

AIRPOWER

Summer 1993

JOURNAL



Summer Readings

- **The Leadership Imperative**
- **Precision Weapons**





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Summer 1993, Vol. VII, No. 2

AFRP 50-2



Editorial	2
Impact of Precision Weapons on Air Combat Operations Lt Gen Buster C. Glosson, USAF	4
Air Campaign Planning Lt Col Maris McCrabb, USAF	11
A New Approach to Command and Control: The Cybernetic Design 1st Lt Gary A. Vincent, USAF	24
Towards a New Airpower Lexicon—or—Interdiction: An Idea Whose Time Has Finally Gone? Col Phillip S. Meilinger, USAF	39
Deterrence after the Cold War: Conventional Arms and the Prevention of War Maj William S. Huggins, USAF	49
The Ultimate Standoff Weapon Lt Col John R. London III, USAF	58
Ricochets Letters	3
Net Assessment Reviews of Current Literature	74
Contributors	95

EDITORIAL

Growing Controversy

We must cultivate our garden.

—Voltaire, *Candide*

CONTROVERSY. ARGUMENTS. Whether in the workplace or without, we confront many controversial, important issues that twine in and out of our daily and professional lives. We have cultural taboos that exclude politics, religion, or other volatile topics from our social conversation. Official Air Force publications such as *Airpower Journal* have to be “approved” before they are published. Is controversy so noxious? Why do we labor so diligently to eliminate argumentation? Two factors—fear and organizationally mandated “political correctness” (PC)—are at work here. Like the two blades of a pair of pruning shears, they work together to cut off useful and valuable discussion and argumentation.

Fear keeps us from voicing our opinions about a controversial issue. Trained from childhood to be agreeable, we don’t want to upset some vague harmonious balance around us. Or we may worry about making fools of ourselves because we don’t know how to express our opinions in a convincing way. So while we may have what at their roots are rational arguments for holding opinions or beliefs, rather than expose ourselves to criticism, we allow only our most comfortable and conforming opinions to blossom. Or like all three candidates in the last presidential debates, we try to avoid saying what we really believe about controversial issues for fear that others will reject *us* at the same time they reject our opinions. Fear simply will not allow divergent opinions to grow.

Unlike fear, PC is mandated from without—by societal institutions that seek to place restrictions on our freedom of speech. Originally, there may have been

good reasons for the development of PC, for often it seems that those people who do have the courage to voice their strong opinions about an issue do so in a manner which labels them as irrational, emotional, inconsiderate, ranting fanatics. No doubt, the PC movement was intended to curb such diatribes. While it may be better to snip off the growth of some offensive forms of speech for the common good, the PC movement would willingly truncate all divergent views in favor of some common, “acceptable,” and barren middle view.

What does all this philosophy have to do with you and with *APJ*? The result of avoiding controversy is that many issues never have the benefit of a useful pruning through critical examination and meaningful debate. Contrary to what you may believe, and in spite of the required security and policy review, *APJ* is not just another vehicle for communicating “the Air Force party line.” Developed as “an open forum for presenting and stimulating innovative thinking,” *APJ* operates within the tenets of academic freedom. The main reason you don’t see more controversial articles is that we rarely get well-written articles on controversial topics that are germane to our target audience.

What are your opinions about the issues our Air Force faces today? Have you sown any good arguments lately? Perhaps you have an innovative way of looking at an old issue. What are you *really* talking about around the flight line or the office coffeepot? Can you cultivate your ideas into a well-researched, well-written, rational article? If you can, we’d like to read it.

GDF

Letters to the editor are encouraged. All correspondence should be addressed to the Editor, Airpower Journal, 401 Chennault Circle, Maxwell AFB AL 36112-6428. We reserve the right to edit the material for overall length.

CLUB CONTENTION

It was with a great deal of interest that I read Capt Clay K. Culver's article, "O Clubs: Tradition or Contradiction?" (Winter 1992). If his purpose in penning this monograph was to stimulate discussion, he certainly achieved his objective. If, on the other hand, his proposed agenda for improving O club attendance is sincere, one must wonder what type of future Air Force he envisions. To his credit, there are current problems, both institutional and sociological, that he correctly identifies and describes as contributing to falling membership in Air Force clubs. But to suggest a reversion to the "old-school" officer evaluation report and associated additional duty emphasis is flat wrong. To apply this "solution" solely to cure flagging club membership is even worse.

After years of suffering through inflation of duties not related to training for combat, most members eagerly embraced the new officer evaluation system. No longer were officers promoted based on achievements in nonmission-related areas. No longer could senior raters/supervisors coerce junior officers in the name of "career enhancement" to participate in nonmission-oriented social activities at the expense of their most important duty—training to excel in applying force to win wars.

If and when I get the chance to be on the pointy end of the sword, it'd better be with a wingman who is damn good at what he's trained to do, not the finest Boy Scout leader/Little League coach in the tri-state area! Community involvement and other "broadening" activities can be a "good thing," but not when mandated. Let's keep the proper perspective.

Capt David S. Leonard, USAF
Fort Lewis, Washington

IGNORANCE

I'm writing in response to the article in the Winter 1992 edition entitled "Ignorance Is Risk: The Big Lesson from Desert Storm Air Base Attacks."

The article—which implies that the B-52, F-111, Royal Air Force, and Royal Saudi Air Force crews who flew the opening night airfield attacks in Operation Desert Storm did not contribute significantly to protecting the lives of fellow coalition aircrews or to achieving coalition objectives—is an insult to the brave airmen who carried out these missions.

As a planner who worked directly for the Director for Campaign Plans (DCP) at Headquarters US Air Forces, Central Command (USCENTAF) Forward during Desert Storm, I can assure you that ignorance is indeed the theme of this article—ignorance of the facts of the Desert Storm campaign plan. Here are a few facts that may serve to clear up some of the misconceptions created by "Ignorance Is Risk":

- The example of Desert Storm air base attack inefficiency cited in the article is incorrect. It assumes that the objective of the first-night RAF Tornado/JP233 runway-denial attack was the permanent shutdown of enemy airfields—when in fact the objective was to limit the number of enemy takeoffs by impeding access to runways. The DCP's stated objective for attacking the seven key airfields that were well equipped enough or close enough to pose a threat to coalition forces on the first night of the war was to slow down enemy operations for 18–30 hours—and to preclude operations during the two- to three-hour periods when coalition attackers were most vulnerable. No mission was disrupted on the first night as a result of aircraft originating from these airfields.

- First-night attacks also successfully cut the enemy off from effective command and control—making independent, uncoordinated "islands" out of the so-called fortress airfields. As a result, we "metered the flow" of enemy takeoffs, feeding the enemy to coalition

continued on page 69

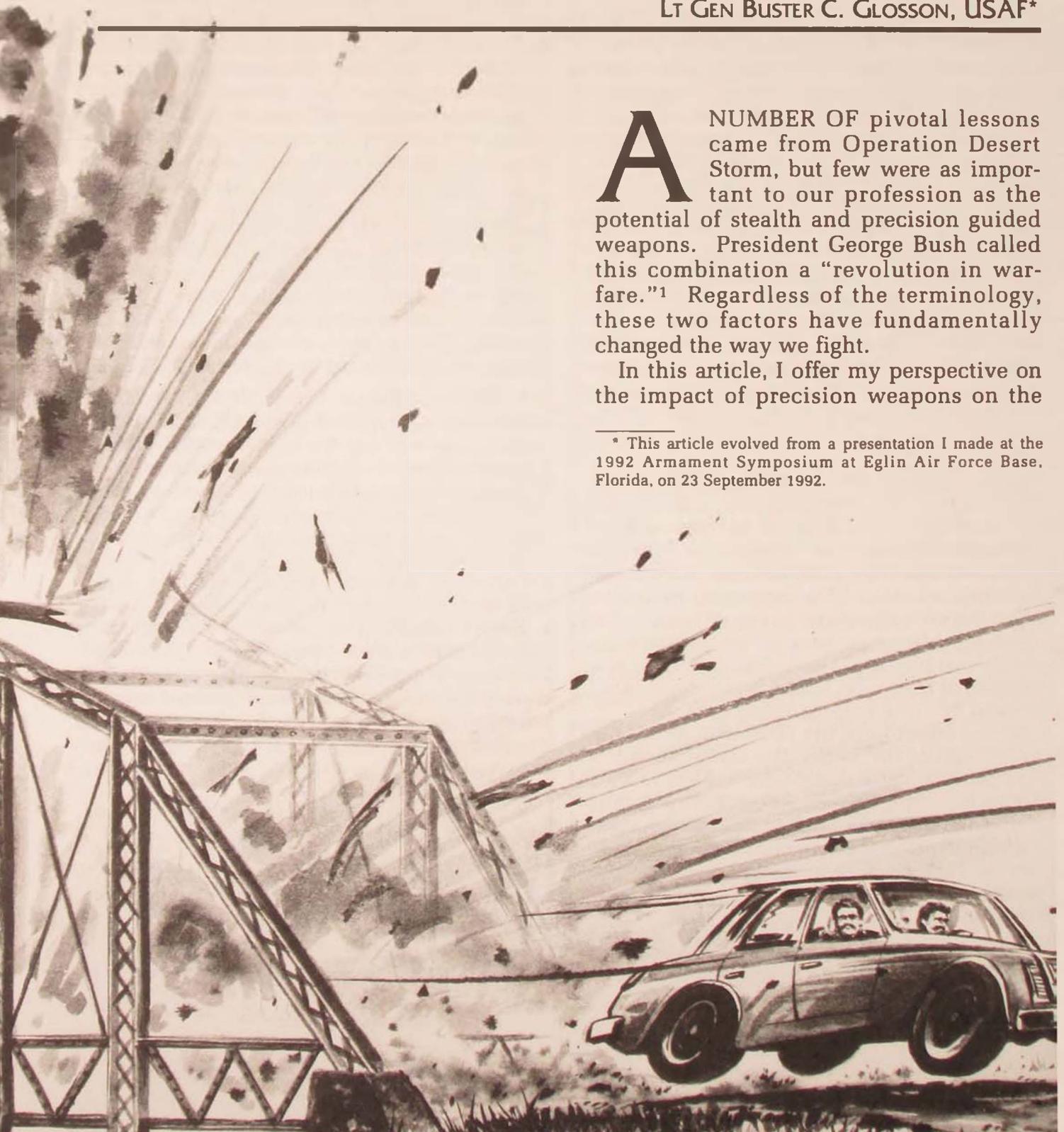
IMPACT OF PRECISION WEAPONS ON AIR COMBAT OPERATIONS

LT GEN BUSTER C. GLOSSON, USAF*

A NUMBER OF pivotal lessons came from Operation Desert Storm, but few were as important to our profession as the potential of stealth and precision guided weapons. President George Bush called this combination a "revolution in warfare."¹ Regardless of the terminology, these two factors have fundamentally changed the way we fight.

In this article, I offer my perspective on the impact of precision weapons on the

* This article evolved from a presentation I made at the 1992 Armament Symposium at Eglin Air Force Base, Florida, on 23 September 1992.



future of air combat operations and briefly discuss some other technologies that I believe will be critical to our success in the next conflict. Although stealth and precision weapons are not perfect, they maximize our combat capability by permitting us to hold any target in a country at risk while minimizing the costs—both in lives and dollars.

We are writing a new and exciting chapter on air power—a chapter made possible in part by precision guided munitions (PGM). Air power advocates have long dreamed of a day when the weapon, platform, and willingness to use them properly would come together to make air power a decisive force. Today, those dreams are reality. One need only look back to our raids on Schweinfurt, Germany, in World War II to see how dramatically precision weapons have enhanced our capabilities over the last 50 years. Two raids of 300 B-17 bombers could not achieve with 3,000 bombs what two F-117s can do with only four. Precision weapons have truly given a new meaning to the term *mass*.

To shut down an industry in World War II, we were forced to target entire complexes because of the inaccuracy of our weapons; today we would need to hit only a couple of key buildings. What we historically achieved with volume we now can accomplish with precision. After all, the objective has never been to see how many bombs we could drop, but to produce results.

Precision weapons may also constitute a revolution in mobility. Of the 85,000 tons of bombs used in the Gulf War, only 8,000

tons (less than 10 percent) were PGMs, yet they accounted for nearly 75 percent of the damage. If we had wanted to, we could have airlifted all of our PGMs with just five C-5s or nine C-141s a day.²

Along with increasing our combat capability, PGMs reduce the human costs of war. No one who has ever sent airmen into combat relishes the idea of their loitering over hostile territory dodging surface-to-air missiles or enemy airplanes in order to deliver their bombloads. Each Schweinfurt raid placed 3,000 airmen in harm's way. Today, we can do the same job with just two airmen. If that is not meaningful to you, then stop reading!

The fact is that few weapons deliver so much for so little. Everyone remembers the startling video of the GBU-27 as it guided in on the communications building in downtown Baghdad.³ At \$69,000 a copy, that bomb might seem expensive, but—compared to the multimillion-dollar telephone switching center it destroyed on the first night of Desert Storm and the disruption it caused the Iraqi high command—it was a real bargain. Tank plinking is another example. Expending a single 500-pound GBU-12 worth \$10,000 to destroy a \$1.5 million T-72 tank is not a bad return on our tax dollars.

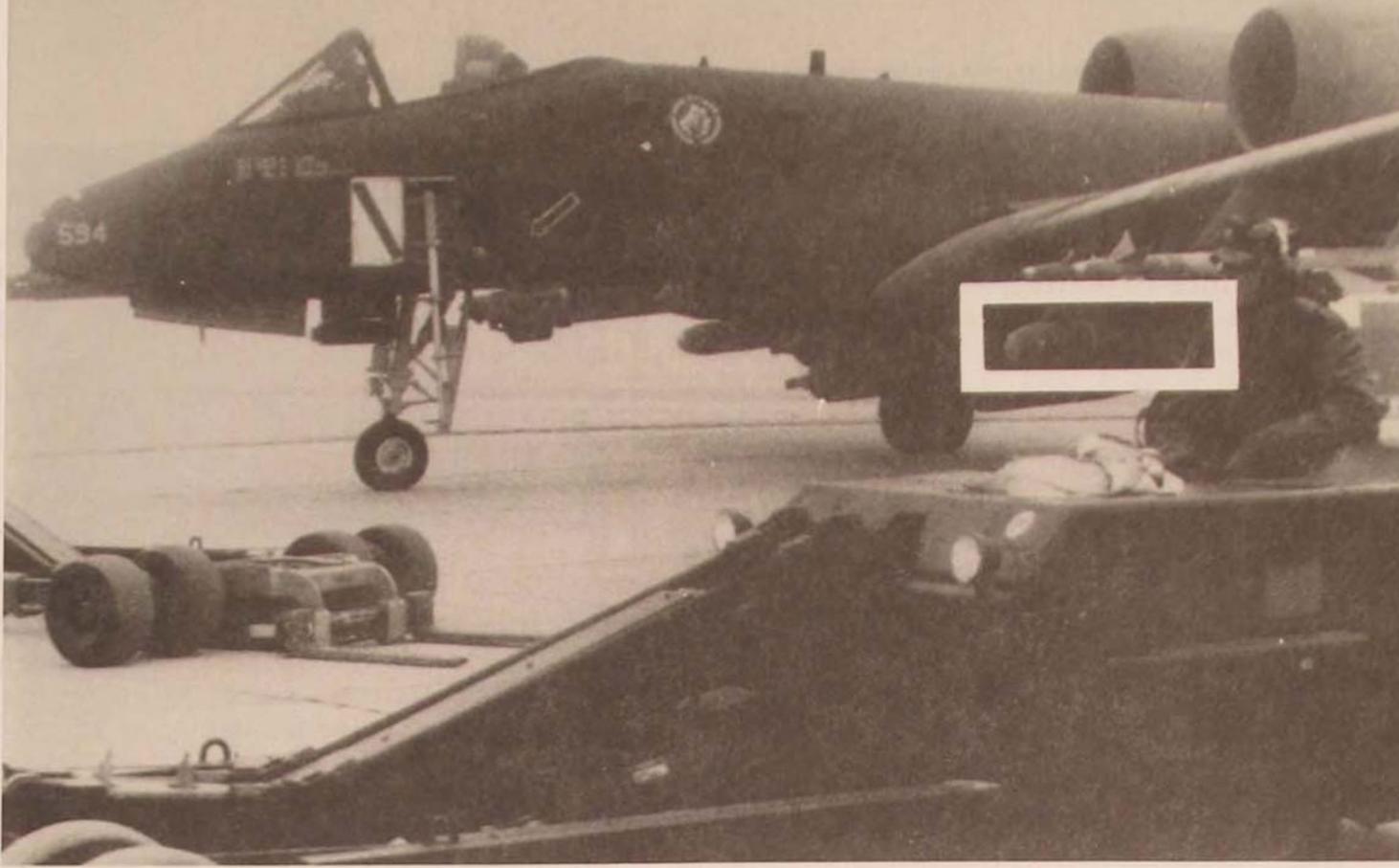
From my perspective, we have no higher priority than developing a hard-target penetrator and area-denial weapon that can be pickled at medium altitude in bad weather and strike a bridge, column of tanks on the move, or communications facility—all of which may be shrouded in fog. Further, our future PGMs must have a better probability of kill than the ones we have today. The Joint Direct Attack Munitions (JDAM) program is a step in the right direction. Its adverse weather capability and autonomous guidance system will allow a single B-2 to precisely destroy 16 separate targets on a single pass. The Joint StandOff Weapon (JSOW) is another accurate munition that promises devastating effects upon enemy armor in the field. Coupled with a Sensor Fuzed Weapon



The inaccuracy of World War II weapons meant that bombers had to fly multiple runs over industrial targets. Here, B-17s drop tons of bombs on a German electrostatic plant that produced hydrogen peroxide for explosives. Note the craters from previous attacks.

Although only 10 percent of the 90,000 tons of bombs used in the Gulf War were precision guided munitions, they accounted for 75 percent of the total damage. Below, members of a US Marine Corps bomb-dump crew spend their day assembling bombs in preparation for the aerial assault on Iraq.





Ready for tank plinking, an A-10 (top) stands uploaded and outfitted with a bevy of weapons, including two Maverick precision guided missiles (see box). These and other PGMs accounted for much of our success in the Gulf War, whether the target was an Iraqi tank (above left) or a key bridge (above right).

(SFW),⁴ JSOW could have stopped those two Iraqi Republican Guard armor divisions—the Hammurabi and Medinah—from bugging out prior to our ground forces making contact. As it was, poor weather and our lack of an all-weather PGM prevented coalition air forces from

destroying them. The fact that they survived proved to be particularly painful because Saddam later used these divisions in his bloody persecution of the Shiites.

Another compelling aspect of precision air warfare is its agreement with American values. Our country has developed a keen intolerance for casualties—even enemy casualties. The Gulf War served only to heighten this sensitivity. Incredible as it may seem, some critics have suggested that the US choose a form of warfare (other than aerial attack) that ensures

some measure of equality in losses.⁵ This idea is absurd, but it does indicate the sensitive nature of the casualty issue. Common sense tells us that any effort to reduce casualties—on either side—is a move in the right direction.



The Sensor Fuzed Weapon, ready to test-fire above, offers promise for the destruction of enemy armor. Results of testing appear below.



The option of strategically paralyzing an enemy with precision munitions (if that will get him to change his mind) is more appealing than the alternative—annihilating him. Sir Basil Henry Liddell Hart astutely observed some years ago that the enemy of today is the customer of tomorrow and often the ally of the future: “To inflict widespread and excessive destruction is to damage one’s own future prosperity, and, by sowing the seeds of revenge, to jeopardize one’s future security.”⁶ History has demonstrated that wholesale attacks on population centers do little to break the enemy’s will to resist. On the other hand, the surgical removal of an enemy’s most vital elements should make it easier for him to surrender. Secretary of Defense Les Aspin observed that air power was “the most significant factor in winning [the Gulf] war” and pointed out that “the mass and precision of the [air] attack induced systemic shock and paralysis from which the political and military leadership never recovered.”⁷

Intelligence is another area affected by precision weapons. You have probably heard someone say that air power is targeting and targeting is intelligence.⁸ This is more than a catchy phrase—it’s the truth. A bomb carried halfway around the world and precisely guided to the *wrong* target wastes time, resources, and perhaps even a human life—not to mention the impotent picture it presents to our adversary! Our weapons now have “air-shaft accuracy,” and so must our intelligence.

I believe that a window of opportunity has opened. Air power’s precision, lethality, and ability to paralyze an adversary is at an all-time high. Our future enemies must realize they are vulnerable anywhere, anytime. President Bush summarized it best when he said, “Gulf Lesson One is the value of air power.”⁹

Of course, precision warfare is not possible without first controlling the air. As Gen Charles A. Horner succinctly observed, “Everything is possible if you



Civilian casualties of war, such as this Iraqi girl, produce an emotional impact that is acute and undeniable. Precision air warfare plays a part in reducing casualties on both sides.

have air superiority—little is possible if you lose it.”¹⁰ The F-22 aircraft, equipped with the advanced medium-range air-to-air missile (AMRAAM) and improved infrared missiles, will be key to achieving air superiority far into the future. We are often pulled in many directions for our time and money, but we must remember that failure to gain and maintain aerospace control jeopardizes everything else.

If history is any indication, there will be future operations in which air power alone can accomplish our nation's objectives. There will also be conflicts in which air power will have to pave the way for a land campaign. But I cannot imagine a future conflict in which air power will not be a major factor in achieving our national objectives.

Of course, with our capabilities of global reach and global power come new challenges and responsibilities. Air Force

Chief of Staff Gen Merrill A. McPeak warned us of complacency and challenged us to rid ourselves of two-dimensional thinking, an admonition that official Air Force doctrine has taken to heart: “If military power (including aerospace power) is to reach its full potential, all aspects of warfare must be reexamined from the aerial or three dimensional perspective.”¹¹

Aerospace control with precision weapons gives us a war-winning strategy for the future. Only air power can threaten every enemy's leadership, infrastructure, military, and national will on day one of the conflict. Any way you cut it, we will need smart airplanes with smart weapons to meet the challenges of the future. However, during this period of frenetic change, we would do well to remember King Solomon's counsel that “wisdom is more important than the weapons of war.”¹² He is right. People are always more important. All the so-called smart weapons in the world could not distinguish their own tail fins from the Pentagon if it were not for the smarter people who develop, build, maintain, and program them.

Outstanding Air Force people around the world helped our country win the last war, and with the support of our defense industry, they are already developing the weapons we will need to win the next one. □

Notes

1. George Bush, “Remarks at the United States Air Force Academy Commencement Ceremony in Colorado Springs, Colorado, 29 May 1991,” *Weekly Compilation of Presidential Documents* 27, no. 22 (3 June 1991): 685.

2. According to the Gulf War Air Power Survey Data Base, we used approximately 180 tons of precision munitions a day in Desert Storm. Our airlift capacity from the continental United States to Southwest Asia was 6,500 tons

a day. Nine C-141s (of the 234 available) a day could supply the daily PGM expenditures of Desert Storm. The bottom line is that we can rapidly deploy and easily sustain precision munitions.

3. GBU=guided bomb unit. The GBU-27 is a laser guided, 2,000-pound, hard-target penetrating weapon.

4. The SFW is a wide-area cluster munition consisting of 10 submunitions contained in a dispenser. Each submunition has four projectiles containing an infrared sensor, warhead, and associated electronics. Upon dispersion, each submunition orients and stabilizes. After reaching an optimum altitude—as determined by an onboard altimeter—the 40 projectiles disperse. Each projectile searches for targets with the onboard infrared sensor and—upon acquisition of a target vehicle—fires a self-forging, high-velocity slug at the target. USAF fact sheet, Air Force Materiel Command, Air Force Development Test Center, October 1992.

5. See Lawrence Freedman and Efraim Karsh, "How Kuwait Was Won: Strategy in the Gulf War," *International Security* 16, no. 2 (Fall 1991): 5–41. "The only factor that began to create pressure to get the land campaign underway

was unease in the West over the judgment, implicit in the massive air campaign, that any number of Iraqi deaths was worth the reduction of risk to coalition forces" (page 31).

6. Sir Basil Henry Liddell Hart, *Thoughts on War* (London: Faber and Faber Ltd., 1944), 42.

7. House Armed Services Committee, *Defense for a New Era: Lessons of the Persian Gulf War*, 102d Cong., 2d sess., 30 March 1992, 7.

8. See Air Force Pamphlet (AFP) 200-17, *An Introduction to Air Force Targeting*, 23 June 1989.

9. Bush, 685.

10. Lt Gen Charles A. Horner, commander, Ninth Air Force, briefing, subject: Reflections on Desert Storm: The Air Campaign, May 1991.

11. Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, March 1992, vol. 1,

15. As AFM 1-1 points out, airmindedness is not a doctrinal concept but a "mindset airmen should develop as they think through their form of military power and then apply to their profession of arms" (ibid.).

12. Eccles. 9:18.

AIR CAMPAIGN PLANNING

LT COL MARIS McCRABB, USAF

OPERATIONS POINTBLANK, Strangle (in both World War II and the Korean War), Rolling Thunder, and Desert Storm are examples of air campaigns that were planned and executed at the operational level of war. How were these campaigns planned? What processes did their air power planners use? Most important, what processes will air power planners use in the future? This article seeks to answer these questions by briefly outlin-

ing the air campaign planning process that is currently taught at the Joint Doctrine Air Campaign Course (JDACC; see sidebar on page 12).

Developing an air campaign is a five-stage process: (1) researching the combat environment, (2) determining the air objectives, (3) determining the air strategy, (4) analyzing centers of gravity, and (5) putting the campaign together. The process, however, does not require that one stage be complete before another



What's a JDACC?

THE JOINT Doctrine Air Campaign Course is a two-week offering in continuing professional military education, currently conducted seven times a year by Air University's Center for Aerospace Doctrine, Research, and Education (CADRE) at Maxwell Air Force Base, Alabama. Our goal is to hold 12 classes a year for a total of 600 students. JDACC is an "iron majors" course that deals with the "stubby pencil" aspects of air campaign planning that one encounters on the staffs of joint force air component commanders. We enroll captains through colonels from the operations, intelligence, logistics, and plans functions at unified, combined, and air component commands.

JDACC's curriculum is firmly grounded in doctrine—joint Air Force, Army, Navy, and Marine Corps, as well as space and special operations. Students use historical case studies to learn lessons and pitfalls from previous air campaigns. The heart of the course (approximately one-third of the total time) is faculty-led seminars in which students build an air campaign as members of a fictitious numbered air force staff. They produce an air campaign plan down to a straw-man master attack plan—a time-phased, prioritized list of targets, aircraft, and munitions that is the basis of an air tasking order. We emphasize process, not product.

begins. That is, although each stage builds upon previous stages, each one also overlaps and refines the process and products of the previous stage. Researching the combat environment, for example, goes on all the time. It's happening now throughout the world. It happens before the bullets start flying, and it goes on after the conflict is over. This iterative process, which has a cumulative effect, is executed parasequentially. That's a great term, but what does it mean? To find out, let's begin with the fundamentals before we address the five stages of the planning process.

Fundamentals and Foundations

What is a campaign plan? Joint Publication (Pub) 1-02, *Department of Defense Dictionary of Military and Associated Terms*, defines it as "a plan for a series of related military operations aimed to accomplish a common objective, normally within a given time and space."¹ I think that Joint Pub 1, *Joint Warfare of the US Armed Forces*, offers a more useful description:

Campaigns represent the art of linking battles and engagements in an *operational* design . . . oriented on the enemy's strategic and operational centers of gravity. . . . They serve as the unifying focus for our conduct of warfare. . . . Campaigns of the US Armed Forces are *joint* (emphases added).²

This definition adds three key concepts: campaigns reflect the *operational level of war*; they *orient on the enemy*; and they are *joint*.

Historically, campaign planning was done only in a crisis—with bullets already flying or about to. The new regional focus of the US armed services will make that impossible. Events may happen too quickly; areas benign for years may suddenly erupt; or areas usually remote to our normal interests may suddenly become our principal concern. All this adds up to uncertainty, and the best way of handling uncertainty is through preparedness—in forces, readiness, and planning. Additionally, campaign planning is the embodiment of the operational art; commanders at the operational level of war need to conduct planning continuously.

Some people may wonder whether campaign planning isn't just another name for crisis action procedures or deliberate planning. Yes and no. The latter two planning cycles affect and are affected by campaign planning. To a great extent, those two systems are concerned with planning for deployment and sustainability. Campaign planning, however, is

employment planning, which must come first. How can one know which type of force to deploy (and where and with which munitions, etc., etc.) without first knowing how one plans to use that force? By planning the campaign with as much detail as possible before conflict, one can identify and address the transportation and sustainability shortfalls. This brings up two related points.

On the one hand, the authors of draft publications such as Joint Pub 5-00.1, "Joint Campaign Planning," claim that there is only one campaign—the theater campaign—and that all others are major operations plans, which are subordinate to the theater campaign.³ On the other hand, Air Force publications such as the *JFACC* [joint force air component commander] *Primer* consider air campaigns part of the theater campaign.⁴ It's silly to debate over whether air operations are campaigns or major operations. The

important fact is that air campaigns/operations are an essential part of the theater campaign. Similar questions arise about counterair campaigns. Are they "separate" from the air campaign, or should they more accurately be called counterair operations? Does it really matter?

Second, recent history and common sense confirm the need for continuous campaign planning. During Operation Desert Shield, planners from US Central Command (CENTCOM) and US Air Forces, Central Command (CENTAF) were up to their ears in deployment/sustainability planning and were hard-pressed to do long-range campaign planning. Additionally, because many intelligence

Effective air campaign planning seeks to synchronize "supporting capabilities to achieve the highest levels of synergy among the forces against the enemy." This long line of damaged Iraqi equipment illustrates successful synergy in the Gulf War.



systems were not immediately available in-theater to support campaign planning, much had to be done in the continental United States. One last pitch. Campaign planning doesn't stop when the war starts. It is a continuous process that becomes more important once the bullets start flying. As objectives or strategies change—or if analyses of campaign execution so dictate—plans must be refined, refined, and refined again. It never stops.

Some people argue that campaign planning cannot occur before a crisis because planners must wait for the national command authorities to select a course of action.⁵ Balderdash! First, where does the commander in chief (CINC) get the information to make recommendations for a course of action? From planners, of course! So someone has started the campaign planning process. Second, I don't pretend that a peacetime campaign plan will contain the same level of detail that a wartime campaign plan will, nor will the peacetime plan necessarily be the one that is executed.

An operational-level campaign plan—any campaign plan—is an outline of broad concepts designed to achieve strategic objectives. It provides the basis for all other planning. For example, the CINC's broad guidance provides the basis for the JFACC's planning much as the JFACC's guidance provides the basis for the air campaign planner's efforts. In other words, we have centralized control and decentralized execution at both the macro and micro levels.

At all levels, the campaign plan must clearly articulate what constitutes success—the desired end state of the campaign⁶—and must clearly articulate the commander's vision and intent. Different doctrinal publications have multiple terms for this concept.⁷ To me it means, What does the boss—the CINC—want done? Two other key fundamentals for a campaign plan are that it orients on the enemy's centers of gravity (more on that below) and that it relays the commander's

ideas on how the campaign is going to flow (i.e., the phasing).

For the US armed forces, these fundamentals are built upon foundations which no other military in the world possesses.⁸ These are the capabilities we can exploit over our adversaries, whoever and wherever they may be. First is our capability to achieve air, sea, and space superiority. Second is our ability to project force anywhere in the world—an ability that Air Force people call “global reach.” Third is our capability to forcibly enter any theater, either through amphibious, airborne, or air assault. By *air assault*, I don't just mean the 101st Screaming Eagles. I also mean making things blow up at two o'clock in the morning without the enemy seeing or hearing about it until the last few seconds when a weapon comes whistling through the air. Air Force people call this “global power.” We have this capability because we have technology—particularly stealth and precision—that no one else on earth can match, and we have people with the fortitude to see the task through.

Additionally, the Air Force has two special capabilities. First, we can attack key enemy centers of gravity throughout the full breadth and depth of the theater and throughout the full spectrum of strategic, operational, and tactical levels of war. Second, we have the hardware (and are developing new hardware) that allows us to exploit the information differential that exists between us and our enemy. That is, we can win the information war. In essence, these fancy terms mean that we can see better, think faster, and react quicker than our foes.

Such capabilities give us the advantage in our campaign planning. We can exploit them through the concept of “force interactions,”⁹ which simply means that we can attack with our strength against the enemy's weakness and that we can protect ourselves against his strength. We do this by having the supported commander synchronize supporting capabili-



STUDENTS AIR CORPS TACTICAL SCHOOL CLASS OF 1937-38

ties to achieve the highest levels of synergy among forces arrayed against the enemy. These are fancy words, but what do they mean? They mean that we have a single boss who can use the strength of one force to complement the strength of another. For example, in World War II Gen Carl ("Tooney") Spaatz used Ultra (Allied signal intelligence on German secret messages) to find out when the Germans were sending resupply ships to North Africa. He then sent reconnaissance planes to pinpoint the ships and coordinated attacks from the air with Royal Navy submarines.¹⁰ The examples are endless. From Gen U. S. Grant and Rear Adm

The work of thinkers from the Air Corps Tactical School in the 1930s still serves us well. For example, the concept "country X as subject of air attack" by then-Capt Thomas D. White (inset and top row, fourth from the right) is a good tool to help organize thought on strategy.

David Porter coordinating their forces at Vicksburg, to the Marines forcing the Iraqis out of Kuwait City so fighter-bombers could chew them up on the highway of death, the idea is the same: If you use what you have in the smartest way possible, one plus one can really equal three.

All this boils down to what Air Force doctrine calls the "airman's operational

art."¹¹ First of all, there has to be a single air commander—an airman—responsible for integrating the employment of all aerospace forces. In a nutshell, a JFACC. Why? Because—like the commanders in special operations—the JFACC is unique among subordinate war fighters in having a theaterwide and campaign-long view. Involved from the first strategic deployment into a theater until the last GI goes home, the JFACC fights the entire width, depth, and height of the theater.

