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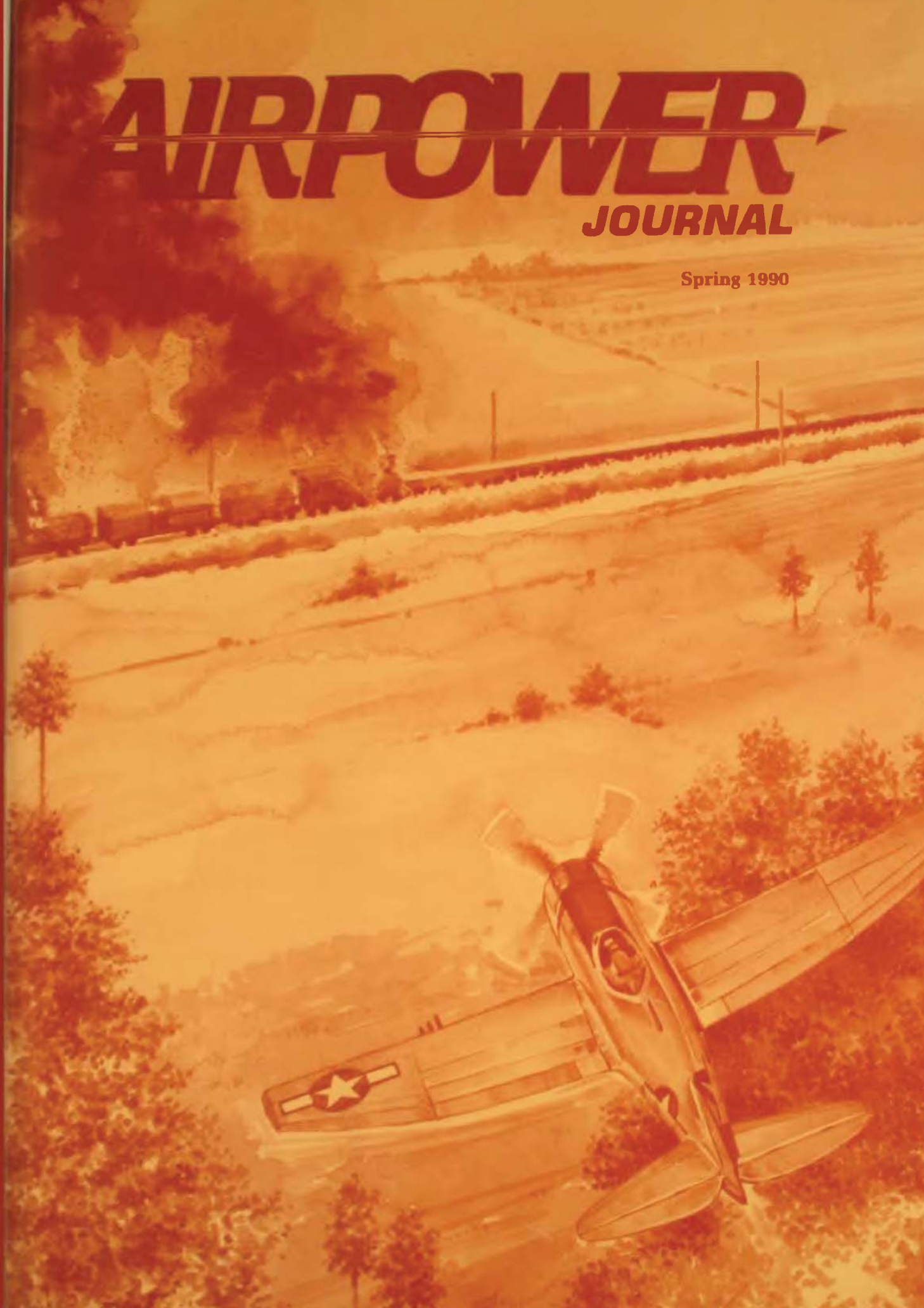

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EDITORIAL

Now That We've Won World War III

Recent events in Eastern Europe have created a strange possibility: World War III may be over! For the American military the changes in Europe have created two challenges: how to handle the changing Soviet threat and how to deal with other threats in the world around us. Within these two challenges lies an important point to remember—world peace has not suddenly broken out.

Our first challenge is to remember that the Warsaw Pact military threat still exists. Walls that are torn down rapidly can be rebuilt just as rapidly. The civilian world hears the peaceful rhetoric and assumes that actions will automatically follow. The military cannot afford to be that optimistic. The threat in Europe appears to have significantly diminished in recent months. But we must remember that the MiGs are still ready to fly and the tanks are still pointed west. Their numbers have not yet diminished.

While we remain vigilant, we cannot afford to hide our heads in the sand. We face very real changes in the future, and we must prepare to deal with them. Virtually all of us serving in the military today, from the newest airman basic to our most senior general officers, have lived with the Soviet threat our entire lives, certainly our entire adult lives. It has been a fact of life for the last 40 years that the main threat was war with the Soviets in Europe. We based our military planning and our operational structure around it. The concern over the next European war dominated our thinking during the Korean War. It caused us to view both the Korean and Vietnam wars as aberrations. Now we must rethink the threat. We must not become mired in a doctrine, a strategy, or an organizational structure that has been overcome by world events. The potential removal of a threat in Europe does not mean that there are no other threats in the world. It does mean that we must consider what those threats are and how we can best prepare for them. We must be open-minded as we rethink the threat—and we must use the best minds available.

The questions that we must answer are numerous. They must have honest answers. Those answers must be given without regard to sacred cows or "gold watches." We cannot afford to develop a horse-cavalry mentality, more concerned with preserving traditional turf than preparing for the future. We must begin by asking the most basic questions and building from the answers. The Air Corps pioneers were considered to be among the most innovative and forward-looking of military officers—visionaries who prepared for the future without being tied to the past. We need to approach our present situation with that same positive and open type of thinking.

Insurgency warfare, drug interdiction, increased airlift requirements, and many more issues face us. We cannot simply force our traditional thinking on these new issues. The role of space, of unmanned air vehicles, and of joint operations must not be looked upon as threats to the Air Force but as opportunities to do our job more efficiently. The way we answer these questions will determine how capable our military is to face the challenges in the years to come.

Throughout it all, the job of the Air Force remains to fly and to fight. But we must prepare now for the next war, not the last one. As Gen Sir Archibald Wavell reminds us, "The ideal officer should be afraid of nothing, not even a new idea." MAK

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

AIR BASE DEFENSE PROBLEMS

I recently read with interest an article in the Fall 1989 *Airpower Journal* entitled "To Protect an Air Base" by Brig Gen Raymond E. Bell, Jr. It caused me to reflect upon my recent experiences in Panama during Operation Nimrod Dancer. I deployed in May 1989 attached to Delta Company, 1st Battalion, 61st Infantry (Mech.)—part of the 5th Infantry Division (Mech.) at Fort Polk, Louisiana. I would like to share my impressions of air base defense that I gained there.

The Air Force is not serious about air base defense. Admittedly, the Air Force's primary interest is in aircraft. However, it seems that if some attention is not paid to base defense, there will be no aircraft to sortie. We received occasional visits from a high-ranking Air Force officer who seemed to spend most of his time complaining about how our M113 armored personnel carriers were tearing up the grass. He did not seem very interested in our defensive dispositions.

The Security Police (SP) are impressive. I think that the older SPs were primarily interested in law enforcement, and only the younger ones were interested in base defense (it's the same way in the Army, where most military police (MP) I have met really want to be police). I think that the Air Force air base defense doctrine is deficient in organization, equipment, and command emphasis to support these impressive men and women. It seemed to me while I was in Panama that the health of the grass was more important than the security of the air base.

Ground personnel other than SPs were unimpressive, in that the skills they had for ground defense were negligible. Soon after our arrival at Albrook Air Force Base, we were emplacing an observation device and required the assistance of the civil engineering squadron and its lifting equipment. Soon, a sergeant arrived with the equipment. There was a short delay, and I had some time to talk with him. I learned several things. This "soldier" was not issued a helmet, web belt, ammo pouch, canteen, or first aid pouch. He was not assigned a personal weapon and fired one only once a year, if at all. He knew nothing of even the most basic infantry tactics. He expected the SPs and the Army to defend him. Worse than that, having lifted us and our equipment and being on an 8-to-5 work schedule, he decided that the job was finished whether we were done or not. So he departed, leaving us stuck 30 feet in the air! My impression of most personnel I met (excluding forward air controllers and pilots) was that they were technicians in uniform and not real soldiers.

My belief is that the Air Force is paying lip service to base defense and is really expecting the Army to take on this unglamorous mission. It is giving only paltry resources to those forces it must have. Most Air Force personnel I met were highly intelligent, motivated, and capable people, but when it came to base defense, we thought of them as prima donna fly-boys who were unwilling to stoop to this work and expected the lowly Army to do it for them.

It is obvious that the interests of the Air Force are and should be centered on aircraft. The article quite rightly stated that the air wing commander's mission is to generate as many sorties as possible. The article also makes the point that if the air base is not defended, there may be no aircraft to sortie. It's apparent to me that if the Air Force is serious about base defense, it must realize that it is going to have to do it by itself in all but level III threat situations. An air base is a priority target for Soviet airborne, Spetsnaz, and reconnaissance units because it contains nuclear delivery means. Army units could be totally absorbed in heavy fighting. According to an MP officer I know, there are not nearly enough MPs for all the missions they have been assigned. The Air Force needs to place considerable command emphasis on base defense. Additionally, it needs to "heavy up" its forces. Compared with a Soviet airborne platoon with three BMD armored personnel vehicles

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HOW TO GET PROMOTED

MAJ GEN DALE O. SMITH, USAF, RETIRED

GENERALLY, people feel that if they do a good job, promotion will be inevitable. Wrong. Most people do well in their work but never move out of their rut. They often see promotions go to colleagues who don't do as well as they. Why? What's the secret?

Well, to begin with, doing a good job is a valuable prerequisite to promotion, but it is only one of many prerequisites. Of course, if you can brighten your corner with an outstanding piece of work or some new and productive ideas, doing a good job will be prominent among the prerequisites and draw attention to you.

So, the first thing you must do is to *like your work* and approach it with enthusiasm. This may take some doing if, by chance, you have no enthusiasm for this type of work in the first place. But even a garbageman can find some positive values in what he is doing. If he dwells on the pluses and attempts to enhance them, he can find ways to improve his job, give better service, and develop pride and enthusiasm in his work.

Remember to keep a positive, can-do attitude. No one likes a complainer, partic-

ularly bosses. They have enough on their minds without having to listen to gripes. However, if there is something seriously wrong that you can't correct on your own, be sure to let your boss know—but don't complain.

When I was a scrub football player practicing blocks, a line coach overheard me say in frustration, "I just can't do that." Then I saw him looking at me with disapproval. I was never promoted. I should have said, "I'm going to learn how to do that yet."

In the subsequent half century, I have learned much about promotion and, except for a number of mistakes and some acts of God, might have made it to higher rank. I learned about promotion through personal experience, observation, and service on a number of promotion boards.

Almost all officers believe they could have become the chief of staff had it not been for some unfortunate event in their careers. An unflattering effectiveness report made out by commanders who didn't appreciate the officers' sterling worth is the usual cause. But many more unfortunate events block their paths to the chief's office. A friend who was definitely brigadier material hit the skids when his wife fell in love with a foreign national behind the iron curtain and tried to smuggle her lover into Austria in the trunk of a car. In Baguio, the Philippines, a brigadier general's wife had a bidet installed in the guesthouse, and an unsympathetic reporter widely publicized it. The general, despite showing promise for advancement, soon retired.

You may wonder why I didn't become chief. No? Well, even if you don't, I'll tell you. I was doing pretty well as commander of the 313th Air Division on Okinawa until an anti-American reporter from Australia visited. He had sullied my predecessor's reputation by writing that his golf course took arable land from poor Okinawans while in fact the golf course had been carved out of the boondocks and provided employment for many of the locals. This unscrupulous correspondent found another target in my Airman's Club on Kadena Air Base.

Virginia and I had arrived on Okinawa just before New Year's Day of 1958, and on New Year's Eve we visited the six clubs of the division. Everyone was having a grand time except the airmen. There were only a couple of dozen of them in the Kadena Airman's Club, a fine facility built and maintained with airmen's dues of one dollar a month. They were glumly drinking 3.2 beer. Where were the 3,000 other airmen? They were in the neighboring gin mills and cathouses off base.

The next day I revised the regulations that governed conduct of the airmen's clubs. If the airmen were old enough to fight for their country, they were old enough to have an open bar with good booze instead of the rotgut they were drinking in the village. Moreover, they could have money-making slot machines like the officers and noncommissioned officers had in their clubs. And instead of the girls of questionable character and health they might pick up in town, we would invite young Okinawan ladies from good families to the club, calling for them and delivering them home at midnight.

That did it. The club was packed every night and made more money than it could spend. It featured dance music from a 10-piece orchestra and one-dollar steak dinners nightly, together with frequent floor shows. The club even bought a Lincoln Continental to raffle off weekly. The lucky winner could have the Lincoln for a week with a liveried chauffeur and 50 dollars spending money. The airmen were having a ball.

Well, you can imagine what that antagonistic Australian reporter made of this! When he was escorted through the club by a less-than-sympathetic local newspaperman (they did an end run on my very capable public relations officer), they couldn't get into the "Key Club," which had been reserved for airmen's wives. The reporter immediately assumed that something evil was going on behind that door.

The Australian was a stringer for *Time*, and his scurrilous article in its entirety was published in that magazine, even though no one checked the story's authenticity. A national "scandal" resulted. The innuendos painted the Kadena Airman's Club as a den of iniquity—an Air Force-sponsored cathouse.

This is not the way to get promoted. As Henry ("Light-Horse Harry") Lee warned his son Robert E., "Avoid the *appearance* of evil!" You can get into trouble that will dog you the rest of your service if you stick your neck out too far, as I did. Anyway, it's my good excuse for not getting a third star.

That's how to *avoid* promotion. Now, what can you do to *get* promoted?

First of all, other people must consider you in a positive and favorable light. The drudge who does a good job will not have this aura. But the person who has an optimistic outlook, pays attention to others, and passes the time of day with them in a cheerful and thoughtful way will develop a "nice-guy" aura. A good reputation among your contemporaries as well as your juniors and seniors is a sound stepping-stone to promotion.

To achieve this aura and draw attention to yourself, you must follow a few rules. The first is to *look for opportunities to compliment*. In almost any social interchange, it's possible to find something that warrants a sincere compliment. The stylized exchanges of everyday life are loaded with compliments: "I'm glad to have met you." "It was nice talking with you." "It was nice talking with you too." "The pleasure is all mine." You can dream up some phrases of your own.

Once, at a nightclub, Pete Croker and I invited a show girl to sit with us. We played a game to see which one of us could pay her more compliments. Before the evening was out, she was walking on air, as proud and happy as a debutante. Perhaps we overdid it, but it makes the point.

Introducing someone is an ideal situation for giving compliments, because they are indirect: "Joe, I'd like you to meet my boss, Colonel Jones, the hottest pilot on the base. Colonel, this is Lt Joe Blow, one of the best backseaters I've ever known."

It's a compliment to use "sir" and "ma'am" because they show deference and respect and are pleasing to hear from time to time. By all means, show deference and respect to your bosses and superiors. Your boss should be the first to be notified of any news and the first to be invited to any function you plan. Don't forget that the boss's spouse deserves equal, if not more, respect. It's a compliment to recognize their seniority at all times. This can be done with good manners and need not be construed as kissing ass.

My daughter-in-law told me that wives' clubs are now egalitarian—no special deference is shown to wives of senior officers. I hope she comes to realize that this practice cannot and should not be followed. In all human interchange, those who fail to show deference to age, experience, seniority, and, yes, wealth are doomed to suffer from their rudeness. Just remember that many people have worked hard and sacrificed much to reach their station in life. They deserve your admiration. Don't strip them of their rank with your attitude. It goes without saying that these people hold the power, but, beyond that, showing that you respect them for their achievement is fundamental courtesy.

The second rule is to *show gratitude*. When you are promoted, give the credit to others, and thank them for their help. Never overlook a kindness done you. Always show your gratitude by word or deed. Because many people help you to get ahead, you should always recognize their help and thank them. You don't have to be accurate. They may not even realize they have helped you or done you a service. As with compliments, look for opportunities to show gratitude.

Yes, to be promoted you have to do more than a good job. You have to be recognized favorably, and the more favorably you're regarded, the more likely your promotion. Practicing words and phrases that pursue

this goal is a lifetime job. But when you learn them well enough to use them habitually and gracefully, they are sure winners. And another thing, look for recreational opportunities with your bosses. That's one reason golf is so important. Such informal contact will allow you to compliment and show gratitude. Obviously, it must be sincere, but that's part of the art. And you don't have to wait until business opportunities arrive. You can practice this art at home with equal success. In fact, you must practice it incessantly so that it becomes habitual and automatic. Terms of endearment, for example, are compliments. Try them on your spouse or friend, and see what happens. A good relationship on the home front is the foundation for success in the professional world. Accentuating the positive, controllable aspects of your life may help you weather the negative, uncontrollable events that inevitably plague us all. □

BATTLEFIELD AIR SUPPORT

A Retrospective Assessment

DR RICHARD P. HALLION

Air power was first used as a weapon during World War I. At the same time, a controversy arose—which continues to this day—over whether aircraft specifically designed for ground attack or "swing-role" fighter-bombers were better suited for battlefield air support.

MORE than 70 years have passed since armed aircraft first attacked troops in what would now be considered close air support (CAS) and battlefield air interdiction (BAI) missions. An extraordinary amount of thought and discussion has resulted in numerous publications, papers, and symposia concerned with the issue of battlefield support in virtually all its aspects. Today, this continuing interest is particularly significant, as the military services struggle to come to grips with the future of the CAS/BAI mission.

Joint Chiefs of Staff (JCS) Publication (Pub) 1, *Department of Defense Dictionary of Military and Associated Terms*, defines close air support as "air action against hostile targets which are in close proximity to friendly forces and which require detailed integration of each air mission with the fire and movement of those forces." But battlefield air interdiction is not so crisply defined. Traditional air interdiction (AI)—again according to JCS Pub 1—is defined as "air operations conducted to destroy, neutralize, or delay the enemy's military potential before it can be brought to bear

effectively against friendly forces at such distance from friendly forces that detailed integration of each air mission with the fire and movement of friendly forces is not required." BAI, basically air interdiction used to support close-in battle, is described in the following definition: "air interdiction attacks against land force targets which have near-term effect on the operations or scheme of maneuver of friendly forces, but are not in close proximity to friendly forces, are referred to as battlefield air interdiction." As one Air Force general recently wrote, "Our concept of BAI—what it is, how it is controlled, etc.—is still evolving."[1]

With all these particulars in mind, it is well to take a look at the CAS/BAI issue from the perspective of over seven decades of operations; we may postulate some points, explaining them in greater detail:

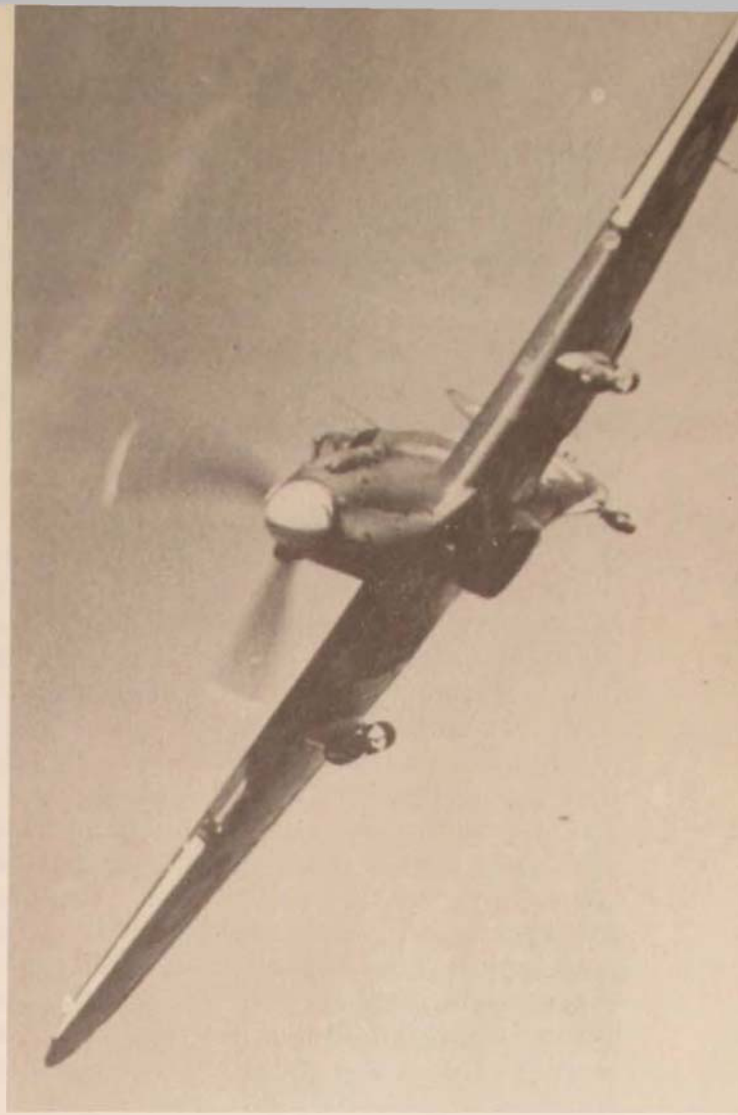
1. *We have always done what are now delineated as CAS/BAI operations.* CAS and BAI date to the First World War, specifically to 1917, when the Royal Flying Corps (RFC, subsequently the Royal Air Force [RAF]) began intensive and well-organized

"trench strafing" (CAS) and "ground strafing" (BAI) missions over the western front. Using modified bomb-carrying fighters such as the S.E. 5a and Sopwith Camel, the RFC undertook operations directly over the front and attacked second-echelon forces to a depth of 30 or more kilometers behind the front. The Imperial German Air Service followed suit. Such activities by British, German, French, and American airmen were commonplace in the ebb and flow of the great offensives of 1918 and were extensively reported in the memoirs and documents of the time. BAI played a decisive role in the collapse of Turkish forces in Palestine during a brief and merciless air campaign in the late summer of 1918. CAS/BAI appeared in many of the interwar conflicts of the 1920s and 1930s and, above all, in the three great wars of the interwar years: Abyssinia, Spain, and China. Spanish fighting was characterized by extensive CAS/BAI employment by both sides, culminating in the climactic fighting at the Ebro River in 1938.[2]

CAS/BAI played a significant role in fighting during the Second World War, particularly during the Nazi blitzkrieg, fighting in the Western Desert, the Italian campaign, the breakout across northern France, and fighting on the eastern front. Despite many false starts in the interwar and early war years, it was only in 1943—after the bitter experience of Kasserine and the exposure of American airmen to the British Western Desert air support system—that the United States first came to grips in a realistic fashion with the problem of supporting ground forces by direct air attack. Field Manual 100–20, *Command and Employment of Air Power*, sprang from this experience and governed the subsequent use of American tactical air support for the rest of the war. Though Gen George Kenney had worked on this problem the previous year (in New Guinea), the peculiarities of Southwest Pacific warfare generated circumstances markedly different from the more traditional form of warfare being waged in the North African and European theaters. In particular, low-level attackers were able to prosecute air strikes with relatively light losses, something that would not have been possible in more densely defended European or Mediterranean skies. In many cases, Kenney's attackers were more frequently—and profitably—employed on air-denial missions against Japanese airfields rather than on actual CAS- and BAI-style missions. For their part, the Navy and Marine Corps refined a particular kind of CAS operation whereby CAS served as a substitute for the lack of available artillery. Rooted in the Marines' "small wars" experience of the 1920s–30s, this system (which tied Marine and Navy air units closely to the ground forces they supported) proved both effective and a source of controversy in the postwar years. During the Second World War, the "swing-role" fighter-bomber reappeared in Allied and Axis service, complementing and eventually replacing the specialized attack airplane as the major instrument of air-to-ground battlefield attack.[3]

Korea witnessed an extensive range of CAS/BAI activity. Further, the short but savage Sinai campaign of 1956 (and the subsequent 1967 and 1973 Middle East wars) witnessed decisive CAS/BAI operations, with the concentrated Israeli attacks upon Egyptian forces in the Mitla Pass region of Egypt during the 1967 war offering perhaps the best example. Far more typical of post-World War II combat was the employment of CAS/BAI during the "limited" wars of the 1950s–80s, particularly Malaya (where it occasionally worked well), Indochina (where it could not save the French from defeat), Algeria (where it did, but other considerations dictated a settlement), southern Africa (especially Dragon Rouge, the rescue of Belgian hostages in Stanleyville, Congo), Southeast Asia (where it was a mixed bag), Morocco (where it proved costly to prosecute), the Falklands (where it had but limited impact), the Iran-Iraq war (where BAI predominated), and Afghanistan (where it first worked well and then fell apart in the face of the growing shoulder-launched surface-to-air missile [SAM] threat).[4]

2. *BAI operations have always been of more value—as well as more extensive—than CAS operations.* By its very nature, CAS tends to be used only in extremis. Even a cursory analysis of battlefield-air-support operations from World War I onwards indicates that BAI has been the more dominant and prevalent. In limited-war situations, particularly in the absence of maneuver or high-tempo combat, CAS has been more frequently employed, but even here it is often surprising how few sorties are actually devoted to the CAS mission. For example, an analysis of Air Force sorties in South Vietnam through October 1966 revealed that only 3 *percent* were devoted to CAS missions; as one Air Force historian subsequently wrote, "many" others fell into "a gray area between those missions that were clearly close air support in the traditional sense and those that would formerly have been called interdiction."[5] Interestingly, this gray area was termed *direct support*, a BAI euphemism dating to British experience in World War II.



Light flak proved devastating to ground-attack aircraft, such as this British Fairey Battle (below), but fighter-bombers like the Hawker Hurricane (right) had more success evading it.

BAI operations clearly have been more useful in their impact upon maneuver land battle; the blitzkrieg, Western Desert campaign, Italian campaign, breakout across France, and epic air-land battles of the Russian front in 1943–45 were essentially campaigns where BAI predominated. Luftwaffe planners emphasized assaulting second-echelon forces, beginning in the latter stages of the Spanish civil war and continuing into the Second World War. So did the *Voyenno Vozdushnye Sily* (VVS—the Soviet army air forces). Both services blended CAS operations at the front with more numerous second-echelon attacks to a depth in excess of 30 kilometers behind the front. During the Normandy landings and the subsequent consolidation phase, BAI by fighters and tactical bombers seriously hampered the arrival of German forces on the battlefield. British and American armored-column cover operations in support of the breakout and pursuit of German forces across France varied between CAS and BAI, but many were more clearly BAI operations, well beyond the range of friendly ground forces. Finally, the twin battles of Mortain and the Falaise-Argentan "Gap" were primarily Army Air Forces (AAF)-RAF combined-force BAI attacks; they had a devastating impact upon German forces. In the postwar years, there was little opportunity to examine battlefield air support in the high-tempo environment of a fluid, mechanized, total war; nevertheless, the few cases that do exist offer confirmatory evidence that BAI played a larger and more significant role than CAS. These cases include the 1956, 1967, and 1973 Middle East wars as well as the tedious Iran-Iraq war (where the Iranians tended to follow American—e.g., US Air Force—patterns and the Iraqi Air Force substituted French tactics for Soviet ones).[6]

This discussion is not intended to denigrate CAS or to imply that there is no need for it; however, its use typically reflects more desperate or peculiar circumstances—such as the fighting at "Bloody Ridge" on Guadalcanal in 1942; "Hellzapoppin Ridge" on Bougainville in 1943; the Naktong and Chosen Reservoir fighting in 1950; outpost,

Since the 1920s, the Soviets had successfully used ground-attack aircraft, such as these Il-2 Shturmoviks, but abandoned them in the 1950s in favor of jet fighter-bombers.

column, and hamlet defense in Indochina and South Vietnam; and siege breaking at Dien Bien Phu and Khe Sanh (one successful and one not). In all of these cases, CAS substituted for the lack of available artillery assets and often offset huge force disparities between opposing sides. *But, as a rule, when mobile forces join combat (particularly in open country) BAI is employed more frequently—and decisively—than CAS.*[7]

3. *With rare exception, the strategic bomber has been of minimal value in battlefield air support.* The notion of the strategic bomber majestically sweeping across a battlefield and releasing a hail of bombs has always had a certain glamour to it, but the peculiarities of strategic bomber operations have greatly limited its effectiveness. These include the need for establishing a bomber stream of some sort, the greater vulnerability of this kind of aircraft to enemy ground and air defenses, and the much greater coordination requirements for successful strikes. Preinvasion B-17 and B-24 bombing strikes against Omaha Beach on the morning of the Normandy landings did little to dent coastal defenses; far more valuable were the 36 Allied fighter-bomber squadrons providing CAS to landing forces and the 33 others flying BAI missions further inland. Operation Cobra, undertaken immediately prior to the Saint-Lô breakthrough on 24–25 July 1944, illustrated both the strengths and weaknesses of using strategic bombers for CAS missions. It achieved its desired effect, devastating the *Panzer-Lehr* division opposite the American VII Corps, but faulty planning, sloppy execution, and ill luck resulted in friendly casualties from errant bombing that killed over 100 GIs, wounded approximately 500 others, and triggered bitter exchanges between air and ground commanders. This acrimony was due in part to the fact that one of the dead was Lt Gen Lesley J. McNair, "commander" of the phantom "1st Army Group." At the end of the war, Gen Omar Bradley's 12th Army Group rated fighter-bombers as particularly valuable for

German Stukas proved to be excellent CAS/BAI aircraft in blitzkrieg, where their air superiority gave them freedom of movement. Even in this environment, air-to-ground communications problems often resulted in "friendly" casualties.

