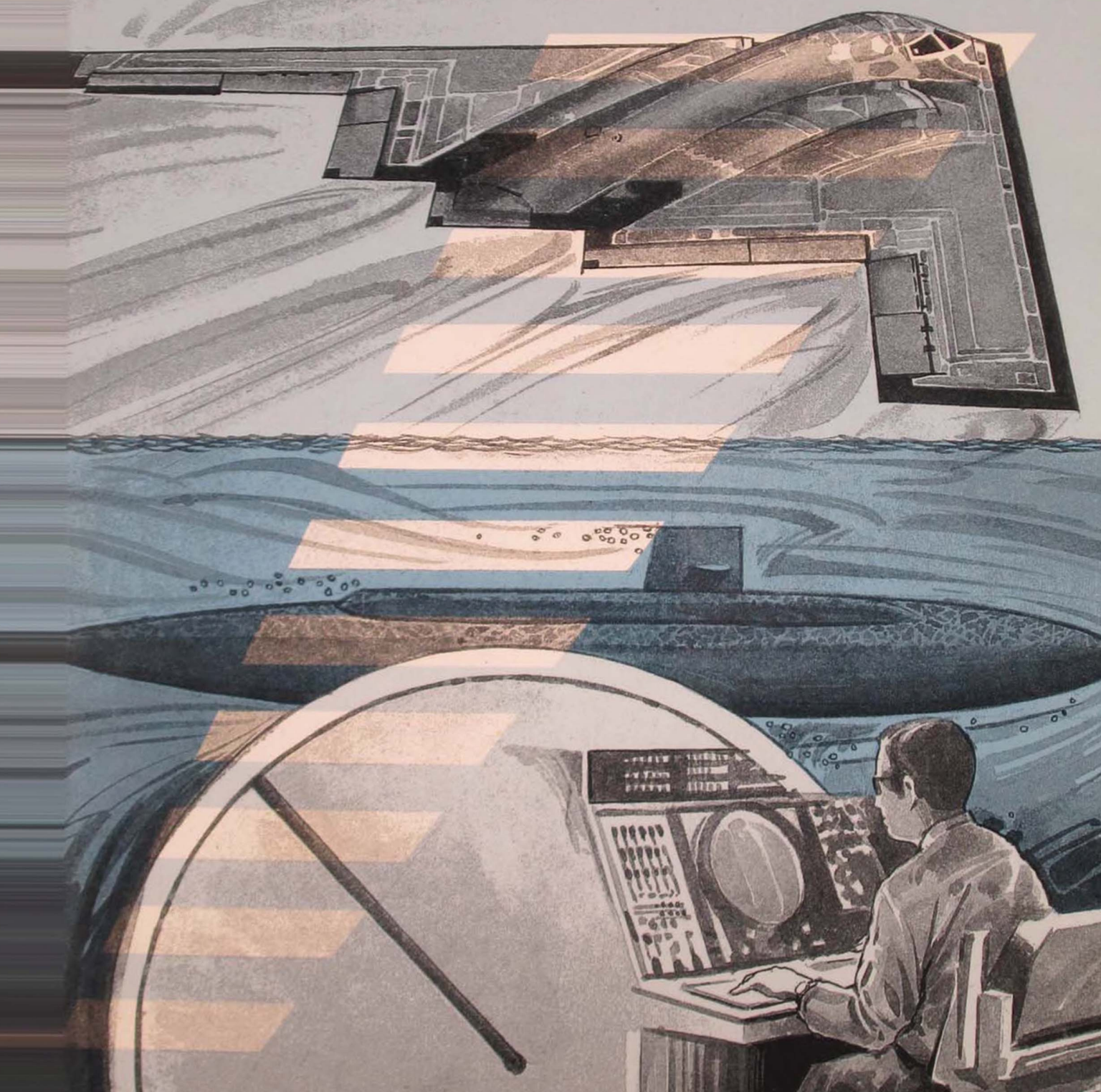
AIRPOWER

Spring 1991

JOURNAL



AIRPOWER JOURNAL

Spring 1991, Vol. V, No. 1 AFRP 50-2

EDITORIAL

... Three to Get Ready ...

DEFINING professionalism is like trying to define leadership—it's hard to describe, but you know when you've been well led and you know when you've had contact with a real professional. One of the telltale signs of military professionals is preparation. When the time comes to use their skills, military professionals are ready. This kind of readiness comes from taking advantage of opportunities to gain experience.

Into each military person's life come opportunities to serve. Some of them are mundane—"We need a volunteer to lead our unit (you fill in the blank) drive." Some of them are more exciting—"Bill is sick today. Could you present his briefing to the general this afternoon?" They are rarely convenient—"I know you just got back last night, but we need you to go TDY again. This afternoon!" Each opportunity represents a chance to gain experience—to grow—to get ready. In most cases we have a choice. We don't have to volunteer to lead the drive. If no one volunteers, the boss will probably ask Joe or Sally to do it. No one would blame us if we declined giving the briefing on such short notice. After all, it's not our job. We can probably weasel out of going TDY again so soon. Surely we can dream up some excuse. But if we make these choices, we will lose those opportunities forever.

Each military professional's background has included a unique set of such opportunities to serve. Ofttimes they didn't look like particularly exciting or rewarding tasks, but they held the seeds of greatness. Doing these tasks—whatever they were—built the experience level needed to sharpen judgment and discernment.

Certainly, no one can do everything. We must select wisely to prevent overloading and burnout. We can round out our perspective vicariously by sharing others' experiences through reading—especially through reading military history and the product of contemporary military thought (such as we try to make available within the pages of this journal). Charles, archduke of Austria, pointed to this thought when he said, "A great captain can be formed only by long experience and intense study; neither is his own experience enough—for whose life is ... sufficiently fruitful of events to render his knowledge universal?"

We should strive to maintain a balance of experiences to keep growth relatively even in all areas of life (physical, mental, emotional, and spiritual). No real military professional is disconnected from the larger world or universe or the source of the power that holds it all together. We must also remember that choosing one task costs us the opportunity to do another.

That said, the military professional—who stands ready to make the critical decision when it really counts and is able to perform his or her duties properly under the pressure of combat—is usually the one who took advantage of the unique set of opportunities that came his or her way. For as Ferdinand Foch said, "No study is possible on the battlefield." From those experiences, these professionals built the confidence, judgment, courage, and integrity they needed to act professionally. Did they always feel ready? Most would probably say no. Most would probably say they wished they had had more experience to base those decisions on or to improve their performance. But that's how most experience is gained—by taking the opportunity to act and learn, even when conditions aren't perfect. RBC

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

COMPOSITE WING SUPPORT

Our new chief is right-on with his "For the Composite Wing" (Fall 1990). My long-standing advocacy of tactical air autonomy and concern for the wartime effectiveness of command and control and other out-of-the-cockpit and off-the-base combat-support resources make the composite wing an overdue initiative.

The cumbersome air tasking order could be reduced to a one-pager or a secure teleconference. General McPeak's observation that "the composite wing makes smaller mistakes because it works and trains together in peacetime" (as it will have to fly and fight in wartime) is a major portion of the bottom line to improved performance in combat. His comment that "our [current] operating concept is to task a large group of strangers to join up and get acquainted on their way to the target" is unfortunately *not* an exaggeration. Although we've come a long way with the Red Flags and Cope Thunders, the composite wing is the next logical step.

As a many-times/many-levels commander and inspector general, I find the peacetime opportunities to evaluate, validate, and improve concepts, campaign plans, and combat capability very exciting. Opportunity for rationalized, other-guy finger pointing will be dramatically reduced—if not eliminated—and result in more constructive and proactive "fixes" (not unlike what the air combat maneuvering instrumentation did to locker-room and barroom air combat maneuvers).

As the great prophet Johnny Carson is prone to say, "Timing is everything." The big, bad bear—though not gone—is distracted and has shrunk; the [Secretary of Defense Verne] Orr/[Air Force Chief of Staff Charles A.] Gabriel maintainability and reliability (M&R) objectives are paying off; ongoing force structure reductions heighten the need for best utilization of resources; the composite wing "fits" an evolving national strategy of mobility, responsiveness, and jointness; and USAF people have the intelligence and dedication to make it work.

If I were asked, my two cautions would be (1) don't study the concept to death and (2) look carefully at two-tier maintenance (M&R improvements may make three tiers affordable, and two tiers reduce autonomy and combat capability).

Though my response is obviously simplistic, I recognize that the chief will run into a lot of head wind, but I am confident that General McPeak will make the right decisions.

Gen Robert W. Bazley, USAF, Retired
Springfield, Virginia

It was a distinct pleasure to read the article "For the Composite Wing," written by General McPeak when he was CINCPACAF. It opens a discussion that is long overdue.

For several decades, the Air Force organizational pattern has been dictated by our logisticians. It was obviously much easier to maintain and supply parts for complex hardware when this hardware was separated out into the biggest possible piles of like equipment. This quite naturally led to entire wings—and air divisions where possible—being equipped with the same type of aircraft and supporting gear.

This was, perhaps, not too bad a way to go against a known enemy if one had a large air force with (1) a relatively straightforward mission that required large numbers of standardized sorties and a minimum of improvisation and (2) most planning centralized at higher-command echelons.

We are now in a new ball game. The Soviet threat is on the wane. The operating ambiance is more diverse and global in nature. In addition, we are facing budget limitations that will require drastic changes in our way of doing business. These two factors will force a careful analysis of just what this new world is going to look like, how American interests can best be served in this new world, what the military

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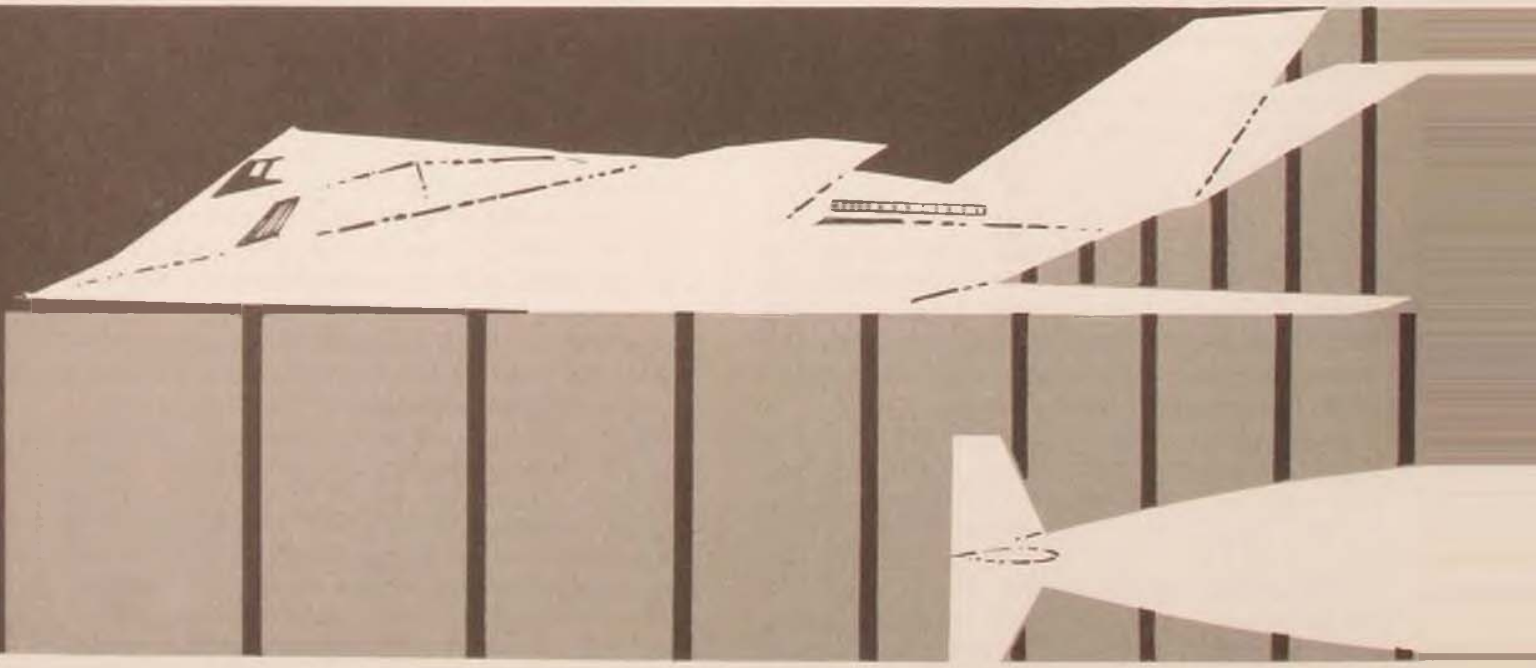
STEALTH IS A ZERO-SUM GAME:

A SUBMARINER'S VIEW OF THE ADVANCED TACTICAL FIGHTER

CAPT JAMES H. PATTON, JR., USN, RETIRED

ONE would hardly expect a submariner to advertise himself as an expert on the developing advanced tactical fighter (ATF), and that is certainly not my intent. As a young boy growing up during World War II, however, I was fascinated by aviation and aircraft, and for three years at the Naval Academy I had intended to enter pilot training upon graduation. But during the last year, I began to have the same doubts about my eye-hand coordination that had been expressed by my Little League coach. When the opportunity presented itself, I chose the "road less traveled" of nuclear-power training—submariners needing only mind-mouth coordination.

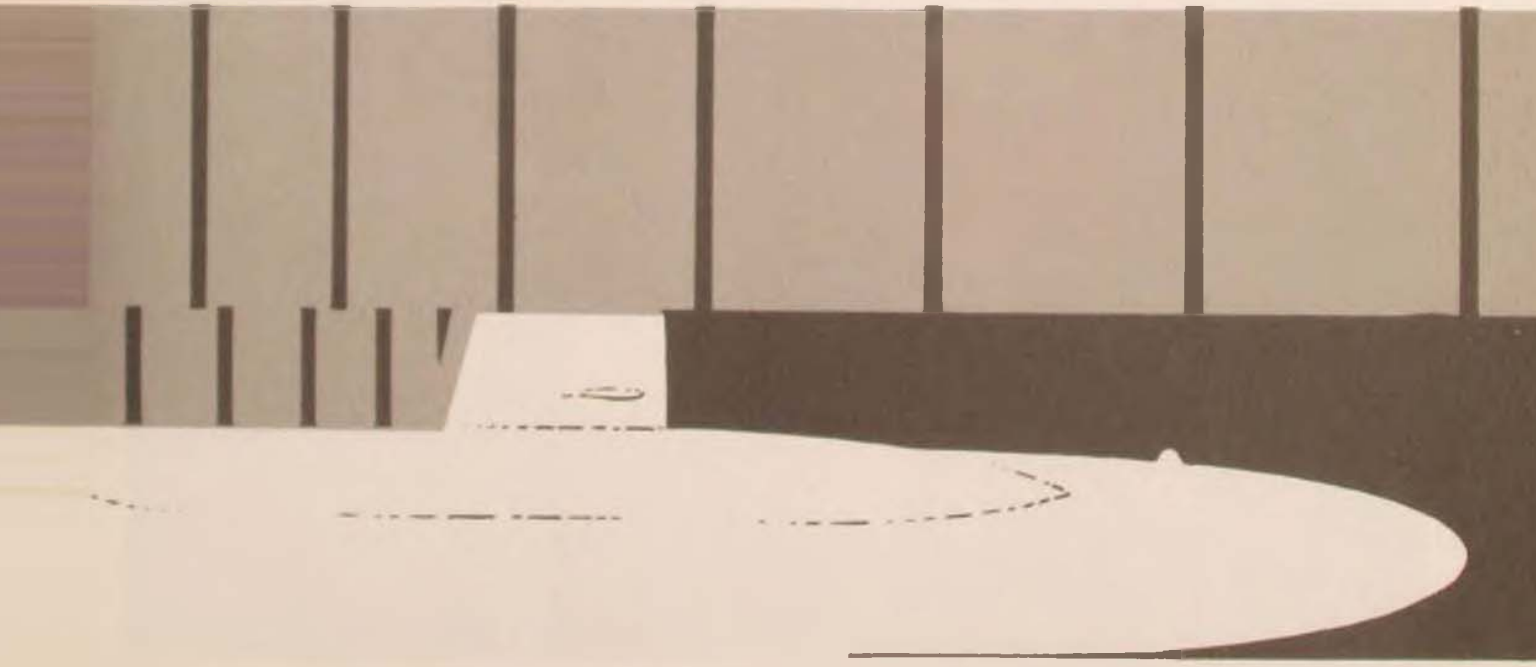
Nonetheless, I'll attempt here to identify some parallels between the nuclear-powered attack submarine (SSN) and the ATF, based on the evidence that the ATF is revolutionary and represents as dramatic an advance over previous fighters as did the SSN over conventionally powered attack submarines (SS). Caution is re-



quired in drawing conclusions from these possible parallels because, in addition to other dramatic differences, there are orders of magnitude between the time constants of the two platforms. Real-time decisions concerning the combat employment of airplanes, particularly those having the projected performance of the ATF, have to be made on a continuous time scale measured in as little as tenths of seconds. On the other hand, about the smallest significant sliver of time on an SSN is 15 minutes or so—the time it takes to wake up the commanding officer (CO), get him a cup of coffee, and ask if he wants to attack now or wait until after the movie. Levity aside, the running time of an SSN-launched torpedo from one's own ship to the target, following a 12- to 24-hour approach from the point of target detection, can easily be longer than the total mission time of an air superiority fighter from takeoff to landing.

With these caveats in mind, I want to make a case for parallels between attack-submarine operations and future air-to-air operations employing stealthy ATFs. In doing so, it is interesting to note that not until the Air Force developed the B-2 bomber did the submarine community realize just what we have been doing all these years—practicing stealth warfare. I say this because I can't recall the word *stealth* being used very much within the submarine force until the term began to be popularized by the B-2. Since then, the

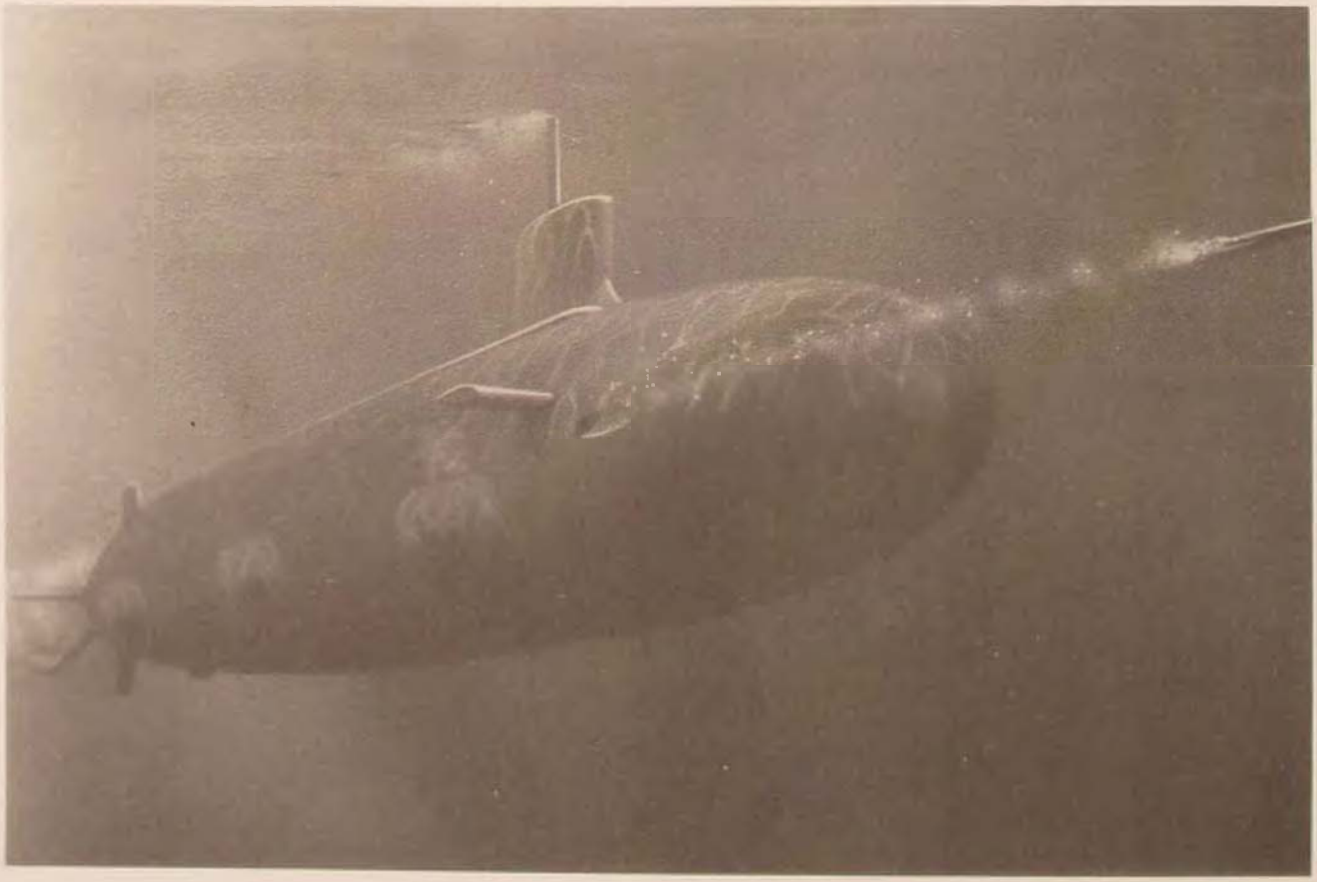
Erich Hartmann



The nuclear-powered attack submarine USS Nautilus *(SSN-571) undergoes sea trials in 1955 off the coast of Connecticut (above). The nearly unlimited endurance, enhanced performance, and relative quietness of nuclear-powered attack submarines (SSNs) make them far superior to conventional subs. The new* Seawolf *(SSN-21) class submarine (artist's conception below), which emphasizes stealth and maneuver, should enter service by the mid-1990s.*

more I learn about the application of stealth technologies and tactics in the air, the more it becomes apparent that concepts and principles of stealthy operation long taken for granted by submariners are now being rediscovered by aviators.