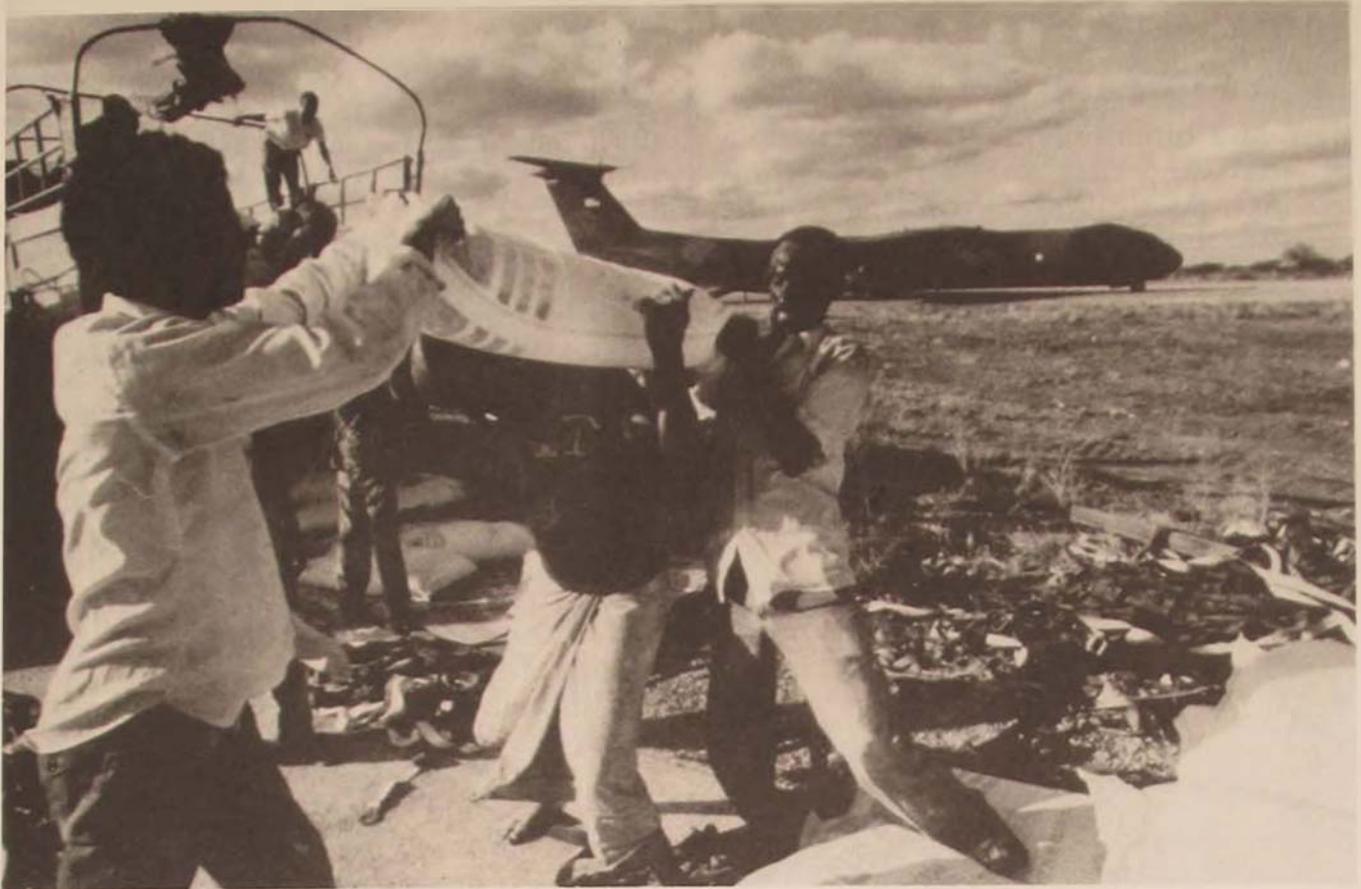
So how does the JFACC do this? By developing a concept of operations and orchestrating it not only among air forces, but also with land, sea, space, and special operations forces; by having the capability

The Berlin airlift below, was an apt example of Sir Basil Henry Liddell Hart's belief that "strategy is the art of distributing and applying military means to fulfill the ends of policy." Like all workable strategies, the one for this mission achieved the objective sought and applied to the situation at hand. However, strategy for the Somalian relief effort (opposite) may be less quantifiable.

to detect changes as they occur, the ability to rapidly decide how to react to those changes, and the systems to relay those decisions in a timely fashion; and finally by exploiting those fleeting opportunities whereby a proportionately small force—applied now—reaps large benefits later. All of this is embodied in the advice the JFACC gives to the CINC. What is that advice? It is called an air campaign plan.

One of the best examples of this art is presented in the discussion about creating dilemmas for the enemy in AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*.¹² There is more to modern combat than a simple examination of how air power can best support surface warfare. Each element—land, sea, and aerospace—wields certain advantages over an enemy at certain times in the campaign. Therefore, the JFACC must articulate how surface forces can optimize the effectiveness of air attacks through synchronized schemes of maneuver, just as surface commanders need to articulate





how air attacks can enhance their own attacks. Thus, an enemy who earnestly defends against air attack leaves himself more vulnerable to surface attack, and one who defends against surface attack leaves himself vulnerable to air attack.

A most important point to keep in mind is the fact that the air campaign (or plan for air operations) is a subset of the larger theater campaign. Depending upon the theater, the objectives sought, and the enemy disposition, aerospace power may be the single most important part of that theater campaign. Conversely, aerospace power may be the single most important supporting part of either the land or the maritime campaigns. Finally, the air campaign may be a relatively minor supporting part of the theater effort. Gen Colin Powell said that air power clearly got the game ball in Desert Storm but that, next time, the ball may be awarded to the ground forces or the sea forces.¹³ Recent history amply bears this out. Operation

Just Cause in Panama was a success because the ground forces went in and did a superb job. Aerospace forces got them there, provided needed support, and brought them out. In Liberia and Somalia, the Navy-Marine team responded decisively by quickly and safely extricating American citizens who were in jeopardy. All three operations were well-planned, smartly executed team efforts tailored to support an overall objective. With these fundamentals in mind, we can now consider the aforementioned five stages of planning the air campaign.

Stage One: Researching the Combat Environment

The combat environment is a broad concept with no clear boundaries. It entails knowing yourself, your enemy, and the theater in which you may be called to

fight. Research, therefore, goes on all the time. Too often, this research is limited to classic "intel" on enemy forces, disposition, and intentions. I think it is much broader than that, including weather, logistics, political-military affairs, history, culture, and so forth—everything from newspapers to novels.

A valuable consideration in the early stages of research is encapsulated in Col



Infrared night-vision devices are just one part of our strong night-fighting ability that helps us attack enemy vulnerabilities.

John A. Warden's discussion of air superiority in his book *The Air Campaign*.¹⁴ We clearly recognize the need to gain control of the air. We need to know whether any part of the theater is vulnerable to enemy air attack and whether we can attack the enemy's air forces. An excellent concept brought out by Colonel Warden is that "enemy air" means much more than just MiGs at 20,000 feet. It means production facilities, maintenance facilities, pilots, and the entire network of people and conditions which must coalesce before a MiG ever gets off the ground. All are potentially vulnerable to our attack.

Since air campaign planning is a continuous process which goes on during peacetime, the transition to war, and war itself, the need to document all aspects of the process seems obvious. But document what? Stacks of books, papers, and notes? An air tasking order? The answer is "all the above," depending on how close one is to having bullets flying through the skies. We have found two useful tools in our documentation efforts.

The first is the "air estimate of the situation" and the second is "country X as subject of air attack." The former is in appendix B of the *JFACC Primer*, and the second is from then-Capt Thomas D. White of the Air Corps Tactical School, who in the 1930s conducted a study on Japan as a subject of air attack.

Although these two items are merely tools, they are nevertheless important. First, they organize thought. The different subitems are by no means inclusive, but they do make it possible to consider important areas. Second, these tools allow you to document your work. "Country X" is specifically designed to assist in researching enemy centers of gravity, while the "air estimate" (my favorite) is more broadly based, in that it includes both friendly and enemy situations.

Stage Two: Determining the Air Objectives

The most important part of air campaign planning is determining the objectives. Period. So what are they? Sir Basil Henry Liddell Hart said that an "objective has a physical and geographical sense and thus confuses thought. It would be better to speak of 'the object' which, in war, is a better state of peace."¹⁵ Clausewitz, in a time-honored quote, says the objective is to "compel the enemy to do our will."¹⁶ Both of these statements are fine and good at strategic levels, but how does one tell

an F-117 driver to obtain a better state of peace or compel the enemy to do our will? My point is that these definitions of objectives are very abstract and, although appropriate at the strategic/national level, provide little guidance to an air campaign planner. My definition is that the objective is *what* you want to achieve. Thus, we must concentrate on determining air objectives, remembering that they must flow from the CINC's objectives (which flow from the national objectives).

Objectives have several key characteristics. First, they must be clear and concise. "Getting Iraq out of Kuwait" is clear and concise. "Resisting communist aggression," "conducting counterinsurgency," or "preserving the integrity of American commitments" (all official objectives in Vietnam from 1949 to 1973)¹⁷ are not clear and concise. Second, objectives must be applicable. "Deterring aggression" after the enemy has invaded your country probably won't hack it. Third, objectives must be attainable. Although some people may find it hard to accept, aerospace power does have its limits in terms of time, resources, or targets. For example, the US was not about to carpet bomb Panama City in an effort to get Manuel Noriega. Finally, objectives must be measurable. This doesn't necessarily mean quantifiable. It does mean you must have some way of knowing if you achieved what you set out to achieve. You must also have some way of knowing what you've done. That's battle damage assessment, and that's a big problem.

Stage Three: Determining the Air Strategy

No clear distinction exists between objectives and strategy. Each plays upon the other. To say that an objective is attainable implies some idea of a strategy. Liddell Hart observed that "strategy is the art of distributing and applying military means to fulfill the ends of policy."¹⁸

Clausewitz noted that "strategy is the use of engagements for the object of the war."¹⁹ I say that strategy is *how* you want to achieve the objective.

Like objectives, strategies have characteristics. First, strategy must achieve the objective sought. Second, strategy must apply to the situation at hand. This makes strategy more "enemy oriented" than are objectives. Expressed another way, if the objective is the end, strategy is the means (or concept) of accomplishing the end. Third, strategy (or the means or resources) must be achievable for the same reasons that objectives must be attainable.

The motivation for determining strategy is the same as the one for determining air objectives—the commander's intent. Strategy is best when it attacks the enemy's plans, when it applies our strengths to the enemy's weaknesses, and when it protects our weaknesses from enemy strengths. For example, some of the key elements unique to the US armed forces are our power projection capabilities and our ability to fight at night. You could combine these by using long-range bombers from the United States to send

Students at the Joint Doctrine Air Campaign Course at Maxwell AFB, Alabama, listen to lectures on joint and service-specific doctrine. They use this information in a seminar to build an air campaign as staff members of a fictitious numbered air force.



the enemy a calling card at two o'clock in the morning—just to let him know that we can do it and that there is little he can do to stop us. It could make him think about whether he really wants to continue his nasty ways. Strategic persuasion has gone out of style since Vietnam,²⁰ but I believe it still has utility. Perhaps it won't stop a determined aggressor, but it may stop a rabble-rouser. Heard much from Qadhafi recently?

Stage Four: Analyzing Centers of Gravity

Analyzing enemy and friendly centers of gravity is second in importance only to determining the air objectives. What are these centers of gravity? Clausewitz said that

one must keep the dominant characteristics of both belligerents [i.e., friendly and enemy] in mind. Out of these characteristics a certain center of gravity develops, the hub of all power and movement, on which everything depends. That is the point against which all our energies should be directed.²¹

The great difficulty is identifying what those characteristics are and which ones are most critical to the enemy. Determining the ones most critical to us is (normally) somewhat easier.

Two considerations are important in this type of analysis. First, we must be wary of being misled by ethnocentrism—of assuming that the enemy thinks like we do.²² For example, throughout US military history one theme plays out loud and clear: we substitute mechanical energy for human energy in order to minimize our casualties.²³ This is not true of every culture, however. During the Korean War, the fact that hundreds of thousands of weaponless North Korean and Chinese troops attacked UN positions shows us that some adversaries consider human life cheap and mechanical means dear.²⁴

Second, we should select centers of

gravity according to the effect that their destruction might have on the will of the enemy. Indeed, the will of the people is itself often considered a center of gravity, but that is too imprecise a concept for me. The will of the leader or the will of the ruling elites seems more plausible. We can argue whether the firebombings of German and Japanese cities or the nuclear attacks on Hiroshima and Nagasaki were aimed at the people or the leaders. The attacks on German cities devastated the people but not the leaders, who didn't capitulate until Soviet troops entered the outskirts of Berlin. Conversely, months of firebombing Japanese cities did not lead to surrender, but the nuclear attacks convinced the emperor that he could no longer accept the devastation of his people and their land. He quit.

Analyzing centers of gravity entails many theories. One is the industrial web (or fabric) theory, which was the basis of the plans for the Combined Bomber Offensive against Germany in World War II.²⁵ This held that modern industrialized nations were like houses of cards. By pulling one card out (or neutralizing one part of the web), one could cause the whole system to collapse.

Closely tied to the industrial web theory is the bottleneck theory, which underlay Operation Strangle in Italy and the transportation plan prior to the Normandy invasion in 1944.²⁶ This theory holds that neutralizing the enemy's key nodes will cause his entire system to back up and grind to a halt—similar to closing a bridge on an interstate highway.

Still another theory—my favorite—identifies enemy centers of gravity by having you place yourself inside the enemy's head and determine what's dear to him. You can do the same for yourself by asking what the enemy could deny you that would cause you the most trouble. The answer is a center of gravity, and you must defend it.

A convenient tool for analysis is the concept of five strategic rings, popularized

by Colonel Warden. Examining leadership, key production, infrastructure, population, and fielded military forces as means of inside-out warfare does in fact focus on the key considerations mentioned above. Further, one can divide each of these rings into key subsets for analysis. For example, leadership includes both military and civilian elements. Key production encompasses the manufacture of weapons of mass destruction (nuclear, biological, and chemical) as well as the production of traditional military hardware. Infrastructure includes much more than a modern industrialized nation's roads, bridges, pipelines, and so forth. Increasingly it includes the capability to process and disseminate information (e.g., computers, as well as fiber-optic, microwave, and space-based systems). As mentioned previously, one can affect the enemy population in a number of ways, whether by attacking power plants—as well as food, fuel, and water-distribution systems—or (most important) by conducting psychological operations. The results are twofold: (1) the enemy population feels the effect of the war and (2) the enemy population realizes that their leaders got them into the war and can get them out of it.²⁷ Some people may think that this approach is too “democratically ethnocentric” and that “bad guy” dictators don't really care what their populations think. Perhaps, but dictators do not rule by themselves. A support group of some description does the ruler's bidding. I call that the “ruling elite”—the ones we want the population to pressure.

One of the unique capabilities of aerospace power is its ability to strike any of these centers of gravity directly without having to take on the fifth ring—the enemy's fielded military forces. This doesn't mean we don't have to fight. It does mean that we need fight only that part of the enemy's military whose destruction would undermine the enemy's will to continue. That is why aerospace control is vitally important to us and why

we pursue it relentlessly—not as an end in itself but as a means to an end.

Stage Five: Putting the Campaign Together

Only after you have taken all the previous steps can you finally put together an air campaign. But this is not just a matter of mechanically building a master attack plan or an air tasking order. Majestic sounding objectives, broad strategies, and precise analyses of centers of gravity—all backed by the latest in decision-matrix technologies—don't mean anything if the first airman off the ground doesn't know where he or she is going, much less what to do.

First, the air campaign identifies targets, assigns priorities, and specifies the level and type of damage desired. Not all targets have to be destroyed, nor do they have to be physically attacked. If you can electronically cut a microwave signal, you may not have to knock down the antenna tower. The air campaign then identifies the weapon system for each job and outlines the phasing of events, the latter involving the classic tasks of apportionment and allocation. Let me emphasize that this is a bottom-up approach. You don't just pull figures from thin air (e.g., 30 percent for counterair, 30 percent for strategic attack, 20 percent for interdiction, and the rest for close air support). You first decide what has to be done and in what priority, and then you determine how those sortie figures translate into percentages (or priorities) by mission.

Conclusion

Campaign planning entails making choices. When you choose the proper objectives, keep in mind the critical link between national policies, theater goals, and operational air objectives. Choose the

strategy that best achieves the objectives and that applies your strengths to the enemy's weaknesses. Choosing the proper centers of gravity is perhaps the most challenging part of campaign planning. Keep the will of the leader at the forefront, and avoid ethnocentrism. Choose the right target, the right weapon system, and the right sequence of employment. Remember too that these choices aren't made in a vacuum. Because we fight our

campaigns jointly, we must plan them jointly. To insist that one key capability dominates all others is both myopic and dysfunctional to this process. Rather than argue over the decisiveness of air, ground, or sea forces, we should choose the smart way to meet the challenge. That done, we can fight the campaign with minimal loss of life and achieve our nation's objectives. All else is rubbish. □

Notes

1. Joint Publication (Pub) 1-02, *Department of Defense Dictionary of Military and Associated Terms*, 1 December 1989, 60.
2. Joint Pub 1, *Joint Warfare of the US Armed Forces*, 11 November 1991, 45.
3. Joint Pub 5-00.1, "Joint Campaign Planning," initial draft, June 1992, IV-10.
4. *JFACC Primer* (Washington, D.C.: Headquarters USAF/XO, August 1992), 16.
5. Joint Test Pub 5-0, "Doctrine for Planning Joint Operations," July 1991, II-13.
6. For an excellent discussion of the pitfalls associated with an ill-defined end state, see John T. Fishel, *Liberation, Occupation and Rescue: War Termination and Desert Storm* (Carlisle Barracks, Pa.: US Army War College, 31 August 1992), 1-9.
7. For example, see Joint Test Pub 5-0, II-13 through 14.
8. See Joint Pub 1, 54-57.
9. *Ibid.*, 58-61.
10. Richard G. Davis, *Tempering the Blade* (Washington, D.C.: Office of Air Force History, 1989), 86-91.
11. Essay N, "Employing Aerospace Forces: The Operational Art," and Essay U, "Airmindedness: An Example," in AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*, vol. 2, March 1992, 125-34, 209-18.
12. Essay Q, "Air Interdiction and Close Air Support," in AFM 1-1, vol. 2, 164.
13. Maj Gen Jay W. Kelley, "A New Military Hallmark," *Policy Letter*, October 1992, 4.
14. Col John A. Warden III, *The Air Campaign: Planning for Combat* (Washington, D.C.: National Defense University Press, 1988), 20-24.

15. Sir Basil Henry Liddell Hart, *Strategy*, 2d ed. (New York: Penguin Publishing, 1991), 338.
16. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 75.
17. Col Harry G. Summers, Jr., *On Strategy: The Vietnam War in Context* (Carlisle Barracks, Pa.: US Army War College, April 1981), 59-66.
18. Liddell Hart, 321.
19. Clausewitz, 128.
20. Earl H. Tilford, Jr., *Setup: What the Air Force Did in Vietnam and Why* (Maxwell AFB, Ala.: Air University Press, June 1991), 90-95.
21. Clausewitz, 595-96.
22. Warden, 58-59.
23. Russell F. Weigley, *The American Way of War: A History of United States Military Strategy and Policy* (New York: Macmillan, 1973), xxii.
24. T. R. Fehrenbach, *This Kind of War* (New York: Macmillan, 1963), 198-216.
25. Maj Gen Haywood S. Hansell, Jr., *The Air Plan That Defeated Hitler* (Atlanta: Higgins-McArthur, 1972), 43-48. See also Col Ed Crowder, "Pointblank: A Study in Strategic and National Security Decision Making," *Airpower Journal* 6, no. 1 (Spring 1992): 55-65.
26. David R. Mets, *Master of Airpower: General Carl A. Spaatz* (Novato, Calif.: Presidio Press, 1988), 199-213.
27. Maj Mark Clodfelter, "Of Demons, Storms, and Thunder: A Preliminary Look at Vietnam's Impact on the Persian Gulf Air Campaign," *Airpower Journal* 5, no. 4 (Winter 1991): 23.



Spring 1993

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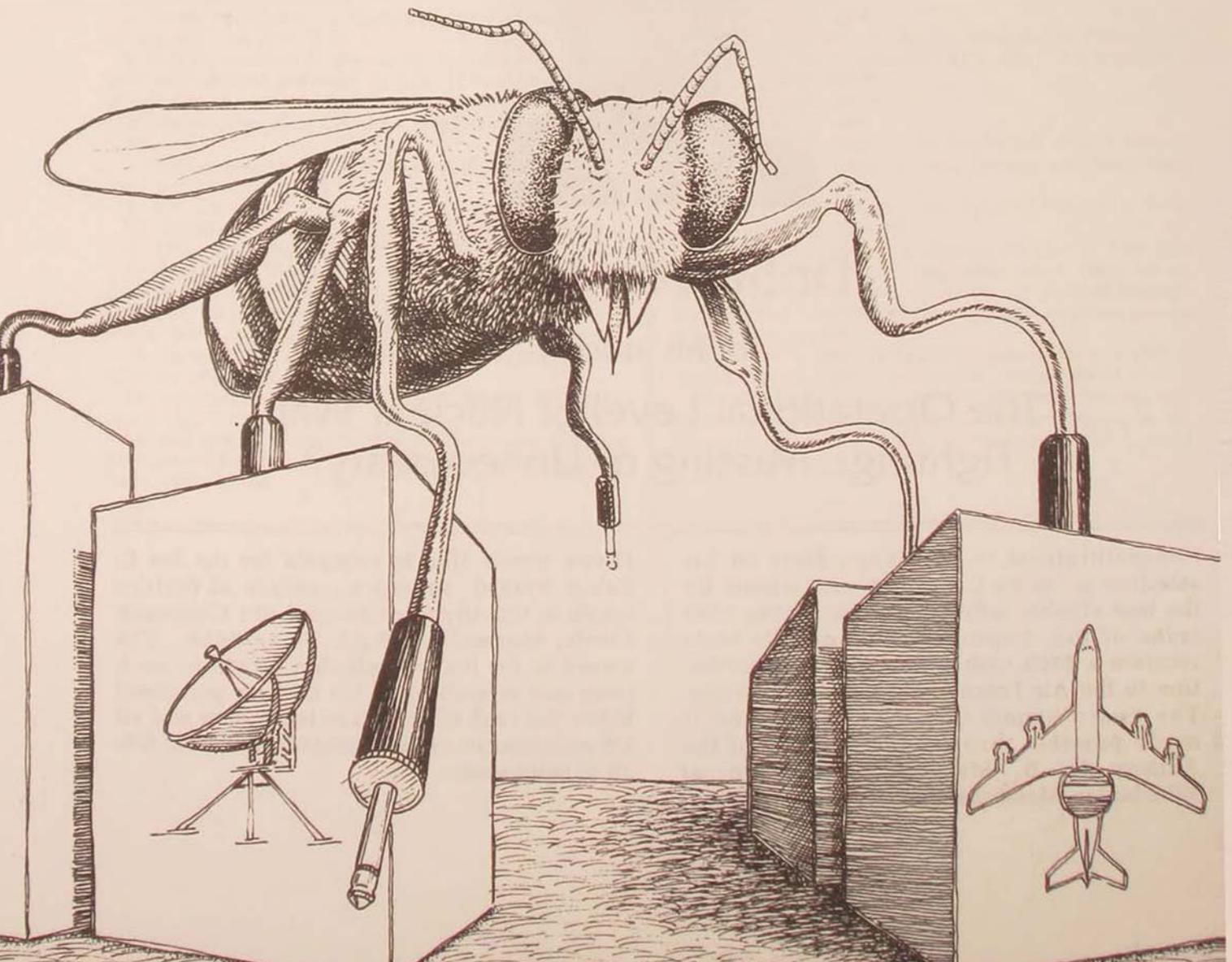
A NEW APPROACH TO COMMAND AND CONTROL THE CYBERNETIC DESIGN

1ST LT GARY A. VINCENT, USAF

cybernetics—The science of communication and control theory that is concerned esp. with the comparative study of automatic control systems (as the nervous system and brain and mechanical-electrical communication systems)

—*Webster's Ninth New Collegiate Dictionary*

CONTRARY TO the science fiction imagery, “cybernetics” is not the science of constructing machines that superficially look like humans. Cybernetics and the related field of systems engineering were the harbingers of the “holistic” view of science. Holism (as opposed to reductionism) sees systems not as simple assemblages of



parts, but as sets of interrelationships. Classic examples of holistic systems are ant and bee colonies. A reductionist would say a colony is a collection of different types of the same insect. This is obviously correct, but a colony is *not only* a collection of insects. On a higher level, a holistic level, the colony possesses an inherent complexity one might totally miss by just looking at the parts. Looking at a single ant or bee, one might say, "Not very big, not very smart, don't give it much of a chance."

Yet we all know the colony, composed of these tiny parts, is capable of engineering projects, collecting food, defending itself, and ensuring its reproduction. Call it "the whole is greater than the sum of its parts," or call it "synergy"; it is an expression of holism. Other examples are a computer program or a Beethoven symphony. We know a program is not just a collection of ones and zeroes and a symphony is not just a collection of musical notes.¹ We know the patterns are just as important as the parts.

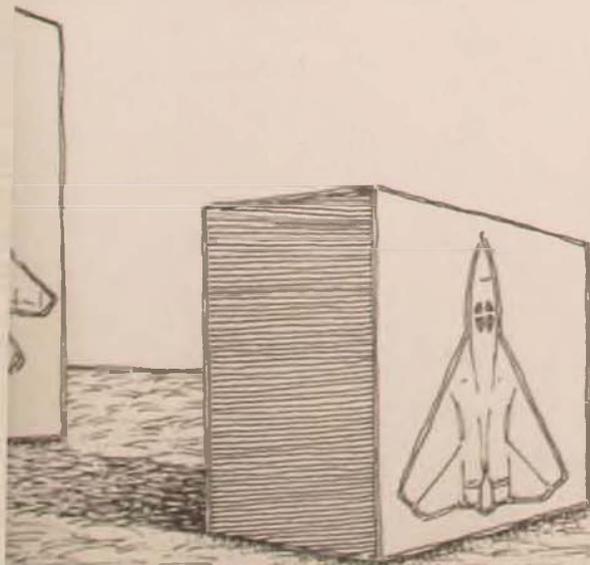
Yet, much of our thinking on command and control (C^2) is strictly reductionist. Every time a problem or a challenge crops up we seek to address it by looking at the parts. Develop a new weapon system here, establish a new linkage there, move this part of the command chain over there. Always thinking about parts and not patterns. It may be of more benefit to look at how the *entire* C^2 network fits together.

The two major challenges confronting C^2 —survivability and speed—will not find their solutions only in better parts. Improving the parts with technology will not give us what we want. The solution will use technology, but it will focus on the pattern. What follows is a look at the pattern of C^2 . We call it the cybernetic design because of the original cybernetic emphasis on control systems. Additionally, the system's main attributes are human intuition and initiative and the technologies of lightweight computing and communications. So perhaps it is a matter of combining human and machine, but in a manner in which the human is the core and the machine is the tool.

Dilemma

If a theater combat force can be thought of as a biological organism, then C^2 is its nervous system. It allows the theater headquarters, the force's brain, to control and monitor the rest of its far-flung body. If one were to diagram all the C^2 connections in a given theater, from headquarters all the way down to the smallest unit, it is striking how much the resulting diagram resembles a map of the central nervous system. The result is similar if one compares a logistics network with the layout of blood vessels in the body.²

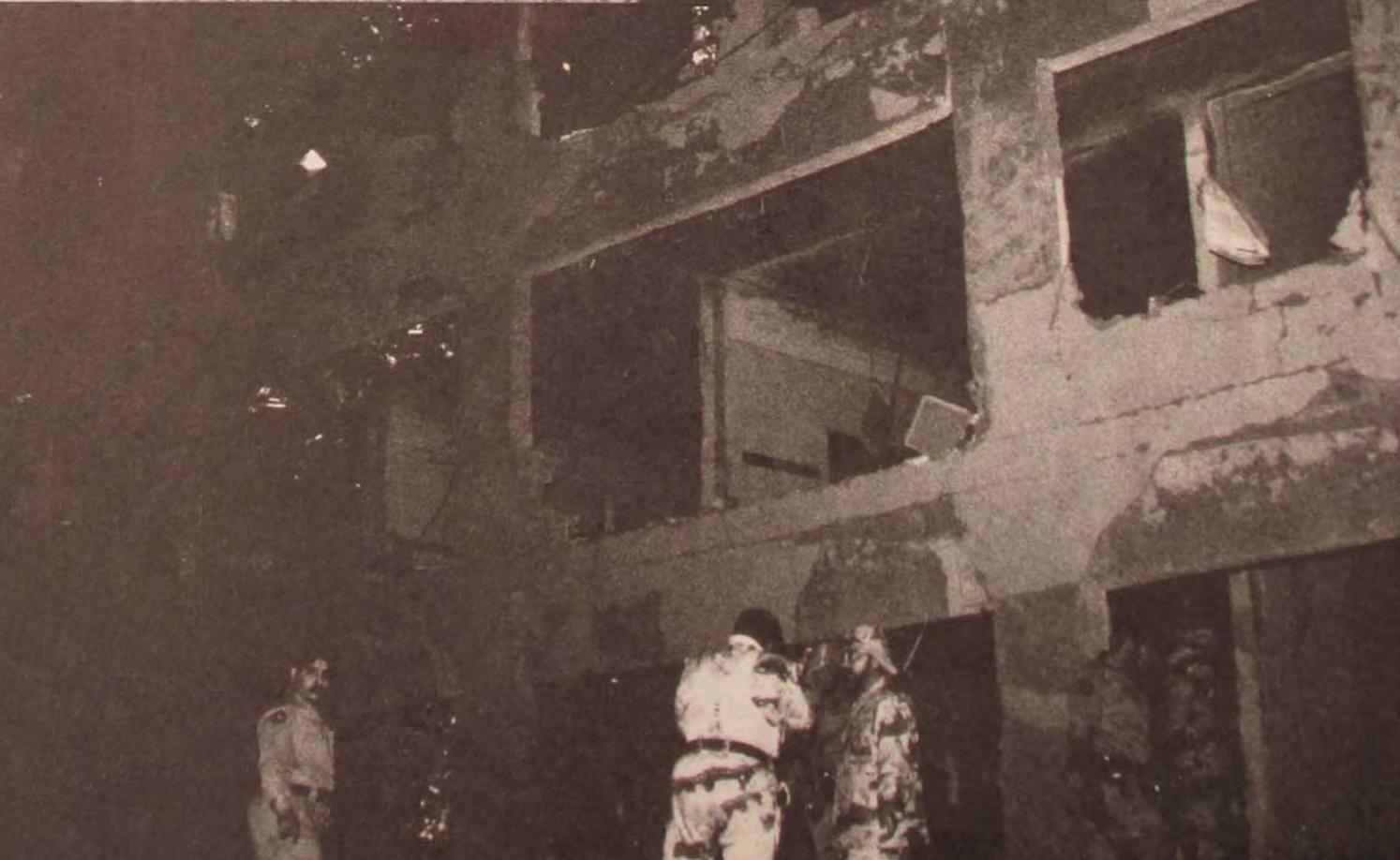
However, this layout has two major problems. First, the fact that this force is in the field means it is not simply trying to get along in its day-to-day environment but that another intelligent organism—another military force—is out there trying to do it harm. The layout of nerve pathways that looks so exquisite on paper can be very vulnerable to destruction in the real world. This destruction usually comes from the skies.



The brain itself is usually well protected and hard to destroy, but many other links in the system can be severed, leaving the brain and other parts of its body out of touch for extended periods of time. While the pathways try to reestablish themselves, the smart enemy is no doubt trying to do more permanent damage. The only military forces that seem naturally resistant to this threat are guerrilla forces, whose C² systems are notably simpler and

more robust. Furthermore, their usual doctrine of strategic defense and tactical offense is easier to execute in a decentralized manner. According to Mao Tse-tung, "matters of general policy should be centralized in the higher levels, while actual operations should be carried out in the light of the specific circumstances by the lower levels, which should have the right of independent action."³ However, large-scale guerrilla operations, even strategi-

A major challenge to C² systems is the need to detect and destroy ever-increasing numbers of small, mobile, and highly destructive weapons. At left, members of an explosive ordnance disposal team recover the remains of a Scud missile found 39 kilometers northwest of Riyadh, Saudi Arabia. Although this particular missile caused little damage, the Scud missile that exploded over the Iraqi elementary school (below) was more destructive.



cally successful ones like the 1968 Tet offensive, have proven to be operational disasters. Mao acknowledged that in order to eject foreign invaders from their homes, guerrillas would have to eventually transform themselves into conventional-type forces. He noted, "It is imperative to get both the commanders and the fighters to realize the necessity of raising the guerrilla units to the level of the regular forces."⁴

The second problem is the very body this brain is trying to control. The body has changed in a drastic fashion over the years. In Napoleonic times, the whole was composed of men on foot, men on horses, men with artillery, and men who supplied food and ammo for the other men. Compare this to the myriad systems that are on the ground, in the air, and in space over a battle area today. Yet the basic C² overseeing forces in both eras has remained largely the same. Some would argue that this only results from the timelessness of military principles. Some, this author included, strongly disagree. In the area of sensors, it is as if various nerve endings all over the body could suddenly provide the same amount of data provided by the eyes or the ears. Would the human nervous system be swamped trying to correlate it all? In the case of humans, the question is moot because the human develops over time as a whole organism. But in the case of the man-made military organism, these sensors have been grafted onto a C² system that has remained largely stagnant. The torrent of data now produced often ends up bottlenecked in one C² node or another, not being processed in a timely enough manner to be useful.

The Gulf War highlighted the competing needs for security and speed in C² systems. The vulnerability of C² systems to destruction by air power was demonstrated by the highly centralized Iraqi system. The mixture of Soviet and Western equipment and doctrine was blinded, then paralyzed, and then largely destroyed by coalition air attack.⁵ The

second major challenge is the need to detect and destroy ever-increasing numbers of small, mobile, and highly destructive weapons. The Scud threat during the Gulf War involved small and mobile—though thankfully not very destructive—missiles. Newer weapons will likely possess all three attributes.

Our Gulf War C² system was structured around a dual-track target engagement system. The overall air headquarters was the tactical air control center (TACC)—the name has recently been changed to the air operations center (AOC). Within the TACC, a combat plans branch was responsible for designing fixed targets and publishing the air tasking order (ATO). Combat operations oversaw the execution of the ATO and handled engagement of mobile or fleeting targets by diverting aircraft from their ATO missions. It further delegated some of these tasks to the airborne battlefield command and control center (ABCCC) and other platforms.⁶

For problems demanding particular attention, "cells" were created in the TACC with representatives in both combat plans and combat operations. The "Scud Cell" was one of them. It was given authority to divert aircraft and retarget missions.⁷ It created new procedures to deal with the threat (such as detailing F-15Es and other aircraft to work directly with the E-8 joint surveillance target attack radar system [JSTARS]).⁸ There were numerous resources involved in a wide-ranging campaign, and yet the entire effort was a limited success and a problem that is still being worked on today. Why?

The reason so many Scuds escaped destruction is a matter of some dispute. Col Allen Doman, the director of combat operations during the war, maintains that it was conflicting, inaccurate, and often untimely data that caused most of the problems. While one sensor would put a Scud launch site at one location, another sensor or intelligence source would place it somewhere else, and some data would be false altogether. In addition, each sen-

sor had a limited degree of accuracy, often not enough to guide an aircraft to acquire the target.⁹

While the above reasons are undoubtedly true, this author believes that the same problems would have existed even if the sensor accuracy problem was resolved. Our present C² system is structured very well to engage targets within hours of detection, and that is fine in the case of large troop formations, but the Scud launcher and its associated vehicles are able to move within *minutes* after the launch. Our present system for passing ground target information is largely voice driven, and information often must be relayed from one platform to another before it reaches the pilot.