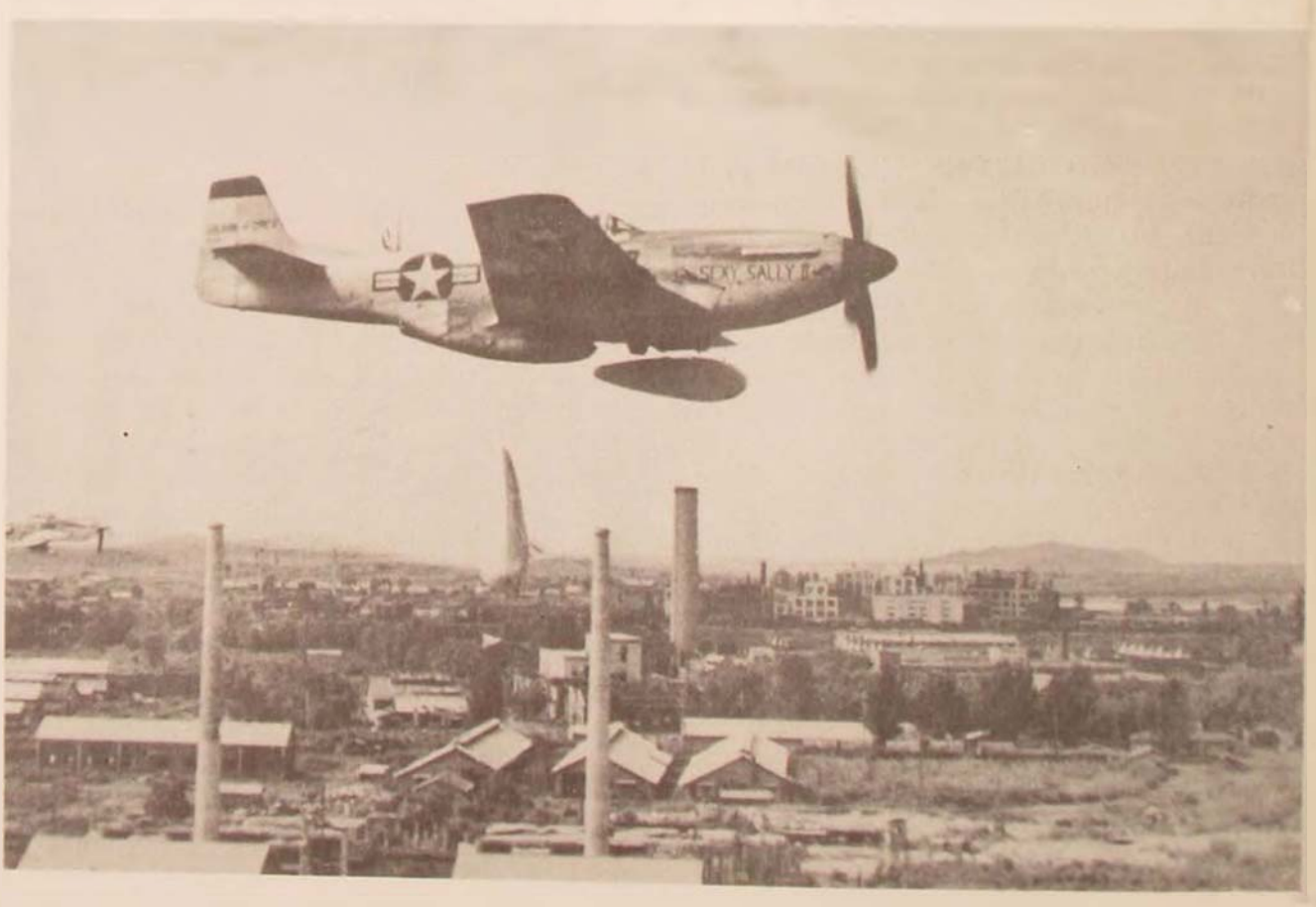
troop support but was noticeably cooler towards medium bombers and, particularly, "heavies." The group's attitude was that heavy bombers had the potential to be devastatingly effective but were prone to generate friendly casualties and thus necessitate the establishment of large safety zones between friendly and enemy forces—constraints not conducive to good post-strike exploitation of a battered foe.[8]

Post-World War II operations have been equally mixed. B-29s flew in a battlefield-air-support role (particularly at night, using radar bombing) for allied forces in Korea and seem to have had little actual impact

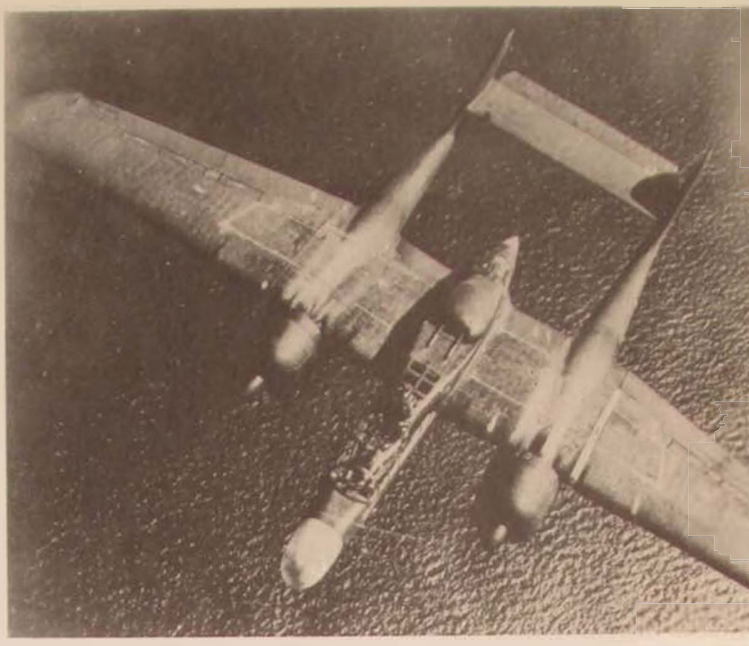
upon the ground situation, despite occasional statements to the contrary. The French unsuccessfully sought intervention by atomic-bomb-equipped B-29s during the debacle at Dien Bien Phu; the British employed Lincoln bombers against the Mau Mau in Kenya (without notable success); and it fell to the United States to demonstrate that developments in precision guidance and control techniques, when coupled with a static situation, could result in profitable support of ground forces by B-52s during the siege of Khe Sanh. It is worth noting, however, that all of these operations (whether undertaken or not) fell far more under the rubric of BAI than of CAS and were undertaken in conflicts where both air and ground commanders greatly preferred to employ smaller, more agile, and operationally flexible aircraft—notably the fighter-bomber.[9]

4. *"Classic" air interdiction has proven disappointing and of less significance than either BAI or CAS; its impact upon battlefield operations is questionable, particularly when it is not synchronized with ground maneuver warfare.* Four examples exist from four separate conflicts that call into question the efficacy of non-BAI interdiction: Operation Strangle (Italy, 1944); Operations Strangle and Saturate (Korea, 1951–52); French interdiction efforts against Vietminh supply lines, 1952–54; and the long and arduous campaign against the Ho Chi Minh trail network over a decade later. Strangle in Italy never attained the degree of supply denial to German forces that its planners had hoped; as a purely "interdiction" effort, it failed. But strikes closer to the front undertaken during the subsequent Diadem phase did hamper German mobility near the line of engagement—another example of BAI effectiveness, as reflected

The F-51 Mustang (shown here releasing napalm canisters) was designed as an air-to-air fighter but was used for ground attack in Korea. The increasingly hostile ground-to-air threat took a high toll on aircraft used in this role.



in contemporary Nazi accounts and postwar memoirs.[10] The same could not be said of Korea's Strangle, which, like its predecessor, attempted to pinch off supplies coming down a peninsula. There, road strikes resulted in little more than expensive earth moving at a prohibitive cost in killed and captured aircrews and lost or damaged strike aircraft. Saturate, its successor, targeted the North Korean rail network with somewhat better success but (given the nature of fighting at the front) still did not deny Communist forces the supplies necessary to continue fighting. An evaluation report, in fact, concluded that in January 1953 "the enemy was better supplied, fed, and equipped than at any previous time."[11] In Indochina (subsequently Vietnam), planners did not even have the advantages of geography—attacking across a peninsula—and, hence, the problems of interdiction were much more severe. The French lacked resources to prosecute a campaign against supply routes from Communist China, and the introduction of increasingly intense antiaircraft assets resulted in unacceptable loss rates of strike and bomber aircraft. The successful capture of Dien Bien Phu was due in great measure to the successful transportation of large amounts of supplies and equipment, coupled with equally successful "air denial" of French ground-attack forces.[12] In Vietnam, the paucity of resources that afflicted the French was not a serious problem for the United States and its allies. In theory, virtually the entire country was within 15 minutes of tactical air power coverage, and CAS/BAI operations worked generally well. But the diversity of route options enabled Communist forces to counteract the intense air campaign waged against them, and the increasing sophistication of their air defense resources led to nagging and continuous losses. Though air attack undoubtedly reduced the amount of supplies that got down the trail, it never succeeded either in stopping the flow or in generating losses so extensive as to compromise the ability of the Vietcong to come to battle. What successes air power enjoyed against the Vietcong were achieved primarily via BAI and CAS, particularly when air action was synchronized with ground maneuver.[13]



Night fighter aircraft often accomplished little, other than harassment of the enemy, and sustained heavy casualties. Night attack remains a weak link in CAS/BAI doctrine.

5. *The greatest recurring problem in battlefield air support has been effecting timely and accurate strikes with satisfactory communications, control, and coordination.* Even in the First World War, ground and air commanders complained about the problems of arranging and coordinating air support missions. Col William ("Billy") Mitchell, for example, went to great lengths to ensure the adequacy of communications and identification procedures in his preparations for the Saint-Mihiel offensive. Such problems continued in the postwar years. The British and French "air control" experiences highlighted continuing problems in this area; the French, in fact, utilized airborne radio-equipped observers who functioned essentially as forward air controllers (FACs) beginning as early as the Rif War of the 1920s in North Africa. Effective direct-control procedures first appeared in the Spanish civil war, thanks to the work of the

The P-47 Thunderbolt was the most successful Army Air Forces fighter-bomber during World War II. Its devastating firepower was extremely effective in CAS/BAI. At right is a rare photo of a P-47 in action at night.

Legion Condor. Subsequently, during the Second World War, virtually all the major combatant nations developed particular air support procedures, to a greater or lesser extent constrained or enhanced by the particular air-army doctrine being followed. American procedures were profoundly influenced by the RAF's experience in the Western Desert. Even so, battlefield coordination and communication proved difficult. When the British first began their Western Desert campaign, the typical lag between a support request and the arrival of strike aircraft over the target was two and one-half to three hours. Needless to say, this tardiness vastly improved by war's end. (In Vietnam, the average time from the eruption of a firefight to the first delivery of CAS was over an hour, but analysis revealed that up to 40 minutes of this time was being lost by ground commanders delaying their request for air support.[14])

Identification of and communication between friendly air and ground forces have posed continuing problems. Air strikes on friendlies were an all-too-common occurrence in the Second World War (and appeared in earlier and later wars as well, though not to the same degree); A-36 dive-bombers, supposedly "precision" weapons, proved notorious in this regard during the Sicilian campaign. But the Germans experienced it in Spain and in the blitzkrieg, as did the other Allies. *Indeed, whenever a ground war is fast-moving and fluid, the number of friendly casualties from air action greatly increases.* This principle unfortunately but understandably cultivates a mentality of "if it flies and is heading our way, shoot at it," which adds to the fratricide problem. Saturation of communications networks, problems with communications security, and the inability of air and ground forces to talk on a common network have likewise posed long-standing headaches. Examples abound from every war. In the Second World War, for example, German air-ground operations as late as 1943–44 suffered from the lack of a single radio capable of handling air and ground message traffic. The opening months of the Korean War were as notable for the problems encountered in communications be-

tween the various services as they were for the dismaying rapidity of the North Korean advance. Further, these communications difficulties seriously hampered the quality of CAS and BAI "target servicing." Vietnam's early days were characterized by a similar problem afflicting FAC operations. Indeed, the FAC concept, which had worked so well in Korea, had to be rediscovered and restructured, initially using Army O-1s transferred to the Air Force. Discussions with a wide range of Army and Air Force officers indicate that significant reservations about the efficacy of contemporary battlefield communication capabilities remain. Worse, the "experience" of recent joint Army-Air Force training exercises confirms that these feelings are not without considerable foundation.[15]

6. *Troops exposed to air attack experience serious psychological and morale damage that hinders their subsequent combat performance.* Ironically, civilian populations exposed to bombardment appear to have strong resistance to morale breakdown, whereas fit, young fighting men attacked on the battlefield often experience a shattering of morale that is out of proportion to the actual strength of the attack. Experience indicates, as would be expected, that this phenomenon is particularly true of troops encountering air attack for the first time. Numerous accounts from the First World War, interwar conflicts, Second World War, and postwar conflicts attest to this aspect of air attack. Noise appears to have a particular value as a "shock weapon" against troops. The shock value of a genuinely severe battlefield bombardment—such as the Cobra bombing—is not surprising. What is surprising, however, is how even a relatively insignificant strafing or two can tie up vast quantities of troops even when their own air force has unquestioned air superiority and is devastating the foe. (Such was the case with the Germans at Sedan [France] and to American forces after D-day). That the Soviets are concerned about the impact of air attack on morale is evident from the recent comments of a Soviet infantry-training platoon commander.[16] As a rule, *armies traditionally fear an enemy air force more than they respect their own.* In contemporary discussions with "ground" and "air" people—regardless of the country—the ground officers generally have little faith in the abilities of their own air force to prevent an enemy air

Observation aircraft such as this O-1 often conducted forward air control in Vietnam. But the high-threat nature of most modern combat eliminated these slow, light aircraft from the battlefield.

force from devastating them and to undertake any sort of equally devastating attack upon enemy ground forces. *In sum, they overemphasize the anticipated effectiveness of the enemy air force, both in defending its own airspace and in projecting power across the front, and they minimize the ability of their own air force(s) to defend them from enemy attack and to conduct meaningful CAS/BAI against the enemy.*

7. *The ground-to-air environment has always posed an ever-increasing threat to battlefield air operations.* Even in the First World War, battlefield attack missions took a high toll of attacking aircraft, particularly as troops became seasoned and learned to fire back. During the battle of Cambrai (France), for example, ground-attack mission loss rates never dropped below 30 percent, resulting in the essential destruction of a fighter squadron in four days. Understandably, pilots expressed a marked preference for dogfighting, believing that it significantly enhanced their chances of survival. The proliferation of light flak in the world's armies by the end of the 1930s had a drastic impact upon subsequent CAS and BAI operations. Light flak took a high toll of ground-attack aircraft during the Spanish civil war, and, during the blitzkrieg, German light flak devastated low-level attackers, particularly in the Polish and French campaigns. Of course, later in the war, the Allies had their own opportunity to suppress enemy air attack, and the combination of radar-directed antiaircraft artillery (AAA) coupled with proximity-fused shells down to sizes as small as 40 millimeters (mm) was of particular value.[17]

The ground-to-air threat environment increased in severity in the postwar years. Though conflicts such as Korea and Indochina were characterized as "limited," they nevertheless took a high toll of aircraft. For example, in April 1951 the Navy and Marine Corps lost 33 aircraft primarily on CAS/BAI missions from light and medium AAA and small-arms fire. During the siege of Dien Bien Phu, the Vietminh moved in heavy antiaircraft artillery formations and succeeded in inflicting air denial upon the French; by May 1954, just before the collapse, French fighters and bombers (let alone transports and liaison airplanes) could not operate over the valley without taking prohibitive losses.[18] American fixed-wing aircraft losses in Southeast Asia (SEA), while not large in the context of the entire SEA air effort, were certainly not inconsequential, and the introduction of the shoulder-fired SAM during the 1972 North Vietnamese spring offensive added a new problem for tactical air planners. Whereas previously in limited wars air attackers could rely on older generations of warplanes or even light propeller-driven trainers converted as "strike" and FAC airplanes, the enhanced SAM threat essentially drove such aircraft—including the fabled Douglas A-1—from the sky. The 1973 Middle East war highlighted the deadly synergy of fixed-base and shoulder-fired SAMs coupled with traditional AAA and radar-directed multiple-barrel light flak. Out of an estimated 109 aircraft lost by the Israeli Air Force (IAF) during the October war, 61 were lost on close support.

During operations early in the war, the IAF had to rely on artillery suppression of enemy SAM defenses to allow its strike aircraft to operate over the Golan Heights. The daunting efficiency of ground defenses cut both ways: Israeli gunners shot down an estimated 101 Arab aircraft that were attacking troop positions—23 falling to SAMs and 42 to 20-mm ground fire.[19]

More recently, experiences in Angola and Mozambique, in Morocco's *Polisario* guerrilla war, in the Falklands (Islas Malvinas), and in Afghanistan have further confirmed the danger that the SAM poses to attackers—particularly the small SA-7-/Redeye-/Blowpipe-/Stinger-class weapon. Stinger wallahs of the Afghani resistance inflicted air denial upon the Soviets. Thus, they defeated a combined-arms Soviet air-mobile system using fixed- and rotary-wing support and reversed a Soviet air superiority that had permitted attacks against the *Mojahedin* virtually at will. Allegedly, from September 1986 to mid-1987, the Soviets lost an average of one airplane or helicopter per day to Afghani air defenders. In any future high-intensity war, preventing attrition of one's forces by air-to-air and ground-to-air threats will be a serious challenge to air commanders. Ground-to-air threats—including fratricide from "friendly" fire—will obviously continue to pose a major headache for battlefield-air-support planners. Indeed, the era of some aspects of battlefield air support—such as the orbiting FAC—are probably gone forever.[20]

8. *The fighter-bomber has always performed more satisfactorily in the CAS/BAI role than the special-purpose attack airplane.* The fighter-bomber possesses the in-

Good air-to-ground communications are essential in CAS operations but remain a problem area. Army and Air Force coordination in the development of communications systems needs to be improved.

trinsic performance, flexibility, and safety to perform the CAS/BAI mission better than more specialized attack aircraft. Both the fighter and the attack airplane appeared in the "Great War," and the performance disparity between them was slight. By war's end, as discussed earlier, the bomb-carrying fighter had appeared as an element of ground-attack warfare. After World War I, the performance disparities, size, and complexity of the specialized attack airplane grew so large that by 1939 such craft were decidedly at a disadvantage to the fighter for the CAS/BAI mission. During that time, the ground-attack airplane had generally evolved into a twin-engine machine almost indistinguishable from contemporary medium bombers or, on the other hand, the specialized dive-bomber. Both proved vulnerable to opposing fighters and the intense low-level flak that increasingly accompanied ground forces, just as both were incapable of undertaking the kind of "swing-role" missions that fighters could. By war's end, both the Allied and Axis powers expressed a clear preference for the modified fighter-bomber (such as the P-47, Typhoon, FW-190G, and Yak-7B) for battlefield ground attack. In the United States' case, this superiority was recognized not merely by the AAF, but by the Army ground forces as well. In the postwar years, even the Soviet Union, which had operated specialized *Shturmovik* (assault) aircraft since the 1920s, abandoned them in favor of the jet fighter-bomber, beginning with the Su-7 Fitter.[21]

It is ironic, then, that the 1970s witnessed the reintroduction of the "attack" airplane in US service—the A-10. It represented a return to an older philosophy of battlefield air power discredited by the experiences of the Second World War. Borne of a limited war need—replacement of the older A-1—the A-10 was, in one respect, an exasperated response to congressional pressure to pacify the ground forces. Specifically, ground forces claimed they needed an up-to-date, heavily armored, long-loiter, high-payload bomb dropper, built without

The threat from the ground. Introduction of hand-held surface-to-air missiles (SAMs) has proven deadly to CAS efforts. If not for SAMs, the Soviets would have enjoyed total air supremacy in Afghanistan.

regard to other issues such as swing-role missions and survivability against sophisticated air-to-air and ground-to-air threats. Even at the time of its creation, it had questionable survivability in a high-intensity war characterized by multiple air-to-air and ground-to-air threats. The current debate over the CAS/BAI mission, the intense interest in upgrading aircraft such as the A-7 and the A-10, and defense reform movement cries for a "mud fighter" all reflect the confusion that continues to plague the acquisition of "attack" aircraft. A far better approach than creating retreads and such potential enemy ace makers as the proposed "mud fighter" is the fighter-bomber, which has worked since World War I. And in this respect, it is immaterial whether such aircraft have an "A" designation, such as the A-16 variant of the F-16 or the A-18 half of the F/A-18. In previous decades we recognized that fighters had a dual-role nature; we didn't distinguish between "P"-47s and "A"-47s, nor between "F"-84s and "A"-84s. Neither should we do so today.

The threat from the sky. The advanced sensor systems of the AC-130 gunship make it a formidable battlefield air support weapon in the low-intensity environment. These sensors also greatly reduce the possibility of accidentally firing on nearby friendly forces.

because making such distinctions helps fuel the belief that there is something inherently desirable in a specialized attack aircraft for battlefield air support—a questionable notion indeed. (Political realities, however, favor such separate designations; having an "A" airplane clearly speaks of an air service's commitment to its ground partners.) The swing-role fighter is just that—a capable air-to-ground and air-to-air airplane. Differentiating further can lead to dangerous dichotomy of thought between air-to-air and air-to-ground warfare. Rather than arguing over "F" or "A" airplanes, planners should be addressing more significant topics, such as the desirability of incorporating vertical and/or short takeoff and landing (VSTOL) technology on future fighter-bombers in light of the historic vulnerability of airfields to air-denial attack.[22]

9. *CAS and BAI have demonstrated a tremendous beneficial synergy.* Examples abound where effective CAS and BAI, working together, have had a devastating effect over the battlefield, particularly in situations where air power has been able to offset disparities between opposing forces on the ground. In US experience, the best examples are drawn from Korea and Southeast Asia. In Korea, the disparate nature of Air Force and Navy-Marine CAS actually seems to have furnished more complete battlefield coverage than if any one system had predominated. The Navy-Marine system emphasized air support within 50–200 yards (45–183 meters), with air support substituting for the lack of artillery. The Air Force envisioned CAS as seldom required closer than 1,000 yards (914 meters). Although great controversy erupted over which CAS system was better, what too often was (and is) missed is that both worked together quite effectively, with the Air Force system furnishing more of the BAI side and the Navy-Marine system more of the true CAS side. Starting in the fall of 1952, the Navy's Cherokee strikes together with a series of Air Force "air-pressure" strikes resulted in intense US Air Force-US Navy BAI operations that did much to hamper Communist tactical mobility and eliminate the supplies that North Korean and Chinese Communist forces had been able to accumulate behind the front. This

effort, when coupled with "traditional" CAS applied directly over the front in support of allied forces, helped prevent the loss of territory prior to the signing of the truce agreement in late July 1953. At Khe Sanh, intensive US Air Force-Navy-Marine Corps CAS/BAI strikes prevented a repeat of the Dien Bien Phu experience and, indeed, enabled Khe Sanh to accomplish what the French at Dien Bien Phu had tried and failed to achieve: create a magnet for the attraction, concentration, and destruction of enemy forces. Massive and sustained CAS/BAI strikes, in conjunction with desperate ground fighting, blunted and then defeated North Vietnam's 1972 spring offensive.[23]

10. *CAS/BAI experience from limited wars has only limited relevancy to high-intensity conflict.* This observation, of course, is actually a subsidiary conclusion of a larger one: limited wars themselves can have but limited relevancy to larger and more intensive conflicts. The benign environment (benign compared to high-tempo, multiple-threat modern war) of a limited war generates its own dangerous limitations on thought and analysis. CAS/BAI operations in such conflicts tend to be more static in nature and not characterized by the loss rates, fog of war, and operational constraints imposed in a high-intensity war where every significant aspect of military operations is usually up for grabs or in question for much of the time. In older wars—Indochina, Algeria, Vietnam, Africa, for example—such conditions were also conducive to the operation of older, less sophisticated aircraft. Since the early 1970s, however, the rapid proliferation of effective ground-to-air weapons has required that modern support aircraft for these "brushfire" conflicts be almost as sophisticated as those intended for, say, a NATO-Warsaw Pact conflict on the central front. Nevertheless, limited wars—despite the changing nature of technology—usually have a set of other conditions that makes them largely irrelevant to more extensive conflicts. For example, there may be "sanctuary" issues; there is usually only one side that has/uses air power; there is a conscious desire to minimize casualties and collateral damage; and so forth. To consider what is more typical of high-intensity war, one should look to the last extensive high-intensity conflict: the Second World War, particularly the eastern and western front campaigns of 1943–45.[24]

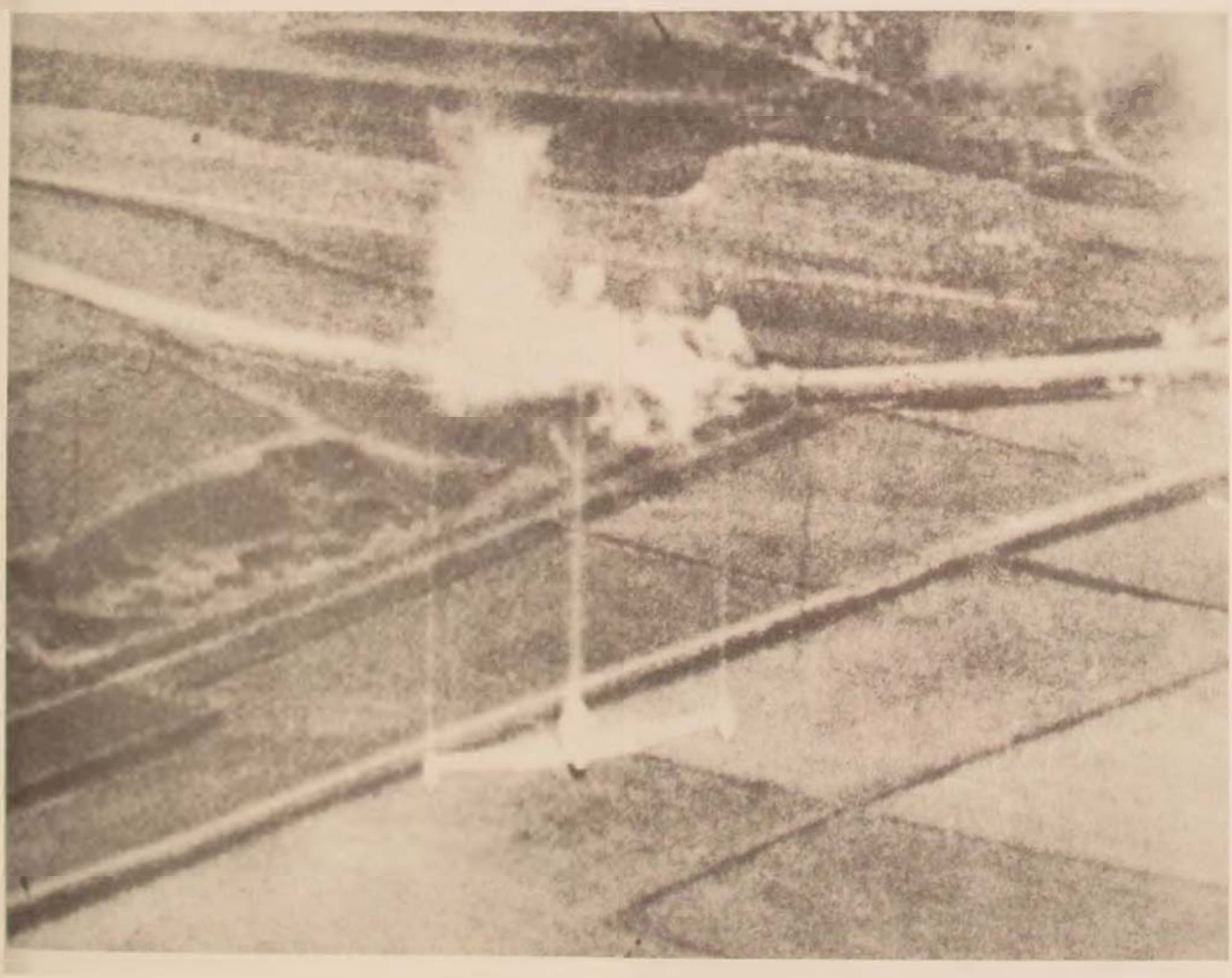
11. *Nighttime CAS/BAI has been the most difficult and frustrating form of CAS/BAI to employ and has proven less significant than daytime operations.* Denying an enemy the ability to move freely at night has been one of the most elusive goals of military planners.[25] Unsurprisingly, all-night air attack—and not just CAS/BAI operations—has posed severe challenges. Attempts to undertake what are now considered night CAS/BAI missions occurred during the First World War, but, even so, night battlefield air attack remained more harassment than "serious" air war until the Second World War. During the Normandy campaign, the RAF used Mosquito bombers as night interdictors, bombing under illumination from Mitchell flare ships; as the threat from German night attackers dwindled in 1944–45, the AAF used modified P-61 night fighters for the same purpose. The Germans established specialized night ground-attack formations though their actual combat contribution appears to have been minimal. The VVS flew night harassment missions using modified trainers (largely crewed by women), presaging similar operations by the North Koreans during the Korean War.

In Korea, US Air Force and Navy aviators undertook extensive night interdiction and CAS operations. While such activity took a heavy toll of Korean road and rail traffic, casualties were high from combat losses and operational accidents. (At one point, Fifth Air Force's director of operations, Col George S. Brown, complained of "'trading B-26's for trucks in a most uneconomical manner.'"[26]) Night attackers typically flew single and multiship sorties, attacking under flares dropped by transports or pa-

trol bombers. They sometimes attacked CAS targets using blind bombing from radar beacons, illumination from battlefield searchlights, or cues from tracer reference firing from friendly positions.

In Indochina, the French found that the night effectively cloaked Vietminh forces from air attack. Vietnam featured extensive night operations, which were both a help and hindrance to air attackers. In the early days of the war, darkness protected aircraft from antiaircraft fire; thus, such aircraft as the B-26, T-28, and AC-47/AC-119/AC-130 could operate with relative impunity. The night was an enemy, however, in that it hid the Vietcong from air observers, challenging the development of advanced sensor systems to permit detection of the foe. Eventually, the steady escalation of the enemy ground-to-air threat endangered operations by aircraft such as the lumbering gunships and necessitated complicated escort and suppression of enemy air defense (SEAD) procedures. Night air attack in Vietnam offered a mixed bag of results. On the one hand, particularly during the early days of the war when US ground forces were few and the Vietcong posed a greater challenge to hamlet defenders than they did later, air attack at night sometimes played a critical role in permitting a hamlet's defenders to hold out until daylight, when the Vietcong would typically break contact. On the other hand, effectiveness of night CAS/BAI was limited by difficulties

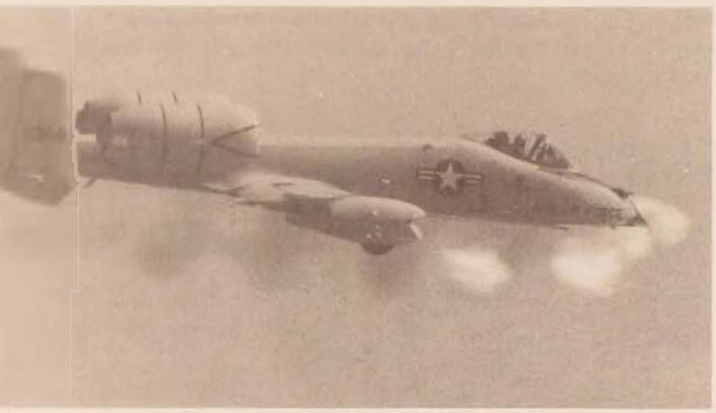
An F-80 attacks enemy vehicles in North Korea. In modern combat, BAI is a useful role for manned aircraft, but deeper interdiction may be better left to unmanned aircraft and standoff weapons.



locating the enemy, increasing vulnerability of night attackers to ground defenses, disorientation problems traditional in night attack (particularly in mixed cloud and clear conditions), terrain-avoidance problems, and operational problems with the aircraft themselves (such as visibility from the cockpit, momentary flash blindness from weapon firing, lack of sufficient cockpit navigational and situational aids, and the like).