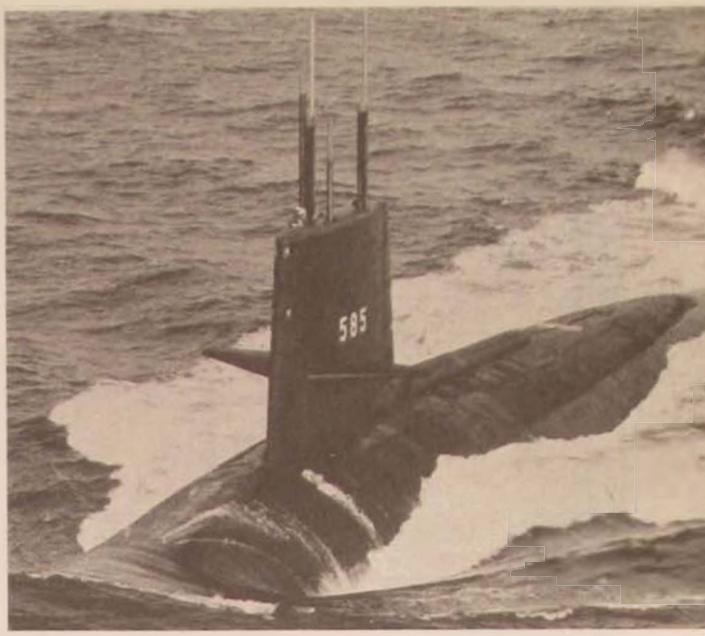
Of course, a considerable level of appreciation for the value of surprise among fighter pilots already exists. (And stealth is nothing more than the substitution of technologically assured expectations as the source of surprise for a mix of consummate skill and blind luck.) The US Navy's Top Gun syllabus from the mid-1970s emphasized, based on Red Baron studies of air combat in Southeast Asia, that 82 percent of all air-to-air victories during the Vietnam War were attributable to the victor's being able to attack prior to his opponent's awareness of his presence. Seemingly, situational awareness in the air is much like (and clearly related to) stealth under the sea—a zero-sum game. (Only one in a given duel can have it—the other is detected first and probably destroyed.)



The best past practitioner of stealthy tactics in the air may have been German World War II ace (with 352 victories!) Erich Hartmann, whose personal doctrine was *see, decide, attack, break*. Top Gun instructors interpreted that terse guidance—based on interviews with Hartmann—to mean that a pilot should attempt to detect without being detected, judge whether he can attack covertly, close to a point that would almost assure a kill, and then disengage rapidly to repeat the process, rather than hang around in what submariners call a *melee*, and fighter pilots term the visual *fur ball*.

Hartmann, as his 352 career kills document, was quite a warrior. Had he less eye-hand coordination, his tactical leanings toward the employment of stealth would have made him a good submariner. Clearly, parallels do exist between the emphasis on stealth in air-to-air combat and the importance accorded stealth in modern submarine operations. Can these parallels furnish any insights for future air combat with stealthy platforms like the ATF? I believe they can, but—to make my case—I need to say a bit more from the submariner's side of the parallel.

Having not exactly gotten in on the ground floor of SSN deployment and employment, I was lucky enough to have gotten aboard early. When I reported to the USS *Scorpion* (SSN-589) at the Electric Boat Company in Groton, Connecticut, as an ensign in 1961, it had just recently joined the fleet as the 12th US nuclear submarine. During the next 13 months, while qualifying in submarines, I watched some early Navy attempts to determine just how the SSN fit into the scheme of things. The fact is, at that time the enthusiasm for SSNs within the Navy and the submarine force was far from universal. Except for the small but growing cadre of (Adm Hyman) Rickover-trained disciples, most people viewed the SSN as a somewhat faster SS whose greatly increased procurement, training, and maintenance costs made its justification questionable. Indeed, the increased cost and trouble of an SSN did *not* compete well with those of the tried-and-tested SS if all that was expected of the SSN was to perform the mission set of the SS a little faster.



The USS **Skipjack** *(SSN-585), shown here in 1959, was once the world's fastest submarine. Many submariners initially questioned the cost-effectiveness of nuclear attack submarines.*

Architectural dogma dictates that form should follow function. Fix the function, and there is no requirement to significantly change the form. Extending this dictum to warship design, why bear the burdens of the SSN form to provide the SS function? An unfortunate but somewhat true criticism holds that the military mind is sometimes slow to notice a new function made possible by a radical development in form. Consider the dilemma within the Army (US and others) between the world wars as to which operational box armor should be placed in—that of cavalry, infantry, or artillery. Few people (Germany's Heinz Guderian excepted) saw it as a development best exploited by a new organizational entity—the armored division—which would come to dominate land warfare in Europe and Africa during World War II.

Back aboard the *Scorpion*, new and

Fighter pilots are in a much better position to achieve an aerial "kill" by maintaining the element of surprise in their encounters with enemy aircraft. Most air-to-air victories during the Vietnam War were attributable to the winner's being able to attack his opponent without warning or detection.

more dominant functions (or missions) began to emerge. In one particular operational exercise, *Scorpion* was tasked to operate in a somewhat constrained area. At the same time, Task Force Bravo—a premier antisubmarine warfare (ASW) group of that time centered on an ASW carrier (CVS)—demonstrated just how easy it would be to detect, track, and simulate the *Scorpion*'s destruction. Operating at periscope depth, the *Scorpion*'s skipper—a tiger of a submariner who had previously commanded an SS—saw them "come over the hill" with all their active sonars blasting away, raised the radar mast, and radiated (fully realizing that every electronic support measures—ESM—set in the task force would be tuned exactly to *Scorpion*'s frequency). While painting the task force disposition, the *Scorpion* saw two escorts—the "pouncers" of that period's doctrine—break off from the rest of the group and race down the line of sight toward their ESM intercept. In a controlled manner shortly after that, masts were lowered, full rudder and a flank bell were ordered, and the *Scorpion* corkscrewed down to test depth, leaving the world's biggest "knuckle" of turbulent, bubble-filled water remaining as a sonar-reflective column. Proceeding toward the battle

group, *Scorpion* slowed, came back to periscope depth, and simulated shooting both units as they raced past toward their target. Oblivious to their simulated destruction, the pouncers passed, detected the knuckle, and began a series of attacks on it.

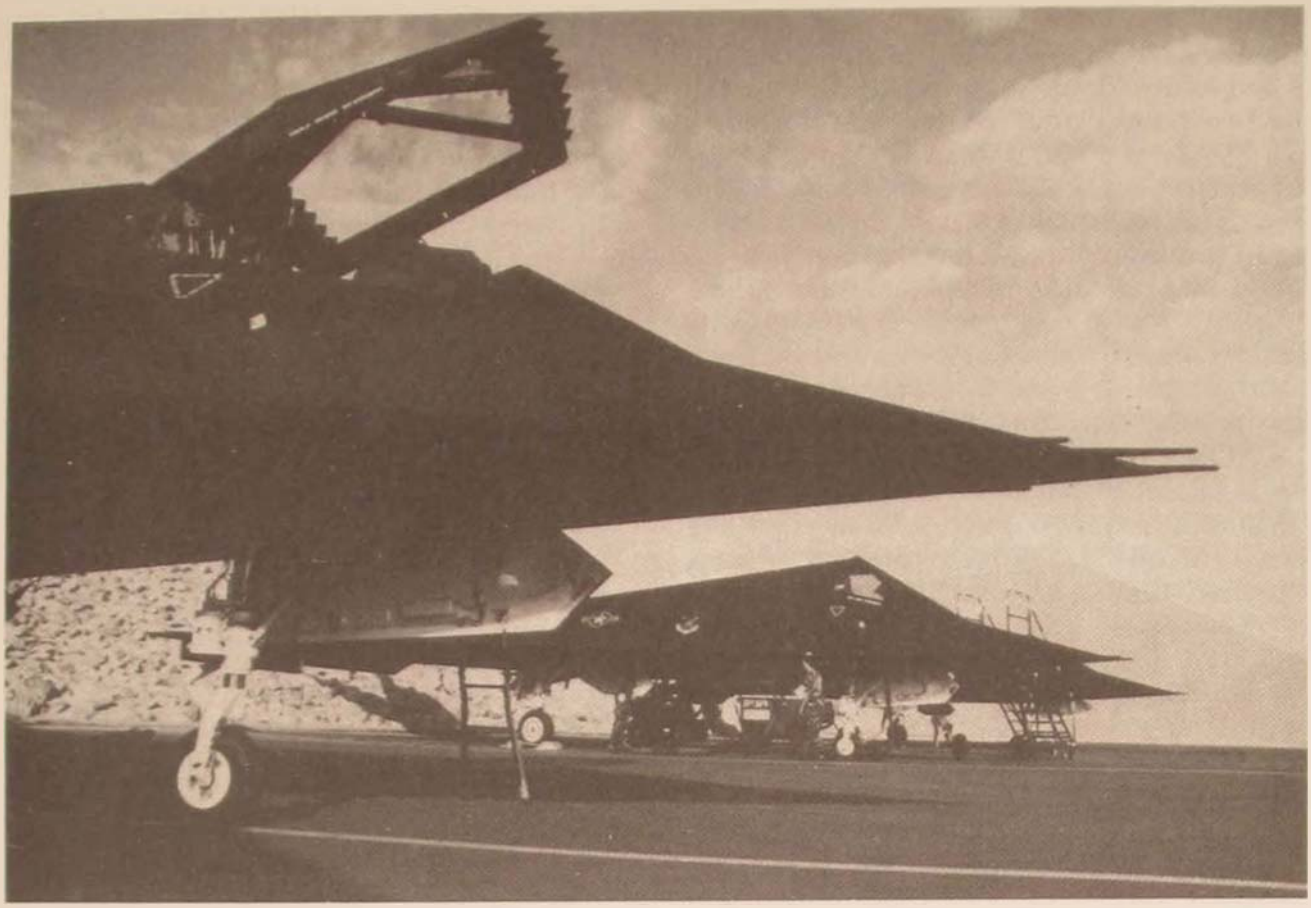
The *Scorpion* skipper then turned toward the remainder of the approaching battle group and increased speed to about 20 knots. Still at periscope depth, he began raising and lowering all masts capable of operating at that speed. Marked by an incredible "rooster tail" of wake and spray

The advanced tactical fighter candidates, the YF-22 at left and the YF-23 below, place a premium on "first-look, first-kill" capabilities via low-observable (stealth) technologies. Aircraft survivability factors are closely associated with those of nuclear attack submarines.

that these masts produced, *Scorpion* passed directly through the task force formation, passing a few hundred yards abeam of the carrier. When the shock of the situation passed, the lead escorts turned around to chase the contact, and the pouncers were called back, despite their objections of having pinned down *Scorpion*. With several destroyers now charging back in the direction of the carrier, the organization of the group of warships deteriorated dramatically and soon turned into a frenzied melee. *Scorpion* meanwhile had slowed and was watching from a moderate distance. When the confusion reached its peak, *Scorpion* moved back in and simulated emptying her torpedo room against the warships. From start to finish, the encounter had taken less than an hour, each unit of Task Force Bravo had been attacked at least once, and no valid attacks or even sonar detections had been made against *Scorpion*.

One would think that this debacle would have unequivocally shown that the SSN was not just another SS whose only hope against a collection of ASW forces was to employ its stealth in a defensive manner, judiciously husbanding a limited quantity of stored energy while carefully extricating itself from danger. In fact, however, the emotional and angry debrief of the exercise all but condemned *Scorpion* for "unfair and dangerous" maneuvers that jeopardized the safety of Task Force Bravo units. The CO of *Scorpion* remained completely unruffled by this criticism and ridiculed his colleagues for not appreciating that undersea warfare had taken on a significantly different aspect. No such lack of understanding of this change was evident among the officers and men of *Scorpion* and other US SSNs, however. We all

Newer Soviet submarines have displayed a marked improvement in quietness and war-fighting capabilities—advances that appeared earlier than expected, according to US analysts. Below is a Soviet Alfa-class nuclear-fleet ballistic-missile submarine under way somewhere in the Atlantic Ocean.



Many of the lessons learned by submariners in their lengthy experience with the stealthy characteristics of nuclear submarines may be applicable to the utilization of aircraft such as the F-117, shown here between missions in the Middle East.

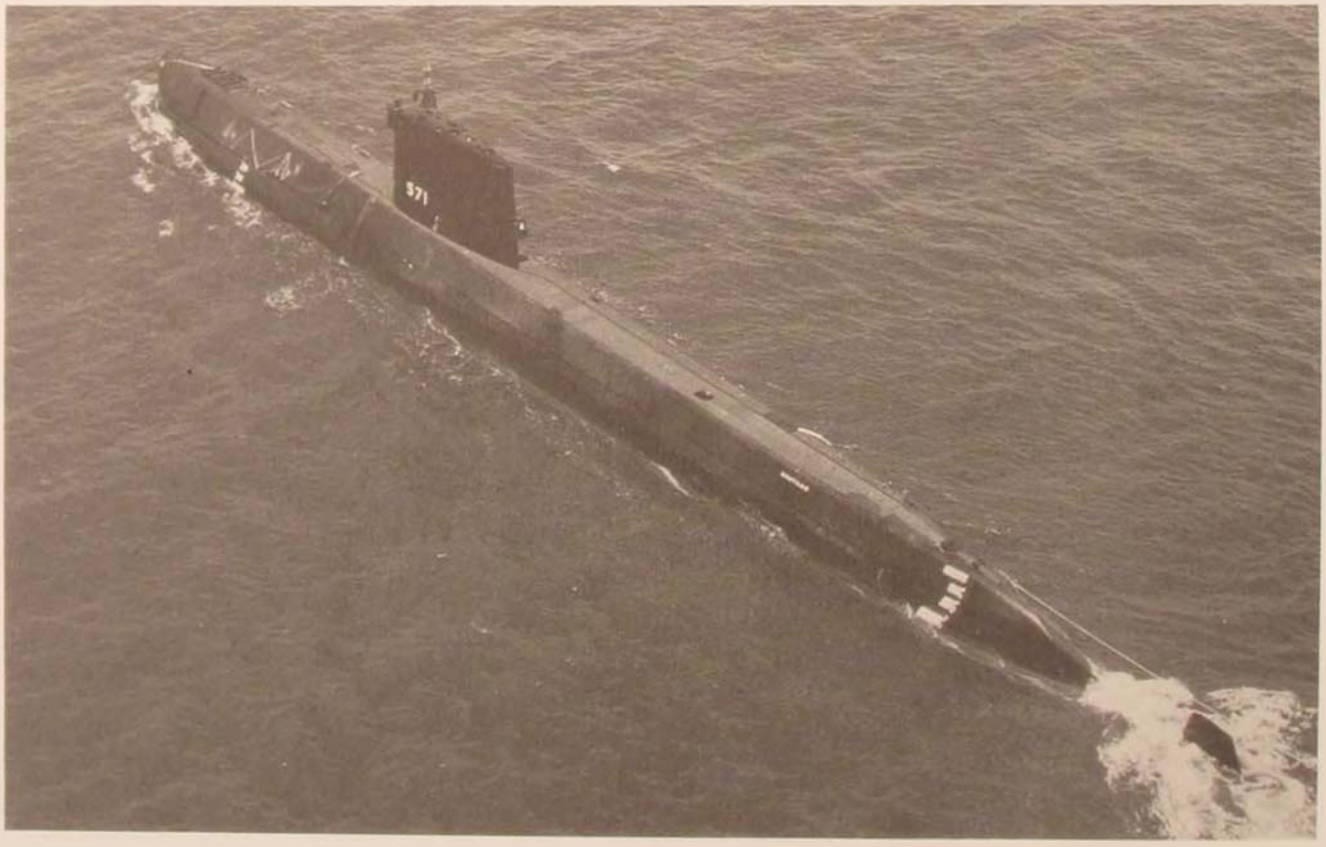
established as an integral part of our own combat philosophy that "if you're not outnumbered, then you've been sent to the wrong place!"—a statement made credible when overwhelming stealth and adequate mobility provide the luxury of engaging and disengaging at will.

Unfortunately, some parties continued to try to pound the square peg of the SSN into the round hole of SS employment doctrine. These individuals viewed the primary attack-submarine mission in wartime as the "barrier," whereby SS/SSNs sat in assigned geographical areas at choke points such as those between Greenland, Iceland, and the United Kingdom (the famed GIUK Gap) and waited for transiting Soviet submarines to drive in front of their torpedo tubes. They drew little or no difference between the SS and SSN regarding the assignment of areas or operational employment. Even the vestigial remains of a wolf-pack concept were to be found in the original design of the SSN-593 *Thresher* class, insofar as operational employment assumed that two such submarines operated together and coordinated through secure underwater communications/data links. Other operational concepts that developed through the years involved roaming the deep ocean basins in a broad-area search role and defensive escorting of carrier battle groups (CVBG). An inescapable conclusion from these years of attempting to validate the historical "concentration of forces" postulate was that the SSN usually suffered a net loss of operational effectiveness when provided local assistance from friendly forces, be they stealthy or not.

In all, about 20 years passed before the Navy found the optimum "impedance

match" between intrinsic platform capabilities (the form) and mission definition (or function). This "best fit" occurred under what is now commonly referred to as the *maritime strategy*, when—exploiting expected intelligence and warning of an impending Soviet attack in central Europe—US SSNs are scrambled to individual areas deep in Soviet home waters. If hostilities do commence, the SSNs quite simply destroy the Soviet navy—surfaced and submerged—with an absolute minimum of communications. Some authorities view this exploitation of the principal characteristics of US SSNs as having created an "uncorrelatable force" that did much to unhinge Soviet military theory. Further, they maintain that—in conjunction with other developments—this force precipitated *glasnost*, *perestroika*, and the outbreak of peace between NATO and the Warsaw Pact. As might be expected, submariners are prepared to humbly accept their share of the credit for winning the cold war.