Every time a person must relay data by voice and every time someone must make a decision about what to do with it means precious seconds that add up to the minutes that allow the launcher to move to another location. Once the launcher begins to move, the search area must widen exponentially, and any original sensor error now becomes irrelevant. Furthermore, because the same data is not available to the pilot in the air as on the ground, he must attack a target in an area he may not be fully briefed on.

Is it realistic to expect detection, engagement, and destruction of distant targets within a matter of minutes? The Soviets certainly thought so. They had devoted much thought to tying sensors directly to precision weapons in what they called "reconnaissance-strike complexes." These complexes "would use high-speed communications and number-crunching computers to speedily connect new electronic sensors with long-range, highly accurate weapons to allow speedy destruction of enemy targets within minutes of their detection."¹⁰ Since we were always far ahead of the Soviets in both sensor and computer technology, it stands to reason that we have a much better chance of destroying targets within minutes than they ever did. However, to do

so we need to rethink our way of doing business.

First Steps

The need to alter our present C² system has not been lost on others. Writing on the Iraqi failure, one defense magazine suggested, among other things, that "a nation under attack must develop an integrated air defense network and keep it operating. Key elements in this effort would be a double or triple redundancy in all air defense systems."¹¹ However, the error of this method soon becomes apparent. The use of multiple redundant systems violates the traditional principles of mass and economy of force.¹² While it is normal to have a reserve, it is not advisable to use only one-third of your assets at any given time. Put another way, what nation can afford to build two or three times the air defense assets it normally needs? Additionally, this type of redundancy only throws good resources after bad. What difference would it have made in the Gulf War if Iraq had possessed three of the same air defense systems? The coalition would simply have destroyed one after the other, and the war would have lasted perhaps an additional week or two. Clearly, redundancy of our present system is like possessing three successive Maginot lines.

Another approach was offered by John R. Boyd in *A Discourse on Winning and Losing*. In a section titled "Organic Design for Command and Control," Boyd proposed "a command and control system, whose secret lies in what's unstated or not communicated to one another (in an explicit sense)—in order to exploit lower-level initiative yet realize higher-level intent, thereby diminish friction and compress time, hence gain both quickness and security."¹³ The Boyd system relied on implicit trust and small unit initiative. Boyd rejected high-technology sensors and centralization, procuring "more and

better" of everything, and noted that "this way of thinking emphasizes hardware as the solution."¹⁴ This rejection of high-tech sensors and communications was championed by others, notably James Fallows in *National Defense*. He claimed that the growth of many C² systems "undermines the very qualities of leadership and initiative that are essential to success on the battlefield, since officers must operate in time of crisis with a commander looking over their shoulder from miles away."¹⁵ With the benefit of hindsight, we can see that high-technology sensors were vital to coalition success in the Gulf War. Boyd and Fallows were misguided in their criticism. The problem is not the sensor but how the system handles the information it generates.

The Boyd design is incomplete because it creates a quick-reacting force, but one that reacts on limited information. Given the range and lethality of modern weapons, even tactical commanders must be interested in things far beyond the range of their eyesight. Nevertheless, the ideas of small unit initiative and implicit trust are important first steps. Boyd wanted to create an "organic" C² system, but clearly computers and sensors are also important to military success. Therefore, the preferred model would incorporate Boyd's ideas with the benefit of newer technologies and be not "organic," but "cybernetic."

Cybernetic Solution: The Massively Parallel Design

A C² system is basically a system for processing information. Subordinates send situation reports up, and superiors send orders and information down (although frontline commanders frequently complain that the information sent down is incomplete or not timely). A computer is also basically a system for

processing information. Because of this similarity, and because so much of our C² system depends on computers, it may benefit us to examine the state of the art in computer architecture.

To achieve higher processing speeds, computers perform many operations at once, or in parallel. There are three techniques for parallel operations: pipelining, functional parallelism, and data parallelism. According to a prominent computer-design expert, "the technique of pipelining is applied in most modern computers. For example, one stage of the pipeline may be preparing the data, while another is performing an addition, while another is storing the previous result. Some computers have dozens of operations 'in the pipe' simultaneously."¹⁶ Note the similarity to information pipelines in our present C² system. A variation on pipelining is functional parallelism, in which the computer uses a separate processor to perform specialized tasks. For example, many computers have a dedicated processor to speed up math operations.

However, the newest supercomputers use data parallelism, or the massively parallel design. By contrast, this design devotes all of its assets to similar operations at the same time. "For example, a massively parallel computer may have sixty-four thousand processors that can add together sixty-four thousand numbers in one step . . . not all the numbers need be identical as long as the operations being performed are similar."¹⁷ Instead of having a large central processor and central memory, a massively parallel computer has many small processors and a distributed memory that work collectively on the assigned task. Because of these differences, "a conventional computer takes twice as much time to process twice as much data. A massively parallel computer can often process twice as much data in the same amount of time by applying twice as many processors."¹⁸

Computer science lessons aside, how do

we draw the analogy between the massively parallel design and military C²? We start with a simple definition. The military equivalent of a computer processor is the "basic action unit" (for the sake of brevity we shall hereafter call it the BAU). Without being too facetious, we simply define the BAU as the unit level at which "things get done." In the Navy, the BAU is easily identifiable as an individual ship. It possesses a strong unity of command and an ability to observe, maneuver, and fire independently. In the Air Force, it may be a four-ship formation of F-15s, a single F-117, or a single E-3. In the Army and the Marine Corps, things get more blurry, but the infantry company and the artillery battery are good examples of BAUs. It is perhaps no coincidence that the commanders of BAUs from all the different services are called "captains." Each BAU is located on a sliding scale from being only an information provider (sensor) to being only an information user (shooter). The E-3 is almost exclusively an information provider while an artillery battery is almost exclusively an information user. The E-3 may see many potential targets but has no way of engaging them, while the artillery battery can only engage targets provided by other sources. The ship and the infantry company fall somewhere in between these two extremes. The point of C², then, is to get information as rapidly as possible from the providers to the users.

This massively parallel analogy ultimately leads to the eventual elimination of units that serve only as conduits of information between sensors and shooters. As incredulous as it may seem, this means removing all intermediate levels of control between the theater component commander and the BAUs. This is not to say that the Air Force wing or the Army brigade would cease to exist, for they would still be needed for training, logistics, and maintenance purposes. In the traditional C² pyramid, these intermediate units serve only as pipelines to funnel

information up and orders down. This places a limit on how fast the system can operate, and in a wartime setting provides critical nodes where the system can be cut.

Doubtless to many, the elimination of intermediate control conjures up the image of an aimless, unruly armed mob. This is certainly not the intent, and this is where modern technology and small unit initiative provide the solution. Communications is simply the technical means to achieve control, and control is simply the structural means to achieve command. Remember, the ultimate goal is command—to translate the overall commander's will into reality. The achievement of this goal requires coherence, which traditionally is done explicitly by telling subordinate units exactly what to do. In the traditional system (fig. 1), subordinate units send reports up to the command unit. The command unit then pieces these reports together to create an inexact model of the "true" situation (the actual truth may be known only to historians or not at all). The command unit then makes decisions and issues orders based on the model. However, only the command unit has access to the entire model. The command unit issues only the letter of its orders and not the spirit of its intent. When a BAU finds that its orders do not seem appropriate to its view of the rapidly changing situation, confusion can result.

In the massively parallel design (fig. 2), we combine Boyd's ideal of implicit C² with the possibilities afforded by modern lightweight computers, even though they might at first seem incompatible. In this system, each BAU has direct access to the situation model. This is achieved by linking all the units together in a single data net. The ongoing contribution of all BAUs creates a constantly updated model of the battlefield, where a user can zoom in or out of areas of interest. In this system, the command unit does not issue explicit orders but instead identifies mission objectives and a focus of main effort (in

the German's blitzkrieg, this was called the *Schwerpunkt*).¹⁹ The BAU commanders can then access the battlefield model and pull out the information they need to accomplish their objectives. The BAUs are given wide latitude in conducting their mission. Coherence is achieved because all the units share a common doctrine, a common goal, and a common view of the situation. In this case:

Common Doctrine + Common Goal
+ Common View = Common Solution

Granted, each BAU may not do exactly as the command unit would have wished (do they ever?), but on the average the result will be the same and will be achieved much faster. Instead of waiting for exact orders to funnel through intermediate units, each BAU will access its mission order against the common model and act accordingly. The C² principle for this system is not "centralized control—decentralized execution" but instead, "centralized command—decentralized control and execution."²⁰

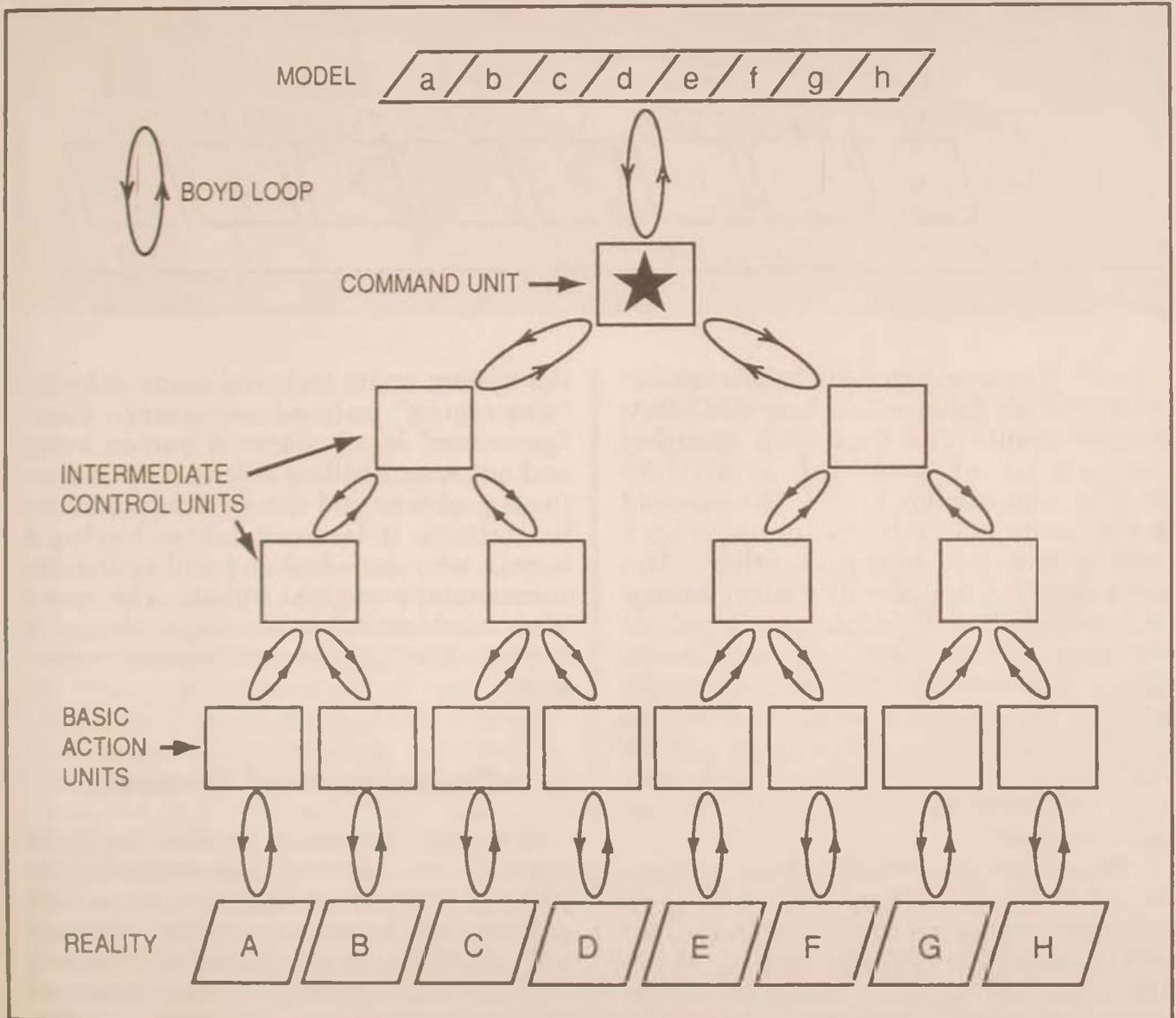


Figure 1. Present C² Systems

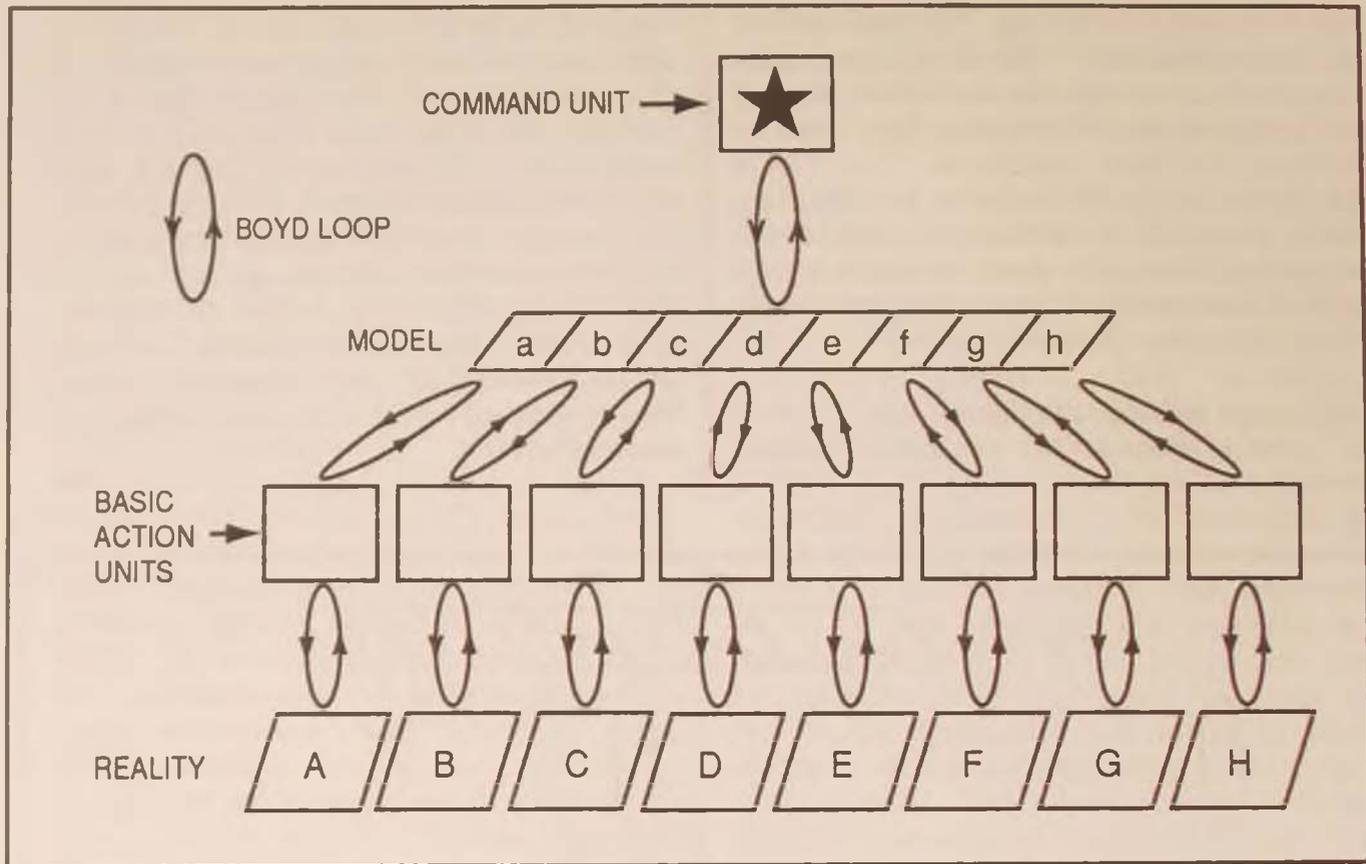


Figure 2. Massively Parallel Design

Boyd also originated the observation-orientation-decision-action loop (O-O-D-A, or Boyd loop). The Boyd loop describes the process of assessing a military situation and reacting to it.²¹ The pyramid model uses many Boyd loops, which overlap and feed into each other. The Boyd loop for the overall system cannot be completed until information goes all the way up the chain and back down again. The massively parallel (cybernetic) design creates Boyd loops that run in parallel and never overlap or run in sequence. Each loop is small and compact, minimizing the "friction" in the entire system.²²

The massively parallel design leaves day-to-day operations on a largely autonomous basis, with the command unit issuing explicit orders only by exception. Since this system is based on a computer design, the command unit is not a puppet master but a programmer. It sets

the system to its task and turns it loose, "debugging" only as necessary. Each "processor" is, of course, a human being and not some soulless silicon chip. Given the fog of war and the dynamic modern battlefield, it is much better having a human who can adapt and still realize the commander's original intent. The speed of a machine with the ingenuity of a human—this is what we mean by *cybernetic*.

Challenges and Rewards

While the massively parallel design is merely a case of using high technology to unleash lower-level initiative, some will nevertheless have reservations. We will next endeavor to answer some potential criticisms and point out some merits of this alternative design.

Many like Boyd and Fallows worry that



The overall headquarters for the Gulf War C² system was the tactical air control center (TACC). Above, Lt Gen Charles Homer receives his morning Desert Storm briefing in the TACC at Riyadh.

automation always leads to overcentralization and micromanagement. In the past, this was largely true because early computers were large and bulky and thus could only be kept at large central sites. Also, many times when an advance in communications comes along, its proponents try to sell it to the top military brass by showing them how it will keep them, not necessarily the soldier in the field, better informed. The advent of lightweight computers now means frontline commanders can get the information they need to make instant decisions instead of waiting for orders to trickle down from headquarters. Furthermore, even if the component commander wanted to micromanage the battle, the fruitlessness of it should become quickly apparent. The elimination of intermediate control units in the cybernetic system makes it nearly impossible for the sole command unit to micromanage all the BAUs.

Aside from the fear of what technology can do, there is the fear that technology cannot do enough. Some might question the ability to tie all these individual units together in one large real-time data network. Clearly, present links are inadequate. The standard links are tactical digital information links (TADIL). TADIL-A was designed for moving units (ships and aircraft), while TADIL-B was designed for stationary units (ground radar sites). These 1960s-era links have very slow data rates and both are patterned after hierarchy models of C² (TADIL-A uses a net control station that polls other stations for their data, and TADIL-B is a point-to-point link). Neither is jam resistant. The first second-generation link, the Joint

Tactical Information Distribution System (JTIDS), is in limited use now. Unfortunately, this system is presently used only in large C² platforms and merely replaces TADIL-A and TADIL-B, while the C² architecture remains the same. This is unfortunate because JTIDS was created from theories based on shared data networks and nodeless C².

JTIDS can trace its creation to Gordon Welchman, an engineer who arrived at his theories after studying the Germans in North Africa during World War II. What particularly impressed him was the C² network used by Field Marshal Erwin Rommel. The Germans were the first to install radios in all their tanks (something thought unnecessary or even heretical by other nations). Furthermore, instead of channelizing their radios so that units only talked to selected other units (like a wireless telephone), they set up common radio nets so many units could both transmit and receive. In this way, all the units could listen in on what was going on and call in when needed. This allowed wide latitude for lower-level commanders and allowed Rommel to command from virtually any point on the battlefield.²³

Welchman and the other engineers who created JTIDS envisioned this same netted approach using digital data and a display terminal instead of voice transmissions. JTIDS uses a large loop of individual time slots. Each participant is given a certain number of time slots to pass information (more for units like an E-3 and less for units like an F-15). There is no net control station like there is in TADIL-A, only a common clock to which everyone must be synchronized. When all the variables are plugged in, each data-link terminal knows when to spit out its information and simply listens the rest of the time. The idea was to give even the smallest unit access to the "big picture" and to eliminate vulnerable nodes in the C² system. Unfortunately, the limits of technology, budget, and Air Force-Navy rivalry problems in the seventies and eighties

scaled JTIDS back to its limited role today. As a result, JTIDS has become a target for critics like James Fallows, who singled it out in *National Defense*. What was originally envisioned as the harbinger of decentralized C² systems was simply viewed as another expensive tool of micromanagement.

However, JTIDS may yet fulfill its original intent. The latest version of JTIDS uses the class II terminal. Class II is small enough to be installed in fighter aircraft or land vehicles and uses a new "subnet" architecture. In addition to the main net (the large loop of time slots), there can be additional subnets devoted to particular users like F-14s or Army air defense batteries. With a proper layout, there can be a full exchange of data between nets and any "nodality" is minimized. In this way, class II allows many more users into the system.²⁴

Whatever becomes of JTIDS, it is important to remember that it is only an early generation data link based on late seventies and early eighties computer technology (think how far this technology has come in a decade). If done smartly, the next generation data link can place an inexpensive, lightweight terminal in any vehicle and in man-portable units. Right now there are hand-held global positioning system (GPS) units that allow users to pinpoint their location on the earth to within a few meters. Coupling the GPS and the data-link units would allow units to report their own positions, thus easing correlation of data and acting as a built-in identification, friend-or-foe (IFF) system, helping prevent friendly fire incidents. The Army has also found that such reporting would free up voice channels for more important messages, since its studies have shown over 40 percent are of the "Where are you?" type.²⁵

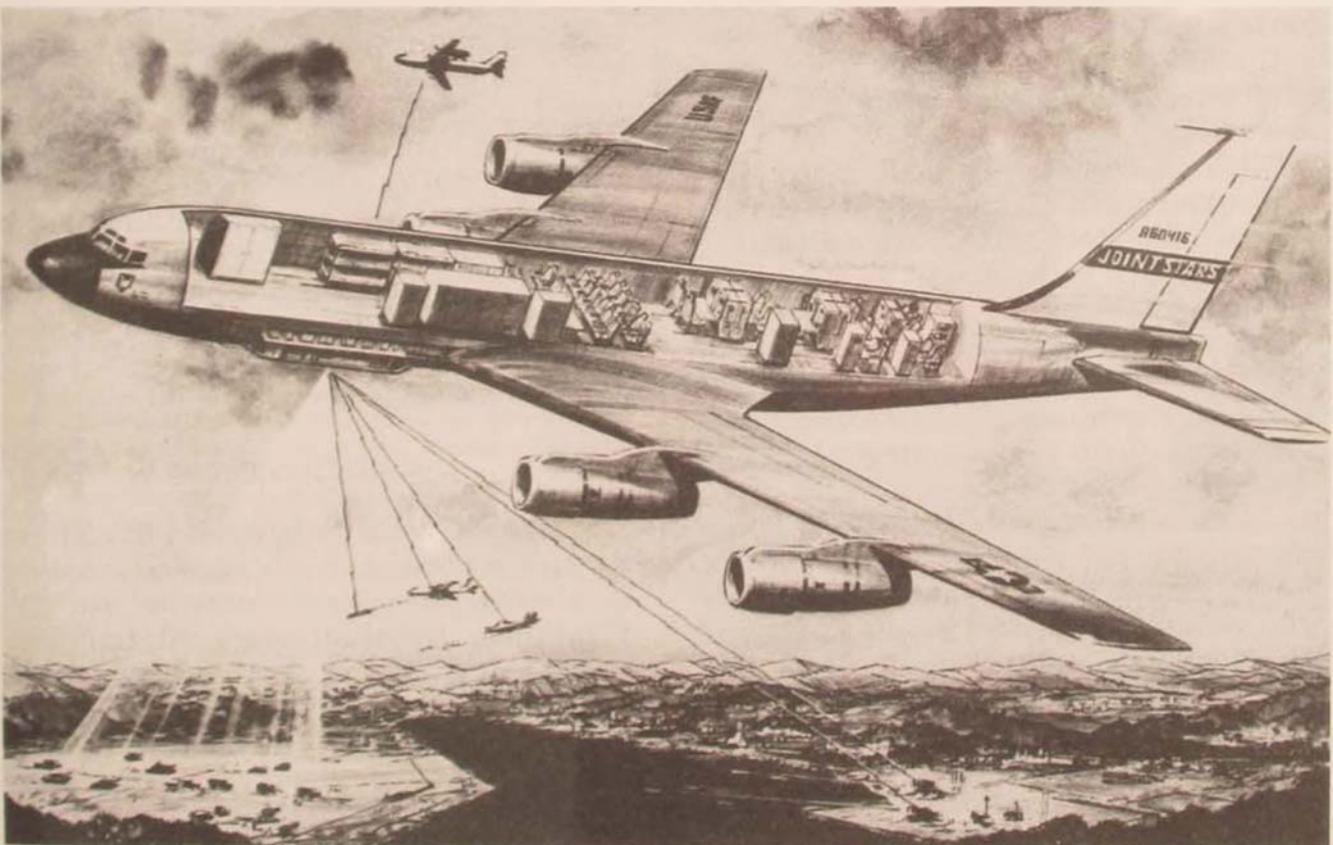
Some might be concerned that an enemy would be able to jam or exploit all the digital transmissions in a cybernetic C² system. Several considerations should allay these fears. First, these communica-

tions are no more susceptible to jamming than voice transmissions and pack a lot more information into a shorter amount of time. Second, modern links like JTIDS hop around to different frequencies to defeat jamming and to hamper eavesdropping and direction finding. Future links could use JTIDS techniques or various other approaches. They could use highly directional signals to up-link with communications satellites. Or they could use spread-spectrum techniques, which reduce transmissions to nearly the level of background noise, creating "stealthy" communications.²⁶ An opposite approach would simply be to have so many transmitters going that the combined signals would swamp any effort at sorting them out. In any case, encrypted signals would prevent the enemy from extracting any timely data from the net.

The challenges of implementing the cybernetic design vary from service to service. For the Navy, this would not be a radical departure from its present system.

The small number of BAUs, the traditional autonomy of a ship captain, and the Navy's leading role in data links would make their transition slight. For the Air Force, the change would be a substantial departure from the current design of central planning and tasking. Nevertheless, execution has always been decentralized. When planes are in the air, they are often on their own, so it only makes sense for the executors to have a greater hand in planning. In the interim, it would probably be necessary to retain certain units that are not true BAUs. Given the varying types of sensor information now available, some units would be needed for on-line massaging of the data into a single, coherent picture (*fusion* is the current buzzword). ABCCC is a natural candidate for

The TACC "Scud cell" in the Gulf War created new tactics to deal with the threat, one of which was the detailing of F-15Es and other aircraft to work with the joint surveillance target attack radar system (JSTARS), an artist's view of which appears below.



this role. Ground-based units like the Control and Reporting Center (CRC) are also candidates, although the CRC is still a BAU since it possesses a sensor. Again, these are deviations from the "pure" design but would be necessary for some time.

The greatest leap would be for the Army and the Marines. The large number of BAUs (and the even larger number of individual vehicles and personnel) usually requires a lot of coordination and hierarchy.²⁷ It would seem prudent for the Army to implement an intermediate system (for example, retaining division headquarters) before leaping straight into the cybernetic design. However, the Army would probably find that many of the things it uses to coordinate its forces—division and corps boundaries, for example—could be done away with. Also, adding units into an existing C² system would not require constant restructuring. In addition, many of the Army–Air Force coordination devices (such as the forward edge of the battle area, fire support coordination lines, missile engagement zones, and other things better suited to a static battlefield) can be done away with in the new design.

Other concerns apply to all the services. Well-trained and highly motivated personnel are mandatory for this system to work. Also, logistics systems will be strained to the limit by the furious pace of operations. These are both issues that demand careful attention.

In fact, regardless of whatever technical challenges there are, the biggest obstacle to the cybernetic design may be the mindset of those who would be left out by the new system. The problem is not those at the bottom of the pyramid, for it is they who would gain wider latitude to do their job and timely information to do it with. The problem is not the component commanders, who would have their will translated into reality sooner on the battlefield. The problem is obviously those in the middle of the pyramid, who would see

their combat command during time of war eliminated. They may not be satisfied with the task of properly training and equipping the BAUs to go into battle. They may point out the relative inexperience of many BAU commanders. This may be so, but the present pyramid design encourages leaders to move up as quickly as possible (equating "higher" with "better"), often before they have mastered their present job. The cybernetic design takes a different approach. Without everyone scrambling to get to the top of the pyramid, since it no longer exists, leaders would be encouraged to master their present jobs.

To some in the military, there may be a "need" for hierarchy, given its rank-conscious nature. They believe everyone must know where he or she stands in relation to everyone else. Perhaps this is so, although many would disagree. But it certainly need not be the case in C², where a clear mission and the information needed to perform it are much more important. The "need" for hierarchy is a value instilled in military personnel, and different values can be instilled if they are found more conducive to wartime success. The cybernetic system is not about people "doing their own thing." It assumes that with proper training and a common doctrine, the BAU commander will more often than not perform as the overall commander would have wanted him to.

Conclusion

The cybernetic design seeks to address the two major challenges now confronting C², the competing needs for speed and survivability. By eliminating intermediate control units and replacing them with a shared data network, both needs can be met simultaneously. The massively parallel nature of the design creates Boyd loops running in parallel and not in sequence or overlaps, thus minimizing the internal

"friction." The cybernetic design trades off a certain amount of set-piece precision for absolute speed. It is "fast-break" warfare. Not that a detailed air tasking order like Operation Desert Storm's could not be used, and its precision may be desirable in any opening strikes. But when things get fluid, that is when the cybernetic design outstrips its predecessors.

Elimination of intermediate units also eliminates the nodes, the vulnerable points in a C² system. These nodes are normally prime targets, whose destruction can lead to paralysis in an armed force. By weaving the C² structure into the very fiber of a military, the cybernetic design presents no such obvious targets. Trying to use smart weapons against this system is like trying to destroy a swarm of killer bees with a deer-hunting rifle. The only obvious target is the command unit. Since the command unit is usually very well protected, this is not a problem. Even if the command unit were attacked, the cybernetic system could function in a "leaderless" state for certain periods of time, particularly in defense. Defense is more like a reflex action, and like a body's reflexes, its execution cannot wait for the cognitive planning of the brain. Since

each BAU still has access to the battlefield model, the cybernetic system could continue to offer coherent resistance until the command unit reconstituted itself. With a common doctrine and a common view of the battle, it is quite possible that the system would possess a collective "conscience" and a sense of purpose even without a command unit.

Some final thoughts. The military is only now beginning to enter the information age. Science will produce more and better sensors, and these sensors will produce more and more data. A properly designed C² system can process all this data, and the resulting information edge will allow our shrinking military to outpace and outsmart possible opponents. If designed improperly, the information will only pile up in the hands of a few and not get to the many who need it. We can make technology a powerful tool or a heavy burden, and the concepts we discuss today will decide the issues for tomorrow. The cybernetic design may not be the only answer and may not be the answer at all, but it seems clear that the present system is pushing its inherent limits and that some alternative system is needed. □

Notes

1. These examples, and a more detailed explanation of holism, are found in Paul Davies, *God and the New Physics* (New York: Simon and Schuster, 1984), 60-63.

2. I offer this "biological analogy" without much argument here, but I do elaborate more in "In the Loop: Superiority in Command and Control," *Airpower Journal* 6, no. 2 (Summer 1992): 16.

3. Mao Tse-tung, *Selected Writings of Mao Tse-tung* (Peking: Foreign Language Press, 1963), 183.

4. *Ibid.*, 181.

5. John D. Morrocco, "War Will Reshape Doctrine, but Lessons Are Limited," *Aviation Week & Space Technology*, 22 April 1991, 43.

6. Interview with Col Allen M. Doman, USAF Air Warfare Center (USAFAWC)/CS, Eglin AFB, Florida, 11 February 1993. Colonel Doman was director of combat operations in the TACC during Desert Shield/Storm.

7. *Ibid.*

8. Morrocco, 43.

9. Doman interview.

10. Neil Munro, *The Quick and the Dead: Electronic*

Combat and Modern Warfare (New York: Saint Martin's Press, 1991), 187.

11. John D. Morrocco, "Flexibility of Attack Aircraft Crucial to Crushing Iraq's Military Machine," *Aviation Week & Space Technology*, 22 April 1991, 47.

12. Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, vol. 1, March 1992, 1. Mass is to "concentrate combat power at the decisive time and place," while economy of force is to "create usable mass by using minimum combat power on secondary objectives. Make the fullest use of all forces available."

13. John R. Boyd, *A Discourse on Winning and Losing* (Maxwell AFB, Ala.: Air University, 1987), 214.

14. *Ibid.*, 198.

15. James Fallows, *National Defense* (New York: Random House, 1981), 52.

16. W. Daniel Hillis, "What Is Massively Parallel Computing, and Why Is It Important?" *Daedalus: Journal of the American Academy of Arts and Sciences*, Winter 1992, 3-4.

17. *Ibid.*, 4.

18. *Ibid.*, 5.
19. Robert R. Leonhard, *The Art of Maneuver: Maneuver-Warfare Theory and Airland Battle* (Novato, Calif.: Presidio Press, 1991), 51.
20. AFM 1-1, vol. 2, 8.
21. For a further elaboration of the O-O-D-A loop, see "In the Loop," 17-18.
22. The original use of "friction" in the military sense is by Carl von Clausewitz, *On War*, ed. Anatol Rapaport (Middlesex, England: Penguin Books, 1968), 164-67.
23. C. Kenneth Allard, *Command, Control, and the Common Defense* (New Haven: Yale University Press, 1990), 206.
24. Interview with Capt Timothy M. DeRossett, USAF, JTIDS test project monitor, 727th Air Control Squadron (Test), Hurlburt Field, Fla., October 1992.
25. Bruce D. Nordwall, "Imagination Only Limit to Military. Commercial Applications for GPS," *Aviation Week & Space Technology*, 14 October 1991, 61.
26. "Stealthy Communications Coming," *Signal*, November 1991, 11.
27. Allard, 154-57. Allard notes that Gen Paul Gorman uses the term *movable subordinate entities* to describe the gamut of units, from squad to battalion on up, which must be controlled by an Army or Marine Corps general. Note that these "entities" are not necessarily the same as "BAUs," since they encompass units both larger and smaller than the BAU.

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TOWARDS A NEW AIRPOWER LEXICON OR INTERDICTION: AN IDEA WHOSE TIME HAS FINALLY GONE?

COL PHILLIP S. MEILINGER, USAF

NORMAL HUMAN discourse requires a standard language. Most professions, including the military, develop a specialized vocabulary or lexicon to simplify communication. A rich and diverse military language has developed over time, and although it sometimes lapses into jargon, this system of communication generally facilitates understanding within the military community. I contend, however, that our military vocabulary—based largely on a perspective of surface warfare that presupposes a major land battle—is becoming increasingly outdated. Certainly, we need not abandon our present lexicon; rather, we need to be “bilingual” so we can better understand our surface colleagues. This article, however, concerns itself with the concept of “air-mindedness” and the means by which we can foster it in our lexicon.