With this record from several wars, it is understandable why there is such interest in successfully prosecuting night and all-weather CAS/BAI/deep-interdiction attacks via advances in technology. One such system is low-altitude night targeting infrared navigation (LANTIRN), intended for the F-15E and F-16. Any future CAS/BAI aircraft will of necessity be expected to operate day and night and in adverse weather. Whether or not we will be able to reverse a historic record of less-than-satisfactory night CAS/BAI operations remains, of course, to be seen—*but we probably should not realistically expect to achieve identical accuracies or overall efficiencies comparable with daytime CAS/BAI employment, though the attempt to achieve such goals is a most laudable one.*

A review of the above points leads to two questions: (1) *How realistic is it to expect that we can continue to undertake the kind of CAS/BAI operations that have characterized air-land warfare in the past?* and (2) *What are the future prospects for "traditional" deep interdiction?* These are two issues that require much more attention than can be given here, but the following closing thoughts are offered in the spirit of healthy dialogue. It is realistic to expect that there will be a continuing need for the application of battlefield air power, but it is questionable whether the returns from CAS missions warrant the expenditure of scarce aircrews and aircraft. This statement should not be interpreted as a callous denial of the ground forces' need for air support. That need historically has best been met with BAI, not CAS. If CAS is what desperate circumstances dictate, so be it, at whatever cost is judged acceptable. *But both air and ground commanders must recognize that in any future high-intensity war, the aircraft and airmen frittered away one day on missions of dubious value will*



The A-10 (above) filled the need for a high-load-carrying aircraft that could remain in the target area for a long time, but it may be too specialized for a high-intensity combat environment. The A-7 (below) has proven to be an extremely effective CAS/BAI aircraft for many years. It proved itself again as recently as the 1989 Panama action, but its performance in a conventional conflict remains open to question.

not be available for use the next day for missions that may be truly necessary. Finally, aircraft employed on "traditional" interdiction missions may well be much more valuable operating in a BAI mode rather than a deep-strike one. The traditional fixed nature of deep-interdiction targets—road and rail intersections, bridges, facilities, and the like—is such that these may prove far better targets for autonomous smart or "brilliant" weapons such as cruise missiles, standoff missiles, unmanned air vehicles, and so forth. Certainly, history indicates the great degree to which these targets become flak traps. If deep interdiction by piloted aircraft is genuinely required, then it may best be undertaken by low-observable systems. *Thus, it may well be in the Air Force's best interest to rethink its prioritizing of air missions so as to place BAI on a higher priority level than deep interdiction and to relegate CAS to a lower priority level, consistent with the recognition of its use only in extremis. A suitable rank ordering would thus be as follows: (1) air superiority, (2) BAI, (3) deep strike, and (4) CAS.* Now, in an all-out war involving nuclear weapons—particularly nuclear exchanges between the superpowers—all of this goes out the window; likewise, Washington's political realities may dictate otherwise.

In conclusion, this article has attempted to examine the issue of close air support and battlefield air interdiction from a variety of perspectives. It has not been intended as the last word on or a definitive accounting of the CAS/BAI experience. It will have served its purpose if it generates an increased dialogue between those individuals within the operational, planning, doctrine, and acquisition communities who are, even now, confronting the challenge of future CAS/BAI warfare. □

Notes

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The F-16 is proposed as the next swing-role fighter-bomber for CAS/BAI. Although critics would prefer a "mud fighter," history shows that the multirole fighter has been more successful in combat.

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WINTER 1989

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THE US AIR FORCE IN KOREA

Problems that Hindered the Effectiveness of Air Power

Maj Roger F. Kropf, USAF

THE North Korean People's Army (NKPA) invasion of the Republic of Korea (ROK) on 25 June 1950 found the US armed forces in a deplorable condition with little conventional capability.[1] The newly established United States Air Force had spent most of its limited budget on strategic nuclear systems, neglecting the tactical air forces. The Far East Air Force (FEAF), based in Japan, and its Fifth Air Force had conducted few joint

exercises to practice air-ground coordination with the Eighth US Army in Korea (EUSAK).[2] Within a month the NKPA drove the United Nations (UN) forces to a small perimeter around the port of Pusan. Despite the unprepared condition of the tactical air forces, air power prevented disaster and complete defeat of the UN forces during the initial NKPA invasion. Lt Gen Walton H. Walker, the commander of EUSAK at the start of the war, stated, "If it had not been for the air support we received from the Fifth Air Force, we should not have been able to stay in Korea."[3] While the USAF was a major factor in helping to ensure the independence of South Korea, there were numerous errors committed by the US forces, including the Air Force, that resulted in ineffective application of air power.

War is a complex endeavor, and the problems encountered are often interrelated. For example, the failure to develop a true joint theater command structure in Korea not only contributed to other problems but inhibited the development of solutions to the problems. Additionally, problems in air-ground coordination led to degraded close air support, and Air Force-Navy coordination remained difficult through most of the war. A true joint staff could have assisted in the resolution of these problems. Air interdiction had an important role in the war but was not always used effectively. Finally, the USAF lost flexibility in employing its new jet aircraft when it ran into problems with the availability of air bases that had long, concrete runways for these aircraft.

This article examines these problem areas of the Korean War. While the history of a war that ended over 36 years ago cannot give us solutions to current problems, it can provide perspective and insight into problems and a basis for asking the right questions.

The Joint Command Structure

At the root of air power's difficulties during the Korean War was the command structure of the Far East Command (FEC) of Gen Douglas MacArthur, commander in chief, Far East (CINCFE). In the words of the official USAF history:

> The Korean war was the first conflict to test the unified military forces of the United States. Although the U.S. Joint Chiefs of Staff had directed the Far East Command to provide itself with a joint command staff adequate to ensure that the joint commander was fully cognizant of the capabilities, limitations, and most effective utilization of all the forces under his command, the United Nations Command/Far East Command operated for the first two and one-half years of the Korean war without a joint headquarters. Practically all of the interservice problems which arose during the Korean war could be traced to misunderstandings which, in all likelihood, would never have arisen from the deliberations of a joint staff. In the absence of the joint headquarters staff, the full force of United Nations airpower was seldom effectively applied against hostile target systems in Korea.[4]

One of the lessons of World War II was the need for a joint command structure for command of a theater. A joint headquarters, with expertise from all the services, oversees the subordinate ground, air, and naval components, ensuring the most efficient, coordinated, and synchronized employment of the theater commander's resources.[5]

MacArthur's Command Structure

As CINCFE, MacArthur and his unified theater headquarters (usually referred to as GHQ) actually had dual responsibility as the unified theater headquarters and as the headquarters of the ground component command (GCC). MacArthur's GHQ was essentially an Army staff and had inade-

quate representation of the Navy and Air Force.[6] In the words of Maj Gen O. P. Weyland, investigating problems in Korea in October 1950:

> The GHQ staff of Cincfe [sic] is essentially an Army staff and cannot be considered a joint staff. With the exception of the Commander-in-Chief, few of the staff previously held command positions higher than that of the regiment or the division . . . very few, if any, of the GHQ staff previously had experience which included the tactical handling of air. The lack of air representation has made it difficult to realize the most efficient and timely employment of air power in Korea.[7]

MacArthur never formed a GCC (Army Forces Far East, or AFFE), but initially kept X Corps (formed for the Inchon invasion) separate from the Eighth Army[8] and directed both ground components from 700 miles away in Tokyo.[9] When he finally placed X Corps under Eighth Army in December 1950, AFFE was still not formed. GHQ continued to perform this role. As a result, MacArthur had all commanding generals report to him through his Army-dominated GHQ.[10] This essentially put the air and naval component commands under the ground component command (fig. 1). To make matters worse, MacArthur remained isolated from his staff and did not work closely with his principal subordinates and commanders. For example, General Walker did not have a close working relationship with MacArthur and GHQ and was visibly hostile towards MacArthur's chief of staff and future X Corps commander, Maj Gen Edward Almond.[11] These traits were nothing new with MacArthur; he had shown them during World War II.

MacArthur's World War II Command Structure

MacArthur's stature and the Navy's suspicions of him led to a division of responsibility in the Pacific Theater in World War II, rather than a single unified command. MacArthur, heading the Southwest Pacific Command, surrounded himself with a staff

General MacArthur's insistence on personal control of Korean activities and the lack of a joint staff under his control resulted in significant problems in prosecuting the Korean air campaign.

of trustworthies (some say sycophants) known as the "Bataan Gang" and kept his theater headquarters far from the front.[12] His first air commander, Lt Gen George Brett, was ineffective and was relieved, but his replacement by Gen George C. Kenney resulted in the successful integration of air power into the campaign. MacArthur still had an Army staff instead of a joint staff, but in Kenney he found an air commander whom he trusted and left alone to run the air campaign.[13] The credit for MacArthur's successful use of air power in World War II must largely be credited to the forcefulness and exceptional abilities of General Kenney.

Problems of the Joint Command Structure

In Korea, the command structure greatly hindered the coordination of joint forces

and communication between forces. A typical failure was in air targeting. Instead of having FEAF, the air component command, perform air targeting, GHQ formed the GHQ Target Group and tried to direct air operations from Tokyo.[14] The Target Group, made up of GHQ staff officers, "lacked the experience and depth of knowledge for targeting an air force. . . . [T]he [Target Group] effort was inadequate."[15] As an example, 20 percent of the first 220 targets designated were nonexistent, such as the rail bridges at Yongwol and Machari—two towns without railroads at all.[16] A GHQ Target Selection Committee, which included high-level USAF and US Navy personnel, was formed to improve targeting. The GHQ Committee did improve performance but was dependent on the FEAF Formal Target Committee, with Navy, Fifth Air Force, and Far East Bomber Command representatives providing expert targeting. This FEAF Committee did not get full authority for air targeting until the summer of 1952, two years into the war.[17] The overall effect was the failure to fully integrate air power into the theater campaign.

Another result of GHQ interference was the hindrance of Eighth Army requests for air support early in the war. GHQ directed the ground forces not to contact Fifth Air Force for air support but rather to send all requests through GHQ in Tokyo. This entailed long and ponderous communications links from EUSAK to GHQ to FEAF and finally to Fifth Air Force. As a result, in the early phases of the war it took about four hours to channel requests for air support from Eighth Army to Fifth Air Force, a major factor inhibiting prompt and effective air support.[18]

In a review of the command structure after taking over as CINCFE in the spring of 1952, Gen Mark W. Clark recognized the poor organization of the Far East Command. He formed and activated AFFE, the ground component command, in October 1952, and it began functioning in January 1953. While General Clark formed a true joint staff at FEC, which was an important improvement, he still took over as CINCAFFE, continuing as commander of both the theater and GCC.[19]

Air-Ground Coordination and Close Air Support

The Air Force also experienced major problems in air-ground coordination and close air support (CAS). Although lack of a true joint command structure contributed to these problems, there were major Air Force and Army shortcomings that were primary causes. Entering the war, FEAF's primary mission was the air defense of the Far East, especially Japan. It had conducted minimal and unrealistic training in close air support with the Eighth Army.[20]

Control of Close Air Support

Initially, FEAF had only rudimentary tactical air control capabilities. It sent two tactical air control parties (TACPs) to Korea immediately to support the ROK troops, but these were inadequately equipped and not well trained. The old, worn-out jeep-mounted radios of World War II vintage, unable to take the beating of the rough terrain, were constantly breaking down and were difficult to repair. The TACPs were often unable to get to the front lines with working equipment, and, if they did, their unarmored jeeps and radios were extremely vulnerable to enemy fire. The result was an inability to get far enough forward to direct effective air strikes.[21] Additionally, the Army had failed to develop adequate communication nets for tactical air requests and liaison, forcing the Army to use (and to overload) the Air Force tactical air direction network.[22] The sum total of these problems was a ploddingly slow network that inhibited rapid response to immediate needs for CAS.

The total inadequacy of tactical air-ground coordination and the initially permissive air environment led FEAF to equip

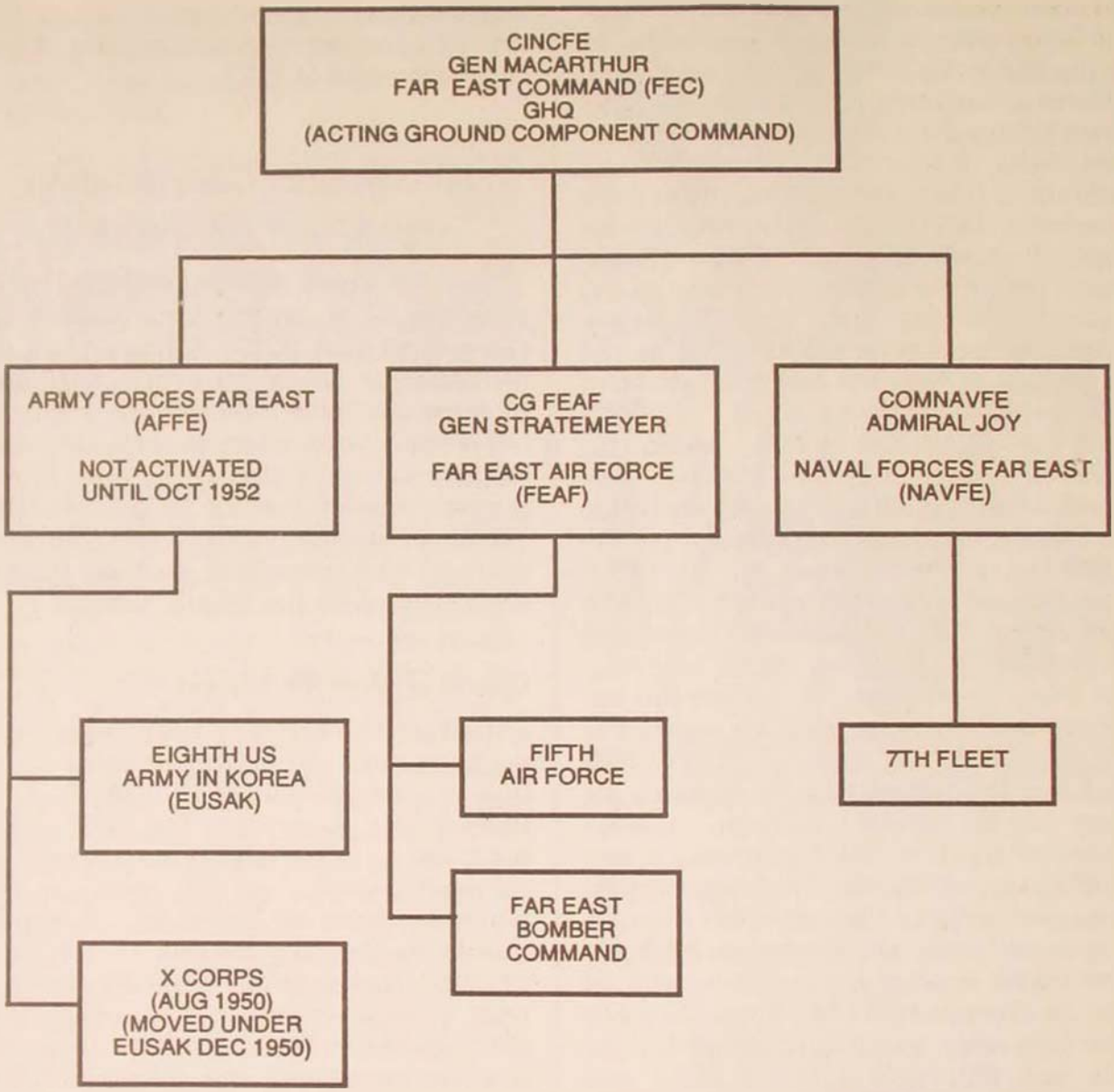


Figure 1. Unified Far East Command Organization of Forces in Korea.

T-6 aircraft as airborne tactical air coordinators, called "Mosquitoes."[23] These Mosquitoes, along with such steps as assigning TACPs to every regiment and setting up a tactical air control net for Eighth Army, improved Air Force CAS. Because such slow, unarmed aircraft are very vulnerable in a high-threat environment, the improved Chinese defenses forced FEAF to restrict the Mosquitoes to within two miles of friendly lines by the summer of 1951.[24] Additionally, the very limited radios of the Mosquitoes quickly led to saturation under heavy usage.

Although the tactical air control system was improved significantly, its continuing deficiencies were masked by the decreasing importance of CAS due to the improved organic firepower of the ground forces and the change from a fluid war of maneuver to a static front in the second six months of the war,[25] a condition that lasted the rest of the war. FEAF shifted its emphasis to air interdiction but continued to provide CAS:

however, even with the static ground environment, CAS was not very responsive. In September 1951, the Marines, now integrated into Eighth Army and without their own organic air support, were involved in the heaviest fighting on the front. FEAF supported their need for CAS with an average response time of 113 minutes.[26]

Overall, the Army and Air Force failed to find a satisfactory way to provide timely response and front-line control of air strikes.[27] This was finally revealed in the last months of the war, when the Chinese mounted one last offensive and the Army needed CAS. The official Navy history noted that

> the close support request net clogged almost at once . . . strikes followed requests by as much as 17 hours. Again . . . the control system collapsed as JOC [Fifth Air Force Joint Operations Center] duty officers . . . rammed aircraft in large numbers into the threatened sectors. Once more . . . the main responsibility [was put on] the Mosquitos [sic] which, in the fluid situation, once more demonstrated their inability to keep track of friendly positions and important targets.[28]

Clearly the ability to rapidly respond to emergency needs for CAS was never established in Korea.

Light Infantry and Close Air Support

The Army entered the war with a piecemeal commitment of light infantry against an NKPA invasion backed by significant armor forces equipped with the powerful T-34 tank. Normally, the Army uses organic artillery and armor to provide close-in firepower, but it entered Korea with few tanks and inadequate infantry and artillery antitank rounds, having viewed Korea as unsuitable terrain for tanks. Additionally, the ROK army was lightly armed, more a police force than an army.[29] Although a buildup of artillery and armor was rapidly made, the initial use of light infantry against the armored NKPA forces in the first months of the war led to the need for heavy air support.

Besides being unable to stand up to armor, the UN forces were consistently outmaneuvered in the fluid situation as the NKPA drove down the Korean peninsula. The tendency of US forces to deploy near the roads and not take the high ground aided the enemy in their typical offensive tactic of envelopment or double envelopment, cutting off the rear lines of communication, disrupting the rear areas and often overrunning the artillery. In the first six months of the war, US artillery was repeatedly overrun, with "scandalous" losses of field pieces.[30] This added to the heavy dependence on CAS for firepower.

CAS was undoubtedly an important factor early in the war, as evidenced by the comments of Maj Gen William Kean, commander of the US 25th Division, after two days of heavy fighting in September 1950: "The close air support rendered by Fifth Air Force again saved this division as they have many times before."[31] The official Army history also noted that

> in the first month of the Korean War, close air support was a vital factor in preventing the North Koreans from overrunning all Korea, and in gaining for the United States the margin of time necessary to bring in reinforcements and accumulate the supplies needed to organize the Pusan Perimeter . . . the U.N. ground forces in Korea were receiving proportionately more air support than had General Bradley's Twelfth Army Group in World War II.[32]

It should be noted that this "close air support" included what we now call battlefield air interdiction (BAI). Indeed, most tanks killed by air power were destroyed by BAI sorties, not CAS.[33]

Coordination with Naval Aviation

The problems of air-ground coordination in the Korean War were compounded by the inability of FEAF to adequately communicate and coordinate with naval (including Marine) aviation. Although routine interservice problems were easily handled, doctrinal clashes over control of tactical air

power between USAF and naval aviation were not solved in Korea.[34] Again, the lack of a joint command structure contributed to these problems and the failure to completely resolve them.

Coordination of Close Air Support

The Marines, in their amphibious role, were essentially light infantry and lacked adequate organic artillery and armor. Their doctrine specified a dependence on CAS to within 50-200 yards. The Army preferred artillery for very close support and usually used CAS farther from troops (beyond 1,000 yards), where ground controllers were of limited use. In contrast to the prewar relationship between FEAF and Eighth Army, Navy-Marine aviation trained extensively and realistically with the Marine ground units. This resulted in very effective Marine air-ground coordination and CAS, with dependence on the Navy and FEAF for air superiority.[35] It seems no coincidence that captured enemy troops said they most feared, "the blue airplanes" of the Navy and Marines.[36]

Of course, the Marines had a major advantage in that their brigade (eventually a division) had its own dedicated Marine air wing, a concept too cost-prohibitive for the much larger theater forces of the Air Force and Army. This dedicated air support assumes air superiority and a limited geographical front, with no requirement to rapidly concentrate air power in other areas of the theater. These factors led to the Marines having aircraft on air alert for 5- to 10-minute response, while the Air Force required them to be on call, with typical response times of 40 minutes.[37] Still, trouble did not start until the Navy ran into the FEAF air-ground control network. The need to check in with the Fifth Air Force Joint Operations Center (JOC) in Taegu forced aircraft to fly within 10 or 15 miles of the JOC for assignment to a controller, adding as much as 200 extra miles to sorties. This greatly limited options and time on station.[38]

Additionally, the Air Force 4- and 8-channel VHF radios on the T-6 did not have adequate capacity, especially compared with the better Navy 12- and 20-channel sets.[39] Two of the T-6 channels were set to ground party frequencies, leaving two (or at best six) frequencies for working air control. When a real need arose, JOC would swamp the sector, leaving the T-6s and their few radio channels overloaded. Because of the limited frequencies and multiple flights, TACPs and Mosquitoes would often all be on the same channel, causing great confusion and inefficiency.[40] An action report from the aircraft carrier *Philippine Sea* provides an example:

> For this vessel the subject of close support is a touchy one. The inability to establish good communications with any controllers has limited its effectiveness. There is apparently no such thing as radio discipline. If a pilot has something to say he just tries to cut out whoever is on the air. Too many tactical air controllers and different support flights are on the same channels. With the present ground situation as it is [that is, fluid] it is mandatory that the pilots be informed exactly as to their

The T-6 Mosquito forward air control aircraft was the mainstay of CAS air operations. Unfortunately, its limited communications and its vulnerability to ground fire hampered its effectiveness.

> mission. In the past this has not been done and has resulted in inefficient use of aircraft from this vessel engaged in close support operations.[41]

Compounding the situation, the poor payload and lack of loiter time of FEAF's Japan-based F-80s often forced Navy aircraft to hold while the F-80s made their runs. Many times the Navy aircraft could not even make contact with the Mosquitoes. Navy captain John Thatch "just couldn't believe that communications could be so bad [that] the pilots would come back and say 'We couldn't help. We wanted to. We were there and we couldn't get in communication with people.'"[42]

Control of Naval Air Resources

The question of unified command of all theater air power remained an Air Force-Navy issue throughout the war. Lt Gen George E. Stratemeyer, commander of FEAF, insisted on operational control of all naval aircraft operating out of Japan or flying over Korea. The Navy, however, although mainly supporting the theater ground forces in Korea, also had responsibility for control of the sea, sea lines of communication, fleet defense, and the defense of Formosa. In light of these responsibilities, the Navy was not willing to subordinate its air resources to an air component commander. Rather than being under the operational control of the theater commander, the Navy saw itself in a supporting role.[43] This fundamental doctrinal difference on control of theater air power never was satisfactorily resolved during the war, although an acceptable working relationship was finally established.[44]

General Stratemeyer felt that to coordinate carrier and FEAF operations over Korea, he needed to control naval air operations, "including the targets to be hit and the area in which they operate."[45] When Adm C. Turner Joy, Commander of naval forces in the Far East (CONNAVFE), objected, Stratemeyer clarified that by *control* he meant "the authority to designate the type of mission, such as air defense, close support of ground forces, etc., and to specify the operational details such as targets, times over targets, degree of effort, etc., within the capabilities of the forces involved."[46] Again, he stressed that to get the most out of air power resources, FEAF needed operational control of all FEAF and NAVFE air resources to ensure deconfliction of targets and effective coordination of all air efforts. The Navy still did not agree, but in an 11 July 1950 meeting, an agreement was made for FEAF to have *coordination control* over Navy air—a new term with different meanings to the Air Force and Navy.[47]

Few tactical air control parties existed in Korea. Their communications gear was limited and often failed due to the conditions under which the TACPs operated. Just contacting CAS aircraft often proved impossible.

The Navy believed its air component had to support the sea campaign first. Although in Korea there was virtually no battle for the sea, there was significant concern over a Communist invasion of Formosa, for which the Navy was responsible. It interpreted the term *coordination control* as fitting its supporting force role and did not accept it as meaning that naval air forces were under the operational control of the air component command. While this arrangement may satisfy short contingency operations, it hampered the long-term theater air campaign.[48]

To solve the coordination problems, NAVFE requested and was given exclusive areas of operation for Navy air close to the east coast of Korea, where the carriers operated. This limitation of naval air power to a geographical area eliminated the capability to mass firepower at the most critical points in the theater, and caused the loss of flexibility in applying maximum air power on the most important targets.

Part of the problem in integrating naval air into the theater air battle was the large amount of communications required by the large, centralized FEAF system. Carriers had limited communications capabilities, often operated under radio silence, and were unable to handle high-volume FEAF communications.[49] One example of the incompatibility of the high-volume Air Force communications with the limited Navy capacity was a FEAF radio message in November 1950 that gave the air plan for one day. Sent to the carrier task force, it required over 30 man-hours to process.[50]

Organic artillery support was the alternative to CAS. Few artillery pieces were located in Korea at the outbreak of the war, and many of those were abandoned during retreats, making air support essential to defeat the enemy.

These problems were partially a result of the bitter "unification" battles that resulted in the National Security Act of 1947. In the end, the Air Force had "won" complete responsibility for air interdiction. As a result, the Navy had no plans to use its air in long-term land campaigns.[51] The lack of training for interdiction and the major differences in employing CAS hindered coordination and cooperation between the Navy and Air Force. As a result of the interservice disputes after World War II, the Navy had a deep-seated distrust of the Air Force. It did not always make an effort to cooperate with FEAF even when FEAF was eager to work jointly.[52] Ultimately both services must share in the blame for their failure to work together.

As the war progressed, Air Force-Navy cooperation did improve significantly. Cooperation was greatly aided by improved Navy representation at both the Fifth Air Force Joint Operations Center and the FEAF Targeting Committee, both of which became solid joint operations.[53] Nonetheless, fundamental differences, especially in the control of air resources, were never completely worked out.

Air Interdiction

The Korean War had some unique factors that affected air interdiction (AI), including terrain and the Chinese sanctuary. It also provides examples of effective and ineffective air interdiction, demonstrating the importance of integrating air interdiction efforts into the overall theater campaign.

Factors Affecting Air Interdiction in Korea

Korea favors air interdiction, being a 400-nautical-mile long peninsula varying in width from about 100 to about 300 nautical miles. It is extremely mountainous, resulting in over 85 percent of the terrain being unsuitable for vehicles. At the time of the war, traffic was concentrated on the few roads and railroads of the existing network. The depth of most rivers varies from deep (between March and September) to fordable at other times. During winter many rivers (including the Yalu) freeze over.[54]

An important factor affecting interdiction was the sanctuary the UN extended to Chinese territory, allowing buildup of vehicles and supplies in China. Additionally, the Communist soldiers needed few supplies by US standards; and they were able to use manpower to carry supplies and to implement effective countermeasures such as using camouflage, restricting travel to night, and deploying repair teams for rails, roads, and bridges.[55] Finally, the static front that developed and the reduced need for ground maneuver limited the effectiveness of interdiction.

Effective Air Interdiction

Initially, as UN forces retreated to establish the Pusan perimeter, FEAF began conduct-

Interservice doctrinal conflict hindered performance in the field during the entire Korean War. The Marines used dedicated air assets (right) to support their ground units. They also operated significantly closer to friendly forces, making them more effective. However, naval air support was often made ineffective due to the cumbersome reporting requirements of the Far East Air Forces control system. Reliance on jet aircraft needing long, concrete runways meant that these F-80 aircraft (below) were staged out of Japan for Korean operations. This resulted in little loiter time and light bomb loads.

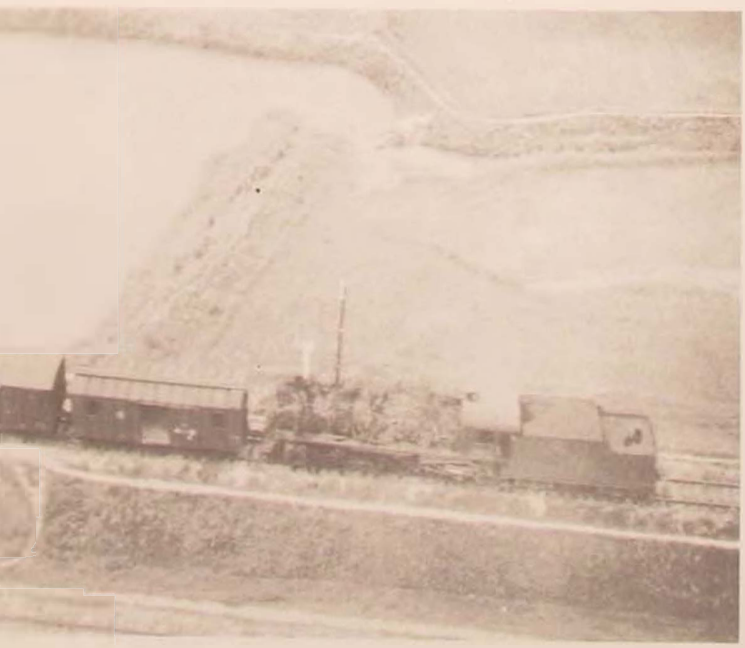
ing air interdiction to cut the lengthening NKPA supply lines. In combination with long lines of communication and heavy ground fighting, interdiction greatly reduced the fighting capability of the NKPA and resulted in extreme shortages of men and virtually all supplies.[56] The bombing of bridges is usually emphasized in this AI campaign, but AI in the form of armed reconnaissance, usually by naval and FEAF fighter-bombers, had the major impact. Fighters roamed the roads and rails, looking for lucrative targets and strafing and rocketing trains and convoys. For example, on 10 July 1950, an F-80 discovered a convoy backed up behind a downed bridge and called in additional air. A combination of F-80s, F-82s, and B-26s destroyed 117 trucks, 38 tanks, 7 half-tracks, and killed numerous soldiers.[57] From the enemy soldier's viewpoint, the effect was devastating. One prisoner described such an attack: "En route from Kwangung area the 8th [NKPA] division was attacked many times by aircraft and lost ten 76mm. field guns, three 122mm. howitzers, 20 tanks, and 50 trucks loaded with ammunition and equipment."[58] This is similar to the experiences of World War II, such as at Normandy, when armed reconnaissance by fighter-bombers was very effective in interdicting enemy ground forces en route to the battlefield in what is now called battlefield air interdiction (BAI).[59] However, interdiction alone did not lead to victory. It was the combination of this continual air interdiction with ground maneuver (the Inchon landing), and ground offensives (the Eighth Army's breakout from Pusan) that resulted in the rout and destruction of the NKPA.[60] This theater-level integration of interdiction into the campaign was the key to success.

