAF, *Corona Harvest: The USAF in Southeast Asia, 1970–1973—Lessons Learned and Recommendations: A Compendium (16 June 1975)*, 82–83, K717.0423-11, USAFHRC.

32. Headquarters Seventh Air Force, *7th Air Force History of Linebacker Operations, 10 May–23 October 1972*, n.d., 7–10, K740.04-24, USAFHRC.

33. William B. Scott, "Electro-Optic Targeting Tools Bolster Bombing Accuracy of Allied Aircraft," *Aviation Week & Space Technology*, 28 January 1991, 25; John D. Morrocco, "U.S. Tactics Exploit Advances in Avionics, Air-to-Surface Weapons," *Aviation Week & Space Technology*, 18 February 1991, 52.

34. Michael Dugan, "First Lessons of Victory," *US News & World Report*, 18 March 1991, 36.

35. Jeffrey M. Lenorovitz, "F-117s Drop Laser-Guided Bombs in Destroying Most Baghdad Targets," *Aviation Week & Space Technology*, 4 February 1991, 30.

36. Julie Bird, "Horner: Further AF role in gulf not needed," *Air Force Times*, 18 March 1991, 8.

37. Secretary of the Air Force Donald B. Rice, "Global Change, Global Reach and Global Power," address at Boston's Tufts University Conference on the Air Force, 3 April 1991.

38. Quoted in John D. Morrocco, "Allies Attack Iraqi Targets; Scuds Strike Israeli Cities," *Aviation Week & Space Technology*, 21 January 1991, 22.

39. Efraim Karsh, "Military Lessons of the Iran-Iraq War," *Orbis* 33, no. 2 (Spring 1989): 217.

40. Phebe Marr, "Iraq's Uncertain Future," *Current History* 90, no. 552 (January 1991): 1.

41. Ibid., 1–2.

42. Dugan, "The Air War," 28.

43. Quoted in Bill Sweetman, "Learning lessons of 'Desert Storm,'" *Jane's Defence Weekly*, 9 March 1991, 329.

44. Bird, "McPeak," 8; Dugan, "The Air War," 26.

45. Schwarzkopf stated that air attacks left Iraqi units on the Kuwaiti border "at 50 per cent or below. The second level, basically that we had to face—and these were the real tough fighters that we were worried about—were attrited to some place between 50 and 75 per cent." See Ian Kemp, "100-hour war to free Kuwait," *Jane's Defence Weekly* 15, no. 10, 9 March 1991, 326.

46. David H. Hackworth, "Lessons of a Lucky War," *Newsweek*, 11 March 1991, 49.

47. Air Force Manual 1-2, *United States Air Force Basic Doctrine*, 1 December 1959, 4.

48. For an analysis of the development of the "AirLand Battle" concept, and the Air Force's projected role in that doctrine, see John L. Romjue, "The Evolution of the AirLand Battle Concept," *Air University Review* 35, no. 4 (May–June 1984): 4–15; and James A. Machos, "TACAIR Support for AirLand Battle," *Air University Review* 35, no. 4 (May–June 1984): 16–24.

49. Robert M. Alexander, "World is rapidly changing and AF must keep up," *Air Force Times*, 11 February 1991, 23.

50. Thomas A. Keaney, *Strategic Bombers and Conventional Weapons: Airpower Options* (Washington, D.C.: National Defense University Press, 1984), 16.

51. Ibid., 29.

52. Alexander, 23.

53. "Schwarzkopf: 'I Got a Lot of Guff'," *Newsweek*, 11 March 1991, 34.

54. Three analysts who contend that AirLand Battle doctrine was a key reason for Desert Storm's success are retired Army officers Harry G. Summers, Jr., William E. Odom, and Trevor N. Dupuy. See Summers' "Airland doctrine seems to be on target, so far," *Air Force Times*, 25 February 1991, 25, 61; Odom's "Storming Past a New Threshold in Warfare," *Christian Science Monitor*, 4 April 1991, 19; and Dupuy's "How the War was Won," *National Review*, 1 April 1991, 29–31.

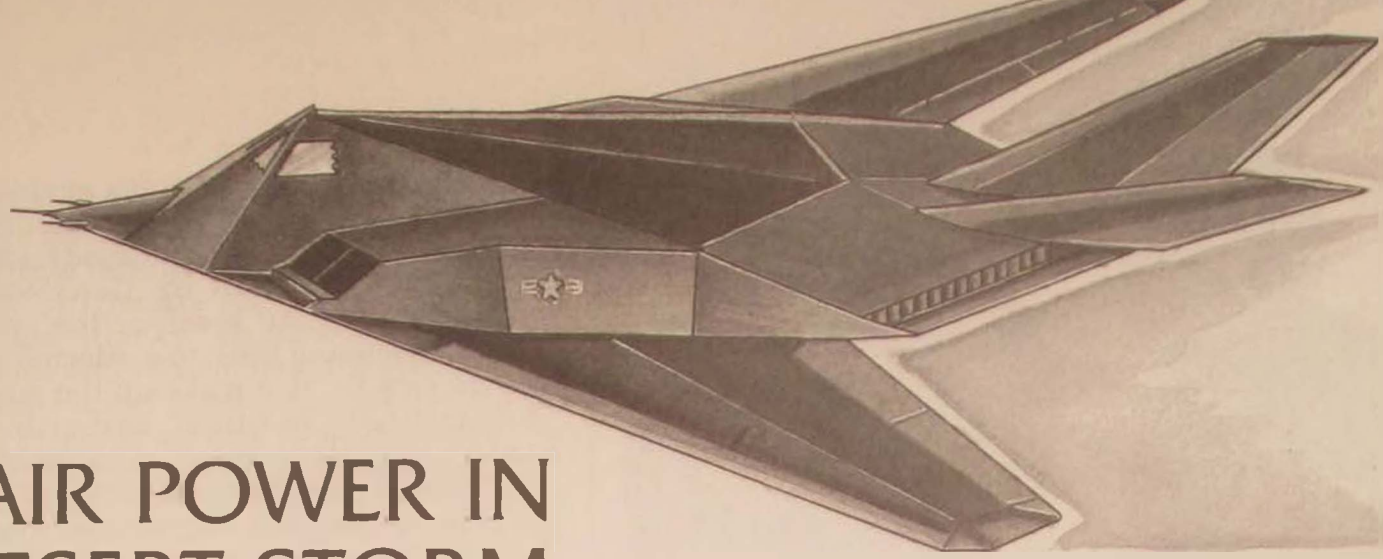
55. Barbara Starr, "Satellites paved way to victory," *Jane's Defence Weekly* 15, no. 10, 9 March 1991, 330.

56. Quoted in "Sayings of Stormin' Norman," *Time*, 11 March 1991, 27.

57. Quoted in Charles Lane, "Saddam's Endgame," *Newsweek*, 7 January 1991, 16.

58. "Excerpts from Interview with Hussein on Crisis in Gulf," *New York Times*, 31 August 1990, A-10.

59. Secretary of the Air Force Donald B. Rice, *The Air Force and U.S. National Security: Global Reach—Global Power* (Washington, D.C.: Department of the Air Force, June 1990), i.



AIR POWER IN DESERT STORM

AND THE NEED FOR DOCTRINAL CHANGE

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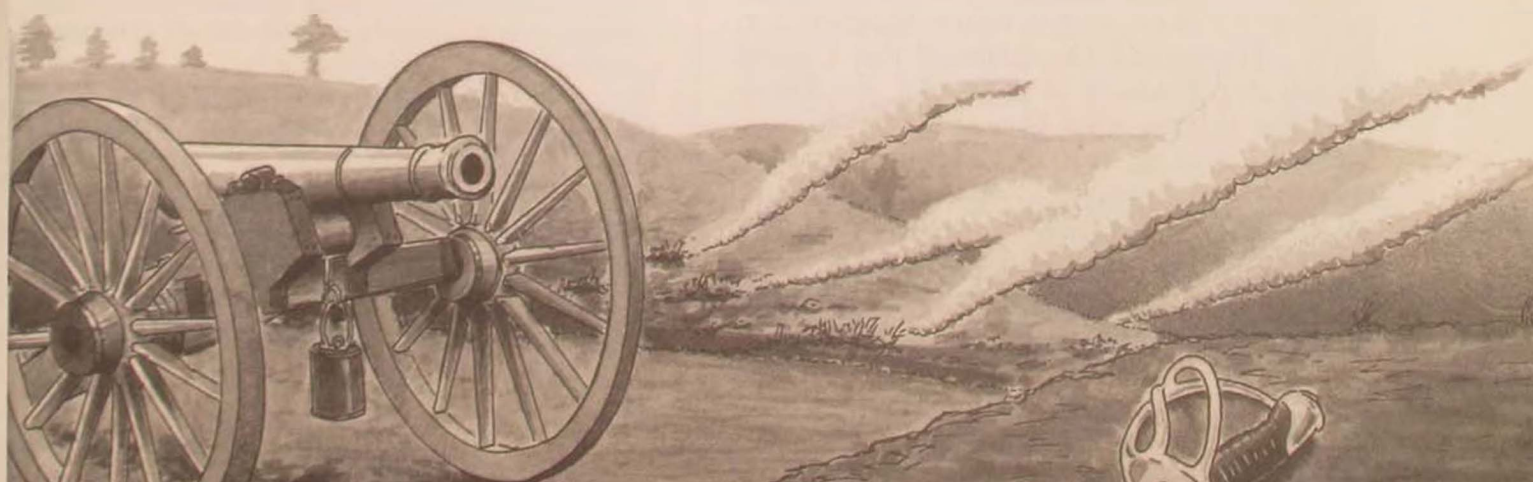
CONTRARY to the underlying assumptions found in much of the US military's current doctrine, air power dominated the conduct of Operation Desert Storm. As a result, perhaps the most important lesson the US military could learn from Desert Storm is that it needs to change its doctrine to recognize the reality that air power can dominate modern conventional war (as opposed to revolutionary war and some military activities short of war like Operation Just Cause). Surface forces are still very important, but campaign success now depends on superiority in the air more than it does on surface superiority.[1]

Changing our doctrine to acknowledge that warfare can be dominated by air power is necessary because doctrine plays a key role in guiding how our future military forces will be organized, trained, equipped, and employed. As the 1940 defeat of France showed, this guidance can spell the difference between victory and defeat.[2] Unfortunately, ensuring that doctrine provides the best guidance is an immensely challenging task. One reason is the difficulty we have in calculating accurately how various developments, such as low-observables, smart weapons, and night sensor technologies, will affect the future conduct of war.[3] An even greater obstacle could be the difficulty of persuading those satisfied with current guidance that it needs to be changed.[4] This is especially true now since our success in the Gulf war provides little incentive for making what are certain to be painful institutional changes. We should keep this second obstacle particularly in mind as we compare the conduct of Desert Storm to Air Force, Navy, Army, Marine Corps, and joint doctrine. This comparison should allow us to see where the guidance in our current doctrine differs from Desert Storm and thus where we need to make changes.



During Desert Storm, Gen H. Norman Schwarzkopf achieved campaign objectives and kept down allied casualties by effectively utilizing ground forces to support the employment of air power.

Air Force Doctrine

Desert Storm validated much of the guidance found in Air Force Manual 1-1, *Basic Aerospace Doctrine of the United States Air Force*. For example, Air Force doctrine claims what Desert Storm demonstrated—that air power "can be the decisive force in warfare."[5] Anticipating how air power was employed in Desert Storm, Air Force doctrine charges an air commander with developing "a broad plan for employing aerospace forces to undertake strategic and tactical actions against the will and capabilities of an enemy."[6] The strategic actions it recommends are the same as those taken by Gen Norman Schwarzkopf. They involve "the systematic application of force to a selected series of vital targets" that make up the enemy's "key military, political, and economic power base."[7] Accurately calculating the effectiveness that was achieved, Air Force doctrine states that "integrated strategic and tactical actions produce a cumulative effect on the enemy's ability to wage war."[8] The lack of Iraqi resistance to the coalition's ground offensive provides still more evidence that Air Force doctrine is right when it states,

> Regardless of an enemy's will to fight on the field of battle, the stresses imposed by persistent and coordinated attacks and the lack of needed logistics and command guidance can make it physically and psychologically difficult, if not infeasible, to remain effective on the battlefield.[9]

The coherency and consistency General Schwarzkopf achieved when he used a joint air component commander to employ air power in Desert Storm also validates the emphasis Air Force doctrine puts on unity of command. Air Force doctrine calls for command arrangements that centralize control of all theater air power under a single air component commander, which it recognizes may not be an Air Force officer. To stress this point, Air Force doctrine quotes Gen William W. Momyer, USAF, Retired, who wrote that

> for airpower to be employed for the greatest good of the combined forces in a theater of war, there must be a command structure to control the assigned airpower coherently and consistently and to ensure that the airpower is not frittered away by dividing it among army and navy commands.[10]

Our experience in the Gulf war revealed that another important strength of Air Force doctrine is the priority it assigns to gaining control of the air. According to Air Force doctrine, air superiority should be the first consideration when employing aerospace forces.[11] Air superiority is essen-

tial to success in modern conventional warfare because it prevents the enemy's air force from interfering effectively with the ability of friendly air forces to conduct strategic attacks, air interdiction, surveillance and reconnaissance, airlift, close air support, and other important air operations. Friendly control of the air not only makes these air operations more effective, which in turn greatly enhances the effectiveness of surface forces, but also can enhance the effectiveness of surface forces by preventing detection and interference with their employment by the enemy's air force. In addition, control of the air denies these same advantages to the enemy.

The Gulf war revealed that the silence of Air Force doctrine on the exercise of operational art is one area where change is needed.[12] Air Force doctrine's lack of guidance on the exercise of operational art may explain why some Air Force officers before the Gulf war seemed to believe that the sole purpose of theater air power was to support a ground commander's scheme of maneuver. As a result, these airmen did not realize that campaign objectives could be achieved more effectively by using surface forces to support an air component commander's scheme of employment.

During Desert Storm, General Schwarzkopf demonstrated that it was possible to achieve campaign objectives at an extraordinarily low cost in terms of friendly casualties when surface forces were used to support the employment of air power. He did this by using coalition ground and amphibious forces at the beginning of the campaign to "fix" Iraqi units into positions where air interdiction could inflict terrible destruction, as was achieved by "tank plinking," while simultaneously denying these units effective resupply. During this time, General Schwarzkopf also used surface forces to protect his air bases and disrupt Iraqi surface-based air defenses. After his air power had destroyed the ability of the Iraqi army to fight effectively, he used the maneuver of his surface forces during the ground offensive to seize Iraqi air bases as well as to force Iraqi units into the open where air power could pursue them and inflict even greater destruction like that on the "Highway of Death."

Lack of guidance on operational art may be the reason for another deficiency of Air Force doctrine. It never mentions the impact air base availability and operability can have on the ability to conduct effective air operations in a campaign. Fortunately for the conduct of Desert Shield and Desert Storm, Saudi Arabia had made a large investment in basing infrastructure. As a result, the obstacles General Schwarzkopf faced were not of the same magnitude as those that hampered the employment of air power in World War II, Korea, and Southeast Asia.[13]

Navy Doctrine

Comparing the conduct of Desert Storm to guidance provided in Navy doctrine could be a problem since the Navy, unlike the other services, does not publish formal doctrine except for that dealing with fleet tactics. However, the Navy's leadership did articulate a maritime strategy which, like the doctrines of the other services, is used as "a key element" in shaping programmatic decisions.[14] Thus, maritime strategy can be used to compare the Navy's view on the role of air power to the conduct of Desert Storm.

The focus of the Navy's strategy is on using offensive sea control to defeat Soviet maritime strength "in all of its dimensions, including base support."[15] Perhaps because of this focus on fighting the Soviet navy, the Navy's strategy needs significant change since it does not provide much guidance on how naval power, especially carrier-based air power, should be employed in a third-world contingency such as Desert Storm. For example, while it does address the importance of "antiair warfare" in protecting the fleet by countering "the Soviets' missile-launching platforms," maritime strategy makes no mention of the importance of gaining and maintaining control of the air over the land. Nor does it explain how carrier-

based air power should be employed to achieve and maintain control of the air.[16] It also does not mention the importance of waging a strategic air campaign or explain how air interdiction can contribute to campaign success.

Maritime strategy's failure to provide guidance on the employment of carrier-based air power in theater campaigns may also be due to the problems presented by such air operations. These air operations tend to require aircraft that can deliver a fairly significant payload against targets located far from where a carrier can safely operate. Yet only 20 A-6E medium-attack aircraft in a conventional carrier wing of 86 aircraft possess such a capability.[17] The limited deep-attack capability of carrier-based air power helps explain why during the first two weeks of Desert Storm the Navy was reported to have provided only 3,500 sorties (12 percent) of the total 30,000 sorties.[18] Moreover, even this effort required six of the Navy's 14 deployable carriers, dependence on massive Air Force refueling support, and carriers positioned in waters that independent naval analysts had previously considered too dangerous for carrier operations.[19]

Gen George B. Crist, USMC, Retired, who served as commander of Central Command before General Schwarzkopf, called attention to limitations in the Navy's capability before Desert Storm. He noted that "the US Navy is well equipped with the hi-tech weaponry to wage combat against the Soviet Union; it is not so adequately prepared to deal with Third World contingencies, as the Persian Gulf experience [of 1987 and 1988] demonstrated." General Crist concluded that correcting the problem "will take a shift from the Admirals' fixation with forward-deployed carrier battle groups and the 'maritime strategy' to the more mundane missions of controlling sealanes, moving troops and providing naval gunfire and tactical air support to amphibious operations."[20]

Such a shift must include attention to command arrangements. Not surprisingly, in ignoring the role of carrier-based air power in third-world contingencies, maritime strategy does not address the command arrangements needed to integrate the employment of carrier-based air power with land-based air power. However, before Desert Storm demonstrated the value of unity of command, the Navy's position that carrier-based air power should *not* be controlled by a functional air component commander had been expressed numerous times and had posed a serious problem in the conduct of air operations in both Korea and Southeast Asia.[21]

Army Doctrine

Several commentators have already credited Army doctrine found in Field Manual (FM) 100-5, *Operations*, with being the key to Desert Storm's success.[22] Perhaps because it is called AirLand Battle doctrine, many of these same commentators also mistakenly believe that it is Air Force as well as Army doctrine. Yet, despite the opinion of these commentators and the "air" in its title, comparison of Army doctrine to the conduct of Desert Storm reveals that it failed to anticipate the dominant role played by air power. Given this failure, it should not be a surprise that Army doctrine also provides remarkably little guidance on how land operations could be conducted to complement the employment of air power.

To its credit, Army doctrine does recognize that "the control and use of the air will always affect operations; the effectiveness of air operations in fact can decide the outcome of campaigns and battles."[23] The problem is that Army doctrine provides little guidance on how land operations can help achieve and maintain control of the air. The lack of guidance is especially apparent in the doctrine's discussion of what it calls "deep operations."[24] Army doctrine makes no reference as to how such operations might contribute to gaining control of the air, perhaps by seizing air bases or areas suitable for air bases, which is how Gen Douglas MacArthur employed land forces in his extremely successful campaigns in the

XVIII AIRBORNE CORPS PHOTO

Although air base availability and operability has a critical impact on the air campaign, it is not addressed in Air Force doctrine. Fortunately, Saudi Arabia had established an extensive basing infrastructure that accommodated allied flight operations during Desert Storm. Above, F-15s from the 1st Tactical Fighter Wing, Langley AFB, Virginia, prepare for another Desert Storm mission at an air base in Saudi Arabia.

Pacific.[25] Nor is there any mention of conducting deep operations to disrupt an enemy's surface-based air defenses, as Gen Ariel Sharon did when his tanks crossed the Suez during the 1973 war and Army AH-64s and special operations forces did during Desert Storm when they attacked Iraqi radar sites.[26]

Of course, achieving air superiority is only a means to the desired end—permitting both air and surface forces to operate more effectively, while denying these advantages to the enemy. Thus, once air superiority is achieved, campaign success depends on how a commander exploits control of the air. General Schwarzkopf's conduct of Desert Storm shows that one of the best ways to exploit control of the air is through strategic air operations. Yet Army doctrine makes no mention that such operations can make a significant contribution to the success of land operations.

Air interdiction is another way to exploit control of the air. Army doctrine does note that interdiction performed by what it calls "air fires" is one of the activities typically conducted as part of deep opera-

tions.[27] It also states that arms and services complement each other by posing a dilemma for the enemy. The problem is that Army doctrine seems to see air interdiction only as a means to "support maneuver on the ground."[28] In contrast, Desert Storm revealed that the deployment of coalition ground forces served to "support" coalition air forces by fixing Iraqi forces in a position where air interdiction could inflict such devastating destruction that many Iraqi soldiers welcomed the coalition's ground offensive so they would have the opportunity to surrender and escape death from the air.

Perhaps one of the reasons the Army's doctrine fails to see the full potential of air power can be found in its use of history. AirLand Battle doctrine uses Gen Ulysses S. Grant's Vicksburg campaign during the Civil War, rather than campaigns that employed air power such as those conducted by General MacArthur in the Pacific during World War II, to illustrate the fundamentals of the offensive.[29] Given the "air" in its title, this is somewhat akin to a book on the conduct of modern football containing only discussion and diagrams for running plays.