To some extent, we airmen are largely to blame for our outdated vocabulary. In



the first place, most air forces and their leaders—ours included—sprang from armies. The Air Corps, for example, was a combat branch of the US Army until 1947. Before that year, airmen wore the same uniform, attended the same professional schools, and competed on the same promotion lists as did infantry or artillery officers. At the same time, airmen voluntarily and deliberately adopted much of

the soldiers' lexicon—not only for obvious practical reasons, but also to establish their pedigree and legitimacy within the context of classic military thinkers and practitioners. The “principles of war” contained in the current version of Air Force Manual (AFM) 1-1, *Basic Aerospace Doctrine of the United States Air Force*, are obvious examples of this practice.¹ *Strategic bombing and air superiority,*

What Is Interdiction?

JOINT PUB 1-02, *Department of Defense Dictionary of Military and Associated Terms* (1 December 1989), defines *interdiction* as “an action to divert, disrupt, delay or destroy the enemy's surface military potential before it can be used effectively against friendly forces” (page 187). “Military potential” generally includes troops, equipment, supplies, and their means of transport. This definition is unsatisfactory because it is both too broad and too narrow; it confuses rather than clarifies; and it misstates and distorts the relationship between air and surface forces. It is time to rethink the term *interdiction* and to specify more precisely what it is and what it is not.

The current definition of interdiction is so broad it could logically include, for example, the slaughtering of all enemy males under the age of 13. After all, young boys who may someday be soldiers are certainly a “surface military potential,” and killing them would qualify as destroying them “before it can be used effectively against friendly forces.” This example is obviously ridiculous, but even more plausible examples tend to be confusing. Bombing shipyards that build naval cruisers and destroyers or striking armament factories in the very heart of an enemy country could fall under the current rubric of interdiction, even though airmen would consider these actions strategic bombing. (The distinction between strategic interdiction and strategic bombing is generally determined by the reason for striking the target. Attacking an armament factory in the enemy capital for the purpose of reducing military production capability would be strategic bombing, but attacking a rail yard in the capital to prevent the transportation of armaments to

fielded forces would usually be considered strategic interdiction.)

The current definition is also too narrow. Its requirement that action against targets must affect an enemy's *surface* military potential excludes, for example, the interception and downing of cargo aircraft en route to an area of operations. A transport plane carrying equipment and ammunition is certainly a lucrative target and falls within the framework of what one normally considers interdiction. However, because the present definition does not cover this situation, it is not included in Joint Pub 3-03, *Doctrine for Joint Interdiction Operations*. Thus, we have no guidance to tell us how such missions should be controlled and coordinated to complement the overall interdiction campaign. (Under the current air tasking order, I suspect that such sorties would be classified as offensive counterair.)

In the interest of clearing up such misconceptions, I propose the following definition for *interdiction*:

In the context of a campaign dominated or characterized by surface maneuver forces, interdiction is a military action to divert, disrupt, delay, or destroy the enemy's tactical forces, equipment, communications, or supplies while they are en route to the battle area.

This modification removes the ambiguity and vagueness of the current definition and better reflects how interdiction has been conducted and how it will likely be conducted. Unfortunately, not all our problems can be solved through such relatively simple and straightforward wordsmithing. Because the problem goes deeper, so must the solution.

newly coined terms unique to airpower,* were exceptions. In addition, Gen William ("Billy") Mitchell of the US Air Corps and Air Marshal Hugh Trenchard of the Royal Air Force consciously tried to make airmen realize that they were different from soldiers. Indeed, Trenchard even designed a new uniform and devised a new rank structure to distinguish his "aircraftmen" and "squadron leaders" from privates and majors.

In the main, however, airmen recognized the political utility in philosophically and epistemologically tying themselves to the surface forces. Unfortunately, over time we forgot *why* we had so pragmatically adopted the language of our brethren and assumed it was the only lexicon that was appropriate. We have thus forced ourselves to compete in the surface ballpark (the theater construct), using surface rules of play (AirLand Battle and "joint" doctrine) and having our effectiveness judged by surface umpires (the theater commanders in chief, all of whom are from the surface forces). An example of this dilemma is our understanding of the term *interdiction*. (See the sidebar for a discussion of this problem.)

The serious and underlying issue here concerns the terms, definitions, and concepts we use to describe the nature and conduct of modern war. Too much of our current military lexicon is based on the increasingly questionable premise that the object of war is to meet and destroy the enemy army, and that all other military operations are mere preparations for that "decisive" engagement. Indeed, Army

Field Manual (FM) 100-5, *Operations*, declares that "close operations bear the ultimate burden of victory or defeat."² Thus, we are instructed that air interdiction is designed essentially to soften the enemy surface force before it meets the friendly army. FM 100-5 fails to acknowledge that airpower itself—by destroying/disrupting the enemy force—may be the decisive instrument of battle. In a modern airwar this can indeed be the case, as was dramatically demonstrated by the Battle of Khafji during the Gulf War.

On the night of 29 January 1991, a battalion-sized element of the Iraqi army pushed into the deserted Saudi border town of Khafji. Coalition forces reacted

Gen ("Billy") Mitchell tried to make airmen realize that they were different from their colleagues in the other services. Although the Army decorated Mitchell for excellence in air combat, it refused to let his innovative ideas about air power take flight.

* Editor's note: In this article, the compound nouns *air power* and *air war* are spelled in the nonstandard solid styling (i.e., *airpower* and *airwar*) to add emphasis to the author's belief that words are powerful and that our lexicon should be open to new words that help develop air-mindedness. Actually, there are three kinds of compound words: open (air strike), solid (aircrew), and hyphenated (air-cooled). Understandably, trying to decide which styling to use for a particular compound can be confusing. To reduce this confusion, we normally use the spelling and styling found in the current editions of *Webster's New International Dictionary* and *Webster's New Collegiate Dictionary*. We have made an exception in this case to accommodate the author's purpose.



quickly and in a much publicized engagement pushed the Iraqis back across the border. Initially, however, this coalition victory also served Iraqi purposes. That is, Saddam Hussein's promise of a "mother of all battles" suggests that the Iraqi dictator desperately wanted a major, bloody land campaign. He knew there was no hope of challenging the coalition in the air but could not sit passively and watch his military dismembered by airpower. Believing he had learned the lessons of Vietnam, Saddam wished to start such a campaign because he did not think the United States could stomach a costly land war. Our refusal to fall into this trap, relying instead on a massive air campaign, left Saddam frustrated.

Evidently, the engagement at Khafji was an attempt to precipitate the land phase of the war, because on the next night Saddam amassed a corps-sized force north of Khafji to further entangle the coalition land forces. Instead, we called upon airpower: joint surveillance target attack radar systems (JSTARS) detected Iraqi forces and directed massive air strikes; B-52 bombers scattered armor-sensing mines; AV-8, A-6, and F/A-18 aircraft dropped cluster bomb units; AC-130 gun-

ships employed their multiple cannons; and F-15 and F-16 aircraft delivered precision guided munitions (PGM) and combined-effects munitions.³ In a matter of hours, the mauled Iraqi III Corps retreated, never even having made contact with our ground forces. Gen Charles A. ("Chuck") Horner, the coalition's joint force air component commander, stated that all 70 of the Iraqi T-72 tanks that headed south that night were destroyed.⁴ Khafji was the only major Iraqi ground assault of the war, and it was detected and then destroyed exclusively by airpower.

Some people were quick to consider the second night at Khafji a classic example of force interdiction. It was not. "Khafji II" was not interdiction because it was not an instance of destroying enemy potential before it could be used effectively against

Many terms in the Air Force lexicon suggest that the object of war is to meet and destroy the enemy army. Certainly, this is the intent of these US ground forces, who must contend with shells exploding around them in the vast desert as they prepare for combat in the Persian Gulf War. However, we must not lose sight of the fact that air power may be the decisive factor in war.



friendly forces. Because our airpower was the friendly force, Khafji II itself was the key engagement—not a preparation for it. In this instance, our lexicon caused confusion instead of promoting clarity.

Also surprising is the fact that many airmen today seldom use the term *strategic bombing* in reference to nonnuclear scenarios.⁵ For example, in NATO—traditionally the largest allied air combat command in peacetime—political constraints have made the planning of strategic air operations impossible. NATO guidance has called only for the defense of alliance boundaries and does not contemplate counterattacks into enemy territory. Indeed, message formats used in Europe, as well as the current air tasking order (ATO), do not even include strategic bombing as a mission category. As a result of this mind-set, the hundreds of strategic sorties flown by F-117s, F-15Es, F-111s, and so forth during Desert Storm—including air attacks on targets such as electrical power plants and nuclear research facilities in and around Baghdad—were listed on the ATO as air interdiction sorties.

Given the ever-increasing speed, range, precision, and effectiveness of airpower, one would be unwise to consider the devastating air campaign of Desert Storm as an aberration or an anomaly. Instead, joint force commanders should now be more inclined to view airpower as the weapon of choice that allows them to avoid a bloody land engagement.

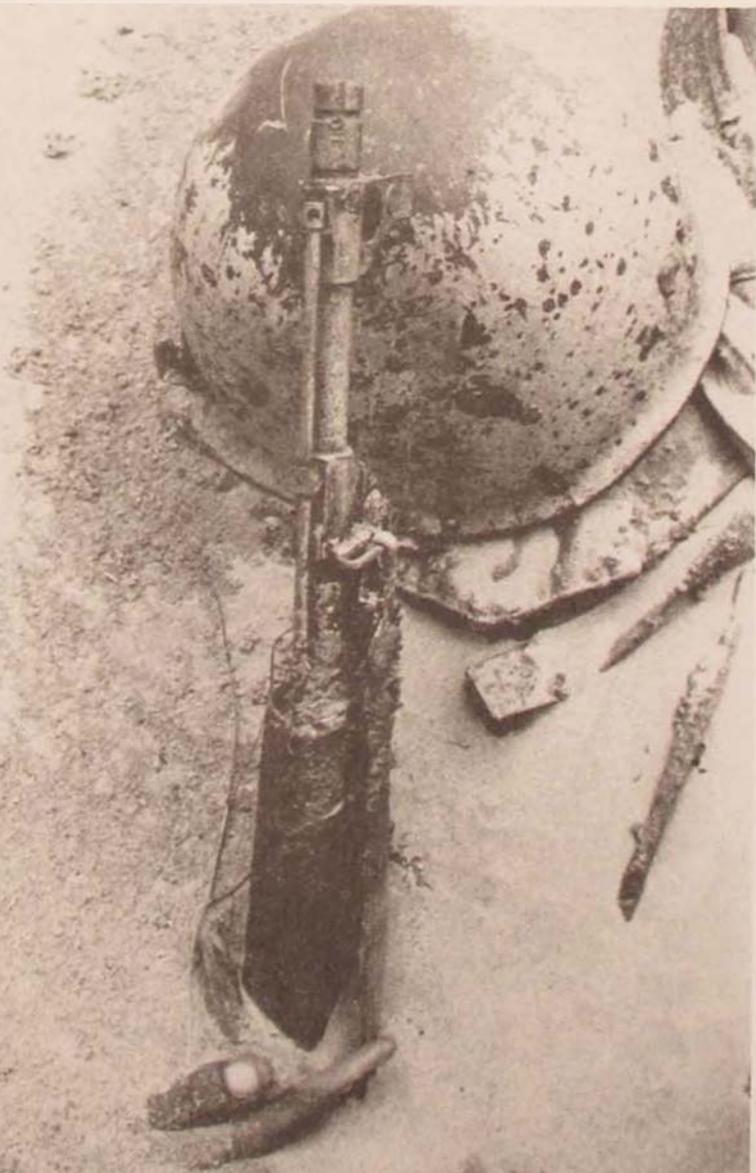
At one time the destruction of the main enemy army may have been a valid objective, but that time is rapidly passing. Not only is bypassing the enemy army possible, but American public opinion likely will demand that we do so in order to avoid casualties—on both sides. Given the magnitude of the forces involved, the low number of coalition deaths in the Gulf War was amazing. Since the public may expect these numbers to remain low, they could become a ceiling for casualties in future wars. This factor is of enormous

significance, and American military planners must henceforth take it into account. Moreover, a surprising outgrowth of the war is some people's belief that killing armed enemy soldiers—even those who have no intention of surrendering—constitutes an excessive use of force. The minor furor over the so-called highway of death and the incident in which a few Iraqi troops were buried alive during trench-breaching operations are cases in point.⁶

We can fume at such unrealistic and misguided calls for one-sided restraint in war, but these expressions of concern may indeed become political mandates in the years ahead. Major research on nonlethal weapons highlights this concern.⁷ Although it is foolish—indeed, dangerous—to believe that war can occur without violence and death, we must nonetheless begin thinking about how we could conduct just such a conflict. In short, there is no logical reason for continuing to believe that war can be decided only by the clash of surface forces. We may now view such an engagement only as a last resort—and a desperate one at that. As in Desert Storm, the ultimate objective should be victory without a land battle or, at the least, one that minimizes friendly casualties.

We also need to reassess the nine classic principles of war: objective, offensive, mass, economy of force, maneuver, unity of command, security, surprise, and simplicity.⁸ Some of these take on a special meaning for airpower, while others seem dated. For example, determining the objective is crucial in any conflict, but it is especially so in airwar because of the airplane's unique ability to strike strategic objectives and operate at the strategic level of war—the only decisive arena of conflict. Let me explain.

In a war between two countries, only the leaders—perhaps influenced by the population, an elected body, or military advisers—can make the ultimate determination of peace or war. This decision is generally based on the level of military



Coalition deaths in the Gulf War were few, and many Iraqi soldiers surrendered to American troops without a fight, as was the case above. Consequently, the American public may now demand that we bypass the enemy army in order to avoid casualties on both sides. Nevertheless, the lifeless fingers of a dead Republican Guard soldier, still clutching his AK-47 (left), remind us of the grim reality of war.

capability remaining (i.e., the number of troops, tanks, planes, ships, etc., that are left to fight), the industrial capacity required to maintain those forces, and the will of the people to continue the struggle. If the leadership finds any of these pillars weakening, it must reassess its chances of winning the war. A unique feature of airpower is its ability to operate routinely at this level of war and directly affect those three strategic pillars. A military, however, can only fight its surface forces in a series of tactical engagements—pitting force against force—and hope that an accumulation of victories will *position* these forces geographically and physically for operational (theater level) and then strategic activities. Alternatively, surface forces can hope that their tactical opera-

tions will have an indirect effect on the enemy's strategic centers of gravity.

Desert Storm clearly demonstrated how airpower has affected the traditional meaning of military objectives. The coalition air campaign thoroughly disrupted Iraq's command, control, and communications (C³) network, as well as the transportation infrastructure—two strategic centers of gravity. This drove the Iraqi military forces to autonomy (i.e., down to the tactical level), rendering them incapable of initiating a coordinated and cohesive response to coalition offensive actions. Thus, individual Iraqi engagements had little strategic purpose, whereas the thousands of operations carried out by the coalition had an overall cohesiveness. Strikes against civilian research facilities, electrical power plants, arms factories, air defense headquarters, and the like were all part of an air strategy to neutralize and paralyze Iraq.

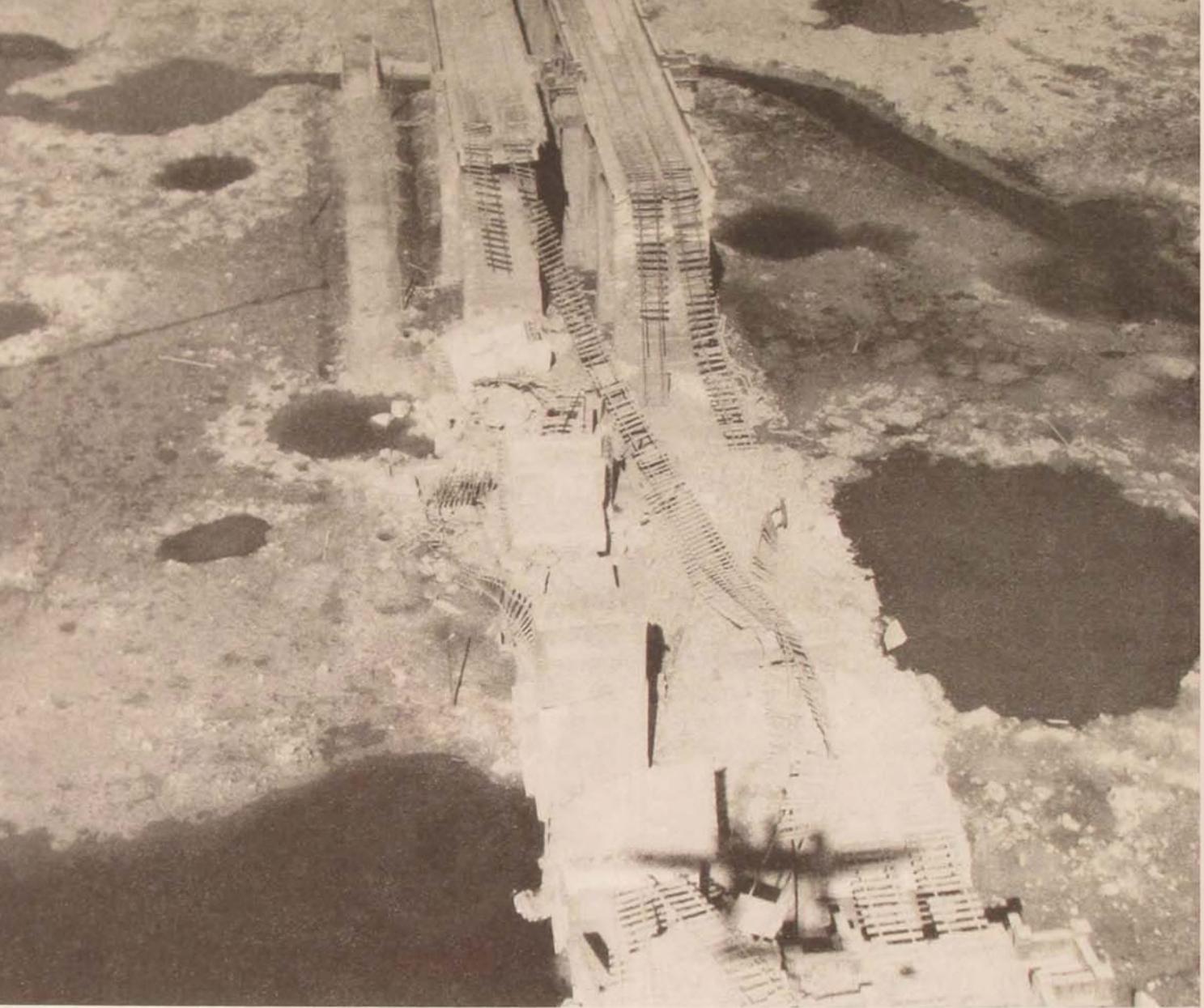
It is imperative to realize that our victory was not the result of an incompetent third world enemy simply disintegrating under the first application of pressure. On the contrary, Iraq had large, well-equipped, and seasoned forces who firmly established themselves in defensive positions (remember, they too had five months of unhindered preparation), fought on interior lines, and fought for what they considered to be their territory. Moreover, as our ground commanders noted, the Iraqi combat engineers were some of the finest in the world.⁹ In truth, even American air and ground forces could not have long succeeded at the tactical level devoid of guidance, reinforcement, and resupply, as were the Iraqi forces in the Kuwaiti theater of operations.

The Iraqis' dilemma teaches us that the goal of the air commander is to always operate at the strategic level of war, focusing on strategic objectives but at the same time forcing the enemy to fight only at the tactical level. (Obviously, aircraft on strategic missions operate at the tactical level. But I am concerned with the *effects*

of those missions. Destroying an enemy's air defense headquarters can have a strategic impact, but shooting down the aircraft that makes that attack generally has only tactical consequences.) In essence, airpower should maximize its unique ability to affect an enemy's strategic centers of gravity by striving to bypass the operational level of war whenever possible and by ignoring the tactical level—except in those rare instances when friendly surface forces are in extremis. The Air Force should adopt the type of strategic/tactical mismatch that airpower achieved in Desert Storm as its goal for future air campaigns.

Similarly, other principles of war are enhanced and made more important by air warfare. Theorists since Giulio Douhet have argued that the airplane is primarily an offensive—not defensive—weapon because of its speed, flexibility, and range. Moreover, the ability to strike hard and quickly allows airpower to exploit—more effectively than any other type of force—two other traditional principles of war: surprise and maneuver. Given these characteristics, we can achieve unity of command by seeing to it that airpower is controlled by an airman who understands its special qualities and knows how to employ them across the spectrum of conflict on a global scale.

Conversely, some principles of war are becoming increasingly inapt. Mass and concentration of force were once necessary to ensure that sufficient firepower or shock effect could be brought to bear on a decisive point. Consequently, air planners arranged the deployment and attack of numerous units in a single geographic locus. Today, however, precision munitions accurate to within a handful of meters and delivered by stealth aircraft turn the concepts of mass and concentration on their heads. Because PGMs carry their own mass, it is now more effective to *disperse* the aircraft that carry them. This allows us to strike several targets simultaneously and thereby shock and paralyze



Is it really interdiction? The current definition of this term is too broad since it could include many attacks that airmen consider strategic bombing. A Ninth Air Force P-38 photo plane casts a shadow as the crew members peruse damage to the Bielefeld-Herford railroad bridge in Germany after attacks by the US Eighth Air Force and the Royal Air Force in World War II.

an enemy across the entire breadth of his country. Such attacks, known as parallel operations, may well be the norm in future conflicts. In short, mass has lost its former importance because targets are no longer massive—and neither are the air weapons that can neutralize them.

Words are important. For too long the lexicon of war has stagnated. Terms applicable to the circumscribed realm of

two-dimensional surface conflict have been imposed upon three-dimensional airwar. This tendency is magnified because the Army's Training and Doctrine Command is so large and well organized that it tends to shape joint doctrine in a powerful way. Although interdiction is—in my view—a significant example of this situation (see the sidebar), others also exist. The penchant in some joint-doctrine publications for referring to *air strikes*, even at the strategic level, as *fires* is an obvious misnomer. In addition, *battlefield* should give way to *battle space*, *battle area*, or *battle zone* so as to more fully describe the medium(s) in which modern battles occur. Similarly, geographic constraints inherent in the *theater*

concept of war are outdated in a world where airpower's true theater is the entire globe. For decades our country has organized combatant unified commands based primarily on geographic regions. This construct may have had utility when hundreds of thousands of surface troops were stationed overseas and when several months were needed to transport reinforcements and equipment if a crisis erupted. But such organizations seem inappropriate to an air arm that can have the precision firepower of a B-1 or B-2 over any spot on earth in less than a day, especially when forward deployments will be increasingly unlikely in the years ahead.

Because airmen are seldom accused of being thinkers, it is debatable whether our lack of conceptual thought on airpower has caused problems with our lexicon (or vice versa). In either event, we must rethink our positions on the role of airpower in modern war, for Desert Storm suggests that a new world situation has

combined with new technologies to usher in a new era of warfare. As we have seen, our traditional understanding of interdiction is becoming increasingly outmoded. It is time to revisit some basic premises and realize that future battles in the conventional realm will likely be fast-paced, fluid, and deadly. The dominance of maneuver and firepower means that airpower will at times support surface forces. But because of airpower's superior speed and firepower, surface forces will at other times support the dominant air effort by seizing and holding airfields, suppressing enemy air defenses, or making the enemy vulnerable to air attack by flushing him from prepared positions.¹⁰ We need to consider whether or not our current conception of interdiction is obsolete. More importantly, we need to foster in all our personnel a sense of air-mindedness. A natural by-product of this effort would be a new lexicon that more accurately describes the nature of modern airwar. □

Notes

1. See Essay B, "Principles of War," in AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*, vol. 2, March 1992, 9-15.

2. FM 100-5, *Operations*, May 1986, 19.

3. *Conduct of the Persian Gulf War: Final Report to Congress* (Washington, D.C.: Department of Defense, April 1992), 174-76.

4. Gen Charles A. Horner, "Desert Storm," lecture, US Air Force Academy, Colorado Springs, Colo., 19 October 1992.

5. Most surprisingly, even Col John Warden's seminal *The Air Campaign: Planning for Combat* (Washington, D.C.: National Defense University Press, 1988) does not discuss strategic air operations but limits itself to air superiority, interdiction, and close air support.

6. George A. Lopez, "The Gulf War: Not So Clean," *Bulletin of the Atomic Scientists*, September 1991, 33; Harry Summers, "Bambifying War," *Washington Times*, 19 September 1991; and *Conduct of the Persian Gulf War*, appendix O, 32-35.

7. For information on this important topic, see Barbara Opall, "Pentagon Units Jostling over Non-Lethal Initiative," *Defense News*, 2 March 1992, 6; David A. Fulghum, "U.S.

Weights Use of Nonlethal Weapons in Serbia if U.N. Decides to Fight," *Aviation Week & Space Technology*, 17 August 1992, 62-63; and Thomas E. Ricks, "Nonlethal Arms," *Wall Street Journal*, 4 January 1993.

8. AFM 1-1, vol. 2, 10-14.

9. *Conduct of the Persian Gulf War*, 349-51; Tamir Eshel, "Engineers Have Key Role in Cracking Iraqi Ground Defenses," *Armed Forces Journal International*, February 1991, 18; and James W. Pardew, "The Iraqi Army's Defeat in Kuwait," *Parameters*, Winter 1991-1992, 20-22.

10. Lt Col Price T. Bingham, USAF, Retired, has written a great deal on this subject and reminds us of other examples of air forces taking the lead in defeating enemy surface units: the Italian campaign of World War II, the Normandy campaign of 1944, the Battle of the Bulge, Operation Strangle in Korea, the Pusan breakout in 1950, and Linebacker I in 1972. Lt Col Price T. Bingham, *Ground Maneuver and Air Interdiction in the Operational Art*, CADRE Paper, Report no. AU-ARI-CP-89-2 (Maxwell AFB, Ala.: Air University Press, September 1989). See also idem, "Air Interdiction and the Need for Doctrinal Change," *Strategic Review*, Fall 1992, 24-33.

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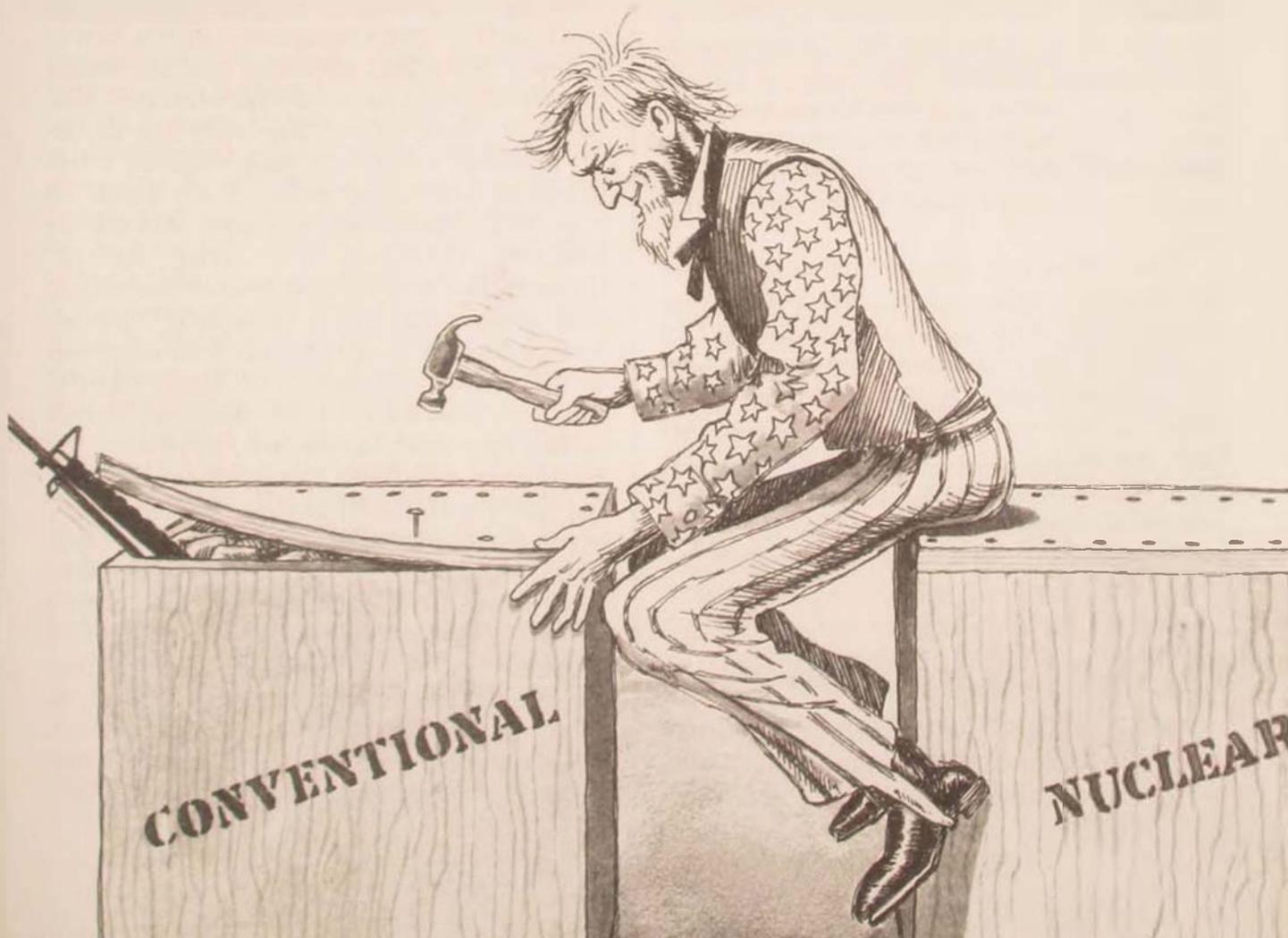
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DETERRENCE AFTER THE COLD WAR

Conventional Arms and the Prevention of War

MAJ WILLIAM S. HUGGINS, USAF

THE EXTRAORDINARY events of the last 36 months have given strategists and foreign-policy observers pause to reexamine the very foundations upon which the analysis of international security issues has rested for the last four decades. Deterrence was the ordering principle in the security relationships which shaped the bipolar world of the cold war. Strategic nuclear arms were the weapons of choice in the standoff between the world's two ideological titans. As progress in strategic nuclear arms control accelerates, the focus of US military strategists and national security decision makers returns to conventional arms. As successful as the grand strategy of deterrence apparently was during the cold war, we must not be seduced into believing that in deterrence we have finally found the Holy Grail of military



strategy. Some observers, both in and out of uniform, suggest that our cold war grand strategy, based as it was on deterrence, with a little sprucing up may transfer effectively to the post-cold war world.¹

We must not be misled by the apparent success of the strategy of containment and its cornerstone—strategic nuclear deterrence. To be sure, nuclear weapons will remain a danger for some time to come. The elements of strategic nuclear deterrence will remain important as long as those weapons pose a threat. However, these elements do not transfer effectively to a strategy in which the threat of conventional conflict dominates.

Technological sophistication and the integrated employment of conventional forces have received much of the credit for the stunning victory in the Persian Gulf. Because of an apparent decline in the significance of nuclear weapons, we must reconsider our reliance on a strategy of deterrence that is based on a threat of Armageddon. Can the fundamentals of deterrence be applied effectively to a strategy that is based primarily on conventional weapons? What does it take to deter? Can decisive employment of conventional force prevent future confrontation?

The following discussion shows that the deterrent effect of nuclear weapons—specifically and most importantly the threatened use of nuclear weapons to prevent war—cannot be duplicated by conventional weapons. It further argues that with the end of the cold war and with a concomitant decline in the significance of nuclear weapons, deterrence no longer can serve effectively as the centerpiece of US grand strategy.

Deterrence: The Basics

As Thomas Schelling observed, the essence of deterrence is simple: the power to hurt is bargaining power.

There is a difference between *taking* what you want and making someone give it to you, between *fending off* assault and making someone afraid to assault you, between *holding* what people are trying to take and making them afraid to take it, between *losing* what someone can forcibly take and *giving* it up to avoid risk or damage. It is the difference between *defense* and *deterrence* (emphases added).²

Schelling's simple but elegant formulation presents two elements essential to deterrence: the power to hurt and the power to bargain.

In his book *Arms and Influence*, Schelling describes the all-important distinction between the use of military power to achieve a particular military goal—to repel an attack, to seize an objective—and the use of military power to simply inflict pain.³ It is the latter use (or the threatened use) of military power that figures in deterrence.

Strategic nuclear deterrence makes a contingent promise: if you attack, you will suffer consequences you cannot accept. Note that strategic nuclear forces (long-range bombers, intercontinental ballistic missiles, submarine-launched ballistic missiles) cannot be employed in a traditional defensive role. They have no capability to delay, disrupt, divert, or destroy inbound attacking forces. (Preemption as a special case of the defensive use of weapons is excluded. The reference here is to action taken in response to an ongoing attack.) By their nature, they are offensive. They threaten devastating damage. They are, says Carl H. Builder of the Rand Corporation, "political instruments of terror, not military instruments of war."⁴ The first incarnation of our deterrence strategy—massive retaliation—best illustrates the unique capacity of nuclear weapons to inflict pain. Progress in the design of nuclear weapons has made them more accurate, lending some weight to the argument that their use in a counterforce targeting scheme approximates a traditional mili-



tary-on-military action. Still, considering what would certainly be phenomenal collateral damage locally, as well as undetermined global effects, improvements in accuracy do not fundamentally alter the conclusion that the primary military utility of nuclear weapons stems from their capacity to inflict extraordinary pain.

Deterrence also involves bargaining. Indeed, bargaining is the sine qua non of deterrence. However, during the cold war this bargaining often had less to do with oak tables and diplomatic legations than it did with alert rates and sub chases in Arctic waters. From American bombers in England, to Soviet missiles in Cuba, to an airborne command post aloft around the clock, nuclear adversaries bargained by posturing their forces. For without posturing (the exchange of threats to inflict pain), there could be no deterrence and no war prevention. Since strategic nuclear weapons cannot be used to repel attack and since the use of strategic nuclear

Deterrence was the ordering principle in the security relationships that shaped the bipolar world of the cold war era. Here, two ideological titans find themselves in a face-off with nuclear weapons on the bargaining table during Strategic Arms Limitation Talks at Jackson Hole, Wyoming, in the early 1980s.

weapons to seize an objective would leave no objective worth having, their only use must be to inflict—or threaten to inflict—pain. And the power to inflict pain has no utility unless it is used to extract desired behavior from an adversary. The process of threatening pain, communicating what must be done to avoid pain, and reacting to the adversary's responses constitutes bargaining, of which force posturing is often the most visible outward sign.

When we bargain, something is always at stake. We can add more texture to our image of deterrence by considering the impact of risk and credibility on the deterrence calculus.

Our erstwhile opponent, the former Soviet Union, may have doubted the credibility of our threat to use the alert forces arrayed against it. There could be no doubting, however, the risks to the Soviet Union if it decided to attack and guessed wrong about our threat to respond with nuclear weapons. As risk goes up, the cost of guessing wrong goes up. With regard to nuclear weapons, the risk of guessing wrong is monumentally greater than a bad guess concerning a threat from conventional weapons. This risk, along with a measure of credibility underscored by the alert posture in which the US and the Soviet Union maintained their strategic nuclear forces, appears to have prevented a nuclear World War III.