Besides helping destroy the NKPA, air interdiction made another significant contribution to the UN effort. When the Chinese Communist Forces (CCF) intervened in the war late in November 1950, the restrictions on CCF maneuver created by interdiction allowed Eighth Army to break clear and retreat to prepared defenses. For nearly three weeks, the Eighth Army was out of contact while air interdiction sorties hammered the CCF.[61]

Throughout the war, AI forced the enemy to travel at night, limiting his maneuver, the distance he could travel, and the availability of his supplies, thus reducing the CCF's capability to mount or sustain offensives.[62] Nevertheless, air interdiction made a significant contribution to victory only when it was combined with maneuver of ground forces as an integral part of the theater campaign.

Unsuccessful Air Interdiction

Despite these successes, the Air Force and Army demonstrated their incomplete understanding of AI by conducting Operation Strangle in isolation from significant ground maneuver over a period of 10 months from August 1951 to May 1952. The operation was a systematic attempt to cut off the enemy in the front lines from their supplies through the sustained exercise of air inter-



Targeting of North Korean supply trains (left) and marshalling yards (opposite page) destroyed a good deal of North Korea's rail system. However, failure to coordinate this effort with ground activity significantly decreased its effectiveness.

diction. Strangle followed a road-interdiction effort in conjunction with an Eighth Army offensive in the summer of 1951. Initially successful, the road-interdiction efforts faded in effectiveness as the offensive reached its objectives and halted. Looking for more effective targets, FEAF developed a plan to destroy the enemy railroad system. They believed that this interdiction campaign "would so weaken the enemy that he could easily be routed by an Eighth Army ground offensive or he would be forced voluntarily to withdraw his troops closer to the Manchurian border in order to shorten his supply lines."[63] It soon became obvious that these expectations were unrealistic.[64] This effort demonstrated an incomplete understanding of air interdiction, since the UN was unwilling to commit the ground forces (and take the casualties) needed to maneuver and take the offensive[65]—key elements in integrating air interdiction into a theater campaign. As the USAF official history notes:

> As was the case in World War II, the best time for an interdiction campaign was when the ground situation was fluid, the fighting intense, and the enemy's logistical needs were greatest.[66]

Air Basing Problems

The Korean War was the first prolonged experience with the runway requirements of jet aircraft in war. The need for long, reinforced concrete runways resulted in inflexibility in air basing, with major impacts on air operations and requirements for aviation engineers to build and maintain suitable runways. The official USAF

The F-51 Mustang was brought out of mothballs to relieve the need for an aircraft with significant loiter time. Because the F-51 did not need long, concrete runways from which to operate, it could be based in Korea, close to the front lines.

history notes, "In two years of war in Korea no single factor had so seriously handicapped Fifth Air Force operational capabilities as the lack of adequate air facilities."[67]

Aircraft Performance and Runway Capabilities

The Air Force was moving into the jet age in 1950. Unfortunately, there were no long, reinforced runways in Korea, and only four in Japan, to support the Air Force's new jet aircraft.[68] Flying from Japan, the F-80 was at the edge of its range, had virtually no loiter time, and initially had no bomb racks to carry bombs and napalm. Typical ordnance consisted of .50-caliber guns and rockets. At one point, an entire squadron averaged only 441 pounds of bombs dropped per day over a 17-day period.[69] Although modifications to the F-80 were rapidly made, the USAF still pulled hundreds of World War II-vintage F-51s out of mothballs for air-ground missions. F-51s and P-47s were both considered for the mission. Although the P-47 was preferred because of its toughness and survivability, there were simply not enough of them available.[70] In its stead, the F-51 could still carry significant ordnance, had a long loiter time, and could operate from primitive runways.[71]

As the front moved early in the war, the older planes were flexible enough to use primitive runways reinforced with metal matting, while those jets that had moved from Japan to Korea were tied to a few large fields—with major consequences when they fell into enemy hands. For example, when Seoul fell again in January 1951, FEAF lost the large jet air bases at Kimpo and Suwon. In anticipation of a possible evacuation of Korea by all US forces, jets were also moved to Japan from Pusan, Taegu, and other bases. The F-86s were back in Japan, where they no longer had the

range to provide air superiority and protect the Eighth Army from air attack. The only air power available for CAS and AI were F-51s, B-25s, and B-26s operating out of the primitive Korean airfields, thus greatly reducing FEAF capabilities.[72]

Aviation Engineer Capabilities

FEAF was consistently short of aviation engineer units—the troops who build and repair runways.[73] The need for reinforced runways to handle jet aircraft required significantly more time and effort than runways for older aircraft. Runways required 4.5 engineer battalion-months to build as compared to 1.5 in World War II.[74] These figures are deceptive, however, as large engineering units could rapidly construct runways suitable for forward operations of fighter-bombers in World War II. For example, in the Normandy landings, an emergency landing field was completed by 2115 hours on the day of the landing. A transport field was built and operating three days after D-day, and in 16 days, five fighter-bomber groups were operating out of Normandy airfields. Within 24 days, nine airfields were completed with seven more under construction.[75] In comparison, it took from June to December 1952 to build the new 9,000-foot concrete jet runway at Osan-ni.[76]

Conclusions

The problems that hindered the effective use of air power by the fledgling United States Air Force in the Korean War should lead us to reflect on what might go wrong in a future war and to ask questions about our capabilities today.

In one key area, the organization of joint commands, Korea clearly demonstrated that a theater commander must properly organize and staff his command structure. The failure to do so will result in inefficiency and inability to harness the synergistic effects of well-coordinated ground, air, and naval forces.

From an Air Force perspective, the key to jointness is for all USAF officers to understand the application of air power in depth, and to understand the basic nature of naval, space, and land warfare. Above all, they should understand that war is not won by air, space, land, or sea power alone but by the synergistic efforts of highly coordinated joint forces. To create synergies, all officers must have the in-depth understanding that only comes from studying the history of war.

Korea provides a good example of the importance of integrating air interdiction efforts into the overall theater campaign and maneuver of ground forces. Any misunderstanding of how air interdiction fits into a theater campaign can lead to further vain efforts such as attempting to shut down the Ho Chi Minh trail or current attempts to interdict drug traffic. Air interdiction

> does, indeed, make its contribution by either destroying enemy forces or delaying and disrupting their movement; however, in order for either effect to contribute fully to the successful outcome of a campaign, air interdiction and ground maneuver must by synchronized so that each complements and reinforces the other. Synchronization is important because it can create a dilemma for the enemy that has no satisfactory answer. His dilemma is this: if he attempts to counter ground maneuver by moving rapidly, he exposes himself to unacceptable losses from air interdiction; yet if he employs measures that are effective at reducing losses caused by air interdiction, he cannot maneuver fast enough to counter the ground component of the campaign. Thus, regardless of the action the enemy chooses to take, he faces defeat.[77]

This is exactly the type of understanding joint officers must have. With the emphasis on supporting the AirLand Battle, all officers must understand that the integration of interdiction into the theater campaign is essential.

In the Korean War, the Air Force faced

problems in air-ground coordination because of the need for CAS created by the commitment of inadequately equipped light infantry forces against a superior, armored foe. Today there remain many unresolved issues in CAS, and we may encounter similar problems in a major theater war. One question that has been raised is the ability of Air Force CAS/BAI doctrine to support the Army AirLand Battle doctrine, especially in a European environment. Do we need to return to the successful organization and command and control of tactical air forces that supported the Army in World War II?[78]

Another question is the future of airborne forward air controllers (FACs). Will the Air Force lose all its corporate knowledge of airborne FAC operations and have to reinvent the airborne FAC again, as was done in Korea and Vietnam?[79] Additionally, will the OA-10 be a satisfactory aircraft for this mission and for keeping the corporate knowledge alive?[80]

Today, much of the emphasis is on a new CAS/BAI aircraft, but it would seem that the airframe itself is not as decisive an issue as some of these other, less glamorous ones. Before the Korean War, we had inadequate joint training in air-ground coordination. Recently, an Army major who has been an armored battalion S-3 told me that in three years his battalion had never controlled a close-air-support strike. Is it likely that in a war things will work out if they are not practiced intensely in peacetime training? The excellent training provided at the US Army National Training Center (NTC) gives us insight into problems that arise in training, such as air-ground communications, Joint Air Attack Team operations, insufficient experience with ground laser designation for aircraft weapons, and inadequate ground FAC equipment.[81] Do we have enough good training such as the NTC provides today?

Problems in coordination of naval and Air Force aviation and fundamental doctrinal differences on the control of air resources contributed to ineffective employment of air power in Korea. General Momyer details how we were unable to solve the issue again in Vietnam, resulting in the inefficient system of "route packages." As he stated:

> The route package system . . . prevented a unified, concentrated air effort. . . . The same issue arose in the Korean War, and my present fear is that our continuing failure to settle this issue may be exceedingly costly in some future conflict. . . . Any arrangement arbitrarily assigning air forces to exclusive areas of operation will significantly reduce airpower's unique ability to quickly concentrate overwhelming firepower wherever it is needed most.[82]

We still have problems working jointly with the Navy. Although some progress has been made in joint maritime air operations, such as B-52s equipping, flying, and training for maritime missions, it is debatable whether we have made any significant progress on the issue of unified command and control of Navy and Air Force theater air resources. Without seriously addressing this issue, the United States could again face degraded effectiveness of air power in joint operations.

Throughout most of the Korean War, the first jet war, the lack of adequate airfields was a limiting factor in FEAF's air war. This raises questions about our dependence on large airfields today, especially in light of those areas of the world, such as the Middle East and the Pacific, with vast expanses between airfields. Moreover, these airfields require enormous time and resources to build and are attractive targets.

This leads to questions about our capacity for movement and mobility in war. For example, do we need aircraft for CAS, BAI, and other missions that can operate out of quickly built, rugged forward operating locations, where they are more responsive, can carry heavier payloads, have longer loiter times, and can fly high sortie rates in support of ground forces without aerial tanker support? Airfields were a limiting factor in a war with total air superiority;

with today's threat, airfield survivability and operability clearly need more attention as factors in the tactical air war equation and as considerations in future aircraft development and acquisition. Additionally, we need to expand responsibility for defense to all base personnel.[83] Can we afford to cut low-cost but high-payoff programs such as F-16 mock-up decoys? Should we find funding for other innovative but low-cost ideas such as barrage balloons?[84]

Finally, since we are so reliant on a few runways, do we have adequate aviation engineer units for runway construction and repair? In World War II, the Ninth Air Force alone had 20,000 aviation engineers.[85] Korea revealed a glimpse of the danger we are in today from overdependence on large airbase facilities and the lack of adequate engineer units to support a theater war.

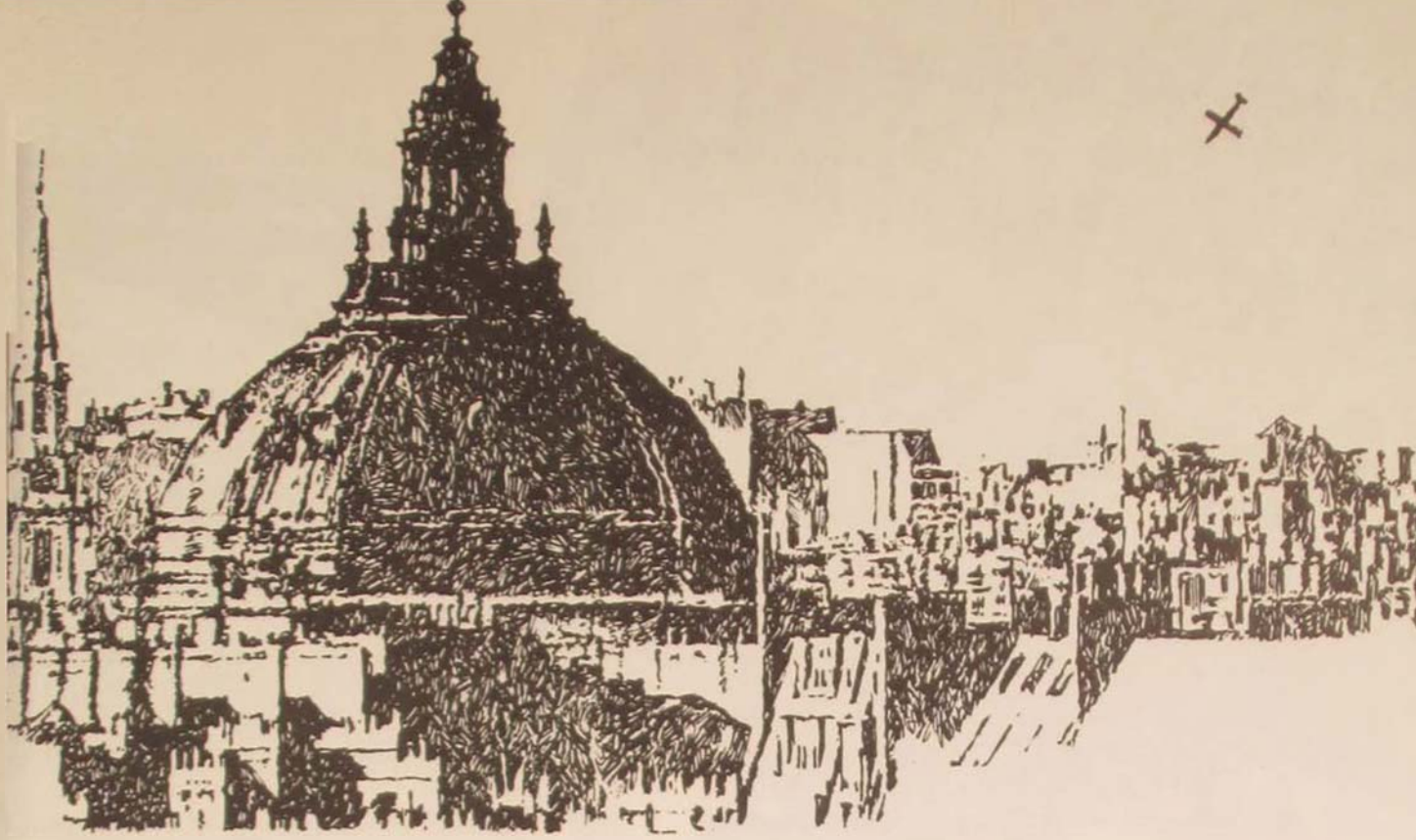
When the Korean War opened, the US military had limited conventional capabilities. Air power was crucial in the early days of the war in preventing the total defeat of UN forces. Nonetheless, numerous problems resulted in less than optimal application of the available air resources. Problems with the joint command structure, air-ground coordination, Air Force-Navy cooperation, air interdiction, and air base availability all give us some insight into similar issues today. Peacetime is the time to ensure that we will not be caught with similar problems again. □

Notes

1. For an overview of the deterioration of US military capabilities following World War II, see chapter 1 of Clay Blair's *The Forgotten War: America in Korea, 1950–1953* (New York: Times Books, 1987), 290. Blair states, "By June 25, 1950, Harry Truman and Louis Johnson had all but wrecked the conventional military forces of the United States."
2. Russell F. Weigley, *The American Way of War* (Bloomington: Indiana University Press, 1977), 384.
3. Ibid., 384–85.
4. Robert F. Futrell, *The United States Air Force in Korea*, revised edition (Washington, D.C.: Office of Air Force History, 1983), 693.
5. William B. Reed, ed., *Condensed Analysis of the Ninth Air Force in the European Theater of Operations*, new imprint (Washington, D.C.: Office of Air Force History, 1984), 96–97.
6. William W. Momyer, *Airpower in Three Wars* (Washington, D.C.: Government Printing Office, 1978), 52–54.
7. O. P. Weyland, "Some Lessons of the Korean War," unpublished memo by Maj Gen Weyland (Maxwell AFB, Ala., Air University Library, 10 October 1950).
8. Matthew B. Ridgway, *The Korean War* (New York: Doubleday, 1967), 42.
9. Ibid., 42; Futrell, 44–45.
10. Blair, 33; Ridgway, 142. Ridgway is especially critical of MacArthur's "tendency to cultivate the isolation that genius seems to require, until it became a sort of insulation [there was no telephone in his personal office in Tokyo], [which] deprived him of the critical comment and objective appraisals a commander needs from his principal subordinates."
11. Blair, 36.
12. Ronald Spector, *Eagle Against the Sun: The American War with Japan* (New York: Free Press, 1985), 144–46.
13. Ibid., 226–27.
14. Futrell, 45.
15. Momyer, 54.
16. Futrell, 52.
17. Momyer, 54.
18. Futrell, 45.
19. Ibid., 490–91.
20. Ibid., 2, 61.
21. Ibid., 80.
22. Ibid., 107–8.
23. Ibid., 80–83.
24. Ibid., 463.
25. James A. Field, Jr., *History of United States Naval Operations in Korea* (Washington, D.C.: Government Printing Office, 1962), 393.
26. Futrell, 465–68.
27. Ibid., 707–8.
28. Field, 455.
29. Blair, 44, 57, 61, 77–78. For an account of the inadequacy of the troops and equipment of the initial deployment of US forces to Korea, see Blair, chapter 4.
30. Blair, 576. Throughout his book, Blair recounts numerous instances of UN forces being outmaneuvered and losing significant amounts of artillery and equipment in the first six months of the war.
31. Roy E. Appleman, *South to the Naktong, North to the Yalu* (Washington, D.C.: Center of Military History, 1961), 476.
32. Ibid., 256.
33. Edmund Dews and Felix Kozaczka, *Air Interdiction: Lessons From Past Campaigns* (Santa Monica, Calif.: The Rand Corporation, September 1981), 59.
34. Field, 385.
35. Richard P. Hallion, *The Naval Air War in Korea* (Baltimore: The Nautical & Aviation Publishing Co., 1986), 42–46.
36. Ibid., 50.
37. Futrell, 120–23.
38. Field, 390.
39. Hallion, 44–45.
40. Field, 389–91, 455.
41. Hallion, 45.
42. Ibid., 45–46.
43. Momyer, 57–59.
44. Field, 385, 393; Momyer, 57–59.
45. Futrell, 49.
46. Ibid., 50.
47. Ibid.
48. Momyer, 57–59. Momyer makes the point that "the support arrangement is essentially tailored for a highly

planned operation of a few days. In a brief operation the support relationship may effectively harmonize the efforts of two or more forces. However, large operations extending over a long time require the more dependable, authoritative relationship of operational control or command. Thus with naval forces committed to the continuing air campaign in Korea, and with no threat from an opposing fleet, FEAF's argument for operational control made sense." Essentially the same problem arose in Vietnam with the same inadequate solution (pp.89–99)

49. Futrell, 49.
50. Field, 387.
51. Ibid., 111.
52. Ibid., 392–93.
53. Field, 393; Momyer, 59.
54. Dews, 43.
55. Ibid., 58.
56. Blair, 239.
57. Futrell, 91.
58. Ibid., 175.
59. Reed, 24.
60. Futrell, 700–701; Weigley, 387.
61. Futrell, 261.
62. Gregory A. Carter, *Some Historical Notes on Air Interdiction in Korea* (Santa Monica, Calif.: The Rand Corporation, 1966), 5; Futrell, 171; Momyer, 170.
63. Futrell, 440–41.
64. For a complete account of Operation Strangle, see Futrell, chapter 14.
65. Blair, 931. Blair notes that "an all-out Eighth Army attack to the Korean waist under existing conditions [stalemate in June 1951] would almost certainly incur a prohibitive cost in American casualties. Even a limited advance (5, 10, or 20 miles) to improve the Army's defensive posture, disrupt a possible CCF counterattack, or gain an edge in the possible cease-fire arrangement would not be worth the cost in American blood."
66. Futrell, 704.
67. Ibid., 498.
68. Ibid., 59.
69. US Air Force Korean Evaluation Group, *An Evaluation of the Effectiveness of the United States Air Force in the Korean Campaign* (Maxwell AFB, Ala.: Air University Library, 1951), vol. 3, chap. 2, sec. 1, January.
70. Hallion, 40–41.
71. Futrell, 112.
72. Blair, 652–53.
73. Futrell, 72, 388–89, 636–37.
74. Ibid., 635.
75. Reed, 21.
76. Futrell; 635.
77. Price T. Bingham, "Ground Maneuver and Air Interdiction in the Operational Art," *Parameters*, March 1989, 16–31.
78. Lt Col Price T. Bingham, "Air Power and the Close-in Battle" (paper presented at the Air War College symposium on Air Support of the Close-in Battle, Maxwell AFB, Ala., 1987), 5–49. In his symposium presentation on "Air Power and the Close-in Battle", Lt Col Price T Bingham points out that "the conditions that we could face in a war with the Soviets are much more similar to those confronting Ninth Air Force in World War II than those we experienced in Korea and Vietnam." (p. 40) He advocates a return to tactical air commands, the equivalent of an Army corps, to provide unity of command for tactical forces in support of the corps. The symposium summarized some of our current problems, "At the various levels of Army and AF organizations that control the CAS, BAI, and defensive counter air missions, command, control, and communications is considered a significant problem area. For example, should defensive counter air and airspace control be handled by Control and Reporting Centers (CRC) or Control and Reporting Posts (CRP) subordinate to Tactical Air Control Centers (TACC). BAI planning and control are handled by TACC, usually located in the rear with the air component commander. CAS planning and control are more decentralized and handled by Air Support Operations Centers (ASOC) at Army corps level. CAS (A-10s) are employed at battalion level but Army attack helicopters are employed at the brigade level, so Joint Air Attack Team (JAAT) coordination is difficult since air assets are tasked without common interface. Coordination among all these levels is critical but they will likely be disrupted in major conflict . . . therefore, our joint doctrinal principles cannot be applied to the theater in which we face our most dangerous threat—Central Europe." (pp. 2–3)
79. Charles D. Hightower, *The History of the United States Air Force Airborne Forward Air Controller in World War II, the Korean War, and the Vietnam Conflict* (thesis, US Army, Command and General Staff College, 1984). Hightower notes, "[airborne FAC] capability must be maintained within the US Air Force. . . . The airborne FAC's history since 1945 has made it clear that failure to train for the airborne FAC mission is a mistake." (pp. 109–10)
80. Ibid., 109. "The airborne FAC must have a viable aircraft in which to perform his mission." Some problems with the OA-10 include one seat, not dedicated to the mission (it would also provide CAS), and it can't be flown hands off for the long periods needed by the FAC.
81. Gary T. Hawes, "Lessons Learned from Air-Land Battle Training at the US Army National Training Center" (paper presented at the Air War College symposium on Air Support of the Close-in Battle, Maxwell AFB, Ala., 1987), 50–55.
82. Momyer, 89–99.
83. Lt Col Price T. Bingham, "Fighting from the Air Base," *Airpower Journal*, Summer 1987, 34–40.
84. Franklin J. Hillson, "Barrage Balloons for Low-Level Air Defense," *Airpower Journal*, Summer 1989, 37–40.
85. Reed, 10.



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Some Historical Perspectives on Cruise Missile Defense

CAPT GEORGE W. CULLY, USAF

HISTORIANS are often challenged to justify their work, and it is at least arguable that many historical studies do not offer immediate application in our daily lives. But that does not make such studies useless; a well-written historical narrative can be educational, and it may even be entertaining. For the professional military officer, however, some specially focused historical analyses will produce important insights not obtainable through any other channel. And there is no question that we need this information. That is because much of the military planning process involves predicting the future—something we do by surmising about what might be, based (in part) upon what has been. This process is not arcane. The truth is that we use insights derived from such analyses every day. Unfortunately, we do not always employ these insights in systematic ways. And equally important, we do not seek out more opportunities to turn them to our advantage.[1]

So how can military professionals put history to better use? First, we must recognize what history will not do. It most certainly will not repeat itself; every historical event is unique. Nor can history be used as a kind of Delphic oracle: it will not answer our questions—at least not directly. But if we study past events carefully, using thoughtful analogies and apt comparisons, then perhaps history can *suggest* what

The German V-1 was a cheaply built and cost-effective "flying bomb." The pulse-jet power plant was inexpensive, yet gave the missile a top speed close to that of piston-powered fighters. (Imperial War Museum).

questions to ask of the present. Provided we exercise caution, the answers will help us anticipate the future.

The following analysis operates with that approach in mind. It examines the Allies' response to German V-1 flying bombs during World War II, and it asks what lessons might be learned from their experience.[2] The answers suggest some perspectives in dealing with a new weapon that resembles the V-1 in many ways but poses a far more serious danger—the long-range cruise missile.[3]

An Earlier Threat

The V-1 (*vergeltungswaffe eins* or "vengeance weapon number one") was an air-breathing flying bomb fielded by the Luftwaffe in 1944.[4] Its mission was to bombard Allied urban areas—London, especially, but other cities as well—with a 1,870-pound, high-explosive warhead.[5] German engineers designed the V-1 so that it could be built of readily available materials, including wood and mild steel, and many of its subassemblies could be made by unskilled laborers. However, these features were meant to reduce costs, not performance. For its time, the V-1 was quite fast, with a cruise speed of about 400 miles per hour. Early V-1 models had a range of about 150 miles; later improvements increased this to over 250 miles. Propulsion was by pulse jet, a form of ramjet with a shutter-controlled intake. Its cyclic operation produced a characteristic sound, leading British listeners to give the V-1 a more memorable name—they called it a buzz bomb. Since pulse jets require a high minimum airspeed to operate, most buzz bombs were launched from large, inclined catapults.[6] After launch, the V-1's self-contained guidance system kept the vehicle on a preset course and altitude, and a simple, propeller-driven distance log directed the vehicle to enter a vertical dive upon completing the measured flight time.[7]

Given the crudeness of the technology, it should not be surprising that V-1s varied in their performance. In fact, about 20 percent of the missiles proved defective. Still, the

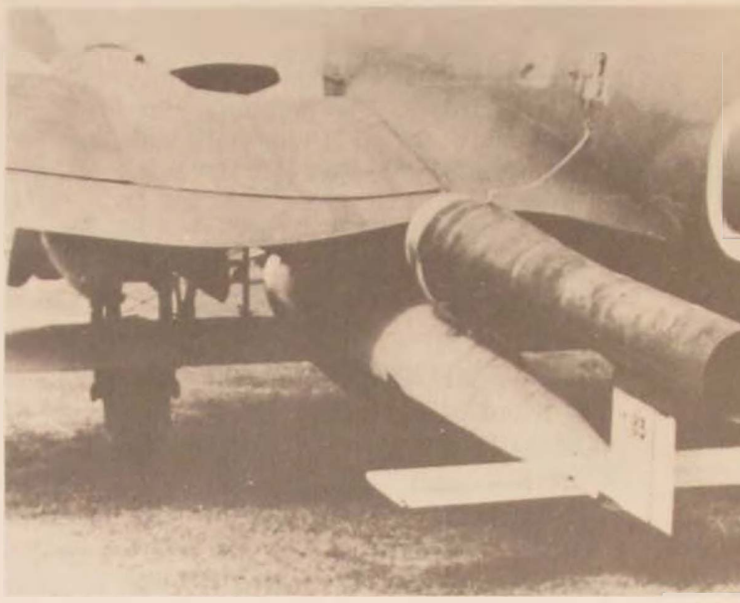
overall result was quite acceptable. During the early stages of the assault on London, for example, V-1s had a mean impact point of about four to four and one-half miles from the center of the city.[8]

V-1 Deployment and Operations

Launcher construction began on the French coast during the summer of 1943. The first seven sites were immense concrete bunkers, but the Germans also built many smaller, simpler facilities.[9] These often consisted only of a launching ramp and assembly shops, and the Germans requisitioned farmhouses, barns, and outbuildings for V-1 sites wherever possible. This approach speeded installation, reduced costs, and helped mask the sites' locations. By December 1943 Allied photo interpreters had confirmed 88 "austere" V-1 sites, and they suspected about 50 more.[10] Conscripted laborers finished half of the projected 150 sites before the Allies invaded Europe on 6 June 1944, and the Luftwaffe launched its first V-1 against London shortly before midnight on 12 June. The Germans soon became quite proficient, and on 22 July they launched their 5,000th missile.

The Germans had expected to launch 8,000 V-1s during September, but by that time all of the sites in France were captured. The brief lull led the Allies to conclude that the V-1 no longer presented a danger. They were mistaken. The Luftwaffe simply reworked the V-1 to increase its range and then built new sites in Holland. The bombardment resumed in October 1944 and continued through the winter, with the target list expanded to include the vital Belgian supply centers of Antwerp and Liège. Although dwindling component stocks gradually reduced the frequency of the attacks, the bombardment did not cease entirely until late April 1945.

In all, the Germans produced about 30,000 V-1s. They launched 10,492 flying bombs against England and about 8,000 against Continental targets. A total of 2,419 warheads exploded in the London Central Defence Region, inflicting 92 percent of all English V-1 casualties. London's civilian losses included 6,184 dead and 17,981 injured, and its military casualties came to about 1,200 killed or wounded.[11] But there were other effects as well. The V-1 bombardment forced British authorities to evacuate between 800,000 and 1.3 million Londoners to outlying areas, and falling



While most of the V-1s were ground launched, about 1,600 were air-launched against Britain. (USAF)

warheads destroyed 23,000 buildings and houses.[12] Missile-inflicted casualties on the Continent—mostly in the Antwerp area—totaled 14,758, although only 211 V-1s hit the central port areas. Afterwards, the Allies acknowledged that the V-1 was a tactical success. It was also a very cost-effective weapon:

> From a strictly dollar point of view, the V-1 cost the Germans less to build and to operate than it cost the Allies in damage and defense. A wartime British study [concluded that] using the German costs as unity . . . it cost the defenders 1.46 for damage and loss of production, 1.88 for the bombing, .30 for fighter interception, and .16 for static defenses, for a total ratio of 3.80:1 [in favor of the Germans.][13]

The Allied Response

The buzz bomb exacted a heavy price, but it could have been much higher. Of the 8,500 or so V-1s that crossed the English Channel, the British detected 7,488 (88 percent) and destroyed 3,957 (52.8 percent of those identified). The defense was poorly coordinated at first, but Prime Minister Winston Churchill intervened personally, and the Allies soon developed an effective strategy.[14] This effort—code-named Operation Crossbow—continued the bombing offensive that began in 1943 and reinforced it with a multilayered defense network.

Offensive Measures

The Allies knew of the V-1 through agent reports, reconnaissance photos, and intercepted radio transmissions well before it posed a direct threat to Britain.[15] They mounted massive bombing attacks against the hardened facilities in France while construction was still under way, and they also targeted each of the smaller austere sites immediately upon discovery.[16] All agreed that bombing was the only offensive measure available until ground troops could capture the launchers, but there were differing views on the effectiveness of the bombing effort. Even the best way to go about it was a matter of dispute.

Long since weary of bombing, English city dwellers put their political leadership under intense pressure to stop the V-1s by every means possible.[17] The British War Cabinet called for direct strikes on the launch sites, even though this diverted efforts away from other important targets. But Air Chief Marshal Sir Arthur ("Bomber") Harris, head of the Royal Air Force (RAF) Bomber Command, and Maj Gen Jimmy Doolittle, commander of the US Eighth Air Force, disagreed. Both leaders wanted to attack the V-1's sources of supply: the central stockpiles that fed the launchers and the factories that created the stockpiles. Tactical air force units continued to pound the launch sites, but Harris and Doolittle won the argument for putting their heavy bombers to better use. Between 2 and 9 August 1944, the Allies dropped 15,000 tons of ordnance on German support facilities. Losses were heavy—1,412 airmen and 197 planes—but thereafter the V-1 launch rates dropped by half.[18] The "heavies" continued their attacks afterwards but on a lower priority basis; by late summer, most of the work was being done by tactical air force fighter-bombers based in France.