The principal characteristics of a modern SSN—defined several years ago by Adm Bruce DeMars in testimony to Congress—are stealth, mobility, firepower, and endurance. In retrospect, what delayed the appreciation of the vast difference between an SS and an SSN was an understandable lack of foreknowledge of the synergistic and nonlinear effects resulting from adding greater mobility and greater underwater endurance to already existing stealth, much as adding even the smallest quantities of vanadium or molybdenum dramatically affects the properties of steel. More than likely, another such dramatic and nonlinear catalytic expansion of intrinsic capabilities will occur when the advanced tactical fighter adds

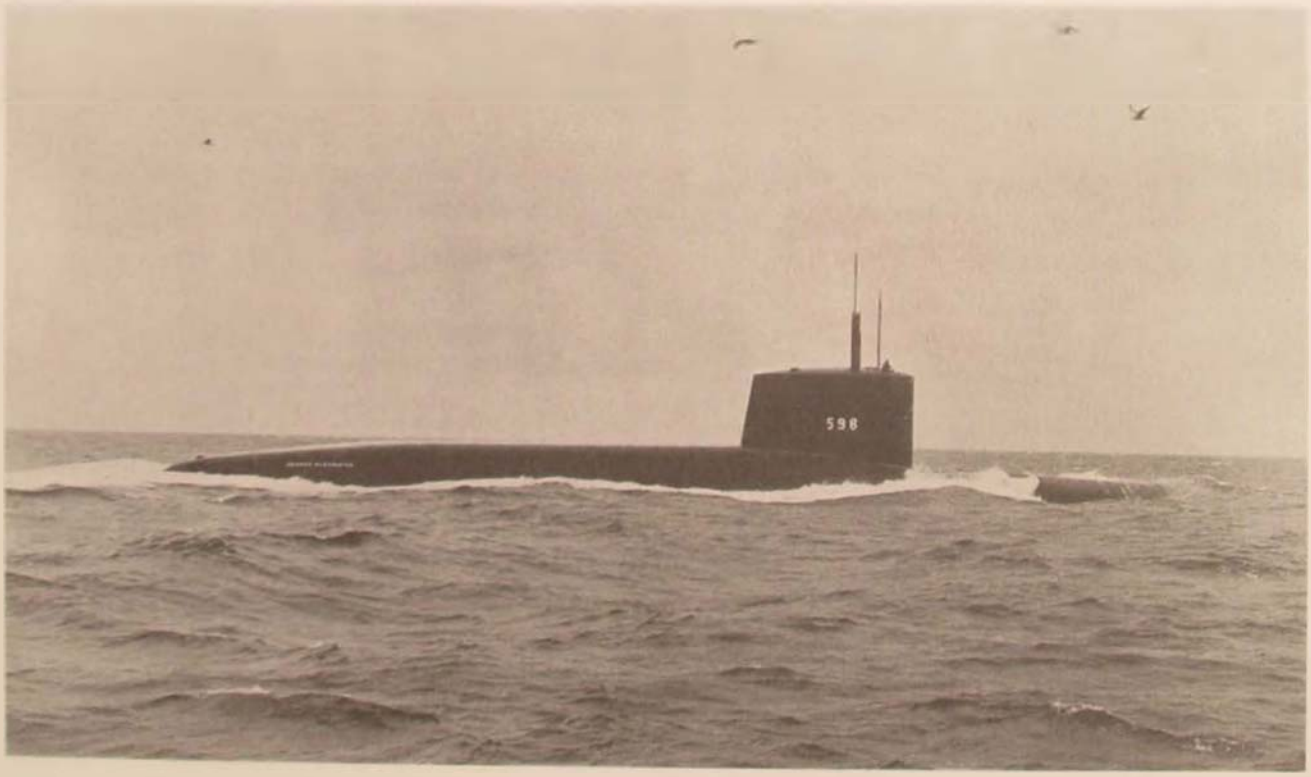


The speed of a nuclear attack submarine allows not only for an improved first-shot kill probability on offense but also for increased survivability in a defensive mode. Here, the USS Nautilus *is shown being towed to Groton, Connecticut, in 1985 to begin a new life as a museum, after it was decommissioned.*

stealth and the ability to supercruise (the capability to exceed Mach 1 without resorting to the extraordinary fuel demands and greatly increased thermal signature of afterburner) to the existing mobility (*agility* and *maneuverability*, in fighter pilot terms) of current fighter aircraft. When the ATF is deployed, one hopes that the same difference in operational time constants between submarines and airplanes equally applies to the length of time it will take to reevaluate existing tactics and doctrine to best suit this radically new platform. With luck, the best and brightest of the fighter community will conceive and implement the "right" new concepts in only two years instead of 20.

Incidentally, one interesting but nonintuitive phenomenon seen during the continuing development of subsequent classes of US SSNs is that among the most reactionary of opponents to new or improved capabilities are the people who currently operate the present versions. Because submariners are in an incredibly introverted and externally cohesive organization, however, their objections to proposed developments are rarely heard outside the confines of submarine wardrooms. For example, personnel serving on *Nautilus*, the first *Seawolf*, and the SSN-578 *Skate* class saw the breaking of submarine construction "rules" on the *Skipjacks* (single versus double hulls, one main propulsion shaft instead of two) as radical and even dangerous—although the results of these dramatic changes made the platform far quieter. While I served on *Scorpion*—a *Skipjack*-class SSN—the SSN-593 *Thresher* class was being developed. Internally, officers expressed concern about why so much money was being spent on her quieting—surely *Scorpion* was quiet enough. Further, we thought at the time that putting torpedo tubes in the middle of the ship instead of in the bow was a dumb idea, that installing such a big sonar array was unnecessary, and that trading any of

Improvements in ICBM range have allowed strategic-missile submarines (SSBNs) to lurk closer to home waters. Stealthiness is important to the skippers of enemy attack subs that attempt to enter these same heavily defended waters in search of an SSBN. The USS George Washington *(SSBN-598) is pictured.*

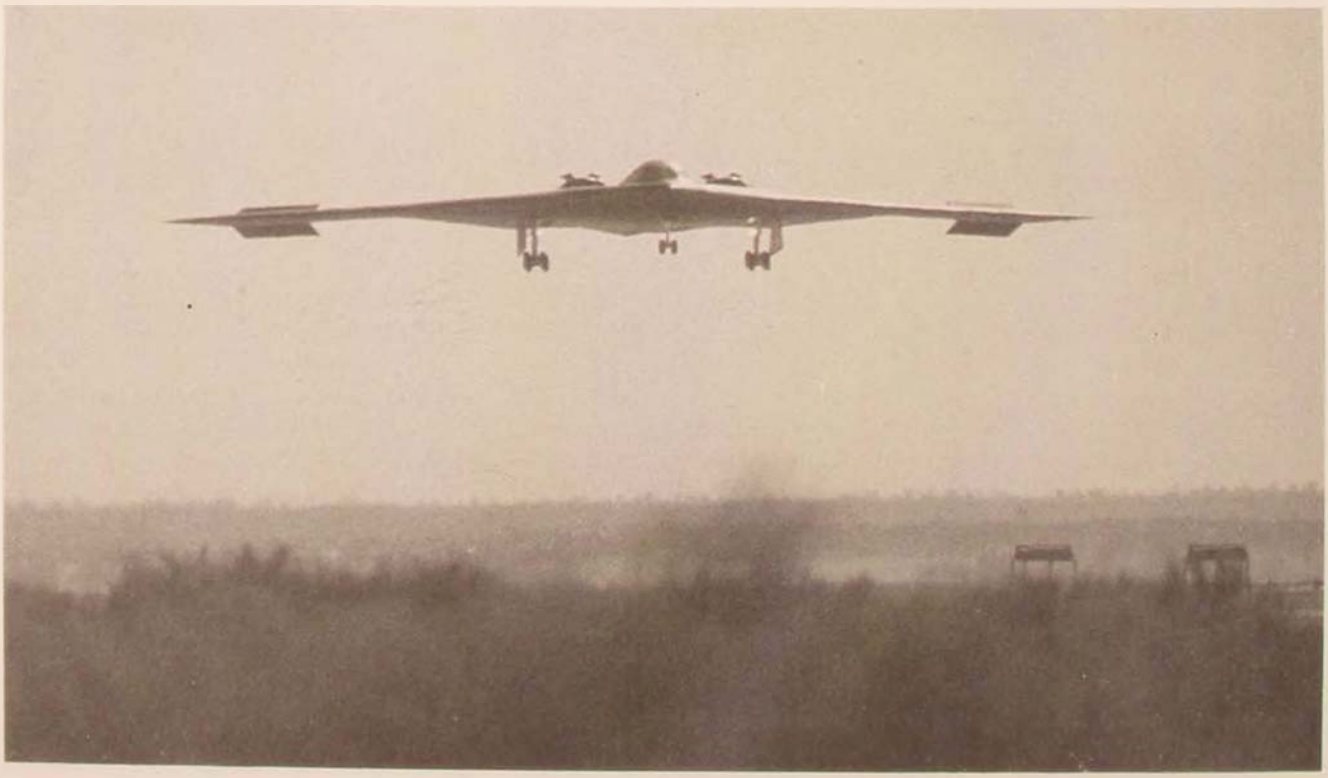


Scorpion's speed for *Thresher*'s increased depth capabilities was foolish.

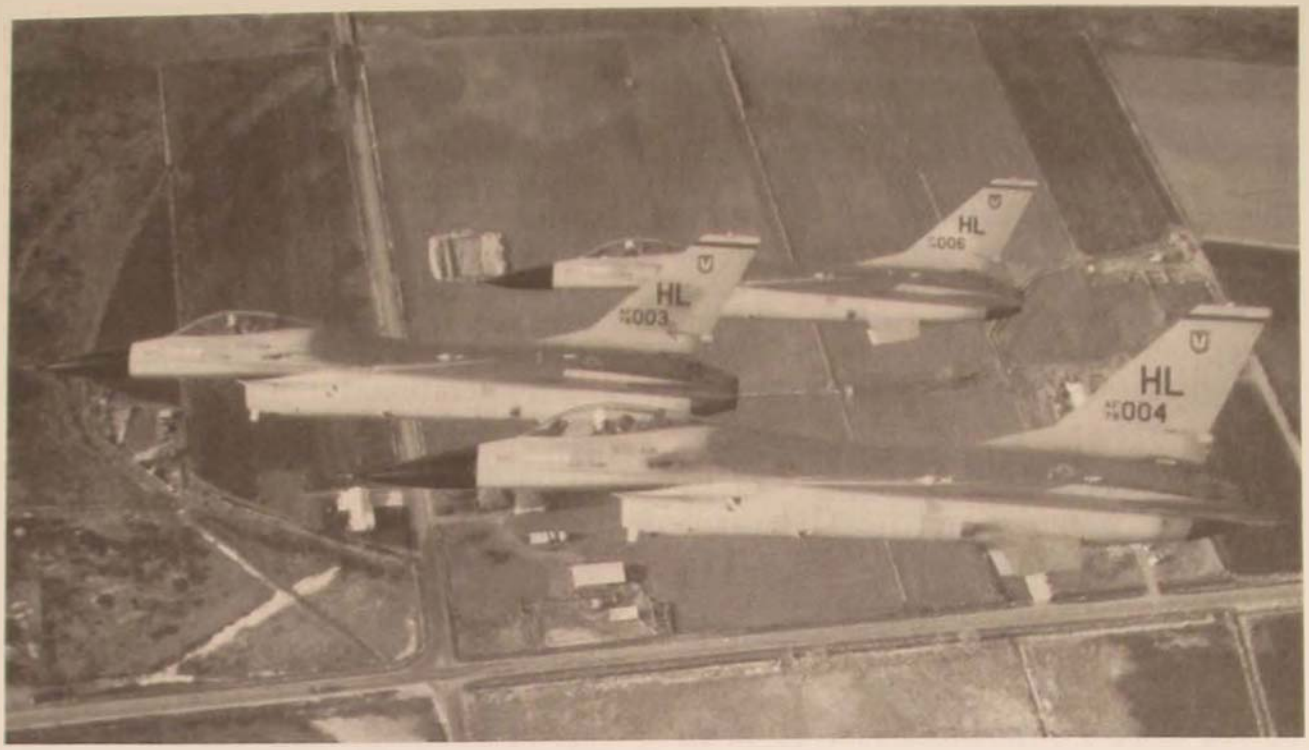
When serving on *Flasher*—a *Thresher*-class SSN—we were convinced that the changes had been worthwhile but questioned the increased cost, greater size, and even further quieting of the SSN-637 *Sturgeon* class. A few tours later, having served on (and become a champion of) two *Sturgeons*, I was now senior enough to lead discussions rather than just listen, and I actively participated in wardroom belittling of the even more stealthy SSN-688 *Los Angeles* class then under development and construction. Why was it so big and expensive? Who needed that much more horsepower? Why give up some depth capability for increased speed? (Complaints had come full circle!) Throughout it all, important characteristics such as firepower, speed, and depth may have been traded off, but never stealth.

In retrospect, the US policy of "stealth first" in successive generations of attack-submarine classes was money in the bank against the first incremental, then dramatic, improvements made by the Soviets. As a result, US SSNs commissioned more than a quarter of a century ago remain as quiet as the Soviets' newest and best. Because stealth is a zero-sum game, one can hardly imagine a situation whereby we would not benefit from achieving the very highest levels of low observability that are technologically feasible. As we speak, however, I suspect that many 688-class submariners are questioning why in the world we should stop building the world's "perfect submarine" in favor of the SSN-21 *Seawolf*—a platform "too big, too expensive and quieter than needed; besides, why do we need to double the torpedo tubes and number of weapons carried?"

I cannot authoritatively comment about professional discussions in fighter-squadron ready rooms, but it would seem almost a violation of human nature if some



Since all energy emissions from a stealth platform like the B-2 jeopardize its covertness, traditional utilization of command, control, and communications (C^3) links must be kept to a minimum or eliminated altogether.



Even with the introduction of the advanced tactical fighter into the USAF inventory, fighter aircraft such as these F-16s will undoubtedly continue to serve the Air Force for years to come.

of the hottest F-15 and F-14 jocks were not somewhat skeptical about why their aircraft need to be replaced by advanced tactical fighters. However, as Air Force fighter pilots begin to realize and exploit the advantages that stealth brings to the arena of air superiority, doubts will soon vanish. Submariners have found intrinsic stealth a valuable asset across the entire spectrum of conflict. As a primary characteristic, stealth provides not only greater probability of mission accomplishment in general war scenarios but also offers incomparable survivability in third-world conflicts, when domestic intolerance of American casualties becomes a primary constraint on military action. Thus, rather than focus on and optimize for present or extrapolated expectations of usage, proper design policy should be to expand the set of all possible employments, particularly when dealing with breakthrough technologies such as stealth. Undoubtedly, future users will determine a purpose for what is currently "excess" capability. These as-designed excess capabilities become ever more critical as weapon systems are expected to last increasingly longer in a fast-changing world.

This approach of maximum technological advantage allowed the US submarine force to be surprised, but not outflanked, by the unexpectedly early arrival of the Soviet "quiet threat"—an SSN five to 10 years ahead of schedule but still five to 10 years behind existing US capabilities. Here again, the differing time constant between SSNs and fighter aircraft is apparent. Although my untrained perceptions tell me that US air assets are still superior to the Soviet fourth-generation fighter aircraft as weapon systems, my intuition tells me that the margin of difference is not the same in the time domain as with submarines. In any case, as present events on the Arabian Peninsula seem to bear out, the very real existence of the technological edge of equipment of superior quality and adequate quantity will hopefully deter and, if necessary, prevail on today's—and tomorrow's—battlefields.

The unique and potentially revolutionary characteristic of stealth is about to invade the military fighter-aviation community. Without being so presumptuous as to predict just how stealth will modify air superiority operations and tactical employment, let me briefly review a few lessons learned (sometimes painfully) as submariners coped with and exploited the stealthy characteristics of modern nuclear submarines. Fighter pilots can judge for themselves whether the lessons apply to them.

• Stealth is a zero-sum game. In a given encounter, one platform has it and the other does not. The tactical advantage accrued by being able to detect, close, and attack from a covert stance completely dominates all other factors in any encounter algorithm.

• Stealth is a commodity that can be employed toward different objectives. In an offensive sense (i.e., SSN), it can be employed to dramatically improve first-shot probability of kill. In a defensive sense (i.e., fleet ballistic missile submarine—SSBN), it can be employed to dramatically improve survivability.

• Stealth significantly increases the emphasis on planning specific operational employments. That is, one must consider as many contingencies and provide as much premission guidance as possible to greatly reduce two-way communications in support of real-time command and control.

• Stealth, which demands a greater degree of flexibility in the time domain, significantly reduces the desired degree of scheduling. The on-scene commander must be able to exploit stealth in support of both mission accomplishment and survivability by picking the right time and place for an encounter. Precise scheduling can create the illusion of professionalism, but—for a stealth platform—too much is forfeited if an action is directed to occur at 1032 hours when it is really needed sometime on Tuesday morning.

• Stealth requires a dramatic change in concepts of command, control, and communications. Since all stealth-platform energy emissions jeopardize its covertness, they must be eliminated or kept to an absolute minimum. Great benefits are gained from exploitation of the "broadcast" mode of command and control, whereby a nonstealthy component (ground controller, airborne warning and control system, etc.) directs actions that the stealthy components execute but do not acknowledge. If this link is "up" continuously—whether or not operational traffic is being sent—this methodology even denies traffic density analysis as a "heads up" to imminent actions.

• Stealth places an extraordinary premium on the employment of passive sensors for detection, tracking, and attack. As in the case of platform-initiated communications, active sensors with a low probability of intercept may be present, but none that are covert or secure by the absolute definition of the terms.

• Stealth dictates as high a probability of survival per engagement as possible. This generally translates to religiously avoiding a melee—a situation whereby each platform is aware of the other's presence and each is within the other's weapon range. This concept is often implemented by doctrine which encourages the release of "more than enough" ordnance in the initial attack from a covert stance if it will even marginally obviate a subsequent melee.

• Stealth is greatly enhanced by the ability to reestablish a covert stance after the conscious decision to reveal one's presence through weapon release. The Battle of the Atlantic was won not by preventing a U-boat's first attack but by denying a second or third. The U-boat simply lacked the requisite mobility to extricate itself from reactive ASW units that first noted a submarine when it was "detected" by an exploding merchant ship within the convoy.

• Stealth, by itself, provides survivability and therefore does not require mutual support. Little is gained and much can be lost by operating with other friendly units. When a stealthy platform is

assigned independent areas of operation in which no friendly units are present, it can avoid the problems associated with friendly fire. As an oversimplification, one might state that when nonstealthy platforms operate together, the trade-offs between mutual support and mutual interference are such that one plus one is greater than two. When stealthy platforms operate together—or with nonstealthy platforms—one plus one can easily be less than two.

• Stealth requires a near-absolute understanding and knowledge of the surrounding environment to properly exploit low observability within it. For submarines this includes historical, synoptic, and in-situ knowledge of temperature, salinity, bottom type, ocean currents, fronts and eddies, and conditions at the air/water interface. It can even include wind speed, cloud cover, and radio-frequency propagation characteristics of the column of air above and around the unit's position, as well as predictive orbital data for satellites—US and others.