Deterrence and "Absolute" War

Curiously, war with strategic nuclear weapons—in terms of classical theory on the nature of war—appears to be impossible. In a way, the Prussian military theorist Carl von Clausewitz anticipated the cold war five generations before the first atomic bomb. In his analysis of the phenomenon of war, he defined absolute war in order to provide an abstract ideal against which to measure and understand the chaos of real war. His three conditions for absolute war were that (1) it must be a wholly isolated act, (2) it must occur suddenly, and (3) it must not be produced by previous events in the political world.⁵ To further underscore the theoretical, abstract nature of these conditions, he went on to say,

Move from the abstract to the real world, and the whole thing looks quite different.

... war never breaks out wholly unexpectedly, nor can it spread instantaneously.⁶

Maybe not. Still, there is a startling congruence between Clausewitz's conditions for abstract/ideal war and the bolt-

out-of-the-blue Soviet nuclear attack for which the US maintained a level of deterrent readiness utterly without precedent in our military history. The no-notice Soviet nuclear attack for which US defense planners prepared sounds a good bit like Clausewitz's conditions for absolute war—that it be an "isolated act, occurring suddenly and not produced by previous events in the political world."⁷

We must take care not to misread the final portion of this condition—"not produced by previous events in the political world"—which could be interpreted in different ways. Clausewitz could have meant it literally—that perfect war (if it were possible) would spring suddenly upon the scene without any antecedent whatever. Or it could mean that, given sufficient tension between two nuclear-armed adversaries, absolute war would occur without an identifiable triggering event.

In any event, the worst case of a sudden and massive exchange of nuclear weapons was the ultimate military mission for which the concept of nuclear alert was designed and for which actual alert forces were trained and postured. Bombers loaded with nuclear weapons flew airborne alert. A hot line linked the White House and the Kremlin. Strategic Air Command (SAC) kept an airborne command post aloft over the central United States for over 30 consecutive years. Peter Paret's comment on Clausewitz's concept of absolute war could just as easily have applied to what we believed World War III would have been: "If war were one short, uninterrupted blow, preparation for it would tend toward totality, because no omission could ever be rectified."⁸

The remarkable similarity between the cold war (that never became a hot war), with its defining strategic feature of deterrence, and Clausewitz's construct for absolute war (by definition an impossibility) has important implications for understanding the role that deterrence may play in future US military strategy. Deterrence

will be effective (i.e., with some reliability will prevent war) only when the conditions under which it is applied approach those of Clausewitz's absolute war. Those conditions prevail only when the military security environment is dominated by nuclear weapons. Absent the preponderant influence of nuclear weapons in a security relationship, deterrence cannot prevent war.

Deterrence, War Prevention, and Conventional Weapons: A False Hope

Deterrent strategy during the cold war was marked by the unique character of nuclear weapons. The good news is that the cold war is over. Happily, the prospects for a nuclear Armageddon are fading. The bad news is that, as the nuclear threat recedes, warriors and statesmen look with renewed interest to conventional weapons.⁹ In even the lowest yields and most restricted circum-

stances, the combat use of nuclear weapons represented a virtually inviolable threshold. No such taboo applies to the use of conventional weapons.

One cannot count on the mere threat of conventional war to raise the stakes in a conflict to levels high enough to forestall the outbreak of hostilities with anywhere near the confidence associated with nuclear weapons. This condition derives from the fact that conventional war, even all-out conventional war, does not threaten the swift and apocalyptic consequences associated with nuclear war (e.g., questionable escalation controls, nuclear winter, and worldwide collateral damage).¹⁰ Potential adversaries may risk the outbreak of conventional hostilities, believing that if they do not win, they can end the fighting through negotiation or

Mankind's bloody history is evidence that the threat of conventional war is not easily deterred. Indeed, some third world forces seem to welcome conventional conflict, as is the case with rival Somali warlords, who refrain from attacking each other only because they fear intervention by US troops.



capitulation before reaching an unacceptable level of destruction or achieving some other diplomatic objective.

Clausewitz taught that war is "a continuation of political activity by other means."¹¹ Inasmuch as politics often consists of the art of negotiation, war is then closely related—through posturing—to this process of give-and-take and to the exchange of signals of intent.

In the case of nuclear war, the exchange of signals—accomplished by posturing forces rather than employing them—occurs within the framework of deterrence. The short history of the nuclear age mentions no tradition of patriotic self-sacrifice in nuclear war. The idea is ludicrous. Nuclear weapons achieve their objectives by threatening a war that nobody can stand. Adversaries posture forces to demonstrate resolve in order to avoid employment of those forces—they dissuade instead of compel.

Conventional war also entails an element of bargaining. In the long history of conventional war, however, simply signaling intent has seldom sufficed; it must be demonstrated. The chief mechanism by

which conventional war achieves its aim is compellence. Schelling captured the essence of this concept, noting that "the threat that compels rather than deters often requires that the punishment be administered *until* the other acts, rather than if the other acts" (emphasis added).¹² Over the course of history, nations or their rulers have shown a willingness—even eagerness—to pass from a war of words to physical combat to get what they wanted. Indeed, sacrifice for God and king is the stuff of glory and legend. The utility of conventional war lies in its ability to compel an adversary to behave in a desired way.

This fundamental difference between conventional and nuclear weapons comes into sharp focus when one considers what Schelling refers to as the principle of the "last clear chance." He writes, "In strategy when both parties abhor collision the advantage goes often to the one who arranges the status quo in his favor and leaves to the other the 'last clear chance' to stop or turn aside."¹³ Since the end of World War II, we have abhorred a nuclear collision above all else. It has been in everyone's best interest to ensure that a way out exists with regard to nuclear confrontation, in the belief that such a way out will always be taken. Mankind's bloodstained history suggests that no such certainty is possible when conventional weapons are involved. Moreover, we cannot assume that the antecedent condition—that both parties abhor collision—applies to a conventional confrontation in

War with conventional weapons is a matter of degree, but the use of chemical and biological agents seems more psychologically threatening. In fact, fear of these weapons deterred their use by most developed nations, who voluntarily banned them for many years. However, such weapons as Iraq's dual-use aerial bomb, which is filled with mustard gas (below), have led to regular chemical, biological, and radiological training of US forces. Crew members from the USS John F. Kennedy (opposite) practice procedures during a drill.





the way we assume it applies to nuclear conflict.

War with conventional weapons is a matter of degree. Even advanced, industrialized societies have proven ready, if not eager, to employ conventional forces and thereby risk losses. Whereas we may characterize the response to a threat of nuclear war as "avoid at any cost," a typical response to the prospect of conventional war might appear to be "go ahead, hit me with your best shot," in the belief that the enemy's best shot may not inflict more damage than we can absorb. Anyway, we can always cry "uncle" if it gets too bad.

A further difficulty with the concept of conventional deterrence involves the special posturing requirements in the deterrent use of forces, especially when those forces are simultaneously committed to a compelling mission. This issue becomes more crucial as reductions in the defense budget shrink the overall size of American military forces, thus putting a premium on the flexibility of the forces that remain.

As was demonstrated in the employment of SAC bombers in the Persian Gulf, the transition from a deterrent posture to a compelling posture can pose serious problems. Those crews whose training had focused on tactics for the delivery of nuclear weapons had to employ seldom-practiced tactics required for conventional bombing and therefore lost some combat effectiveness.

Credible deterrence, whether nuclear or conventional, requires an extensive command and control infrastructure designed to ensure prompt response. In turn, prompt response requires sophisticated operations plans that include predetermined targets, attack routes, and weapons packages. Furthermore, since deterrence aims specifically to avoid the employment of forces, one must establish the credibility of those forces by overt posturing, by making alliance agreements which irrevocably commit the nation, and by making public statements that put the nation's reputation at stake and thereby transfer the "last clear chance" to avoid war to the

adversary. Finally, because deterrence involves the communication of intent to a specific audience, one must clearly identify the enemy.

The compellent use of force, however, takes wholly different forms of expression. It involves the actual demonstration of capabilities through such actions as open testing and military exercises. Unlike deterrent forces—which tend to be single-purpose weapon systems¹⁴—compellent forces are designed to serve multiple purposes and missions, since we expect to actually use them in combat. Because we cannot definitely identify our next enemy in a conventional war, our planning for war must be flexible and adaptable.

If conventional forces are by their nature unsuited to deterrence, what about the popular conclusion that the rapid allied response to Saddam's invasion of Kuwait deterred him from continuing into Saudi Arabia? Likewise, what about Israel's substantial conventional war-making capability and its role in deterring war in the Middle East? Isn't deterrence at work in these cases? Apparently so. But there is a catch.

We must remember that American and allied conventional forces ended up fighting in the desert and that Israel has been involved in at least four wars and countless military exchanges in its 45 years of existence in modern times. War was delayed but not prevented. Apparently, the effects of conventional deterrence have a limited shelf life. Periodically, one must demonstrate intent in order to restore credibility to conventional deterrence. So far, one demonstration of nuclear weapons in war has been enough. Unfortunately, it appears that the deterrent effects of nuclear weapons apply only in a narrow band of the conflict spectrum—that is, against adversaries comparably equipped with nuclear weapons.

We should not assume that the persistent popularity of the concept of strategic nuclear deterrence strengthens, by exten-

sion, the case for reliance on a strategy of deterrence in a world security environment now dominated by conventional weapons. Issues concerning nuclear weapons have more to do with politics—in particular, alliance politics—than with military strategy. American statesmen enjoy support, both foreign and domestic, for their efforts to maintain America's superpower status, to which our nuclear arsenal makes an important contribution. As such, nuclear deterrence—the glue which has held NATO together—will not pass quickly from the landscape of the Atlantic alliance. This commitment to nuclear weapons and the correspondent deterrent strategy persist despite the fact that US nuclear weapons no longer can provide a credible military threat (in the absence of a comparable opposing nuclear threat). Such is the case because no foreseeable adversary poses a danger sufficient to generate either the domestic or the international support that would be required to employ nuclear weapons.

Why does any of this matter? It matters because we have spent the last 40 years fine-tuning a military policy and programming community to a grand strategy based most fundamentally on the concept of the prevention of war through deterrence. But the world has changed. We must be prepared to change with it.

We recognize that threats to our interests can (and certainly do) exist. For the most part, these threats involve conventional weapons. We must be able to compel an adversary to abandon an action rather than just threaten to punish him if he does not. Such a compellence strategy must be built on forces capable of a variety of military actions. Since the business of predicting the site and source of the next war has become extremely difficult, we must be ready to act wherever, whenever, and in whatever manner an unfolding crisis requires.

Here is the bottom line. On the one hand, effective war prevention through deterrence is based on threats: those

received and those sent. It demands a particular sort of force structure based on survivable offensive weapons capable of visiting unacceptable destruction on a specific enemy who threatens us. The enemy must know that we can and will use these weapons. On the other hand, compellence is based on capability and the sort of flexible, durable, lethal forces that can enter a conflict and decisively determine the outcome in our favor.

We must resolve the fundamental ques-

tion of strategy, for the choice of an appropriate force structure depends on it. Widespread belief that the greatest threat to US interests comes from major regional conventional conflict makes a persuasive argument for a strong, flexible force structure based on conventional weapons. A national military strategy designed primarily to meet the threat of conventional combat must focus on the war-fighting approach of compellence instead of the war-prevention approach of deterrence. □

Notes

1. See Gary L. Guertner, *Deterrence and Conventional Military Forces* (Carlisle Barracks, Pa.: Strategic Studies Institute, US Army War College, 20 May 1992); and Capt Richard D. Hooker, Jr., and Capt Ricky L. Waddell, "The Future of Conventional Deterrence," *Naval War College Review* 45, no. 3 (Summer 1992): 78-87.

2. Thomas C. Schelling, *Arms and Influence* (New Haven, Conn.: Yale University Press, 1966), 2.

3. *Ibid.*

4. Carl H. Builder, *The Future of Nuclear Deterrence*, Rand Report P-7702 (Santa Monica, Calif.: Rand Corp., February 1991), 12. Note also that Bernard Brodie recognized the peculiar political power inherent in nuclear weapons as early as 1946, when he observed that "thus far the chief purpose of our military establishment has been to win wars. From now on its chief purpose must be to avert them. It can have almost no other useful purpose." Though Brodie overstates the case, his prescient analysis of the peculiar value of nuclear weapons is right on the mark. Bernard Brodie, "Implications for Military Policy," in *The Absolute Weapon: Atomic Power and World Order*, ed. Bernard Brodie (New York: Harcourt, Brace and Co., 1946), 76.

5. Carl von Clausewitz, *On War*, ed. and trans. Michael Howard and Peter Paret (Princeton, N.J.: Princeton University Press, 1976), 78.

6. *Ibid.*

7. *Ibid.*

8. Peter Paret, ed., *Makers of Modern Strategy: From Machiavelli to the Nuclear Age* (Princeton, N.J.: Princeton University Press, 1986), 200.

9. Senate Armed Services Committee, testimony of Gen George L. Butler, 102d Cong., 1st sess., 20 April 1991, S. 1507, pt. 1.

10. Barry Wolf, *When the Weak Attack the Strong: Failures of Deterrence*, Rand Report N-3261-A (Santa Monica, Calif.: Rand Corp., 1991), 3; and Builder, 7.

11. Clausewitz, 87.

12. Schelling, 71.

13. *Ibid.*, 44.

14. Although intercontinental ballistic missiles and submarine-launched ballistic missiles are clearly single-purpose weapons, such is no longer the case for intercontinental bombers. Nonetheless, both the B-52 and the B-1 were originally designed for the nuclear mission. Their conventional-weapons capabilities, now robust in the B-52 but still minimal in the B-1, were added after the aircraft were fielded.

THE ULTIMATE STANDOFF WEAPON

LT COL JOHN R. LONDON III, USAF

THE WORLD has seen staggering political changes in the last few years that are having major impacts on the US military's force structure. No longer focusing on an unlimited nuclear exchange with what used to be the Soviet Union, the US Air Force is now building its capability around a strategy of global reach—global power. However, the most likely conflicts in the future are radically different from those for which some current US weapon systems were designed. To establish an Air Force that has truly effective global reach and global power for the limited conflicts of tomorrow, military planners must ensure that appropriate weaponry is available and properly employed.

Key tenets of global reach—global power include the capability to project force quickly, effectively, and accurately anywhere in the world.¹ One type of force application that is particularly dependent on these tenets is the limited strike against a well-defended target far from any fixed US military operating location. Operation El Dorado Canyon—the raid on targets in Libya by US Air Force and Navy aircraft in 1986—was a good example of this type of force application.

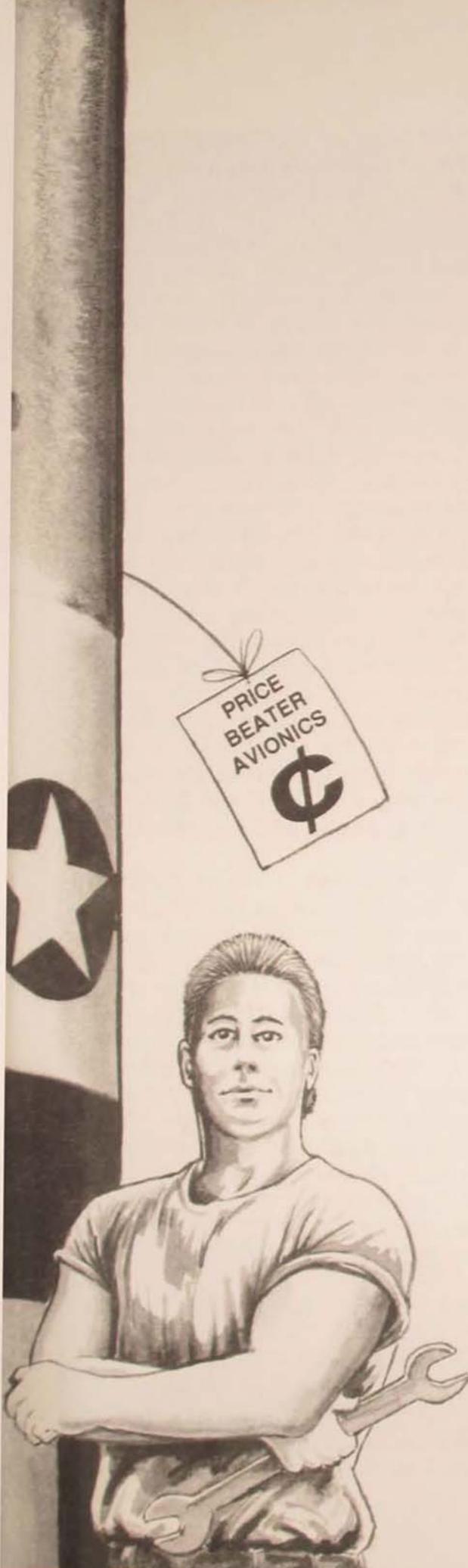
The Libyan attack was a strategic success for the United States. However, this raid was a significant undertaking requiring considerable planning and logistics support. The Navy, of course, operated from carriers that had been deployed into the area. The Air Force provided the precise delivery of heavy ordnance for the mis-



sion using F-111 aircraft. Because of basing and overflight restrictions, the F-111s had to launch out of England and fly a circuitous route to Libya and back. The mission required extensive tanker support, multiple refuelings, and fatiguing cockpit time for the F-111 flight crews. It also exposed the operation to many opportunities for a security compromise. Once over Libyan territory, US aircraft were subjected to hostile fire from ground-based air defenses, and an F-111 and its crew were lost.² If an American aircrew had been taken prisoner, a political circus would have certainly ensued, with the ultimate fate of the flyers in the hands of the Libyans.

The US needs to consider what future weapon systems would be best suited and most cost-effective to accomplish long-range, limited, surgical strikes against heavily defended targets. The Libyan raid was a successful but risky mission. America paid a price for this success with the lives of two of her sons. Although loss of life is hard to avoid in combat, we should strive to minimize these losses. Additionally, the high cost of military equipment and personnel, coupled with a declining post-cold war defense budget, dictates that future weapons be truly cost-effective. Mission needs will have to be balanced with fiscal realities.

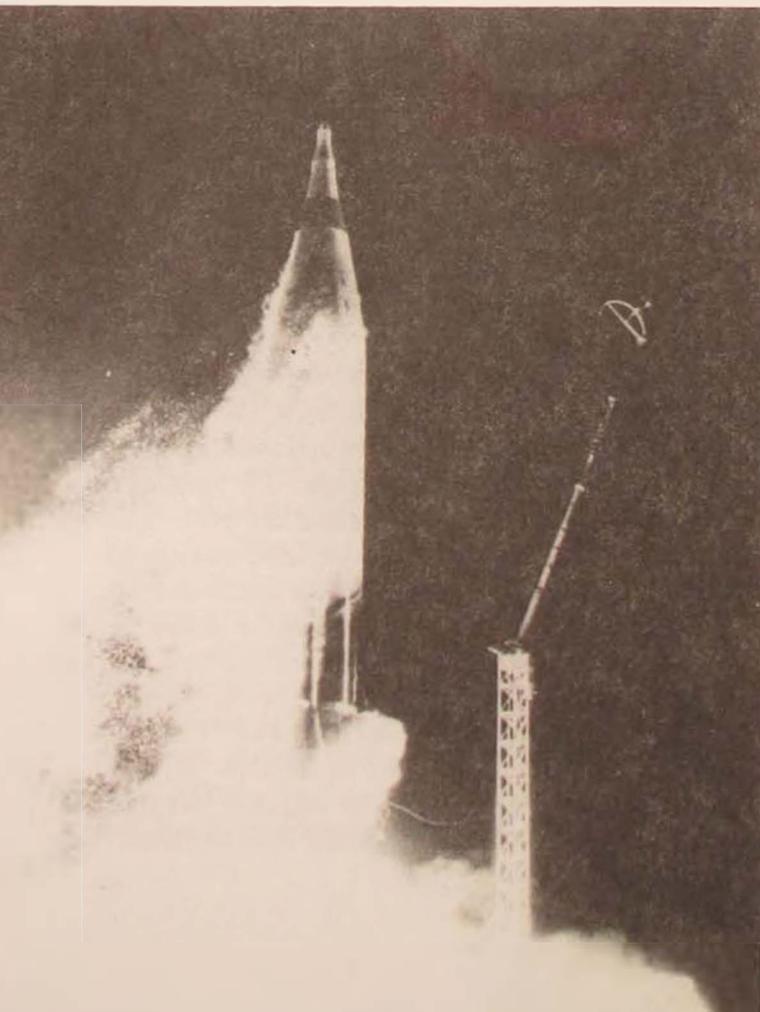
The US military could provide a rapid, powerful, and accurate striking capability for limited engagements by basing long-range, unmanned missiles with relatively large conventional warheads in highly secure sanctuary areas. An air-breathing cruise missile launched from US territory is one possibility to perform this role, but the missile would have to be fairly large to fly thousands of miles. This increase in size over current cruise missile designs would increase the weapon's cost and its vulnerability (especially to look-down, shoot-down defensive systems). The 17 January 1993 cruise missile strike launched by the US Navy against targets outside Baghdad highlighted the vulnera-



bility of cruise missiles to antiaircraft artillery when some missiles missed their targets and at least one was knocked off course by hostile fire and hit a high-visibility civilian target.³ Long-range cruise missiles would also have a flight time measured in many hours, and overflight of foreign territories could be a problem. Even forward-deployed or ship-based cruise missiles would have to be large and have very long range to be able to strike distant inland targets. The missiles could not be quickly programmed for long-distance missions, especially if they were exercising low-altitude flight profiles.

Another possibility for a long-range strike weapon is the conventionally armed

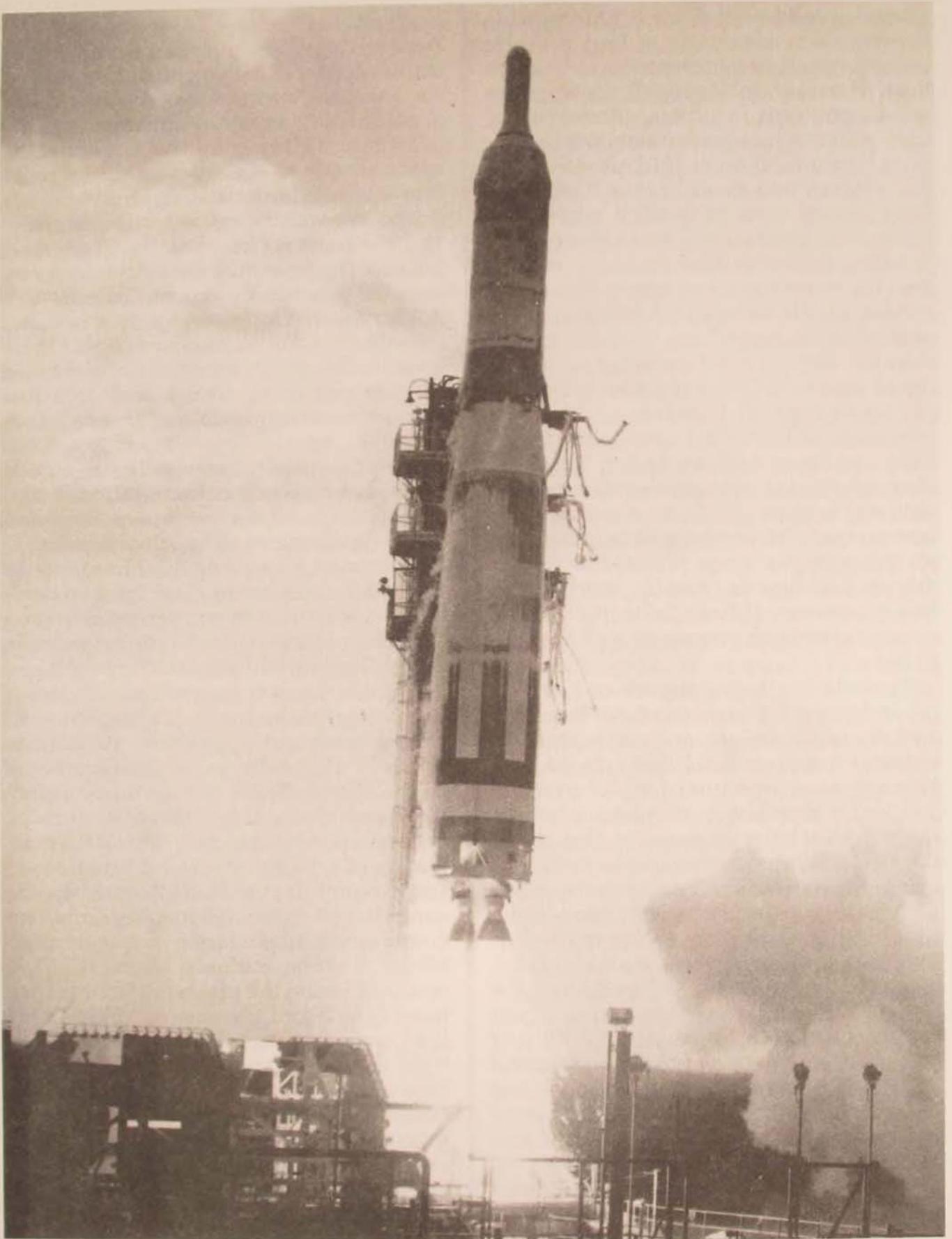
Due to the threat of nuclear attack by the Soviet Union, the thrust of early ICBM development did not focus on the criterion of low cost but on providing functioning, capable weapon systems very rapidly. The development of the Atlas F (below) and the Titan G (opposite page) by the aircraft industry, however, meant that early missiles were designed for maximum performance and minimum weight.



ballistic missile. A large number of Minuteman II intercontinental ballistic missiles (ICBM) are becoming surplus assets as they are taken off strategic alert as a consequence of arms reduction agreements. There is a growing group of potential military and scientific experimenters lining up to use the Minuteman II. Some in the commercial launch community have even discussed using it as a launch vehicle for small payloads. However, the missile would also seem to be an excellent candidate for a carrier vehicle for conventional weapons, at least in the near term. For the long term, however, the unit cost and operating expense of a conventionally armed ICBM needs to approach the cost of a cruise missile if the weapon is to be practical for widespread application. Therefore, the Air Force would ultimately require a completely new ICBM with greatly reduced acquisition and operating costs as compared to ICBMs of the past. This may be possible by eliminating all strategic nuclear vestiges of the ICBM design and emphasizing design and functional simplicity.⁴

The development of the ICBM in the United States began in the 1950s as a response to the threat of a massive nuclear attack by the Soviet Union using long-range ballistic missiles.⁵ Engineers designing the early Atlas and Titan ICBMs were not concerned about developing low-cost missiles but focused instead on providing functioning, capable weapon systems very rapidly. The Air Force had chosen the aircraft industry to develop the ballistic missile, so many design practices common to aircraft were extrapolated for application to missiles.⁶ Consequently, the early missiles were designed for maximum performance and minimum weight. Also, plans called for the ICBMs to be deployed in concrete coffins or silos and maintained on constant alert; therefore, limiting missile size became critical to facility construction and routine operability.⁷

The Minuteman ICBM introduced solid-propellant strategic missiles into the US



arsenal. Solid-propellant ICBMs provide the important advantages of long-term silo storability and near-instantaneous reaction time. However, solid propellants also have some significant liabilities. For example, they provide less performance, kilogram for kilogram, than liquid propellants. Minuteman and Peacekeeper ICBMs are fully loaded with propellant when they come from the factory, and this requires handling processes that are more difficult than those needed for an empty liquid-propellant missile airframe. Additionally, the cost of solid propellant is much higher than the cost of liquid propellants such as liquid oxygen (LOX) and rocket propellant (RP)-1 (a type of kerosene). The cost advantage of LOX/RP-1 over solid propellants can be as high as 44:1.⁸ There are also significant environmental concerns with the exhaust products of solid-propellant motors. Moreover, solids must operate in a narrower range of temperature conditions than liquids. Finally, solid-propellant motors are difficult to inspect during the manufacturing process as well as in the field.⁹

By designing for minimum cost instead of designing for maximum performance and minimum weight, we can postulate a notional low-cost ICBM that may be cost-effective as a conventional weapon carrier. The key to this design technique is to seek the simplest missile possible that meets the total performance requirement without being overly concerned about the system's performance per kilogram of gross weight. Liquid-propellant designs are more conducive to this approach, since their performance is more directly tied to the specific design of the rocket engine. Also, liquid systems using liquid oxygen and RP-1, if extremely simple in design, can take better advantage of manufacturing and operating economies of scale due to the ease of inspection and the much lower cost of propellant.

In 1966, The Aerospace Corporation developed design-for-minimum-cost criteria for space booster and ballistic missile

systems.¹⁰ Aerospace, TRW, and the Boeing Company pursued a number of studies for the Air Force and the National Aeronautics and Space Administration (NASA) applying this design criteria in the late 1960s.¹¹ However, NASA selected the space shuttle as the solution to the problem of high launch costs, and the Air Force eventually agreed to be a prime shuttle user. The shuttle, of course, became a capable and versatile launch system, but it was an economic failure. The military never followed up on a ballistic missile program that used simple, inexpensive designs (that were not optimized for performance), and the design-for-minimum-cost approach was largely forgotten.¹²

Simplification of a missile's design is possible by relaxing the traditional constraints imposed by the maximum-performance/minimum-weight criteria. Most of the reasons for applying this criteria in the first place were appropriate for a strategic nuclear missile but not necessarily for a simple, long-range conventional missile. Simplification will reduce the total number of interfaces a missile has, and this is absolutely critical to achieving low-cost procurement and operations. Simplification will also reduce the total number of missile parts, which will in turn enhance the system's overall reliability.¹³

One important step in reducing the complexity of a liquid-propellant missile is to greatly simplify, or eliminate entirely, the complicated and costly turbomachinery common on most large rocket engines today. Turbomachinery boosts the flow rate, and hence the pressure of the propellant being fed to the engine. This allows the propellant tanks of the missile to be lightweight, thin-wall structures. However, the turbopumps are complex mechanisms with extremely high-speed rotating components that require very tight and very expensive manufacturing tolerances.¹⁴ Increasing engine performance generally requires better-performing turbomachinery.

If the turbomachinery is eliminated from the propulsion system design, the propellant must be fed to the engine by pressurizing the propellant tanks. This requires higher operating pressures in these tanks and therefore a thicker and heavier structure. Since the airframe of this pressure-fed missile is heavier than an equivalent performance pump-fed design, the engine must be larger (have a greater thrust) to carry the same weight of payload. The overall result of turbomachinery elimination is typically a larger, heavier vehicle with a bigger engine that is drastically simpler and cheaper to manufacture and operate. The total number of parts and interfaces is greatly reduced, and the structure has more robust design margins. The missile is less susceptible to handling damage or launch weather constraints, and has an increased operational reliability.¹⁵

Because of the aerospace industry's proclivity for maximum-performance/minimum-weight designs, pressure-fed rocket propulsion systems have not been used extensively in ballistic missile and space booster applications. However, due to their inherent simplicity, they have always been used when maximum reliability was absolutely critical. For example, the Apollo Command Module's Service Propulsion System Engine, the Lunar Module Descent Engine (LMDE), and the Lunar Module Ascent Engine were all pressure-fed. All satellite liquid-propulsion systems, where a maintenance-free and long operating life is a paramount consideration, use pressure-fed engines.

The simple design of the LMDE prompted the engine's manufacturer, TRW, to initiate a study that would apply a similar design philosophy to a large rocket engine concept. In 1966, TRW designed a simple, throttleable, pressure-fed engine that would ultimately demonstrate a maximum thrust of 250,000 pounds (1,112,000 newtons).¹⁶ They contracted with a Gardena, California, commercial pipe and boiler fabricator to build the engine to "shipyard production toler-

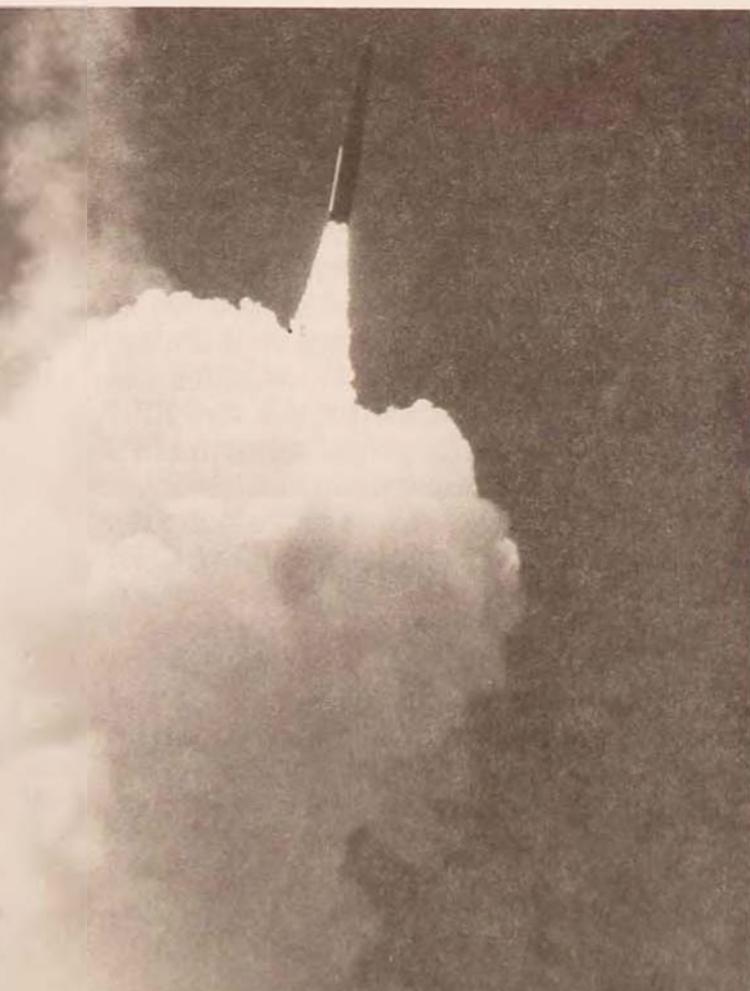
ances."¹⁷ The manufacturing cost of the entire propulsion assembly was \$7,500 in fiscal year (FY) 1967 dollars. Ablative liners were later added for an additional \$14,000.¹⁸ This engine, along with several smaller engines designed and manufactured in a similar fashion, was tested at the TRW San Juan Capistrano Test Site and the Air Force Rocket Propulsion Laboratory. All of the engines demonstrated good combustion stability.¹⁹ The total part count for the TRW 250,000-pound thrust engine was around two orders of magnitude lower than large pump-fed engines of that day.²⁰

In addition to the elimination of the engine turbomachinery, designers can take a number of other steps to achieve simple, reliable, inexpensive missile systems. Engines can use ablative liners to provide thermal control of the engine interior. Ablative liners are heavier than systems using techniques such as regenerative cooling but are cheaper and less complicated. Missile steering can be accomplished using simple liquid-injection or thrust-magnitude control systems as opposed to electromechanical or hydraulically powered actuators. Missile systems can be designed to use modular, parallel-burn configurations to maximize component and subsystem commonality and manufacturing economies of scale, and minimize nonrecurring development costs. Modular, parallel-burn missiles would tend to be short and fat and would not be as amenable for silo deployment as the traditional serial-burn ICBM.²¹ Missiles can be designed to use liquid oxygen and RP-1 for propellants. This propellant combination is not the most energetic available, but it is extremely inexpensive and among the easiest of rocket propellants to design for and to operationally handle. Design margins can be relatively large, allowing robust vehicles that do not require the excruciating manufacturing tolerances and the process oversight that is typical of launch vehicles and ballistic missiles. Inexpensive, heavier structural materials

that are easy to work such as steel can be substituted for the more exotic, lightweight, and more expensive aerospace materials that aircraft and missiles typically use.