The Navy does not publish a formal doctrine except for that dealing with fleet tactics. Its "Maritime Strategy," a similar document to the other services' doctrine, does not provide adequate guidance on how carrier-based air power should be used in a third-world contingency such as Desert Storm.

NAVY PHOTO, PH2 NAEGELE

Marine Corps Doctrine

Since the Marine Corps possesses both air and ground elements, some might assume that Marine Corps doctrine would provide effective guidance on how air and ground forces should be employed together in a campaign. However, comparing Fleet Marine Forces Manual (FMFM) 1-1, *Campaigning*, which "establishes the authoritative doctrinal basis for military campaigning in the Marine Corps," to General Schwarzkopf's conduct of Desert Storm shows that this would be a bad assumption. Like AirLand Battle doctrine, Marine Corps doctrine does make some extremely good points about operational art.[30] Yet it is similar to Army doctrine in requiring change because it almost totally ignores how air power has dramatically changed the conduct of war.

Evidence of the Marines' neglect of the dominant role air power can play is found in the fact that, like the Army, the Marines use Civil War campaigns fought before the invention of aircraft changed the conduct of war to illustrate their doctrine.[31] Surprisingly, when Marine Corps doctrine does refer to more modern campaigns, it does not discuss the Solomons campaign of World War II in any detail.[32] At Guadalcanal and throughout the war in the Pacific, at the operational as opposed to the tactical level of war, Marine ground elements "supported" the air elements by seizing and holding air bases—in this case, Henderson Field. Henderson Field was the key to US success in this extremely important campaign because it extended the range of land-based Marine, Navy, and Thirteenth Air Force aircraft so they could achieve air domination over the Solomon islands, and in doing so, break the back of Japanese air and surface forces. It will probably astonish marines who fought in World War II that instead of using as examples campaigns in the Pacific—where the Marine Corps played such an important role—Marine Corps doctrine generally refers to campaigns from the European theater, such as Gen Dwight D. Eisenhower's design for the reconquest of Europe.[33] Moreover, in none of these examples, including Eisenhower's, is there a single mention of air power's critical role.

To its credit, Marine Corps doctrine does address strategic actions and their impact on the conduct of a campaign.[34] However, its examples include only one mention of air power, the 1986 raid against Libya. As with the Solomons, this doctrine fails to mention the crucial contribution the Marine Corps made to strategic actions in World War II by seizing the Mariana islands. The Marianas were critical to the war in the Pacific because they provided the Twentieth Air Force with air bases for its B-29s that made it possible to conduct a strategic air offensive against Japan. This strategic air offensive was so successful that a costly amphibious assault on Japan was not necessary to end the war.[35]

Another deficiency is that organization arrangements receive only indirect attention in Marine Corps campaigning doctrine. After making reference to how his organic aviation allows a Marine air-ground task force (MAGTF) commander to project power well in advance of close combat, this doctrine states, "A MAGTF commander must be prepared to articulate the most effective operational employment of his MAGTF in a joint or combined campaign."[36] It then notes that "if he cannot, he will in effect depend on the other services to understand fully the capabilities of the MAGTF and employ it correctly, an assumption which is likely to prove unwarranted."[37] This statement supports the long-held Marine Corps position against giving an air component commander—especially a non-Marine, as was the case in Desert Storm—control over the MAGTF's air element.

It is obvious that the doctrines of the US Navy, Army, and Marine Corps, unlike Air Force doctrine, did not anticipate air power's domination in the conduct of Desert Storm. As has been pointed out, these three doctrines fail to recognize the monumental contribution strategic air attacks can make towards success on the battlefield, a contribution that was especially apparent in Desert Storm. It is also obvious

that these doctrines do not put the same emphasis on the importance of gaining and maintaining control of the air as does Air Force doctrine.

The low priority many soldiers and marines seem to assign to achieving control of the air helps explain the humor they saw in a cartoon that appeared in the 1980s. This cartoon showed Soviet generals watching their tanks parade through a conquered Paris and asking, "By the way, who *did* win the air superiority battle in the end?"[38] Quite likely one reason for the popularity of this cartoon is the fact that American ground forces have not experienced serious air attacks for almost half a century. But there is another reason for the lack of understanding exhibited by some soldiers and marines regarding the critical linkage between air superiority and the successful employment of friendly air and land forces. It is the failure by those officers responsible for Army and Marine Corps doctrine to learn from the experience of others, such as the Iraqis, who have been on the receiving end of intense air attacks.

Those who do not understand the dominant role air power can play in modern war could learn much from a study of Desert Storm, although abundant evidence was available much earlier. Field Marshal Erwin Rommel, who first experienced the effects of Allied air power in North Africa, made the observation that "a balance of power in the air would have made the *old rules of warfare* [emphasis added] valid again.... Anyone who has to fight, even with the most modern weapons, against an enemy in complete command of the air, fights like a savage against modern European troops, under the same handicaps and with the same chances of success."[39]

Unfortunately for Rommel, he was unable to convince fellow soldiers like Field Marshal Karl Rudolf Gerd von Rundstedt and Gen Geyr von Schweppenburg, who had not had similar experience, of the debilitating effect Allied command of the air would have on their ability to defeat an Allied invasion of Europe.[40] Later, while recovering from wounds received in Normandy during an air attack, Rommel reflected that "ultimately it was shown that no compromise of any kind can make up for total enemy air and artillery superiority."[41]

Rommel was not alone in concluding that success was unlikely without control of the air. Writing about his experience commanding the XIV Panzer Corps in Italy, Gen Frido von Senger und Etterlin noted,

> The enemy's mastery of the air space immediately behind the front under attack was a major source of worry to the defender, for it prevented all daylight movements, especially the bringing up of reserves. We were accustomed to making all necessary movements by night, but in the event of a real breakthrough this was not good enough. In a battle of movement a commander who can make the tactically essential moves only by night resembles a chess player who for three of his opponent's moves has the right to only one.[42]

Perhaps the opinion of Rommel, von Senger, and other foes regarding the importance of controlling the air receives too little emphasis by soldiers and marines responsible for doctrine because they perceive such comments as attempts to deflect blame for being defeated. Another reason, however, could be a perception that recognizing the tremendous role air forces have had in past successes would somehow cheapen the contribution made by ground forces. Worse, they may fear such recognition would relegate the Army and Marine Corps to an unimportant role in future warfare. This fear could not be further from the truth since Desert Storm revealed how essential ground and amphibious forces can be to air power's effectiveness.

Whatever the reason, failure to recognize the full role air power must play in the conduct of war remains a serious shortcoming of the Army and Marine Corps doctrines. Airmen in these two services remain under the domination of the surface elements who see support running in but one direction, with air providing direct support to ground maneuver or amphibious units. Moreover, the Army and

Marine Corps both put great emphasis on the contribution air power makes through close air support. Yet, while absolutely critical in some situations, close air support is usually the most ineffective way to employ air power in a campaign. Unlike a strategic air offensive and air interdiction, close air support puts at risk only those enemy forces that are in close proximity to friendly ground forces. If air power is employed primarily in close air support, the enemy would have a greater opportunity to use operational level maneuver to seize the initiative. Still another disadvantage with close air support is that it imposes added communications requirements and can force airmen to employ what are often less effective tactics and munitions in order to reduce the risk of fratricide.

The Army's doctrine fails to recognize the full potential of air power. To illustrate the fundamentals of the offensive, AirLand Battle doctrine examines the Vicksburg campaign of the Civil War rather than campaigns that utilized air power. Below, soldiers participate in a training exercise in Saudi Arabia during Desert Shield.

Joint Doctrine

Given that the four services provide the officers who make up the joint staff, it should not be a surprise that joint doctrine is no better than Navy, Army, and Marine Corps doctrine when it comes to recognizing how air power can dominate the conduct of war. For example, the latest draft of Joint Pub 0-1, "Basic National Defense Doctrine," that was circulated for comments, states that campaigns may be composed of a variety of types of operations but then fails to mention the contribution that can be made by a conventional strategic air offensive. Nor does this doctrine mention the requirement to gain control of the air, a key feature of *all* successful mod-

ARMY PHOTO, SPC HENRY

NAVY PHOTO, PHC VOLUMES

The synergies that resulted from his employment of air power gave General Schwarzkopf overwhelming advantages by the time he launched his ground offensive. Above, Army units advance during the "Hail Mary" maneuver and, right, the infamous "Highway of Death" littered with Iraqi vehicles.

ern military campaigns, except for insurgencies, up to and including Desert Storm.[43]

Compounding its error of not recognizing that air power can dominate warfare, this draft seems designed to ensure that an Air Force officer will never be in charge of future campaigns like Desert Storm. This possibility begins with the draft's guidance that "the dominant warfare or functional orientation of the force as a whole for continuing day to day execution of the strategic mission should determine the Service affiliation of the combatant commander."[44] The draft then divides the world into maritime, continental, and space "zones."[45] Such a division makes little sense unless these zones are to identify the "dominant" form of warfare. If so, the term *dominant warfare* is likely to be interpreted as meaning that only surface services should provide commanders for unified commands with continental or maritime responsibilities, while the Air Force would be limited to providing commanders for commands with functional or space zone responsibilities. Given the increased doctrinal and budgetary powers possessed by the chairman of the Joint Chiefs of Staff and the combatant commanders under the Goldwater-Nichols Act of 1986, such an arrangement could cause the future US military to reflect the current perspective of Navy, Army, Marine Corps, and joint doctrine that air power only supports surface forces, not the opposite possibility that was demonstrated by Desert Storm.

The keystone joint operations doctrine, Joint Pub 3-0, *Doctrine for Unified and Joint Operations*, recently distributed as a test publication, is yet another example of joint doctrine's lack of guidance on the key role air power must play. This publication

is supposed to set forth doctrine to govern operations by commands such as Central Command. Yet, if General Schwarzkopf had looked at it when preparing his campaign plan, he would not have found any guidance on specific methods, concepts, and principles on *how* the air and surface elements that make up joint forces should operate together.

Looking at Joint Pub 3-0's list of joint operations categories, General Schwarzkopf would not have found conventional strategic air offensive or offensive counterair operations, let alone guidance indicating that control of the air is essential to effective military operations for both air and surface forces.[46] Nor would he have found guidance that such control is best achieved through coordinated offensive operations in which enemy air bases, air defenses, and command and control facilities are the focus of synchronized attacks by fixed- and rotary-wing air forces, special operations forces, and long-range missile systems. Finally, he would have found little guidance on the best organization for integrating the air power provided by the four services into a single, coherent air campaign. All he would have found was the statement that "CINCs establish command relationships and assign authority to subordinates based on the operational situation, the complexity of the missions, and the degree of control needed to ensure that strategic intent is satisfied."[47]

If General Schwarzkopf had looked at the more focused JCS Pub 26, *Joint Doctrine for Theater Counterair Operations (from Overseas Land Areas)*, he would still have found insufficient guidance. For example, instead of a strong statement that control of the air is essential to success, this doctrine only says, "When there is an enemy air power offensive threat to friendly surface operations, the requirement for friendly counterair actions must

USAF PHOTO, TSGT MCLEOD

be a major consideration in the joint planning for those operations."[48] This rather vague "guidance" is followed by what the Iraqi military would see as a tremendous understatement: "Limiting the enemy's use of its air power provides increased potential for friendly force success."[49]

The guidance provided in joint counterair doctrine on command arrangements is even more flawed, although it begins well when it states that "the joint force commander will normally designate a joint force air component commander."[50] Unfortunately, the doctrine contains no explanation of why such an arrangement is "normally" best. Instead, it proceeds to create ambiguity by limiting the responsibilities and authority of the joint force air component commander (JFACC), while simultaneously acknowledging that "nothing shall infringe on the authority of the Theater or Joint Force Commander [in his ability] to ensure unity of effort in the accomplishment of his overall mission."[51]

Fortunately, despite joint doctrine's lack of guidance, General Schwarzkopf decided to appoint a JFACC to be responsible for developing a coherent plan for employing coalition air power that was not limited to counterair operations. He then approved the plan in the form of a single air tasking order that integrated the employment of Air Force, Army, Navy, Marine Corps, and allied air power. Finally, he delegated to his JFACC the authority to execute this plan, which allowed his air forces to win control of the air and made it possible to conduct a strategic air offensive and air interdiction operation in a way that produced a powerful synergy.

The synergies that resulted from his employment of air power gave General Schwarzkopf overwhelming advantages by the time he launched his ground offensive. The Iraqi army had been severely weakened physically by intense, almost continuous air attacks that had demonstrated that aircraft can be extremely effective tank killers. The Iraqi army had also been greatly weakened psychologically by the knowledge that it had almost no ability to resist the coalition's devastating air attacks, an effect compounded by the warnings the coalition often gave Iraqi units before attacking. Thanks to his airborne warning and control system (AWACS) and joint surveillance target attack radar system (J-STARS), General Schwarzkopf possessed unprecedented near-real-time information on air and surface operations of both coalition and Iraqi forces. Plus he was able to deny the enemy similar information, which was the key to the coalition's successful shift of forces to the left flank resulting in the envelopment of the bulk of the Iraqi army.

Control of the air allowed General Schwarzkopf to use the electromagnetic spectrum to communicate quickly with his forces, whereas the Iraqi military was often reduced to using couriers. Observation made possible by control of the air greatly enhanced the effectiveness of coalition artillery, while simultaneously rendering Iraqi artillery largely ineffective. Finally, unlike the Iraqis who had almost no supplies of any kind because of the coalition's air interdiction, General Schwarzkopf was able to support his advancing maneuver forces with bumper-to-bumper convoys of trucks.

In conclusion, comparing US military doctrine to General Schwarzkopf's conduct of Desert Storm reveals how fortunate we were that Air Force doctrine fully recognized air power's ability to dominate the conduct of modern war. Thanks to Air Force doctrine, General Schwarzkopf possessed aerospace forces that made it possible for him to achieve his objectives at a very low cost in terms of friendly lives. By the same token, this comparison reveals that we are fortunate Desert Storm gave us the opportunity to learn so cheaply that much of the US military's current doctrine, which tends to see air power primarily as support for the employment of surface forces, needs to be changed to recognize that air power can play a dominant role. Under these doctrinal changes, US military forces would be organized, trained, and equipped to fight conven-

tional campaigns in which surface forces are employed to enhance the effectiveness of US air power while minimizing the risk of friendly casualties.[52] What has not yet been revealed is whether our relatively low losses in Desert Storm provided sufficient incentive to persuade those responsible for doctrine that there is a need for change. If not, the question might be, What losses will it take for the US military to recognize the degree to which air power has, to paraphrase Rommel, made the old rules of warfare invalid? □

Notes

1. Air power's dominance results from its ability to enhance a commander's exercise of operational art in an environment characterized by fog, friction, and chance. The chance a commander will wage a successful campaign is increased by air power's ability to minimize his own fog and friction while simultaneously magnifying the enemy's. See the author's "Operational Art: An Airman's Perspective" (Presentation to the Military Operations Research Society's Mini-Symposium on Operational Art and Analysis, Fort McNair, Washington, D.C., 6–9 March 1990).

2. For an excellent discussion of the importance of doctrine to Germany's success in May 1940, see Robert Allan Doughty, *The Seeds of Disaster: The Development of French Army Doctrine, 1919–1939* (Hamden, Conn.: Archon Books, 1985).

3. The historian Michael Howard compares the problem of verifying military calculations made in peacetime as being like a sailor navigating by dead reckoning, noting that

> you have left the terra firma of the last war and are extrapolating from the experiences of that war. The greater the distance from the last war, the greater become the chances of error in this extrapolation. Occasionally there is a break in the clouds: a small-scale conflict occurs somewhere and gives you a "fix" by showing whether certain weapons and techniques are effective or not; but it is always a doubtful fix. ["Military Science in an Age of Peace," *Royal United Services Institute [RUSI]*, March 1974, 4]

4. The magnitude of the problem involved in making major institutional changes due to the challenge of new weapon systems is illustrated by the case of the horse cavalry. According to Edward L. Katzenbach,

> The military history of the past half-century is studded with institutions which have managed to dodge the challenge of the obvious. The Coast Artillery continued until the middle of World War II, at least in the United States. Other such institutional anomalies will spring to mind. But the most curious of all was the horse cavalry, which maintained a capacity for survival that borders on the miraculous.... When today's weapons are already out of date and there is therefore a daily need for reassessing our military institutions' response to them, the strange and wonderful survival of the horse cavalry may amount to something more than a curiously alarming anachronism [Edward L. Katzenbach, Jr., "The Horse Cavalry in the Twentieth Century: A Study in Policy Response," in *American Defense Policy*, ed. John E. Endicott and Roy W. Stafford, Jr., 4th ed. (Baltimore: Johns Hopkins University Press, 1977), 360–61, originally published in *Public Policy* 7 (1958): 120–49]

5. Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, 16 March 1984, 1-3.

6. Ibid., 2-11.

7. Ibid., 3-2.

8. Ibid., 2-13.

9. Ibid., 2-13 and 2-14.

10. Ibid., 4-2. See also 2-8, 2-20, and 4-4.

11. Ibid., 2-11.

12. The final draft of the revised AFM 1-1 that was recently circulated for comments within the Air Force puts great emphasis on the exercise of operational art.

13. See the author's "Operational Art and Aircraft Runway Requirements," *Airpower Journal* 2, no. 3 (Fall 1988): 57–63.

14. Adm James D. Watkins, "The Maritime Strategy," supplement to US Naval Institute *Proceedings*, January 1986, 4.

15. Ibid., 11.

16. Ibid., 12.

17. John D. Morrocco, "Revolution in Jeopardy," US Naval Institute *Proceedings* 116, no. 6 (June 1990): 59.

18. Jeffrey Record, "AF's Future Bright after Stellar Gulf Showing," *Air Force Times*, 11 March 1991, 36.

19. Proposed budget cuts could reduce the number of deployable carriers from 14 to 12. Morrocco, 57. Independent naval analysts questioned moving carriers into the Persian Gulf where the ships would be vulnerable to mines and Iraqi Exocets and where the narrow shallow water and the presence of oil rigs and shipping limited maneuverability. Rowan Scarborough, "Carrier to Sail within Attack Distance of Iraq," *Washington Times*, 27 September 1990, 8; and Melissa Healy, "Gamble Seen in U.S. Carrier's Entry into Narrow Gulf," *Los Angeles Times*, 28 September 1990, 6.

20. Gen George B. Crist, USMC, Retired, "A U.S. Military Strategy for a Changing World," *Strategic Review* 18, no. 1 (Winter 1990): 19.

21. See Gen William W. Momyer, USAF, Retired, *Air Power in Three Wars* (Washington, D.C.: Government Printing Office, January 1978), 51–59, 88–99, 107–8.

22. For example, see Stephen S. Rosenfeld, "Military Doctrine Today," *Washington Post*, 22 March 1991, A25. He mentions learning from retired Army colonel Harry Summers that war fighting was rediscovered after Vietnam and that it generated "the Army's and Air Force's Airland battle doctrine." From retired Army colonel Trevor Dupuy he learned that "[General Schwarzkopf] and his staff applied a doctrine which the U.S. Army and Air Force adopted about 10 years ago: the AirLand Battle Doctrine."

23. Field Manual (FM) 100-5, *Operations*, 5 May 1986, 4.

24. Ibid., 19–20, 37–39.

25. For example, see George C. Kenney, *General Kenney Reports: A Personal History of the Pacific War* (New York: Duell, Sloan and Pearce, 1949; Washington, D.C.: Office of Air Force History, 1987), 91, 111. Soon after arriving in theater, General Kenney convinced General MacArthur of the need to use ground forces to seize the Dobodura plain just west of Buna for an air base. Such a base was needed to make Kenney's aircraft more effective by extending their range and payload since they would not have to cross the Owen Stanley mountains and penetrate the thunderstorms that often formed over this mountain range.

26. M. J. Armitage and R. A. Mason, *Air Power in the*

Nuclear Age (Urbana, Ill.: University of Illinois Press, 1983), 134.

27. FM 100-5, 20.

28. Ibid., 25.

29. Ibid., 91–94.

30. Fleet Marine Forces Manual (FMFM) 1-1, *Campaigning*, 25 January 1990.

31. Ibid., 21–23, 66.

32. Ibid., 24.

33. Ibid., 42–43, 49.

34. Ibid., 27.

35. Maj Gen Haywood S. Hansell, Jr., USAF, Retired, *Strategic Air War against Japan* (Maxwell AFB, Ala.: Airpower Research Institute, 1980), 30–35, 90–93.

36. FMFM 1-1, 29.

37. Ibid.

38. Prepared statement of David C. Isby, historian and analyst, BDM, in House, *Roles and Missions of Close Air Support: Hearing before the Investigations Subcommittee of the Committee on Armed Services*, 27 September 1990, 101st Cong., 2d sess., 1991, 16.

39. Erwin Rommel, *The Rommel Papers*, ed. B. H. Liddell Hart, trans. Paul Findlay (New York: Harcourt, Brace and Company, 1953), 285.