Which of these parallels of stealth best transfer from the SSN to the ATF? Bright aviators will have to determine that. What does seem to be a valid observation is that air combat is at the doorstep of dramatic change. If the F-117A was the *Nautilus* of airborne stealth warfare and the B-2 the *George Washington* (the strategic nuclear counterpart), then the ATF is the *Scorpion*. While all but the brightest saw *Nautilus* as a "better" SS—more easily accomplishing the same missions—all but the dullest saw the *Scorpions* and the Polaris submarines as revolutionary developments—new types of platforms which gave birth to entirely new employments and missions.

The long history of the development of stealthy operations in the attack submarine suggests that the most articulate and obstructionist opponents to innovative thinking in air superiority are likely to originate from among those pilots presently flying the world's best fighter aircraft. Because the historical exploitation of stealth technology and tactics under the oceans clearly has application in the air, the Air Force and Navy would do well to ensure that their new ATF possesses as many low-observable characteristics as possible so that pilots can quickly overcome their skepticism and learn how to exploit stealth in the zero-sum game of air-to-air combat. □

PREPARING FOR THEATER AIR DEFENSE AS AN AIRLAND TEAM

MAJ MICHAEL L. STRAIGHT, USAF

TODAY'S conventional air defense requires both air-to-air and surface-to-air weapon systems. The North Atlantic Treaty Organization (NATO) typifies this with a balance of 300 air defense-capable fighters and 1,100 surface-to-air missile (SAM) launchers in West Germany and the Benelux countries (Belgium, the Netherlands, and Luxembourg).[1] Similarly, Britain's crucial air defense battle in the 1982 Falklands conflict demonstrated a balanced dependence on fighters and SAMs, with 31 Argentine aircraft destroyed by Harriers and 28 shot down by ship- and shore-based missiles.[2]

Fusing SAMs and fighters into an effective air defense team is a major challenge in a land theater when they are owned and operated by separate services, with the Air Force flying the fighter aircraft and the Army shooting the missiles. This joint air defense responsibility requires joint training that can meld both systems into a coordinated, mutually supporting team. This training requirement is currently unfulfilled. Army and Air Force air defenders are training hard, but they are too often training separately for this joint mission. There must be integrated practice if our air defenders are to be successful. To build a case for the need for increased joint air defense training, we need to address the following areas:

- Current Army and Air Force air defense training.

- Risks of not training jointly.
- Benefits of joint training.
- Some possible fixes.

Consider the analogy of a football team whose backfield and line always practice separately, never putting it all together before the first game. Although both team elements may consider themselves individually proficient, the team would certainly suffer significant execution problems when the backfield and the line played together for the first time. Hard scrimmaging as a whole team is vital to a team's preparation. Unfortunately, our air defense team, consisting of an Army front line and an Air Force backfield, currently trains much like the misguided football team—seldom, if ever, as a whole. Let us begin with a look at how we currently train.

Practicing Separately

A review of major Army and Air Force field exercises and advanced tactics courses reveals the missing "jointness" in air defense training. Two primary field and tactics training bases in the United States focus on Army Hawk and Patriot SAM training: Fort Irwin, California, and Fort Bliss, Texas. The National Training Center (NTC) program at Fort Irwin emphasizes combined-arms employment and effectively integrates Air Force close-air-support (CAS) assets like the A-10. However, no air defense aircraft, such as F-15s, participate in the combined-arms exercise. At Fort Bliss, the Army teaches advanced SAM tactics to experienced air defense artillery (ADA) officers in the 20-week Officer Advanced Course, but once more, integration of the other half of the air defense team is generally missing.[3] A major joint training innovation, initiated in 1989, is the annual Roving Sands Exercise. Hosted by both Fort Bliss and Holloman AFB, New Mexico, it combines SAM training with air defense fighter participation. There are still significant feedback problems in the form of real-time kill removal for the SAMs and in the reconstruction of results. Despite this, the exercise is an outstanding forum for exchange of air defense ideas, capabilities, and techniques between not only the Army and Air Force but also the Navy and Marines, who also participate with SAMs and aircraft.[4] As a result, one experienced F-15 pilot who has participated in both Roving Sands exercises to date judges it to be far superior to the air defense training experienced in Red Flag at Nellis AFB, Nevada, and Cope Thunder at Clark AFB in the Philippines.[5] Another milestone is the Central Enterprise exercise in Europe (1987, 1988, and 1989), which was designed to evaluate new joint air defense employment concepts. This exercise is a good start for NATO, though Air Force participation is relatively scripted in support of the Army evaluation and emphasis is on the evaluation as opposed to training.[6] That's a quick look at our lineman training; now for our backfield.

The Air Force's Red Flag training at Nellis AFB is a major exercise for conventional air defense fighter practice in the United States. But since Red Flag is normally geared toward offensive air employment, the only SAMs available on the air defense side are simulated *threat* emitters. Obviously, there is limited utility in F-15 pilots learning effective coordination with Soviet SA-2s. A second major air defense training source at Nellis is the Fighter Weapons School (FWS), which, like the advanced ADA school at Fort Bliss, trains experienced F-15 and F-16 pilots to be the tactics experts of our squadrons. From this author's own experience as an FWS instructor, both academic and in-flight training on joint air defense teamwork are lacking. The bright spot in air defense at Nellis is the yearly Green Flag Ex-

ercise that has included Army Patriot batteries since 1988. This exercise has potential, but the current training exchange is limited, with the Army's focus on validating a specific employment concept as opposed to stressing the joint training. Once the SAMs are fully integrated into Nellis's instrumented training range, Green Flag should provide excellent feedback and tactics exchange for joint air defense training with real-time kill removal and debrief replay.[7]

As you can see, the current norm is for separate Army and Air Force air defense practice, though there have been important improvements in the last couple of years. There are potential risks associated with segregating almost all of our fighter and SAM air defense training.

Risks of Insufficient Joint Training

The costs of poor air defense teamwork are fratricide (killing friendly aircraft by mistake) and less-effective employment. Lack of frequent, joint training increases the risk of fratricide and poses a major challenge to SAMs and fighters defending the same airspace, especially if they depend strictly on electronic identification (ID) instead of trained judgment to determine friend from foe. In the 1973 Arab-Israeli War, the Soviet-trained Arab forces employed dense concentrations of SAM and antiaircraft artillery (AAA) batteries with their MiGs in the same airspace. Using only their identification, friend or foe (IFF) systems to differentiate between the Israeli and Arab aircraft, they used their SAMs and AAA impressively to destroy 70 Israeli aircraft in the 19-day war (70 percent of Israel's total losses from all causes).[8] *But, fratricide from these same systems cost the Arabs 60 to 90 aircraft, or 15 to 20 percent of their own total losses!*[9] We have similar potential weaknesses in our own IFF systems. In the words of Maj Gen Michael Nelson, assistant chief of staff, Operations, Supreme Headquarters Allied Powers Europe, "Current electronic identification systems are easily spoofed or jammed and sort out only those aircraft not responding, for whatever reason."[10] Therefore, it is no surprise that some of the same joint exercises we reviewed at the beginning have demonstrated our own current fratricide potential.[11] This fratricide challenge influences the second cost of little or no air defense team training—less effective employment.

Our past solutions to fratricide have *not* included joint training for higher levels of operator judgment and coordination. Instead, we have attempted to separate fighters and SAMs into individual zones, which degrade our air defense effectiveness.[12] General Nelson explains that "procedural and visual identification systems are simply inefficient, unreliable and inadequate."[13] In fact, one authority estimates that NATO's current IFF limitations result in a 25-to-60 percent decrease in potential air defense effectiveness due to the need for this procedural separation.[14] Our geographic zones make US air defense predictable because the two weapon system types cannot effectively support each other. The enemy can take on one system at a time. First, he can suppress our forward SAM zone with coordinated jamming and antiradiation missiles (ARM) similar to the way the Israelis operated in the Bekaa Valley in 1982. Then, he can counter our rear fighter zone with offensive fighter sweeps or escorts.[15] Additionally, zone defense limits air defense support of the deep operations of the Army's AirLand Battle doctrine.[16]

Our fighters cannot work through our forward SAM zones to extend the air defense umbrella beyond Patriot/Hawk coverage into enemy territory. Similar limitations cost the Egyptians a mechanized infantry brigade on 10 October 1973 when it attempted to extend a bridgehead beyond the SAM umbrella without air cover. Israeli aircraft quickly destroyed the entire brigade, including all 50 tanks.[17] The point, so far, is that our current preparation for the air defense fight holds sig-

A Hawk surface-to-air missile prepares for firing during a Brim Frost exercise. Lack of "jointness" in air defense training may lead to aerial fratricide in time of war.

nificant risks. Our separate Army-Air Force training has allowed our IFF limitations to pose a risk of fratricide. This, in turn, has driven us to less-effective zone employment. Returning to the football analogy, what can joint backfield and frontline practice buy us?

Being a Team

Joint training can help resolve our ID limitations, improve mutual support, and complicate the enemy's task. Working together, our SAM and fighter operators are more likely to solve the ID/fratricide problem. Familiarity alone would help a great deal. Hawk and Patriot operators would become familiar with F-15 and F-16 air defense tactics and formations that are often recognizably different from those of the adversary.[18] In the same vein, fighter pilots would become more familiar with friendly SAM capabilities and with how to deal with or avoid likely fratricide situations.

Frequent joint training would force communication improvements between the two systems.[19] Direct communication would allow fighters to warn SAM batteries when their radar warning systems detect friendly SAM tracking. Direct communication could also decrease the "fog of war" for both systems by decreasing unknowns and surprises. Such improvements to our ID limitations would allow major improvements of our air defense team's effectiveness.

With SAMs and fighters supporting each other in the same airspace, the enemy would have to deal with both system types

Although the services have long integrated ground forces and close-air-support aircraft such as the A-10 in various training programs, exercises featuring joint air defense employment are, for the most part, in their infancy.

simultaneously.[20] His attempts to suppress our Hawks and Patriots with air-launched ARMs would be significantly degraded in the face of our air defense fighters.[21] And though his low-altitude bombers can use terrain masking against the SAMs, they cannot consistently hide from F-15 and F-16 radars.[22] A potential mutual support example might task our fighters with digging adversary bombers "out of the weeds" while the Patriots and Hawks target higher-altitude air-to-air threats attempting to attack our fighters from above. This combined arms defense significantly complicates the adversary's planning and execution.[23] Our bombing campaign in Vietnam demonstrated that an offensive strike against a combined SAM/fighter defense requires complex support. For example, the 10 May 1972 Linebacker I strike of 32 bombers required 28 escorts to counter the MiGs and another 27 aircraft to counter the SAMs: almost a two-to-one ratio of support aircraft to bombers.[24] The preceding examples are a taste of the synergistic benefits of increased joint air defense training. The potential payoffs from fratricide control and improved effectiveness should prompt us to bring our team's linemen and backfield together more frequently for joint training.

Easy Fix

Actually, our basic service doctrines already allude to this joint training require-

ment, which can be implemented via exchanges, tactics analysis, and exercises. Air Force Manual 1–1, *Basic Aerospace Doctrine of the United States Air Force*, states, "Realistic training is an important element.... To insure the readiness of our forces, commanders must develop and implement training programs that build required warfighting skills and that simulate, as closely as possible, the combat environment in which we expect to fight."[25] Since we realistically expect F-15s to execute air defense missions in cooperation with Army ADA assets, these aircraft should be training with the Army assets as part of the "combat environment." Army Field Manual (FM) 100–5, *Operations*, makes a similar statement:

> Unit training aims at developing maximum effectiveness with combined and supporting arms in specific, mission essential tasks.... Units and headquarters that will fight together in teams, task forces, or larger units should train together routinely. Such combined arms training is far more effective and realistic than the training of units in isolation from their routine attachments and support.[26]

Combined-arms training for ADA units, especially Hawks and Patriots, includes air defense fighters. With that definitive guidance, let us look at some options for improving joint air defense training.

Exchanges are an easy way to start. A lot can happen if we simply get people to talk to each other. For example, an exchange between the ADA experts at the advanced course at Fort Bliss and the Nellis AFB fighter experts at the Fighter Weapons School would help spark academics emphasizing specific sister-service capabilities and integrated air defense employment generally lacking in both courses. A quick look at our tactics manuals—such as Multi-Command Manual 3–1, *Tactical Employment*, vol. 4, *F-15 Employment*; and FM 44–1, *Air Defense Artillery Employment*—uncovers a disquieting lack of joint air defense techniques and options.[27] A joint air defense

Joint air defense exercises will provide the flying air defenders with the opportunity to get to know their ground air defense counterparts. Here, Air Force and Navy crews pose with their aircraft after a Cope Thunder exercise.

A "friendly" SAM such as the Patriot (above) might be inadvertently launched towards USAF F-15s (below) due to weaknesses in the identification, friend or foe (IFF) system. The likelihood of this happening is heightened by the lack of adequate joint air defense exercises.

tactics evaluation between the Air Force's 422d Tactical Evaluation Squadron, 57th Fighter Weapons Wing, Nellis AFB, and the Army's test and evaluation function at the ADA School at Fort Bliss, Texas, might spark the focus needed to generate some worthwhile written analysis.

Finally, increasing the number of exercises incorporating joint air defense is likely to produce the greatest results. The Green Flag and Roving Sands exercises are great starts, but Red Flag and the NTC exercises are ripe for the same opportunities.[28] The challenge will be for these exercises to develop feedback systems that allow SAMs and fighters to experience the accountable, real-time results of their execution. Responsive kill removal may require innovations such as providing SAM batteries with direct communication to the air war. But even short of perfect training arrangements, simply getting motivated Army and Air Force air defense warriors together will surely produce valuable results.

Train as a Joint Air Defense Team

Though we have initiated some joint SAM and fighter training, we obviously have only cracked open the door. Acceptance of the status quo of separate training poses significant risks in fratricide and perpetuates an inefficient air defense. But these risks can be countered through increased joint training with potential for significant innovations in air defense tactics. There are a wide range of options for increased joint training, many of which are relatively easy to incorporate. Additionally, our current fiscal constraints make significant equipment fixes, such as a perfect IFF system, less likely. On the other hand, many training improvements cost comparatively little yet offer synergistic potential for SAM and fighter integration. The bottom line is simply this: if our Air Force-Army air defense team does not

practice as a unit ahead of time, we will surely be tripping all over each other on the day of our first game. □

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Effective suppression of North Vietnamese SAM/fighter air defense systems necessitated the employment of nearly twice as many support aircraft as bombers during a 1972 Linebacker I operation. Joint training would highlight such "lessons learned" in the combined air defense arena.

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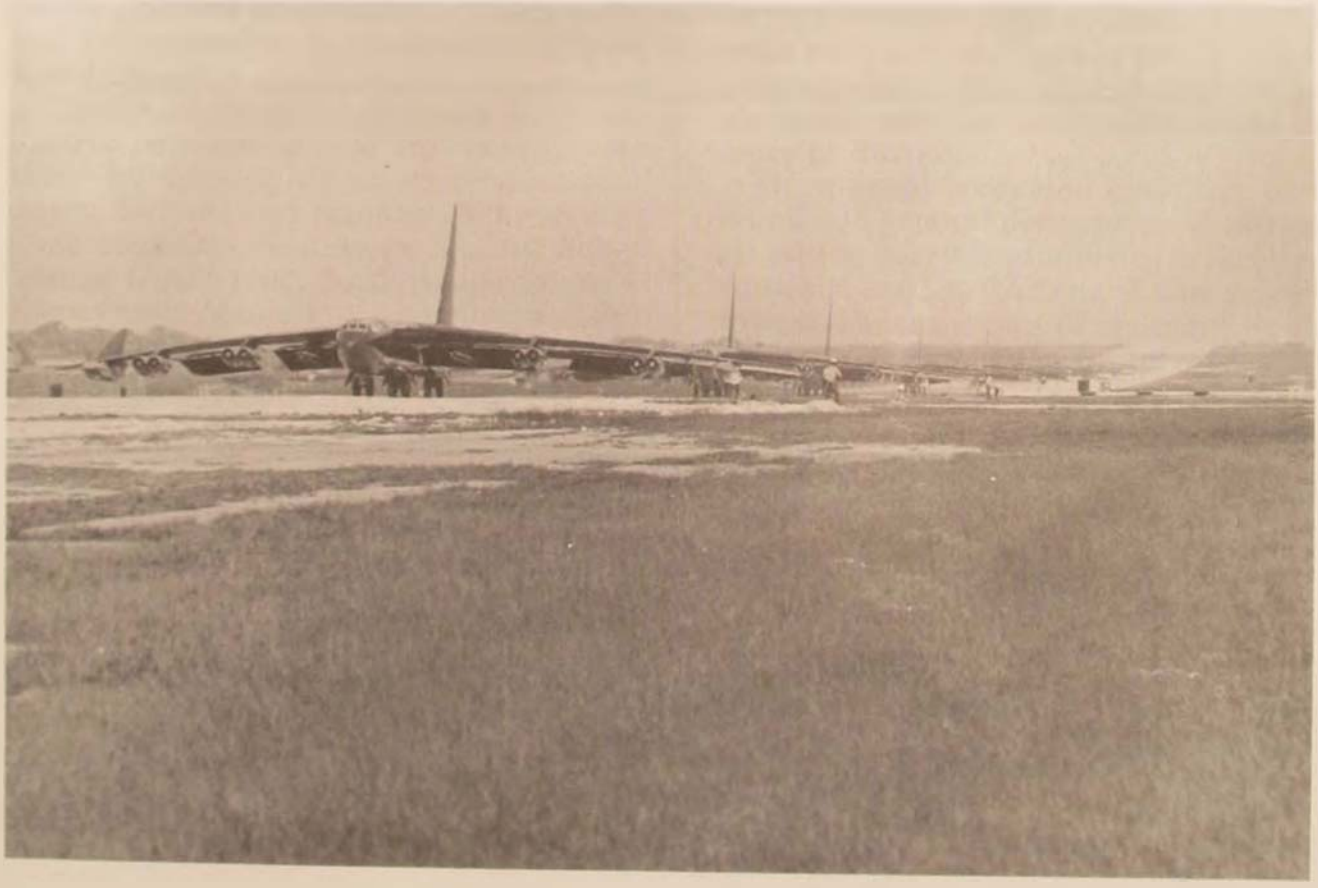

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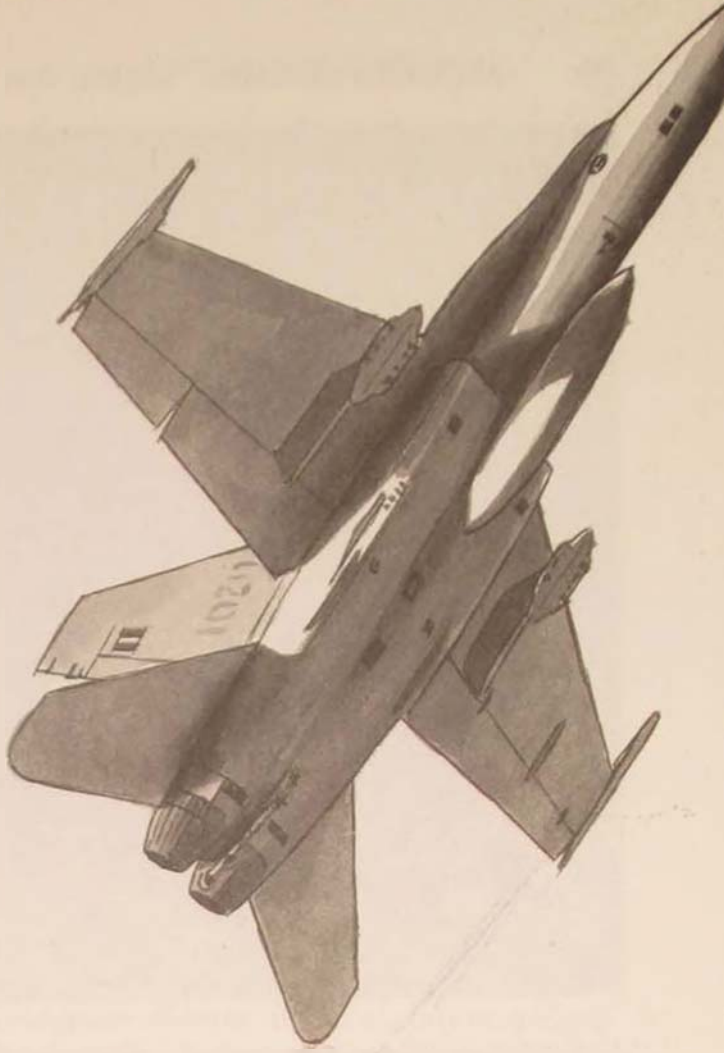
AIR POWER
AN AUSTRALIAN APPROACH

GROUP CAPT BRIAN KAVANAGH, RAAF
GROUP CAPT DAVID SCHUBERT, RAAF
WING COMDR GARY WATERS, RAAF



SINCE its foundation in 1921, the Royal Australian Air Force (RAAF) has relied on an air doctrine borrowed from larger allied nations. The RAAF's fine record of achievements shows that this reliance has not adversely affected the service's ability to refine technical and tactical skills at the operator or working level. However, the lack of a uniquely Australian air power doctrine has discouraged the development of necessary conceptual skills, particularly at the strategic level.