Defensive Measures

Unlike the manned bombers in the blitz of 1940–41, V-1s could be launched at all hours and in every kind of weather. The Allies responded with a layered defense net and with measures intended to reduce the target areas' vulnerabilities as much as possible. One risk-reducing measure was to reevacuate all nonessential civilians, particularly the women and children who had returned to the English target areas after the blitz subsided in 1942.

Another measure was made possible by the successes of MI5, Britain's secret counterintelligence organization. MI5 had "turned" virtually every German espionage agent in the British Isles by late 1939, and it manip-

ulated German intelligence-gathering efforts in Britain throughout the rest of the war. This affected the V-1 campaign because the Germans largely relied upon their agents to report V-1 impact points.[19] By feeding false data to German intelligence agencies through these controlled sources, MI5 made it appear that the V-1s were overshooting London. The launch crews shortened their missiles' flight times to correct for this "error," consequently shifting the mean impact point away from the center of the city.

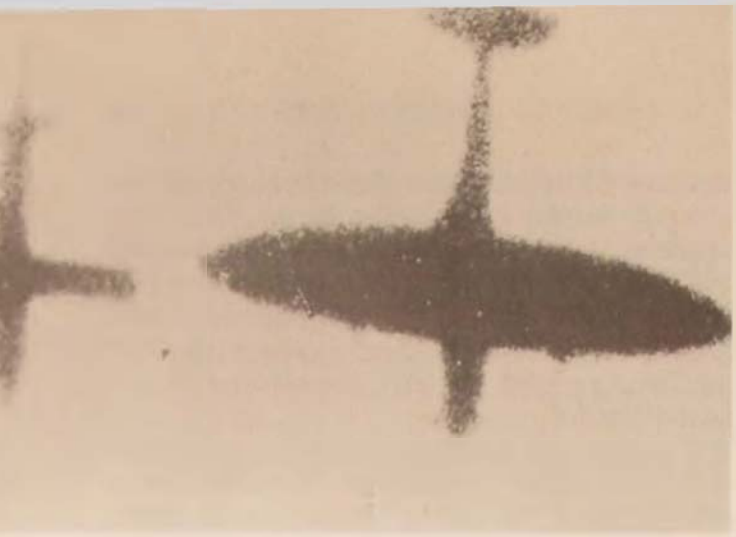
The defense measures took time to become fully effective. By late June 1944, however, the Allies had the outline of a workable system, and they continually strengthened it during the remainder of the summer. This integrated network included an excellent detection and control system, high-speed interceptors, radar-directed guns firing proximity-fuzed shells, and barrage balloons.

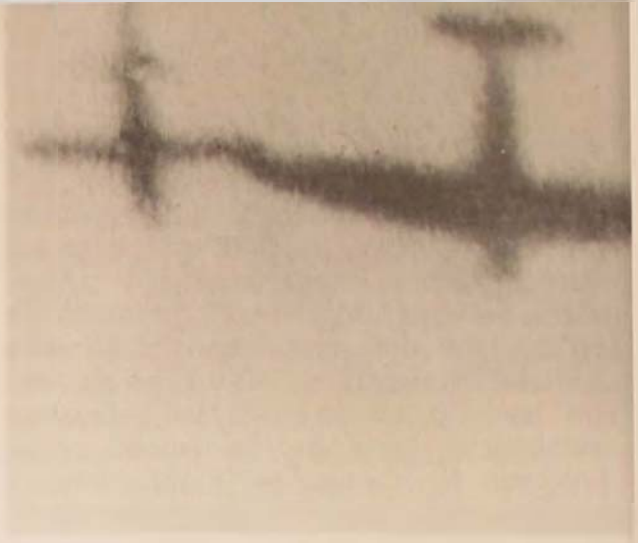
Detection, Tracking, and Force Control. The defenders could usually detect incoming V-1s by radar. The more difficult task was making best use of the available force (e.g., deciding whether to scramble fighters on warning or maintain standing patrols, determining which fighters should be vectored for intercept and which held in reserve, minimizing the number of fighters allocated per missile, and coordinating fighters and antiaircraft artillery [AAA] so that they did not interfere with each other's efforts). In the end, the system of raid reporting and aircraft control developed for V-1 defense was more elaborate than the one that had worked so well against German bombers during the blitz of 1940–41.[20] Two methods of fighter control were employed.

The first method, called "running commentary," was used primarily to control fighters operating over England; it required two radar stations and two Royal Observer Corps stations.[21] Each station provided a controller who advised patrolling fighters of the incoming missile's course and position. Pilots devised their own intercept vectors. Thus, they ran the risk that several aircraft might chase one bogey, but the method worked well overall, especially with additional ground input for final interception (e.g., radio guidance from ground observers in visual contact, marker gunfire, special flares ["snowflakes"], or searchlights).

The second method, called "close control," was used by fighters patrolling over the English Channel. Radar controllers vectored the pilots on intercept courses with the incoming V-1s. The close control method allocated fighters more efficiently than did running commentary, but it had several drawbacks. The V-1s crossed the narrow channel very quickly—in perhaps as little as four or five minutes—and did not stay on radar for very much longer. This cut reaction time to a minimum. It also meant that the defenders had to commit a larger number of aircraft for the same degree of barrier coverage: they had to travel further to get there, and they had to keep enough fuel in reserve to make sure they got back. And there was another unforeseen difficulty imposed upon close control immediately after D-day: air traffic over the channel became much heavier. This increased the controllers' identification work load, thereby reducing the reaction time still further.

Interceptors. Fighter interception was not particularly effective during the first few days of the campaign. The RAF Fighter Command's squadrons had been trained to attack Luftwaffe bombers flying at lower speeds and higher altitudes, and it took time to devise more appropriate tactics and become proficient in their use. The problem was difficult. Minimal warning times and the V-1's high speed combined to make interception an unlikely proposition for all but the fastest fighters. (Once a V-1 crossed the channel, the defenders had only about six minutes to bring it down.) The British initially assigned 12 fighter squadrons to the campaign, but many other units tried to engage the speedy missiles on a catch-as-catch-can basis. This only confused the





A less orthodox method of destroying a V-1 was to fly alongside (left) . . . slip a wing under the missile's wing, and then flip the device over, tumbling its gyro, causing it to crash. (above). (Imperial War Museum)

controllers and antiaircraft gunners alike, and many defending aircraft were damaged or shot down by mistake. Within a few days the Allies had limited the effort to their best fighter types, and as the summer wore on, they continually assigned additional units to buzz-bomb defense. By mid-August, 21 Allied squadrons were committed exclusively to V-1 interception, and two more assisted as required. Even so, successful interceptions were not easy. Radar could direct the fighters to the vicinity, but the rest of the work was on visual terms. The buzz bomb's small size and camouflage paint made it difficult to see from above in daylight, especially in the summer haze. The pulse jet's exhaust flame was easily spotted at night, but it tended to appear to the eye as a point of light at an uncertain distance. Even if the sky were clear and moonlit, the V-1's narrow wingspan gave few depth-perception cues for effective gunnery. Moreover, the short reaction time forced the RAF Fighter Command to maintain standing patrols, and fatigue quickly became an additional factor. Many pilots seldom left their aircraft between first light and dusk, although few complained of boredom.

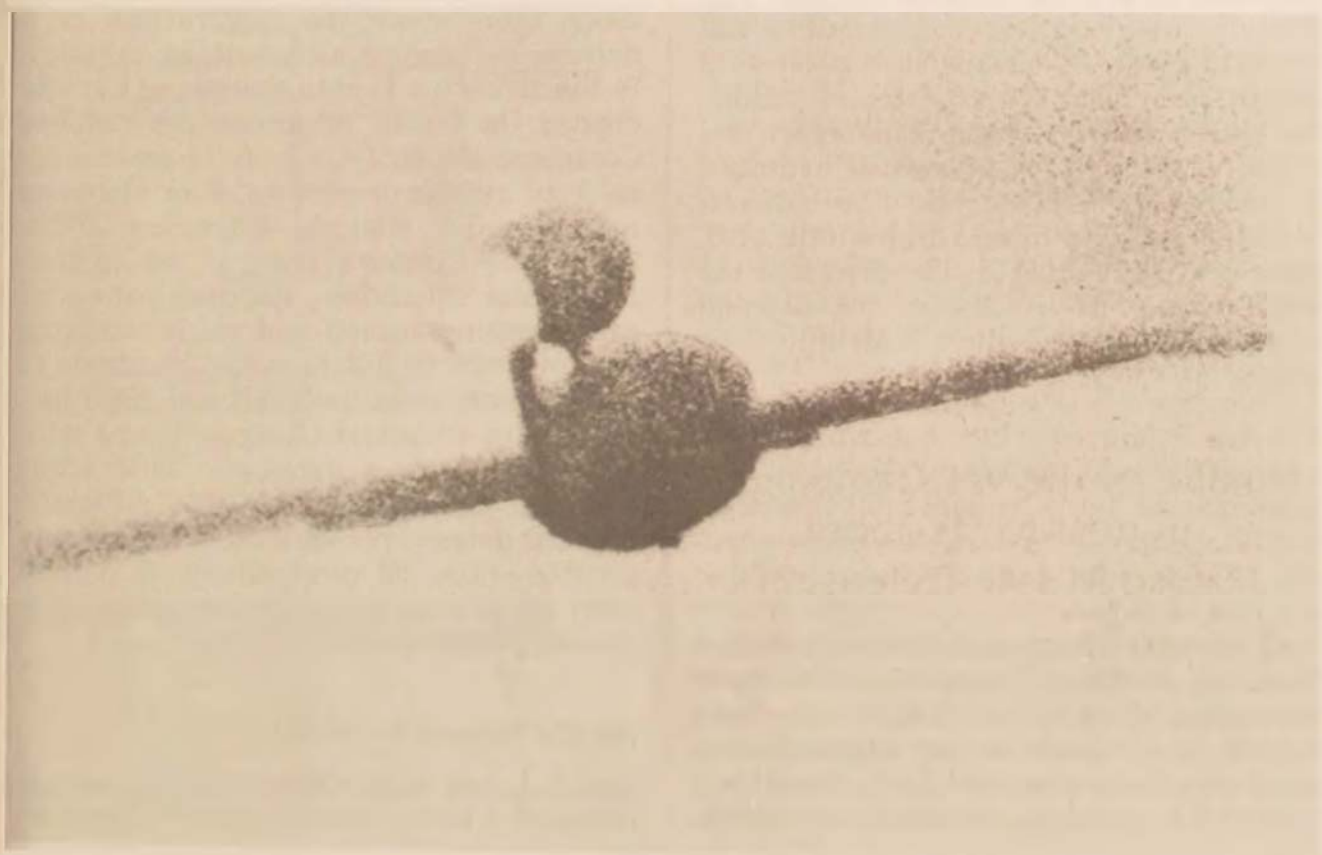
As the defenders became more experienced, they found that the best tactic was to approach the missile from above and astern in a long, shallow dive. They usually opened fire at about 300 yards but were careful not to close to less than 150 yards because of the turbulence of the pulse jet's exhaust and the lethal radius of the V-1's large warhead. Buzz bombs were reportedly several times more difficult to kill than piloted aircraft at the same range, in part because they were smaller and had fewer critical components, but also because the V-1's fuselage was a simple metal cylinder tapered to a point at both ends. This shape tended to deflect projectiles fired from a beam-end aspect. At first, pilots averaged about 500 rounds per kill; this dropped to 150 later in the summer.[22] Much more famous, of course, was the tactic of simply flying alongside and tipping the vehicle with a wingtip. This tumbled the V-1's gyroscopic autopilot, and the missile went out of control.

By every analysis, aircraft interception became very effective. Even though they were sometimes grounded by bad weather, the fighters accounted for 1,846 of the 3,957 missiles destroyed—almost 47 percent.[23] Many pilots achieved multiple kills, with RAF Squadron Leader Joseph Berry leading the list at 61 and one-third, including seven in one day on two occasions. Sadly, Berry was mistakenly killed by Allied antiaircraft fire on 1 October 1944.[24]

Antiaircraft Artillery. AAA was the second line of defense against the V-1, accounting for 1,878 missiles—just over 47 percent of those destroyed. The British be-

gan planning AAA requirements for V-1 defense as early as January 1944, and they expected to install 400 heavy and 346 light guns south of London. Unfortunately, their efforts were soon found wanting for several reasons. To begin with, the attacking missiles were far more numerous than the defenders expected; they had overestimated the bombers' ability to knock out the launching sites. The Allies also underestimated the AAA needs of the invasion force; as a result, only half of the guns the plan had demanded were actually in place at the start of the campaign. Further, the defense planners also presumed that the V-1s would approach London at an altitude of 6,000 to 8,000 feet. As chance would have it, the V-1s flew much lower—2,500 feet on average—and this zone fell between the respective altitudes at which British light and heavy guns were most effective.[35] Finally, to make matters worse, the initial plan was not well thought-out. It stationed the guns close to London and put their fire-control radars below the terrain line to avoid an anticipated German countermeasures effort. This had the double disadvantage of reducing the gunners' tracking times and allowing the damaged V-1s to fall within the target areas. These errors were soon corrected, but the most serious problem remained unresolved: how to coordinate the fighter and AAA efforts.

In the beginning of the campaign, fighters roamed at will, and AAA batteries were required to cease fire if the fighters came within range. This allowed the fighters to work very effectively (as of 13 July, 883 of the 1,192 kills had been achieved by aircraft), but it severely hampered the gunners. In mid-July the British decided to move most of the guns to the coast and establish "gun belts," where aircraft operated at their own risk below 8,000 feet. A



Aircraft could intercept and down the V-1, but not without difficulty. An aircraft closing within 200 yards of the missile risked damage or destruction from the V-1's jet exhaust or its explosion. (Imperial War Museum)

large number of bed-down sites for the mobile guns, called "mattresses," were prestocked with ammunition, electric power generators, and other necessities. This greatly increased the flexibility of the AAA defense network. The number of guns was also continually increased, so that by late summer the AAA batteries included almost 600 heavy-caliber and over 1,400 light-caliber weapons, including some installed on platforms built out over the Thames estuary.[26] The British installed the latest fire-control equipment, including centimeter-band, gun-laying radar sets, and they also obtained large quantities of proximity fuzes from the United States. The net effect was a major improvement in AAA lethality. On the nights of 27–28 August, for example, 90 of 97 V-1s were shot down, and only four hit London.

Barrage Balloons. As a last resort, the British suspended steel cables from barrage balloons in the most likely approach corridors. This effort was the least effective response, in that the defenders had to maintain over 2,000 balloon stations that brought down only about 230 missiles. But it was a relatively inexpensive defense to mount, was clearly visible to the public, and occasionally worked. This effort was often hampered by shortages of hydrogen gas and rubber sheets, and 630 balloons were lost to lightning and high winds. Still, there is evidence that the Germans took the balloons seriously: some of the downed missiles had cable cutters built into their wings.

What Can the V-1 Campaign Suggest to Us about Cruise Missile Defense?

This analysis began with the premise that historical studies—if carefully defined and properly limited—could help us evaluate current trends and thereby suggest future prospects. Remember that the past will not *predict* future events. Within these boundaries, however, such studies may be very useful. Indeed, what else can provide us with a body of real-world experience beyond the limited perspective of the immediate present?

The long-range cruise missile (CM) is a good candidate for historical analysis. Certainly, the CM represents a dramatic improvement over the V-1 in performance capabilities, but both weapons share an obvious and distinctly similar design concept: they seek to achieve strategic success by overwhelming the enemy's defenses with relatively inexpensive, "disposable" vehicles. This similarity encourages the military historian to make some general observations about CM defense problems.

CM Defense Will Be Very Expensive

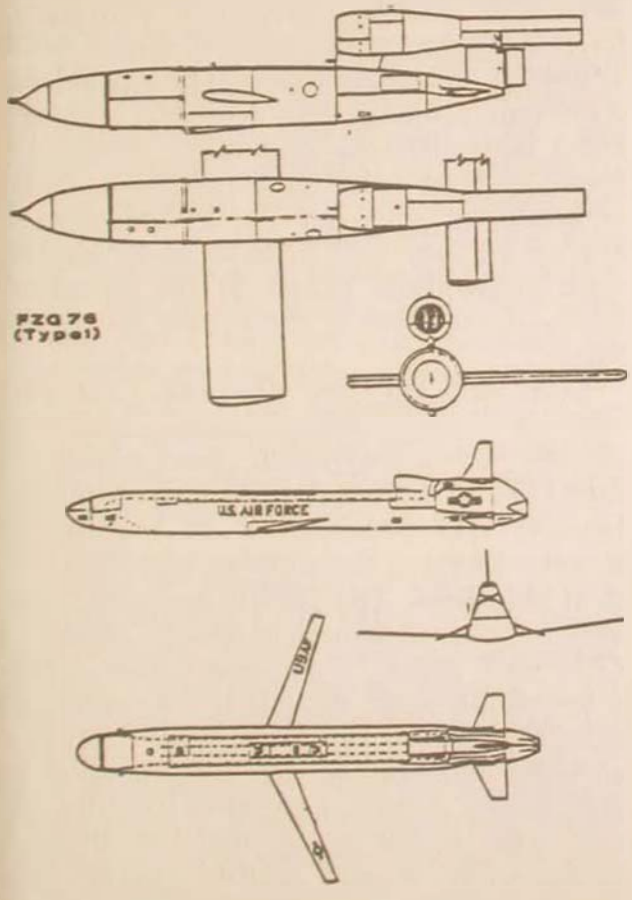
The defensive effort that the V-1 imposed on the Allies was substantially more expensive than the Germans' effort to develop and deploy the missile. Granted, this exchange ratio included unique circumstances, but since then we have learned much more about the construction of a defense net against air-breathing vehicles. In the 1950s the United States and Canada created the North American Air Defense Command (NORAD), a fully integrated binational system consisting of an elaborate net of radar stations extending above the Arctic Circle, a force of 65 fighter-interceptor squadrons, standing patrols of early-warning aircraft and ships watching over millions of square miles, hundreds of surface-to-air missile (SAM) and AAA batteries, and a Ground Observer Corps with 350,000 volunteer members. That effort cost over half a billion pre-1957 dollars.[27] The CM defense network must be far more capable—thus, far more costly—if it is to deter or if it is to protect us adequately should deterrence fail.

But CM Defense Is Crucial

The V-1 was a primitive weapon, but it imposed a heavy burden upon the Allies.

The CMs of the future will be able to do what the V-1 program attempted but failed to accomplish for lack of sophisticated technology: they will supplant the long-range, penetrating bomber for the purpose of attacking fixed targets. Moreover, their deployment in large numbers—and their inevitable adoption by third world combatants—will present a threat that we are not presently equipped to counteract.

Consider the range of problems that CMs will pose. Their small electromagnetic signatures will make them difficult to detect, and as CM guidance computers become more sophisticated, they will approach the operational flexibility of piloted aircraft. CMs will demonstrate increasing autonomy, including the ability to loiter, to exercise a limited degree of judgment in target selection, to detect and evade enemy forces, and perhaps even to respond to a change of mission or recall.[28] CMs can be launched from covert and unconventional platforms; this would make them particularly difficult to eliminate by preemptive strike. They are also attractive for economic reasons. Specifically, they can be stockpiled more cheaply than manned systems, and they will force an opponent to spend enormous sums on defensive, rather than offensive, measures.[29] Finally, the successful deployment of a ballistic missile defense system can only encourage CM development. Why? Because a space-oriented defense network won't eliminate long-range strategic bombardment as a military technique. Rivals will simply look for something else to replace readily detected and vulnerable rocket boosters and reentry vehicles. Air-breathing missiles are the most effective alternative.



Side and overhead views of V-1 (above) and cruise missile (below).

For all of these reasons, CMs could very well become the long-range strategic weapon of choice by the end of the century. An efficient defense is imperative.

Effective Planning Is Essential

Although it may seem self-evident, the V-1 experience underscores the importance of thoughtful advance planning. The Allies knew that the V-1 was being developed at least 18 months before the first warheads fell on London, and their intelligence "data base" grew rapidly after the winter of 1943–44. Nevertheless, they did not anticipate the magnitude of the threat, and as a result they substantially underestimated the resources required to deal with it. Further, their initial response was not efficient or well coordinated, and correcting it entailed significant risk and effort. Shifting the gun batteries to the English coast, for example, disrupted the defense net for a week. It also required moving 23,000 men and 60,000 tons of equipment and supplies, and diverted trucks and fuel from the support effort for the Normandy invasion—a significant cost at a critical time. Tomorrow's defenders will have even less latitude, and only an effective defense *in place* can hope to deter a would-be aggressor. Moreover,

given that we cannot specifically anticipate how this threat may develop, we must emphasize flexibility and adaptability in our preparations. More pilots and planes will clearly be necessary,[30] but strategies for "doing it smarter" must lie at the heart of any effective CM defense plan; high-tech approaches may not provide the entire solution.[31]

CM Defense Must Receive Coordinated Support

The Allies failed to successfully coordinate their forces at first, thereby allowing some V-1s to get through that could otherwise have been destroyed. Their failure also contributed to the tragic loss of Allied pilots and planes to "friendly" AAA fire, and this in turn reduced the defenders' ability to deal with incoming V-1s. Even so, the Allies were fortunate. They only had to mesh the efforts of airmen and gunners who spoke the same language, and they already had a well-integrated command, control, communications, and intelligence apparatus. Their units were abundantly supplied and well equipped, and they had long since been united in an all-out wartime effort. Further, they had to defend only a limited number of targets in a relatively small area against attacks coming in predictable directions from known launching grounds. In contrast, CMs could be launched simultaneously against many US and allied targets from a variety of platforms operating in very different environments. Preparing an adequate defense will require a large and continuing investment at the expense of other important needs. Shrinking manpower pools and the ever-rising costs of high technology will make this even more difficult.[32] Perhaps the net effect of these trends will force us to adopt a kind of triage defense, in which we have to prioritize our efforts in favor of certain locations or kinds of targets—and abandon others to less-certain outcomes. Considerable political consequence will undoubtedly attend such choices. Nevertheless, we must answer the CM threat, and doing so will require a sustained, major, multiservice and transnational commitment if we hope to achieve success.[33] Both the V-1 and NORAD experiences show that such a commitment can be achieved when the stakes are high enough. Subordinating the narrow interest is the single most difficult task.

CMs Will Be Difficult to "Find and Fix"

The Allies quickly learned that the buzz bomb was not easy to locate, but the CM will pose a much greater challenge. Unlike the immobile V-1 launch sites in France and Holland, CM carriers will be constantly on the move, and they will encompass a variety of forms, including aircraft, ships, submarines, and trucks. This flexibility means that targets can be attacked from many points of the compass, in flight patterns that will be difficult to anticipate. Even if we know the general direction of approach, detection will still be a problem. Although space-based, synthetic-aperture radar constellations and other exotic defense systems offer great promise, these technologies will not be fielded soon.[34] Moreover, they will have to be integrated with appropriate tactics at the squadron level—down where "the rubber meets the ramp."

Even after they are detected, CMs will still be hard to bring down. Defending aircraft have a significant speed advantage over CMs at present, but that will probably become less pronounced in the future, thereby limiting the number of useful tactical solutions. The greatly reduced radar and thermal signatures of small, "stealthy" CMs will make target acquisition much more challenging, especially for defending missile seekers. The latter will always be severely constrained by weight, antenna size, power supply, and other limiting factors. This is not to say that the problem is insoluble. Recent studies suggest that bundling different sensors together and interpreting their combined signals with

artificial-intelligence techniques could be very effective.[35]

CMs May Not Be Defenseless

Finally, we should address the common assumption that CMs may be hard to locate but, once found, are "meat on the table" for modern interceptors. That may not be so. Allied airmen developed a healthy respect for the buzz bomb because its exploding warhead could easily bring an overeager pilot to grief. Even at the normal kill distance of between 150 and 300 yards, the fireball often generated enough energy to damage the attacking aircraft, and a closing stern chase forced the interceptor to fly through the exploding missile's debris. A CM carrying a nuclear weapon poses a much greater threat, and we should not assume that it will stay "safed" when fired upon.[36] In fact, deliberately programming a CM to detonate if attacked may benefit the aggressor in several ways.

First, if it is attacked, the CM will probably not be able to complete the intended primary mission. Should that occur, the aggressor could logically be expected to pursue a useful alternative mission—the destruction of the attacking interceptor. This tactic would be particularly attractive if the size of the interceptor force were limited, and it could even form the basis for a deliberate strategy. In such a scenario, the primary goal of the aggressor's first salvo would be to eliminate the defending interceptor force, thereby turning the defender's cities into naked hostages facing a follow-on attack.

Second, the prospect of attacking nuclear-weapon-carrying CMs fitted with "dead-man switches" would certainly encourage caution. Firing short-range missiles at an armed quarter-megaton bomb could be the beginning of a real adventure. This possibility must surely put even the most determined pilot in a difficult position.[37] The too-cautious will hesitate and risk all that failure implies, while the too-aggressive will rush in to attack, thereby losing their aircraft and their lives. Even if it remains only an unconscious question, the effect of this quandary might give the CM just enough advantage to escape. Technical and tactical countermeasures can help, but only a well-balanced mixture of dedication, judgment, and second-nature flying will successfully overcome such a weapon. Like all other skills, those traits can only be ingrained through constant training and practice.

Conclusions

The V-1 was a cost-effective weapon to begin with, but the Allies' mistakes magnified its impact. They failed to anticipate the scope of the threat, and they suffered an agonizing period of false starts and confusion before fashioning a successful response. Fortunately, time and resources were on their side, and they prevailed. The V-1 took lives and destroyed property, but it could not change the outcome of World War II. The cruise missile poses a much greater threat than the V-1, but it too can be countered if we and our allies undertake sufficient preparations. The most serious problem we face, however, is one of perception, not technique.

Many Americans believe that an attack upon their homeland is unthinkable—a conclusion supported by 40 years of nuclear standoff between roughly equal superpowers. And we have spent our resources according to that consensus. We are willing to fund research for the Strategic Defense Initiative, but in the meantime we will defend only very limited portions of our airspace with a mere handful of fighter-interceptor squadrons. We do not see a clear need to spend enormous sums in yet another arena against an opponent who already seems sufficiently deterred. The world is changing, however, and the old, familiar, stable balance of power appears to be breaking up. We face new threats from new directions—including messianic theocracies that may not subscribe to the

self-restraining, "rational-man" theory of deterrence. In the past, we have vigorously opposed the proliferation of nuclear weapons. Today, we also oppose the diffusion of sophisticated missile technologies for the same reason: the world is already a sufficiently dangerous place.[38]

Our desire to limit access to advanced military hardware is understandable, but the reality is that we cannot succeed indefinitely. Thus far, the United States and the Soviet Union are the only nations that have fielded sophisticated, long-range CMs, and neither has announced any willingness to make them available to anyone else. Nor has the current climate of relaxed tensions encouraged any sense of urgency in publicly addressing this issue. But is silence prudent? Experience suggests that CMs will enter the international marketplace sooner or later, just as medium-range ballistic missiles are beginning to enter it today. Analysis also suggests that nuclear weapons may be becoming militarily irrelevant, thereby underscoring the urgency of the CM problem. Multikiloton warhead yields are not necessary, provided that the delivery vehicle is extremely accurate and that the target is vulnerable and important—an increasing likelihood in complex, industrial societies.[39]

Like the Allies in 1942, we can still consider this problem in relatively abstract terms. For now, we deem it sufficient to maintain only a nominal defense against air attack because we are unable to envision its occurrence. But what about tomorrow? When shall we begin to prepare? □

Notes

1. Historians are slowly developing a literature on the systematic application of their craft to policy-making. See, most recently, Richard E. Neustadt and Ernest R. May, *Thinking In Time: The Uses of History for Decision Makers* (New York: The Free Press, 1986).

2. Most of the defense of England was carried out by British forces, but units and personnel from other nations—including the United States—also took part. Moreover, the campaign was directed by the integrated command structure created by the Grand Alliance. For that reason, the word *Allied* is used throughout to describe the effort, except where the narrative describes the activities of a particular national force.

3. This essay is intended as a generic analysis. Its conclusions apply equally to all air-breathing, pilotless strategic systems, regardless of whether they are launched from air, sea, or land. To be sure, the Intermediate-range Nuclear Forces (INF) treaty (see *New York Times*, 9 December 1987, A24–26 for text) will have a significant impact on the future development of cruise missiles, but they continue to be developed. Only the US and the USSR have signed the treaty, and cruise missiles, per se, are not disallowed. In effect, the INF treaty rewards efforts to increase CM range by merely prohibiting short-range vehicles. Adaptive efforts are already under way. See William M. Arkin, "Stealth Cruise Sneaks into Canada," *Bulletin of the Atomic Scientists* 45, no. 4 (May 1989): 6–7; "USA Begins Development of LRCSW," *Jane's Defence Weekly* 12, no. 4 (29 July 1989): 153.

4. For a detailed technical description of the V-1, see Anthony Kay, *Buzz Bomb*, Monogram Closeup no. 4 (Boylston, Mass.: Monogram Aviation Publications, 1977).

5. The Germans also considered using V-1s to deliver chemical and bacteriological payloads, but they were deterred by fears of retaliation. See Stephen L. McFarland, "Preparing for What Never Came: Chemical and Biological Warfare in World War II," *Defense Analysis* 2, no. 2 (June 1986): 107–21.

6. About 1,600 V-1s were air-launched from Heinkel He-111 medium bombers, but the Luftwaffe abandoned this method in January 1945 because of fuel shortages and overwhelming Allied air superiority. In all, the Germans lost an estimated 77 carrier aircraft to Allied interceptors. Oliver Thiele, "Unternehmen Rumpelkammer," *Flugzeug* 4, no. 1 (January–March 1988): 38–41.

7. Peter G. Cooksley, *Flying Bomb: The Story of Hitler's V-Weapons in World War II* (New York: Charles Scribner's Sons, 1979), chap. 2.

8. Kenneth P. Werrell, *The Evolution of the Cruise Missile* (Maxwell AFB, Ala.: Air University Press, 1985), 47, 50. Another source reports that the V-1's "circular error probability" was 14 miles. McFarland, 115. This relative inaccuracy did not pose a problem, however, as the primary target—metropolitan London—encompassed 630 square miles.

9. Some of these structures still exist. See Phillip Henshall, *Hitler's Rocket Sites* (New York: St. Martin's Press, 1985).

10. The unusual shape of the V-1's steam-powered catapult led Allied photo interpreters to refer to these locations as "ski sites." Werrell, 43.

11. Werrell, 60–61.

12. The effects of V-2 attacks are included in some of these statistics. The V-2 was the world's first ballistic missile. Once launched, there was no effective defense against it. The use of the V-2, however, lies outside the scope of this essay. See James McGovern, *Crossbow and Overcast* (New York: Paperback Publications, Inc., 1964).