40. Ibid., 468–71, 508–9.

41. Ibid., 511.

42. Frido von Senger und Etterlin, *Neither Fear Nor Hope* (New York: E. P. Dutton, 1964), 244.

43. Joint Pub 0-1, "Basic National Defense Doctrine" (draft), undated, V-16 through V-23. Since this draft was circulated for comments a new "proposed final pub" has been written but not circulated for comments. This proposed final pub still fails to provide useful guidance on the vital role aerospace power must play in a campaign. Evidence of the problem can be seen in that the publication divides the world into maritime and continental theaters, a division that lost its value when aerospace power changed the conduct of war. Under the maritime theater, the final publication states campaigns may be composed of nine types of operations, but it does not list counterair operations as a separate type of operation, as it does with amphibious and airborne operations. Instead, the publication includes "establishing and maintaining local superiority (including air) in an area of naval operations." The joint or single-service land-based air operation category does list "antiair warfare," but also includes in this category surface sea surveillance, antisurface ship warfare, antisubmarine warfare, aerial mine laying, and aerial refueling. Joint airland operations is still another of the publication's categories. Control of the air receives only passing attention when the publication states that joint airland operations are those that "seize or defend major land areas together with associated airspace necessary for the prosecution of the theater campaign." Under continental theaters this publication does list joint counterair operations, but only as one of three subsets of joint airland operations, which is one of eight types of operations in this theater. Its list of operations also includes amphibious, airborne, riverine, and "joint or single-Service strike, interdiction, electronic warfare, special, reconnaissance and surveillance operations." The publication's placement of these different types of aerospace operations in a single category at the same time that it includes riverine and amphibious as categories distinct from naval operations provides further evidence that this pub fails to provide appropriate guidance on the key role aerospace power plays in modern war. Proposed final pub, Joint Pub 0-1, 7 May 1991, IV-7 to IV-11.

44. Ibid., V-7; III-40.

45. Ibid., III-3.

46. Joint Pub 3-0 (test pub), *Doctrine for Unified and Joint Operations*, January 1990, III-12.

47. Ibid., III-5.

48. JCS Pub 26, *Joint Doctrine for Theater Counterair Operations (from Overseas Land Areas)*, 1 April 1986, III-2.

49. Ibid.

50. Ibid., III-4.

51. Ibid., III-4 and III-5.

52. Our tremendous superiority in aerospace technologies and the public's lack of tolerance for high casualties are two realities that should guide the employment of US military power. If they do, commanders will conduct campaigns in a manner that avoids putting our surface forces into situations where the full effectiveness of US aerospace power cannot be realized or where the enemy can inflict high casualties. In such campaigns commanders would first employ their surface forces to help aerospace forces achieve control of the aerospace environment. Once they achieve this control, commanders would then employ their surface forces to exploit the advantages control provides, perhaps by moving into easily defended positions that are chosen for their ability to force the enemy commanders to expose their forces to destruction by our aerospace forces.

TOWARD A RATIONAL SPACE-TRANSPORTATION ARCHITECTURE

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SPACE IS probably the least understood of all military environments today. Whether it is the lack of personal experience in the medium or the fantasies planted by twentieth-century science-fiction writers, more misconceptions exist about systems and their possibilities for space than for any other theater of operations. It is not unusual, for example, to read about Department of Defense (DOD) plans for constellations of orbiting death-ray satellites or brilliant pebble intercontinental ballistic missile (ICBM) killers that are neither practical nor affordable. With single-satellite launch costs running in the hundreds of millions of dollars while booster reliability lingers in the low 90-percentile range, one questions whether projections for thousand-satellite weapon constellations are anything more than wishful thinking.[1] Unfortunately, a large number of space power advocates, unfamiliar with the principles of satellites in orbit, are attracted to such promotions without seriously considering how these platforms would be placed in orbit or maintained, once there. This article addresses that weakness by examining what is in space, why it is there, why only certain orbits are useful, and why the first requirement of any future military space program must be a reliable, affordable, and responsive access to the theater. What evolves is an operationally derived space-transportation architecture.

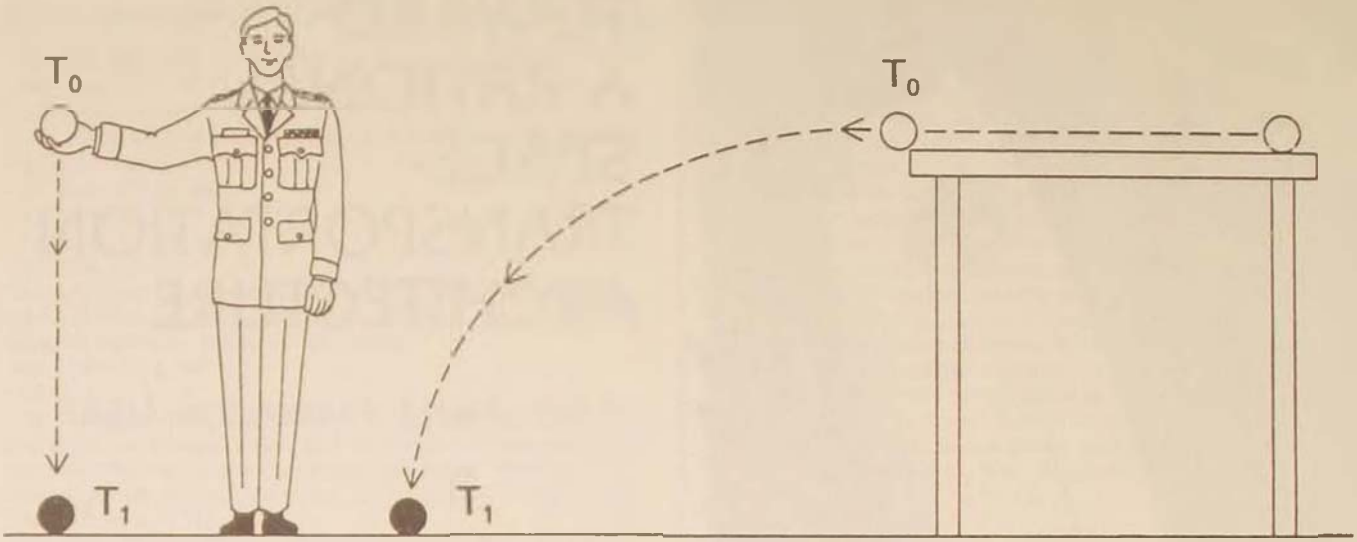


Figure 1. The time of fall for two objects dropped from equal heights is the same, regardless of forward velocity.

Before aviation fans rush off to a more familiar subject, let me first say that space is a relatively uncomplicated environment whose principles of operations were explained over 300 years ago. During the last three centuries, little has changed to complicate the concepts that define the two-body (earth and satellite) motion that controls orbiting satellites.[2] Thus, the discussion can be kept simple and illustrative. More importantly, as space systems play an ever-increasing role in how we conduct air, sea, and ground wars below, it is fundamental that all military leaders become knowledgeable about the highest frontier in order to correctly anticipate future changes that are sure to occur. Space power advocates, in turn, could benefit from the cross-pollination of war-fighting experience that is currently the domain of aviators.

The Principle of Satellites in Orbit

An earth satellite, for purposes of this article, is defined as any object revolving about the earth unpropelled—except for altitude- and orbit-adjustment maneuvers. The moon is an example of a satellite in orbit. To understand how a satellite remains in orbit, one need only recall the trajectory of a ball as it rolls off a table (fig. 1). A ball dropped from a fixed height (left side of figure) will accelerate toward the floor (and the center of the earth) at a certain rate. Released at a given start time (T_0), it will strike the floor a fraction of a second later at end time (T_1). If another ball simultaneously rolls off a table of the same height (right side), it will also accelerate toward the earth's center at an identical rate and strike the floor simultaneously with the vertically dropped ball. The only difference between the two projectiles is the total distance covered by the ball and the trajectory of the fall with respect to the floor (and the surface of the earth). The time actually spent in reaching the floor (T_1 minus T_0) will be the same for both objects.

The curvature of the earth's surface recedes at a rate of about 16 feet over a distance of about five miles or 26,000 feet. This means that if the second ball in figure 1 were rolled at a horizontal velocity of five miles per second (26,000 feet per second—fps), its arc would match the curvature of the earth (fig. 2). Thus, it would fall toward the earth at the same rate as the earth's surface receded from the ball. This would result in a sort of equilibrium, whereby no height (with respect to the earth's ever-receding surface) was ever gained or lost. This is the phenomenon

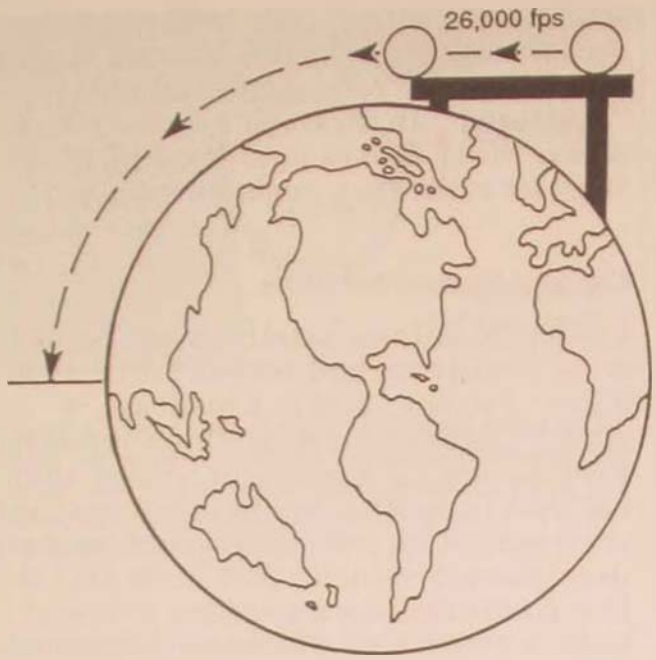


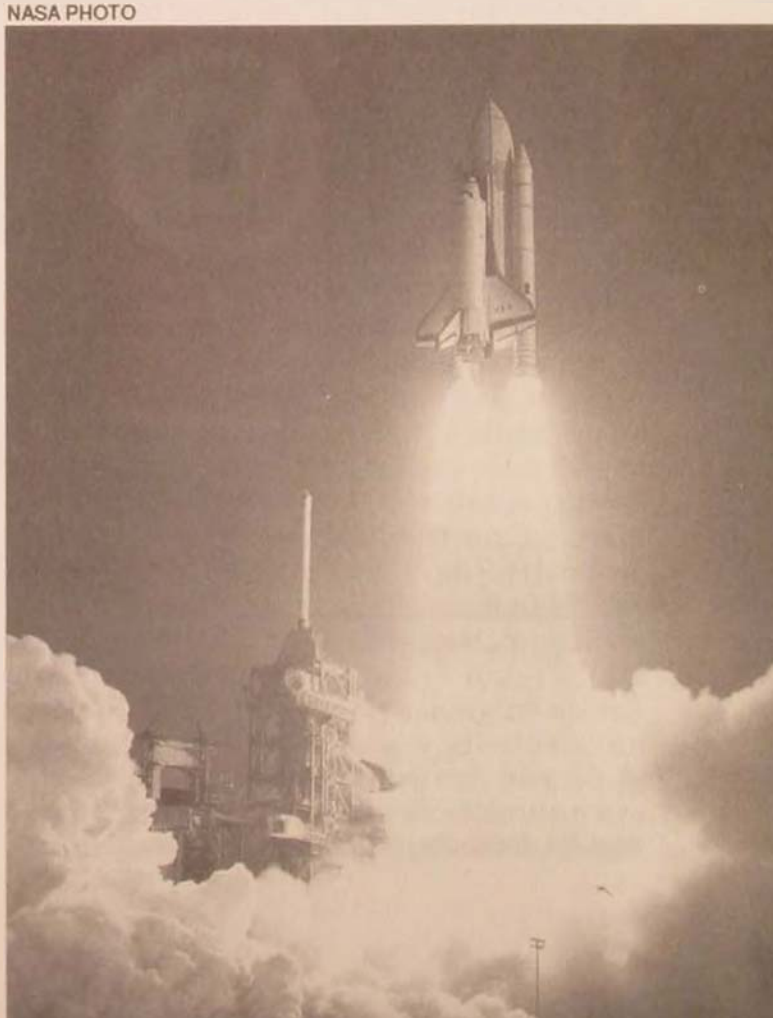
Figure 2. An object traveling 26,000 feet per second will fall toward the earth's surface along a trajectory that matches the contour of the earth.

that keeps a satellite in orbit. In other words, when a satellite's forward velocity and gravitational fall combine to produce a ballistic flight path that matches the contour of the earth, it is said to be in orbit. It is neither weightlessness nor centrifugal force that keeps the object in orbit—just this simple relationship between velocity and gravity.[3]

Although a ball could theoretically go into orbit a few feet above the ground, the air is far too dense to allow such a blunt object to reach orbital speed. Furthermore, the enormous drag at those velocities (Mach 25 plus) would slow the ball continuously, resulting in a rapid deceleration and steepening of the trajectory. So the object must initially gain altitude to avoid the drag effects of the denser atmosphere. In addition, the farther two bodies are from each other, the less the gravitational attraction. As orbits increase in altitude, gravity becomes measurably less, and—as a result—forward-velocity requirements decrease correspondingly. Although a satellite at an altitude of 100 nautical miles (NM) must maintain a circular velocity of about 25,000 fps, the same satellite at 19,360 NM (geosynchronous [GEO] orbit) need only maintain a velocity of about 10,000 fps.[4]

Earth orbits are generally described with respect to their altitude above the earth's surface. Normally, one specifies three altitude bands: low-earth orbits (LEO) range from 60–1,000 NM; medium-earth orbits (MEO) from 1,000–19,000 NM; and high-earth orbits—including GEO—at 19,360 NM and above. All earth orbits are ellipses, ranging from near-circular to very egg-shaped (highly elliptic). Although near-circular orbits maintain fairly constant altitudes, highly elliptic orbits can change heights dramatically—from low points (perigee) in the hundreds of miles

NASA PHOTO



The space shuttle has not turned out to be the flexible, responsive, and affordable addition to the space transportation system that we hoped for. DOD requirements that it be able to carry large satellites made it too heavy to provide the usual advantages of a recoverable launch vehicle.

to high points (apogee) in the tens of thousands of miles.

The other common description of an orbit is its direction or inclination (*i*). Because of the earth's curvature, a straight line in space describes a ground track on earth that is almost always curved. Historically, these tracks were known to ancient navigators as "great circle routes." Because their geographic direction with respect to north continually changes, one cannot use a conventional heading reference. Instead, one must substitute a common reference point to all orbits. As a satellite passes over the equator in a northerly direction, one measures the angle its orbit makes with the equator and defines it as the satellite's inclination (fig. 3). If the satellite were heading east at the time it crossed the equator, its inclination would be zero degrees; if it were headed north, *i* would equal 90 degrees; and if headed west, *i* would equal 180 degrees. With these two simple references—altitude and inclination—one can usefully describe all satellite orbits. As we will see, the desired function of the satellite determines its altitude and inclination.

Satellite Functions

Satellites have thus far proven useful for only three basic functions: communications, navigation, and observation. Except for scientific experiments, every resident satellite placed in orbit in the last four decades falls into one of these three broad classifications. As a result, satellites are "clustered" in strategically important areas, which makes a military planner's work far easier than might be imagined.[5]

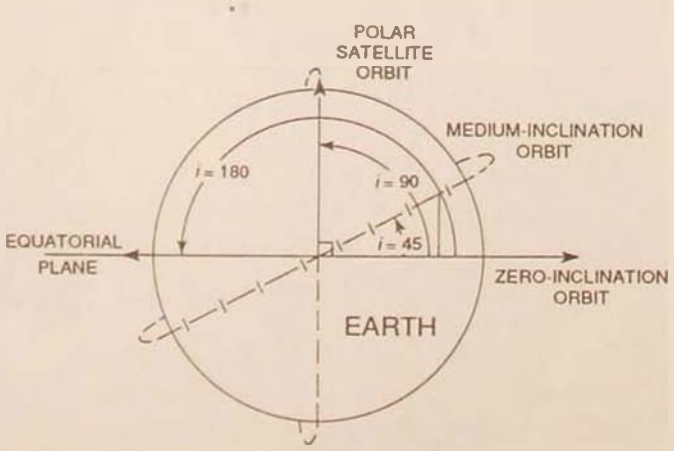


Figure 3. Measuring Inclination

Communications Satellites

Communications satellites (COMSAT) were first launched into orbit in 1958, when Project Score broadcast a recorded Christmas message from President Eisenhower to the world. Since then, COMSATs have dominated the space environment for both civilian and military uses. Launch-vehicle constraints kept the first communications satellites at low altitude, but by 1963 the National Aeronautics and Space Administration (NASA) was launching some vehicles into orbits at zero-degree inclination and a height of 19,360 NM (geostationary orbit), where the majority of COMSATs are located today.[6]

As mentioned earlier, satellites at low altitude must maintain very high velocities because of the increased effect of gravity. This requirement results in a circumnavigation of the globe about every 90 minutes. In addition, satellites rotate through a relatively fixed orbital plane while the earth spins beneath. The combined effect of the low altitude, high speed, and revolving earth means that these satellites are in view of individual ground stations for brief periods of time (fig. 4). Many of us remember the days when television satellites routinely faded in and out of coverage as we followed an overseas event; thus, one needed large constellations of low-altitude COMSATs to maintain continuous communications coverage.

As early as 1944, writers such as Arthur C. Clarke—of *2001* and, more recently, *2010* fame—published works advocating the use of geostationary orbits for the ideal location of relay satellites.[7] Not only can as much as 40 percent of the earth be viewed from such an altitude (fig. 5), but also the orbital mechanics are such that if

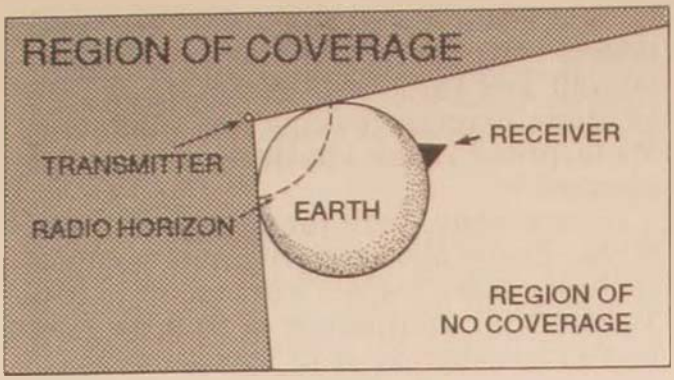


Figure 4. Direct Line-of-Sight Limitations of a Low-Altitude Transmitter. From AU-18, *Space Handbook*, ed. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin (Maxwell AFB, Ala.: Air University Press, January 1985), 7–5.

the satellite is placed in circular orbit at zero-degree inclination (directly above the equator), it will travel once around its orbit in the same amount of time that the earth rotates once on its axis (24 hours). From the earth, the COMSAT appears to be stationary. Thus, the satellite is always in view of the same ground sites—which greatly simplifies antenna tracking—and three equally spaced satellites can cover most of the globe.

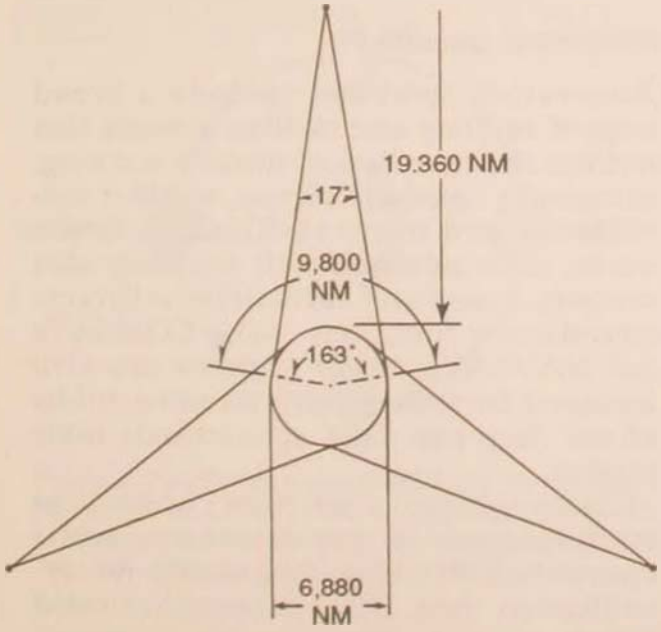


Figure 5. Concept of Three Communications Satellites in 24-Hour Equatorial Orbit, Showing Geometrical Relationships in the Equatorial Plane. From AU-18, *Space Handbook*, ed. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin (Maxwell AFB, Ala.: Air University Press, January 1985), 7–4.

Although GEO COMSATs have obvious advantages over LEO platforms, the altitude of 19,360 NM necessary for GEO requires approximately 60 percent more launch energy to attain than does a low-earth orbit.[8] Furthermore, because of the earth's curvature, extreme latitudes above and below 70 degrees are not within line of sight and cannot be reached from geostationary satellites. These two limitations caused the Soviets to develop a highly elliptical orbit to provide service to their northern frontier. Launched on 23 April 1965, the Molniya I communications satellite was inclined at 63.4 degrees, had a perigee of 264 NM in the Southern Hemisphere, and an apogee of 21,487 NM in the Northern Hemisphere. The different altitudes resulted in a very slow speed at apogee and a very high speed at perigee. The size of the orbit also made the satellite travel once around the globe every 12 hours. The combination of all these factors gave the Molniya COMSAT orbit a "hang time" of almost eight hours over the far north, providing excellent polar communications coverage. The Soviets continue to use these COMSAT orbits today, as do other nations with similar requirements.[9] The choice of a 63.4-degree inclination provides an all-important aspect of stability.