The RAAF is now redressing that imbalance between tactical and conceptual skills by developing an Australian air power doctrine and recording it as an air force document. The Australian Air Publication (AAP) 1000, *Royal Australian Air Force Power Manual*, is a comprehensive and coherent recording of knowledge, guidance, ideas, values, and attitudes on the necessity for air power and the likely shape of that air power in the Australian context. As such, it provides the basis for commanders at all levels to determine how air power may best be applied in the defence of Australia.

The manual is divided into three parts. Part 1 is a general description of war and air power; part 2 is oriented specifically to Australia and the RAAF; and part 3 details the continual process of maintaining and validating doctrine to preserve its dynamism.

This article encapsulates and disseminates the broad air power ideas discussed in parts 1 and 2 of the manual. In so doing,

To gain maximum use of the air, the Royal Australian Air Force (RAAF) looks to the part of its doctrine that deals with three campaigns or strategies: control of the air (air superiority), air bombardment, and air support for combat forces. RAAF F/A-18 Hornets play a major role in the most important of these campaigns: control of the air.

it discusses the nature of air power and postulates three fundamental and necessary air campaigns before deriving specific maxims for the most effective employment of air power. The article then discusses the relevance of that air power theory to Australia today and interprets the maxims in an Australian context. Finally, it examines the RAAF in detail by determining relevant operational planning and organisational imperatives and by listing the operations and roles which the RAAF must be able to conduct.

Nature of Air Power

Air power represents the ability to project military force in the third dimension, by or from a platform, above the surface of the earth. It encompasses the sum total of a nation's aviation and related capabilities. The extension of the perceptive horizon, the speed of air travel, and the freedom from surface barriers are the very basics of air power; however, all of these elements are limited by relatively high costs.

The positive attributes of air power, evidenced from history, include flexibility, swiftness of application, ubiquity, range, and shock effect. From these attributes, air power derives a relative advantage over other forms of combat power in terms of rapid concentration. Moreover, its application introduces a different order of magnitude of time and space.

These factors make air power very responsive to, and capable of demonstrating, a nation's political intent. However, this propensity to use air power for political demonstrations is potentially limiting if,

for reasons of political expediency, a nation does not fully utilise the positive attributes of air power. Other limitations of air power include its dependence on prepared bases, its cost, and its vulnerability—both in the air and on the ground. Further, air power cannot hold ground, has limited endurance, and can be negated by weather—all of which lead to a perception of impermanence.

Historical Development of Air Power

The military first used air power in an airborne observation role as an extension of land and sea power, and by the end of 1918 had recognised its ability to bomb, strafe, and shock the enemy. Also, the concept of leapfrogging the battlefield and taking the war to the enemy's homeland had been considered for the first time. The interwar period saw Western air power doctrine of strategic bombing conducted by an independent force (an air force) as, theoretically, the most effective means for exploiting the air.

The myths of strategic bombing were dispelled in World War II when military planners recognised that air power alone could not bring an enemy to his knees. Undoubtedly, the most important principle of air power to emerge from this war was not that the bomber would always get through but that the need to gain control of the air was paramount to successful operations by surface forces. Other principles to emerge were the use of tactical air power in contributing to the surface battle, the importance of using air power offensively for shock and decisive results, and the overriding importance of applying air power as a unified force.

After World War II, the most influential factors affecting Western nations' air power doctrine were nuclear weapons and the threat of global conflict. Not until after the Korean and Vietnam wars—considered by Western nations to be aberrations at the time of their occurrence—were forces once again structured for limited, conventional warfare. In more recent experiences, the use of preemptive attacks on aircraft on the ground, the exploitation of the electromagnetic spectrum, and other initiatives such as the use of remotely piloted vehicles and aerial refuelling have greatly influenced air power doctrine. Further, technological developments affecting airframes, engines, avionics, and munitions have exerted considerable influence on war in the air.

A historical perspective of the development of air power highlights three primary aerial campaigns that air forces can wage in a conventional air battle. These campaigns are the keystone of the theory of air power.

Air Campaigns

The objective of air power is to gain maximum military effectiveness from the use of the air. It does this through an ability to prosecute three campaigns or aerial strategies: control of the air, air bombardment, and air support for combat forces. An air campaign—which, by itself, can have an influence on the war—is defined as a series of air operations that share a common objective aligned to the overall conduct of the war.

Control of the air—also known as air superiority—is necessary for friendly forces to operate where and when they choose and to deny such freedom to enemy forces. It involves nullifying the effects of enemy air power, both in the air and on the ground. An appropriate degree of control of the air is necessary for success in subsequent air and surface battles; hence, control of the air is regarded as the prime campaign.

The air bombardment campaign uses air power to attack an enemy's homeland, national interests, resources, and war-making capacity. Used preemptively, it also provides the wherewithal to best shock and surprise an enemy. An air force should use this campaign only under the

following circumstances: when its outcome will immediately affect the course of the war and thus avoid bombing simply for the sake of bombing; when manoeuvre by friendly surface forces has produced a favourable situation; when stalemate has occurred; or when friendly forces can achieve a decisive effect only through the destruction of the enemy's economic sources for continuing the conflict.

The third campaign, air support for combat forces, complements the combat power of sea, land, and air power assets in terms of firepower, mobility, manoeuvre, and sustainability. Because this campaign is so interactive and widely applied, centralised control of air assets, unity of effort, and independent decision making are paramount to its success.

Maxims of Air Power

Any analysis of the fundamental nature of air power, its historical development, and the evolution of the three air campaigns, leads logically to the derivation of a number of maxims for its application. Four maxims, however, simply cannot be avoided. They encapsulate the essence of what we have discussed so far, and disregarding them can have devastating consequences on the effectiveness of air power. These maxims do not merely represent a checklist of what was successful in the past; they are concerned with the future application of air power.

The first maxim is that if air power is to be effective, one must apply it across the full spectrum of its uses—that is, across the three campaigns. Furthermore, it will most often demand concurrent application among those campaigns. The ability to apply air power concurrently is fundamental to achieving the objective of air power. An air force must conduct concurrent campaigns so that each one contributes in its own specific way to the overall objective of the conflict. The alternative is for air power's inherent flexibility—so necessary to meet the changing needs of battle—to become eroded or even lost. Air power can easily become dissipated through poor employment doctrine in pursuit of short-term, possibly diversionary, goals.

Second, air power is a composite of numerous roles, and its full potential can be realised only when it is treated as an entity. Operational and organisational unity—also termed *critical mass*—is necessary to allow flexibility and the rapid concentration of firepower in time and space. Implicit in unity is centralised command of all air power assets. Because air power is expensive to use, in terms of manpower and other resources required, unity is necessary if one is to attain optimum effectiveness from the complex amalgam of organisation and skills that determine its successful application.

Third, air warfare is conducted in a discrete environment and produces a combat effect of a greater order of magnitude than do surface forms of combat power. To exploit this potential, one must achieve a level and depth of expertise necessary for planning, directing, and executing all aspects of air power. For maximum effect, air forces must retain a flexibility in the detailed tasking of air power. Thus, they must exercise an independence in decision making and practical application that is not unnecessarily constrained by the tactics of surface forces. Independence, the third maxim, aligns decision making at an appropriate level with the overall objective of the operation or campaign.

Last, an air force should have a balanced force structure that enables it to deal with likely threats whilst retaining a degree of flexibility to react to the unexpected. However, balance is not a rigid formula for force structure. It is affected by external factors such as prevailing geostrategic circumstances and national characteristics of geography and economy. Internal factors also reflect the relative importance of national capabilities. For example, a force must achieve the right blend of quality and quantity, as well as the right balance between its doctrine and the technology available to it. Finally, a force which is an

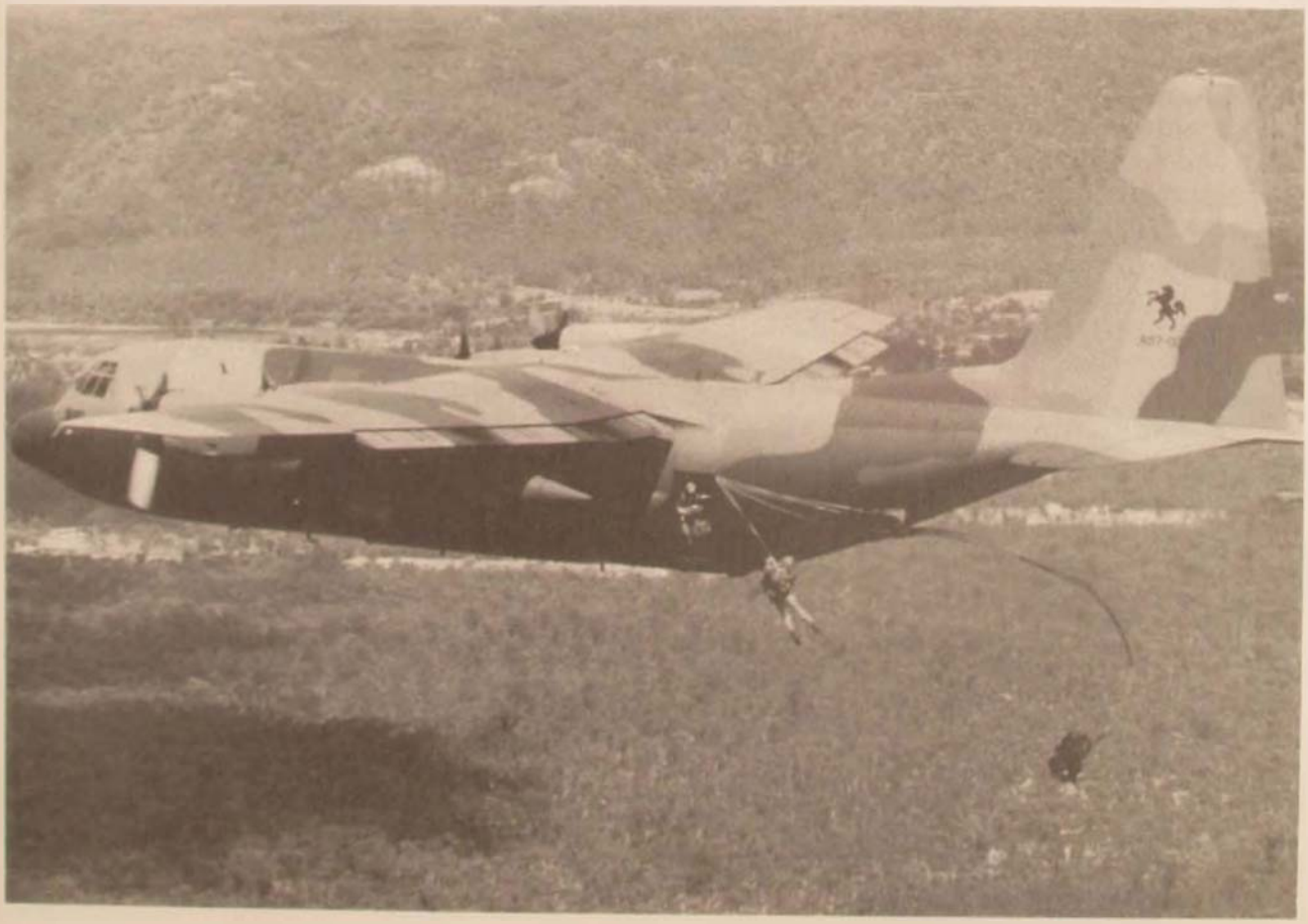
integral part of an alliance may forego individual balance to promote balance within the alliance.

These four maxims—concurrent campaigns, unity, independence, and balance—and their interdependence provide the philosophical basis for air power doctrine. However, the interpretation of these maxims for the purposes of doctrine must ultimately depend on national imperatives.

Relevance of Air Power to Australia

Australia has paralleled the Western world in air power development and experience, and was one of the first countries to establish and retain an independent air force. Australian air power has supported the air forces of its allies in many conflicts and has been called upon for the air defence of the nation. Moreover, the great distances and relatively sparsely popu-

Using aircraft such as the F-111 (above), RAAF's second campaign—air bombardment—calls for attacks on an enemy's war-making capacity. The RAAF intends to employ air bombardment only when it would have an immediate effect on the course of the war, thereby "avoiding bombing for the sake of bombing." The C-130 (below) plays an important part in the RAAF's third campaign, air support for combat forces, which—due to its wide application—demands centralised control of air assets and unity of effort.



Maxims of Australian Air Power

- Concurrent Campaigns
- Unity
- Independence
- Balance

lated areas that separate major Australian cities make the country peculiarly well suited to the development of civil aviation.

Thus, Australian air power has reflected overseas developments and experiences and should indeed reflect a predilection for air campaigns and maxims of air power similar to those of its allies. However, Australia has always needed to tailor this general appreciation of air power to its own unique circumstances. The "Defence White Paper" of 1987 has provided strategic guidance in defining the nation's unique circumstances, and AAP 1000 now provides the philosophical basis for meeting that guidance.

The unique circumstances of Australia have led to a government strategy of defence in depth and a defence policy of self-reliance. This national stance requires an Australian Defence Force (ADF) structured to meet a continuum of responsibility. Air power, through speed and flexibility, provides the ADF with the capability to apply appropriate levels of combat power across that continuum. For example, the air force can switch its multirole air assets to the type of defence required. Through the advantages of flexibility, speed, and mobility, air power can complement the naval quality of sustained presence and can airlift and support ground forces in an area of operations. The air force can also apply its assets in forward reconnaissance, surveillance, and identification roles, and is quite capable of stopping an enemy transiting Australia's approaches or at his source.

To meet these national commitments and to gain maximum military effectiveness from the use of the air, Australia needs to have the potential to conduct all three traditional air campaigns concurrently. Without this capability, Australia cannot properly provide for its own defence. Moreover, the broad lessons for applying air power especially relate to a nation which must use its limited but advanced technological force over a vast regional interest.

Those same broad lessons suggest that Australia can most effectively conduct concurrent air campaigns by using a unified, independent air force that is balanced for the country's unique needs. That is, operational and organisational unity, independence of decision making from tactical surface battles of the moment, and a force balanced to meet the various threat levels are all necessary to allow Australia to conduct concurrent air campaigns with maximum effect. Australia's interpretation of these maxims provides the philosophical basis for the national application of air power.

Australian Interpretation of Maxims

Australian reaction to aggression would initially be defensive; however, as the conflict continued, Australia would wish to seize the initiative and therefore would take offensive action. Furthermore, because enemy aggression could be projected along several axes and involve a diversity of actions, Australia would need to retain maximum flexibility in using its air power. It would therefore need the potential to conduct concurrent campaigns. This requirement will become evident as we examine the individual air campaigns in more detail.

Australia's defence strategy calls for a military capability to defend the approaches to the nation. To a large extent, air power would achieve this goal by using its speed, range, and responsiveness. In

this respect, the ADF should view control of the air as its prime air campaign, in order to maintain air sovereignty in peacetime and to afford a defensive umbrella to surface forces in time of conflict.

Australia may facilitate the task of defending national approaches in conflict by deterring potential aggressors in the first instance with its ability to project air power beyond these approaches. An offensive capability engenders the most effective deterrent. At the same time, provision of such an offensive capability to its balanced force offers Australia the political and strategic options of prosecuting an air bombardment campaign, which would be vital to an island nation should conflict escalate.

Because Australia is constrained in the size of its standing defence force, the multiplier effect of air power in naval and land engagements would be a significant feature of future conflict. However, this multiplier effect is not only limited to air power supporting naval and land power, but also must be extended to air power supporting air power. Hence, the air support for a combat forces campaign will provide a qualitative edge by multiplying the effects of all three forms of Australian combat power.

For Australia, the maxim of unity calls for treating air power as an entity and organising it accordingly. This critical mass produces an economy of scale. Yet for sound reasons, Australia has consciously accepted some reduced efficiency for the sake of effectiveness in using limited resources. Importantly, this decision has not reduced the critical mass of Australian air power to ineffectiveness, because the air force retains the majority of air power functions, complemented by specialist air arms which provide immediate but limited support to their parent surface forces.

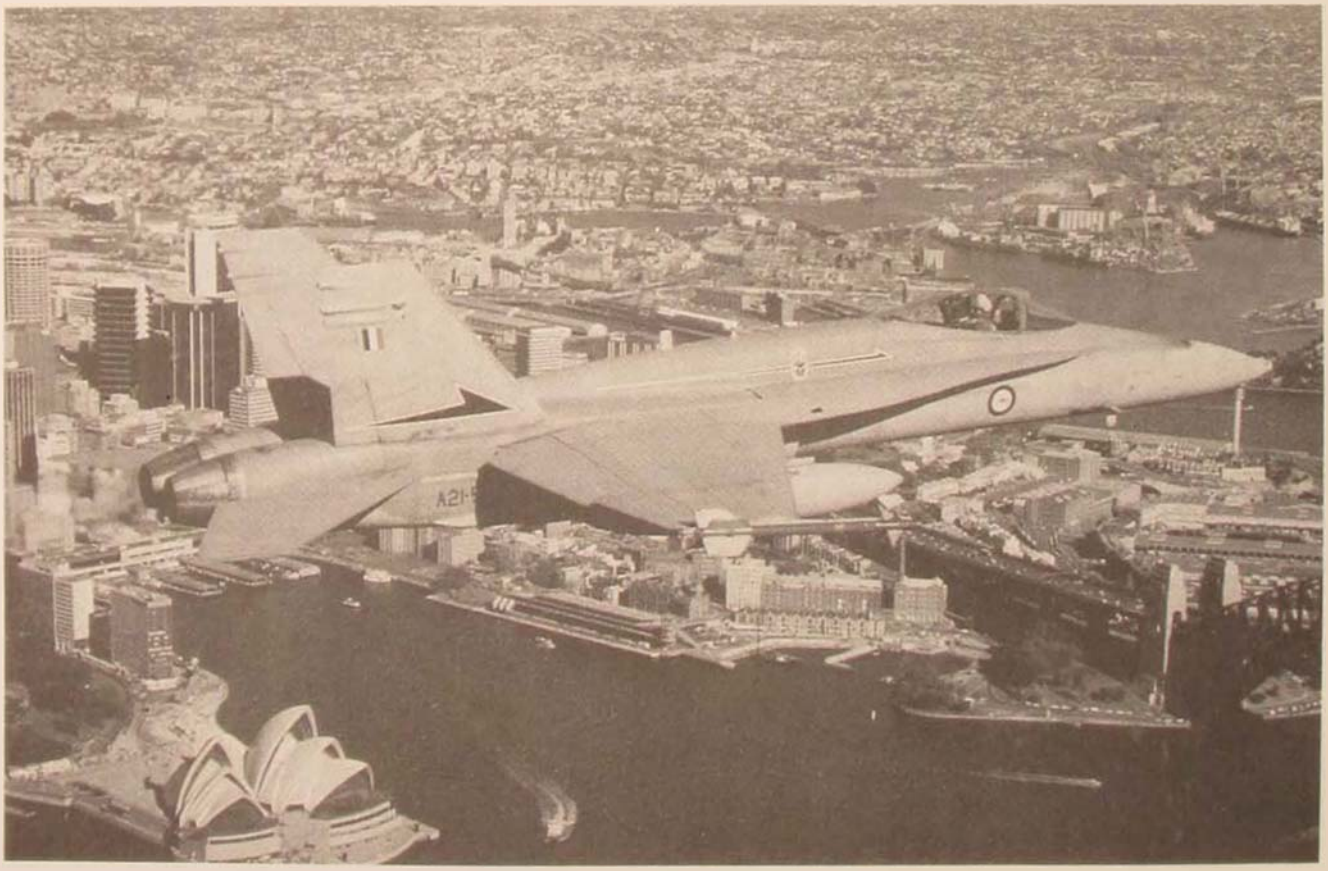
The maxim of independence means that Australia must organise its air force to make decisions and recommendations on the application of air power jointly with surface forces when necessary and, in certain circumstances, separate from those surface forces. This requirement does not mean that the air force should operate discretely from the other forms of combat power. However, in a defence force of limited assets and competing demands, the most effective use of air assets will be forthcoming only if the service controlling the air is free to allocate priorities for the application of air power optimal to the circumstances.