13. Werrell, 61.

14. Winston S. Churchill, *The Second World War*, vol. 6, *Triumph and Tragedy* (Boston: Houghton Mifflin Co., 1953).

15. R. V. Jones, *The Wizard War: British Scientific Intelligence, 1939–1945* (New York: Coward, McCann & Geoghegan, Inc., 1978).

16. Between 1 December 1943 and 12 June 1944, US and British bombers dropped 36,200 tons of ordnance on 96 sites. Allied intelligence analysts assessed 82 of the sites as destroyed, but the attackers lost 771 aircrew personnel and 154 aircraft. Furthermore, they did not prevent the Germans from constructing alternate sites. Because the effort required 25,150 sorties, other important missions, such as preinvasion

transport-net interdiction, had to be deferred. See W. F. Craven and J. L. Cate, eds., *The Army Air Forces in World War II*, vol. 3, *Europe: Argument to V-E Day, January 1944 to May 1945* (Chicago: University of Chicago Press, 1951), chaps. 4 and 15.

17. Churchill's War Cabinet considered every solution that promised even the slightest chance of success, including poison gas. For example, some British scientists proposed an incredible electromagnetic jammer:

> Their idea was to form a magnetic loop employing existing railway lines, suitably interconnected, all the way around London—a circumference of about 60 miles. This loop would be energized with a hefty current to make it a giant magnetic deflector. They worked out a system which would have required something like 1,000 amps D.C. . . . The power requirement for the system would have been on the order of 20 to 30 megawatts, which would have meant dedicating quite a large (commercial) power station for this purpose. The system was very seriously considered, and design work began on some of the necessary equipment.

Alfred Price, *The History of U.S. Electronic Warfare*, vol. 1 (Washington, D.C.: Association of Old Crows, 1984), 241.

18. Werrell, 49–50.

19. J. C. Masterman, *The Double-Cross System in the War of 1939 to 1945* (New Haven, Conn.: Yale University Press, 1972), chap. 12. The obituary columns of London newspapers were another source of information, but British authorities recognized this leak and closed it in the summer of 1944. German attempts at aerial reconnaissance were generally rendered ineffective by RAF air superiority.

20. Cooksley, 108–13.

21. The Royal Observer Corps (ROC) added visual tracking to the overall air defense network. ROC lookout posts reported their sightings—including altitude, heading, and force strength—to filter centers for correlation with radar and fighter inputs. They also reported other matters, such as parachuting airmen, downed aircraft, and bomb impacts.

22. Cooksley, 102–5.

23. Unfortunately, the Allies denied the benefits of dedicated air cover to the liberated cities on the Continent. The British War Cabinet feared that any assets diverted to Belgium for V-1 defense would undermine morale on the home front. European target areas were supported by extensive AAA installations, however. See Werrell, 60–61.

24. Werrell, 55.

25. The light guns lacked sufficient range. Without powered traversing gear, the heavy guns could not be brought to bear fast enough to track the speedy V-1s. Werrell, 52–55.

26. For a more complete account of AAA defense during the V-1 campaign, see Kenneth Werrell, *Archie, Flak, AAA, and SAM* (Maxwell AFB, Ala.: Air University Press, December 1988), 10–21.

27. James M. Eglin, *Air Defense in the Nuclear Age: The Postwar Development of American and Soviet Strategic Defense Systems* (New York: Garland Publishing, 1988); Richard Morenus, *DEW Line* (New York: Rand McNally, 1957).

28. The increasing sophistication of current systems supports this projection. See, for example, "Anti-Radar Missile Could Loiter over Target," *Air Force Times* 47, no. 36 (20 April 1987): 35; and Edward H. Kolcum, "Martin Pursues Development of Autonomous Cruise Missile," *Aviation Week & Space Technology* 130, no. 18 (1 May 1989): 85–86.

29. Assuming that the mission requires penetration of an enemy's home airspace, compare the costs of a CM to those incurred by a manned system. Size alone makes the CM cheaper to build, and although current CMs require carrier vehicles, such carriers need not be especially robust. Since they need not penetrate enemy airspace, CM carriers do not have to perform abrupt evasive maneuvers or risk significant combat damage. Nor do they have to include elaborate self-defense suites in their payload, particularly if they incorporate stealth technologies. Future CMs will further divorce themselves from their carriers through increased range. Other operational factors include greatly reduced tanker requirements (as a function of sortie/warhead generation), fewer preparations for poststrike recovery and force reconstitution, and no need for constant strike-crew refresher training (beyond guidance data refinement). The CM's life-cycle costs are also lower in a number of other important categories, including fewer support personnel requirements (and their associated basing costs), reduced operating expenses (beyond that associated with the carrier vehicle), and lower maintenance costs.

30. This process has already begun. See "First F-16 ADFs Delivered," *Jane's Defence Weekly* 11, no. 20 (20 May 1989): 943.

31. See, for example, Maj Franklin J. Hillson, "Barrage Balloons for Low-Level Air Defense," *Airpower Journal* 3, no. 2 (Summer 1989): 27–40.

32. Demographic trends suggest that aircrew recruitment—among other personnel needs—will become increasingly difficult in the future as the nation's birthrate continues to stagnate. See, for example, George C. Wilson, "Looking for More Than a Few Good Men and Women," *Washington Post National Weekly Edition* 6, no. 17 (27 February–5 March 1989): 32; and "US Manpower Warning As Recruitment Hits Low," *Jane's Defence Weekly* 11, no. 9 (4 March 1989): 341. A reevaluation of previous assumptions has already begun. Given recent developments in USAF policies regarding the assignment of female aircrew personnel, however, perhaps we should also reconsider the role of women in air defense. If they can serve aboard reconnaissance, tanker, and patrol aircraft—performing missions that will undoubtedly be opposed by enemy forces in wartime—then surely they can also fly interceptors against pilotless vehicles over friendly territory. But the thought of female pilots in combat is not a new one. See, for example, Maj Sandra S. Bateman, "'The Right Stuff' Has No Gender," *Airpower Journal* 1, no. 3 (Winter 1987–1988): 63–74.

33. Special problems seem to arise in coordinating naval and air forces, particularly in jurisdictional matters. Consider, for example, the inability of the US Army Air Forces and the US Navy to agree upon an effective division of responsibility for antisubmarine warfare in 1941–42. German submarines operated at will in American coastal waters as a result. See W. F. Craven and J. L. Cate, eds., *The Army Air Forces in World War II*, vol. 1, *Plans and Early Operations, January 1939 to August 1942* (Chicago: University of Chicago Press, 1951), 514–37; Edwin P. Hoyt, *U-Boats Offshore* (New York: Stein and Day, 1978). New technical departures suggest that some effort is being made to address this issue. See David A. Brown, "Airship Pushed for Early Warning, Mine Countermeasures Missions," *Aviation Week & Space Technology* 129, no. 23 (5 December 1988): 65–70.

34. For a glimpse of what one space-based, anti-CM radar system might look like, see William E. Burrows, *Deep Black* (New York: Berkley Books, 1988), 300–303. But that doesn't get us from here to there: high tech is expensive. For some thoughts on space-based air defense costs, see James W. Canan, "The Big Hole in NORAD," *Air Force Magazine* 72, no. 10 (October 1989): 54–59.

35. Promising results have been obtained by computer integration of radar, infrared, television, and possibly laser signal returns. This use of combined, correlated imagery may counteract attempts to mask various segments of a stealthy

CM's electromagnetic signature. See David Fulghum, "Stealth Technology Brought into New Focus," *Air Force Times* 49, no. 43 (5 June 1989): 30.

36. Although this analysis treats CM-carried nuclear weapons as the most dangerous form of the air-breathing threat, we should keep the ever-quickening pace of technological development in mind. Consider for example, the tantalizing opportunities suggested by "excited" molecular fuels, ultrahigh-density energy storage using superconductivity, and the prospective manufacture of antimatter in microgram quantities. These possibilities existed only in science-fiction magazines even a few years ago. The recent USAF Forecast II technology survey recommended that they receive serious attention (i.e., significant funding) in future weapons system planning. This rapid acceptance reminds us that surprises are always at hand. Moreover, the impetus for technological progress is being continually fueled by political developments: nuclear weapons may be eclipsed as a result. See, for example, "INF Treaty Likely to Intensify Race in Exotic Conventional Weapons," *Aviation Week & Space Technology* 127, no. 24 (14 December 1987): 19–20; and Paul Mann, "Study Fuels Strategic Shift to Advanced Conventional Weapons," *Aviation Week & Space Technology* 128, no. 4 (25 January 1988): 135.

37. This tactic also raises an opportunity for strategic deception. CMs need not actually have this capability, so long as the defenders believe that they do. The effect is the same.

38. Stephen Engelberg, "Third World Missile-Making Prompts Campaign by C.I.A.," *New York Times* (international edition), 31 March 1989, 5; Barbra Starr, "Controlling the Spread of Ballistic Missiles," *Jane's Defence Weekly*, 22 April 1989, 696; Barbra Starr, "USA Debates Missile Proliferation," *Jane's Defence Weekly* 12, no. 19 (11 November 1989): 1007.

39. The advent of long-range, accurate, conventionally armed CMs is fraught with danger for several reasons. First, consider their effect upon potential aggressors. Since 1945, decision makers of every political persuasion have operated within a climate of near-unanimous opposition to the use of nuclear weapons; "madness" is the common metaphor used to describe any initiative which favors first use. Governments which have these weapons at their disposal have been made more circumspect by this consensus. The Teheran-Baghdad bombardments of the Iran-Iraq War, on the other hand, suggest that no such general psychological barrier exists against ballistic-missile-delivered, high-explosive warheads. A CM-delivered, conventional first strike—or the threat of one—is therefore likely to be thinkable in at least some quarters.

Second, consider their effect upon potential victims. The immediate result of a successful, CM-delivered, high-explosive attack upon an industrialized nation's nuclear power plants, for example, would include an extended power blackout affecting thousands of square miles. The long-term results could include severe, lasting economic disruptions and a broad landscape made uninhabitable for centuries. What political leverage accrues to the aggressor who can threaten "one, two, three . . . many Chernobyls?"

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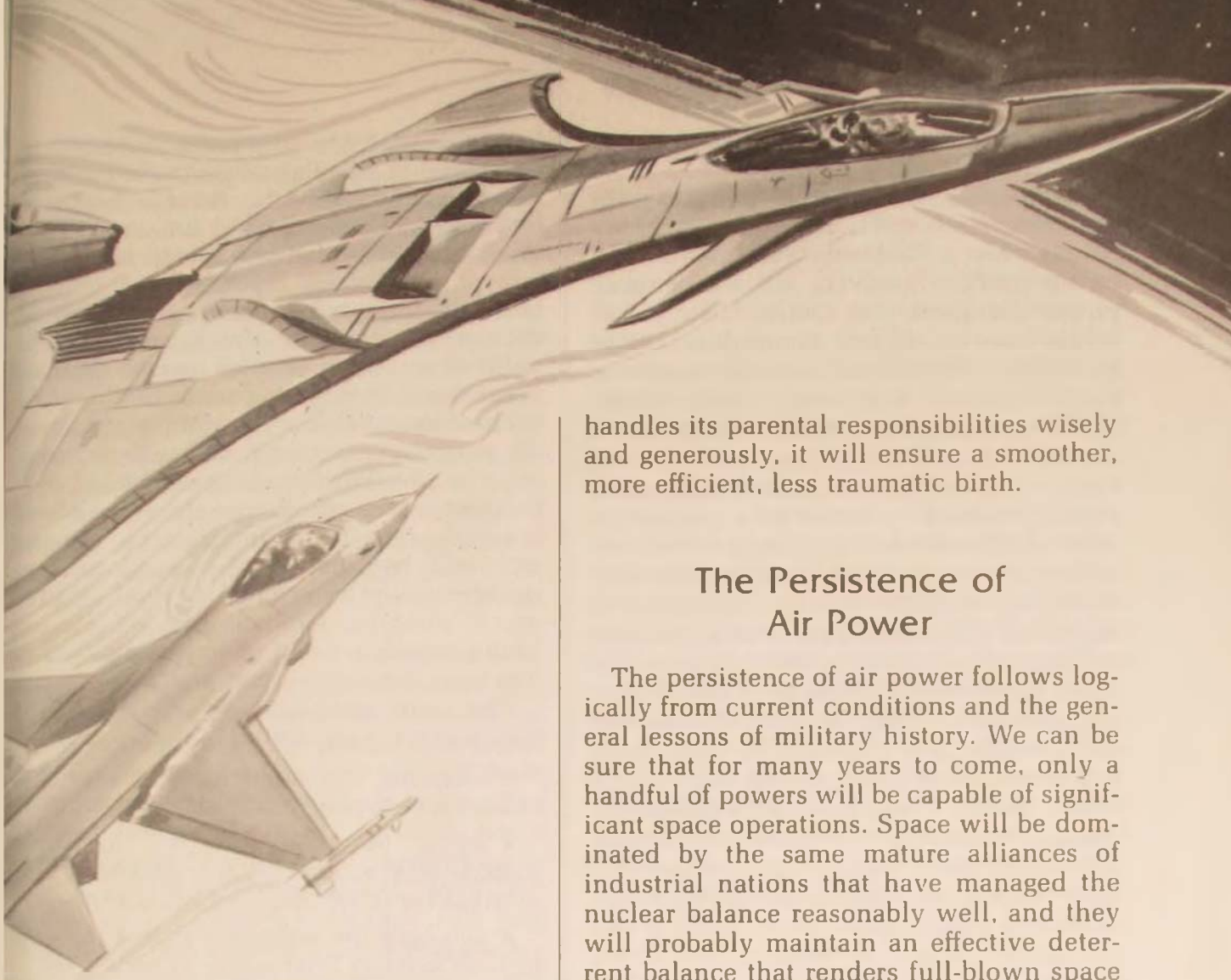
AIR AND SPACE FORCES

The One Endures as the Other Emerges

HARRY F. NOYES III

IT is hard to contemplate man's future in space without getting excited. Many military people feel a sense of urgency: What can my service do in space? How can I get involved? For Air Force people, the answer seems self-evident. The Air Force flies high and fast. A little higher and a little faster and—*whoosh*—you're in space. It seems like a natural step. And so it is—so far. The Air Force is the lead service in space and will keep that role for a few decades.

Eventually, however, an independent US space force will emerge to handle deep-space operations. At that point, the Air Force will be what it is today: an atmospheric force with only limited, ancillary space operations. Like Army aviation, the Air Force's space presence will be limited to activities that are essential to support its primary earthbound functions. This conclusion stems from two conditions that can be demonstrated in a fairly convincing manner: (1) We will always need an atmospheric, flying Air Force. That mission will prevent the Air Force from devoting itself exclusively to space and simply evolving into the US space force. (2) Space and air



operations will differ so much that the two cannot reside in the same military household. They will demand different kinds of people, skills, and world views.

Logic and historical experience suggest that both these propositions are most likely to prove true. And, if they are true, the Air Force will always be deeply committed to air operations, and someone else will have to carry out missions in deep space. Yet (and this is important), that "someone" will grow out of today's Air Force, as a child grows out of its mother's womb. The Air Force will remain what it is, but it will give birth to the space force and nurture it through its childhood. If the Air Force handles its parental responsibilities wisely and generously, it will ensure a smoother, more efficient, less traumatic birth.

The Persistence of Air Power

The persistence of air power follows logically from current conditions and the general lessons of military history. We can be sure that for many years to come, only a handful of powers will be capable of significant space operations. Space will be dominated by the same mature alliances of industrial nations that have managed the nuclear balance reasonably well, and they will probably maintain an effective deterrent balance that renders full-blown space war unlikely. This means that the world will continue much like today's—one in which nuclear and space power form a kind of containment structure that limits but does not eliminate conflict. Lesser nations will still seek to impose their wills through low-intensity warfare, and the great powers will mix in this process while avoiding open war with each other.

In this environment, the low visibility of the enemy will limit space observation, while world opinion and deterrence will shackle spaceborne weapons—much as nuclear power is rendered "powerless" in so many conflicts today. Thus, conventional air forces will remain vital for projection of national power, for low-intensity tactical operations against non-space-power foes, and for peacetime functions. Although this seems a pretty tame future for air power, it should not be underrated. It is, after all,

precisely what air power has been doing since World War II.

In any event, the general lessons of military history strongly suggest that air power would play a vital role even if a superpower conflict involving full use of space power did break out. Granted, air power would have to adapt to changed battlefield conditions. Terrestrial combat against a foe with spaceborne observation/weapons would certainly be a tough chore, much more hectic and dangerous than anything known before. However, one great lesson of military history is mankind's genius for precisely that kind of adaptation.

Despite drastic changes in warfare over the ages, no major weapon category, no branch of the armed forces, and certainly no arena of conflict has ever been eliminated. Every prediction of obsolescence has proven false. To this day, edged weapons and animals have a role in war. Successful bayonet charges were mounted in World War II, Korea, Vietnam, and the Falklands. Animal transport proved as vital in Afghanistan as it did in the Italian mountains in World War II, and some of our North Atlantic Treaty Organization (NATO) allies still have mule trains. One history of the 10th Armored Division in World War II contains a photo of US soldiers using a log battering ram in a German town. And there are reports of GIs using crude catapults to throw grenades in the French hedgerows. The machine gun did not render the foot soldier obsolete, the tank did not doom trenches and barbed wire, the bomber did not drive the battleship from the sea, the submarine did not eliminate surface vessels, and no "anti" weapon ever eliminated the thing it was "anti" to.

War becomes more complex as arsenals grow more sophisticated, and warriors seek the best combination for each war. Yet all arms find ways to adjust, albeit often in modified or reduced roles. Conclusion: no matter what happens in space, terrestrial (land, sea, and air) forces will always have vital roles.

To convince the doubters, one may find it helpful to examine why war manifests this odd blend of change and permanence. The reason is found in the tension between technological progress and human nature. War is a running battle between technology's propensity for rapid, radical change and human nature's obstinate refusal to change at all. Since war is above all a political and psychological process, human nature tends to win out over technology. As users of new weaponry, people rarely show the imagination, energy, and will to maximize its effectiveness. As the targets of new weaponry, the same people muster astounding amounts of imagination, energy, and will to frustrate the weapons and thereby ensure their own survival. Result: man's stubborn survival instinct always limits weapons to an effectiveness far below their theoretical potential.

The usual mechanisms for tempering a new weapon's impact include

- adopting the same weapon (my machine cancels your machine),
- using passive protective measures (camouflage; armor; terrain, darkness, and weather for cover and concealment),
- avoiding the weapon's effects through tactical gambits (maneuver, surprise, etc.),
- dispersing one's forces to complicate the enemy's targeting and reduce the effect of a hit, and
- above all, suppressing enemy weapons by engaging them with one's own—using destruction and fear to impair their crews' accuracy.

All these factors will apply to space forces and keep land, sea, and air forces effective in the future—albeit under new pressures.

Additionally, two other nontactical factors often limit the effect of new weapons and may especially affect space forces. First, the tremendous cost of space forces, especially manned platforms, will limit their numbers for the foreseeable future. Given the enormity of the world's size and population, these numerical limits will hobble even sophisticated space forces' potential. Second, the human factor is not

limited to tactical behavior. Man's survival instinct also affects political leaders and the general public and inspires changes in politico-military strategy. Homefolks and politicians will impose rules on war to protect themselves.

The limiting factor in the "fightability" of war is not so much the effects of weapons but the human tolerance of those effects. When one side or both decide the stress is too high, it (or they) will act to reduce the level of stress. This may mean ending the fighting by surrender, limitation, or truce (either formal or tacit). Or it may mean a change of strategy, such as gearing down to a lower-intensity form of combat (e.g., guerrilla resistance, in which high-tech forces are less effective).

We may expect all these techniques to be used to mitigate the impact of space operations on terrestrial conflict. We will use many of them ourselves. Much of the rest of this article discusses how we will use them to preserve the efficacy of air power. The bottom line is that every measure has a countermeasure and every countermeasure has a counter-countermeasure. War will rarely be a high-tech walkover and will never stay that way for long. It will always be a complex pattern of struggle, risk, and chance, in which victory depends on a complicated interaction of technology, numbers, leadership, training, morale, and strategic/tactical ideas.

The Impact of Space Operations

In war, challenge is the flip side of opportunity. Whoever gets on top of a technical, tactical, or political development can meet the challenge and seize the opportunity. Whoever does this best wins.[1]

Today, in the infancy of space operations, we are mainly reaping the benefits of being a space power. Such operations increase the precision and reliability of our command-and-control infrastructure for military action on land, sea, and air (e.g., communications, reconnaissance, meteorology, navigation, etc.). These improvements do not change our enduring principles of organization, strategy, and tactics. They do improve the execution of those principles, reducing the "fog and friction" of war. They confer similar benefits on our most sophisticated rivals. However, we feel little pain because (1) we aren't actually fighting them and don't expect to and (2) at this stage, space would only make the familiar threat a little more efficient, not transform it into anything shockingly new.

However, as space surveillance improves—especially if and when earth-attack weapons are introduced into space—we and our foes will start to feel a cramp in our terrestrial (land, sea, and air) combat styles. We will have to start routinely adapting our terrestrial operations to the reality of observation and perhaps attack from the new "high ground" in space. This can be done, but it will be demanding and unpleasant. Life on the battlefield will become more hectic; we will have to make decisions and take action much faster. People doing the fighting will suffer more or less the same kinds of hardships and hazards as always, but the intensity and frequency of unpleasantries will be higher, and they will be much harder to escape from.

The kind of chaos that used to assail frontline combatants sporadically and rear-area forces only rarely may become a steady diet for all, if weapons are placed in space. It will become as easy for a space-power foe to destroy a truck being loaded onto a ship in Boston as to destroy it after its arrival in theater. Some may find this prospect unbearably frightening. However, by smart planning and training, we can prepare for this threat and operate successfully in such an environment.

As space surveillance improves, achieving strategic (global, long-term) surprise will become increasingly difficult unless we use methods that do not require massing of military forces. Catching a foe off guard will demand imaginative strokes that cannot be detected from space (e.g., subtle

nonmilitary actions—political, economic, social, cultural, and psychological) to dislocate the enemy's posture and plans. Small military forces whose presence or intentions can be concealed will usually be more effective than much larger forces that cannot be hidden. Chemical, biological, weather-control, terror, and other "invisible" weapons will appeal to belligerents lacking scruples. To preserve the option of large-scale action, military forces will need radically improved camouflage/stealth measures. Old ideas will reappear on a grander scale: underground and underwater bases, facilities disguised as civilian activities, and so forth. Most such measures will lag behind space surveillance a long time, partly due to cost. In short, strategic surprise will depend on deceiving the foe.

Tactical (local, short-term) surprise can be achieved another way—as long as space observation data must be relayed to earth for analysis before it can be acted on. The detection-analysis-decision cycle creates a significant time lag, which can be exploited for tactical action. Instead of fooling the satellites, one need only act so fast that the enemy cannot react in time. However, this "window" will narrow when terrestrial commanders get direct, real-time access to space intelligence. This may be through direct field links to unmanned satellites, as their number and technical sophistication grow; or through manned space stations, which will exercise intelligent initiative in alerting commanders. It may be decades before this becomes a major factor, but it will happen and will begin to hamper tactical surprise.

Tactics will be hampered much more if and when space platforms graduate from tattling to shooting.[2] Missiles, lasers, particle beams, and hypervelocity guns might all be fired from space against terrestrial targets. "Hampering" does not mean eliminating, however. Besides the inherent limits imposed on space observation/weaponry by cost and the earth's size, terrestrial forces can take passive and active countermeasures to protect themselves.

First, as mentioned, one can hide better. This means not only improved camouflage/stealth technology, but also broader technical and tactical evolution to make forces easier to camouflage. For the Air Force, this means reducing reliance on highly visible bases and logistics support by using vertical-takeoff aircraft and concealed bases. Other passive technology options include armor to shield aircraft against beam weapons and hypervelocity guns, and electronic countermeasures to "jam" the space weapons or the observation-and-computation gear that directs them.

Some tactical countermeasures also suggest themselves. One is expanded reliance on standoff attack, even at extreme ranges. Instead of long approaches to the target, vertical takeoff and landing (VTOL) aircraft would make brief hovers over their own hidden and/or fortified bases. They would offer the foe only fleeting targets, getting back into their ground shelters—mission accomplished—before return fire could arrive from space or ground weapons. (While ground-launched standoff weapons can do similar things, hovering aircraft offer some target-acquisition and lock-on advantages and can displace rapidly to new bases. Also, air-launched systems may be legal in cases where ground ones are banned by arms-control treaties. Finally, standoff missions are a way to use aircraft when conditions preclude conventional employment, just as unemployed tanks sometimes work as artillery.) Standoff action helps preserve surprise by letting us concentrate weapons on the target without concentrating the aircraft that launch them. Widely dispersed aircraft could attack the same target, and the foe would not know it was under attack until too late.

Another tactic is to exploit aircraft and pilot agility to evade fire. Any aircraft making extended flights will need to use ground-hugging tactics such as those that helicopters already use (to evade space-directed ground fire) and violent changes in speed and direction such as those that dogfighters use (to frustrate the aim of spaceborne

gunners or dodge their fire). In short, against a foe with significant space forces, there will be little chance for straight-and-level flying—not even for transport missions behind the lines. Virtually all aircraft will have to be high-performance, high-agility machines that spend most of their time very close to the ground. (This will demand quantum leaps in air traffic control and tactical air control, too, of course.)

A potentially controversial countermeasure would be to disguise air operations as civil aviation. Despite the moral and legal question marks, this is a gambit we may encounter even if we don't use it. A legal form of disguise would be to use decoy aircraft—remotely piloted vehicles (RPVs) or robot-piloted vehicles designed to simulate the sensor images of the real things—to provide cover for the real craft in their midst. In many cases, the "real" planes could be dispensed with altogether, and harder-to-kill, cheaper-to-lose RPVs would carry out the missions. Despite RPV nimbleness, losses could be high in a space war. That means we will need large numbers and the cost will be high, despite their relative cheapness per airframe. Nonetheless, it beats risking pilots and even more costly manned aircraft, so we can expect a big role for RPVs. Finally, air commanders may often have to use extremely small forces, which are easier to hide than big masses of aircraft.

Taken together, all these factors may substantially reduce the significance of traditional air superiority operations. As the space threat forces aircraft to adopt extremely low profiles, there won't be many accessible targets for our fighters and little chance for them to survive the chase anyway.

Using aircraft (manned or unmanned) under these conditions demands revolutionizing ground as well as air mobility. Aircraft *and* their support forces must master rapid, concealed ground movement between hidden, unprepared bases inside buildings, forests, caves, and so forth. Aviation must become like artillery: "shoot and scoot." Timing of exposed movement will become a critical skill, with units adjusting both to the foe on the ground and to the complex orbit schedules of satellites and space stations. Despite all, terrestrial forces will continue operating and will remain decisive, since the people who make war's all-important political decisions reside on the earth. In the end, a private with a bayonet in your parlor is more persuasive than a ray gun circling many miles above.

Space weapons will not be omnipotent, space surveillance alone even less so. Consider tanks: they are powerful beasts, yet there is still a role for infantry on the battlefield. There will always be targets that space stations cannot see, hit, or damage, due to camouflage, motion, or armor. An old-fashioned airplane will be able to handle some of these targets better, due to its shorter reaction time (including the short flight time of its weapons), closer vision, or better angle of attack. No space station can shoot into a horizontal cave, for example, but an aircraft can. Also, there's combat economics. With a multitude of possible targets on a major battlefield, it takes thousands of weapons to do the job. Since no one can afford so many space weapons, space forces will be precious resources that commanders reserve for special targets.

Even with the most sophisticated sensors and weapons, space forces are unlikely ever to totally overcome the protection earth targets get from terrain, vegetation, sea, and atmospheric effects. Even nuclear-weapon effects are attenuated by these factors, and space-weapon effects will be too. Deep surface features will provide cover against all except direct overhead fire, and caves can defeat even that. By exploiting

such features, advanced air forces can survive and fight in space-war conditions. Battles are outrageously complex transactions, with niches for every conceivable weapon. By learning what the niches are and how to exploit them, we can ensure that aircraft remain powerful actors on future battlefields, even against space powers.

All of the foregoing, however, is about passive countermeasures. We've saved the best for last: active interference. Confederate cavalry leader Nathan Bedford Forrest reputedly got a message once from a desperate officer who was surrounded on all sides by overwhelming enemy forces. What should he do? Forrest's answer was "Fight 'em!" Simplistic as it sounds, that idea is the secret to the complexity of the battlefield—the continued value of traditional weapons and methods, and warfare's stubborn refusal to succumb to one supposed wonder weapon after another. War is a struggle of contending wills, not machinery. Man's obstinate, creative, even desperate will always seems to find ways to frustrate the wonder weapons. And the best way of all is to "fight 'em."

Even wonder weapons must be controlled by human minds and hands, and a burst of hot steel close to those minds and hands has a truly wonderful power to degrade the effectiveness of those weapons. It's called suppression. It works against machine guns, antiaircraft guns, tanks, and aircraft. It will work against space platforms. Weapons that can shoot down through the atmosphere to hit targets on earth can also be directed upwards, to hit targets in space. In fact, the guy on earth has some advantages: less concern about weapon weight, lower costs (permitting more weapons), a stable firing platform, the predictable motion[3] and visibility/vulnerability of orbiting targets, and the use of terrain for cover/concealment. However, if antiaircraft experience is any indication, the effectiveness of ground-to-space fire won't satisfy the people ducking space-to-ground fire. Soon space powers will do what aviation powers started doing early in World War I—going after their harassers with manned combat craft.

If space war were preceded by a period of armed space peace, we could see the development of "watchdog" spacecraft. As permanently orbiting platforms or shuttles operating in shifts, they would shadow the armed platforms of potential foes to deter the firing of weapons and retaliate immediately against any hostile action. Besides the outrageous expense of such a system, it could lead to perilous harassment tactics like the "chicken" games the Soviet navy has sometimes precipitated. Nevertheless, the watchdog concept might be a useful counter to exceptionally threatening space platforms (e.g., those armed to attack strategic civilian targets).

Actual space combat may take two different forms and will probably take both. One is long-range exchanges of fire between permanently orbiting stations; the other involves fighter craft using speed and maneuver to attack from *relatively* close ranges (for reasons given below, those ranges may in fact be quite long). Fighters may be developed that can be launched from earth to penetrate space for a short time. However, the obvious limitations of such operations dictate that true space fighters—based on orbiting space stations—would eventually emerge for both attack and defense. Space-based fighters would be essential for deep-space operations against high-orbit platforms. Some fighters could be operated by remote control or piloted by robots, but commanders will want the flexibility, adaptability, and initiative of human crews.

An Independent Space Force

So far, it is easy to see space operations as a natural extension of the Air Force mission. The service already primarily responsible for providing overhead cover for our forces will just fly a little higher and a little

faster to provide space cover as well. However, the deeper we move into space and the more extensive our space operations become, the harder this connection will be to maintain. Fighting in space will not simply be a case of flying higher and faster. It will be drastically different from air combat on earth. As the differences become ever clearer and more important, the need for an independent space force will arise.