The earth, due to its spinning, is not a homogeneous spherical mass. Like most middle-aged systems, it has a slight bulge around its middle. This bulge—like that of a ball that is out of round—causes perturbations to otherwise relatively undisturbed orbits. At medium and high altitudes, these disruptive effects are negligible, but at low-altitude, high-inclination orbits (e.g., Molniya ellipses) where line-of-sight angles to the continuously changing apparent center of the earth are greatest, the effects can be severe. However, at a 63.4-degree inclination, the perturbations are uniquely cancelled out (fig. 6). This, there-

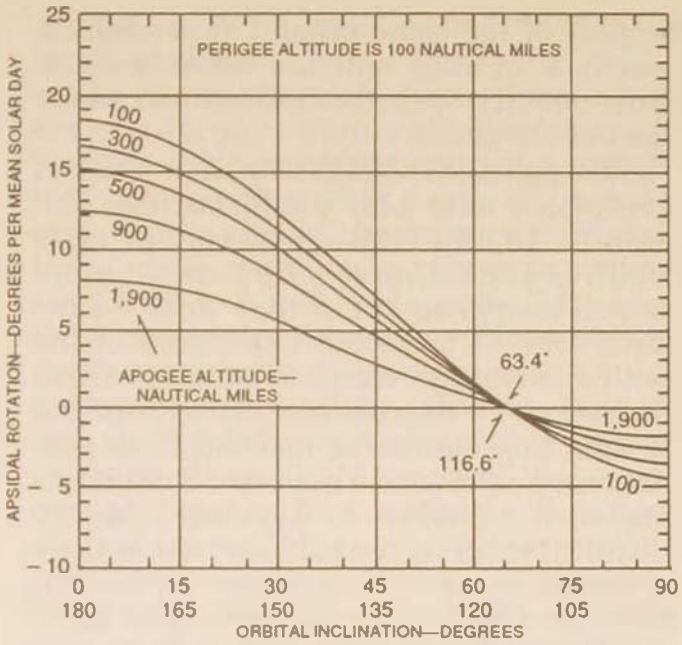


Figure 6. Apsidal Rotation Rate Per Day for Orbits with 100 NM Perigee Altitude. From AU-18, *Space Handbook*, ed. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin (Maxwell AFB, Ala.: Air University Press, January 1985), 2–45.

fore, is the optimum inclination for highly elliptical orbits. It is also the inclination where most navigation satellites are found.

Navigation Satellites

Navigation satellites (NAVSAT) beacon information to terrestrial and space users to enable them to precisely determine their present location for accomplishment of various missions. Like terrestrially based VHF omnidirectional radios (VOR), tactical air navigation systems (TACAN), and long-range aid to navigation (LORAN) stations, the primary requirement for NAVSATs is to be in a known or predictable position. The United States and the Soviet Union deployed primitive low-altitude systems in the past and are now replacing them with highly sophisticated medium-altitude constellations that greatly improve accuracy. The partially deployed US version—navigation satellite timing and ranging (NAVSTAR) global positioning system (GPS)—and its Soviet clone—global navigation satellite system (GLONASS)—will provide worldwide navigation accuracy on the order of several meters.[10] By the turn of the century, most aircraft and ships will probably use GPS as their primary navigation reference. Widespread Army applications are also planned.[11]

Interestingly, both the original US and Soviet deployment patterns were identical in nearly every respect: circular altitude of 10,800 NM, inclination of 63.4 degrees, and a constellation of 12 Soviet and 24 US satellites in three Soviet and six US orbital planes.[12] The similarity is not merely coincidental, as these 12-hour orbits provide the best worldwide coverage for the least cost and the all-important aspect of orbital stability. Although the earth's irregular shape causes little perturbation to GPS orbits at medium altitude, one must use highly elliptic transfer orbits to get there, and the disturbing effects during the low-altitude portions of those maneuvers can be severe. NAVSATs, like COMSATs, are thus confined to certain locations because their function—as well as the peculiarities of earth orbits—requires them to be there.

Observation Satellites

Observation satellites include a broad range of military and civilian systems that perform the missions of missile warning, cartography, geodetic survey, weather surveillance, and treaty verification. In the future, such satellites will probably also perform space and terrestrial military-surveillance functions. Like COMSATs and NAVSATs, these systems are also deployed in strategically oriented orbits where they can best accomplish their mission.

Contemporary warning satellites are deployed in geostationary orbits where they continually provide treaty-verification data. Other less-sophisticated launch-detection satellites are deployed in Molniya-orbit constellations because they use a different type of sensor.[13] In both instances, orbit stability is a driving concern for the development of useful data.

Terrestrial-observation satellites are gen-

Launch vehicles such as the Delta rocket have been an important part of the military space program over the years. However, newer and heavier satellites forced the Air Force and NASA to develop a new class of rockets with larger throw weights. Unfortunately, development costs have been high.

erally found at low altitude in polar inclinations. One selects this orbit because the earth's rotation beneath the inertially fixed plane provides the opportunity for observation of the entire surface of the earth over a short period of time. Unlike early-warning systems placed at high altitudes for greater area coverage, observation systems are placed at low altitudes to maximize sensor resolution. The sun's position is also very important for photoimagery missions. To optimize sun angle and establish consistency for purposes of analysis, one selects a sun-synchronous polar orbit that maintains a constant relative sun position with respect to the orbital plane throughout the various seasons of the year (fig. 7).[14] Here again, orbital dynamics define the inclination.

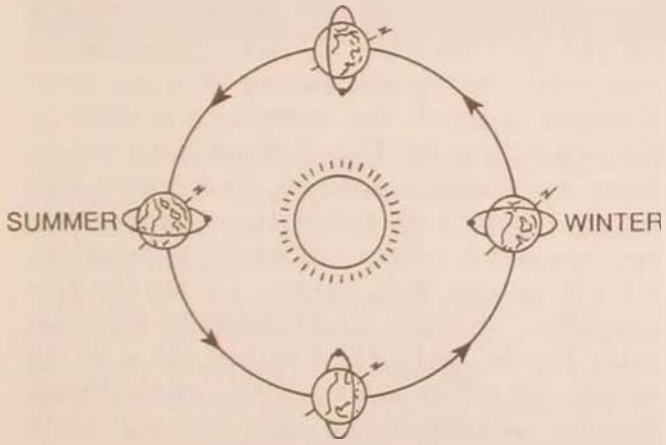
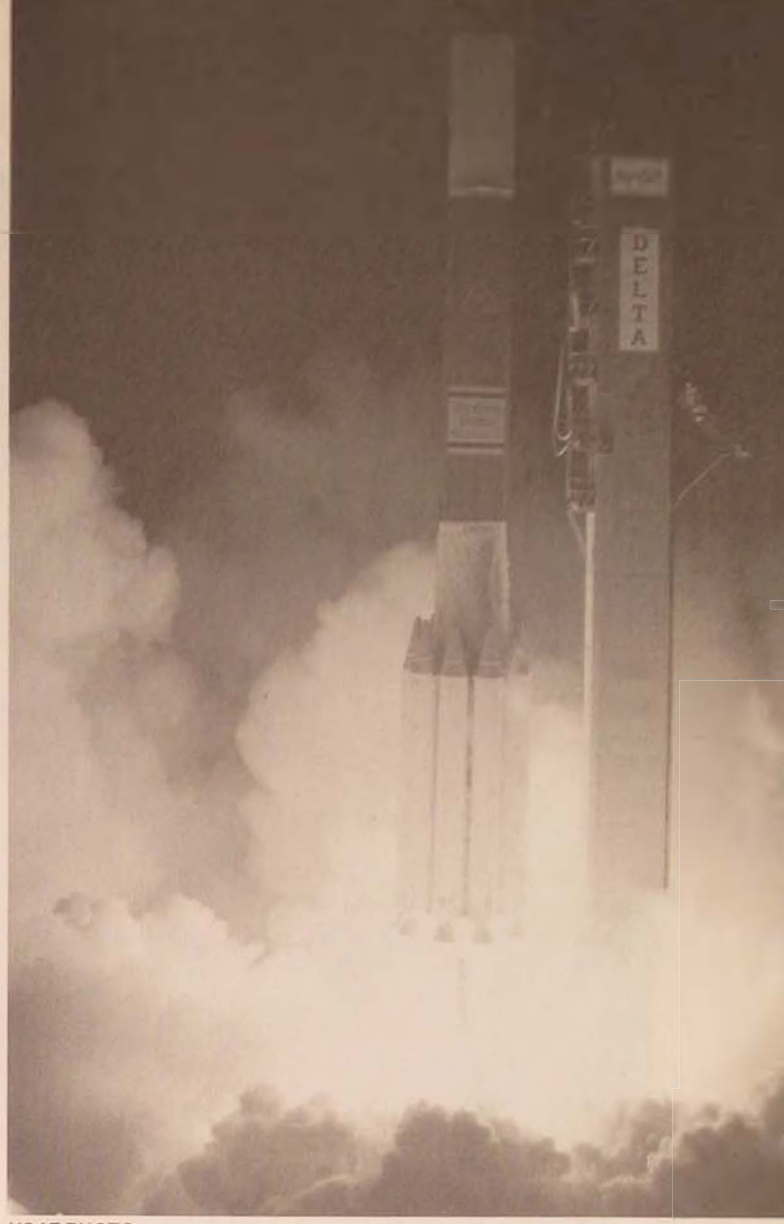


Figure 7. Sun-Synchronous Orbit. From AU-18, *Space Handbook*, ed. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin (Maxwell AFB, Ala.: Air University Press, January 1985), 2–44.

For LEO observation satellites, one uses the earth's oblateness—or bulge around the middle—to keep the orbital plane aligned with the sun as the earth travels through its own orbit about the sun. This



USAF PHOTO

perturbation, known as nodal regression, causes the satellite's orbit to slowly regress (move westerly) at about one degree per day throughout the year, thereby keeping the satellite's orbit aligned with the sun. Sun-synchronous orbits are a function of altitude and inclination, beginning at approximately 200 NM/97-degree inclination and extending to 600 NM/100-degree inclination (fig. 8).[15] At heights much below this altitude, atmospheric drag precludes long-duration flight; at heights much higher than this, one loses the advantage of nodal regression, as well as photographic resolution.

Weather satellites can be found in both geostationary orbits for general observations and in low-earth orbits for detailed

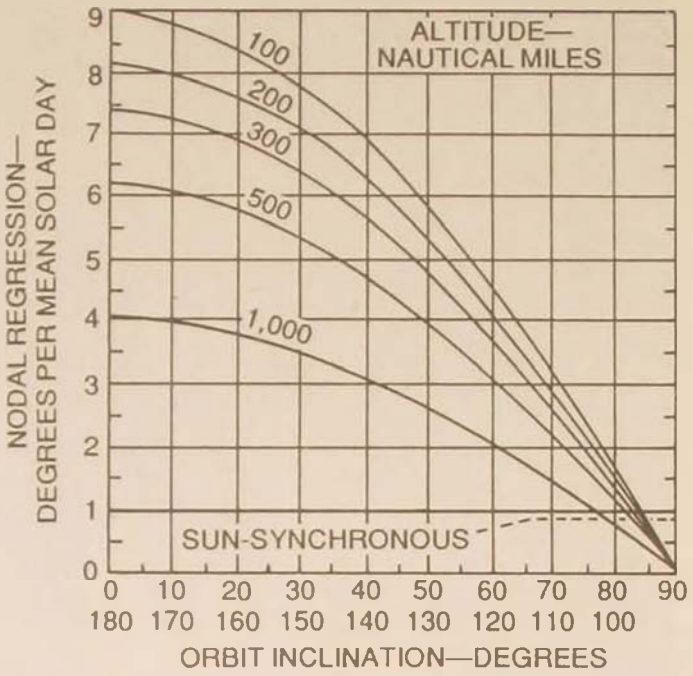


Figure 8. Nodal Regression Rate Per Day for Circular Orbits and Sun-Synchronous Altitudes. From AU-18, *Space Handbook*, ed. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin (Maxwell AFB, Ala.: Air University Press, January 1985), 2–43.

analysis. Like other low-observation systems, they generally make use of sun-synchronous orbits in the 500-NM range.[16]

In summary, were a researcher to catalogue space systems by type, altitude, and inclination, it would quickly become obvious that functional satellites fit into one of four particular bands:

- Low-earth orbits at 100–1,000 NM and 0–110 degrees of inclination.
- Middle-earth orbits at 10,800 NM near 63.4-degree inclination.
- Molniya orbits at 300/23,000 NM and 63.4-degree inclination.
- Geosynchronous orbits at 19,360 NM and zero-degree inclination.

So, although space is often described as infinitely vast, reality suggests that—like the trade routes across the earth's oceans—only a limited amount of space is useful to humanity. Examination of future military and civilian uses shows no major changes.

Future Satellite Systems

Communications, navigation, and observation satellites are strategically located in certain orbits because near-earth orbital dynamics drive them to those locations. Like the great-circle navigation routes used not only by Christopher Columbus but also by the crew of the space shuttle *Columbia*, the orbits of the four primary bands will continue to be used—as they are now—to conduct communications/navigation/observation missions. Indeed, the orbit reservations now on file with the International Frequency Registration Board show no change to deployment patterns well into the next century.[17] What is expected to change is the creation of a new class of satellites—space-based weapons.

It is not the intent of this article to determine the feasibility—technical or political—of the Strategic Defense Initiative (SDI) and similar proposals. For our purposes, we need be concerned only with the question of where these constellations might be deployed if they were developed.

Space, despite unsubstantiated claims to the contrary, is not the perfect medium for the propagation of directed-energy weapons. Energy attenuates in space over distance in much the same way it does in the atmosphere. The further a target is from an energy source, the more the energy beam is spread with a corresponding negative effect on energy density, which is the kill factor in laser-type weapons.[18] Strong electromagnetic fields, solar flares, galactic-cosmic rays, solar wind, and other solar-system phenomena disrupt particle-beam weapons and thus restrict their range.[19] As regards kinetic kill devices, the large nominal distances and velocities involved in tracking, targeting, and intercepting satellites and ballistic missiles pose special problems all their own. The one common thread that runs through the entire spectrum of possibilities is that any near-term to midterm space weapon will have to get relatively close to its target to be effective. That is, SDI platforms will be deployed in low-earth orbits

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The Challenger disaster and the failures of new military booster rockets combined to put the entire US space program on hold. The Air Force has opted to rely more heavily on unmanned satellites at a time when other nations, especially the European space partners, are moving ahead in the development of recoverable space vehicles.

where orbital dynamics drive deployment patterns to the previously described inclination (i.e., 100–1,000 NM and 0–110 degrees *i*).

In short, space systems envisioned for the next 20 years show no major changes in deployment-orbit selection. The exclusive use of the four bands of limited altitude and inclination should remain constant. What will change—indeed, must change—is the method by which we reach these strategically important destinations. Now that we are armed with the knowledge of what is in space and why it is there, a brief look at the development of US space-launch systems will reveal inherent flaws in our current methodology and provide a basis upon which to rationalize a future space-transportation architecture.

Space-Transportation Systems

For the past 40 years we have relied upon expendable launch vehicles (ELV) to deliver payloads to space. ELVs, like balloons in the early days of aviation, were selected over other systems because—at the time—they provided the most lift for the least technology. Unfortunately, like early balloons, they were (and still are)

large, cumbersome, highly explosive vehicles that could operate only in good weather; they were also unaffordably expensive.[20] NASA recognized these inherent drawbacks in the 1960s and proposed the development of the space-transportation system (STS), which promised to revolutionize space launch.[21]

The STS was to have consisted of three parts: (1) a two-stage, fully reusable space shuttle that hauled cargo and fuel to (2) a low-earth-orbit space station where (3) an orbital-transfer vehicle (OTV) transferred satellites from the space station to final orbit. Each part of the system was reusable and optimized for its own peculiar environment, promising long-term efficiencies. The overall $10 billion price tag was, however, too much for the Nixon administration to swallow, given the technology risk involved. With an expensive war in Vietnam and inflation problems at home, the ambitious STS program was reduced to development of the space shuttle by itself; even the shuttle's design was modified to rely heavily on existing expendable technologies. The resultant space shuttle, as we know it today, took on the very characteristics of the ELVs it was supposed to correct. Consequently, it could not produce the economies originally promised.[22] The $200–300 million shuttle launch costs, although cheaper than those for competing ELVs, are still too high for anything other than a very limited space program. NASA studies have attributed the high costs to the shuttle's expendable components, its vertical launch, the need for extensive ground support, and its enormous size.[23] No doubt, the shuttle was a marvel of engineering expertise, but at 4.5 million pounds of lift-off weight (seven times the weight of a Boeing 747), its operational limitations were numerous.[24] To the outside observer, the question, Why is the shuttle so big? naturally arises. To get at the root of the problem, one needs to ask, Why are space-launch systems, in general, so big?

To establish a low-earth orbit, one must accelerate satellites to over 25,000 fps velocity (i.e., over 17,000 miles per hour). Although the majority of acceleration occurs outside the earth's atmosphere (above 300,000 feet) where drag is at a minimum, laws of physics still require an exponential amount of energy to reach such high speeds (kinetic energy equals one-half mass times velocity squared). Energy, of course, translates into fuel required. Compounding the problem is the absence of oxygen with which to burn the fuel. As a result, the vehicle must carry an oxidizer, which increases total propellant weight by as much as six times, which, in turn, increases fuel and oxygen requirements even further. Thus, the vehicle must be very large.[25]

To put the problem in perspective, we need only point out that Sputnik I—the world's first satellite—weighed a mere 184 pounds but used a 588,735-pound rocket to propel it into orbit.[26] The first US satellite, Explorer I, was but a 10-pound radio launched atop a 64,000-pound Juno I test vehicle.[27] Even today's most advanced systems have payload-to-gross-weight ratios of only 2 to 3 percent. Hence, large satellites require massive launch vehicles weighing millions of pounds.

The shuttle is particularly large because in 1971 the Air Force established the requirement that it be capable of carrying the largest US satellite, even though 90 percent of existing payloads were less than one-half that size.[28] The proportional growth in payload size forced an exponential increase in the overall structure due to the factors mentioned. The programmatic loss of both the space station (for refueling) and the OTV further compounded the problem by adding the necessity of carrying an expendable upper stage for higher-orbit transfers. So, rather than build a system of small vehicles—each optimized for its own peculiar environment—the US elected to construct one large, all-purpose launcher that, in the end, satisfied no one.

Improvements in electronics during the 1970s and 1980s greatly reduced the size of most satellites, but expected savings

in launch costs were offset by high aerospace-industry inflation factors. By 1985, costs exceeded $3,000 a pound to LEO and 10 times that for GEO.[29] In turn, the high cost of space launch drove the military services toward "piggybacking" one satellite onto another, so that it became difficult to discern the real driver of payload size—the satellite's function or the launch vehicle itself.

Numerous government-funded studies concluded that a completely reusable launch system could be developed that would provide a capability to launch 90 percent of all military and civilian satellites at one-tenth the cost incurred during the 1980s.[30] Before the proposals had a chance to mature, however, the space shuttle *Challenger's* attempted launch during out-of-the-envelope weather conditions resulted in catastrophic failure and the reversal of DOD policy.[31]

Ironically, the *Challenger* mishap occurred in the midst of a string of ELV failures that left the entire US space program grounded. No common fault was found among the five accidents, but—faced with the embarrassing prospect of being unable to launch critical military payloads—DOD impulsively returned to its 1960s doctrine of reliance on a mixed fleet of unmanned vehicles. Thus, the initiative to develop new manned concepts went the way of the Wright brothers' biplane, passing out of the hands of the US military and into the waiting arms of Europe's aerospace industry. At the very moment DOD was reversing its policy of reliance on the shuttle, British, French, German, and Japanese authorities were initiating research into new reusable systems.[32] The European objective was to build a vehicle capable of servicing another US innovation—a permanently manned space station.[33]

As previously pointed out, a US space station was an original part of NASA's space-transportation architecture—the destination point for the reusable shuttle that delivered satellites, supplies, and fuel. Unsupported by Congress in the early 1970s because of its high cost, the low-altitude space station came of age in the late 1980s and is scheduled for deployment in the late 1990s. The concept includes a manned low-earth-orbit platform, at least one unmanned polar platform, and reusable orbital-transfer/-maneuvering vehicles.[34]

The manned platform is to be placed in a "low inclination" 250-NM orbit, where it can be serviced from the Kennedy Space Center in Florida. A phenomenon of contemporary space-launch vehicles is that the latitude (degrees north or south of the equator) of the launch point determines the minimum inclination in which a payload can be placed. NASA's operating base at Cape Canaveral, Florida—28.5 degrees north latitude—limits the inclination for the space station to between 28.5 and 151.5 degrees (the difference between 180 and 28.5 degrees). Ideally, the space station should be placed in equatorial orbit (zero-degree *i*) where it can most easily access geostationary satellites, but to do so would preclude its use by all ELVs launched from US bases. The European Space Agency's launch site in French Guiana, South America, can access all inclinations, but it makes little sense for the agency to launch a satellite into a 28.5-degree orbit only to return to where it started upon reaching geosynchronous altitude. These conflicting ELV limitations have created some doubt as to the utility of the station until the US develops a more flexible concept such as the one the Europeans are pursuing.