The maxim of balance places an appropriate emphasis on long range and rapid response—primarily over sea but over land as well. Thus, the capability for long-range reconnaissance and maritime patrol, strike, and counterair becomes essential. Airlift in the air/land environment provides the mobility and rapid response required. Both the air/land and air/sea environments require tactical reconnaissance and combat air support; accordingly, a tactical counterair capability is also necessary.

Sources of Air Power in Australia

As with most other developed nations, those sources which Australia can call upon to provide air power include its air force, air arms of army and navy forces, and civil aviation. Within Australia, the air force has traditionally provided the breadth of expertise needed to effectively employ air power, specifically by demonstrating a capability to wage all three air

The Australian Defence Force (ADF) must have the flexibility to respond to a number of different threats. Air power allows the ADF to apply appropriate levels of combat power as circumstances dictate. The RAAF employs multirole aircraft like the F/A-18 to best meet the threat at hand.



campaigns and by concentrating firepower with the most economy of effort.

Air arms, as organic components of the Royal Australian Navy and the Australian Army, have traditionally been used to provide a specialised capability that their parent surface forces could not otherwise achieve. Importantly, such a capability has been directly aligned to the immediate tactical objectives of the surface forces.

Civil air power contributes to national infrastructure and provides a reserve capacity should Australia require a particular capability, such as surge in airlift support for its combat forces. Civil aviation could also augment ADF air power in time of conflict by conducting surveillance, as well as search and rescue. Of course, augmentation need not be confined to times of conflict.

Satellites and other spacecraft are also potential vehicles for applying air power, particularly in the areas of navigation, sur-

Australia's military must be able to defend the approaches to their island nation. The RAAF's ability to project air power beyond these approaches with platforms like the F-111 (above) serves to deter potential aggressors. Furthermore, tactical airlift aircraft such as the C-7 (below) permit the rapid movement of combat forces in defence of the country.

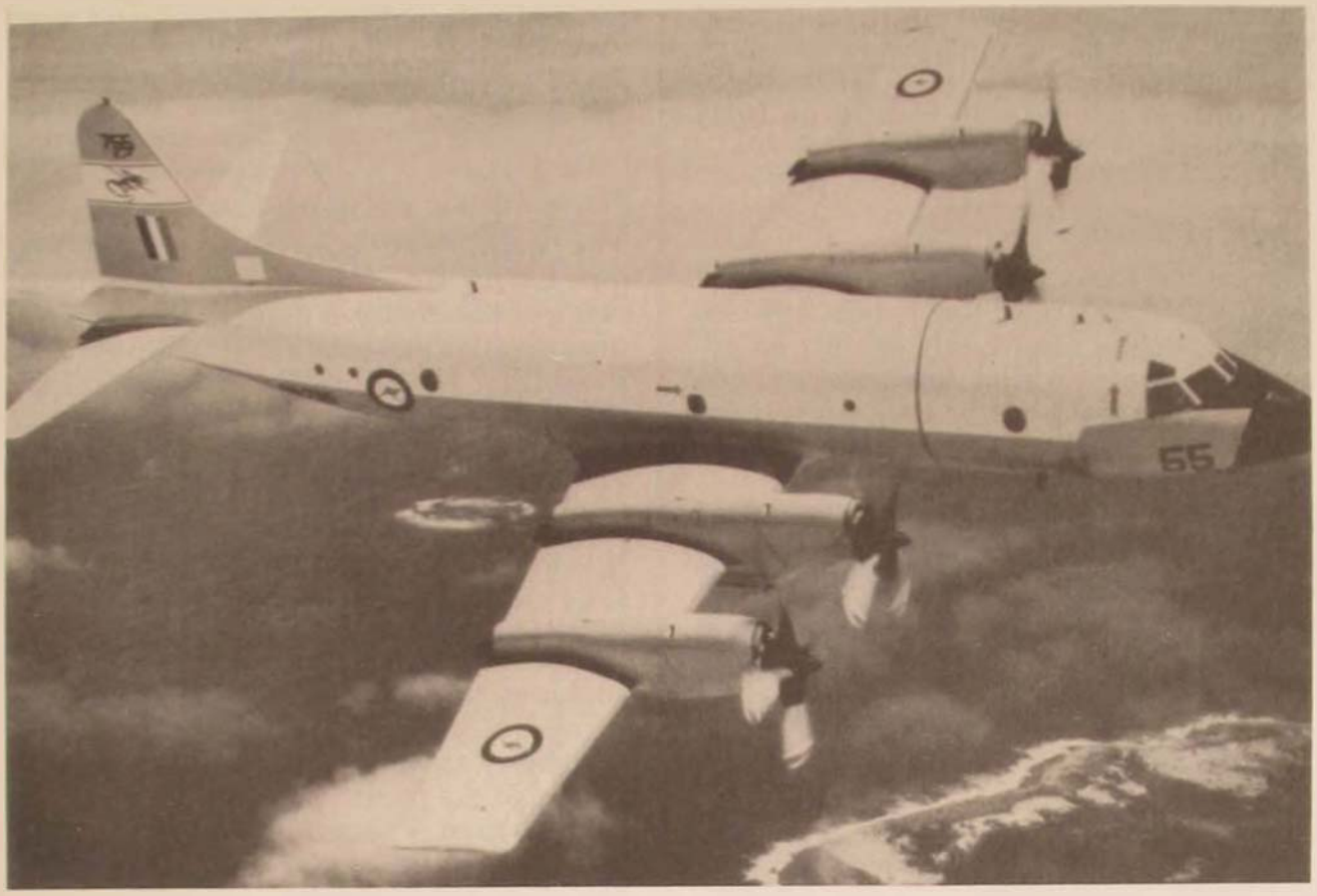
veillance, reconnaissance, communications, and early warning. The use of space, either as an extension of air power or as a fourth dimension to combat power, is already well developed in some nations. Australia, like most other middle-power nations, must now address this issue. Future improvements in technology may result in some aspects of space-based systems becoming cheaper, relative to the more traditional types of air power assets.

Royal Australian Air Force

The major source of air power in Australia has been and continues to be the RAAF. Its function is to conduct air campaigns for the most effective defence of Australia and Australian interests through air operations and sustainment operations, both of which are explained below. In peacetime, the RAAF offers the Australian government a range of options for community assistance and regional activities.

Control of the air is the prime campaign for the RAAF and, as such, will most often be its initial and most pressing concern. Once the RAAF has attained the requisite degree of control of the air, it would see air bombardment as the next priority, based on the successful historical experience of taking the war to the enemy. This campaign does not imply massed bomber raids on cities but could mean single aircraft raids on crucial strategic military targets. These priorities do not prevent the RAAF from providing the necessary, concurrent air support for combat forces, especially in the air and sea approaches.

Both the Australian navy and army have an air arm that offers direct, specialised assistance to its service. Shown here is an army aviation regiment's multipurpose Pilatus Turbo Porter.



The P-3 Orion of the RAAF provides long-range reconnaissance and maritime patrol support to the ADF. Fitted with a rotodome, the Sentinel variant (not shown) of the P-3 adds an advanced airborne early warning and control capability.

Thus, the RAAF has set priorities for how it would normally apply air power in combat. Other compelling factors are also associated with the application of air power by small air forces like the RAAF. Based on defence policy, ADF priorities, RAAF structure, and Australia's unique needs, the RAAF must adhere to certain imperatives in planning, organising, training, and equipping its forces. These elements are considered characteristic of any small air force and are termed imperatives because failure to address them will have dire consequences for any air force, but more especially for small air forces, which have little margin for error. The imperatives include command, qualitative edge, attrition management, centre of gravity, timing, and preparedness.

Command

The RAAF must be commanded operationally at the highest practical level by a single, experienced commander with expertise in the application of air power.

Qualitative Edge

The RAAF must achieve a qualitative edge over potential enemies through a balance between quality and quantity, exploitation of suitable technology, quality of training, and expertise and attitudes of personnel.

Attrition Management

The RAAF must employ its assets in a way that minimises the risk of attrition of limited resources. Thus, capability levels

should be consistent with potential threats, and unique circumstances—such as geography, isolation, and high-technology air assets—should be fully exploited.

Centre of Gravity

The central focus of a force is its centre of gravity. RAAF air power is best applied when matched offensively against an adversary's centre whilst defending its own centre of gravity. Only by determining areas of national importance—which can vary, depending on the situation—can the RAAF contribute optimally to both offence and defence.

Timing

The RAAF can concentrate its effect quickly in time and space. Therefore, being at the decisive point at the decisive time requires exploitation of the speed and flexibility, as well as the close coordination, of RAAF assets.

Preparedness

In order to respond effectively to likely air threats and be ready for the unexpected, the RAAF must maintain a high level of preparedness through operational readiness and sustainability. This preparedness includes provision of competent reserve forces. Moreover, if readiness and sustainability are to be capable of meeting expected surge requirements, then a system of evaluation is necessary. Implicit in such a system would be provision of feedback for future enhancement.

The Application of Air Power by the RAAF

An air force achieves the objective of air power—the gaining of maximum military effectiveness from the use of the air—only through the proper conduct of the three air campaigns. These air campaigns are characterised by specific operations, which in turn are achieved through combinations of specific roles. Therefore, the application of air power by the RAAF depends on the correct and optimum execution of specific operations and roles.

Smaller air forces function with an inherently tiny margin of error. Failure to abide by the imperatives of air operations (command, qualitative edge, attrition management, centre of gravity, timing, and preparedness) would negate the effectiveness of even the most sophisticated aircraft such as the F-111 (top left) and the F/A-18.

whilst adhering to the four maxims. The six specific operations are counterair; independent strike; aerial reconnaissance, surveillance, and electronic warfare; airlift; combat air support; and sustainment.

1. Counterair operations are the prime means for achieving control of the air and employ the offensive counterair role to destroy enemy air power on the ground and the defensive counterair role to attack intrusive enemy air power in the air.

2. Independent strike operations represent the prime means for prosecuting the air bombardment campaign. These operations employ the roles of strategic land strike and strategic maritime strike against targets not in contact but posing a threat. The third role, that of interdiction, is used against enemy lines of communications outside the surface battle area.

3. Aerial reconnaissance, surveillance, and electronic warfare operations seek out intelligence, which is fundamental to all operations. These three roles best demonstrate air power's ability to exploit space.

4. Airlift operations employ the two roles of strategic and tactical air transport. They depend on a combination of civil and military air assets, as well as associated infrastructure.

5. The air support for combat forces campaign involves combat air support operations, which provide assistance to naval power through the prime roles of antisubmarine warfare and anti-surface-shipping warfare. They provide assistance to army forces in contact through the roles of close air support and battlefield air interdiction. Finally, they provide assistance to other air power assets through the roles of air-to-air refuelling, airborne early warning and control, and suppression of enemy air defences.

6. The last category of operations—sustainment—is equally necessary for the conduct of air warfare. Sustainment operations are not integral to airborne activity, but they are enablers of all other air operations. They are diverse and encompass the roles of command and control; communications; intelligence; ground defence; research, development, test and evaluation; logistics; infrastructure; administration; and training and education.

Tasks and missions are performed in the execution of roles but are not exclusively

Gaining the most from the air is possible only through proper utilisation of the three air campaigns. By writing its own air power doctrine, the RAAF provides the basis for commanders to determine how air power may best be applied in the defence of Australia. Shown is an RAAF F/A-18 equipped with Harpoon missiles.

role-specific in the same way that particular roles are almost uniquely characteristic of specific operations. Because they are so numerous and do overlap, the many different tasks and missions are not described in detail. An example of a task is combat air patrol as part of the defensive counterair role, whereas a mission relates to the actual despatching of aircraft to accomplish one particular task that has a singular purpose and is limited in duration.

The RAAF must have the potential to conduct all roles associated with the six operations of air power. However, each role does not necessarily receive equal emphasis; rather, the emphasis depends on the RAAF's particular balance and external factors (e.g., economic constraints) which affect that balance. The RAAF's balance also responds to internal factors, such as assigning priorities to roles which are necessary to meet credible contingencies and to roles which require long-term training.

RAAF Organisation

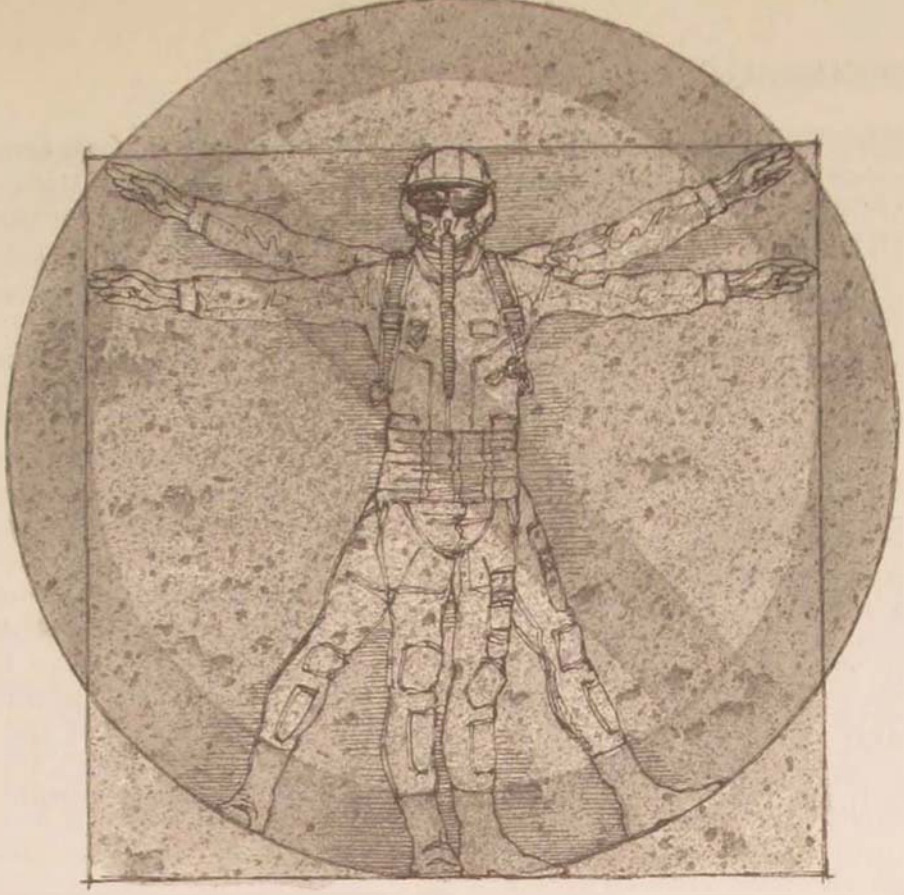
The various air campaigns, operations, and roles can be effectively applied through the RAAF structure. Furthermore, the organisation of the RAAF is well attuned to the maxims of air power and the imperatives for a force of its size. Within the RAAF, command and control is exercised by the chief of the Air Staff (CAS) and through commanders of three commands (Air Command, Logistics Command, and Training Command). The Air Force Office provides staff functions for the CAS in preparing, implementing, and reviewing RAAF policy and contributing to ADF policy, as appropriate. Air Command carries out air operations of the RAAF through a headquarters (Air Headquarters) and five force-element groups: the Strike Reconnaissance Group, the Tactical Fighter Group, the Maritime Patrol Group, the Airlift Group, and the Tactical Transport Group. Logistics Command provides—through bases, stores depots, and aircraft maintenance depots—the wherewithal to conduct many of the sustainment roles. Training Command provides all nonoperational air and ground training through specific units and schools.

The Future

The success of the RAAF in applying air power across the full spectrum of operations and roles will be dependent on its ability to meet the six imperatives—command, qualitative edge, attrition management, centre of gravity, timing, and preparedness. In so doing, the RAAF must remain abreast of technological advances and innovation. Increasing costs—associated with advances in technology—will provide scope for refurbishing and extending the life of aircraft, matching new weapons systems with old airframes, and using multiroling to a greater extent.

Effective early warning and improved base security provide scope for moderating the potential vulnerability of air power. Future developments in dispersion capability and a reduced dependence on fixed runways and support facilities are also likely to help. Furthermore, tactics and technology aimed at minimising attrition will receive more attention.

Finally, personnel will remain a critical factor, through both the decision-making function and the skills they employ in the actual application of air power. The RAAF recognises a duality of professions—one demanding the technical skill and knowledge necessary for the best application of air power and the other demanding broader military knowledge linked with the profession of arms. Accordingly, the RAAF may need to incorporate greater emphasis on motivation into the training and education system. It could also provide greater degrees of motivation by increasing the scope for decision making at lower levels and increasing the spheres of responsibility at those levels. □



UNMANNED AERIAL VEHICLES
THE FORCE MULTIPLIER OF THE 1990s

CAPT BRIAN P. TICE, USAF

THE United States needs more force multipliers in this decade than ever before because of the decreasing size of our armed forces without a corresponding decrease in our worldwide commitments. The Air Force, for example, projects a cut in personnel from 608,000 in fiscal year (FY) 1986 to 470,000 in FY 1995—almost a quarter of its people![1] There is a corresponding decrease in its force structure, a fact applicable to its sister services as well. Yet the Air Force's (and the United States') worldwide commitment remains the same. Although we are withdrawing troops from some areas of the world, the commitment to our allies in those areas continues. Unexpected contingencies elsewhere may also require US forces to deploy to places where there are no troops. Witness our leadership of the multinational force in Saudi Arabia as a current example. How to do more with less? One answer is increasing our use of force multipliers.

Recognizing the need for force multipliers, our armed forces over the years developed a variety of aircraft. Examples include the Navy's EA-6B Prowler and the Air Force's F-4G Wild Weasel, which can suppress enemy air defenses so more of our bombers and fighters can get through to their targets. Another force-multiplying effort involves development of aircraft that find and track mobile targets on an increasingly fluid battlefield so we can destroy them more efficiently. Examples in-

clude our airborne warning and control system (AWACS) and the joint surveillance target attack radar system (J-STARS).

All these aircraft are manned, however, which makes them expensive and their loss less acceptable. The expense applies not only to buying, operating, upgrading, and maintaining these technically advanced aircraft but to aircrew training as well. The lives of the aircrews who fly the planes have no price tag, of course, and their survival is increasingly put at risk by ever more capable threats. Because these force-multiplying aircraft are so expensive in terms of people and machines, only a relative few are bought, and we cannot afford to lose many. As a result, we plan to use most manned airborne force multipliers in a standoff role behind friendly lines. This limits their coverage, thus denying our forces the full extent of their capabilities.