The critical differences about the space environment are twofold: (1) the sheer nakedness of the place and (2) the unlimited three-dimensional quality of space flight, much more than just "altitude plus." We will not achieve a Buck Rogers performance—hiding behind the moon, zipping out to fire, then dodging behind some asteroid belt. For the foreseeable future, deep space will offer no place to hide. There will be nothing like clouds or mountains to shelter combat vehicles. Astronomical phenomena will be too distant or too thin to hide behind, though man-made objects may offer some limited hide-and-seek options in earth orbit.

This suggests that battles will be long-range affairs—cruising fights in which intervisibility will be continuous and relative motion leisurely. Spacecraft will be in sight of each other's sensors and human eyes for long periods. Closure rates and changes in relative position (i.e., angular changes in aim point) will be slow in terms of computer-aided reaction time, however rapid they may be in absolute terms.

The nakedness of space and deadliness of long-range weapons will make it hard to close with the enemy, so true maneuvering combat (i.e., anything resembling a dogfight) will be rare at best. Combat will resemble long-range interceptor missions or surface naval actions more than dogfights. Agility will still count, as a way to dodge weapons or baffle the aim of weapon operators. However, effective combat will revolve mainly around the sophistication of high-tech weapons and electronic-warfare equipment and skill in their use.

The likelihood of frequent hits in such no-concealment, no-cover combat will put a premium on armor, antimissile defenses (guns, beams, or antimissile missiles), systems redundancy, and damage control. Those requirements suggest larger vessels and crews. Yet the risk of catastrophic hits also suggests a "more-and-smaller-baskets" approach—large numbers of smaller craft to complicate enemy targeting and preserve the force despite losses. Study and experience will reveal how to balance those conflicting imperatives.

Add the demands of three-dimensional navigation/maneuvering on a grand scale, and it's clear that deep-space combat will be a radically new experience for which air combat provides no particularly relevant preparation. If anything, naval surface combat with its relatively slow, almost pure-geometry maneuvering might be a more relevant example for space fighters (albeit totally lacking the third dimension). No traditional terrestrial force is suited for this mission. A new kind of warrior, with different training and a different kind of military vision, is needed.

These people will be very much technical warriors. Their survival and success will depend on mastery of extremely sophisticated equipment, more than on anything else. Soldiers, sailors, and airmen must be as attuned to their environment as they are to their equipment. Space warriors, however, will be almost exclusively machine-oriented people, since their environment will offer little of tactical value. Tactically, they will operate in a purely geometrical arena. The ability to visualize constantly changing, almost infinitely variable angles and speeds in three dimensions (plus time) will be the soul of tactics.

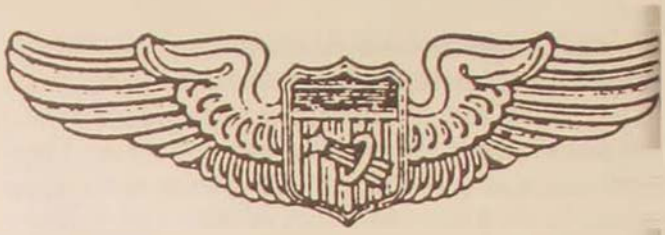
Such war may be a grim, inelegant pro-

cess of attrition, in which subtle differences in technical quality and skill will be multiplied by time into the decisive difference between winners and losers. There will be few Inchons in space, but there may be all too many Hamburger Hills. Poker may be a better metaphor for space war than chess.

Just as the Wright brothers had to invent not only the airplane itself but also a new kind of human being—the aviator—so will deep space demand development of true "spacemen." We can begin now to analyze what kind of people these will be. People who have flown in space can help us lay an orderly basis for their identification and training. But one way or another, they will emerge.[4] And when they do, why can't the Air Force control them? Even if they aren't interchangeable with aviators, why shouldn't they fall under the Air Force umbrella? One might as well ask why the Air Force cannot fit under the Army umbrella.

The medium always dictates the profoundest and most insuperable boundaries between services. What is more set in concrete than the distinction between land, sea, and air? Even when operational requirements or history results in combining land, sea, and air forces in one service, the boundaries of the medium are never really overcome. There is more than a little evidence that Marines understand soldiers and Navy pilots understand Air Force flyers better than either group understands sailors. It's an example one could repeat in all the services.

Put a mixed bag of service people in one room, stir for a while, then sit back and watch professional chemistry sort them out. The final discussion groups will be defined more by their media of conflict than the color of their uniforms. The fighter jocks will talk to fighter jocks—Air Force, Navy, and Marines (with perhaps some Army helicopter pilots trying to butt in). Marine grunts will talk to Army grunts (and Air Force parachutists). Seamen will swap tales with Army engineer boat operators and riverine-warfare veterans.



It is naive to think that space will be an exception to this rule. Space is at least as different from air as land and sea are, both tactically and in terms of human experience. In addition to the tactical differences discussed above, the mechanics of motion, propulsion systems, controls, and life-support systems are different. The physical and psychological demands and sensations are alien. Space vehicles will demand a quite different set of engineering, maintenance, supply, and in-flight expertise.

The Emerging Challenge

All these differences will lead to challenges against Air Force control of military deep-space operations. The challenge will not come from any existing service. Such challenges do not grow out of theory: they evolve from existing missions, hardware, and experience. They do not come from people who claim they could do it better: they come from people who are already doing it and want more freedom to exercise their own judgment. In other words, the challenge will come from within. It will resemble the Air Force's own struggle for independence from the Army. It will come from Air Force space people, who will insist that the old-fogey airplane drivers do not understand space operations, are crippling them with old-fashioned aviation ideas, and cannot provide the leadership our space force needs.

The Air Force must begin now to prepare for this challenge. That does not mean girding for bureaucratic battle to protect its turf. It means preparing mentally to respect the spacemen's views and do what is best for the nation. It means planning ahead for a smooth, orderly, *friendly* emergence of an independent space force at just the right

stage of development, as soon as it is ready to function on its own but not before.

If the Air Force tried to fight the inevitable, it would fail. Eventually, the space force *will* become independent. Fighting the inevitable would only distract from more important work and create bitterness in an arena where cooperation is essential (because the Air Force will operate under the space umbrella and because space and air operations will overlap in the transatmospheric regime). The lessons of the Air Force's own birth should make it sensitive to the need to avoid such a struggle.

A struggle would damage air power as much as it would space power. The air mission could get lost in a space-dominated organization. How? As space developed into a high-visibility, high-cost, "glamorous" military specialty, politics and public opinion could force Air Force leaders to favor the fair-haired space boys. Air operations could be neglected, even orphaned. Better that aviation should have its own "independent" Air Force to look after it. The Air Force must be careful not to become the dog that gets wagged by the space tail. The way to avoid that is to turn the space force loose before it gets too big for the doghouse.

This does not mean that the Air Force will have no role in space. It will continue to operate in shallow space, up to the point where the earth ceases to be the operational point of reference. The Air Force will launch and service satellites supporting terrestrial operations (though it may not monopolize this mission). Air Force shuttle astronauts will do in-space repairs. The Air Force will also man low-orbit military space stations (along with Army and Navy astronauts) to support terrestrial operations. The Air Force will also fight to defend these operations, with transatmospheric fighters or space fighters based on low-orbit stations.

Just as the Army operates a large force of aircraft working closely with its primary ground mission while leaving major air operations to the Air Force, so will the Air Force operate on the fringes of space to support its terrestrial mission while leaving deep space to the independent space force. Meanwhile, the Air Force will be adapting its equipment, training, and tactics to carry on effective air operations—down where it really counts, on earth, the home of those who ultimately decide the outcome of all conflict: civilian society.

Space war would make conflict much more harrowing for civilian society. They would find space weapons even harder to hide from than bombers in past wars. Perhaps the threat of this no-place-to-hide kind of war will create a powerful deterrent effect, rendering all-out space war as nearly unthinkable as nuclear war has proven to be. If so, the Air Force will be the proud parent of the forces that create that peace-preserving effect. In any case, beneath the space umbrella, the Air Force will continue to play a vital deterrent role in the medium it has mastered so well, where it has defended American liberty for so long: the air. □

Notes

1. Let me emphasize that I do not claim that every possibility described in this article is desirable policy for the United States. This is an effort to analyze historical and technical forces and their likely effects, not to prescribe policy decisions on what to do about all of them.

2. US policy opposes placing offensive weapons in space, but we must consider what might happen if somebody did it anyway.

3. The threat of ground fire will soon compel the orbiters to become less predictable by zigging and zagging in orbit. Such jinking will degrade the accuracy of their fire and thus accomplish the purposes of the suppression.

4. Keep in mind that we speak here of deep-space combat. Close to the earth, a more traditional combat environment is possible with the earth's surface as the continued reference point. Combat here may remain within the purview of traditional warriors (e.g., the Air Force). Transatmospheric fighters can be launched from concealed earth bases, loiter in weather or ground clutter, then zoom into space to fight. Space-based craft may "dip" into the atmosphere to disguise their intentions or exploit air's obscuring effects, then zip back into space at unexpected points and times. Here the old-fashioned aviator will still be a suitable model, and such operations can be handled by the Air Force as an extension of its atmospheric mission.

Ricochets
(continued from page 3)

(73-mm gun, Sagger missile, two machine guns, armor protection, and six infantrymen—all in one vehicle), a security squadron is not intimidating at all. The Royal Air Force regiment has Scorpion light tanks, Rapier air defense missiles, and so forth. I understand that the Air Force is now considering light armored vehicles (LAV-25s). That is certainly a step in the right direction.

The Air Force also needs to train its non-SP ground personnel in at least minimal self-defense tactics. Every ground unit should be self-reliant in self-defense. The article quoted Gen William Westmoreland as saying that "every US military member, regardless of service, must be prepared to engage the enemy in combat." Those who are not capable of doing so cannot truthfully be called soldiers. The objection was given that it would cost money to give the training. What does the Air Force teach at basic training? What could be more basic? Sustainment training should take place in units. Hopefully, Air Force units would give self-defense more emphasis than they give the annual M-16 rifle qualification. Additionally, Air Force units should be armed on the same basis as Army combat service support units, with M-16 rifles, M-203 grenade launchers, light antitank weapon (LAW) rockets, and M-60 machine guns. The Air Force has some very fine personnel, and—if properly equipped, trained, and led—they could present a formidable defense of an air base.

The Air Force needs to seriously think about base defense if it wants to concentrate on flying aircraft. I hope it will give ground defenders the resources they need to do the job.

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KENNEY AND THE AIR WAR

Maj Charles M. Westenhoff's article ("Aggressive Vision," Fall 1989) about Gen George C. Kenney's exploits as air component commander in the Southwest Pacific Area was very interesting. The key qualities that Kenney possessed were an iconoclastic flexibility and a take-charge attitude. He also had an understanding of the meaning of air power in its truest sense. He recognized that he had to use air power, of whatever kind, to accomplish what might be done. In using B-17s temporarily for troop operations and for low- and medium-level attack with skip-bombing techniques, he was turning his back on prewar Army Air Corps doctrine about the use of strategic bombardment aircraft.

Major Westenhoff makes a point about unity of command of the air on the United States side as opposed to mere coordination on the Japanese side. However, there was unity of command of the air on the US side before General Kenney relieved Gen George Brett, yet the Japanese had done quite well. In fact, their whole advance into Southeast Asia—including the attack on the Philippines—was a coordinated, rather than a joint, operation under one theater commander with subordinate component commanders. It appears that while unity of air command was helpful, the key factors were Kenney's drive and flexibility.

John F. O'Connell
Alexandria, Virginia

SPACE DOCTRINE

I write to compliment Lt Col Alan J. Parrington on his recent article "US Space Doctrine: Time for a Change?" in the Fall 1989 issue of *Airpower Journal*. He strikes a telling blow in pointing out the discrepancy between the active, offensive mandate of AFM 1–1, *Basic Aerospace Doctrine of the United States Air Force*, and the passive, reactive, defensive wording of AFM 1–6, *Military Space Doctrine*. I have urged in various addresses and papers the need for greater concern for the active role, but I think he has done so more effectively than I with this simple contrast between the two doctrinal manuals.

Colonel Parrington has made a good beginning with his suggested doctrinal points, but I hope he will go further and not only add to the three major points he makes but elaborate these in much greater detail. I would hope in his next try he will include the necessity for redundant or alternate launch facilities. Our current available facilities are too close to the sea, too vulnerable, and almost certainly pinpointed for initial destruction by an undeclared surprise attack. With "peace breaking out all over" and the declining probability of a major war in the immediate future, thoughtful projections such as his become all the more important. Historically, our greatest failures between wars, when

funding is cut back sharply, have been intellectual failures—an absence of lively professional debate on doctrinal issues.

Maj Gen I. B. Holley, Jr., USAFR, Retired
Durham, North Carolina

I found the article by Lt Col Alan Parrington very interesting, particularly the section on the history of space development. I was somewhat puzzled, however, to see no mention of Dr Robert H. Goddard's work with liquid-fueled rockets in the 1920s. I was under the impression that his work made major contributions to the German scientists' efforts prior to and during World War II.

CMSgt Lawrence J. Dongilli, USAF
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net assessment

Defending America's Security by Frederick H. Hartmann and Robert L. Wendzel. Elmsford, New York 10523: Pergamon-Brassey, 1988. 378 pages, $38.00.

These two professors, one from the Naval War College (Hartmann) and the other from the Air War College (Wendzel), have produced a treatment of what may be called the "defense problem." They have made the claim that their book is for the new student of US defense policy as well as for the professional analyst. This goal is a difficult one, but—considering that they set out to determine "what to consider in arriving at answers" rather than to give "solutions"—they have well succeeded.

Further, they have done an important service to the discipline by producing a text that has such a goal. Books abound on this or that defense issue; what has been lacking until now is a comprehensive text that addresses conceptual issues and then builds on them in a logical manner. Every teacher of defense issues has probably wrestled with the problem of getting behind the current issues of the day for the purpose of conveying to the student the subtleties and difficulties of actually arriving at workable solutions to create and implement a real US defense policy.

In fact, this sense of logic may be among the book's strongest points. The authors immediately dispel the notion that one can just sit down and begin to discuss, say, the Strategic Defense Initiative or the maritime strategy without first understanding the actual and normative bases of those strategies or capabilities. The logical progression from a conceptual analysis to an organizational treatment and only then to a section on "Threats, Responses, and Issues" in itself teaches much to the student of defense policy.

A second and related strong point of the book is its uncompromising position that "how to think about defense" is the proper basis for analyzing all defense issues. This point in particular makes the text truly useful for the mature student of defense policy. Both the high-level policymaker and the American undergraduate have a tendency to forget that we Americans must first determine what we want to do (and the context in which we must act) before we do it. If this book succeeds in teaching nothing other than this perspective, US defense policy will have gained from this effort.

A third refreshing point about the text is the authors' ability to go beyond the traditional method of analysis involving "bureaucratic politics." Such "conventional wisdom" approaches a type of fatalism in accepting policy as an outcome of a process in which rationality plays a minimal part. Hartmann and Wendzel, while giving full weight to the bureaucratic problems in formulating and implementing policy, implicitly refuse to say that nothing can be done about intractable problems. Although not primarily engaged in advocacy, they do not shrink from realistically addressing solutions to problems.

If there are any drawbacks to the text, they must include the admittedly ambitious attempt to cover the entire range of defense issues in one book. Although the authors' effort is commendable from a standpoint of comprehensiveness, one does find that the result is a text crammed with facts and analyses. This amount of data

may make it difficult for the new student to follow the argument.

Finally, one substantive criticism comes to mind. It may be that previous applications of the "indirect approach" as a preferable direction for defense policy do not receive fair treatment. Specifically, Dwight D. Eisenhower is said to have used a "direct approach" (nuclear-oriented), and former President Reagan's defense policy is criticized as trying to do too much (that is, not setting priorities—a prerequisite of "strategy"). It is possible, however, that both of these presidents understood quite well the "limits of power." Eisenhower's doctrine was to respond to aggression on American terms; Reagan's was to implement the concept of "competitive strategies." Both doctrines, it seems, are prime examples of the indirect approach. Perhaps the shaping of our environment through this approach would be aided by recognizing its past successes.

In sum, though, this text is exceptional in what it tries to do and what it accomplishes. It fills a real need in the field of US defense policy: it tells the student how to approach the problem, not simply what solutions are available. If a generation of future defense analysts (or present ones for that matter) can learn (1) that there are no easy solutions and (2) that they must think about goals, environments, and limitations before they act, then Hartmann and Wendzel are to be commended.

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The Military: More Than Just a Job? edited by Charles C. Moskos and Frank R. Wood. Elmsford, New York 10523: Pergamon-Brassey, 1988. 322 pages, $30.00.

Even though interest may wax and wane about topics such as the institutional/occupational (I/O) thesis, current emphasis places this subject squarely amidst Air Force studies of officer and enlisted development. Other services as well continue to examine their roots in light of I/O forces. Charles Moskos and Frank Wood have crafted a magnificent monument to the central theme that Western militaries have drifted away from institutionalism toward occupationalism. Clearly, their collection of contributing authors provides a litany of reasons for this drift, as well as some hint of possible outcomes. This review addresses the four parts of the book and comments about the editors' views on policy implications.

Part 1 provides an overview of the I/O model with an excellent thumbnail sketch (6–7). A strong aspect of the introduction is the discussion of the consequences of moving toward occupationalism. But it is not clear that the link between the presence of women in the military and a drift toward occupationalism is a valid one, as discussed in chapter 2. Chapter 3 presents a good theory overview of social organizational change and examines an insightful delineation of differing organizational levels and their own unique requirements for research methodology. However, it is probably dangerous to focus solely on the process rather than the outcome, as advocated here (33). Surely the bottom line has to include outcomes—both positive and negative. Chapter 4 offers an interesting parallel between the private-industry movement captured by Thomas J. Peters's *In Search of Excellence* and the military's move toward institutionalism. Charles A. Cotton suggests that peace probably leads to occupationalism. This premise creates a conundrum: militaries cannot want war because it leads to institutionalism. In chapter 5 John H. Faris proposes that bureaucratic rationalism is extant in today's military (vice occupationalism) and that the tensions developed from an I/O conflict can be found in all organizations.

Part 2 centers on topical issues of importance to the US military. Mady Wechsler Segal describes families and the military as two competing (and greedy) institutions, with society moving toward a new institutional form to accommodate both. Interestingly, Segal postulates that dual-service couples may be more institutionally inclined than couples with only one service member. In chapter 7 Patricia M. Shields says that military women were/are very institutional and that only men in combat specialties are more institutional. Her arguments are somewhat persuasive. Next, John Sibley Butler writes about race relations in the military from an I/O perspective. He attributes racial behaviors and attitudes to differences in I/O structures. The last chapter in part 2 provides insights into the institutionalization of US Air Force Academy cadets. Thomas M. McCloy and William H. Clover review evidence that shows cadets to have both institutional and occupational values.

Part 3 is an amalgam of several Western-oriented countries and their resident authors'

research (or thoughts) on the applicability of the I/O thesis in the militaries of these countries. Several of the reasons touted as leading to occupationalism include all-volunteer recruiting inducements (Great Britain), affluence (France), lack of on-base housing (Australia), technological advances (Switzerland), and increases in number of personnel (Israel). One gets the impression that most of these foreign militaries are struggling with modernization movements that (in the absence of protracted conflicts) foster deinstitutionalization. At least one country (Greece), however, feels that the drift toward occupationalism is beneficial. The common denominator here is the universality of the I/O thesis.

Part 4 is a wrap-up by Moskos and Wood, with a strong urging for a return to institutionalism. Conditions of this return are (1) leadership by deed (not word only), (2) demonstration of how the parts relate to the whole, and (3) motivation through values. Both editors suggest a review of policy implications according to the level of organization where those policies (i.e., recruitment and retention, military family, sex roles, and organizational commitment and leadership) interact. The micro-, macro-, and organization-level analysis frame is quite enlightening. There is an excellent logical tie presented between institutionalism and an effective military, but no real evidence is offered. Obviously, the inclusion of evidence would have made a much more convincing case.

Generally speaking, this book is very stimulating if not provocative. Although it is probably targeted at a rather esoteric audience, the authors really succeed in tweaking anyone's interest in the essence of military personnel.

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Swords Around a Throne by John R. Elting. New York 10022: The Free Press, 1988. 768 pages. $35.00.

The French Revolution marks a new era in the history of Western warfare no less than in the history of Western political ideas and institutions. The mass conscriptions that began in 1793 raised the first truly national armies of citizen-soldiers, and the primitive efforts at economic mobilization during the brief Jacobin dictatorship were an early attempt at waging total war. Revolutionary armies pioneered such tactical innovations as screens of skirmishers, massed column attacks, and rapid mobility over a wide front in order to achieve local superiority at a decisive point. At its height, under Napoléon, the empire conquered by these armies stretched from Portugal to the border of Russia and from the Baltic to the Mediterranean. One of the secrets of the Revolution is how it managed to release such powerful forces buried in the seemingly moribund *ancien régime*.

But the Revolution's military aspect is scarcely a subject that historians have neglected. A vast library of books deals with Napoleon and his republican predecessors. The four volumes published by William Phipps in the 1930s probably rank as the classic work on the revolutionary armies available in English. More recently, Gunther Rothenberg has written a short, lucid account of Napoleonic strategy tactics. To this already large and growing literature Col John R. Elting, USAF, Retired, has now added a long and amply documented study of the *grand armée*. Elting's *Swords Around a Throne* focuses, however, on military organization and daily life rather than on the battlefield. The early chapters trace the backdrop of the old royal army, describe the reforms introduced during the chaotic years between the fall of the Bastille and Coup of Brumaire, and provide some colorful miniature portraits of Napoleon's principal companions-in-arms. Elting then moves on to a series of more or less self-contained essays covering virtually every aspect of the social organism that was the Imperial Army. Attractively decorated with contemporary sketches, knowledgeable even on the subtle intricacies of uniform designs, this richly comprehensive book deals with such diverse topics as diet and pay, bivouacs and marching formations, the enforcement of discipline, and the practical functions of drumbeats and bugle calls.

Written with clarity and verve, crammed with information that makes it a useful reference work, Elting's book will probably, nevertheless, disappoint professional historians. Based entirely on published memoirs and printed sources, *Swords Around a Throne* is very much old-style social history, content to luxuriate in its subject and blissfully unaware of the sociological concepts and methods that might help to explain the world it so gustily describes. Take, for example, the myth of the Imperial Army as an instrument of social mobility (the baton in a knapsack thesis): Elting's brief sketches of Na-

poléon's marshals—certainly a ragtag lot—suggest that the army may have been an instrument of upward mobility, but other evidence points in a different direction (105 captains who served under Napoléon had once outranked him), and no attempt is made to measure the phenomenon precisely. In fact, the issue of the relationship between the army and social mobility is never even broached directly. The role of the mass army of the Napoleonic period as an instrument of modernization breaking down provincial loyalties is likewise left unexamined. Elting has a large fund of anecdotes on draft dodgers and deserters and understands the formal administrative procedures for dealing with them but says nothing of the familial and community networks that made draft dodging and desertion on an ever-increasing scale possible. Finally, to conclude a list of omissions that might have been extended further, one notes that the interpenetration of civil and military society is ignored, although the same man administered both and was in the habit of using his generals as temporary ambassadors and of appointing disabled veterans to electoral colleges.

Napoléon's armies, at least in the early days, were interesting organizations where peasant boys and footloose clerks rubbed shoulders with émigrés waiting to go home and with ex-terrorists, both red and white, unable to go home for fear the friends and relatives of those they had murdered might murder them. An archival historian with an eye for picaresque detail wedded to an intellect attuned to underlying structures (Richard Cobb, for example) could make of such material the pretext for a brilliant exercise of historical imagination. *Swords Around a Throne* is something else and something less than this.

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Who Serves? The Persistent Myth of the Underclass Army by Sue E. Berryman. Boulder, Colorado 80301: Westview Press, 1988, 127 pages, $20.00.

Our national defense strategy is presently under significant revision. The effect of the Intermediate-range Nuclear Forces (INF) treaty, the condition of our conventional forces, the feasibility of the Strategic Defense Initiative, the debt crisis, and the new administration present enormous challenges to military planners. A further but less obvious issue lies in our personnel policies. Will, as has been suggested, the reinstatement of the draft soon become a necessity?

A central concern in reaching such a decision will be the present condition and future prospects of the all volunteer force. How well has it worked, especially in attracting and retaining highly qualified people and in resolving divisive social aspirations and overall military efficiency? Dr Sue Berryman attempts to answer these questions, as well as the more fundamental one of our traditional perception of our military rank and file.

Particular attention is given to what are termed *social compositional* issues concerning the Army's enlisted force. These concerns are defined as "race, ethnicity, recency of immigration, citizenship, age, sex, family socioeconomic status, or geographical origin," as well as "educational attainment, verbal and mathematical abilities, and aptitudes." By emphasizing the former, more empirical, set of values, Dr Berryman wisely concludes that a more effective process may be found to influence both policymakers and the general public to consider more dispassionately the actual results and possible future uses of volunteer forces.

"Writing this book," declares the author, "was pure pleasure." Reading the book might also have been pleasurable for this reviewer had more care been taken. Present are the usual blemishes of jargon ("percents" for "percentage"), as well as an annoying dual system of references to authorities, both in the text and in footnotes. There are also several questionable sociological premises. Dr Berryman states that "military service . . . offers opportunities that fundamentally distinguish it from domestic welfare programs." Such opportunities "are best thought of as *status transformations.*" One of these confers "*legitimate careers on those from groups that hold marginal social and economic positions in the country*" (2).

This distinction between military service and social welfare may not be as sharp as Dr Berryman supposes. One can imagine that certain welfare programs, particularly those offering full- or part-time employment in conjunction with education or those subsidizing child care for single or welfare mothers who thus obtain upwardly mobile employment, also offer "legitimate careers" as well as social and economic status transformations.

Moreover, Dr Berryman rightly demonstrates that public opinion throughout this and the last century has perceived pejoratively the social composition of the Army's enlisted ranks. Such a valid point could have been made more meaningful had the author discussed the nature and prevalence of the popular notion of the Army as a mild social reformatory. This well-known concept has been discussed in, for example, Morris Janowitz and Lt Col Roger Little's *Sociology and the Military Establishment*, rev. ed. (1965), which is not cited in Dr Berryman's bibliography.

Even more dubious is the supposed "historical" perspective of her work. Dr Berryman does not claim to be a historian, but she does state that she received assistance from historians in the preparation and exposition of her case. Such work as presented is very superficial. A 24-year-old unpublished doctoral dissertation on "The American Enlisted Man in World War I" is hardly the best single authority for the inequity of that much-studied subject, the Civil War draft. Furthermore, to discuss the nature of the twentieth-century draft without any references to such authorities as John Chambers, George Flynn, J. Gary Clifford, and Samuel R. Spencer does little to create confidence in Dr Berryman's conclusions, however ingeniously offered.

One finishes the book wishing that its subject would have received the thoroughgoing and sophisticated treatment it clearly deserves.

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Soviet Ballistic Missile Defense and the Western Alliance by David S. Yost. Cambridge, Massachusetts 02138: Harvard University Press, 1988. 405 pages, $40.00.

As this masterful study makes clear, Soviet ballistic missile defense (BMD) programs are long-standing, antedate the Strategic Defense Initiative (SDI) program, and pose a major threat to both US and NATO security options. The comprehensive Soviet program of air, space, and missile defense not only enhances the defenses of the USSR, even if they are not perfect, but also threatens the capability of our offensive weapon systems and enhances the threat posed by Soviet systems in the absence of a credible Western threat.

Even if Gorbachevian proclamations about defensive doctrine and reasonable sufficiency are correct, the Soviet program guarantees—especially in the absence of a NATO consensus about missile defense against tactical ballistic missiles' conventional, chemical, and strategic nuclear capabilities—a high and persisting degree of threat to the Western alliance. As Yost demonstrates, Moscow has reached the stage of being able to creep out of the antiballistic missile (ABM) treaty without openly breaking it by virtue of its long-term increase in its defenses. This program has already seriously degraded NATO offensive options and is forcing the United States into an expensive and controversial reorganization of its own strategic forces.

The ongoing controversy about SDI and its related ambition to make nuclear weapons impotent and obsolete has met with great skepticism in Europe. Specifically, France and Great Britain alike have concluded that in the event of conventional disarmament, given the Soviet threats on both offense and defense, they will have to continue upgrading and modernizing their nuclear deterrent. Moreover, no strategic consensus exists within NATO as yet for countering Soviet defenses or missiles.

No better study exists in detailing the scope, comprehensiveness, and purposes or benefits accruing to Moscow from these programs. It should also be noted that Yost fails to point out that Soviet air, missile, and space defenses are becoming mobile on land, at sea, and in the air and are in nature combined-arms defenses. Meticulous and sobering by turn, this study belongs in the hands of every analyst concerned about the related issues of NATO security and BMD. These will be among the two most intractable security issues facing the Bush administration, and they need to be addressed in tandem—not separately, as they were in the Reagan administration. Moreover, this book should conclusively demonstrate that while BMD defenses are hardly perfect (what defense is?), they are essential and need to be introduced with a comprehensive strategy and doctrine behind them to protect ourselves and our allies. Hopefully, as a result of books like this one, we can get away from the Buck Rogers ideas about technological submission and get back to strategy and doctrine in our security planning against this persisting threat.

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Beyond Military Reform: American Defense Dilemmas by Jeffrey Record. Elmsford, New York 10523: Pergamon-Brassey, 1988. 186 pages, $17.95.

Jeffrey Record believes that the military reform movement, of which he is one of the most prominent members, must expand "its present narrow focus on the operational level of war in recognition that, for the United States, operational reform must be accompanied by strategic reform" (18). The reform movement, in his view, has neglected strategic foundations, without which tactical success means little.

Record outlines several basic strategic failures that jeopardize the security of the United States, and he believes that reformers have ignored these failures for the most part. Record summarizes the problem:

> Not even the most operationally superb US military force can prevail in war if it
>
> is assigned objectives beyond its capacity to fulfill;
>
> cannot be brought to bear at the right time and place;
>
> is grossly unrepresentative of the society from which it is drawn;
>
> is trained and equipped for the wrong war;
>
> reflects excessive investment in forces irrelevant to the main threat;
>
> has unwarranted faith in machines over men;
>
> lacks allies in circumstances requiring them;
>
> ignores the presence of nuclear weapons and their implications; and
>
> is sent away to fight under tactically and politically self-defeating conditions (178).