The guidance requirements for a conventionally armed ICBM would need to be more precise than those of a nuclear-tipped ballistic missile because of the greatly reduced warhead yield and, consequently, the need for greater accuracy. Although technologies exist to provide this level of accuracy, any guidance system used must be inexpensive enough to keep the overall weapon system cost-effective. Since a missile depending solely on an inertial guidance system for weapon placement would likely not be accurate enough for many combat scenarios, some

In spite of the advantages of long-term silo storability and quick reaction time, the solid propellants of the Minuteman missile had several significant disadvantages over the liquid propellants of earlier missiles—higher fuel costs, difficult handling processes, and environmental concerns.



form of terminal guidance system for the warhead would be required. A number of potentially acceptable terminal guidance techniques are available, and the system could be as simple as using a global positioning system receiver with the warhead. Active control technologies used by existing smart weapons, as well as emerging maneuvering reentry vehicle technologies, could be adapted for guidance and control.²²

A conventionally armed ICBM would likely look different and be operated in a drastically dissimilar manner than nuclear ICBMs. This is primarily due to the low cost-optimized design of the vehicle and the lack of a requirement for a strategic, instantaneous-response, alert posture. We will now discuss the key physical and operational characteristics of a conventional ICBM.

The conventional ICBM could be maintained in a relatively low state of readiness in extremely well-defended sanctuary areas such as the continental US or Hawaii. This would eliminate the need for silo deployment and quick-response features like solid propellants. It would also enable the use of the larger, heavier, simpler, and cheaper vehicles that will result from the application of design-for-minimum-cost criteria. Missiles could be garrisoned in hangars or storage facilities, where they would be horizontally built up for launch but without their warheads or propellant. Once the order came to strike a particular target or targets, the required number of missiles could be armed with the appropriate type of warhead. At the last possible moment, the missiles would be rolled out, erected, fueled, and launched. The missiles would be relatively easy to handle prior to propellant loading, since their dry weight would not be excessive.

The available choices of warheads would always be limited to conventional weaponry, but could represent a wide spectrum of capabilities including multiple warheads, cluster munitions, and non-



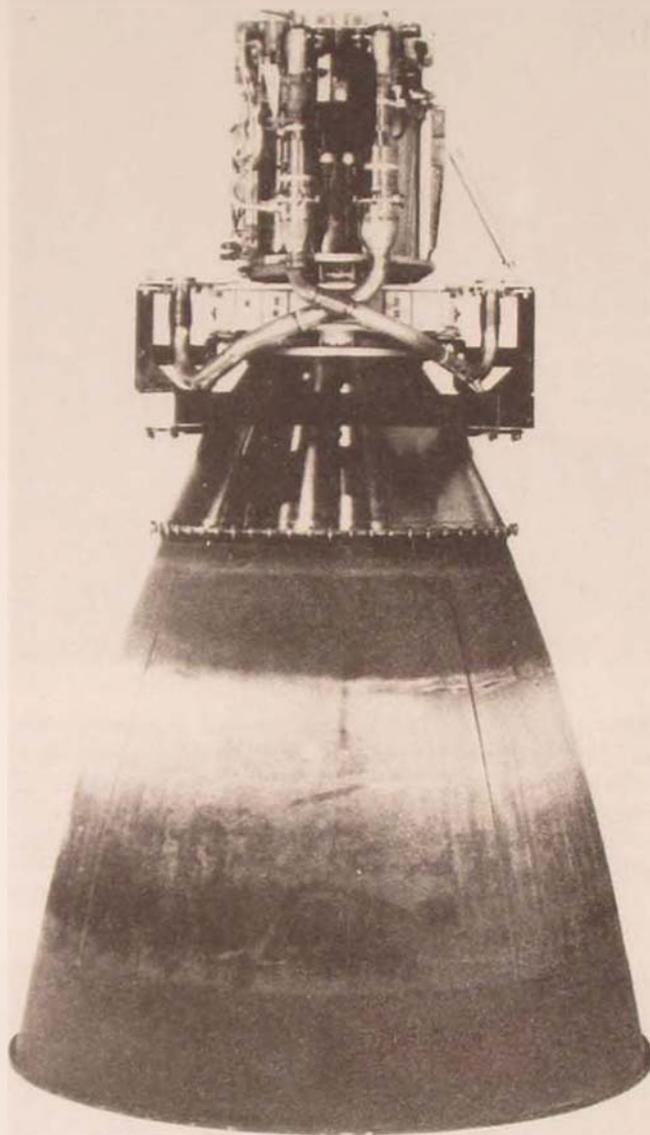
lethal weapons. The kinetic energy of a solid inert warhead made of high-density material impacting at intercontinental reentry velocities could provide for a very potent deep-penetrator weapon.

Since the system is intended to be a long-range weapon used primarily for low-intensity conflicts and limited war, it would probably be based at coastal sites on US territory. Safety restrictions would not allow overflight of populated areas during the early boost phase except under the most extreme wartime conditions. Coastal launch sites would afford ocean areas into which booster stage components could fall. To provide adequately short flight times, facilities redundancy, and targeting flexibility, military operators may need two launch sites. Strong candidates for the two-site locations would be on the east coast of the continental US and in Hawaii. Although the east coast site, and to a lesser extent the Hawaii site, will have limitations on allowable launch azimuths due to range safety, the combination of both sites should allow deployment of missiles that would hold most potential targets worldwide at risk.²³

Military planners will be concerned about operational security; therefore,

Although the mid-1960s saw several studies by the aviation industry that examined "design-for-minimum-cost criteria," NASA selected the space shuttle as its solution to high launch costs. Consequently, the idea of simple, inexpensive designs for missiles seemed grounded.

launch facilities must be located in as remote a site as possible. Hopefully, the missiles will be inexpensive enough to allow frequent and routine test launches so that preparations for actual offensive strike launches would not be immediately recognized as such. An alternative would be to base the missiles on an active launch site like Cape Canaveral Air Force Station, Florida, where unauthorized observers would not be able to clearly discern actual weapon launches from other launches. Missiles should have a maximum amount of launch preparation accomplished inside the closed confines of their maintenance and storage hangars, so that they would spend as little time as possible on the pad prior to launch. Additionally, it might be desirable to make the missile system transportable so that for an extremely sensitive strike, military personnel could conduct the launch from a classified location.



When maximum reliability was absolutely critical, the aerospace industry always seemed to turn to pressure-fed rocket propulsion systems such as the TRW-manufactured lunar module descent engine (LMDE) (above). Because of the system's simplicity, TRW later looked into applying LMDE technology to a large rocket engine. The result was the 250,000-pound thrust pressure-fed engine (opposite), under test at the Air Force Rocket Propulsion Laboratory at Edwards AFB, California, in 1969.

The employment of conventionally armed ICBMs for certain missions offers a number of distinct advantages over the use of piloted aircraft and other unmanned weapon systems. Use of ICBMs will pose no direct threat to American lives. The

missiles can hit heavily defended targets with virtual impunity. Operators can make the ICBMs ready for a mission on reasonably short notice. Once launched, the missiles will impact any target in the world in about 30 minutes or less. There would not be any foreign basing or deployment entanglements, and overflight of foreign territories should not be an issue since a missile's trajectory is largely in space. Launch sites would enjoy the security and logistics benefits of being in US territory. The simple, inexpensive nature of the ICBM's design would allow large manufacturing runs and their attendant economies of scale to affordably produce a large inventory of missiles. The ICBMs would require no radar, no defensive avionics, and no offensive avionics other than the guidance package needed to deliver the warhead with an appropriate accuracy. Unless the country or group being attacked possesses an advanced missile defense capability, all ICBM warheads will always reach their targets. Even a system like the Patriot missile, which gained such notoriety in Operation Desert Storm, would not be effective against long-range ballistic missiles because of the warhead's high reentry velocity and small target cross section.

There are three mission areas in which a conventionally armed ICBM could be highly effective. The first is using conventional ICBMs to demonstrate resolve. In the past, the US has used ships, aircraft, and—more recently—cruise missiles for this purpose. The primary advantages of using conventional ICBMs is extremely rapid weapons delivery and virtual invulnerability. The second promising mission area is using ICBMs for crisis response. For example, a particularly threatening weapon could be destroyed quickly, thus limiting or even avoiding damage to the US or our allies. The third mission area is using conventional ICBMs as the leading edge of a combined forces attack. ICBMs could not only attack the most heavily defended targets, but could do so with no

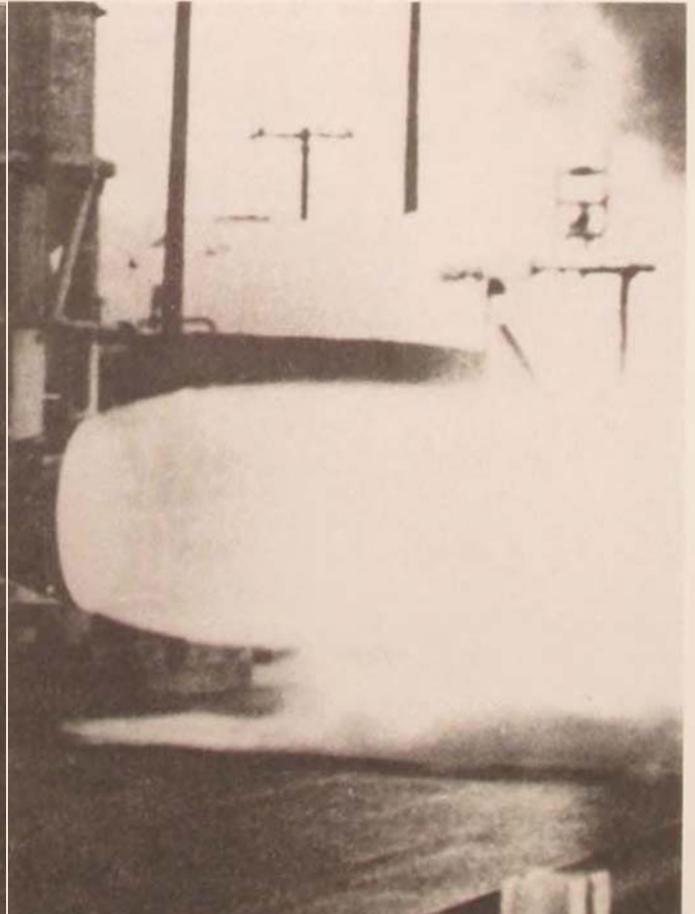
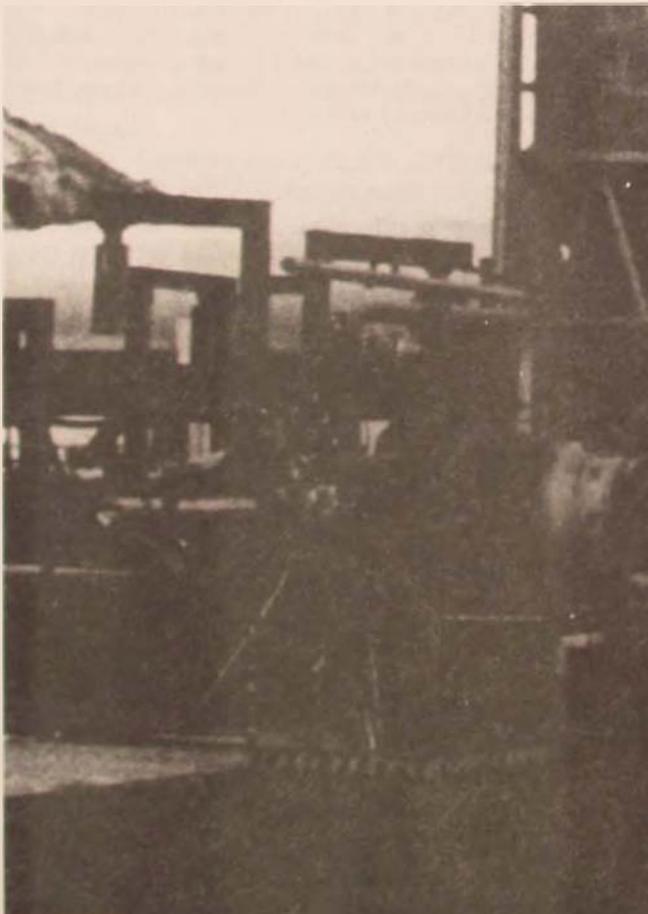
warning whatsoever to most potential adversaries.²⁴

With the transfer of the US ground-based ICBM force to Air Force Space Command on 1 July 1993, the command will possess for the first time an offensive nuclear strike capability.²⁵ The development of conventionally armed ICBMs could provide Space Command a conventional strike capability as well, making the command a potential prime player for future limited offensive actions.

Verification of the ICBM's conventional nature would be critical to any operational deployment or use of the weapon system. The missiles must be based where no nuclear warheads are ever present. Countries such as Russia that have a strategic nuclear capability may require access for on-site inspections, but the US and Russia have already set precedents in this area. There will likely be a prohibition on using the weapon system against countries that possess nuclear-tipped ICBMs, but hopefully the number of countries in this category will remain in the extreme minority for some time to come. The US may

deem it prudent to provide prior notification to certain key countries of an imminent US missile strike. Any country monitoring the start of a conventional ICBM strike by the US will be able to verify its conventional nature by the launch location.

Finally, we must recognize that whether or not the US develops conventional ICBMs, the proliferation of ballistic missile technology will almost certainly expand. Other countries may apply design-for-minimum-cost criteria to field large numbers of inexpensive, long-range ballistic missiles. Even without nuclear, chemical, or biological warheads, potential US adversaries that have a stockpile of conventionally armed ICBMs could pose a very troubling military challenge. For example, if prior to January 1991, Iraq had possessed just one ICBM armed with a conventional high explosive and had targeted the missile at New York City, Washington, or London, the threat may have had a significant impact on the political support for, and military planning and execution of, Desert Storm. Clearly, the US must either



deploy conventional ICBMs capable of providing a commensurate, flexible, and timely response to such threats or deploy a credible missile defense system capable of handling limited attacks, or both.

The US Air Force of tomorrow will face new challenges in the post-cold war era that require a rethinking of our military force structure and the doctrine to employ it. A low-cost conventional ICBM, designed for manufacturing and operational simplicity, could provide a swift,

reliable, and cost-effective means of global power projection during limited conflicts. The ballistic missile has been in use as an operational weapon of war for almost 50 years, but it is still virtually invulnerable to all defensive systems. Application of ballistic missiles as a conventional weapon is burgeoning worldwide, and the US needs to take the lead to avoid a conventional ICBM gap with a plethora of unstable, unpredictable, third world countries. □

Notes

1. Air Force News Agency pamphlet, *Building a Quality Air Force*, Washington, D.C., 1992.

2. *Low Intensity Conflict* (Maxwell AFB, Ala.: Air Command and Staff College, November 1992), 271, and associated lecture.

3. George C. Wilson, "Cruise Missiles Fast Becoming Irresistible Weapon," *Air Force Times*, 8 February 1993, 27.

4. R. C. Truax, "The Global Ballistic Missile—A Weapons System for the Post Cold-War Era" (Paper presented at the US Naval Postgraduate School, Monterey, Calif., 12 March 1991), 1–3.

5. Jacob Neufeld, *Development of Ballistic Missiles in the United States Air Force, 1945–1960* (Washington, D.C.: Government Printing Office, 1990), 108–9, 133–35.

6. *Ibid.*, 38, 44.

7. *Ibid.*, 74, 117; Gerard W. Elverum, Jr., "Scale Up to Keep Mission Costs Down" (Paper presented at the 24th International Astronautical Federation Congress, Baku, USSR, October 1973), 3, 47; and Roger Barrett et al., *A Historical Look at United States Space Launch Vehicles, 1967–Present* (Arlington, Va.: ANSER, February 1990), II, C-1.

8. T. J. Frey, Jr., "Sea Launch and Recovery (SEALAR): Responsive and Affordable Access to Space" (Paper presented at the AIAA Space Programs and Technologies Conference, Huntsville, Ala., 24–27 March 1992), 2.

9. Pacific American Launch Systems, Inc., *Evaluation of an Innovative Propulsion Concept (EIPC)—Final Report*, USASDC Contract DASG60-88-C-0056 (Menlo Park, Calif.: 24 May 1989), vol. 2, 2-5, 2-6.

10. Naval Center for Space Technology, *Sea Launch and Recovery (SEALAR): System Concept to Launch Brilliant Pebbles* (Washington, D.C.: Naval Research Laboratory, January 1992), 18.

11. D. E. Fritz and R. L. Sackheim, "Study of a Cost Optimized Pressure Fed Liquid Rocket Launch Vehicle" (Paper presented at the AIAA/SAE/ASME 18th Joint

Propulsion Conference, Cleveland, Ohio, 21–23 June 1982), 2–3.

12. For a much more detailed treatment of DFMC criteria and its application to space launch vehicles, see the author's "Methods for Achieving Drastic Reductions in Space Launch Costs," forthcoming from the Air University Press.

13. Paul Dergarabedian, "Cost-Model Considerations for Launch Vehicles" (Unpublished study, The Aerospace Corporation, El Segundo, Calif., 14 November 1991), 8.

14. Edward L. Keith, "Low-Cost Space Transportation: The Search for the Lowest Cost" (Paper presented at the AAS/AIAA Spaceflight Mechanics Meeting, Johnson Space Center, Tex., 13 February 1991), 11–12.

15. *Ibid.*, 10–13.

16. Elverum, 27.

17. *Ibid.*, 27; and Gregg Easterbrook, "Big Dumb Rockets," *Newsweek*, 17 August 1987, 50.

18. Elverum, 27.

19. TRW, Incorporated, *Low Cost Shuttle Surrogate Booster (LCSSB)—Final Report* (Redondo Beach, Calif.: TRW, Inc., 15 May 1981), 41.

20. *Ibid.*, 44.

21. Edward L. Keith, "System Analysis and Description of an Ultra-Low Cost Ground to Low Earth Orbit Cargo Delivery System" (Paper presented at the World Space Congress, Washington, D.C., 31 August 1992), 5.

22. Briefing chart 9301-U-78184, Phillips Laboratory/VT-B, Kirtland AFB, N.M., January 1993.

23. Lt Col Curtis D. Cochran, Lt Col Dennis M. Gorman, and Maj Joseph D. Dumoulin, eds., *Space Handbook*, AU-18 (Maxwell AFB, Ala.: Air University Press, January 1985), 13-14.

24. Briefing chart 9210-U-77754 A R 01-06-93, Phillips Laboratory/VT-B, Kirtland AFB, N.M., January 1993.

25. Neff Hudson, "Missile Wings Shifting to Space Command," *Air Force Times*, 15 February 1993, 26.

Ricochets

continued from page 3

fighters in "digestible chunks." Most of the few Iraqi aircraft that did manage to take off on the first night were destroyed.

- After the shelter campaign began, the enemy dispersed his least-capable aircraft around airfields, nearby population centers, and religious monuments. The more capable Iraqi aircraft were either destroyed in their shelters or forced to flee to Iran. In either case, those aircraft no longer posed a threat to the coalition. The objective of the air campaign was not the destruction of every Su-7, Su-19, and MiG-21 in the country after the more sophisticated warplanes were neutralized; rather, it was to attain unchallenged air supremacy over Iraq (which we did, preventing a single air attack on our ground forces).

- Contrary to the statements in the article, planners had a thorough understanding of Iraqi airfields from the number and composition of runway surfaces and shelters to the location of POL; command and control; crew quarters; and other facilities.

The prestrike and poststrike analyses represented by this article are narrowly focused on tactical inputs to the air base attack problem (i.e., how many aiming points were hit) and ignore the operational results (i.e., reduction in enemy sortie rate to near zero, 37:0 air-to-air kill ratio in favor of the coalition, and complete air supremacy by the second week of the air campaign).

We do need to analyze the effects of attacks on runways, airfield maintenance hangars, control towers, POL storage, crew quarters, and other facilities; but we need analysis of how attacks on sector operations centers, airfields, and national command elements can combine to paralyze an adversary's air defenses and allow us to impose our will on him far more.

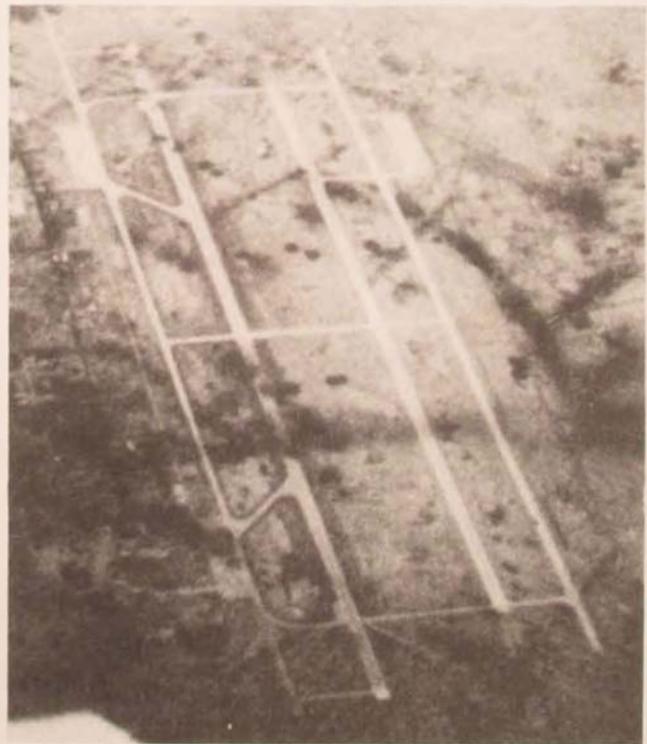
Teaching analysts and planners to focus on the narrow issues of air base attack at the expense of the broader objectives of the air campaign would be a disservice to future war planners and to the nation.

Capt William W. Bruner III, USAF
Washington, D.C.

I have read the article "Ignorance Is Risk: The Big Lesson from Desert Storm Air Base

Attacks" (Winter 1992), which highlighted the difficulty that weapons-effects planners have always recognized: a modern hardened airfield is a difficult target to destroy. That is why NATO nations and others have expended so much money on building such bases. However, I take issue with the author on some points of fact.

The author states that because Tornado aircraft overflew Iraqi airfields to deliver the JP233 weapon, SAMs and AAA were able to take "a disastrous toll" and that "at least four Tornados [sic] were lost during ineffectual airfield attacks" (page 30). The initial requirement for low-level operations was driven by the potential Iraqi fighter and SAM threat and not by JP233 delivery parameters, per se; pre-planned attack missions were prepared well in advance and without the knowledge of when the campaign would start. Low-level operations were favoured because of the prevailing poor weather conditions and because JP233 was the only coalition runway aerial weapon available to the air commander. The aim was to disrupt operations by attacking airfield facilities and taxiways rather than by attempting to close runways (note the JP233 scars on the airfield photograph). Analysis has shown that the combined efforts of the coalition OCA campaign prevented Iraqi air operations from the



targeted airfields for the first few days of the war, and there is every indication that the JP233 attacks greatly contributed to this goal. Thereafter, when the primary aim of preventing Iraqi air force operations had been achieved, the emphasis shifted to the destruction of aircraft in hardened aircraft bunkers (HAB). At that stage, coalition aircraft adopted medium-level delivery tactics to avoid the risk from Iraq's only remaining strength—optically laid AAA. It was not until some weeks later that Iraqi aircraft fled to Iran (no doubt because of the success of the PGM attacks against HABs), and it is quite likely that Iraq would have repaired the JP233-damaged pavement surfaces in that time.

Six Tornados were lost between 17 January and 14 February. Of those, three were lost to SAMs: two were conducting loft-type 1,000-pound bomb attacks, and one was carrying out a medium-level 1,000-pound bomb attack. Two aircraft were seen to hit the ground following successful JP233 and 1,000-pound loft-bomb attacks (the wreckage has not been recovered and so the exact cause of these two accidents remains undetermined), and one aircraft was destroyed when one or more of its own bombs fused prematurely on release from the aircraft. No aircraft were lost to AAA. In terms of loss rate, the figure for the Tornado GR1 worked out at less than 2 percent overall, which bears favourable comparison with any other conflict; the figure could be reduced further if Tornado GR1A reconnaissance sorties were included in the total.

I hope I have clarified these issues that have been misunderstood by several authors.

Gp Capt N.E. Taylor, RAF
Bracknell, Berkshire, United Kingdom

ECHOES FROM VIETNAM

Lt Col John G. Humphries, in his article "Operations Law and the Rules of Engagement in Operations Desert Shield and Desert Storm" (Fall 1992), provides a useful account of the way in which operations law was applied in Operations Desert Shield and Desert Storm. His comparisons with the application of rules of engagement (ROE) during the Vietnam War would have had more bite were it not for a persistent misunderstanding of the causes of failure in that conflict.

I find it distressing that professional military officers continue to sustain the conviction that the situation in Vietnam was militarily resolvable. "The Vietnam War would have been over in about 1966 had we been given our heads," we hear from Adm Thomas H. Moorer, USN, Retired.

Due to numerous factors, the political, cultural, and historical assessment of the conflict in Vietnam that led to the initial US involvement was flawed, resulting in a poor appreciation and in vague, often contradictory, political objectives. Further, given the strategic circumstances surrounding the conflict, the Vietnam War was severely limited and military options restricted. Fundamentally, however, the conflict was poorly understood, and its resolution by military means was never possible. Ironically, this is evidenced by the continuing problems in Indochina today. The military victory obtained by North Vietnam *also* failed to resolve the crucial issues.

The misuse of ROE and political interference in the detail of military operations experienced in Vietnam are, for sure, errors to be flagged. But let's not forget the seminal lesson of that war: a right appreciation and a clear objective, first on the political level and then on the military, are essential before we commit the lives of our people and the reputation of our nation.

Squad Ldr Christopher McGregor Wright, RAAF
Melbourne, Victoria, Australia

DOCTRINAL DISPUTES

The new AFM 1-1, *Basic Aerospace Doctrine of the United States Air Force*, is a valiant effort, capturing the spirit of a rejuvenated Air Force. However, in his article "The New AFM 1-1: Shortfall in Doctrine?" (Winter 1992), Lt Col Robert N. Boudreau correctly identified its authors' "failure to explore adequately the flexibility inherent in aerospace power to achieve national security objectives short of war" (page 38).

Driven by necessity to reduce the size and strength of the military, Air Force leaders have been forced to make some crucial decisions about the relative merits of all of their resources. They are faced with the necessity to make smarter use of those limited resources, while attempting to preserve our nation's credi-

bility and capacity to respond adequately to threats.

However, as I read between the lines of AFM 1-1, its authors imply that we cannot afford the relative "luxury" of supporting nonwarfare taskings. In other words, success in combat is the sole test of validity for weapon systems, operational plans, and doctrine. This mind-set specifically excludes the types of noncombat air power applications illustrated in Colonel Boudreau's article. The unfortunate and unrealistic aspect of this mind-set is that it makes combat operations much more likely to occur in situations that could well have been handled at a level short of combat.

By espousing doctrine that relegates the prevention of warfare to secondary significance, we commit the military forces of this nation to an all-or-nothing scenario akin to the outdated policy of massive retaliation. This attitude works wondrously well until it suddenly falls flat on its face, and then it does not provide any means of recovery!

Potential adversaries invariably capitalize on such designed-in weaknesses. It takes less imagination to render such policies impotent than it does to sing their praises. Anyone enraptured by the aura of these shortsighted policies is vulnerable to being blindsided at the next turning point in current events.

The future poses new challenges that require innovative solutions. Nonlethal warfare, conflicting commitments and agendas among coalition allies, and the redefinition of national sovereignty are but a few examples of the challenges ahead. Can the Air Force meet these new challenges without expanding the vision of AFM 1-1?

Lt Col Barry G. Litherland, USAF
Maxwell AFB, Alabama

In the "Ricochets" section of the Winter 1992 *Airpower Journal*, Lt Col Jeff Kohler asks some important questions regarding doctrine and the new AFM 1-1. As a "banked" pilot researching and writing a master's thesis on Air Force doctrine while awaiting my next flying assignment, I think I can shed some light on the points he raises.

The 1992 AFM 1-1, by virtue of its two-volume approach and authorship by the Center for Aerospace Doctrine, Research, and Education (CADRE), represents a significant departure

from past manuals. However, as in past manuals, individual personalities still play a major role in the doctrinal process. Certain sections are in the manual, or not in the manual, because of decisions by senior officers as to what they felt our doctrine should contain. The willingness of Colonel Kohler and others to question and criticize the manual ensures that these decisions have positive, not negative, effects.

Colonel Kohler's letter also raises another important issue. He states that, "coming from the trenches," he was not aware of the new manual's existence. Here in the Raleigh-Durham area, there are several active duty Air Force captains and majors, and a former chief of the Office of Air Force History, none of whom were aware of the new manual's existence until September 1992. This seems to illustrate the need for even more effort by the Air Force to reach the grass roots with its doctrine so that young airmen can be better prepared for the future.

1st Lt Andrew D. Dembosky, USAF
Raleigh, North Carolina

KUDOS TO THE AUTHORS

Lt Col Robert N. Boudreau's "The New AFM 1-1: Shortfall in Doctrine?" in the Winter 1992 issue was an excellent article and to the point. You can expect more readers in the future.

The article by 1st Lt Matthew M. Hurley in the same issue ("Saddam Hussein and Iraqi Air Power: Just Having an Air Force Isn't Enough") was also well done. The lieutenant is the type of future leader I look forward to working for. "Aim high," Lieutenant Hurley.

MSgt Sal R. Holguin, USAF
Stuttgart, Germany

I enjoyed the thoroughness of Lieutenant Hurley's article. His assessment was insightful and showed a true depth of understanding.

Dr James R. Hicks
Newport News, Virginia

BOUGAINVILLE BLUNDER

In the Fall 1992 issue, Dr James S. Corum reviewed Harry A. Gailey's book, *Bougainville*,

1943–1945: *The Forgotten Campaign*, which asserts that the responsibility for the senseless 1945 Australian campaign against Japanese forces on Bougainville, largest of the Solomon Islands, rests with Australian general Sir Thomas Blamey, who demanded aggressive operations “to maintain the reputation of Australian arms in a theater of war dominated by Gen Douglas MacArthur and the US Army” (page 84). While Corum does not dispute Gailey’s interpretation and admits it is “plausible,” he says that this interpretation “is not backed up by adequate research.”

I have on my own researched through the archives of the Australian War Memorial in Canberra, Australia, as well as in American archival sources, the issue of the blame for Australian operations not only in Bougainville, but elsewhere in the Southwest Pacific to reduce previously bypassed Japanese-controlled areas, and I have found conclusive evidence that Gailey is on target. The blame (no pun intended) rests with Blamey, the Australian army commander, and with the civilian government of Australia, which wanted and approved these operations for Australian policy goals. For example, in an 8 October 1943 cablegram to Prime Minister Winston Churchill, Prime Minister John Curtin of Australia asserted:

The Government (of Australia) considers it to be a matter of vital importance . . . that her military effort should be concentrated as much as possible in the Pacific and that it should be on a scale to guarantee her an effective voice in the peace settlement.

In a 1 June 1945 cablegram to the Australian high commissioner (equivalent of ambassador) in London answering criticism of the use of Australian forces to liquidate previously bypassed Japanese-held areas, Prime Minister J. B. Chifley (who had replaced Curtin on his death) explained:

From the aspect of prestige and participation in the Pacific peace settlement, it is of great imperative to Australia to be associated with the drive to defeat Japan.

And at the San Francisco Conference a few weeks later, the Australian representatives, as Chifley explained in a cablegram on 20 July 1945 to Churchill, “stressed that the war effort that Australia has made and intends to continue until Japan is defeated entitles us to a

special consideration of our views on and our part in the final Pacific settlement.”

In a speech to the Australian House of Representatives on 24 April 1945 justifying the Australian operations in Bougainville and against other bypassed Japanese positions, Prime Minister Curtin explained that the Australian government “considered it was both logical and appropriate that Australian forces should take over the islands which formed our outer screen of defence and which were mostly our own territory.” And he went on to say, “The Government accepts full responsibility for the operations that are being carried out.”

Some historians have claimed that General MacArthur was responsible for these controversial Australian operations and had conceived of them and ordered the Australians to carry them out. But in fact the operations were indisputably the responsibility of the Australians. In the same speech of 24 April 1945, Prime Minister Curtin explained that while the Australian general in charge, Blamey, kept MacArthur informed, MacArthur gave “no specific instructions” regarding these operations. And communications between MacArthur and the Australian prime minister reveal that when Curtin had asked MacArthur his opinion of Blamey’s proposal “to attack the Japanese instead of using passive defense measures,” MacArthur told Curtin that “the tactics of the problem naturally were a responsibility of the local commander,” but that he “was in disapproval of the method suggested as being unnecessary and wasteful of lives and resources.” MacArthur “advised him [Curtin] strongly not to permit the tactical program suggested by General Blamey.” Thus, Gailey is correct in attributing the Bougainville operations to Blamey, but the policy goals of the Australian government were also involved.

Joseph Forbes
Pittsburgh, Pennsylvania

TWO COMMENTS

I have two comments on your Winter 1992 issue. First, Lt Col Suzanne B. Gehri’s article on Gen Merrill A. McPeak’s new mission statement (“The Air Force Mission [Singular]”) was enlightening, but it didn’t point out the new statement’s one deficiency: while there is no question that defense of the US is our very reason for being, the mission goes far beyond that.

Tying the Air Force to only that premise is too limiting. By the single thesis of defending the US, our Air Force has no business being in Somalia or flying over Bosnia and Iraq.

It even takes elliptical thinking to justify our participation in Operation Desert Storm using the premise of General McPeak's new mission statement. Liberating Kuwait was certainly worthwhile and in our national interest, but it had nothing to do with the direct defense of the United States. I suggest that General McPeak modify the statement as follows: "Our mission is to defend the United States and support its worldwide policy objectives through control and exploitation of air and space."

Second, Lt Col Brian W. Jones's article on the close air support doctrinal disconnect ("Close Air Support: A Doctrinal Disconnect") was much needed, and I'm glad you printed it. It is a subject near and dear to my heart. I do, however, offer a modification to the new definition of CAS he gave on page 69: what he defines as CAS should instead be called battlefield air support (BAS). Real CAS then becomes a subset of BAS. CAS should indeed mean *close*, a term reserved exclusively for air support (helicopter or fixed-wing) of troops in contact and ground forces that are in direct-fire range of each other.