To ease the dual problems of small numbers and limited usage of current airborne force multipliers, fresh consideration needs to be given to unmanned systems. The idea is not to replace aircrews but to supplement them by letting unmanned aerial vehicles (UAV) conduct those missions for which they are best suited.

What Are Unmanned Aerial Vehicles?

UAVs are powered aerial vehicles that do not carry human operators. They use aerodynamic forces to provide air vehicle lift, and they are designed to carry nonlethal payloads for missions such as reconnaissance, command and control, and deception.[2] (UAVs may also carry lethal payloads, but such configurations are considered standoff weapons and will not be addressed in detail.) UAVs are directed by a ground or airborne controller or are pre-

Many manned aircraft have been developed to multiply the effectiveness of other forces. The F-4G Wild Weasel multiplies the effectiveness of strike packages by suppressing enemy air defenses.

programmed. UAVs only having the controller option are called remotely piloted vehicles (RPV). UAVs come in a variety of designs ranging from model airplanes to missiles to ball-shaped vehicles with helicopter blades. Sizes vary from a vehicle small enough to fit into a backpack to one with a longer wingspan than a Boeing 747. Investment in these aerial vehicles for our armed forces is a good idea because of their successful combat performance, great versatility, and relatively low cost.

The Need for UAVs

From a warrior's perspective, the best reason to have UAVs is their proven performance in combat. Israel learned the value of UAVs in the 1973 Yom Kippur War and used them with great success in the 1982 Operation Peace for Galilee campaign. The Israeli strike against Syrian missile batteries in the Bekaa Valley provides several examples of effective UAV use in combat.

Months before the attack, Israeli UAVs "fingerprinted" Syrian surface-to-air radars by gathering the electronic frequencies of those radars and programming them into Israeli antiradiation missiles for use during an attack.[3] When the attack came on 9 June, UAVs flew over the battlefield first, emitting dummy signals designed to make Syrian radar operators believe real Israeli aircraft were attacking. This tactic was effective in two ways. First, the Syrians launched most of their available surface-to-air missiles (SAM) against the UAVs. When the SAM batteries were in the midst of reloading, Israeli fighters attacked.[4] Second, this deceptive tactic caused Syrian radars to actively track the UAVs, thus tipping off the Israelis to where the emitting radars were. Using the electronic frequency signatures gathered earlier, Israeli fighters carrying antiradiation missiles closed in and, along with artillery fire, destroyed the SAMs.[5]

The Navy EA-6B acts as a force multiplier by providing tactical electronic warfare capabilities.

The accuracy of the lethal artillery barrage was helped by UAVs performing a surveillance role. The flying vehicles transmitted real-time pictures of the Syrian SAM sites to Israeli commanders so they could assess the effectiveness of their artillery fire and adjust it accordingly.[6] The Israeli Air Force also used UAVs in a surveillance role by positioning them over three major airfields deep within Syria to gather data on when and how many aircraft were taking off from Syrian airfields. This information was given immediately to the E-2C AWACS aircraft, which vectored Israeli fighters against the unfortunate Syrian MiGs.[7] UAVs made matters worse for the MiGs by helping to jam Syrian ground control intercept (GCI) communications with their fighters. Highly dependent on GCI, the confused Syrian pilots literally did not know what to do.[8] In yet another role, UAVs acted as laser designators for laser-guided weapons launched by fighters against the SAMs.[9]

UAVs in all these roles worked extremely well in a modern war against a determined enemy. The result? Seventeen of 19 sophisticated Syrian SAM batteries in the Bekaa Valley were damaged or destroyed, and a large number of the Syrian fighters defending the SAMs were shot down or damaged. Israel had achieved complete air superiority in a single afternoon. Israeli defense minister Ariel Sharon called the raid the "turning point" of the campaign, as all Syrian and Palestinian Liberation Organization forces were now exposed to air attack.[10]

Granted, the Israelis had several advantages going for them, such as poor Syrian SAM and fighter tactics, poor use of camouflage, and Israeli familiarity with the terrain.[11] Americans may not have all of these advantages, but we can exploit the ones open to us, including the use of UAVs. Israel demonstrated that smartly used UAVs can certainly help a modern armed force achieve its objective. The ultimate test of combat proves it.

From a commander's perspective, the versatility offered by UAVs is tough to beat. Besides the many roles used by the Israelis, UAVs could play a future role in air base operability. They could help security police watch the base perimeter for evidence of intruders, thereby greatly increasing the surveillance area without the need to increase manpower. UAVs could also serve as detectors for the presence and strength of chemical agents in the air, thus informing the commander that countermeasures are necessary and how long they will be required. Poststrike reconnaissance would tell the commander what damage the airfield sustained, including the location of unexploded ordnance. UAVs could also perform electronic warfare before an attack in an effort to degrade it and serve as a communication relay platform for enhanced coordination of recovery efforts after the attack.[12] Although air base operability is a possible future role for the Air Force, UAVs have already served in a variety of roles for the Army, Navy, and Marine Corps.

The Army uses the Pioneer UAV to watch mock battles as they occur at its National Training Center (NTC) at Fort Irwin, California.[13] The Pioneer system is serving as a test-bed to determine future operational requirements for UAVs. It provides near-real-time reconnaissance, surveillance, target acquisition, target spotting, and battle damage assessment within line of sight of the ground control station, day or night. The Pioneer, which looks like a crude model airplane, is launched from field positions or from ships. Its flight endurance is five hours, during which it can fly up to 13,000 feet, from 60 to 95 knots, and range out to 136 miles from its ground station. Flight operations require 20 people.[14] Using the Pioneer, the mock battles observed at the NTC can be replayed for the participants via videotape to reinforce the lessons they learned in their training.[15]

Another test-bed UAV used by the Army in the reconnaissance role is the Pointer. The 82d Airborne Division has used Pointers to conduct surveillance of likely enemy avenues of approach during training exercises at Fort Bragg, North Car-

The E-3A (AWACS) finds and tracks mobile targets on today's fluid battlefield so strike forces can attack more effectively. Due to their complexity and high cost, many manned force-multiplying systems are used in a standoff role.

olina.[16] The Pointer uses a fixed day television camera for real-time reconnaissance, surveillance, target acquisition, and battle damage assessment. It looks like a glider, is typically used by infantry companies and artillery forward observers, has a three-mile range and a one-hour flight duration, and can be carried in backpacks and operated by two people.[17] Army commanders monitoring enemy avenues of approach liked the idea of seeing pictures of enemy tanks before engagements occurred, thus giving them warning time to adjust their forces accordingly. Pointers were also used to assess battle damage inflicted by the division's artillery. The 25th Infantry Division from Hawaii has used the Pointer in similar roles during combined exercises last year with our allies in Korea, Thailand, and Australia. In the future, the 82d Airborne plans to use the Pointer in a surveillance role for perimeter defense after parachuting into contingency areas.[18] The Army in Panama (and the Marines in Lebanon) could have used these UAVs in the perimeter security role, especially to spot hostile mortar or artillery fire from surrounding buildings and hills. The Pointer is currently deployed with the 82d Airborne to Saudi Arabia.[19]

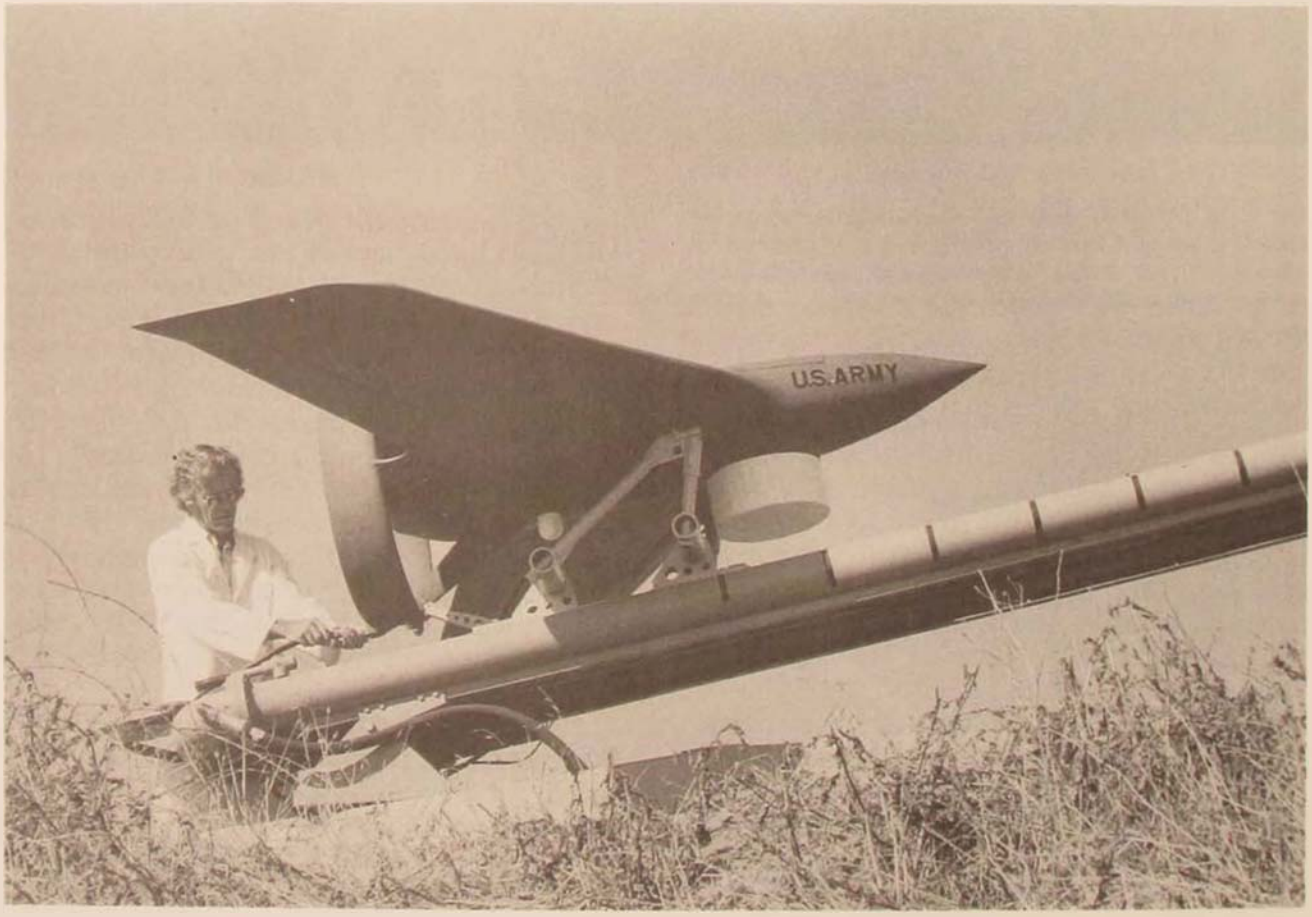
The Navy, inspired by Israel, has used the Pioneer UAV in a variety of roles for years. Israel's successful use of UAVs in Lebanon in 1982 "seem[s] to have convinced even the most sceptical US experts of the value of UAVs. US Navy experts

who were previously reluctant to accept [Israeli UAV industry] presentations became eager to acquire the unmanned flying platforms."[20] In the Persian Gulf during the last year of the Iran-Iraq War, Pioneers were used in a over-the-horizon-targeting (OTH-T) role to direct shore bombardment training by the USS *Iowa*'s huge 16-inch guns. Using Pioneers as spotters, the ship's gunners recorded impressive hits. In one instance, gunners using the Pioneer were able to hit their target using only one-third as many shells as gunners without a UAV.[21] Besides directing naval gunfire, the Pioneer was also used in an OTH-T role during Harpoon antiship missile training.[22] Pioneer UAVs are currently deployed on three of four US Navy battleships, including the USS *Wisconsin*, now on duty in the Persian Gulf in response to the Kuwait crisis.[23]

The Navy has also used the Pioneer in the gulf in a ship-surveillance role around the clock.[24] This capability was demonstrated in 1989 when the Navy conducted day and night operations with Pioneer. The results were impressive. "The system read ship names at 1500 feet altitude, and identified deck cargo."[25] The commander of the Sixth Fleet, based in the Mediterranean, reported Pioneer performance as "flawless.... The remotely piloted vehicle has proven its capability and has added a new dimension to real time intelligence."[26] As a result of this demonstrated capability, Pioneer is probably helping the Navy maintain its blockade of Iraq today.

The Marine Corps uses both Pointer and

Unmanned aerial vehicles have been developed to multiply force effectiveness over the battlefield without endangering more expensive manned aircraft. Depending on their payload, they can perform reconnaissance, command and control, and deception missions.



Pioneer UAV systems. The Pointer is currently deployed to Saudi Arabia with the First Marine Expeditionary Force from Twentynine Palms, California, and the Fourth Marine Expeditionary Brigade from Camp Lejeune, North Carolina. The Marines use the Pointer primarily for over-the-hill reconnaissance and battle damage assessment for their artillery. Marine commanders also use it in a surveillance role to view the positions of their own troops prior to engagement and to monitor the ensuing mock battle.[27] The Pioneer UAV is also currently deployed to Saudi Arabia with Marine RPV companies from Twentynine Palms and Camp Lejeune. In the United States, these units used the Pioneer to perform route-reconnaissance, artillery-adjustment, and close-air-support battle damage assessment roles.[28] In the past year, Pioneers have successfully supported combined arms exercises, fire support coordination exercises, weapons and tactics instruction, and other activities. While at sea, the Pioneer has operated from an amphibious ship and a helicopter carrier.[29]

In addition to the vehicle's versatility, there are continuous improvements in UAV capability as the technology matures. For example, the tactical Searcher UAV from Israel Aircraft Industries (IAI) can carry a heavy (140-pound) payload for more than 24 hours as a result of a recent breakthrough in UAV wing design by adding Fowler flaps to increase lift.[30] A joint French/German project, the Brevel UAV, incorporates a jam-resistant data link as well as stealth features that reduce the vehicle's radar and infrared signatures along with its noise level.[31] Boeing recently completed flight-testing of its huge Condor UAV. The vehicle has a wider wingspan (200 feet) than a Boeing 747 and can operate above 65,000 feet for several days.[32] Maturing technologies in sensor payloads carried by UAVs also offer promising capabilities to military commanders in the future.

In addition to proven capability and versatility, the low cost of UAVs makes them the force multiplier of the 1990s. In this era of tight budgets, UAVs offer a wide variety of capabilities at relatively little expense. For example, the US Joint Project Office (JPO) for UAVs is currently pursuing a "very low cost" close-range reconnaissance system. One of the vehicles currently being used as a test-bed for this class of UAV is the Pointer, at $10,000 per vehicle with payload. At the other extreme is the Condor UAV mentioned earlier. The Condor costs about $20 million without payload.[33] But with its high altitude and long endurance, it is expected to have global reach, conducting missions ranging from military surveillance to drug enforcement. The Defense Advanced Research Projects Agency (DARPA) supports the flight-testing of the Condor in a military configuration. According to DARPA UAV program manager Bob Johnstone, many potential users look at the Condor "as a cheap satellite with a long dwell time."[34] At $20 million (without payload), Condor would indeed be a cheap supplement to the amount of money now being spent on state-of-the-art satellite systems.

In addition to price, versatility also makes UAVs more cost-effective than manned aircraft. In the midst of uncertainty over future force structures, versatility is the key. For example, the Defense Department proposed canceling the successor to the Air Force's specialized air defense suppression fighter in its FY 1991 budget. Termination of the F-4G Wild Weasel follow-on program was due to affordability concerns. "Air Force officials have concluded that the service cannot afford dedicated platforms in the tight budget environment."[35] Cheaper, more versatile UAVs fit better into today's smaller budgets. In addition, the technology developed for military UAVs has many civilian applications. For example, the Canada Electric Association is evaluating an Israeli UAV with a dedicated payload for monitoring high-voltage power lines.[36] Israel even received a letter from a nature preservation organization in Africa asking about using UAVs to counter the activities of ivory poachers.[37]

Pioneer (left) can be used for reconnaissance and surveillance missions. It flies for extended lengths of time while observing and transmitting video images of surface activity day or night. Pointer (below left) is a hand-launched, low-cost, expendable, battery-powered reconnaissance asset. It can be carried in backpacks and operated by a crew of two.

Survivability also makes UAVs more cost-effective. Due to their small size, UAVs usually have a diminished radar cross section, infrared signature, and noise level than most manned aircraft. In fact, the Pointer uses a virtually silent electric motor.[38] This reduced presence should translate to lower attrition and overall cost. For example, it costs more than $1 million just to train a pilot.[39] Neither the pilot nor the airplane is easily replaced during a war. Israel is an example of a country that cannot afford much attrition. "The expense of modern aircraft and the value of trained pilots are so great that the Israelis have substituted unmanned vehicles for many hazardous missions."[40] Maj Gen Avihu Bin Nun, Israeli Air Force commander, recognizes the important role of UAVs, and says he currently has a shortage of them.[41]

UAV Limitations

Despite the many capabilities of today's UAVs, there are limitations to overcome. Current concerns are UAV survivability, data-link technology, and the extensive manpower training necessary for the program.

UAV survivability is a double-edged sword. Although the reduced radar cross section, low infrared signature, and reduced noise level are strengths of UAVs as noted earlier, they are not invulnerable. For example, most UAVs are relatively slow compared to manned jets. Jets depend on speed to reduce their exposure time to hostile fire. UAVs, on the other hand, use a slower speed to increase their endurance for more time on station, where they loiter over a hostile area to pass information back to friendly forces. Also, due to their line-of-sight guidance, UAVs do not hide behind terrain to shield themselves from enemy fire while performing their mission like airplanes. Once damaged by enemy fire, current UAVs lack redundant onboard systems like aircraft. Finally, as operational experience and publicity for UAVs grow, potential enemies will step up efforts to counter them.[42]

With a wingspan of 200 feet, the Condor can climb above 65,000 feet and stay aloft for five days or longer without refueling. Some see its potential as a relatively inexpensive satellite substitute.