Record makes a very good case that the security troubles of the United States derive mainly from the failure to match strategy and resources. Strategic reform would create the conditions that make military operations worthwhile. However, whereas the government may not have moved in the correct direction (in his view), Record is wrong in his assertion that the reformers have ignored strategic issues. For example, James Fallows, in *National Defense* (1981), included chapters on technology, the nuclear dilemmas, and personnel problems—including the lack of a draft. Edward N. Luttwak, in *The Pentagon and the Art of War* (1984), pressed similar arguments on the kinds of forces the United States should have. Sherwood S. Cordier, in *US Military Power and Rapid Deployment Requirements in the 1980s* (1983), explained in much greater detail the strategic mobility shortfall. Fallows and James Webb, in a pair of articles in the April 1980 issue of the *Atlantic Monthly*, offered many of the same arguments on the need for a draft that Record now uses. Therefore, those issues have not been ignored, but neither have they been outlined in as simple and readable a form as in *Beyond Military Reform*.

This book is clear, and—in some places—Record's essays are both novel and brilliant. For example, chapter 10—on the decision to commit forces to fight—is particularly good, and it raises issues about the six Weinberger principles that have not been heard before. However, the book has several major flaws. First, it is inadequately documented; therefore, verification of Record's presumed facts is difficult if not impossible. For example, Record writes, "When the British warship *Sheffield* was sunk by a single Argentine Exocet missile, many of the same technological faith-healers who had declaimed the historical exit of the main battle tank after the 1973 October War quickly declared the extinction of the surface warship" (124). However, he doesn't cite even one "faith healer." I would like to see the names of just three of the "many" people who condemned both tanks and surface warships so I can judge their statements myself. Also, Record includes a large list of numbers (28) and refers to "many observers" (53–54), but the reader wonders where he got this information. There are only 17 footnotes in 180 pages of basic text, and that number of references is simply insufficient for the reader to determine how Record collected his facts.

A second flaw is that there are numerous small errors of fact (aside from editing mistakes). Record's statement, "We have never been invaded" (120) is not true. The British burned the White House after invading during the War of 1812. Another example: "Hanoi's conquest of South Vietnam, Laos, and Cambodia breathed encouraging military life into the Association of Southeast Asian Nations (ASEAN)" (175, note). Again, not true. ASEAN, an economic entity, has gotten worried enough about Hanoi to make political noises, but there has never been even a hint of "military life" in ASEAN.

The third major flaw results from Record's obvious contempt for the intellectual capacities of those people who disagree with him. This contempt appears plainly where he writes about the abilities of "the Pentagon" (81, 87). Apparently he believes that an educated person could not disagree with him on, for example, tactical

doctrine or on the use of special operations forces.

These flaws detract from an otherwise good, concise overview of an important topic. Record's own *Revising US Military Strategy* (1984) covers some of the same ground in a better manner. The earlier book is preferable to the present one, which is recommended only for the general reader who needs or wants an outline of some major strategic issues facing the United States. This restriction is unfortunate because Record has shown that he has important thoughts on these topics, and he is capable of much better work.

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Defending the NATO Alliance by Col Peter N. Schmitz. National Defense University Press, Washington, D.C. 20402: Government Printing Office, 1987. 178 pages, $4.50.

As NATO approaches its fortieth year, we are being inundated with political observations about the alliance's viability and future. Pick up a political journal, and you are likely to find yourself reading about either a positive or negative aspect of what has come to be known as NATO's "crisis." This buzzword focuses on perceptions of ever-increasing tension between the United States and its European allies over military, political, and economic issues. At best, the crisis is perceived as healthy. Some consider debate fundamental to the checks and balances so necessary in an alliance of 16 sovereign nations. At worst, it threatens a "transatlantic rift" and the eventual demise of NATO. Most of the friction is related to NATO's operating area. The most heatedly debated issues have been the Soviet and Warsaw Pact threat to Western Europe, nuclear policy, defense expenditures, Intermediate-range Nuclear Forces (INF) deployment, and East-West trade. Each relates directly to the alliance's role as guarantor of peace in Western Europe.

Now Col Peter Schmitz, of the West German air force, adds a new dimension. He argues that in addition to resolution of the internal issues cited by other observers, NATO's future success depends on revising global strategy. He posits that NATO's lack of a comprehensive and coordinated worldview strategy threatens the alliance just as seriously as do internal arguments. Looking at NATO's foreign policy over the past 40 years, the current state of world affairs, and the NATO political process (with special emphasis on consultation, cooperation, and sharing burdens), he does an excellent job of presenting his argument.

According to Colonel Schmitz, NATO can no longer be tied to its concept of territorial defense of its 16 nations. Times have changed, and—although the threat of a Soviet invasion of Western Europe cannot be discounted—greater danger is posed to the alliance in geographic areas external to the NATO landmass. Soviet expansionism, Communist subversion, and international terrorism affect the allies' needs for energy and raw material and their relationships with third world countries. Those people who would delimit NATO's ability to act or react to extra-NATO events are being shortsighted. The alliance needs to reassess its foreign policy and effect the changes necessary to make it a collective power to be reckoned with, both inside and outside the region. The time has come for NATO to influence world events over the long term, rather than react to real-time events in patchwork fashion.

Schmitz says that NATO's inability to develop a coordinated, comprehensive global policy has contributed to an identity crisis. NATO must achieve political-strategic cooperation in global policies "if it is to defend itself and preserve the ideals for which it was designed." To accomplish this objective, he implies that NATO must go on the offensive. It must take the initiative, on a global basis, to counter any threat. He suggests that measures critical to this initiative would include a program of technological and economic aid, a lower-profile US role, and joint US-allied military presence in critical areas. The net effect of this initiative would be to offset the ability of the Soviets (and others) to force NATO reaction to such events as Afghanistan, the Persian Gulf, and African crises. Coordinated initiatives by the allies would reduce internal NATO friction, making the alliance stronger.

Although his book was published in 1987, Colonel Schmitz actually wrote it between October 1982 and July 1984, when he was a National Defense University international fellow. By the time it was published, the material was somewhat dated. Nonetheless, events in Libya and the Persian Gulf and subsequent cooperative allied efforts support his arguments.

I found his book thought provoking and well written. Colonel Schmitz's command of English

is impressive, especially so because he was able to concisely articulate a very complex issue in 178 pages. If you are looking for another dimension to the discussion of the NATO crisis, I highly recommend his book.

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The Defense Management Challenge: Weapons Acquisition by J. Ronald Fox with James L. Field. Boston 02163: Harvard Business School Press, 1988, 348 pages, $24.95.

Few people doubt the questionable manner in which the US government goes about the business of procuring hardware for the nation's defense. Recent press reports on the so-called Department of Defense (DOD) procurement scandal have only added the taint of personal malfeasance to the widespread feeling of profound dysfunction. The defense industry is running for cover, fearing a new round of congressional reform, while the general perception deepens that the government acquisition process is out of control.

Critics of how the government goes about its defense business generally fall into five groups: self-interested industrialists (eager to escape overregulation), ideologues (of various persuasions), moralists (who blame self-interested participants), technocrats, and managerialists. J. Ronald Fox falls into the latter group. The author has held high-level civilian positions in both Air Force and Army procurement, contracting, and logistics bureaucracies, in addition to pursuing an academic career in government-industry relations and an entrepreneurial career in manufacturing. He authored *Arming America: How the U.S. Buys Weapons* (Harvard Business School, 1974), which the current work under review updates.

He does not bring good news. The problems identified in the first book still exist, he argues, and some have gotten worse. The following are among the major elements of the problems he discusses: government-industry relations continue to swing between collusion and adversarialism; costs increases and technical shortfalls are on the rise; inappropriate contractor charges continue; and—most alarmingly—while costs increase, output has declined, even given greater weapon system capability. Over the years, in response to these basic conditions, Congress has added intrusive micromanagement to the problem. After nearly 30 years of defense procurement tinkering, Fox believes we are no nearer to efficient and effective acquisition.

To Fox, the main reason things have gotten worse is that reformers have failed to improve how defense procurement is managed. In this respect he agrees with a comment John Kenneth Galbraith made some years ago during the height of the Reagan-led public disaffection with big government. One thing the American government needs is a good school in public management and the right incentives. What ails the government's defense procurement business most is the absence of a cadre of experienced and trained procurement managers. In Fox's view, there can be no substitute for day-to-day evaluations and negotiations between buyers and sellers. Parenthetically, it should be noted that this book is published by the Harvard Business School, which would surely benefit as an instructional institution for the professional skills and training of the DOD military and civilian acquisition force.

How does he propose to improve management? Basically, Fox would like to see more and better incentives for those military and civil service acquisition managers. This action would attract a better trained and skilled cadre and would present a genuine alternative to the revolving-door problem. Will the cost of increased incentives be offset by the savings of better management? Fox's projections of savings up to $40 billion per year from more efficient management seem ridiculously optimistic and are precisely the kinds of estimates likely to underline the idea that more dramatic changes are necessary.

At bottom, Fox's solution comes down to two competing visions of what a program manager might be. In the first vision, the program manager is a program promoter and contract monitor, a role that minimizes cost controlling and smacks of military-industrial-complex collusion. In the second vision, the program manager is an acquisition management specialist whose principal function is the control of contractor costs, in addition to managing a technically excellent program. To achieve this vision requires strengthening the autonomy of the government manager's side, while diminishing the influence of the DOD's civilian leadership, whose historic role has been to coddle the contractors from whose ranks they are invariably taken.

Since it is unlikely the contractor community

would ever support such a change, we can only hope for deliverance in this direction. Greater management autonomy at the program-office level, however, might offer benefits that bolster Fox's case. For example, in the military space-procurement field, space system acquisitions are structured along lines similar to large-scale production activities, even though the small number of space units makes space acquisition resemble a classical research and development model. The result is inflated procurement costs. A more intelligent approach to administrative structure would allow program managers to better fit together what business historian Alfred D. Chandler refers to as strategy and structure.

Regardless of whether one agrees with Fox's solutions, one is certain to find his work both informative and insightful. It contains a detailed description of the major aspects and phases of acquisition, an explanation of major legislation, and a good deal of history to help us understand how and why procurement problems have changed for the worse.

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Great Military Disasters: A Historical Survey of Military Incompetence by Geoffrey Regan. New York 10017: M. Evans & Company, Inc., 1988. 320 pages. $22.50.

The explanation of the moral element in war has gained a popular resurgence in print. Although the human dimension has been the theme of many recent books, it is still, for very good reasons, the least understood or predictable facet of combat and the greatest influence on the "fog and friction" of warfare. In examining the moral and psychological elements of war, the preeminent nineteenth-century military theorist Carl von Clausewitz concluded that all aspects of war emanate from the human condition: "Moral forces are among the most important subjects in War. They form the spirit which permeates the whole being of War." Written from a historical perspective, Geoffrey Regan's *Great Military Disasters* continues the investigation into understanding the relationship of man to warfare.

Regan highlights our erstwhile inability to identify the types of incompetence of commanders, staff planners, and politicians that resulted in the failure of various battles and campaigns. He presents a comprehensive range of factors that lead to incompetence and integrates it into a historical perspective, seeking to discover "the unusual or surprising event" that dramatically influenced the outcome of combat. *Great Military Disasters* addresses the inadequacies of commanders by focusing on the frailty of their physical, mental, and psychological constitution. Among those qualities, Regan discusses overconfidence and timidity as characteristics of incompetence. Besides psychological inconsistencies, commanders are afflicted by personal inadequacies such as physical incapacity, emotional jealousies arising from professional rivalry, and cowardice. Regan completes his analysis of commanders by scrutinizing their professional ineptitude—those tactical and operational blunders that contributed to military disasters.

In addition to relating the personal inability of a commander to make correct battlefield decisions, Regan devotes attention to the institutional incompetence associated with military bureaucracies and the relationship of unrealistic political policy to military affairs. The inability to overcome institutional inertia or interpret intelligence data and the unfortunate tendency to relate doctrine to technology are some of the detrimental qualities of staff planners found in *Great Military Disasters*. Politicians falter in relating their policy decisions to the military by making unrealistic demands of commanders. In the diplomatic and domestic arena, politicians err by alienating natural allies, by miscalculating adversaries' intentions, and by not appreciating the value of propaganda.

By citing numerous historical examples, Regan adequately documents these individual and institutional qualities that contribute to military failures. Organized in two parts, *Great Military Disasters* identifies characteristics of incompetence associated with commanders, staff planners, and politicians in part one and then demonstrates these negative attributes in 11 minor case studies in part two. Possibly the best two battles used to illustrate patterns of incompetence are Marston Moor (1644) and San Juan Hill (1898). Expanding its scope from the personal inadequacies of commanders in battle, to military bureaucracies' reluctance to change, and finally to national leaders' misunderstanding of the relationship of politics to war, *Great Military Disasters* portrays the fundamental element of warfare—man.

An in-depth treatment on the calamitous conduct of war, *Great Military Disasters* concen-

trates on the moral and psychological factors that negatively influence warfare. However, Regan fails to mention the foremost deficiency of commanders, staff planners, and policymakers—their disregard for the importance of history. Although Regan does not comment directly on this aspect, his historical perspective demonstrates the usefulness of studying history to gain insight, temper judgment, and train the mind. Combat experience for most people is relatively scarce, but one may obtain vicarious exposure to warfare by studying military history. The institution that disregards the usefulness of military history is myopic. The human dimension, institutional evolution, and political relationship to war are rooted in history. Geoffrey Regan's *Great Military Disasters* recounts some of these intricate complications of warfare by illuminating the negative aspects of military blunders. It should be read by military and political professionals who make critical decisions about military policy and the conduct of war.

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The Rise of American Air Power: The Creation of Armageddon by Michael S. Sherry. New Haven, Connecticut 06520: Yale University Press, 1987. 435 pages, $14.95 paperback.

The title and the cover illustration (a B-29 escorted by 10 P-51s) might lead a reader to expect just another book exploring the contemporary appetite for military history. Not so. Sherry has written a history of an idea—the idea of strategic bombardment.

The predominant theme is that ideas, expectations, emotions, hopes, dreams, and ignorance about air power led US policymakers to use excessive force thoughtlessly in World War II bombing campaigns. This overindulgence occurred despite a prevalent prewar belief that air power was so terrible that it would never be used. Sherry believes that the history of strategic bombing theory provides an ominous example for nuclear deterrence theory.

Sherry traces thought on strategic bombing from H. G. Wells's 1908 novel *The War in the Air* through the end of World War II. In the process, he employs the tools of intellectual history, augments the major apocalyptic air power theorists with popular views of air power (including fiction, poetry, and movies), and offers detailed analyses of the words and actions of major decisionmakers. Two-thirds of the book is devoted to bombing policy and strategy in World War II.

In developing the themes that "technological fanaticism" drove strategic bombing and that bombing with unclear strategy led to exorbitant use of force, Sherry applies a "calculus of blame" (293) to major decisions, actions, and players. He describes both what should have been done (in his opinion) and what might have occurred had other actions been taken.

Sherry covers the apocalyptic theorists of air power well, although his concentration on strategic bombing might lead the innocent reader to assume that theorists were all of the Stanley Baldwin persuasion ("the bomber will always get through"). The interplay of technology, institutional desires, doctrine, and policy over the 20 years between the world wars illustrates the problems of prophecy very well.

Sherry's narrative of decisions, actions, and outcomes in World War II is studded with valuable insights on strategy and policy. While he does not quote Clausewitz, it's hard to find better examples of war's uncertainty, its resistant medium, and its tendency to change in nature and objectives, once begun. Ineffective efforts (such as bombing submarine pens), dispersal of effort, equating amount of effort (hours flown or bombs dropped) with results, and inefficient operations (bombing from China) reveal sobering mismatches between means and ends. The tendency to pursue quantifiable goals, simply because results could be reliably measured and reported, clearly parallels the generation of purposeless sorties that crippled the Luftwaffe in World War II.

Sherry's most detailed argument is that strategy in the Pacific was not properly focused on a political center of gravity that could force Japan's surrender. Ideally, strategy should have "rested finally on a view of the enemy: a conception of the adversary's resolve, of the conditions under which it would cease fighting, and of the institutions that made decisions" (239). The Indian author S. T. Das has stated that "the objective of war . . . is the effective control over the political elite of the state to enforce a political decision." The point—that Americans tend to have difficulty identifying political centers of gravity other than the popular will—is significant.

Sherry argues that because no clear determi-

nation of the political center of gravity was made, a wasteful and aimless strategic bombing campaign resulted. This argument, of course, assumes that a susceptible center of gravity was available, that it could be identified, and that strategists would recognize the information as reliable. Sherry postulates that the Japanese cabinet was the political center of gravity and that less costly measures such as interdiction of transportation might have induced surrender, at reduced cost in lives (whether Japanese or American or both is not clearly spelled out). One should keep in mind that "a clear and accurate model of how the enemy thought and how destruction might compel his surrender" (239) is the Holy Grail that strategists have always sought.

Sherry's idea of identifying a single, minimum-effort strategy and his criticism of the simultaneous pursuit of multiple strategies in the Pacific should be treated with caution. Because the lives of men and the future of nations are involved, strategists are wise to adopt mutually supporting strategies. Rigorous approaches chosen to increase the certainty of victory—as opposed to chancy, dispersed, or excessive efforts—appear to be proper responses to war's most basic condition: uncertainty.

This brings up the most serious flaw in Sherry's book, if taken as history. Military errors or excesses, by their very cost in lives, should compel examination of how decisions were made by individuals who were there with information then on hand. Learning about decisions depends on a rigor of chronology that this book loses in seeking the "calculus of blame." With hindsight, it is easy for us to see factors that decisionmakers didn't know they were ignorant of, as well as events not yet known to these actors. The effectiveness of the atomic bomb and even its consequences are presented as if they were known before the Trinity explosion, while certainty of victory is presumed early on. Heavy reliance on postwar sources and the omission of the most objective evidence for or against "fanaticism"—the rules of engagement—weaken Sherry's calculus.

For the reader with some background in the history of air power, strategy, and the history of World War II, Sherry offers much worthwhile food for thought. For the prepared reader, his detailed exposition of the costs of nuclear strategic thinking provides a useful vehicle for examining past mistakes to avoid repeating them. But if this book were a reader's introduction to air power theory (or World War II, or strategy), the author's omissions, predispositions, and admonitions would not provide a sufficiently broad view of these big topics.

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Secret Intelligence: The Inside Story of America's Espionage Empire by Ernest Volkman and Blaine Baggett. New York 10016: Doubleday, 1989. 266 pages, $19.95.

This self-professed "brilliant popular history" of America's espionage empire will probably result in more confusion than answers. Outwardly, the book seeks to take the reader into the dark depths of America's intelligence community but does so by presenting a confusing history and concludes with a vague warning that intelligence-collection capabilities can be a threat to our own constitutional rights. Surely, this idea is nothing new!

The book begins with a vividly written scenario, giving a brief account of the American intervention during the Bolshevik revolution. From this interesting starting point, the authors then present converging and confusing accounts about the rudimentary pre-World War II American intelligence efforts, and the reader is unsure if these efforts are directed more against foreign targets or US citizens. From there, in increasingly broad strokes, Volkman and Baggett begin to recount some historical events involving intelligence.

For example, they roundly condemn Pearl Harbor as an intelligence failure. Yet those who have read Wohlstetter and Prange's extensively researched accounts may wonder if intelligence data was simply not acted upon rather than unavailable. The intelligence difficulties cited are well known and add nothing to the Pearl Harbor controversy. The critical battle of Midway, which was won largely due to good intelligence, is dealt with in one sentence. The authors ignore a golden opportunity to show what good intelligence collection and analysis can do. But it seems here, as is the case throughout the book, that they favor the sensationalist point of view.

Concerning more recent events—nowhere is Penkovsky mentioned—reconnaissance aircraft, satellites, and collection techniques are scarcely even alluded to (certainly not described), and the Cuban missile crisis is dealt with in but two

paragraphs. Worse, the book's chronology would make Faulkner rejoice. Chapter 11, "Desert One," begins with a cursory account of the tragic rescue attempt; jumps to President Carter's intelligence policies; covers Allende's overthrow in Chile, the Portuguese withdrawal in Angola, the Soviet brigade in Cuba, the shah of Iran's overthrow; and ends with Ronald Reagan coming to power. None of these diverse, complex topics are covered beyond the most superficial level, much less in depth.

Overall, the book devotes itself to intellectual sensationalism under the guise of providing a work that will help US citizens protect their constitutional rights. But in fact it provides nothing new; nor does it even shed new light on familiar topics. It concludes with the observation that intelligence activities need to be closely monitored—scarcely an original idea. Baggett is involved in the PBS television series "Secret Intelligence," and the book seems to be merely a printed version of that series. But what works on video, with interviews and footage, just doesn't work well in print. While there is much information of interest to the popular audience, this book has been done before, and it has been done much better. If you are interested in a good, popular, intelligence history with outstanding illustrations, try William Kennedy's *Intelligence War*.

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Nuclear Strategizing: Deterrence and Reality by Stephen J. Cimbala. New York 10010: Praeger Publishers, 1988, 306 pages, $45.00.

In this intricately reasoned study, Stephen J. Cimbala offers a Clausewitzian critique of our current nuclear deterrence strategy. According to the author, US deterrence doctrine is too mechanistic. It may seem a rational response to a dangerous predicament, but the rationality behind nuclear deterrence is conditional. Security planners may try to account for all the variables in a thermonuclear war, but that task is impossible. Conditional rationality leaves out or improperly accounts for intangibles like instincts about life and death, feelings about national honor, and the impact of pride and fear. It tries to substitute a well-calibrated decision-making process for the recognition that the "fog and friction" of war are inescapable features of any military theory. As a result, Cimbala argues that our nuclear doctrine rests on strategizing, which inspires erroneous policy decisions, rather than strategy.

According to the author, strategizing is nuclear strategy divorced from strategy proper. In a pseudoscientific way, it assumes precision and exactitude in warfare. It does not completely deal with the collective impact of operational, social, and logistical factors. It further ignores the reciprocal relationship between war and policy and thus leads to a nuclear strategy that is asocietal and ahistorical.

Given its utilitarian bent, Cimbala notes that strategizing blinds policymakers to an uncomfortable truth: one can rationally conduct an irrational war with stupid political objectives in mind. Strategizing also obscures the distinction between diplomacy based on a balance of terror and that found in a traditional balance-of-power system. As a result, the author argues that current planners wrongly believe the reasoned use of nuclear forces to gain limited objectives is possible within a balance of terror. In fact, the opposite is true. To Cimbala, nuclear war cannot function as an extension of politics by other means because it is uncontrollable and cannot ensure victory in the traditional meaning of the word. Clearly, strategizing and its Jominian emphasis on rational control and predictability is a blind alley.

Another problem that afflicts our current nuclear strategy is scientism. According to the author, scientism is a self-defeating approximation of science. It is a commingling of facts, values, and biases that focus on firepower ratios and other quantifiable irrelevancies. It substitutes cost-effectiveness and payoff tables for true strategy. As a result, scientism also contributes to mistaken assumptions. Planners fretted over an intercontinental ballistic missile (ICBM) window of vulnerability in the early 1980s while a shift to diversified deterrence, which included new mobile missiles of various kinds, made the controversy irrelevant. NATO, and West Germany especially, subscribe to a militarily untenable forward strategy and expects to compensate for it with improved gadgetry. Policymakers seem to believe that limited nuclear war is possible and that it ensures both escalation control and success at acceptable costs. All these muddleheaded beliefs, according to Cimbala, spring from scientism and its substitution of marginal utility theory for a strategy that includes the human element in war.

What is the solution to these problems? Cimbala argues that we should adopt the right kind of rationality to act as the foundation of deterrence—the rationality of coping. In lieu of strategizing and scientism, where you bend reality to fit rigid intellectual constructs, the rationality of coping encourages you to live with conditions instead of trying to triumph over them. It stresses accepting limits rather than searching for options that an opponent might misconstrue as hostile. It further emphasizes avoiding military and political situations that lead to trouble.

The strategy of coping thus accounts for "frictions." It recognizes there is no cross-national logic of deterrence. As a result, a coping strategy focuses on avoiding hostilities rather than fixating on how to control and terminate a nuclear war. It acknowledges the need for reduced nuclear arsenals and changes in their character. Finally, a coping strategy calls for well-rehearsed leaders who, rather than adhere to a previously advertised course of action, shape their ends and means based on a real-time approximation of goals. Musclebound strategizing and scientism would thus yield to an approach that accommodates the internal contradictions in our deterrence policy.

When it comes to exposing the internal contradictions of a deterrence strategy based on strategizing and scientism, this is a splendid book. The author shows with surgical precision that a credible deterrence is not necessarily a moral or rational one, that ballistic missile defenses may undermine stability and actually encourage a nuclear first strike, and that extended deterrence in NATO rests on dubious war scenarios.

On the other hand, the continuing flux surrounding nuclear issues may quickly date portions of this book. Secretary Mikhail Gorbachev's concept of "reasonable sufficiency" and its potential impact on our nuclear strategy gets short shrift. The current scaling back of some ballistic missile defense programs also receives limited recognition, as does the US Navy's apparent shift away from the maritime strategy advocated by John Lehman. Finally, this is a work that uses "technostrategic" language. Those who have a distaste for the never-never land of abstraction, where critics of nuclear policy use elaborate and sanitized euphemisms for an ugly subject, may find this book hard going. Ironically, the author's use of "nuke speak" involves using the very same language found in nuclear strategizing. Yet, even though the author's language suggests a personal search for the formalized control that he condemns elsewhere, this work makes a powerful point about our nuclear strategy not being truly rational.

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The Shield of Faith: A Chronicle of Strategic Defense from Zeppelins to Star Wars by Barry Bruce-Briggs. New York 10020: Simon and Schuster, Inc., 1988. 464 pages, $22.95.

This book is exactly what it claims to be, a chronicle rather than a history. Barry Bruce-Briggs—who worked for Herman Kahn's Hudson Institute from 1969 to 1983, followed by a brief assignment at the Futures Branch in the Strategic Studies Institute at the Army War College—has put together his recollections of strategic defense issues "based almost entirely upon hanging around the courts and camps of the Business." He defines the "Business" as the national security apparatus made up of politicians, soldiers, engineers, and think-tank analysts. Defense is a "Good Thing," according to the author, but convincing the decisionmakers to develop and implement defensive weapons has had its ups and downs. Bruce-Briggs leads the reader down a bumpy road, pointing out along the way the rise and fall of numerous continental air defense and antiballistic missile (ABM) weapon schemes. His unsurprising conclusion is that defensive systems have generally taken second billing to offensive weapons. For example, during the Eisenhower administration, antiaircraft guns, air-to-air missiles, and Nike Hercules air defense missiles could not compete with the Department of Defense's priority to build B-52 bombers for the Strategic Air Command (SAC) and later nuclear-tipped intercontinental ballistic missiles (ICBMs).

With the proliferation of ICBMs under President Kennedy, and his decision to drop the B-70 bomber, attention shifted from SAC bombers to Minuteman and Polaris missiles as the primary means to win any future war. The defense assumed the role of "defending the deterrent"—the strategic offensive forces. This meant hardening Minuteman silos, building an invulnerable command post inside the Cheyenne Mountain Complex, and paying lip service to a

plan for building a network of fallout shelters throughout the country as an "insurance policy" to protect the general population. These passive measures failed to satisfy the proponents of an active defense who lobbied for and briefly succeeded in installing the nation's only ABM system, Safeguard.

What is frustrating about this book is that in spite of the author's preference for the defense, he provides a strong case for the offense. Throughout he highlights the think-tank and government studies that showed ABM systems were not cost-effective or were plagued with technical shortcomings. The problems of the perimeter acquisition radars, the sorting out of reentry vehicles from decoys, the difficulties of multiple retargeting, the extremely demanding task of maintaining a high reliability for "hitting a bullet with a bullet," and the enormous expense of keeping the system operational all contributed to the demise of Safeguard and prevented other systems from getting under way. What Bruce-Briggs does not adequately answer is, with limited resources, why should large investments have been made in defensive weapons? Even when the cost of a system seems to favor the defense there are inconsistencies in the discussion. While the writer points out that "the great virtue of fallout shelters was . . . that they were cheap" (p. 119), Eisenhower was "flabbergasted" by the excessive cost of blast and fallout shelters presented by his advisers (p. 130).

In terms of balance, the book focuses primarily on the evolution of defense programs from the 1950s through the 1970s. Although the reader might expect to find a lengthy coverage of Reagan's Strategic Defense Initiative because of the book's title, this subject appears mainly as an afterthought in a brief epilogue. The author is very effective in describing the personalities and behavior of the think-tank experts who were constantly wheeling and dealing in their quest for government contracts. Based on interviews, experience, and knowledge obtained from "hanging out," he presents some interesting and humorous vignettes on the Herman Kahns of the Hudson Institute, the Albert Wohlstetters and Harry Rowens of the Rand Corporation, and numerous others from the Massachusetts Institute of Technology Research (MITRE) Corporation and private contractors. He also does an excellent job of identifying and tracing the careers of lesser-known luminaries in government and the private sector who played an important role in building a strong case for strategic defense.

How does one rate this book? It depends. If you want anecdotes and an overview of the debate on offensive and defensive strategic systems, then this will be a useful source. If you are looking beyond that for an explanation or interpretation as to why those events occurred as they did, you will have to look elsewhere.

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Air University Review Index

The Air University Press is in the process of publishing a complete index of the *Air University Review* (1947–1987). This two-volume index will contain an author index, a title index, and a cross-referenced subject index. Any Air Force or other government organization, college or university library, or similar organization with a need for this index can be placed on distribution. Requests for distribution and other inquiries should be addressed to Maj M. A. Kirtland, CADRE/RI, Walker Hall, Maxwell AFB AL 36112-5532. Major Kirtland can also be contacted at AUTOVON 875-6629 or (205) 293-6629.

Army Aviation Convention

The Army Aviation Association of America will hold its annual convention from 11–15 April 1990 in Orlando, Florida. The theme for this year's convention is "Army Aviation in a Changing World." For more information, contact AAAA, 49 Richmondville Avenue, Westport CT 06880-2000 or call (203) 226-8184.

Psychology in DOD Symposium

The Department of Behavioral Sciences and Leadership at the US Air Force Academy will host the Twelfth Biennial Psychology in the Department of Defense Symposium from 18–20 April 1990 at the Air Force Academy. Inquiries concerning attendance or submission of papers should be addressed to Lt Col Dave Porter or Maj Lee Lever, USAFA/DFBL, US Air Force Academy CO 80840-5701. Telephone inquiries to AUTOVON 259-3860 or (719) 472-3860.

Space Logistics Symposium

The Third Space Logistics Symposium will be held from 30 April to 2 May 1990 in Colorado Springs, Colorado. The topic of the conference is "Space Logistics in Transition—The Shift from R&D and Experimental to Operational Systems." Inquiries concerning the conference should be sent to Mr David P. Martin, Science Applications International Corporation, 2860 S. Circle Drive, Suite 2400, Colorado Springs CO 80906.

USAFA Military History Symposium

The Air Force Academy's Department of History will host the Fourteenth Military History Symposium at the academy from 17–19 October 1990. This year's topic is "Vietnam, 1964–1973: An American Dilemma." Sessions will be conducted on Vietnam War scholarship, the war during the Johnson and Nixon eras, and Vietnamese perspectives of the war. The symposium also features the Harmon Memorial Lecture. For more information, contact Capt Scott Elder, Department of History, US Air Force Academy CO 80840-5701 or call AUTOVON 259-3232 or (719) 472-3232.

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