It would take a tremendously large education effort to get both air and ground force comman-

ders to understand this distinction, but once done it would provide large rewards in the joint understanding of air support of ground forces. While the Air Force has seldom done a good job of real CAS, we have done an excellent job of BAS. That is what we should promote as our capability, and that is what we should call it.

Our true job in supporting land forces—other than making sure no enemy air force attacks them—is to (1) keep enemy land forces off the battlefield completely, (2) slow down the rate at which enemy land forces come onto the battlefield so our ground forces can handle them, or (3) weaken the enemy so our ground forces can handle them on the offensive. All of that is *battlefield air support*, and that is what we should call it.

We may even want to abandon true CAS completely (troops in contact and engagements within direct-fire range), since troops on modern battlefields are often intermingled and control and coordination becomes almost impossible. Air support on that part of the battlefield is probably best left to the land force commander's attack helicopters, which the commander can more easily control and synchronize with the fire support scheme.

Lt Col Gary L. Dikkers, USAF, Retired
Otterbach, Germany



NET · ASSESSMENT

AIRCRAFT AND AVIATION

The Politics of Aircraft: Building an American Military Industry by Jacob A. Vander Meulen. University Press of Kansas, Lawrence, Kansas 66049-3904, 1991, 292 pages, \$35.00.

The contents of this book are summarized in its title, which alludes to the politically supervised development of the American military aircraft industry during the interwar period. As a piece of technical historical research, the book stands up well, boasting 10 pages of bibliography, 36 pages of notes, a comprehensive index, ample illustrations, and four appendices that make their limited points concerning selected eras of aircraft production.

However, by failing to hold our interest, Vander Meulen violates Barbara Tuchman's iron law of history: "Keep the reader turning the page!" This work does not excite or inspire us, as does Wayne Biddle's *Barons of the Sky*, which deals with the same men and events and was published contemporaneously with Vander Meulen's book.

The author outlines the development of the American aircraft industry in the interwar period and uses the concepts of political economy and political culture as the agar to feed his ideas. Had he demonstrated more familiarity with castor oil, banana oil, flathead rivets, lapping machines, and the total development of military aviation in this period, he would be more convincing. But any criticism of this book (and Biddle's) must take into account a central and abiding handicap: the aircraft industry would not allow full access to its records for either book.

Nevertheless, Vander Meulen's arguments are not convincing because he seems not to understand the 1920s and 1930s, aircraft and their military uses, aircraft building, the tenor of the times, or the ordinary rapaciousness of the business community. Further, the author's conclusion is puzzling and, I think, simplistic, given the enormous volume of literature on the

care and feeding of the military-industrial complex. In his final statement he says,

Along with the shaping role of political culture in the development of the warfare state, defense industries, and their technologies, the early experiences suggest the connections among war strategy, military doctrine, and the social base of weapon supply.

Despite its shortcomings and because serious, scholarly aviation history is in its infancy, Vander Meulen's work will be a touchstone for some time to come.

Lawrence Carroll Allin
Norman, Oklahoma

AUTOBIOGRAPHY, BIOGRAPHY, AND MEMOIRS

I Could Never Be So Lucky Again: An Autobiography by Gen James H. ("Jimmy") Doolittle with Carroll V. Glines. Bantam Books, 666 Fifth Avenue, New York 10103, 1991, 574 pages, \$22.50.

What a delightful book! Carroll V. Glines (*Attack on Yamamoto* and *Four Came Home*), who has written extensively about Doolittle and his Tokyo raiders for almost 30 years, has helped General Doolittle create an entertaining and enlightening account of a truly inspiring life. But this is really the story of two such lives, for—throughout the book—we are also treated to all-too-brief insights into the equally inspiring life of Josephine Daniels Doolittle, "Joe" to her husband and friends. As General Doolittle says at the end of the book, "Thanks, Joe, I couldn't have done it without you."

Obviously a raconteur at heart, General Doolittle reveals his sense of humor and pugnacious nature as he tells us his story. His laconic style makes this book easy to read but also results in numerous gross understatements. For example, describing the reaction to his decision to cut the fighter escorts loose from the bombers, General Doolittle states that

"many bomber crews remained very unhappy. Some still are." Unhappy indeed! Because of this decision and his decision to increase the sortie requirement of bomber crews—both of which were made fairly shortly after he assumed command—many of the Eighth Air Force bomber crews despised him. It didn't help that General Doolittle had just assumed command from the very popular Gen Ira Eaker. But in true Doolittle style, luck and leadership saw him through these very trying times.

General Doolittle was probably the best known of the air power pioneers and World War II aviation personalities, and his accomplishments almost make your head spin. West Coast Amateur Flyweight Boxing Champion at age 16 and Winchester-Western Outdoorsman of the Year at age 78, he enjoyed and excelled at the physical side of life. A hotdog pilot and air racer, he achieved four aviation firsts, won all of the major aviation trophies, and closed out his pilot logbook in 1947 after 30 years of flying at over 10,000 hours pilot time in 265 different types of military and civilian aircraft. A military leader, he won the Medal of Honor for the Tokyo raid, commanded the mighty Eighth Air Force, and retired as the only Air Force reservist to be promoted to lieutenant general. A respected scientist and businessman, he received one of the first PhDs in aeronautical science and served on the boards of a number of different companies.

Although the book is not an especially reflective account, to hear the Doolittle story in his own words is both engrossing and revealing. If you couple this book with the other good biographies of General Doolittle, a consistent theme emerges. We all have been very lucky to have such heroes as Jimmy and Joe Doolittle.

Lt Col William F. Furr, USAF
Maxwell AFB, Alabama

Driven Patriot: The Life and Times of James Forrestal by Townsend Hoopes and Douglas Brinkley. Alfred A. Knopf, 201 East 50th Street, New York 10022, 1992, 587 pages, \$29.50.

Who was James Forrestal, and why should I read a 587-page book about his life and times? For readers who know the answers to these questions, this book will provide a well-researched, fully documented (80 pages of

notes and bibliography), and well-written source of information and insights. Readers who don't know the answers are in for an even greater treat. This often-compelling account adroitly sketches the events and captures the mood of the times to help us understand Forrestal and his contributions to our nation.

So who was James Forrestal, and why is his name on the corporate research park at Princeton University, an office building in downtown Washington, D.C. (part of the L'Enfant Plaza quadrangle), and an aircraft carrier? Born in 1892 in Dutchess County, New York, Forrestal quickly developed a single-minded determination to rise above his humble beginnings, exhibiting "a relentless drive for the prizes acclaimed by society." Showing journalistic talent, he attended Princeton University, where he was editor of the *Daily Princetonian* but left during the spring of his senior year without graduating. With the onset of World War I, he was commissioned in the US Navy and earned his wings as naval pilot number 154. However, he did not see combat since his superior thinking, writing, and administrative skills caused his commanding officers to continually assign him to desk jobs. Resigning from the Navy in January 1920, he spent the next 20 years making his fortune and climbing the corporate ladder at the Wall Street investment banking firm of Dillon and Read. In June 1940, through the good offices of his friend, Supreme Court Justice William O. Douglas, Forrestal went to Washington to serve his country—first as a special assistant to President Franklin D. Roosevelt and two months later as under secretary of the Navy. In April 1944, he succeeded Frank Knox as secretary of the Navy, and in September 1947 he became the first secretary of defense. On 22 May 1949, two months after being forced to resign by President Truman, Forrestal committed suicide at Bethesda Naval Hospital.

During his almost nine years of public service, Forrestal ably guided the building of the "largest Navy in all the history of man—probably the largest ever again to be seen," helped shape a compromise that resulted in the loose and hostile confederation which became the "National Military Establishment" (Department of Defense) in 1947, and presided over the often-acrimonious debates on service roles and missions. The initial impotence of the secretary of defense and of the Joint Chiefs of Staff was a direct result of Forrestal's aggressive lob-

bying against a centralized military establishment that would impinge upon the Navy's autonomy. After becoming secretary of defense, he discovered that he had succeeded all too well, as the Navy ruthlessly hamstrung his efforts to achieve consensus among the services. The current statements on service roles and missions (DOD Directive 5100.1, *Functions of the Department of Defense and Its Major Components* [25 September 1987], and Joint Pub 0-2, *Unified Action Armed Forces (UNAAF)* [1 December 1986]), which in many cases are imprecise and overlapping, are a direct legacy of this lobbying, as well as of Forrestal's reluctance as secretary of defense to "crack down and make heads roll."

Forrestal was indeed a complex personality whose driven, workaholic public life, combined with an emotionally unsatisfying personal life, led eventually to mental collapse. Townsend Hoopes—an assistant to Forrestal from 1947 to 1948 and former under secretary of the Air Force from 1967 to 1969—and Douglas Brinkley—an assistant professor of history at Hofstra University—have captured Forrestal's triumphs and tragedies, as well as his accomplishments and failures. While holding Forrestal out as a "model hero," they present the man—warts and all. Although written in very readable prose, this book is not for the casual reader who might be turned off by such insightful yet challenging sentences as,

But beneath these surface manifestations of the Horatio Alger syndrome lay qualities of jesuitical complexity and secretiveness wedded to extraordinary discipline and placed in the service of a driving ambition, early determined upon but slow to find focus or definition beyond a perceptible gravitation to the effective exercise of power.

But don't let such sentences deter you; whether or not you know who James Forrestal was, this book has much to offer.

Lt Col William F. Furr, USAF
Maxwell AFB, Alabama

Thunderbolt: Creighton Abrams and the Army of His Times by Lewis Sorley. Simon & Schuster, 1230 Avenue of the Americas, New York 10020, 1992, 429 pages, \$25.00.

Thunderbolt is a warm and readable story about a great American war hero, a man who carried out his difficult duties in Vietnam with integrity and professionalism, and who, as the

Army chief of staff, worked to rebuild the morale and integrity of the Army after that war. It is not, however, the definitive biography of Gen Creighton Abrams as claimed on the dust jacket of the book.

For the benefit of those who have come of age since Abrams's era, he was a graduate of the West Point Class of 1936, a class that also included such future generals as William C. Westmoreland, Bruce Palmer, Jr., and Benjamin O. Davis, Jr. During World War II, he became famous as the cigar-chomping, can-do tank battalion commander who led the drive to relieve Bastogne during the Battle of the Bulge.

In the postwar years, Abrams held a series of staff, command, and school positions. He missed out on Korea, arriving only at the very end, but in 1962 and 1963 he held some sensitive jobs under the Kennedy administration managing federal troops during the desegregation crises in Mississippi and Alabama.

Rising to vice-chief of staff of the Army, he was sent to Vietnam in the spring of 1967 as General Westmoreland's deputy and heir apparent. In June 1968, Abrams officially became commander of Military Assistance Command, Vietnam (MACV). He had the difficult task of withdrawing American forces from an unpopular war and simultaneously preparing our South Vietnamese allies to soldier on alone.

In the summer of 1972, Abrams returned to Washington to become chief of staff of the Army. He worked hard to reestablish the professionalism and integrity that had been so badly eroded by the war and to ensure that the Army would never again go to war without the National Guard and Army Reserve. His efforts were tragically cut short by his death from cancer while in office in 1974.

With such an illustrious career, Abrams deserves an in-depth and objective biography. Author Lewis Sorley, however, is interested in something else. His intent, expressed clearly in the prologue and acknowledgments, is to tell the story of General Abrams as an example of the integrity and professionalism that all Army officers should aspire to. Sorley believes these ideals were sadly lacking in some of the senior leaders he served under. Unfortunately, he has let this laudable goal interfere with producing a balanced and objective story of General Abrams.

There is a didactic feel to the narrative, and lest the reader fail to draw the right moral from

some anecdote, Sorley is not at all shy about pointing it out. The irony of this approach is that one of Abrams's principles was his indifference to his public image. His overall public affairs policy in Vietnam was to avoid optimistic predictions and "let results speak for themselves."

In a way, Sorley has written two books: Abrams before Vietnam and Abrams during and after Vietnam. The pre-Vietnam story seems somewhat superficial with anecdotes and tributes strung together with warmhearted family stories. About half the book covers Abrams's experiences in Vietnam, and it is clear that this is where Sorley's interest lies. Here he is willing to delve into detail and controversy, but even so, he occasionally seems too sensitive about offending people. Sorley's source documentation is uneven. In some instances, such as the case of the murder of a double agent by Green Berets in 1969, he is careful to footnote quotations and controversial statements. But elsewhere (and frequently), the reader who wants to follow up on some point will be disappointed.

Sorley also has an exasperating habit of interjecting characters without introducing them until pages later, if at all. This may be fine for those familiar with Abrams's life and times, but the unfamiliar reader will make many frustrated trips to the index.

The book represents a good first step in filling a void. I recommend it to those who knew and admired General Abrams, as well as those who know little of him. Those who want to study him in depth will have to wait for another book.

Gregory Wilmoth
Cambridge, Massachusetts

Colin Powell: Soldier/Statesman—Statesman/Soldier by Howard Means. Donald I. Fine, Inc., 19 West 21st Street, New York 10010, 1992, 369 pages, \$23.00.

Colin Powell became chairman of the Joint Chiefs of Staff (JCS) on 1 October 1989. Selected over 30 other senior officers, Powell became the youngest chairman and the first African-American to hold the nation's highest-ranking military position. Since assuming his duties, General Powell has led the military during operations Just Cause, Desert Shield/Desert Storm, and Provide Comfort.

Additionally, he has been instrumental in redefining the military roles and missions of each of the services. How did Powell come so far? What are his qualifications? Who is he? What molded him into what he is today? These are some of the questions that Howard Means attempts to answer.

The author bases his book on more than 120 interviews with family members and colleagues of General Powell, including Powell himself and his wife. Relatives, childhood friends, and classmates give us insight into his formative years in the Bronx as the son of Jamaican immigrants, through his days in college and the Army Reserve Officer Training Corps at the City College of New York. Early Army commanders and comrades discuss the general's initial assignment to the Infantry Officers Basic Course at Fort Benning, Georgia; his first field assignment in Germany; two tours in Vietnam; and residency at both the Army Command and General Staff School and the National War College. Mentors, bosses, and friends provide glimpses of General Powell during graduate school at George Washington University; as a White House Fellow; in numerous assignments at the Pentagon on the Army staff and in the Office of the Secretary of Defense; as a commander of a battalion, brigade, corps, and of Forces Command; and as deputy national security advisor to the president and later as national security advisor.

General Powell's success will prompt many people to read this book. Without a doubt, Powell is better known by the public than any other JCS chairman, due in part to the fact that he is the first African-American to hold the position. His fame is also due to his on-camera presentations during major military operations and to the successful performance of the military under his guidance.

Although informative, the book isn't without problems. I found the book lacking in terms of transition and organization. Means's writing style is rather choppy, and he tends to jump abruptly from one interview to the next. Additionally, a few statements presented as facts appear to be in error, although only a student of military history would notice them. Despite these problems, the book is useful for gaining some insight into Gen Colin Powell, the man and the leader.

Maj David K. Swafford, USAF
Kirtland AFB, New Mexico

FICTION

Air Force Eagles by Walter J. Boyne. Crown Publishing, Inc., 225 Park Avenue South, New York 10022, 1992, 464 pages, \$20.00.

In *Air Force Eagles*, the last volume of his fictional trilogy (preceded by *Trophy for Eagles* [1990] and *Eagles at War* [1991]), Walter J. Boyne spans one of the most tumultuous periods of our nation's history, from the onset of the cold war, through the rise of Strategic Air Command (SAC) and the beginning of the civil rights movement, to the outbreak of the Korean War. Although we are introduced to a huge cast of characters, the novel's principal interest lies in the struggle between the forces of good—led by aviation pioneers Frank Bandfield and Hadley Roget, and Tuskegee airman and fighter pilot John Marshall—and the forces of evil—led by scheming politician Milo Ruddick and corrupt aerospace magnate Troy McNaughton.

These characters find themselves caught up in turbulent events that mirror the social, political, and military upheavals of the time. For example, Bandfield and Ruddick—secretly a member of the Ku Klux Klan—clash over proposed legislation to integrate the services and over the loss of Ruddick's son in a plane crash, prompting Ruddick to have Bandfield brought before the McCarthy hearings as a Communist sympathizer. Further, the Korean War provides the setting for Marshall's efforts to become the nation's first black ace, and the civil rights movement serves as a backdrop to romantic intrigue when Marshall learns of his wife's involvement with Dr Martin Luther King. Boyne also touches on scandal and corruption in the aircraft industry in an episode involving the installation of defective parts on B-47s assembled at McNaughton's aircraft company. The interweaving plot lines come together in a swiftly moving climax when Ruddick's Klansmen clash with Marshall, Roget, and Bandfield on the streets of Little Rock.

Not only is *Air Force Eagles* fun to read, but it accurately describes many of the key problems that emerged during the rise of SAC's nuclear forces, especially the mechanical difficulties of the B-47. The flying scenes are vividly detailed, the characters are realistic, and the story moves ahead at Mach speed.

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GULF WAR

How CNN Fought the War: A View from the Inside by Perry M. Smith. Birch Lane Press, 600 Madison Avenue, New York 10022, 1991, 256 pages, \$18.95.

How CNN Fought the War describes in detail Perry Smith's six-week experience as one of two Cable News Network (CNN) military analysts who interpreted the war against Iraq for an audience unprecedented in its size and scope. He chronicles the fast thinking under pressure, the lightning phone calls, and the 18-hour-plus days that go into CNN's virtually immediate reporting of a major news story. In all of this, he accurately provides an account of an organization meeting a challenge so great it might be compared to the challenge of war.

However, Smith's book really shines in presenting the background of the war and its subsequent prosecution. General Smith describes the leaders, weapons, and tactics used in the war in language that is so eloquent yet succinct that one can safely assert that this volume is *the* book on the Gulf War for the reader who is unfamiliar with military matters. Whether the topic is the history of precision bombing, the technology of "smart" weapons, or the lessons learned in the air and ground campaigns, General Smith's work provides thorough information and (the reviewer believes) worthy analysis.

Of course, when one thinks of the Gulf War and CNN, one cannot help thinking of the controversy surrounding Peter Arnett's exclusive transmissions from Baghdad. Smith, who had misgivings about remaining with CNN during this time, provides full details about the episode. Although he criticizes Arnett, Smith ends his tempered analysis by calling for the military to "view the media not as an enemy, but as an institution of vital importance to the American political culture." But the essence of armed conflict for soldiers and nations is survival; for reporters, it is a drama in which two persons or teams compete. Accordingly, the reviewer sees as fundamentally flawed Smith's notion of a future in which the press and the military cooperate more fully.

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On Strategy II: A Critical Analysis of the Gulf War by Harry G. Summers, Jr. Dell

Publishing, 666 Fifth Avenue, New York 10103, 1992, 302 pages, \$4.99.

Harry Summers does it again—whatever it is. There is much that is new and much that is interesting in *On Strategy II*, but there is little to nothing that is new and interesting. If you liked his *On Strategy [I]: A Critical Analysis of the Vietnam War*, you should be quite pleased with *most* of II. One thing is for sure: Harry hasn't changed his mind. Indeed, the term *ossification* suggests itself.

On Strategy II seems to be made up of about two-thirds rehash of I, one-sixth self-serving back-patting over how critical I's analysis was to the recovery of the US Army, and one-sixth vituperation of the *schizophrenic* (Harry's term) US Air Force. His treatment of Vietnam has changed little; his back-patting is understandable but ill conceived; and his treatment of the Air Force, though in one *small* sense correct, stems from total ignorance of air warfare. Harry knows ground war; he should go with his strong suit and stay away from a discussion of air power until he's willing to spend some time learning about it. He gives himself away from the opening moment.

In his real heart of hearts, Harry believes that the Army won the war all by itself. Don't rely on my judgment—go to the library (please don't encourage Harry further by actually spending money on this lightweight work) and check it out for yourself. The frontispiece, which purports to show "How the War Was Won," is vintage ground-pounder. In Harry's world, the only things that count are little flags and arrows on (very) simple Mercator projections. His version of the war began on 23 February 1991, with the Iraqi order of battle precisely as it was on 16 January of the same year. Whatever the silly airmen did in the intervening period was simply superfluous (unless, of course, you might happen to belong to one of the tens of thousands of families that *didn't* lose a son or daughter during the ground phase—but then again, we tend not to concern ourselves with what didn't happen).

Interestingly, this narrow parochialism is precisely what Harry accuses the Air Force of:

The Army, Navy, and Marine Corps concede that they are joint services . . . but there are those within [the Air Force's] ranks . . . who have the conceit that air power can win wars all by itself. . . . Official Air Force doctrine [says that] aerospace power *can* [emphasis added] be the decisive force in warfare.

Can is a long way from *is*, Harry, and *decisive* doesn't necessarily mean *only*. What is totally amazing is how proud Harry is of the Army's countervailing "joint service" perspective.

According to Harry, "FM 100-1 also reflected the Army's renewed confidence in itself and its *primacy* on the battlefield." In fact, "the June 1986 revision was even more direct: 'The Army is *the* decisive component of military force by virtue of its ability to control the land areas essential to people and nations'" (emphases added). Summers says that for some people "the real issue is the Orwellian argument that while all the armed forces are equal, some are more equal than others." Absolutely correct, and they do not all wear light blue.

The glorification of the US Army and the vilification of the US Air Force constitute a major flaw, especially to an airman, but the problems with this book go much deeper than that. Summers does a creditable job of exploring a Clausewitzian construct of our problems in Vietnam (a rehash of *On Strategy [I]*) and speculating about how that *may* have affected our operations in Desert Storm. This will be of some use to readers who wish to examine *possible* explanations for the outcomes. I personally think that Clausewitz is amazingly useful today, considering that he wrote in the early nineteenth century. His, however, is only one of many useful works on the subject of warfare, and there is at least some possibility that one or two of his points may be outdated a century and a half later. Clausewitz himself emphasized the necessity of utilizing recent experience: "The further back one goes, the less useful military history becomes, growing poorer and barer at the same time." *On Strategy II* is not so much flawed as it is limited by making Clausewitz its sole frame of reference.

The list of critical flaws is nearly endless, but my short list of favorites includes the following:

- AirLand Battle "would prove to be the blueprint for victory in the Persian Gulf war." Try to find the premise for a 38-day strategic air campaign in AirLand Battle.
- "Even though the bombing had inflicted severe damage, the Iraqis were able to . . . maintain the strategic initiative." No comment necessary.
- The "euphemism" *national command authority* was not used "for whoever it was making the key decisions." Instead, it was "the

president of the United States, George Herbert Walker Bush," who was making the decisions. Apparently Harry doesn't know that the national command authority *is* the president, along with his secretary of defense.

• "The first response to a crisis abroad should be the deployment of an intervention force, primarily naval forces, including carrier battle groups." I suppose if you've seen one crisis, you've seen 'em all, huh, Harry?

My final recommendation on the work: As an airman, if you've read *On Strategy I*, you've no real need to read II, unless you haven't enjoyed a real good rage in a while.

Lt Col Edward C. Mann III, USAF
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With the Gulf War more than a year behind us, yet another book emerges on how it went. This one, however, is worth reading! A well-written companion to Colonel Summers's acclaimed best seller *On Strategy: A Critical Analysis of the Vietnam War*, *On Strategy II* seeks to show the man in the street how we came so far since the Vietnam War. Yet, the military professional is the one who will most appreciate this work.

If you are looking for a nice coffee-table book with glossy photos of your favorite airplane, tank, or ship, this book is not for you. Likewise, if you are looking for a blow-by-blow account of Operation Desert Storm, you had better pass this one up. In fact, Summers tells us up front that "this work is not intended as a history of the Persian Gulf War."

Though the title indicates that this is *A Critical Analysis of the Gulf War*, it might appropriately be subtitled *How We Learned from Our Mistakes in Vietnam*. Far more than analyzing how we did things right in the Gulf, it is very much an analysis of how we did things right in the years between the conflicts. More than just a story of lessons learned, it is a story of applying what we learned to make sure Vietnam never happens again.

By drawing on his previous work, Colonel Summers describes the mind-set of the US "military establishment" (the services, secretary of defense, and the president) during Vietnam and the way that attitude led to our defeat (?) in Southeast Asia. He then proceeds to explain the route the services took in "fixing what we could fix." You will learn that rein-

roducing Clausewitz into the professional military education curriculum was a deliberate attempt to get the military out of the frustrating business approach of Secretary of Defense Robert S. McNamara and back to thinking about the principles of war fighting. Further, Colonel Summers rightly gives credit to a few members of Congress who forced the services to take jointness seriously, just in time for Desert Shield/Storm.

Colonel Summers explains how President Johnson made several fundamental errors in his prosecution of the Vietnam War and how President Bush avoided them. Getting congressional approval to use military force (something Johnson never did) was an absolute necessity, both because it was a constitutional requirement and because it united the government. Likewise, a large-scale call-up of the Guard and Reserves (another thing Johnson refused to do) was not only necessary from a military standpoint, but also served to unite the country behind the president because the call-up touched virtually every town in America. Finally, we had military leaders in the Gulf who were free to prosecute the war within the broad guidelines laid down by the president and the UN, without the constraints imposed by political micromanagement.

As you read *On Strategy II*, keep in mind where we are headed today, in light of the emphasis that we are placing on total quality management and team building. This is not the first time we have tried to apply business principles rather than war-fighting principles to the US armed forces. That is what both of the *On Strategy* books are all about.

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LEADERSHIP, MANAGEMENT, TOTAL QUALITY, PERSONAL AFFAIRS

Personal Computers for the Computer Illiterate: The What, When, Why, Where, and How Guide to Understanding, Buying, and Using by Barry Owen. HarperCollins Publishers, 10 East 53d Street, New York 10022, 1991, 181 pages, \$10.95.

Here's the challenge: without resorting to computerese, explain the concepts that beginning computer users will need to understand the dynamic and complex world of personal

computing. Barry Owen is up to the challenge in this guide for the new computer initiate. Throughout the book, he keeps his audience—those getting ready to dive into the world of personal computing—in mind. The book maintains a readable voice, though its “plain English” claim may be a bit misleading. The voice you hear when reading this book is less like the voice of Rudolph Flesch than the voice of Chris, the philosophical disk jockey on television’s “Northern Exposure.” As Owen expounds on the distinction between “software—glorious, triumphant, empyrean software” (page 77) and hardware, he writes, “It’s the old yin-yang dichotomy. You know: Plant and animal. Male and female. Good and evil. Mind and matter. Software and hardware” (page 77). Plain English? Maybe not, but it is entertaining English and, more importantly, not computerese.

Although Owen touches on every aspect of personal computing, this concise book is noteworthy not only for its writing style but also for the technical detail that’s left out. You won’t find lengthy explanations of binary and hexadecimal arithmetic, nor of data-transfer rates, fixed-disk seek times, and so forth. Instead, you’ll find a book that focuses on the concepts that transcend the technical details—concepts such as deciding upon software (the programs you want to use) before committing to specific hardware (the machinery that runs the software).

Owen provides an extensive listing and discussion of types of programs available, and he explains other important software considerations such as ease of use, compatibility, customer support, and transfer of work between different programs. Avoiding the temptation to describe specific applications such as WordPerfect or dBaseIV, he describes each class of programs from accounting software to word processors. Few will read this section without wondering how we did anything before the computer arrived. But if you’re looking for specific information about particular programs, you’ll need to search elsewhere; a book can’t keep up with all the latest releases of updated software versions. That kind of late-breaking news rightly belongs elsewhere, and to his credit, Barry Owen handles the task of providing a practical background for making software decisions without bogging down the reader with details about last year’s software releases.

After discussing software, Owen provides an overview of hardware, and here he may face the greatest challenge in trying to communicate the important concepts without relying upon dated details or ideas that technology has passed by. The task is more difficult because hardware has changed more than software has. When personal computers (PC) first became popular a dozen years ago, the software used was of the same type as the software we use today—word processors, spreadsheets, games, graphics, communications, and so forth. Today’s software may be more reliable, easier to use, and more powerful, but these changes haven’t been of the magnitude we see in hardware. Today’s entry-level personal computers offer 30 times the memory, 50 times the speed, and 100 times the long-term storage as their early 1980s ancestors. Such rapid change makes it difficult to discuss hardware without dating oneself. While many would agree that among PC enthusiasts “hard disk size . . . has become a macho thing” (page 114), some may take issue with his dictum that “average users . . . will get by quite nicely with 40 megabytes maximum” of hard drive space (page 115). And others will suspect that since writing the book, Owen has probably replaced his 1986 10-megabyte hard drive with something more macho. Nevertheless, his underlying advice—that buyers of personal computers should have good reasons for investing in the technology—is especially sound. Further, it’s not the kind of advice that’s easy to find in most computer stores. *Personal Computers for the Computer Illiterate* won’t make anyone an expert, but it does point the beginner in the right direction.

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POSTWAR YEARS

First Call: The Making of the Modern U.S. Military, 1945–1953 by Thomas D. Boettcher. Little, Brown and Company, 205 Lexington Avenue, Boston 02108, 1992. 464 pages, \$27.50.

In 1945 America emerged from her greatest war expecting a traditional return to normalcy. The great armies, navies, and air forces that had played a central role in bringing totalitarianism to its knees would stage triumphant victory parades and then be broken up, and sol-

diers, sailors, and airmen would return to civilian life. Only a "saving remnant" of professional noncommissioned officers and commissioned officers—the latter primarily service academy grads—would maintain what little defense the nation required. In less than a decade, however, this American idyll would be shattered, broken upon the rocks of an emerging cold war, and consumed in the flames of Korea. In its place would emerge a "balance of terror" and a military-industrial complex assembled to compete in a bitter ideological struggle that would last half a century.

Thomas D. Boettcher's *First Call* is a gripping, balanced account of the nine most crucial years (1945–53) in modern American defense and foreign policy. Beginning with the great victory parades of 1945, Boettcher shows how American expectations of disarmament and retrenchment were slowly yet powerfully reshaped by the emerging consensus that saw the Soviet Union as a mortal threat. It quickly became apparent that military power would have to serve as the cornerstone of containment. Thus, for the first time in history, America would commit herself to a peacetime military buildup. Despite the shadow of Pearl Harbor (i.e., the fear of unpreparedness and surprise attack), made even more ominous by the advent of nuclear weapons, this rearmament was grudging and resulted in a classic "ends and means" conundrum in which American military power lacked the ability to enforce our foreign policy goals, should they be challenged by armed force.

This "gap" between policy goals and their requisite tools culminated in Korea, where soft, undertrained, miserably equipped American soldiers came perilously close to outright defeat at the hands of North Korean forces in the early days of the conflict. By the end of the Korean War, the American defense establishment had assumed a distinctly "modern" look that would stand watch over the nation's security throughout the cold war. But hammering out the new Defense Department had been anything but easy. Expectations of retrenchment had fueled vicious interservice budget battles, culminating in the notorious "revolt of the admirals." The specter of defeat in Korea had prompted a hard look at the nuclear option, and one of the critical aftershocks of President Harry Truman's dismissal of Gen Douglas MacArthur was the initiation of the policy that these awesome devices would become

weapons of last resort. Most importantly, the American people had received their first, hard lesson about the problems and pitfalls of war in the nuclear age.

The greatest strength of *First Call* is its characterization. Gen George C. Marshall, General MacArthur, Dean Acheson, James Forrestal, and George Kennan—the men who assisted in shaping the American response to the cold war—are convincingly portrayed. Looming over all these men was the figure of Harry Truman; perhaps more than any other man, he was the architect of modern American defense and foreign policy. Boettcher, while never fawning, clearly admires him and drafts a convincing argument for the long-term success of the Truman presidency.

First Call's other great strength is its readability. Boettcher has crafted a fine narrative; his chapter on the Chinese intervention in Korea, with all the problems this caused, is powerfully written. The volume is a judicious, even-handed assessment of arguably the most crucial period in modern American history. *First Call* is a fine interpretation of this period and merits a place on the bookshelves of the military professional.

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SISTER SERVICES

The Leverage of Sea Power: The Strategic Advantage of Navies in War by Colin S. Gray. Free Press, 866 Third Avenue, New York 10022, 1992, 276 pages, \$24.95.

In the debate over land power, air power, and sea power, scholars have argued over the advantage that each provides in decisive military victories from the Persians' war with the Greeks in the fifth century B.C. to the cold war in the twentieth century A.D. Every war needs investigation from historical as well as current perspectives, and this text provides an excellent example of how naval power has been the strategic edge in military victory. According to our 1992 *National Military Strategy of the United States*, military power must provide strategic deterrence, forward presence, crisis response, and reconstitution. The role of sea power in these foundations and principles must be broached. This text may be one impor-

tant step toward an understanding of where sea power should be placed in our strategic landscape.

This text first investigates the nature and uses of sea power and then sea power practices. It next analyzes sea power in comparison with land power and then chronicles the history of sea power from the age of the galley through the cold war over six chapters. Finally, the author speaks of his own philosophy of "the leverage of sea power for victory."

In a century that has experienced advances in technology far beyond our wildest imagination, the author feels that the role of sea power has been undermined. It is his feeling that sea power has and will always be leverage necessary in military victory. He backs his claim with a chronicle of naval battles throughout history as well as in reference to Operation Desert Shield/Desert Storm. In today's supersonic, information age, the author has failed to give air power proper credit. Even though all will agree that sea power, land power, and air power are all needed for decisive military victories, the catalyst in the modern age has shifted from sea power to air power as the technological breakthroughs of the last century have made air power more important. Gray does not deny this but contends that technology has made sea power more important as well. I will not argue against either, but air superiority has become primarily important in the projection of military power as was sea superiority in the past. Both are necessary, but air superiority must come first for sea superiority to be possible—a point missed unfortunately by the author. Even though Gray correctly analyzes that what was primarily an air war in the Gulf was sustained by sea power that supported heavy forces, he fails to mention that the air strategy guaranteed victory. All three were needed, but air power provided the decisive blow.

Gray quotes Herbert W. Richmond in *Statesmen and Sea Power* (1947) as saying, "Sea power did not win the war [World War II] itself; it enabled the war to be won." However, Gray says, "War is a team enterprise." Sea power combines with land power and air power and, in today's modern battlefield, even space power. Sea power, he believes, provides the "leverage" for victory. He goes on to say, "Sea power, land power, and air power are partners rather than foes." Gray, however, laces his argument with hundreds of historical

references that detail his views on combined arms. He reflects on how every major power has used military advantage to their benefit and defended their global and regional interests using primarily a naval-based strategy.

Of all the conclusions made by Gray, the most telling are his conclusions with respect to wars between sea powers and land powers. He concludes, "First, a continental power can win a war by securing military command at sea, by achieving sea denial, or even by disputing command at sea vigorously (and) second, for a sea power or a maritime-dependent coalition, command at sea provides the strategic conditions indispensable for success at war." Unquestionably, mobility and forward presence of naval forces have and will prove themselves the decisive edge to successfully win wars, but technology and methods of war change. Mobility of air forces in the age of information must not be overlooked. The author fails to realize that in an age when leaders worldwide can view events as they occur by satellite, action and reaction often occur instantaneously. Naval forces have proven their part in each of the foundations of our national military strategy, but more in the area of strategic deterrence and forward presence. I believe the author fails to notice the critical role air power plays in crisis response as well as in rapid deployment. Air power works well in concert with sea power and land power as the author suggests, but in an age of information, air power and soon, space power will dominate. Air power's response to global threat must preclude movement of naval vessels on a planet surface that is covered mostly by water but covered completely by air.