The USAF's position on the space station has been the familiar, Who needs it?[35] The answer to this rhetoric is, The future Air Force needs it! We simply cannot continue to expend the cost of a B-2 bomber for every major satellite launch. Nor can we afford to let foreign nations unilaterally develop a reliable, responsive manned access to space while we remain content with our 1960s-era methodology. The US made a similar mistake with the airplane in the early 1900s and paid the price in World War I.[36] If we are to remain a leader

in space, we must first solve our basic problem of getting to and from important orbits in an efficient manner.

A Proposed Space-Transportation Architecture

Although the space station was an integral part of NASA's 1960s space-transportation system, its concept is almost a century old, having originally been proposed by Russian schoolteacher Konstantin Eduardovich Tsiolkovsky in the early 1900s. Tsiolkovsky also envisioned an aerospace vehicle that could rocket into space and return by "braking itself against the air and gliding without explosions."[37] The usefulness of space became apparent in the radio age of the 1920s, but it was another 30 years before technology caught up with the professor's ideas to orbit man-made platforms. Only now have we reached the point in scientific progress where the century-old idea of a space-transportation system consisting of a completely reusable launcher, space station, and OTV can be developed with minimum risk and long-term economies.

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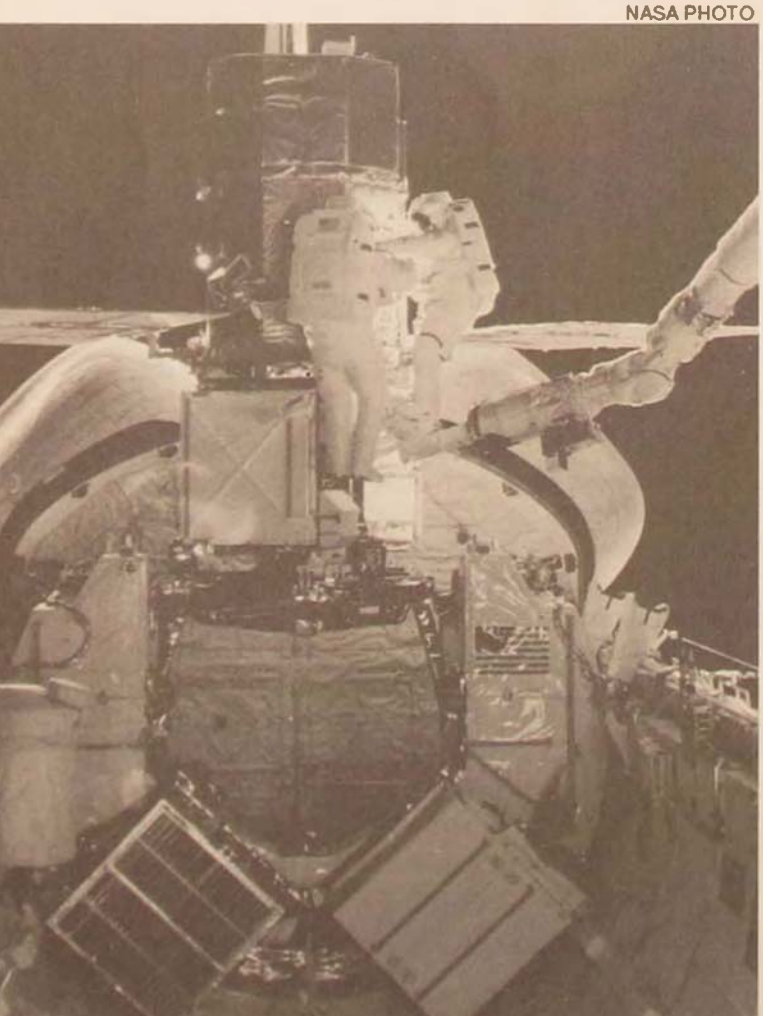

The ability of the space shuttles to rendezvous on-orbit with other satellites gives us the flexibility to retrieve and repair satellites. However, our current method of launching by direct insertion is complex, costly, and time-consuming. Offset launch techniques would eliminate phasing problems.

At the core of a rational space-transportation architecture is a new earth-to-orbit launch concept that will be to spaceflight what the aeroplane was to aviation (fig. 9). Because it must operate in the atmosphere for launch and recovery, the vehicle will use conventional runways and have strong aerodynamic qualities that will enhance its reliability and operability. It will be capable of delivering a 20,000-pound payload to an easterly orbit of 250 NM or 10,000 pounds to polar inclinations at 600 NM. Most likely, it will be a two-stage vehicle consisting of a carrier/tanker first stage and an aerodynamically capable orbiter as the second stage.[38]

Separation will occur around 100,000 feet and Mach 3—a trade-off between simplicity and on-orbit maneuverability requirements.[39] Although a purely single-stage-to-orbit (SSTO) system seems most desirable from its simple airplane-like concept of operations, both technology and operational requirements argue against this specious alternative. From an engineering standpoint, most experts consider the SSTO system very high risk because the performance required to get to orbit in one stage demands a fuel/engine/structural efficiency combination that is unlikely to be available until well into the next century.[40] Current technology has already been stretched near its theoretical limit, and—short of some unexpected scientific breakthrough—the best that one can hope for in the near future is a hypersonic single-stage vehicle that cannot reach orbit.

From an operational standpoint, the argument against the SSTO system is even

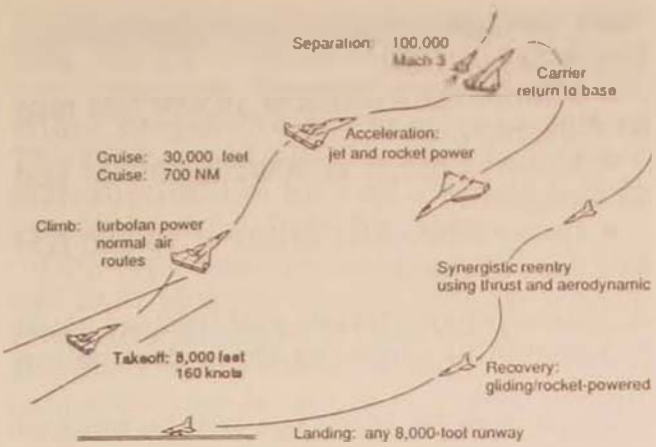

Figure 9. Takeoff and Recovery Profile Using Advanced Tactical Fighter and Shuttle Engine Technology

more compelling. The system, if it were possible, would produce an on-orbit vehicle significantly larger than any staged system using comparable technology. Furthermore, the relationship is not linear but exponential, as alluded to earlier. Suffice it to say, if next-generation space-launch vehicles are to have any operational value, they must have the capability to maneuver in space in order to perform rendezvous with the space station, a satellite, or even that age-old soldier's nemesis—to get within weapons parameters. To maneuver on orbit, vehicles must use thrust, which burns precious fuel. For a given payload capability, an SSTO vehicle would have far less maneuvering potential than a smaller staged system and would reduce its flexibility to perform a variety of missions.

The amount of required maneuverability is open to debate. Obviously, more is better, and that's where staging is particularly useful. The higher and faster the final separation maneuver, the smaller and lighter the final vehicle can be. (A helpful analogy is the dependency of fighter aircraft on airborne tankers or drop tanks.) In the case of payload-to-gross-weight ratios of only 2 or 3 percent, every pound saved pays a highly leveraged dividend. Additionally, rocket engines—unlike jet engines—become more efficient as ambient air pressure decreases; therefore, one can design a two-stage system to optimize environmental conditions.[41] The two-stage concept also provides a flexible launch-point feature that converts a seeming handicap into a significant advantage.

Offset Launch versus Direct Insertion

Americans were extremely proud of NASA's 1984 shuttle missions that rendezvoused with the malfunctioning Solar Max, Palapa B, and the WESTAR (Western Union) satellites. The shuttle's inherent flexibility and on-orbit maneuverability allowed in-space repair and retrieval of malfunctioning space systems for the first time ever. However, very few of these same enthusiasts were aware of the extremely complex and time-consuming procedures that had to be executed to effect the space rendezvous because of the ELV direct-insertion launch technique employed by the shuttle.

"In a rendezvous mission, it is imperative that the orbiter closely match the orbit plane of the target at launch, as changing the orbit plane after launch is very fuel expensive."[42] In fact, a 60-degree plane change requires almost as much energy as it takes to get to orbit in the first place. One matches orbital planes by allowing the intended launch site to rotate under the inertially stabilized orbital plane and then launching the interceptor in the desired direction. This is called direct insertion. "The time at which a direct launch into the orbital plane can be made is called a launch window."[43] For low-earth-orbit launches, only one or two launch windows exist each day. This is independent of the target's location inside the orbital plane. Thus, a launch must occur when the plane passes overhead, regardless of where the target is in the orbit. This, in turn, results in the orbiter's having to chase the target to match orbits and phase for join-up. Like two kids separated on a Ferris wheel, the procedures are not all that simple for two ballistic vehicles falling at 17,000 mph. It can be done only by orbiting at different altitudes, which results in different periods of orbit (time to complete an orbit). The process is

further complicated by the fact that on-orbit burns (to adjust altitude) change the shape and alignment of the orbit if not done at perigee or apogee.[44]

Rather than digress into the unusual and confusing phenomenon of on-orbit maneuvering, suffice it to say that one cannot simply thrust when and where one wants to. Burns have to be anticipated far in advance and programmed at specific intervals to accomplish the rendezvous. To do this, the shuttle employs a double coelliptic rendezvous sequence which, as the name suggests, takes days—sometimes weeks—to accomplish. This can all be eliminated and the rendezvous reduced to less than two hours by employing what can be called the *offset launch* concept.[45]

An offset launch is the capability to move the launch point to its optimum location in order to eliminate phasing problems. By moving the launch-insertion point to the ideal lead point, one can time the insertion burn with the phasing burn to produce the desired rendezvous in one and one-half orbits. The F-15 antisatellite employs a similar technique, although the weapon remains suborbital. A two-stage carrier/orbiter launch system with a first-stage range of 700 NM is all that is required to accomplish any low-earth-orbit rendezvous.[46] So, while building a two-stage system may seem like a handicap to some observers, from an operational viewpoint it is a significant advantage whose attributes have not been lost on our European competitors. A two-stage vehicle is also much cheaper to build than the SSTO-system prototype.[47] Of course, any idea can be taken too far, and there is a practical limit to how much performance should be required for the next-generation space-launch vehicle. A review of basic satellite orbits will define what that limit should be.

Space-Transportation Requirements

We previously established that all current and future satellite systems will be located in one of four particular bands:

- Low-earth orbits at 100–1,000 NM and 0–110 degrees of *i*.
- Middle-earth orbits at 10,800 NM near 63.4-degree *i*.
- Molniya orbits at 300/23,000 NM and 63.4-degree *i*.
- Geosynchronous orbits at 19,360 NM and zero-degree *i*.

A space-transportation architecture must be capable of servicing these destination orbits.

The low-earth orbits can best be reached directly by taking off in the two-stage system using normal turbofan jet-engine power (fig. 9). A cruise at an altitude of 30,000 feet for up to 700 NM in any direction provides the necessary offset to achieve a minimum-time rendezvous. If the vehicle used a combination of rocket and afterburning turbofan power, a climb to 100,000 feet and acceleration to Mach 3 would give the initial momentum to the orbiter, which would continue to orbit with a 400-second insertion burn after separation. The burn would be programmed to achieve the desired orbit ephemeris for payload deployment, satellite rendezvous, or observation duties. The 10,000-pound polar (20,000-pound easterly) payload capability would handle 90 percent of all future satellite requirements. Infrequent large/outsized payloads that could not be accommodated by the two-stage vehicle could be sent aloft on ELVs whose modular launch components (i.e., engines) could then be retrieved by a following orbiter.

Geostationary orbits are best served by launch to the low-inclination space station, where rendezvous, docking, and berthing would occur. As discussed earlier, all geosynchronous payloads—without the need for integral upper stages and fuel—could quite easily be handled by a 20,000-pound capability. At the station, the payload would be mated to an orbital-transfer vehicle for propulsion to geosynchronous orbit, where plane change and acceleration to circularize the elliptical transfer orbit would occur. After one

established the correct longitudinal position, the OTV would deploy its payload and return to the space station, using either propulsive or synergistic means. The OTV could also be used to retrieve malfunctioning or fuel-depleted geosynchronous satellites for repair.

GPS-type medium-earth circular orbits and their Molniya counterparts are a more interesting situation. As one would expect, all orbits in the same inclination are not coplanar—that is, not in the same slice of space (except for equatorial orbits). Referring to a Mercator projection with two equally inclined orbits (fig. 10) will help explain this fact. Recall that inclination was defined as the angle made by a satellite's orbit as it crossed the equator on an ascending pass. In the figure, both ascending passes make a 60-degree angle with the equator but are clearly not coplanar. In fact, their orbital planes intersect at two places called nodes and would require a remarkable turning maneuver to become coplanar. The point is that although a space station may be inclined at 63.4 degrees, its orbital plane is totally out of sync with all other equally inclined planes. Therefore, using a 63.4-degree-inclined military space station as an OTV interface would almost always require a difficult and fuel-expensive plane change by the OTV unless one employed an orbital anomaly to correct this deficiency.

Recalling that low-altitude, sun-synchronous orbits use the perturbation of nodal regression to remain aligned at the proper sun angle throughout different seasons of the year, the same effect can be used to drag a 63.4-degree low-altitude space station through the other equally inclined—but noncoplanar—orbits. Nodal regression varies with altitude and inclination. In the case of equally inclined orbits, the nodal-regression rate becomes solely a function of orbit altitude.

At 250 NM and 63.4 degrees *i*, nodal regression is about three and one-half degrees per day, whereas at the Molniya and medium altitudes the regression is almost negligible. If one uses this differential, then a low-altitude, 63.4-degree space station would pass through every medium-altitude coinclined plane once every 100 days [(360° − 3.5°) ÷ 3.5°/day = 100 days]. Although not being able to visit a particular GPS or similar orbit for an average of 50 days may seem restrictive, one must remember that satellite lifetimes and on-orbit spares provide necessary redundancy to ensure continued operation of the system.

Figure 10. Two Equally Inclined Noncoplanar Orbits. Adapted from AU-18, *Space Handbook*, ed. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin (Maxwell AFB, Ala.: Air University Press, January 1985), 2–33.

The military impact of a moderately inclined space station would also enhance our ability to observe other nations' activities within the same plane, as well as provide the opportunity for human overflight of most of the world's landmass twice per day. In fact, a military space station—in conjunction with the other transportation components advocated in this article—promises to revolutionize the entire space program by providing new reconnaissance, surveillance, targeting, and weapon-delivery options. It would move the United States out of the twentieth-century space-support environment and into the twenty-first-century space-operations arena. But until we solve the basic problem of getting to and from orbit in an efficient manner, those forward-looking ideas will remain just wishful fantasies of twenty-first-century planners. □

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42. Steven Clark and Daniel Sedej, *Rendezvous/Proximity Operations Workbook* (Houston, Tex.: NASA Johnson Space Center, 1983), 1–46.

43. "Astronautics 332 Course Text," vol. 2 (Colorado Springs, Colo.: USAF Academy, 1984), V-74.

44. Ibid., VI-10 to VI-11.

45. The term *offset launch* arose out of a discussion I had with my supervisor at USAF Space Command in 1984 when I was developing a concept of operations for a military aerospace vehicle. The idea was mine; the term came from my supervisor—Lt Col Mike Rhynard, USAF. The term has been widely used in articles and publications since.

46. Due to the earth's rotation, orbit ground tracks progressively work their way westward, depending on the inclination and period of the orbit. For LEO the worst-case scenario is a polar orbit of 1,000 NM, in which case the earth will rotate approximately 1,400 NM at US launch-site latitudes. Thus, 700 NM is the farthest the vehicle would have to fly to reduce the phase angle to zero for launch or wait for the next orbit to occur 107 minutes later.

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Fall 1991

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THE SOVIET MILITARY

AND THE NEW AIR WAR IN THE PERSIAN GULF

MARY C. FITZGERALD

PROMPTED by the abortive coup attempt, the Soviet revolution of August 1991 has opened a new chapter in Soviet military affairs. Although accurate predictions of ultimate effects on the Soviet armed forces are impossible until the situation stabilizes, one can make rudimentary judgments regarding basic forces and general tendencies. Written before the coup attempt, this article nevertheless provides the basis for such judgments by examining both long-term trends in Soviet military thought and recent lessons learned from the Persian Gulf war.

Issues of national security and geopolitics—whether of the Soviet Union, Russia, or numerous successor states—will continue to be a major concern to those nations themselves and the rest of the world. Nuclear deterrence, supplemented by a smaller and leaner conventional military establishment, will likely emerge as the military component that will back up strategic concepts. The great Soviet strategic debates of the 1980s and 1990s will leave a lasting imprint on the future. Current lags in the military-technical sphere will therefore remain a central concern, while obstacles to implementing the new military-technical revolution may initially multiply. The Soviet General Staff will likely remain both a viable structure and the chief articulator of the nature of future

war. Defense Minister Ye. I. Shaposhnikov and Chief of the General Staff V. N. Lobov, for example, have long supported technological modernization of the Soviet armed forces to cope with the high-tech nature of future warfare—especially as exemplified in the Gulf war.

Soviet Views on Future War

In Soviet military thought, the armed forces must be structured according to the nature of future war. Soviet military doctrine is thus riveted to future military capabilities and environments even in the era of "new thinking" and *perestroika*. Although the Soviet military establishment has undergone substantial changes under President Mikhail Gorbachev, mainstream views on future war reflect the same focus on emerging military technologies that Marshal N. V. Ogarkov initiated in the early 1980s. Despite a noticeable degree of civil-military divergence regarding the future of the Soviet armed forces, the civilian leadership has not sought to impede the development of technologies perceived to be at the heart of future Soviet military capabilities. Weapons that employ these technologies include advanced conventional munitions (ACM), directed-energy weapons, and space-based systems. Convinced that the wide-scale deployment of these weapons was inevitable, the Soviet military developed a comprehensive and revolutionary vision of future war long before the Persian Gulf conflict.

According to prominent military scientists, the ongoing development of nuclear and nonnuclear strategic offensive forces provides a basis for predicting a near-term shift toward the waging of an "essentially new type of war—the aerospace war."[1]

DOD PHOTO BY R.D. WARD

Both the war plan put together by Gen Colin Powell and the coalition's theater command structure reflected the innovative mix of modern weapons and careful planning that the Soviets characterize as "intellectualized warfare."

Such a war is characterized by a massive employment of cutting-edge technologies: ballistic missiles with maneuvering warheads, long-range cruise missiles, ACMs, reconnaissance-strike complexes, orbital aircraft, wide-scale application of stealth technology, directed-energy weapons, space-based strike weapons, and third-generation nuclear weapons. Gen-Maj V. I. Slipchenko believes that by the year 2000 the space-based layer alone will be capable of destroying 30–50 percent of the opponent's retaliatory strike means.[2]

Proceeding from such analyses, Soviet military theorists envision a future war whose politico-military objectives are achieved not by seizing and occupying territory, but by destroying the opponent's military capabilities and military infrastructure. General Slipchenko maintains that the three criteria for achieving victory are (1) destruction of the opponent's armed forces, (2) destruction of the opponent's military-economic potential, and (3) overthrow of the opponent's political system. In the past, achieving these objectives was said to be impossible without capturing and occupying the opponent's territory. Today, however, the capture and occupation of territory are unnecessary. With the help of ACMs alone, it is possible to deliver powerful strikes against important strategic targets and to destroy the opponent's military infrastructure. As a result, the political system will not survive.[3]

Air- and space-based systems now give war a new dimension, and the Soviets assert that while they lack sufficient quan-

tities, they have already developed the technologies required to wage such a war. These technologies are reflected in air- and sea-launched cruise missiles, remotely piloted vehicles, and space-based means of supporting ground actions. The Soviets predict that by the year 2000, both sides will have accumulated these systems in sufficient numbers to conduct the aerospace war. During the ongoing transition period, warfare will resemble that conducted in the Persian Gulf, with a declining role for piloted aircraft and a growing role for air-, sea-, and space-based directed-energy weapons.[4]

Through the Prism of the Persian Gulf

In the Persian Gulf war, the Soviet military has seen the nature of future warfare—and it works. Representatives of the General Staff Academy term the Gulf war a technological operation and therefore a prototype of future war. As a result, the development of the Soviet armed forces will now be planned through the prism of the Persian Gulf. The Soviet military has been quick to link the coalition's victory to the achievement of surprise and air superiority at the outset of war. Military experts have thus begun to argue that the Gulf war dictates significant changes in Moscow's defensive doctrine.

According to the Soviets, the operations in the Persian Gulf represent the first concrete example of "intellectualized" warfare. General Slipchenko thus explains that the Persian Gulf war was a clash between two concepts of war: the past (Iraq) and the future (the US-led coalition). The coalition forces won because they were fighting in the future, and Iraq lost because it was fighting in the past.[5] The Soviets, therefore, view the war as a transition between old and new, a stage that has now arrived because the basis of victory was the action of air-attack weapons. Marshal Ogarkov's prescient demands for a rapid incorporation of emerging technologies into Soviet military theory and practice have now been vindicated.

The Soviet military's assessments of its own doctrine and strategy in light of the Gulf war cover a spectrum ranging from obsolete to prophetic. Col A. Tsalko, for example, observed that the crushing defeat of the Iraqi army demonstrated the obsolescence of not only Soviet military doctrine, but also the entire model of military development.[6] Speakers at a conference of the Moscow City Council noted that the war revealed "considerable drawbacks" in Soviet doctrine and its principles of military development and pointed up the outdated quality of prevailing Soviet views on modern war.[7] In a milder vein, Marshal V. Kulikov, former commander in chief of the Warsaw Pact, has acknowledged that the Gulf operations "modified the ideas we had on the nature of modern military operations." A deeper analysis is necessary, he concluded, "but one point is already clear: the Soviet Armed Forces will have to take a closer look at the quality of their weapons, their equipment, and their strategy."[8]

On the other hand, prominent Soviet military scientists argue that the impressive performance of high-tech weaponry in the Gulf represents the realization of the qualitative revolution in military affairs that Ogarkov forecast nearly a decade ago. In his 1984 interview in *Krasnaya zvezda (Red Star)*, for example, Ogarkov noted that the emergence of automated search-and-destroy complexes; long-range, high-precision, terminally guided combat systems; remotely piloted vehicles; and qualitatively new electronic control systems will inevitably alter the nature of modern operations.[9] All of the developments that Ogarkov highlighted were used in the Gulf war, including the automated search-and-destroy complex or reconnaissance-strike complex (i.e., joint surveillance target attack radar system [JSTARS] aircraft in combination with the multiple launch rocket system [MLRS]).

Soviet military experts have stressed repeatedly that the coalition won so

quickly and with minimal losses because of its "overwhelming superiority in contemporary methods of warfare: in aviation, ACMs, and means of reconnaissance, communication, command and control, and electronic warfare."[10] Also telling was the coalition's superiority in strategy and tactics; the skillful combination of fire and maneuver; and coordination among tank, motorized infantry, artillery, aviation, and marine units. Further, according to analysts such as Gen-Lt V. Gorbachev, the centerpiece lesson of the Gulf conflict is the allied achievement of surprise and command of the air at the very outset of war.[11]

Prominent military scientists such as General Slipchenko have characterized the Gulf war as prototypical of an air war.[12] Col M. Ponomarev, for example, has described the allied air operation as a contemporary version of Giulio Douhet's strategy of command of the air, but applied in this case to create an "aerial blitzkrieg."[13] Gen-Lt A. Malyukov writes that the Gulf war was conceived from the outset as an air war to wear out the opponent by means of air strikes, disorganize his command and control (C^2) systems, destroy his air defenses, and weaken the strike power of the ground forces. In terms of choice of objectives, it was therefore more a classical air offensive than an airland battle.[14]

The Soviets contend that the United States used the theory of the air war against Japan in World War II. But the capabilities of air-attack forces and means were then insufficient. Today, however, these capabilities have grown immeasurably—to the point that air forces can actualize the theory of air war.

In such a war, say the Soviets, tens of thousands of precision guided cruise missiles capable of striking point targets at long ranges can be used simultaneously to destroy thousands of targets. The air war can include the delivery of tens and even hundreds of massed strikes by ACMs from a variety of axes. In the intervals between massed strikes, air forces can deliver pinpoint ACM strikes against the most important targets not destroyed by massed strikes. Furthermore, one can extensively employ remotely piloted vehicles plus ground- and air-based radio-electronic warfare systems to blind the opponent's air defense systems.

Such an air war can include delivering unpiloted air strikes to disable state and military C^2 points, interdict lines of communications and supplies, and paralyze both the rear area and the country's economy. Targets would include vulnerable areas of the economy, C^2 centers, road networks, bridges, and so forth. The destruction of up to 50 percent of such important targets could plunge even the Soviet Union or the United States into a crisis. Strikes will also be delivered against military targets during an air war—above all, against airfields, naval bases, missile launch positions, and battlefield C^2 points. The military can extensively employ space-based reconnaissance, communications, and attack means to support the air war; in the future, it can employ means of destroying targets from space.

Military experts such as General Slipchenko describe the Gulf conflict as prototypical of a war to be conducted with massive employment of advanced technologies. Opponents will use remotely piloted vehicles, robotics, electronic warfare systems, long-range guided weapons systems with artificial intelligence, and space-based weapons, as well as reconnaissance and deception.[15]

Soviet experts argue that all of this is radically changing the nature of future war. Large groupings of ground troops will not be employed. Massive strikes will be delivered by remotely piloted, precision guided weapons and reconnaissance-strike systems capable of automatically finding and destroying the target to any depth of the opponent's territory. The entire country being subjected to precision strikes will become the battlefield, and the war will proceed without borders or flanks. The terms *front* and *rear* will be replaced by the concepts of *subject to strikes* and *not subject to strikes* (i.e., targets and non-

targets). First-priority targets will be state and military C^2 points, energy sources, and military targets—especially retaliatory strike means.

By concentrating the enormous might of strikes on the farthest depth of the opponent's territory, air forces can now achieve both operational-strategic and strategic objectives. In fact, the Soviets say that in such a war the lines between tactics, operational art, and strategy disappear. The war can begin and end with a powerful strike by precision guided weapons—painstakingly planned and precisely executed within a designated period of time.

General Slipchenko notes further that the Gulf war dictates essential changes in the employment of ground forces. Warfare has shifted from reliance on these forces to reliance on air-attack weapons.[16] The role of piloted aircraft has also changed—from accomplishing missions over enemy territory to delivering standoff weapons. The Gulf war demonstrated that an air war alone can be conducted to achieve victory. The introduction of such novel elements as ACMs—especially cruise missiles—permitted the execution of a technological operation that was not massive but sufficient to prove its effectiveness.

High-Tech Weaponry in the Gulf

Gen-Maj N. Kutsenko, deputy chief of staff of the General Staff's Center for Operational-Strategic Studies, observes that the NATO leadership exploited the Gulf war as an opportunity for testing the

XVIII AIRBORNE CORPS PHOTO

The surprise and air supremacy achieved by coalition air forces allowed them to inflict heavy losses on Iraq's armored forces. Some observers saw this "aerial blitzkrieg" as a clear demonstration that Soviet military theory and force-development doctrine are obsolete.

latest weapons systems and military technologies, many of which have already entered the arsenals of NATO armies.[17] These include the F-117A stealth fighter-bomber; the Patriot air defense missile complex with its antimissile missiles; the E3A airborne warning and control system (AWACS) aircraft with its radar system for ground-target reconnaissance and target designation; reconnaissance-strike complexes; air- and sea-launched cruise missiles; laser-guided bombs; and new armored equipment. Equipped with targeting lasers, the Patriot and Hawk missiles were highly protected against interference. Indeed, to remark that "this is very promising weaponry the Americans have" seems an understatement.[18] But Kutsenko also notes that the desert terrain and climate revealed serious deficiencies in coalition equipment.[19] Further, Gen-Maj S. Bogdanov has noted that the war was a proving ground for employment concepts of high-tech weapons against an opponent who could not field appropriate countermeasures.[20]

According to Rear Adm A. Pauk, the sea-based Tomahawk cruise missiles demonstrated a high degree of combat effective-

The fate that befell Iraqi aircraft shelters, such as this one in Ali Al-Salem, Kuwait (below), convinced Soviet air defense officials that they needed more advanced surface-to-air missiles and radar systems.

GENERAL DYNAMICS

High-tech, precision weapons such as the Tomahawk cruise missile gave theater commanders greater flexibility in selecting specific targets in populated areas. The success of advanced conventional munitions in the Gulf war demonstrated that the quality—rather than the quantity—of weapons will be emphasized in future warfare.

ness. In just the first days of the air operation, US ships launched about 100 of these missiles against ground targets. The launches were coordinated with the actions of carrier-based and tactical aviation, while computerized trajectories allowed the missiles to approach heavily defended targets from different directions. Targets of the Tomahawks included the command posts of the Iraqi armed forces, posts and centers for surveilling the air situation, administrative and industrial structures, electrical stations, and the communications system.[21] Remarkably, the Tomahawk is said to have a circular error probability of about 30 centimeters. Rear Admiral Pauk also praised the performance of sea-based remotely piloted vehicles. They accomplished such tasks as final reconnaissance of targets, adjustment of artillery fire against the shore, damage assessment, and so forth.[22]

In addition to ACMs, the Soviet military points to the role of space-based systems in the allied victory. According to General Kutsenko, allied forces of battalion size and higher utilized space-based communications systems, and allied staffs used satellite reconnaissance to monitor developments along the front.[23] In fact, the first article in *Voyennaya mysl' (Military Thought)* to examine Gulf operations focused on the performance of space-based systems. The authors of the article, Cols V. V. Romanov and V. P. Chigak, declare that these systems constituted "the basis of all technical reconnaissance" in the war.[24] With a resolution of about half a meter, electro-optical means provided the capability to swiftly and reliably detect changes in the operational configuration of Iraqi armed forces.

In addition, the US is said to have experimented with ways of expanding the application of space-based reconnaissance means. For example, space-based systems proved effective in detecting ballistic missile launches, thereby increasing warning time from one to five minutes. These systems also proved effective in correcting the trajectories of airborne and cruise missiles. Further, space systems functioned effectively at all levels of coalition forces, including the tactical. Because the Iraqis lacked radio-electronic means of suppres-

sion, space-based systems ensured uninterrupted and undetected C^2 of troops and weapons.[25] At the same time, Romanov and Chigak note that the effectiveness of space-based systems was reduced by the Iraqis' use of decoys; measures of disinformation and operational *maskirovka* (cover, concealment, and deception); the dispersal and concealment of equipment and supplies; and poor meteorological conditions. Moreover, the war is said to have refuted the assertions of "American specialists" that space-based systems could detect dug-in targets.[26]

On the whole, however, authoritative Soviet analyses stress that the Gulf war was the first example of the significant—if not decisive—role that space can play in modern warfare. General Slipchenko notes that past warfare had two dimensions—latitudinal and longitudinal—but that air- and space-based systems are giving war a new, third dimension.[27] Before the Gulf war, space-based systems were said to increase combat effectiveness by 50 to 100 percent. However, according to Gen-Maj A. N. Bazhenov, editor of *Military Thought*, the Gulf war demonstrated that these systems can increase combat effectiveness by 150 to 200 percent. He also observes that the Gulf war confirms the need to shift warfare to theaters of military operations in space.[28]

The head of the strategy section of the General Staff Academy argues that with the Gulf war, so-called duels—which use only strike means—have become a phenomenon of the past for civilized states. Now one must take all weapons into account—not only strike means, but also means of reconnaissance, radio-electronic combat, guidance, and effective defense. Iraq's lack of such systems greatly reduced the capability of its strike means, which were unprotected, and led to great losses in the Iraqi army.[29]

The performance of coalition weaponry in the Gulf war has triggered Soviet concerns over the future of arms control. According to the Soviet military, the war demonstrated the obsolescence of current formulas for US-Soviet arms control. The coalition victory invalidated the *quantitative* paradigm that is the heart of current treaties and proved that a *qualitative* paradigm will determine the balance of forces in future warfare. The Soviets have long argued that emerging technologies are negating many of the traditional measures of military power and are generating a revolution in future warfare. In the Gulf war, a smaller, technologically superior force was thus able to defeat a much larger, technologically inferior one.

Speaking shortly after the outbreak of the war, General Lobov warned that US testing of advanced weapons such as cruise missiles and stealth aircraft could "disturb the qualitative parity in the weapons sector and have serious consequences for the future."[30] Among others, Marshal S. F. Akhromeyev has pinpointed the performance of stealth technology; automated command, control, communications, and intelligence (C^3I) systems; ACMs; cruise missiles; and laser-guided aviation bombs.[31] "A crisis had only to break out in the Persian Gulf region," argues Maj M. Zheglov, "for NATO to begin putting the brakes on programs to reduce armed forces and armaments, and to call for the creation of new mobile forces capable of operating in any region."[32] This Western response to the coalition victory is said to undermine all arms control progress of the recent past.[33]

A senior defense ministry official comments that the Soviet armed forces possess weapons similar to most of those used by the US forces in the Gulf.[34] On the other hand, Gen-Maj V. Chepurnoi stresses that the Gulf war demonstrated the necessity of "technically re-equipping" the Soviet armed forces on the basis of the latest weaponry.[35]

Roles of Surprise/Initial Period

The Soviet military believes that ACMs have generated an enhanced role for sur-

prise in modern warfare. In discussing the impact of ACMs on combat operations, for example, Gen-Maj I. Vorob'yev notes that in the past, one achieved surprise by using passive methods: all types of *maskirovka*, decoy targets, demonstrative moves, smoke screens, and so forth. Today, however, active measures are more important and include surprise maneuvers on land and in the air, unexpected offensive and nonstereotypical battle formations, and novel systems of fire destruction. Automated reconnaissance systems and computer-based homing ammunition are now used to disrupt the opponent's troop- and weapon-control systems. The idea is to blind the opponent before the onset of action by a massive use of electronic warfare against his reconnaissance, warning, and C^2 systems.[36]

According to Vorob'yev, ACMs facilitate the use of surprise on a much wider scale than before. Surprise ACM strikes ensure the achievement of not only the operational-tactical but also the strategic initiative on the future battlefield.[37] Prominent theorists such as General of the Army Lobov have gone so far as to argue that the incorporation of ACMs "raises the issue of achieving surprise in both the *defense* and the offense"[38] (italics added). If achieved, wrote Gen-Lt N. G. Popov, surprise can exert a "decisive" influence on the course of the war.[39] Long before the Gulf war, Vorob'yev asserted that the skillful application of the principle "guarantees a victory."[40]

Zarubezhnoye voyennoye obozreniye (Foreign Military Review) reports that the coalition used the factor of surprise to suppress Iraq's air defense, disrupt its military C^2, disable nuclear and chemical centers, achieve overwhelming command of the air, and seize the initiative.[41] Among others, Gen-Maj G. Zhivista of the General Staff's Center for Operational-Strategic Studies has reiterated that the US used the element of surprise to almost completely disable Iraq's air defense and C^2 systems, thereby disrupting the operations of Iraqi ground forces. In addition, the US gained total command of the air while sustaining minimal losses.[42]

Before the Gulf war, says General Slipchenko, achieving surprise was not really possible because of the need to mass large ground forces and because of the lack of sufficient ACMs. But the Gulf war showed that achieving surprise with ACMs and aviation is now realistic. For the first time in nonnuclear warfare, surprise is now said to be "decisive for the course and outcome of the war."[43] The best means of deterring the temptation to launch a surprise strike, the Soviets say, is to ensure that the armed forces of both sides are fully prepared to fight such a war—in other words, to ensure parity in nonnuclear strategic offensive forces.

Coincidentally with the US adoption of the AirLand Battle, Soviet military writers began to link the importance of a future war's initial period with the combat characteristics of ACMs. Writing in late 1985, for example, Gen-Lt A. I. Yevseyev asserted that if a war begins with ACMs, the initial period can exert an "enormous influence on the subsequent course of military actions."[44] By 1988, however, prominent military scientists argued that an initial period with ACMs can exert a "*decisive* influence on the course *and outcome*" of the war[45] (italics added). Long before the Gulf war, then, the Soviets were already viewing a high-tech initial period as the decisive factor in victory.

General Yevseyev also made a statement unprecedented for Soviet military thought. In contrast to past wars, he wrote, "the main content of the initial period in present-day conditions can be the delivery by the belligerents of nuclear strikes or *strikes with conventional means of destruction* ... for achieving the war's *main* objectives"[46] (italics added). By Soviet definition, the war's main objectives are to destroy the opponent's war-fighting potential and war economy. In the past, therefore, only an initial period with nuclear weapons was said to achieve these main objectives. But since 1985, Soviet military thought has explicitly acknowledged the

potential of ACMs to accomplish these nuclear tasks in a future war.[47] For all practical purposes, the achievement of these objectives signifies victory.

General Gorbachev states that the outcome of the Gulf war was determined "in its first few minutes" by the ability of allied air forces to seize the initiative in the air and win command of the air at the outset. Having no opposition in the air, the coalition was able to compensate for Iraq's superiority in tanks.[48]

Experts assert that the Gulf war thus illustrates that future warfare will involve a massive use of technology and will be over quickly. In fact, say the Soviets, the conflict demonstrated that war's "course" and "outcome" are now "a single phenomenon." Indeed, General Slipchenko declares that the initial period is "essentially the only period in future war."[49]

Changing Force Structure

In general, initial Soviet commentary on the Gulf war has confirmed earlier predictions of a declining role for ground forces and growing roles for air, air defense, and naval forces. But this commentary in particular is clearly influenced by the parochial and budgetary factors endemic to any military organization.

Soviet military assessments of the impact of Gulf operations on the role of ground forces span a predictably wide spectrum. According to Col A. Tsalko, for example, it is "sheer madness" to believe—as some military authorities in the Soviet Union continue to do—that "the outcome of a war is determined by a clash of huge masses of ground troops." The Gulf war clearly demonstrated that "the Iraqi army was simply overwhelmed by airstrikes and the troops had to keep their noses buried in the sand." Tsalko goes so far as to argue that the main lesson of the war is that huge numbers of tanks, armored vehicles, and artillery pieces were "absolutely useless."[50]

On the other hand, the head of the Military Academy of Armor Troops insists that the Gulf war reveals the impossibility of accomplishing all missions without a large-scale use of ground forces.[51] In addition, General Bogdanov asserts that the war graphically demonstrated the "determining role" of ground forces in achieving the war's ultimate objectives.[52]

Even before the Gulf war, *Foreign Military Review* noted that, according to the foreign press, the Air Force was the only branch of the US armed forces capable of concentrating its efforts on the scale required by a future war waged with cutting-edge technologies. "American specialists" therefore focus on (1) perfecting the capability for delivering precision air strikes on fixed and mobile targets in the opponent's deep rear without entering the range of his air defense and (2) continuing the development of space-based offensive and defensive systems and systems for controlling them.[53] Among others, General of the Army I. M. Tretyak has stressed that air defense is also a critical element of the conventional "aero-space war."[54]

According to General Gorbachev, superior US technical intelligence and highly accurate weapons played a key role in neutralizing Iraq's air defense system.[55] In addressing the USSR Supreme Soviet, Defense Minister D. T. Yazov thus admitted that the allied victory in the Gulf war had prompted the Ministry of Defense to reexamine its air defense capability. He warned that, while the Soviet Union is currently capable of repelling attacks, this might not be true in two or three years. Yazov even admitted that Soviet air defense systems already have "weak spots."[56] Col-Gen R. Akchurin was equally direct: "Today our anti-aircraft defenses are capable of repelling the attacks of any air targets." But he warned that "the echo of missile thunder in the desert must put us on our guard."[57]

Soviet air defense (PVO) officials state that the allies employed several new means of avoiding air defenses: space-based reconnaissance systems, universal use of electronic warfare systems, and the preventive cruise missile strike. Further,

the high-speed antiradiation missile (HARM) was another new type of weapon employed. Altogether, allied air power exceeded the Iraqi air defense potential tenfold.[58] Soviet PVO officials highlight the lack of automated fire control as the main reason for the relatively low level of Iraqi air defense activity. These experts point out that modern battle management is impossible without automated systems. The lack of these systems could reduce Iraqi air defense capability by about 40 percent.[59]

PVO officials also note that by the year 2000, the Pentagon plans to have tens of thousands of strategic and tactical supersonic cruise and operational-tactical missiles. The role of air- and space-attack forces will keep growing, which makes the Soviet air defense capability an extremely important factor. Only armed forces equipped with modern weapons and modern air defense technology will be able to withstand massive aviation strikes at the outset of future wars.[60] Most Soviet experts agree that a critical lesson of the Gulf war is the need for a high degree of combat readiness and air defense assets that can fight against the new, most advanced air and space means of attack at any moment.[61] These experts assert that the PVO badly needs to be upgraded with the most advanced systems. Obsolete models of weapons, which accomplished little in the Gulf war, should be retired. Clearly, as ground troops are reduced, PVO power should increase and its combat deployment made denser.[62] PVO officials maintain that combat operations in modern war will undoubtedly start with the destruction of reconnoitered military targets by air force operations. To fight more effectively in such conditions, the Soviets are said to require different types of surface-to-air missiles and radar systems, as well as a high degree of automation in battle management, reconnaissance, and target guidance. Neither the Patriot nor the Hawk would have performed as effectively as they did without reconnaissance, including space-based reconnaissance.[63]

Soviet military experts from all of the branches agree that the Gulf war suggests that all future military operations will begin with a massive use of air power. On the whole, however, their analyses conclude that air power alone was insufficient to accomplish all of the war's final objectives.