I highly recommend this book, nevertheless, as a valuable chronicle of naval history in a concise and lively format. All military officers will benefit from historical facts and in-depth analysis of naval power. The projection of naval forces will always be part of a nation's overall military strategy, but readers should be warned that air power will not be highlighted.

Dr Saul Z. Barr
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SPECIALIZED INTEREST

Swords of Lightning: Special Forces and the Changing Face of Warfare by Terry White.

Brassey's (US), 8000 Westpark Drive, First Floor, McLean, Virginia 22102-3101, 1992, 279 pages, \$24.95.

Since the ending of the cold war and the collapse of the once formidable Soviet military machine, military thinkers have been engaged in a mental exercise designed to make clear what the nature of future operations will be. In the face of a supposedly less dangerous world, all of the armed services are trying to justify their role in the defense of nations. Of course, at the heart and soul of this exercise is the fact that with peace, or at least a perceived lack of an external threat by the public and by politicians, there are shrinking budgets. With the spectre of the Red Army pouring across that inter-German border gone, perhaps it is time to reallocate resources and look for cheaper ways to counter new threats. A reliance on the use of special forces or special operations units against terrorism or against smaller states who upset the international tranquility seems appealing. Since this is part of the post-cold war debate, it would be wise to know the nature and origin of those units. Much can be gleaned from historical investigation. Terry White's *Swords of Lightning* does indeed fill in needed gaps in the basic understanding of special forces and what they have been able to do in the past.

White's work is not a scholarly monograph drawn from archival sources. *Swords of Lightning* is drawn from open sources with a definite affinity for those groups in the Anglophone world. There will be disappointment for those looking for a detailed analysis, but those looking for a handy, well-written survey of special forces and their history and application will find much to recommend in this work. What we have in this work is a very direct narrative that delivers what it promises—an overview or a brief, sometimes too quick, discussion. The postscript on the Gulf War adds nothing to the work or to our understanding of special operations and forces in the Persian Gulf War.

The text begins with a discussion of the extraordinary requirements to become a member of a special forces unit. White starts with the area he is most familiar with—Britain's Royal Commandos. The author covers a multitude of specialized units from Britain's famed Special Air Service (SAS), the Australian SAS, American Rangers, and Special Forces. White

states that "the Rangers serve as a 'mailed-fist' within USSOCOM [United States Special Operations Command] and as an integral part of the US Rapid Deployment Force" (page 33). If such is indeed the case, why were the fine-tuned Ranger units left out of the Persian Gulf War? Certainly special operations were a viable part of combat in the Gulf, but it does appear that, regardless of claims, these units were not always used. There is no question, however, about the method of training of these specialized formations. Of particular value, and often overlooked, is the author's discussion of air support for special operations and special forces.

Part three of this book deals with "the changing face of warfare," and it is here that Terry White makes his greatest contribution to the casual reader. He discusses the training of proxy forces, counterterrorism, and quick-reaction forces. White capsulizes major new trends and, for those not familiar with military operations, describes the new challenges.

There is a short, very select English language bibliography, a very helpful listing of acronyms, and a large number of illustrations. Terry White did not write *Swords of Lightning* as a definitive work, and probably no one will be able to do so until archives are made available. This book is valuable for those who want a well-written survey of special forces and operations. It is not for the specialist or practitioner, but that was not White's purpose. For general, readable literature, this book will more than suffice.

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STRATEGY, POLICY, AND INTERNATIONAL AFFAIRS

Making People Disappear: An Amazing Chronicle of Photographic Deception by Alain Jaubert. Brassey's Defense Publishers, 8000 Westpark Drive, First Floor, McLean, Virginia 22102, 1989, 192 pages, \$27.95.

Alain Jaubert has compiled "an extraordinary collection of photographs that have been doctored or falsified to achieve political effects at various times in the twentieth century." His book will give readers unusual—and often grim—insight into the manipulations that are

possible when someone is determined to deceive others. Again and again he shows us how political opponents or competitors have been excised from photographs, while the accompanying text explains how these people simultaneously disappeared from public life—frequently through assassination.

Jaubert turns his attention to some of the most notorious of this century's totalitarian regimes: Russia and the Soviet Union, Fascist Italy, Nazi Germany, Communist China, Czechoslovakia of the 1968 "Prague Spring," and "lesser" players such as Vietnam, the Balkans, and Cuba. In 13 brief chapters, he illustrates the five principal methods of altering a photograph (retouching, blocking, cutting out, recentering, and effacing), sometimes with almost humorous irony. In one segment, he points out how over 60 years retouchers used each of these methods on a picture taken in July 1920 at the Second Congress of the Communist International: a balustrade behind Lenin is repaired, people disappear, Lenin's shoes get shined, weeds at his feet get cut, and his little finger disappears into his pocket. In other examples, we see the results of the retoucher's inattention to detail when people disappear but their shadows or tips of their shoes remain.

Intelligence professionals might do well to comb through the photographs and text in *Making People Disappear* to enhance their interpretive and analytical skills. Unfortunately, Jaubert neglects to support his text with footnotes. Further, the format of his bibliography is undecipherable, so it is difficult to corroborate his claims. One claim in particular that bothered me was an entry that mentions a photograph of a memorial service for sailors aboard the French freighter *La Coubre*, which exploded while it was allegedly carrying weapons to Cuba in March 1960. Jaubert declares that the ship was "no doubt sabotaged by the CIA." Such an unsupported comment just does not fit in this otherwise enjoyable book.

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Strategic Surprise in the Age of Glasnost by David Thomas Twining. Transaction Publishers, Rutgers, the State University, New Brunswick, New Jersey 08903, 1992, 309 pages, \$39.95.

The Strategic Revolution: Thoughts for the Twenty-First Century by Neville Brown. Brassey's (US), Inc., 8000 Westpark Dr., 1st Floor, McLean, Virginia 22102, 1992, 248 pages, \$39.95.

Together, *Strategic Surprise* and *Strategic Revolution* explore a wealth of issues in the post-USSR era. The failed coup and the surprising victory of democracy in what is now the Commonwealth of Independent States (CIS) created a euphoria as well as a vacuum in international thinking. These events also raised the question of what the strategic landscape of the twenty-first century will be like. Reading these two books would be a good place to start looking for the answer.

The most compelling fear of the post-USSR age is the threat posed by the enormous arsenals of nuclear weapons aimed by the CIS at what one Russian submarine commander called in a recent issue of *Izvestia* "our new friends in the West." Twining explores this threat in detail, addressing surprise nuclear combat in his first three chapters. He feels that the "possibility of a strategic surprise attack is ever present as long as the capabilities for execution exist" (page 19)—a sobering thought in light of the two powers' vast nuclear arsenals. Twining investigates what he feels are the principal factors relating to strategic surprise: the collapse of containment as a military/political strategy; strategic commitment by the US that far exceeds its available resources; the paradox of nuclear deterrence in a multipolar world; nuclear proliferation and the associated fear of accidental nuclear war; and the military advantages of surprise attack. As director of Soviet and East European Studies at the United States Army War College, Twining—both as a student and professor of Russian history—clearly explains both where Russia has been and where it is now going. This is an insight that few military planners can afford to miss.

Neville Brown's *Strategic Revolution* looks into the post-USSR world from a totally different vantage point. Brown examines an emerging world so highly complex that professionals as diverse as economists, geographers, climatologists, and ecologists must come together to refine international security strategy.

Brown begins by explaining what he sees as a strategic revolution in the post-USSR age. This strategy is based on the Roman precept that holds, "If you want peace, prepare for

war," but adds a slight twist: "If you want peace, prepare for war, but also prepare for peace." While the world seeks peace, though, new issues arise. For example, Brown sees not only the military but also global issues such as a stable ecology as causes for conflict. He believes that the world has been temporarily distracted by the so-called end of the cold war; consequently, people fear that the current peace may be unsupported and imaginary.

Strategic Surprise and *Strategic Revolution* approach the subject of the post-USSR world quite differently. Because Twining documents the possibility of a nuclear surprise attack against the US, I recommend his book to all military strategists. Brown, on the other hand, believes that a strategic revolution will follow the demise of the Soviet Union. Although *Strategic Revolution* looks at the world from an interesting perspective, it never comes to any specific conclusions. Together, however, both texts examine the politics of the post-cold war world in a way that would be useful to military planners trying to forecast an uncertain future.

Dr Saul Z. Barr
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A Paper House: The Ending of Yugoslavia by Mark Thompson. Random House Inc., Pantheon Books, 400 Hahn Road, Westminster, Maryland 21157, 1992, 350 pages, \$23.00.

A Paper House is a book with an identity crisis. The author walks a fine line between providing the reader with a travelogue on the one hand and providing the reader with a subjective history on the other. This book, like its topic, does not fit neatly into categories. The historian in me was frustrated by not having more information of all kinds on almost everything on which the author touches. The tourist in me was frustrated because the author *does* describe some interesting places that I can no longer hope to visit.

As a social commentary, it marks the death of a nation-state and gives insight into the complexities of a region that is too little understood. Perhaps that is the strongest reason why a military professional should take the time to read it. The events unfolding daily in that corner of the world have a high probability of impacting our military careers and our lives. One of the author's acquaintances in the book

puts it very well: "It's not how small a nation is, but whereabouts it happens to be small."

Thompson's account begins a year before the most serious of the problems began to highlight the daily evening news. In the author's defense, this world region does not fit neatly into traditional Western analysis. Its complexity defies nation-state boundaries and hence poses a serious quandary for US policymakers. US interests in the region dictate stopping the predatory expansion, stopping the atrocities of ethnic cleansing, and easing starvation. US interests do not lie in creating another small country. The use of military force to benefit Bosnians being held captive to starvation can be equated to a de facto alliance for Bosnian independence, while US humanitarian interests dictate that we not stand by idle.

The region has been on the boundaries of major powers for thousands of years. At times it has been the pawn and at times it has been the chessboard. The question before US policymakers is whether we deal with the government de jure or the government de facto. Tito's partisans kept the German forces of World War II occupied in the mountains for years, and they never caught him. Some assessments indicate that Tito also made sure his beloved Yugoslavia had two or more years of arms and supplies cached away in case there was a need to fight that same kind of war again. Those arms now fuel the fires of nationalism that rage across the lands of the Bosnian Muslims, the Croatian Catholics, and the Serbian Eastern Orthodox Christians.

Thompson is not a military strategist or a national security analyst; he is a journalist. If his analysis is found lacking, his journalistic ability to tell a story is not. His style is very readable and understandable, and he takes you into the homes and occasionally into the minds of the people. He has captured their passion and conveys it to the reader. Again, this book is worthy of consideration by the military professional contemplating operations in the region. It is never too soon for one to try to come to grips with the complexities of the region.

Lt Col Albert U. Mitchum, USAF
Maxwell AFB, Alabama

The United States Military under the Constitution of the United States, 1789-1989
edited by Dr Richard H. Kohn. New York

University Press, 70 Washington Square South, New York 10012, 1992, 424 pages, \$40.00.

The average US citizen simply assumes that the military does not have a role in the politics of the nation. In fact, this belief is so ingrained in the American way of life that we often forget this is not the case in most of the nations of the world. That the American military has for over 200 years maintained as its only legitimate role the defense of the nation is in large measure due to the foresight of our founding fathers in their development of the United States Constitution. US military personnel swear their allegiance to the Constitution of the United States, not to any individual—military or civilian—except in his or her constitutional capacity. Dr Richard Kohn, former chief of the Office of Air Force History, suggests in this work that the 200th anniversary of the Constitution of the United States is an appropriate time to consider the interplay of the US military and the Constitution.

In the time since the contributors to this anthology undertook that task, significant changes in the world political scene have made the review of this unique political-military relationship even more worthwhile. As new nations emerge and as we reconsider the appropriate role for the military in the "new world order," it is especially appropriate that we review the role of the US military under the Constitution for lessons it can teach us for the future. These lessons will have value, both in determining the role of the US military in a changed world and in preparing us to help the emerging nations of the world develop their fledgling democracies. Dr Kohn's book provides us with an excellent starting point for this review.

As with most anthologies, the quality of the individual chapters varies, and the appropriateness of the chapters to military people varies as well. The chapter on "Woodrow Wilson as Commander in Chief," for example, is well written and interesting but is really more about how Wilson dealt with political needs during World War I than it is about how the military and the Constitution were affected by the conflict. However, this does not detract from the overall value of the book to military officers who wish to consider their role in national defense.

Dr Kohn has constructed a variety of topics

that are relevant to the constitutional role of the US military. The book first considers why the framers of the Constitution constructed the role of military forces the way they did. Emphasizing the fact that our forefathers wished to avoid the mistakes of European military establishments, the contributors discuss the relationship of citizen-soldiers to the rest of American society, as well as the role of blacks in both the military and society. A major portion of the book is devoted to tracing the development of the United States into the dominant power of the twentieth century, a process which did not impede its ability to maintain complete civilian control of the military. The broad range of chapter topics within this area gives a complete view of civil-military relations. Current issues concerning the legal status of military personnel and the problems of secrecy and intelligence-gathering in a democratic society round out the subject matter. All of these subjects prove interesting and worthwhile for the reader who seeks broad understanding of the role of the military in America or specific knowledge in a particular area. The book is well worth adding to one's personal library and is useful as reference material for courses in professional military education as well.

Lt Col Michael A. Kirtland, USAF
Maxwell AFB, Alabama

House of Cards: Why Arms Control Must Fail
by Colin S. Gray. Cornell University Press,
124 Roberts Place, Ithaca, New York 14851,
1992, 256 pages, \$28.95.

Arms control will never succeed because it does not take the political realities of international relations into account. So argues Colin Gray in his newest national security text. Although existing approaches to arms control appeal to common sense, they are logically unsound and inherently impractical. Arms control throughout history has reflected—but has not influenced or shaped—the international political situation. *House of Cards* compares the failed naval arms limitation agreements of the 1920s and 1930s, the Washington Naval Treaty (1922), the London Naval Agreements (1936), and the Anglo-German Naval Agreement (1935) with the recent Strategic Arms Limitation Talks (SALT), Strategic Arms Reduction Talks (START), Intermediate-range Nuclear Forces (INF)

Treaty, and Conventional Forces in Europe (CFE) Treaty.

In what Gray calls his arms control paradox, the more that nations are motivated to fight one another, the less interested they will be in supporting significant arms limitations. Gray makes extensive use of past arms limitations agreements to document his case. For example, he finds similarities in the American objections to the Soviet antiballistic missile (ABM) radar at Krasnoaryarsk and the British irritation with the French fortification of the port of Dunkirk in the eighteenth century. Both actions were illegal, according to treaty (the ABM Treaty of 1972 and the Treaty of Utrecht of 1713, respectively), and the aggrieved parties were unable to force compliance of the Soviet Union or France because doing so would have led to total war. Thus, arms control achieved nothing except to allow one party to circumvent the provisions of the treaty and to force the other to accept the violation.

Another myth held by certain arms control advocates is that arms races have caused wars. Studies in the area of national security show that evidence for such a proposition is nonexistent. Gray argues that what leads to war is the possession of weapons by states motivated to use them for self-aggrandizement. Arms control can also encourage innovation. Since it places restrictions on existing weapons systems, states will develop capabilities in areas which are unrestricted by arms control agreements. One example is the construction of aircraft carriers on battleship hulls and on very large cruisers (treaty cruisers) after the Washington Navy Treaty went into effect. Similarly, the SALT Treaty rewarded the developer of cruise missiles and of large ballistic delivery vehicles.

Parity in nuclear weapons after 1945 has lost its earlier meaning, making arms control vague. In Gray's opinion, compliance and verification of arms control agreements—issues which have bedeviled all US administrations since 1969—demonstrate all that is wrong with arms control. There is no way to force states—especially authoritarian ones—to comply with arms control agreements. Gray points out that in the 1930s Germany and Japan—two "revisionist" states (so named because they attempted to change the world order)—ignored and deliberately violated the treaty provisions of the naval arms control treaties they were party to.

Specifically, legal systems of arms control do not provide the kinds of regulation that really matter for international security. During START, the US attempted to remove the destabilizing SS-18 weapons system by reducing the deployed number of missiles by 50 percent. The USSR, however, modified the system (SS-18 Mod 5), thereby nullifying the value of the 50 percent cut.

Although neoliberals will claim that Gorbachev's rise to power helped bring about a new era of arms control, Gray has some examples which show that this is far from the case. The SS-23 short-range ballistic missiles which were transferred to East Germany, Czechoslovakia, and Bulgaria in spite of the INF Treaty constitute one such example. Prior to implementation of the CFE Treaty, the Soviet Union starved its people during winter months while Soviet trains shuttled over 75,000 pieces of military equipment to an area behind the Urals to conceal them. Although this act was not a violation of the treaty, it did show bad faith on the part of the Soviets.

National security analysts and students of arms control and international affairs will want to read this book and debate its far-reaching conclusions. Military officers will want to pay close attention to those parts of the book which deal with verification and compliance. With the world shifting into new power blocs, arms control in the traditional bilateral sense is probably gone. Instead, multilateral agreements will become the new political expedient of the future. But Gray points out that the Nuclear Nonproliferation Treaty and the Missile Technology Control Regime have not worked and have not prevented new states from seeking status as great powers.

Capt Gilles Van Nederveen, USAF
Kelly AFB, Texas

VIETNAM

To Heal a Nation: The Vietnam Veterans Memorial by Jan C. Scruggs and Joel L. Swerdlow. HarperCollins Publishers, 10 East 53d Street, New York 10022, 1992, 415 pages, \$16.00.

Each Veterans Day, the United States officially recognizes and remembers individuals who have served their country by defending it in times of conflict. But on 11 November 1992, national attention turned to Washington, D.C.,

where a vigil took place at the Vietnam Veterans Memorial much like one that took place 10 years earlier. One by one, volunteers read each individual's name on the memorial so that the country could pause and reflect on the sacrifices made by these men and women.

To Heal a Nation traces the events leading up to the 13th and 14th of November 1982, when the United States first viewed the memorial at its official national presentation. The book tells the story of how one man's (Scruggs's) dream was transformed into reality through hard work and determination. Scruggs, a Vietnam veteran who had served in the Army's 199th Light Infantry Brigade, came up with the idea for the memorial while tossing and turning in bed one night in March 1979. What followed was a constant three-and-one-half-year struggle through the depths of the Washington bureaucracy.

Several key players were involved in keeping this struggle active; among them were two attorneys: a former Air Force officer named Bob Doubek and a former Army officer named Jack Wheeler. Together they started a recruiting campaign for their dream, which would eventually extend to major corporations, Hollywood performers, Congress, and even the White House.

To Heal a Nation does a good job of delivering the complete story. The book presents a detailed chronological description of this three-year uphill struggle—the financing, the design, and the political turmoil—and concludes with a list of every name on the memorial and its panel location. Also included in the book are excerpts from letters received by the Vietnam Veterans Memorial Fund (VVMF) during this time. They range from letters of hope and promise to those of anger, resentment, and emptiness. Scruggs and Swerdlow present a story filled with self-sacrifice and determination.

This book does more, however, than discuss the struggle involved in getting a memorial placed in Constitution Gardens. It discusses a deeper, inner struggle—the struggle that over two and one-half million Americans suffered through when they came home to a country unwilling to accept them and the struggle encountered by the families of almost 60,000 men and women who didn't return from Vietnam. Those scars will probably never be completely healed, but the efforts recounted in this book have at least led to an official thank-

you to the men and women who served in Vietnam. The book's final paragraph deserves to be quoted:

One vet returning from the [Memorial's 1982 Salute Ceremony] walked into his house and set down his suitcase. His wife came running up from the basement. With tears in her eyes, she smiled and ran over and put her arms around him. "Welcome home," she said. "Welcome home." (Page 156)

To Heal a Nation provides a sincere thank-you to those dedicated individuals whose hard work led to the completion of the memorial, and more important, to the people who gave reason for its creation.

2d Lt Richard J. Bailey, Jr., USAF
Laughlin AFB, Texas

WORLD WAR I

Zeppelins of World War I by Wilbur Cross.
Paragon House, 2 Hammarckjold, New York
10011, 1991, 220 pages, \$18.95.

Zeppelins of World War I is rather narrowly focused on the operations of the German Naval Airship Division against Great Britain, especially attempts at what today would be termed *strategic bombing*. It does not address activities in other theaters of war, support of the German High Seas Fleet, or any other zeppelin operations. It also fails to address, except peripherally, the remarkably effective British defensive measures against these airships. This is a serious shortcoming, for Britain's strategic air defense system of World War I was the forerunner of the one employed during the Battle of Britain in 1940. Although Cross's prose can be somewhat strained, the book is easy to read. Unfortunately, that is one of its few virtues.

The book has no footnotes—a deficiency which cripples the reader who wants to further explore any of the topics or incidents Cross discusses—and the brief bibliography is cursory at best. The small section of photographs (many from the Smithsonian's National Air and Space Museum) contains a representative selection but does not tap into collections such as the archives of the German Naval Airship Association. *Zeppelins of World War I* seems intended for a general audience interested in easy reading instead of painstaking research and scholarship. The serious reader would do

better to consult Raymond Rimell's *Zeppelin! The Battle for Air Supremacy in World War I*, which contains a wealth of technical information and literally hundreds of outstanding photographs, or Douglas Robinson's classic *The Zeppelin in Combat: A History of the German Naval Airship Division, 1912-1918*, which is the most balanced and analytical evaluation of the German zeppelins' overall impact. Still in print, it remains the best work on the subject.

Lt Col Daniel T. Kuehl, USAF
Washington, D.C.

WORLD WAR II

Desperate Venture by Norman Gelb. William Morrow and Company, 105 Madison Avenue, New York 10019, 1992, 330 pages, \$25.00.

Norman Gelb, former correspondent for the Mutual Broadcasting System and author of seven other books on war, describes his book *Desperate Venture* on the dust jacket as "the story of Operation Torch, the Allied invasion of North Africa." Gelb's book can best be described by dividing it into four parts. The first 102 pages describe the strategic priority arguments that raged following America's entry into World War II, arguments in which the participants disagreed on whether the United States should concentrate its efforts in the Pacific theater first or the Atlantic and on the best location for the first Allied European theater of operations. The second part, reaching to page 201, outlines the planning, high-level leadership, security, and intrigues executed by the Allies once they had decided where to attack. The third part portrays the actual landings in North Africa in November 1942 and subsequent combat up to and including the windfall entrapment and surrender of approximately 250,000 Axis troops in Tunisia the following May. The last chapter is an epilogue that describes the results of the Allied victory in North Africa and questions in a contradictory fashion some of the assumptions of the "players" in part one.

The extensive introductory background portion is necessary if the reader is to understand the significance of the multitude of politico-military events that occurred and the complications that were involved in invading the possessions of a conquered nation and potential ally. The reader is further struck by the vigor

with which priorities were assertively discussed, particularly on the part of the Americans, without having conducted even the most basic analysis to determine the validity of claims. One tends to credit Gelb's view of this process as being accurate, given the comprehensive list of 132 published sources appearing in his bibliography and his critical acclaim as an author. Gelb characterizes the American military as being fairly adept at following up on existing initiatives, yet (for practical purposes) totally disinterested in applying analytical critical thinking to new strategies in new theaters of operations. (Of course, such an obvious Achilles' heel could not possibly still exist today.)

The second part devotes considerable attention to the political maneuverings of intelligence agents and of French leaders whom Gelb portrays as self-absorbed. Further, it evidences a case that the American Torch participants lacked fundamental hands-on training with their equipment. It is no wonder that Gelb describes the whole operation as a "dress rehearsal" for the invasion of France two years later.

The third part describes the actual combat, although at a high level of abstraction. While what is described here is interesting and informs the reader of the reasons behind events, the reader may find that it whets the appetite for further accounts in which the reality of this campaign is more personally and vividly described.

In the epilogue, Gelb questions whether Torch was the right operation in the right place at the right time. He asserts that a reaction to Torch was the reduction in priority of sending soldiers and landing craft to the European theater, delaying D day until 1944. He cites the lower levels of readiness of German troops based in France as being one mitigating factor favoring a 1943 cross-channel invasion. He discounts the capabilities of the Luftwaffe to interfere with such an invasion because, he states, "The Luftwaffe would have been torn between defending German cities and factories from air assault and coping with the invasion." And Gelb downplays the value of experience gained in Torch by implying that US "lesson-learning punishment" could just as easily be endured in France. Thus, Gelb believes that "it is not unreasonable to conclude" that the effect of Torch was to lengthen rather than shorten the war against Germany. The evidence pre-

sented to support these conclusions is brief and thus lacks detail, but it should stimulate debate in US military educational institutions.

Maj Thomas C. Blow II
Scott AFB, Illinois

Flames over Tokyo: The U.S. Army Air Forces' Incendiary Campaign against Japan, 1944-1945 by E. Bartlett Kerr. Donald I. Fine, Inc., 128 East 36th Street, New York 10010, 1991, 348 pages, \$22.95.

On the night of 9 March 1945, 325 B-29 bombers laid waste to almost 16 square miles of Tokyo and killed over 83,000 people in the most devastating air raid of all time. E. Bartlett Kerr's belief that the current American public has a meager understanding of that attack and the incendiary campaign that followed caused him to write this book. "I found that most people knew very little and what they did know was often inaccurate or ill-conceived," he states in his foreword (page xi). By attempting to mix "popular" history with sound scholarship, he hopes to set the record straight.

Kerr, author of a study on World War II American prisoners of war in the Pacific, relies on interviews, documents, and secondary accounts for source material. His work is especially useful for its insights into the development of the M-69 incendiary bomb, the mainstay of the B-29 offensive against Japanese cities. Created by the National Defense Research Committee (NDRC) of the Office of Scientific Research and Development, the 6.2-pound cylindrical device contained a TNT charge that ignited a gasoline gel and blew it out of the steel bomb casing a distance of 100 feet. Scientists tested the M-69 against mock-ups of Japanese homes at Utah's Dugway Proving Ground in mid-1943 and determined that, of all the bombs tested, it was capable of causing the greatest amount of damage to Japanese residences.

Yet, as Kerr notes, the Dugway test structures were replicas of dwellings—not factories—the latter of which were the primary concern of Henry H. ("Hap") Arnold, commanding general of the Army Air Forces. The B-29 offensive against Japan that began from Chinese bases and continued from the Marianas originally targeted Japanese industries in high-altitude, daylight, precision-bombing raids that paralleled those conducted against Hitler's Germany. The

effort proved unsuccessful, however, for a number of reasons: the fierce winds of the jet stream over Japan blew bombs away from targets; Japanese weather was often miserable, frequently forcing crews to resort to relatively inaccurate radar bombing; and Japanese cities contained numerous "shadow factories" that were scattered throughout the heart of residential areas, employed fewer than 50 workers, and proved impossible to eradicate through precision attacks.

Kerr notes that Arnold did not disapprove of the fire raids—the commanding general desperately wanted to demonstrate that strategic bombing could play a decisive role in the Pacific war and was distressed by the B-29s' lack of progress. Yet, Kerr also observes that Maj Gen Curtis E. LeMay's air offensive from March to August 1945 vacillated between area attacks against residential districts and precision raids against specific large factories. LeMay continued the precision raids for two reasons: he repeatedly exhausted his supply of M-69s, and he remained convinced that precision attacks had merit.

For the researcher attempting to use Kerr's book to track down source materials, the absence of footnotes is frustrating. Although the chapter notes provide some information on sources, the notes are far from complete, and the method used to list references is cumbersome. Curiously, Kerr does not cite Michael S. Sherry's *The Rise of American Air Power: The Creation of Armageddon* (1987), a provocative study and Bancroft Prize winner that offers an extensive analysis of LeMay's incendiary campaign. Nonetheless, *Flames over Tokyo* provides a solid account of the air assault against Japan and should help to educate its readers.

Maj Mark Clodfelter, USAF
Maxwell AFB, Alabama

There's a War to Be Won: The United States Army in World War II by Geoffrey Perret. Random House, 201 East 50th Street, New York 10022, 1991, 656 pages, \$29.50.

There's a War to Be Won is a crackerjack book—a joy to read on at least three levels. First, its thesis is fresh and provocative. Geoffrey Perret argues that our ground forces in World War II made up "one of the greatest armies in history . . . at least a decade ahead of any other army in the world" (pages 541, 543). He borrows an assessment of German soldiers

from historian Eric Larrabee—"no one who ever met them on their own terms ever defeated them"—and convincingly asserts that "no one who ever met the U.S. Army of World War II on its terms ever defeated it either" (page 542). It was the American Army, defeated only once on the battlefield, that bore the brunt of the worldwide fight against the Axis powers.

Second, since Perret is convinced that the creation of the Army "was one of the supreme American achievements of the twentieth century" and since its creators thus were a special breed (page xxvi), he focuses on the principal officers who put the Army together. However, the author is no cheerleader; neither is he a fence sitter. The text fairly crackles with pithy, fair, yet pungent critiques of the great and the merely famous who led or blocked the way to victory.

Finally, the book is written with verve and wit; it may anger some and will amuse many. Perret describes British general Bernard Montgomery, for example, as "sporting an Identikit British general's mustache" (page 184). Gen Joseph Stilwell's conduct of the Burma campaign resulted in "probably no worse instance of troop neglect by a field commander in the wartime Army" (page 295). These are but two examples of a host of assessments and assertions almost epigrammatic in their quality.

Perret's book is likely to become a classic. There are enough controversial assertions and enough reputations skewered to keep military historians happily arguing with this book and each other for a very long time. More importantly, by staking a persuasive claim for the dominant role in gaining victory in a truly global conflict, *There's a War to Be Won* does for the Army what Samuel Eliot Morison's *Two-Ocean War: A Short History of the United States Navy in the Second World War* did for that service. This enjoyable reassessment of World War II operations ought to be included on any airman's bookshelf.

Lt Col Gary P. Cox, USAF
Maxwell AFB, Alabama

To Command the Sky: The Battle for Air Superiority over Germany, 1942-1944 by Stephen L. McFarland and Wesley P. Newton. Smithsonian Institution Press, Washington, D.C. 20560, 1991, 344 pages. \$35.00.

Air power evolved during a struggle between parochial interests. Specifically, as the United States approached World War II, the fighter and bomber communities vied to influence the development of air power doctrine. These interests were reflected in the 1930s in the curriculum of the Air Corps Tactical School, which looked to the Italian air power theorist Giulio Douhet for doctrinal justification as it developed the US strategy of high-altitude, daylight strategic bombing. This strategy produced heavy losses of US bombers in Europe but failed to destroy German industry or demoralize the German people. Consequently, Allied leaders sought a different approach. The new strategy incorporated "interlocking formations" of bomber and fighter aircraft which not only would continue to attack industry but also would lure the Luftwaffe into a battle for air superiority.

The authors provide a thorough treatment of their subject, beginning with a brief history of air power and concluding with a detailed account of the Allies' attainment of air superiority. The authors claim, however, that the "means by which Eighth Air Force completed this assignment is an untold story."

As is the case in works of this type, the authors occasionally succumb to what is evidently a strong urge to romanticize aviation. Their description of the effect of aerial bombardment on urban populations is a case in point: "[N]ight or day, the fear was contagious, the terror consuming—the phenomenon of the most modern cities in the world blacked out, their populations hiding. Horrendous sounds and tart smells filled the air and gripped the emotions." Fortunately, this type of purple prose is—for the most part—held in check.

To Command the Sky is a serious, scholarly work that is well researched and documented. The book includes a variety of figures and tables that simplify what otherwise could prove to be a puzzling collection of data. A generous complement of high-quality photographs also supplements the text. In sum, *To Command the Sky* will prove useful even to readers who are well versed in the subject of air superiority over Germany in World War II.

Maj Ralph Millsap, USAF
USAF Academy, Colorado

Doomed at the Start: American Pursuit Pilots in the Philippines, 1941-1942 by William H.

Bartsch. Texas A&M University Press, College Station, Texas 77843-4354, 1992, 503 pages, \$24.50.

Doomed at the Start details the trials and tribulations of the 24th Pursuit Group in both an entertaining and enlightening manner. Faced with extremely limited flight training, an inadequate warning system, and a lack of familiarity with the few pursuit aircraft available to them, the men of the various squadrons comprising the 24th Pursuit Group were destined for defeat. But this book, based on numerous interviews, personal correspondence, and war records, is more than a mere history of a combat unit during the initial stages of war. It analyzes decisions made by senior military leaders, examines the strategies and tactics of the invading Japanese forces, and describes the disparity between the ends and means of the 24th Pursuit Group. Although the book is comprehensive to a fault, its insights into the day-to-day combat activities of senior commanders, pilots, and mechanics, as well as its descriptions of their aircraft, fill a gap in the history of air warfare in the Pacific theater.

Within the book's pages are lessons for logisticians, tacticians, planners, leaders, and historians. Unfortunately, many of these lessons can be deciphered only in bits and pieces from the personal accounts of the key participants of the group. That is, Bartsch provides a chronological account of events that occurred during

the first few months of the war, but he continually interrupts the narrative with one-time glimpses from these group members. Although their tales are interesting, they hamper the reader's ability to see the big picture—the progress of individual squadrons and major players.

This book is not a stand-alone account of the Far East Air Forces during the war, nor is it intended to be. Its key strength as a historical work is also its main weakness. Specifically, while the many personal accounts provide an intimate look at war from the people closest to it—the pilots and mechanics who fought the enemy, suffered the consequences of inadequate training, and confronted equipment shortages and death on a daily basis—the accuracy of these reminiscences is debatable because of the amount of time that has elapsed. Yet, these recollections allow us to view the war through the eyes of the people who were there. Thus we are able to capture a part of history.

Doomed at the Start will fascinate readers interested in war at its most basic level—the day-to-day actions of people who waged war on the ground and in the air. For others, it offers significant insight into fighting a war with a force that is undermanned, under-trained, and underequipped—and thereby teaches lessons we may need to know in the coming years.

Maj Gary Trogdon, USAF
Offutt AFB, Nebraska

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Lt Gen Buster C. Glosson is currently the Air Force deputy chief of staff for plans and operations. Prior to assuming his present duties, he was director of legislative liaison for the secretary of the Air Force. During the Gulf War, he was director of campaign plans and commander of the 14th Air Division (Provisional). He has commanded at every level from squadron through air division and is a combat veteran of the Vietnam War and a command pilot with over 3,600 flying hours in the F-15C/E, F-4, F-5, and T-38. General Glosson is a graduate of Squadron Officer School, Armed Forces Staff College, and National War College.



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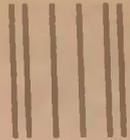
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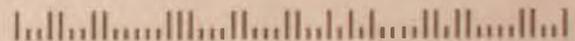


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