General Malyukov notes that the Gulf war was the first wherein aviation accomplished almost all of the main missions. But it also demonstrated that having modern aviation in the arsenal is not enough—one must also ensure operational, materiel, and technical support. From its first days, the Gulf war was clearly a war of modern high-tech systems—that is, of everything that modern aviation represents. "He who does not realize this runs the risk of falling hopelessly behind in the qualitative improvement of aviation equipment—with all the ensuing consequences."[64]

The success of the war as a whole, according to General Bogdanov, turned on the outcome of the struggle to achieve command of the air. In other words, it depended on the result of the air operation. The apparent trends in modern warfare "really do predetermine to a certain degree the priority of aircraft as the most long-range and maneuverable means of combat."[65] As a result, General Malyukov insists that "major [Soviet] investments" are necessary to keep up with high-tech US air power.[66]

The Soviets are convinced that the Gulf war was determined by air forces, marine corps units, and naval aviation, which should "vividly show us what lies in store in the near future in local clashes or any other potential combat operations."[67] General Slipchenko offers that the Soviet forces of the future are the Strategic Rocket Forces, the air force, the navy, and the Air Defense Forces. The Soviets had discussed the diminishing role of ground forces for years, "but now we have proof."[68] On the other hand, General Chepurnoi argues that in the future the Soviet armed forces could consist of three branches: the "Aero-Space Forces," the navy, and the Group Troops.[69]

Whither the Soviet Military?

According to prominent military scientists, the Gulf war dictates several specific directions for the qualitative improvement of the Soviet armed forces. These include (1) the development of a rapid-deployment capability for the ground troops, (2) major investments in high-tech air power, (3) a review of the national air defense network and systems, (4) a higher degree of automation in C^3I and weapons guidance, and (5) an overall technical reequipping of the Soviet armed forces.

In addition, authoritative Soviet analyses highlight the impact of the Gulf war on specific dimensions of future warfare. First, military experts assert that the war portends a new type of arms race—one emphasizing capabilities for implementing strategic mobilization and deployment in theaters remote from the homeland. Observers thus stress the US ability to move a sizeable force and conduct an impressive logistical buildup in a distant region that lacked a well-developed communications infrastructure.

Second, Soviet military assessments of the Gulf war focus on the role of surprise as the key to victory in modern warfare. According to Defense Minister Shaposhnikov, the Gulf war demonstrated that air power is the "main means" of achieving surprise—now said to be the decisive factor in determining both the course and the outcome of the war.[70] Indeed, the course and outcome of war are now said to be a single phenomenon. Thus, as previously mentioned, the war's initial period is now said to be the *only* period in future warfare.

Third, Soviet military experts stress that the Gulf war is the prototype of the so-called technological operation. Characterized by a massive use of technology, such a war will be short. Because advanced nonnuclear technologies will accomplish all of the missions previously reserved to strategic nuclear forces, these systems can achieve all of the objectives once envisioned for a nuclear war. In addition, one will achieve these objectives without the collateral damage and political complications associated with the use of nuclear weapons.

Initial Soviet commentary also highlighted several larger and more long-term lessons of the Gulf war. First, the war confirms Marshal Ogarkov's forecasts on the nature of future war. In the early 1980s, Ogarkov predicted that the order-of-magnitude improvements in emerging nonnuclear technologies were making these systems equal to nuclear weapons and were generating a revolution in the methods of conducting combat operations.

Second, the Gulf war is said to invalidate Moscow's 1987 defensive doctrine, which is now viewed as extremely dangerous for both the armed forces and the country. Soviet military doctrine has always been defined as having two aspects: the sociopolitical and the military-technical. Since the early 1980s, the sociopolitical side of doctrine was described as defensive because the Soviet Union would never launch aggression against any nation. For the first time, however, the 1987 defensive doctrine proclaimed that henceforth the military-technical side of doctrine would also be defensive: the Soviet armed forces would eliminate the capability for launching surprise attacks and mounting offensive operations in general. But since the Gulf war, the Soviet military has redefined the defensive doctrine to include only the sociopolitical side: the defensive doctrine, they argue, means neither a defensive *strategy* nor a rejection of the offensive.

Third, the Gulf war has prompted the Soviet military to redefine the whole concept of deterrence. While nuclear parity remains the linchpin of strategic stability, the performance of ACMs in the war is said to prove that the new nonnuclear technologies are threatening the old strategic equation. The Soviets now believe that deterrence requires not only nuclear parity, but also parity in high-tech nonnuclear forces.

Finally, the Gulf war has generated serious Soviet concerns over the future of US-Soviet arms control negotiations. The crushing weight of advanced technologies confirmed that high-tech weapons and the systems employed to integrate them could negate the more traditional measures of military power and revolutionize combined-arms concepts. The arms control process must therefore include such critical elements of future warfare as electronic warfare systems. In short, the Gulf war demonstrated that a qualitative future has replaced the quantitative past of warfare. According to Soviet military experts, the heart of current arms control treaties belongs to that past.

In the chaotic aftermath of the August 1991 coup, it is impossible to predict whether or not the Soviet military will ultimately implement its new vision of future war. It is significant, however, that Chief of the General Staff Lobov has long called for a rapid qualitative development of the Soviet armed forces to cope with the high-tech nature of future warfare—much as Marshal Ogarkov did a decade ago. In September 1991, Ogarkov wrote that

> the Gulf war, which many military men regrettably regarded as merely an episode, demonstrated in my view that victory in modern warfare can be achieved not only by quantity, but mainly by quality. We must see this and learn from it. Our country must also adopt definite decisions on this.[71]

According to Defense Minister Shaposhnikov, there is no sense in cutting R&D because of the current Soviet lag in ACMs and stealth technology. "Here we should not be second best," he argued, "as far as our partners are concerned."[72] □

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Ricochets
continued from page 3

in the field like soldiers or marines. Although the Air Force was blessed by access to an abundant network of modern bases in Desert Storm, this may not be the case next time.

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SPACE DOCTRINE DELIBERATION

Capt James R. Wolf, in his "Toward Operational-Level Doctrine for Space" in the Summer 1991 issue, astutely identifies "one of the most divisive issues facing scholars of doctrine and one of the greatest obstacles to publishing Air Force doctrine for space." He reports that the Air Force has consciously decided "not to separate air and space doctrine but rather to promote the concept of *integrated aerospace power*" (emphasis added). His thesis is that this "reflects the current reality in which the Air Force exercises responsibility in both mediums." In essence, this leads me to conclude that organizational interests are about to supersede fundamental doctrine and national military strategy interests. The implications for national security are not only foreboding, they are dangerous. The inescapable reality is that space is different from air is different from land is different from sea, and neither policy nor technology nor a decision by an organization like the United States Air Force can alter this fundamental doctrinal truth.

What we are being asked to do here is to condone publication of another pair of fuzzy documents on "aerospace" doctrine. As detailed in "Real Tenets of Military Space Doctrine," appearing in the Winter 1988 issue, the current version of AFM 1-1 compromises effectiveness of space doctrine, and the now rescinded AFM 1-6 offered little more than a policy statement on space by the Air Force. The approach described by Captain Wolf, however, would adjust air doctrine in AFM 1-1 to accommodate a dissimilar space doctrine; at the same time, a new AFM 2-25 will attempt to bridge the "basic and operational doctrinal gaps" that are organizationally unacceptable in either document. The end result will be another compromised space doctrine, except this time we will also compromise well-established and proven air doctrine.

Come on, airmen and spacemen, let our leadership know you are not this naive. This is *your doctrine* we're talking about—your experience, your knowledge of what works in the air vice what works in space. You *know* the environments are different, the systems are different, and the capabilities are vastly different. Of course the employment doctrine and basic warfighting concepts differ. Why can't we officially tell it like it really is?

Look at what has happened to our national and military space programs over the past 10 years. Sure there has been technological progress, and there were strokes of luck in recent contingency operations, but where is our space infrastructure today? Think of the irrevocable impacts on evolving system acquisition programs and national military strategy if we allow these basic doctrinal compromises and untruths to be perpetuated in the future.

Space operations doctrine must first of all be viewed from a joint perspective. For this reason, the Joint Staff tasked Headquarters United States Space Command (USSPACECOM) in 1988 to write JCS Publication 3-14, *Joint Space Operations Doctrine*. An intensive doctrine planning group effort was mounted, and a final draft, dated 31 March 1990, was completed for approval by USCINCSPACE. But political differences over the content and approach for the document reduced the original draft to little more than another summary of space policy that is now being coordinated with the unified and specified commands and services. Part of the difficulty has been the inability of USSPACECOM to establish a consensus between its components as well as the services and defense agencies on how to operate in space. This stems from a problem in DODD 5100.1; namely, each service is assigned the same missions and responsibilities in space. The conflict is that each service has a different doctrine; so the implementation of these assigned missions and responsibilities naturally differs for each service.

This begs the question. How does space play in the doctrine of not only the Air Force but of each of the services? The US Army, Navy, and Marine Corps have just as much at stake here; the integration of space with land power and with sea power is just as relevant as "integrated aerospace power" proposed by the Air Force. While each of these integrated doctrines needs to be developed, no single service can address *joint* space operations doctrine, which lies at the heart of the controversy. Instead of an Air Force manual on space operations doctrine, we need a joint space operations doctrine articu-

lated from a joint perspective by joint space operators. Until this happens, our space infrastructure and assured mission support to the services and the CINCs will continue to flounder.

Consider Desert Shield/Desert Storm, where many joint space operations-related contingency capabilities were proven for the first time in actual conflict. These capabilities are in no way espoused by the doctrine in AFM 1-1; but the resounding success of the air campaign clearly exemplified AFM 1-1 at its best. Instead, space operations in support of the war effort directly reflected joint doctrine in the original draft JCS Pub 3-14, now discarded by USSPACECOM. The success of space in these joint operations, aptly termed a *watershed* in the evolution of space capabilities by COMAFSPACE, heralds even greater dependence and integration in the future. So this is not just an Air Force problem; it is a joint problem.

Although the lack of "jointness" is a major flaw in the proposed Air Force doctrine, there are other problems. Of the four philosophical premises stated in the article for AFM 2-25, only two appear reasonable. The premise that "doctrine should attempt to anticipate future capabilities and modes of operation" is certainly vital, particularly with the rapid pace of change in space technology. The premise that doctrine should not be "constrained by policy" could potentially, for the first time, unleash a more realistic, powerful statement of official doctrine for space forces that would significantly enhance our future national security posture.

On the other hand, the premise that the four broad mission areas of space (space control, force application, force enhancement, and space support) are "extensions or larger groupings of basic Air Force missions and supporting tasks" cannot realistically accommodate either the roles of all the services in support of these missions or how these missions support each of the services. Finally, the premise that "AFM 2-25 will toe the party line ... [and that it is] ... integrated aerospace power that most effectively accomplishes Air Force missions" is a veritable admission that this will be a politically contrived, single-service-oriented document rather than real, joint doctrine that we all know works best.

Lt Col David E. Lupton's work on the characteristics of space forces, in his seminal *On Space Warfare: A Space Power Doctrine*, appears out of context in the article. His careful, erudite analysis of the "characteristics of space forces" does not necessarily translate directly into finished doctrine. Characteristics of space forces should be independent of his "politically/legally influenced characteristics" in the doctrine. As pointed out by Captain Wolf himself, policy should influence strategy and plans, not doctrine. Also, Lupton's "logistics influenced characteristics" should derive from capabilities and characteristics of the forces and the environment, not the other way around. Please see "Real Tenets of Military Space Doctrine" (Winter 1988) for clarification of these basic doctrinal principles for space.

The employment principles, briefly listed in the article, are incomplete. Although they may address how to employ forces for space control, they do not address how space forces are employed for space force enhancement, force application, or space support. Also, the principles state neither how space forces are integrated with other military components nor how joint forces support the mission of space control. Thus, the Air Force is proposing a doctrine to singly "gain and maintain control of space, centralize control and decentralize execution, attack the enemy's centers of gravity, seize the initiative, execute concentrated and persistent attacks, and maintain sufficient reserves." In the real world, the proposed employment concept could not be implemented without joint services and unified and specified commands support. This is another key reason why military space doctrine needs to be articulated from a joint war-fighting perspective.

It appears to me that a major organizational change is required before real military space doctrine can be officially recognized and implemented. I submit that the best way out of our predicament is to create a new service organization dedicated to resource management for military space forces. After all, doctrine has as much to do with efficient preparation of forces as it does with effective operations and support. This is a service-related responsibility, not the responsibility of a unified or specified command. A separate service could articulate realistic doctrine in conjunction with all the services and implement assured mission support capabilities for all the unified and specified commands, the defense agencies, and the national command authorities. Unless responsibility for space forces is assigned to a single, independent military department for space, budget competition and interservice rivalries will continue to overshadow attempts to implement realistic space doctrine.

Until such time that a space service organization can be independently established, how-

ever, let us "jointly" work toward publication of a realistic space operations doctrine in JCS Pub 3-14. The task will be challenging for all DOD components, but it will be equally rewarding if we succeed. At the same time, Air Force doctrine in AFM 1-1 and the 2- and 3-series publications as well as comparable basic, operational, and tactical doctrine for the other services should be revised. Changes in service-related doctrine should properly reflect not only how space power is really exploited by the war fighters in each service but also how basic service missions really support the needs of joint space operations.

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IP SATISFACTION

I was sitting in a conference room waiting for yet another supervisor/SMS meeting to start when I read the editorial "Have you hugged your IP Lately?" (Summer 1991). Most of us here at Laughlin felt out in left field during Operation Desert Storm. It was a real push to know that there are folks like you out there in the real world who know and care. Thanks.

Since I discovered the *Air University Review* and *Airpower Journal* years ago, I've tried to read every copy that I could find. They have always been educational and thought-provoking.

Maj Geoff Whisler, USAF
Laughlin AFB, Texas

COMPLIMENTS TO THE CHIEF

CMSgt Robert D. Lewallen's article "Sex, Power, and Ethics: The Challenge to the Military Professional" (Fall 1991) was important, timely, and relevant to *all* workplaces! The careers of several people that I have known were "terminated" due to their lack of understanding of these basic principles. I will reference the chief's article in the future.

Lt Col Ben Jester
Offutt AFB, Nebraska

net assessment

Kiss the Boys Goodbye: How the United States Betrayed Its Own POWs in Vietnam by Monika Jensen-Stevenson and William Stevenson. New York 10016: Dutton, 1990, 493 pages, $21.95.

In the waning months of 1972, President Richard M. Nixon and Secretary of State Henry Kissinger offered Hanoi billions of dollars in postwar economic assistance as an inducement to reach an accord. They did this in response to pressures to end the Vietnam War from an increasingly impatient electorate and a Congress bent on legislating an end to the war contingent only on the return of American prisoners of war (POW). To keep Washington honest, Hanoi retained a significant number of American POWs to use as bargaining chips. In April 1973, responding to North Vietnam's continuing violations of the Paris Accords and to stories of torture by returning POWs, Congress forbade any future aid to Hanoi. Meanwhile, Nixon already had declared (for public consumption) that the last of the POWs had been returned.

Monika Jensen-Stevenson, formerly of CBS's news program "60 Minutes," and her husband, novelist William Stevenson (*A Man Called Intrepid: The Secret War*), claim in *Kiss the Boys Goodbye* that this is the beginning of a cover-up which left hundreds of American POWs hanging (figuratively and literally) in prison camps in Vietnam and Laos. The authors trace a complex conspiracy which began when a cynical Congress, suffering from its own brand of post-Vietnam stress, clamped down on covert activities conducted by the Central Intelligence Agency (CIA). In response, a group of determined cold warriors within the government and the military developed informal (and illegal) groups—proprietary companies—and made contact with international drug and arms dealers to finance and support certain initiatives. These included the Contras in Nicaragua,

the Khmer Rouge in Cambodia (who were fighting the Vietnamese-backed government in Phnom Penh), and a Laotian resistance movement. The models already existed from the "good old days" of clandestine operations in Laos. (Air America had been a CIA proprietary company.) Covert military operations, such as Military Assistance Command, Vietnam's (MACV) studies and observations group and the Air Force's Project 404 in Laos provided a pool of potential operatives and agents. If these groups were to retain their emerging but still officially nonexistent covert capabilities, they had to write off American POWs still held in Laos and Vietnam. Should any of the POWs return, former high officials like Nixon and Kissinger might be embarrassed. Beyond that, a potential "can of worms" could be opened if former and present high-level members of the government were ever tied to past and current illegal, covert activities. The potential scandals, ruined careers, and possible jail terms would make pale by comparison the Watergate and Iran-Contra conspiracies. To keep the secrets, a powerful group of Americans—in and out of government—engaged in intimidation, character assassination, and murder. Fantastic!

There is a great deal of smoke in *Kiss the Boys Goodbye*, and much of the book will appeal to the same people who groove on *Rambo* films and like to muse at the possibility that John Lennon may be alive in a vegetative state in a Tijuana hospital. Historians deal in facts based on verifiable evidence. As a historian who served in Air Force intelligence, working with the secret war in Laos, I know there is a shadowy world where rules of evidence, logic, and—sometimes—human decency do not apply. To accept the thesis of *Kiss the Boys Goodbye*, one has to forsake the rules of scholarship and put into jeopardy one's concept of honor (like the notion that the military takes care of its *own*—warriors as well as bureaucrats) and enter a world where conspiracies and forces operating beyond the law are givens. This is the world of novels and spy-thrillers, not history. But when I served in Air Force intelligence, I occasionally made the excursion into a kind of *Alice in Wonderland* world where facts were relative to whatever institutional prerogative was at issue and integrity was in short supply.

It is much more comfortable to be a history professor. Fifteen years have passed since I was in the "intelligence business," and I can write off books like *Kiss the Boys Goodbye* as easily as the authors can claim that the US government has written off the soldiers missing in action (MIA). I would be more at ease dismissing their thesis if it were not for men like Richard Secord, Ed Wilson, and Oliver North, and a sleazy operation called the arms-for-hostages deal which marked the Iran-Contra affair. Furthermore, it now seems possible that high-ranking American officials were rather tight with Panamanian strongman Manuel Noriega as a part of a conspiracy to provide arms and money to anticommunist forces throughout Latin America. Furthermore, having served in Air Force intelligence, I know that—as Hamlet said—"There are more things in heaven and earth . . . than are dreamt of in your philosophy." Maybe *Kiss the Boys Goodbye* is not all Ramboloney.

At the crux of the authors' argument is the troubling figure of Bobby Garwood. In 1979, six years after Nixon declared the last of the POWs home, US Marine Private Garwood surfaced in Hanoi. According to *Kiss the Boys Goodbye*, both the US and Vietnam—for a variety of reasons—needed to discredit Garwood. Neither government wanted anyone to believe that he was a legitimate POW, and both Hanoi and Washington feared that he might reveal the existence of many more POWs in Vietnam and Laos. Hanoi cast him as a collaborator, and the Marines court-martialed and convicted him of treason. Now that Garwood's reputation was ruined and his credibility destroyed, no one would believe his potentially dangerous allegations that the United States had abandoned American POWs still in enemy hands. Covert operations continued, and the reputations and careers of many important, influential Americans remained secure.

The book asserts that with Garwood dismissed, the POW/MIA issue was sent back to its corner to be acknowledged as a worthy cause by the same hypocritical government that wanted this issue buried and forgotten, even if American servicemen (and others) still being held in Vietnam were buried as well. The cause, however, persisted simply because it made good press for the political right. Additionally, the authors point to a group of die-hard POW/MIA activists who remain convinced that Americans may still be held in caves in Laos or prison camps in Vietnam. Leading this group is retired Navy captain and former POW Eugene ("Red") McDaniel. He is supported by retired Air Force Lt Gen Eugene Tighe who, as a former head of the Defense Intelligence Agency, brings credibility to the effort. H. Ross Perot, Texas billionaire and long-time sup-

porter of the POW/MIA cause, lends his considerable resources to the fray. This would be a formidable alliance except that their most potentially important constituency is the right wing of the Republican party. Instead of receiving the important backing they need, the POW/MIA activists have been attacked and discredited by this group's members because the latter are the very ones who have gained access to power by supporting illegal activities like the Iran-Contra affair. Many of these people hold influential positions in the State Department, Defense Department, and various intelligence agencies, and they do not want their careers jeopardized for the sake of a potential handful of Americans who may still be alive in Indochina. Furthermore, these people are powerful enough to discredit or eliminate those who cross them.

The problem with *Kiss the Boys Goodbye* is twofold. First, it is poor history. As a scholar, I can shove it to the end of the bookshelf next to *The Politics of Heroin in Southeast Asia*, the 1972 expose by Alfred McCoy, Cathleen B. Read, and Leonard P. Adams. More troubling, however, is the second problem. Where there is so much smoke, there is often fire. While the scholar can denigrate this book, the ex-intelligence officer is not so sure. I, along with many others, do not believe that all of our prisoners of war were returned in 1973. In that part of me, I know that the same evidence which is the warp and woof of the historian's trade is less relevant in the murkier world of covert operations.

Dr Earl H. Tilford, Jr.
Maxwell AFB, Alabama

Secret Dossier: The Hidden Agenda behind the Gulf War by Pierre Salinger and Eric Laurent. New York 10014: Penguin Books, 1991, 241 pages, $9.95.

This book is a journalistic "quickie," a fast fix for the mass market on the policies and personalities that shaped the Gulf war. Like most quickies, it panders to the public need for an immediate and vicarious participation in epic events. By gratifying this need, the book allows the public to dismiss the experience altogether. There have been better-quality quickies about the war, such as Bob Woodward's *The Commanders*, published this year. Sadly, Salinger and Laurent's book is not one of them.

The novelistic style and narrative format compromise the book's claim to authority. Everywhere the authors play the omniscient observers; close on or from afar, their right to pronounce derives from an assumed position at the heart of the policy-making process. The tone of their reporting is intimately conversational. They unfold the story of the Gulf war sequentially. They place their emphasis heavily on the momentous weight of personality in deciding the course of conflict. But nowhere do the authors risk a documented citation. The book is, as the title suggests, a secret dossier. Hence, to disclose the identity of their informants would naturally open to scrutiny the privileged source of their information. So the truth is precisely what the authors say it is—take it or leave it.

Such writing leads, at best, to some amusing pretensions and, at worst, to a number of patent absurdities. To establish a tone of intimacy, the authors pepper the book with good-old-boy, folksy dialogues. For example, Secretary of State James Baker is reported to preface an important telephone call to his Soviet counterpart, Eduard Shevardnadze, with the question, How's your vacation, Shev? (page 133). Since neither man is known to speak the other's language, one can only guess how "Shev" translates into Russian! Then there is the report of a statement made in Libya by Muammar Qadhafi to Yassir Arafat, chief of the Palestine Liberation Organization (PLO): "'Abu [Abu is the PLO chief's real name], it's absolutely essential to find a peaceful solution'" (page 109). If the authors had even the slightest conception of the Arabic language and culture, they would have known that *Yassir* is, in point of fact, the PLO chief's real name and that Abu is the first element of *Abu Ammar*, Arafat's two-word honorific title pronounced in tandem.

To the authors, history is obviously the actions of Great Men, and the remainder of the book is devoted to their importance in the shaping of it. The impersonal factors inherent to the environment in which Great Men operate count for nothing.

Here are some of the authors' findings. Because he likes to be liked, President George Bush conducts personal diplomacy and relies heavily on the opinions of people he trusts. Until the last moment, Bush thought that Saddam would not attack Kuwait since President Hosni Mubarak of Egypt and King Hussein of Jordan told him so. Mubarak turns out to be the Machiavellian heavy, Bush the resolute hawk, and Hussein the dupe of Saddam. For hawkishness, however, John Sununu—White House chief of staff—upstages his chief's character

transformation with a "nuke 'em till they glow" attitude, and Prime Minister Margaret Thatcher of Great Britain is credited with originating the famous Hitler metaphor. During the crisis, King Fahd of Saudi Arabia is shown to be out of his intellectual depth, Emir Jabir al-Ahmad al-Sabah of Kuwait a cringing neurotic, and James Baker too obsessed by his relationship with Shev and Gorby to pay much attention to Saddam Hussein's bounding ambitions.

Concealed somewhere in this insider's story of the events and personalities that have altered the present and prepared the way for the future new world order, there is a bit of analysis. Such analysis contends that, although he was a nasty, Saddam could have been managed diplomatically if only we had understood the Pan-Arab political culture from which he springs. That conclusion may be safe enough, but nothing in this book establishes in any way its credibility.

Secret Dossier is a book to be avoided. One wonders why Penguin Books, which has the reputation for printing serious literature, would agree to publish Salinger and Laurent's "quickie" at all. If the reader feels, nevertheless, the need for an immediate fix, this book will no doubt be found on the local supermarket shelves—next to the *National Enquirer*.

Dr Lewis Ware
Maxwell AFB, Alabama

The Dynamics of Defeat: The Vietnam War in Hau Nghia Province by Eric M. Bergerud. Boulder, Colorado 80301: Westview Press, 1991. 383 pages, $29.95.

The strategic debate over the Vietnam War has generally pitted conventional warriors against pacification advocates. In his in-depth study of Hau Nghia province, Eric Bergerud asserts that while the United States used both force and pacification measures with some degree of success to diminish the communist presence in the area, it could never hope for a lasting victory since the Vietnamese people never supported the Saigon government. The Vietnamese saw North Vietnam as a nation forged in battle, its independence earned with blood. On the other hand, they saw South Vietnam as the illegitimate child of French imperialists, supported by Americans. Soldiers of the National Liberation Front and People's Army of Vietnam came from the same background that produced common Vietnamese peasants. These soldiers gained a reputation among the latter (and many US servicemen) as dedicated, courageous fighters. However, those same peasants saw the officials from the government in Saigon as aristocratic, corrupt, and unable or unwilling to accomplish any significant military or civil operations without American intervention. Hence, the combination of attrition and pacification administered by the Americans may have kept the communists from winning, but victory would never be realized so long as the people continued to identify themselves with the enemy rather than with the Saigon regime. The only hope for success, Bergerud concludes, was to get to the root of the problem and have the Republic of Vietnam instigate political and social reforms, a task that both Military Assistance Command, Vietnam (MACV) and the South Vietnamese government were unwilling—and probably unable—to undertake.

To prove his point, Bergerud confines his analysis to the single province of Hau Nghia. He chose this particular province because of its geographic proximity to the South Vietnamese capital. Because many of the directives that came out of Washington (and then Saigon) were put into effect in Hau Nghia, this province became a military laboratory for both attrition and pacification strategies. Bergerud shows how these strategies evolved by tracing the short history of the province from its inception by decree of President Ngo Dinh Diem in 1963, through the introduction of American advisors who preceded the US Army's 25th Division, the operations and effects of the Tet offensive, the advent of Vietnamization and consequent withdrawal of the Americans, to the occupation of the province by North Vietnamese troops in 1975. Throughout this history, Bergerud continually emphasizes the failure of the South Vietnamese government to elicit the people's support even after some American successes in ridding the country's hamlets of Vietcong. In short, the Saigon government simply lacked legitimacy in the eyes of the Vietnamese.

While Bergerud does a fine job of explaining how the general conduct of the war translated specifically to operations in Hau Nghia, he is less clear about if and how the experiences of this lone province were a microcosm for the entire war. Nowhere does he compare events in Hau Nghia with similar occurrences in other provinces. One might wonder, for instance, if the Marine combined action platoons on the coast were experiencing the same problems or successes with their pacification program as were the Army advisors in Hau Nghia. Such

examples would have strengthened Bergerud's case.

Research is the author's strong point. Nearly all his sources are either primary documents held at the Center of Military History and the Federal Records Center or interviews with advisors and soldiers who were stationed in the province. In addition, he includes an extensive bibliography.

While *The Dynamics of Defeat* is inappropriate as a general book on the Vietnam War, it is quite appropriate for people who have a basic understanding of the conflict and are searching for more detailed information. It is also a good study of the concepts of insurgency for students interested in unconventional warfare.

Capt John F. Farrell, USAF
USAF Academy, Colorado

Desert Victory: The War for Kuwait by Norman Friedman. Annapolis, Maryland 21402: Naval Institute Press, 1991, 435 pages, $24.95.

Thunder in the Desert: The Strategy and Tactics of the Persian Gulf War by James Blackwell. New York 10103: Bantam Books, 1991, 252 pages, $12.50.

In the publishing business, being first has its advantages. Almost everyone who is interested will buy the *first* work on a subject. When the subject is as interesting as Operation Desert Storm, it isn't even necessary to be first. Just being early carries some of the same advantage. Eventually, however, economics takes over, and one reaches a point where the book must also be good if one is to sell enough copies to justify printing. The Naval Institute Press and Bantam Books are both obviously cognizant of this reality. Having missed being first, both publishers claim to have produced definitive works with *Desert Victory* and *Thunder in the Desert*. *Thunder in the Desert* is touted as "the first comprehensive, in-depth history" of the war, while *Desert Victory* is purportedly "a thoroughly researched assessment." Neither work hits the bull's-eye, but one is certainly much closer than the other.

Thunder in the Desert, though not a documented history, is a very balanced reporting of events accompanied by thoughtful analysis of what worked, what didn't, why, and what it might mean for the future (though some conclusions are a bit shaky, and none are very well supported by a specific relationship to fact or analysis). If there is a bias, it is toward ground forces and is very slight, though some of the ramifications are serious. Probably the worst is the author's casual acceptance of the 38-day air war as merely "the opening phase of the air campaign portion of ... Air-Land [sic] Battle." In fact, both the planning and execution of this air campaign represent a dramatic departure from the precepts of AirLand Battle, which emphasizes air *support* of a land campaign—not the potential of air to lead the way in some scenarios, like Desert Storm. This is a mistake easily enough made by a former Army officer (Blackwell is a retired major). AirLand Battle is, after all, Army doctrine. For all the potential seriousness of this mistake, there is no smoking gun here.

Desert Victory, on the other hand, is a free-wheeling blend of fact, fiction, and Navy apocrypha more clearly linked to interservice acquisition issues than to "assessment." We learn, for instance, that the only truly mobile forces we have are aircraft carriers and marines, even though the 1st Tactical Fighter Wing and the 82d Airborne Division were arriving in Saudi Arabia by 8 August 1990. Again, even though the USAF had around 270 aircraft in theater by 15 August and an additional 300-plus by 31 August, Friedman claims that "the carriers on station probably accounted for the bulk of available airpower in the theater until late fall 1990.... Without the instant availability of the maritime forces there would have been no five-month buildup, no military option." (His internal logic fails here, however, as he later tells us that the Iraqis were stopped at the Saudi border by the maintenance status of their tanks.) Perhaps the cruelest blow of all was learning that "neither *ground* service [emphasis added—clearly in reference to the Army and the Air Force!] [can] live, let alone fight, for long unless the navy" manages to beat off opposing naval forces (in this instance Iraqi missile boats). The concept of scenario dependence seems to escape him completely.

Friedman does manage to perform a most amazing feat: transforming defense into offense at the turn of a phrase. He tells us that since a carrier represents "an offensive threat" to the enemy, it draws attacking enemy aircraft, which are then destroyed by the carrier's defensive fighters. Since this constitutes destruction of an enemy's offensive capability (the attacking fighters), presto-whacko—offense! This bit of wisdom is offered twice in the book, just in

case the reader thought it was some sort of slip. Certainly, the logical end of his argument would prove Saddam Hussein the offensive genius of all time and turn Gen Norman Schwarzkopf into a quivering Caspar Milquetoast.

Dr Friedman's analytical balance might be restored by a careful reading of *Thunder in the Desert*. "The fact is that no single service won this war; all of them did. None was singularly sufficient and each was absolutely necessary." Only a limited number of examples can be offered here, but these are genuinely representative of the tone of each book.

Representative of the relative overall quality of the two books is the authors' handling of documentation, and each has a problem. One deals with it; the other tries to fool us. Blackwell makes no attempt to feign academic rigor. His "primary source" is his "own collection of experiences and images" from wartime service with Cable News Network. He also refers to "an unusually robust collection of field notes" from the military services, numerous personal interviews, discussions at the Center for Strategic and International Studies (where he is deputy director for political-military studies), official briefings, and other sources. In this sense, his work is more journalistic than scholarly—he reports what he believes to be true after conducting extensive research but doesn't tie information to specific sources. This doesn't help us sift for factual errors (there are most assuredly some), and it keeps his book from being truly useful history, in the textbook sense. Of course, no one has suggested that it should or will be a text.

Desert Victory is a different story altogether. Friedman's book, which is unabashedly touted as a likely "standard text," takes an entirely different tack here. One of the commentaries quoted on the book's dust jacket declares it a "fully documented study." Being a military man, the commentator is apparently easily taken in by an old academic trick—endnotes by volume. *Desert Victory* has 58 pages of notes—a huge quantity of documentation if indeed it were documentation. Actually, the vast bulk of these notes are merely expanded text. Only rarely does Friedman offer real source documentation, and then usually from a standard reference text or popular news journal.

For example, the six and one-half pages of notes from chapter 5, "The Buildup" (a section for which timely resources ought to have been abundantly available during the writing of *Desert Victory*), contain only two actual reference citations: Friedman's *U.S. Maritime Strategy* (1988) and "Sealift: Keystone of Support," an article in US Naval Institute *Proceedings* (May 1991). Lest anyone become confused, these are not general references for the entire section. They merely support specific statements and demonstrate the extremely sporadic nature of documentation in the book. Nowhere does Friedman give any indication of the depth of his research or the sources of the bulk of his information. In fact, it appears to have come from casual conversation with Navy participants in Desert Storm. There is no indication whatsoever that any formal interview or documentary research was done to support the work. Nor is there any reason given to accept his credentials as an individually acceptable source. (Imagine, this from a PhD! Shame!)

With *Thunder in the Desert*, James Blackwell has attempted to faithfully report the historical background for Operation Desert Storm, the significant actual events of the war, and their meaning in the aftermath. He has fairly well accomplished that. Norman Friedman, having established the same objective, has failed—electing instead to vent his spleen and make an undisguised pitch for John Lehman's 600-ship Navy. It won't float. Improve your military library and save the trees. Buy *Thunder in the Desert*—recycle *Desert Victory*.

Lt Col Edward C. Mann III
Maxwell AFB, Alabama

Russian Roulette: Afghanistan through Russian Eyes by Gennady Bocharov. New York 10022: Bessie/Harper Collins, 1990, 181 pages, $18.95.

> I could never shake off a feeling of depression in Afghanistan. I felt it most sharply even before I flew to Kabul, at the moment when ... I heard about the Soviet government's decision to send troops into Afghanistan.
>
> —Gennady Bocharov

Gennady Bocharov is a Soviet journalist who has had a variety of assignments for the popular *Literaturnaya gazeta*. His first trip to Afghanistan came in February of 1980, only one month after the first Soviet armored units rolled into that country. Until the first of the Soviet "Geneva columns" withdrew to the USSR eight years later, Bocharov was sent frequently to Afghanistan for extended stays. Even under the

most repressive censorship of the early years of the conflict during the Brezhnev regime, the author was considered the best source of accurate information about the war. The events from 1980 to 1988 marked staggering changes, not only in Afghanistan, but also through four Soviet regimes. According to Bocharov, "The transition from total silence to miserly glasnost was unforgettable" (page 55).

The assignment of Soviet journalists, wherever they may have been, was to establish and confirm the soundness of the Marxist ideological basis on which all actions were justified. The Procrustean process of censorship was the art of fitting events to the correct Marxist analytical framework. "Here," observed Bocharov, "the politician is king of a multitude of variations, a journalist is the slave of what he has seen" (page 50). This book is a rejection of all analytical frameworks, as well as a rejection of doctrines and definitions. It becomes instead a search for the human dimensions of a peculiarly horrible war.

The author alternates chapters entitled "The Journalist's Story" with those called "A Soldier's Tale," roughly in pairs. (Curiously, each chapter of "The Journalist's Story" is prefaced by a passage from the *Book of Ecclesiastes*.) "The Journalist's Story" chapters sketch some aspect of the conflict, while "A Soldier's Tale" chapters illustrate in greater detail the profound impact that these incidents had on individual lives. Bocharov's sketches are just that—quick phrases, unfinished sentences, verbal snapshots that leave behind intensely subjective impressions that impart a sense of grit and gore.

He writes with compassion for the soldiers and empathizes with them. (Are the names real? It does not matter. The soldiers are real.) He sees the endless sorrow of the family whose son went to Afghanistan to do his duty as a good internationalist, only to return in a sealed box and rest in a grave which must remain unmarked by order of the Communist party. There is the soldier who can never drive a truck again because both hands are gone. There is the soldier sentenced to years of hard labor for committing murder. (His defense was that he was following orders.) There was another whose courage under fire led to madness and the muffled calm of a padded room.

In all of these stories, Bocharov highlights soldiers' anger and frustration over equipment failures, the vulnerability of infantry fighting vehicles, the fact that there were never enough radios or none at all, untrained or half-trained commanders, and supplies that are wrong or late. Tactics could never seem to change fast enough to be effective against mines, snipers, and Mujaheddin fanaticism. The rigidity of Marxist doctrine prohibited adaptive and innovative strategies in the Soviet army, but the relaxation of Marxism left nothing in its place.

Marxist doctrine had dismissed, then ignored, religion as a force in human history. The war in Afghanistan reopened ancient hostilities of atheist versus believer and of Islam against all others. It was a hard lesson. "There is not one atheist under the sun who can predict what will happen in the next minute in the world of believers. Nor a single Christian who can foretell what will occur in the next moment in the world of the Muslims. No believer wants to know a world other than his own" (page 11).

The author lashes out at all of these matters in a way that leaves the reader thinking that perhaps he has at last been able to publish all those pieces from his notebooks that have remained hidden until *glasnost* freed them. Perhaps, but there must be more. Even now, Bocharov saves his harshest attacks for the safest targets. Mikhail Suslov, former chief of the International Department of the Central Committee, is a particular object of ire, and Bocharov refers to him as "an unliving intellect." But Suslov is now long gone from the scene. Concepts and doctrines are good targets. They do not shoot back, especially now that they are in a state of disrepute. It is also quite orthodox to take a potshot at the United States by comparing its involvement in Vietnam to that of the Soviets in Afghanistan, thereby damning both at once. Afghan nationals willing to identify themselves with the Soviet occupiers are objects of derisive comment. After all, who could defend collaborationists?

Bocharov has been a working journalist in the Soviet Union for many years. He has survived many regimes and repressions because his professional agility is remarkable. The reader would do well to take careful note of where and how the author chooses his targets.

Russian Roulette is well worth the effort for those readers who have a discerning eye and a strong stomach. A dose of vodka to go with it might help.

Bonnie J. Baker
Maxwell AFB, Alabama

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The Air University Press has published a complete index of the *Air University Review* (1947–87). This reference work contains an author index, a title index, and a cross-referenced subject index. Any Air Force or other government organization, college or university library, or similar organization with a need for this index can be placed on distribution. Requests for distribution and other inquiries should be addressed to Capt John Doherty, AUCADRE/RI, Walker Hall, Bldg. 1400, Maxwell AFB AL 36112-5532. Captain Doherty can also be contacted at DSN 493-6629 or (205) 953-6629. Base libraries may have copies of previously published issues of *Air University Review*.

USAFA Instructor Opportunities

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New Publications from Air University Press

Air University Press announces the release of *Setup: What the Air Force Did in Vietnam and Why* by Dr Earl H. Tilford, Jr. Dr Tilford, a retired USAF intelligence officer, takes a critical look at how the Air Force flew and fought in Southeast Asia. He argues that although the Air Force effectively applied air power in particular places at particular times (e.g., Khe Sanh, An Loc, and Linebacker I), it was unable to devise a strategy and doctrine appropriate for the conflict in Southeast Asia. Tilford surmises that the Air Force's institutional experience and the mind-set of its leadership doomed it from the beginning to expect much but achieve little with air power. He points out that the 94-targets list devised by the Air Staff was deeply rooted in the mind-set of the plan for the strategic bombing offensive that emerged in AWPD-1 during World War II. The Air Force leadership firmly believed in the efficacy of that strategy. Air Force doctrine, rooted as it was in the World War II experience and leaders, prevented the generals from realizing that Vietnam was a far different war and that North Vietnam did not have a clearly defined center of gravity (i.e., a modern industrial and transportation infrastructure that supported the war machine of North Vietnam).

Other recent books and monographs:

ANZUS in Revision: Changing Defense Features of Australia and New Zealand in the Mid-1980s by Lt Col Frank P. Donnini, USAF, 1991 (book).

Responding to Low-Intensity Conflict Challenges by Dr Stephen Blank et al., 1991 (book).

Space Control and the Role of Antisatellite Weapons by Maj Steven R. Petersen, USAF, 1991 (monograph).

Military Airlift: Turbulence, Evolution, and Promise for the Future by Lt Col Thomas E. Eichhorst, USAF, 1991 (monograph).

To order the above publications, contact the Air University Press, Publication Support Branch, Maxwell AFB AL 36112-5532 or call (205) 953-6452 or DSN 493-6452.

Conference Announcement

The United States Air Force Academy will host the Fifteenth Military History Symposium, "A Revolutionary War: Korea and the Transformation of the Post-War World," 15–17 October 1992. For further information, contact Capt T. N. Castle, Headquarters USAFA/DFH, USAF Academy CO 80840-5701 or phone (719) 472-3230.

Desert Storm Submissions

Air University and the Squadron Officer School are looking for lieutenants and captains who participated in Desert Shield/Storm and who would like to share their experiences in an upcoming book. Submissions should be no more than 10 typed, double-spaced pages or the handwritten equivalent. Any photos that illustrate the story should accompany the manuscript along with a biography and photo of the author. Mail to Capt Michael Vriesenga, SOS/EDOA, Maxwell AFB AL 36112-5582 before June 1992. You may call Captain Vriesenga at (205) 952-2294 or DSN 493-2294. Material will be returned if a self-addressed, stamped envelope is enclosed.

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contributors

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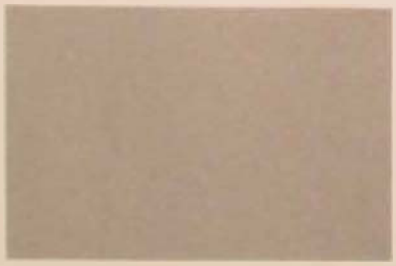

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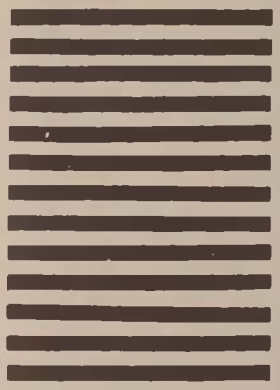

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