Maturing UAV technology is helping to correct these shortcomings. Efforts continue on making UAVs even harder to detect through signature reduction. Multispectral sensors are also being developed to effectively operate UAVs in bad weather, thus making them harder to detect and kill. Other improvements include increased range for the sensors so the vehicles can stay further back from threats, changed flight profiles so the vehicles become more unpredictable and thus harder to hit, and the use of countermeasures against the guidance of enemy air defense weapons.[43]

Another concern of UAVs is current data-link technology. It limits UAV range and flexibility, as mentioned previously in the terrain-masking example. The line-of-sight guidance limitation may be resolved in the future, however, by using a relay UAV that is within sight of the gathering UAV to pass collected information back to friendly forces. Current data links are also susceptible to jamming, and reduction of this vulnerability drives up the cost of UAVs.[44] Nevertheless, technologies such as millimeter-wave data links, laser communications, and ultrawide-band data links will reduce the probability of detecting, much less jamming, future links.[45]

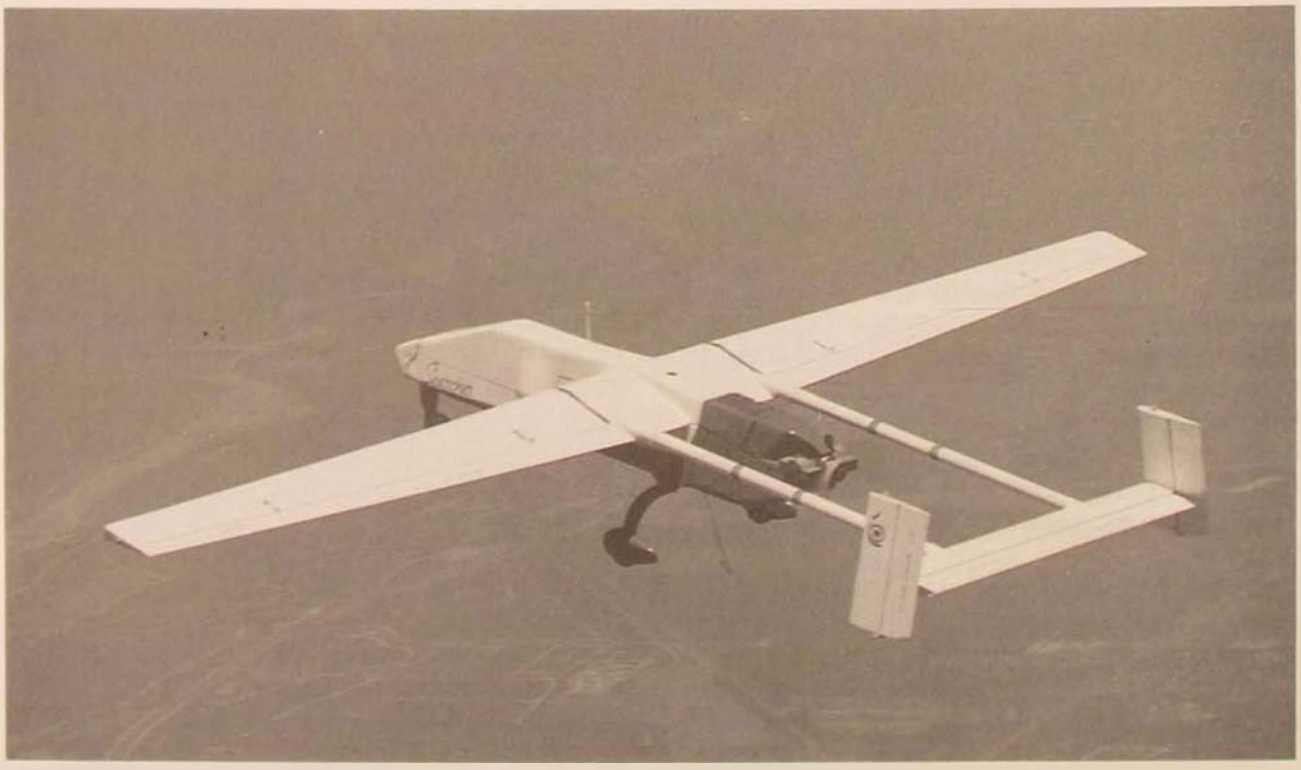
Finally, current manpower and training requirements for UAVs is an area that needs to be reduced. The situation is improving, however. For example, operating an air-launched UAV unit in Southeast

Asia in 1974 required 94 people to sustain a sortie rate of two per day. The same sortie rate for a ground-launched version of the new US medium-range UAV, due to become operational in 1995, requires only 16 people. The goal in the foreseeable future is to get it under 10 people.[46] Smaller, simpler UAV systems like the Pointer require only two people. Manpower requirements will also fall as automated maintenance aids reduce the need for trained maintenance technicians in the field. Training requirements will be reduced as planned technology improvements provide "smart" training systems.[47] For example, training to operate the Pioneer UAV currently takes 26 weeks. In the foreseeable future, training will be reduced to just a few weeks.[48] Again, simpler systems like the Pointer have been operated by two untrained Marines in 30 minutes after taking it from the backpack and reading the instructions.[49]

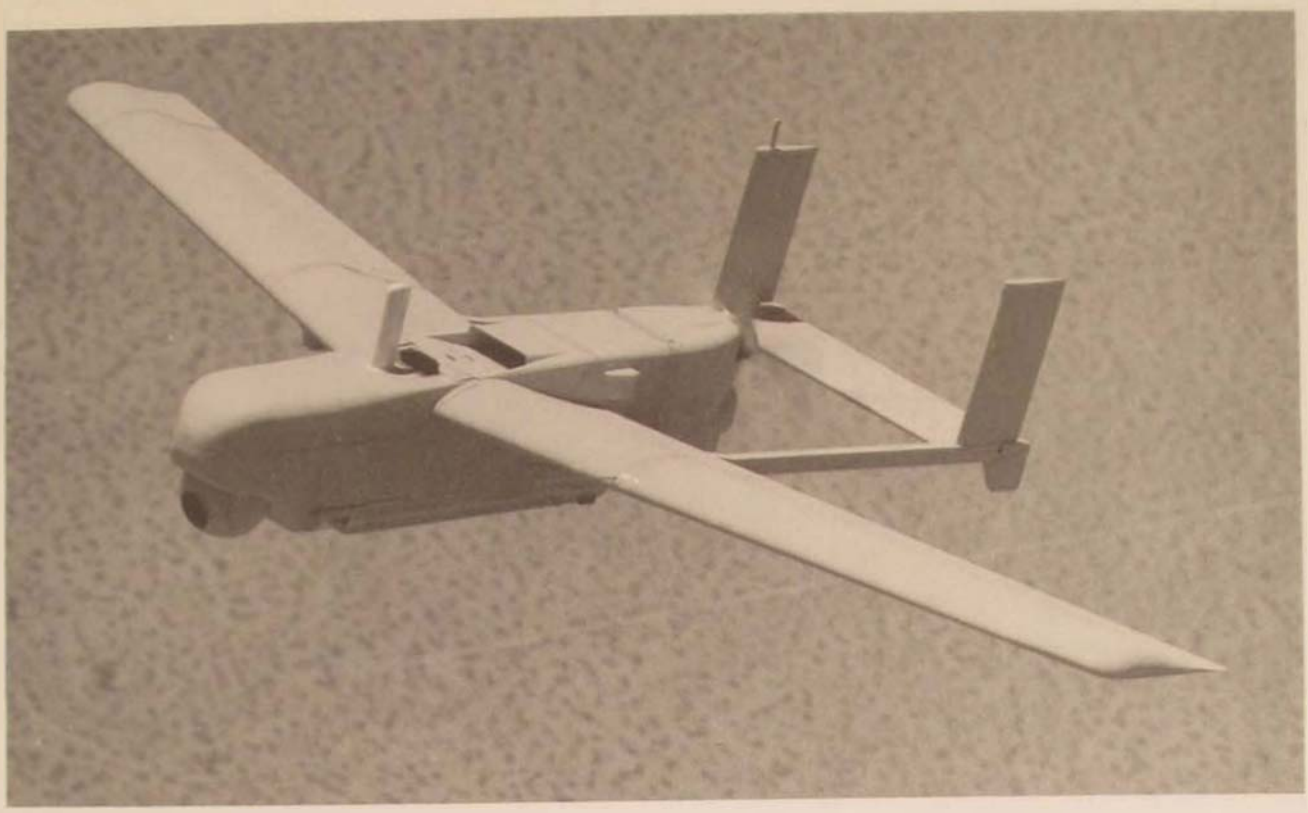
US UAV Program

Where do our armed forces get the UAVs they need? They get them through the Defense Department's UAV Joint Project Office, now in its fourth year within Naval Air Systems Command. The JPO reports to a joint-service executive committee and is responsible for acquiring UAVs for the services in four requirements categories: close range, short range, medium range, and endurance.[50]

Close-range systems will serve lower-level tactical units and small ships, giving them the capability to investigate local area activities. The Pointer and other UAV systems (including foreign competitors) are currently being evaluated for this role to better understand user requirements. Close-range systems must be able to launch and recover from land or ships, have an endurance of one to six hours, and display information in real time. Missions include day and night reconnaissance, surveillance, target acquisition, electronic warfare, and chemical agent detection. Delivery of production systems starts in the mid-1990s.[51]



Searcher's design incorporates Fowler flaps to increase its lift capacity. It can carry a 140-lb payload for more than 24 hours.



UAVs are prime candidates for "dull, dirty, and dangerous" missions. Skyeye (above) is in the short-range class, and its derivative, Skyowl, is a competitor for the Army/Marine Corps unmanned aerial vehicle, short range (UAV/SR) contract to be let in 1992.

Short-range systems will have ranges of over 100 miles and be able to launch and recover from land or ships. They will have an endurance of eight to 12 hours and provide near-real-time information. Missions include many of the close-range missions plus a command-and-control role.[52] A short-range system for the Army and Marine Corps is under development by two competitive teams: Israel Aircraft Industries/TRW and McDonnell Douglas/Developmental Sciences Corporation. A winner will be selected early next year. Both services require about 50 short-range systems, which include 400 air vehicles. Two-thirds of the systems will go to the Army, with the rest to the Marine Corps.[53]

A medium-range system will augment manned aircraft conducting day and night prestrike and poststrike reconnaissance for operations against heavily defended targets and will augment manned airplanes in this role. It will also be used for target acquisition and electronic warfare. This system will have a 400-mile range and a two-hour endurance, and it will provide both near-real-time and recorded information. It will also be capable of being air-launched.[54] The medium-range system is being developed by Teledyne Ryan Aeronautical for the US Navy and Air Force and is due to become operational in 1995. Approximately 500 medium-range systems will be bought.[55]

The Endurance UAV responds to a broad range of needs characterized by greater range, longer flight times, and higher altitudes than other categories of UAVs. Due to its size (the Condor is in this class), the Endurance UAV will launch and recover from land only, remain on station for 24 hours, and relay near-real-time information. Its range is classified, and its missions will include many of those of the other UAV categories plus special operations. If approved and funded, production could start in 1997.[56]

A-7s have had a long and venerable career. Rather than being sent to the boneyard, they could be modified to perform one last mission for the nation. As UAVs they could be loaded with ordnance and remotely piloted to enemy targets.

Funding for the UAV program is controlled by Congress, where *interoperability* and *commonality* are the key buzzwords in winning approval for Defense Department UAV plans. While the relationship between Congress and the Pentagon over UAVs is "positive," House Appropriations Committee staffer Robert Davis believes that unmanned systems may lack support from the services during the current budget squeeze.[57] Robert Fitch, a House Permanent Select Committee for Intelligence staffer, states that "there is sincere interest and support for UAVs in the Congress."[58] However, staffer Kirk McConnell of the Senate Armed Services Committee believes that "if there is no [overall] Pentagon support, there is little Congress can do" to deploy UAVs.[59]

While UAV support at the Pentagon is improving, there is still some reluctance to trade a known capability for a projected capability, according to Air Force Maj Kenneth Thurman at the UAV JPO. Spending millions of precious dollars for an unknown capability that has not been tested in combat would be akin to taking a leap of faith.[60] However, three factors may overcome this hesitation in the future. First is a positive experience with UAVs by our troops in the field, especially in contingency areas such as the Middle East. Second is a maturing UAV technology that increases the UAV's survivability, capability, and deployability through reduced requirements for manpower. Third is an employment concept that takes maximum advantage of the strengths of unmanned systems.

UAV Employment Concept

To take maximum advantage of UAVs versus manned systems, the former should especially be used during the first critical days of a conflict. That is when air defenses are most numerous and aircrews most vulnerable to these defenses because of inexperience in combat. High losses of UAVs are much more acceptable than those of aircrews and their airplanes. In fact, in the Israeli experience, UAV losses are very low.

When used, UAVs should generally perform missions characterized by the three *D*s: dull, dirty, and dangerous. *Dull* means long-endurance missions which, in the future, could continue for several days. *Dirty* means jobs such as detecting chemical agents and their intensity; certainly a good manned mission to avoid if possible. *Dangerous* missions for unmanned vehicles are numerous and growing.[61] Two that come to mind, however, are reconnaissance deep behind enemy lines and suppression of enemy air defenses.

UAVs could also be used in politically sensitive areas. Our Navy's experience over Lebanon in 1983 and the Air Force's experience over Libya in 1986 argue for giving future US presidents the option of using unmanned operations to accomplish limited objectives in the third world. When political statements need to be made in the future, UAVs can help make them. This will reduce or eliminate the risk of losing our military personnel to some third-world dictator for use as hostages or for propaganda against the United States. This is just the sort of option UAVs will make viable in the future.

How will this option occur? By integrating nonlethal UAVs in support roles with

Lt Robert O. Goodman was captured after his A-6E was shot down during a mission over Lebanon on 4 December 1983. He was released on 3 January 1984 after the Reverend Jesse Jackson met with Syrian president Hafez al-Assad. UAVs could provide a means to make political statements without endangering aircrew members and could eliminate the risk of hostages being used for anti-American propaganda campaigns.

lethal UAVs. Nonlethal UAVs would launch first and "prepare" the route and target area for attack, while lethal UAVs would deliver the blow. As mentioned earlier, lethal UAVs are generally considered standoff weapons. An example is the air-launched Tacit Rainbow missile being developed for use by the Air Force. An unmanned weapon system that would pack much more punch, however, would be an unmanned aircraft loaded with bombs and flown by a controller straight into the target.

Lt Comdr Robert Norris, an operations officer for an F/A-18 squadron at the Naval Air Station, Lemoore, California, explains this concept using old A-7s as the platform. Instead of retiring hundreds of A-7 Corsair IIs, he argues we should modify them to perform in unmanned "suicide" attack roles. He cites the use of Japanese manned suicide planes in World War II, the Kamikaze, as "easily the most effective single weapon ever employed against US naval forces."[62] This was due to the ability of the Kamikaze aircraft to successfully penetrate the teeth of enemy air defenses with devastating results. Unmanned A-7s could be launched from aircraft carriers, remotely piloted to targets, and provide the hard-kill potential of 30,000 pounds of aircraft and high-explosive munitions. Unused A-7s could potentially be recovered back on the carrier for future use.[63] The idea of completely unmanned operations in certain contingencies may seem strange now, but it will become a viable option in the future as UAV technology matures and we become more comfortable with their use. The way to do this is to start incorporating UAVs into daily training on a widespread basis. This requires our armed forces to start buying more UAVs now.

Supporting UAVs

What can we do to fit more UAVs into the tight defense budgets of the 1990s? First, educate members of our armed forces on UAV capabilities and their cost-effectiveness. Remember, the idea is not to replace aircrews but to augment them by performing missions that are uniquely suited to unmanned systems. Second, the rank and file of the services should apply their knowledge of UAVs so they are included in planning and conducting routine training and exercises. Where UAVs are unavailable, the need for them should be documented and sent up through channels to ensure our senior leaders are aware of this need. Finally, our senior leadership should take these documented needs and seriously consider them when making crucial force structure decisions to enhance our combat capability.

In summary, US armed forces will shrink in the 1990s, but the commitment to our friends around the world will not. Doing more with less has never been more timely, and this is where force multipliers come in. UAVs are especially suitable in this role for the 1990s due to their combat success, versatility, and cost-effectiveness.

UAVs still have their limitations, but these problems are being worked and should be overcome in the future. Although the services are starting to get a UAV program flying, more Pentagon support is needed to take full advantage of the potential capabilities these systems offer. More support should be forthcoming if an employment concept maximizing the strengths of unmanned systems is used. This concept envisions using UAVs at the start of a conflict to fly missions that are characterized as dull, dirty, and dangerous.

As we become more comfortable using UAVs, unmanned strike operations should be offered as a viable option to future US presidents for contingency operations in politically sensitive areas. Our armed forces need UAVs, and we as service members can help ensure that we get them.

The bottom line is that we need to increase the combat capability of US armed forces at a price we can afford. UAVs help us do just that. □

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THE OTHER SIDE OF THE COIN: LOW-TECHNOLOGY AIRCRAFT AND LITTLE WARS

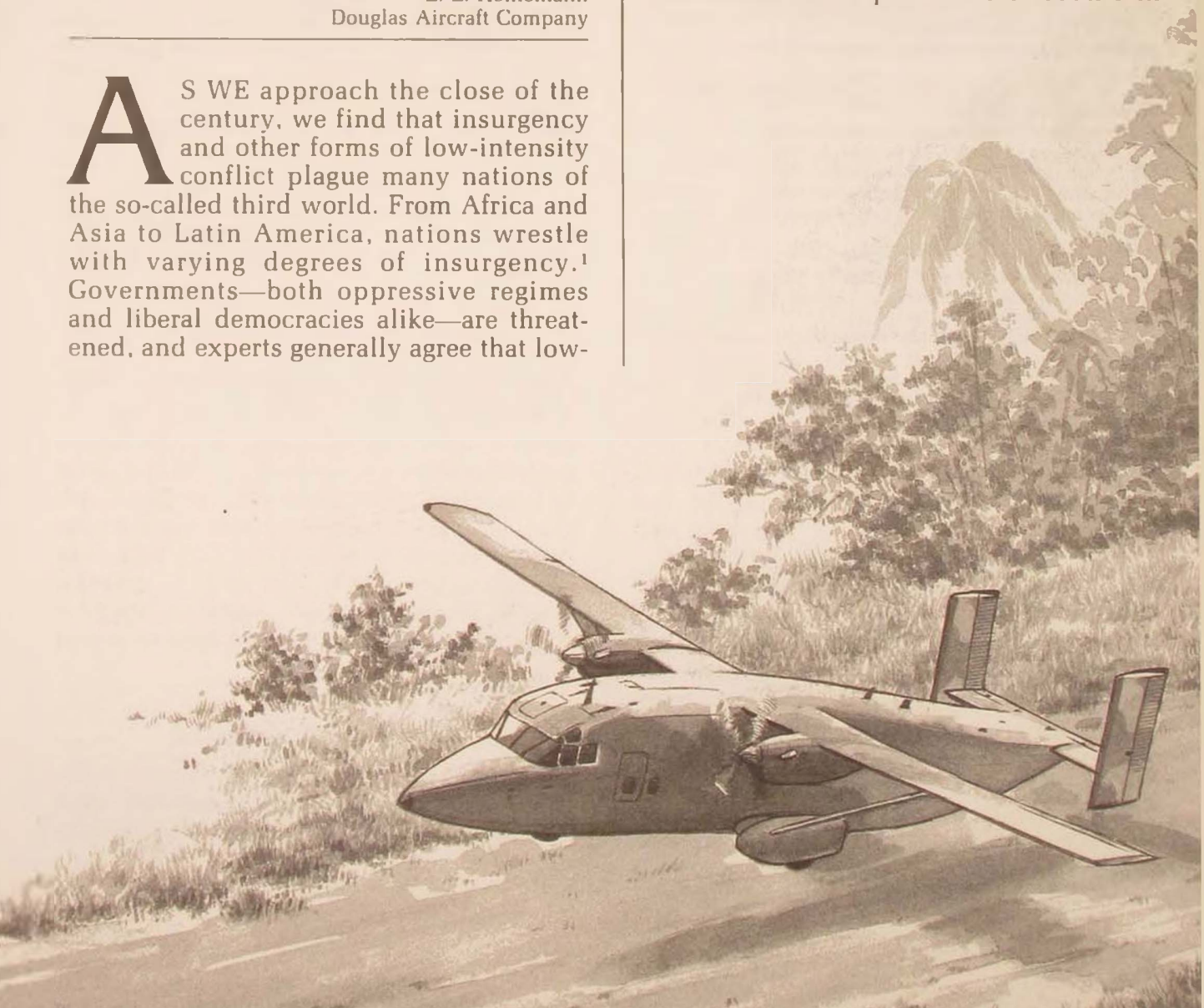
CAPT GEORGE C. MORRIS, USAF

The obstacles to any simplification may seem insurmountable, and the reasons for more complexity are many and powerful. But if we permit this Frankenstein of complexity to continue to work at its current plodding, insidious rate, it will slowly overwhelm us to impotency.

–E. E. Heinemann
Douglas Aircraft Company

AS WE approach the close of the century, we find that insurgency and other forms of low-intensity conflict plague many nations of the so-called third world. From Africa and Asia to Latin America, nations wrestle with varying degrees of insurgency.[1] Governments—both oppressive regimes and liberal democracies alike—are threatened, and experts generally agree that low-intensity conflict, including insurgency, will remain the most likely form of confrontation for the foreseeable future.[2]

Air Force professionals have studied the nature of low-intensity conflict and insurgency.[3] Scholars have addressed the social and economic implications of counterin-



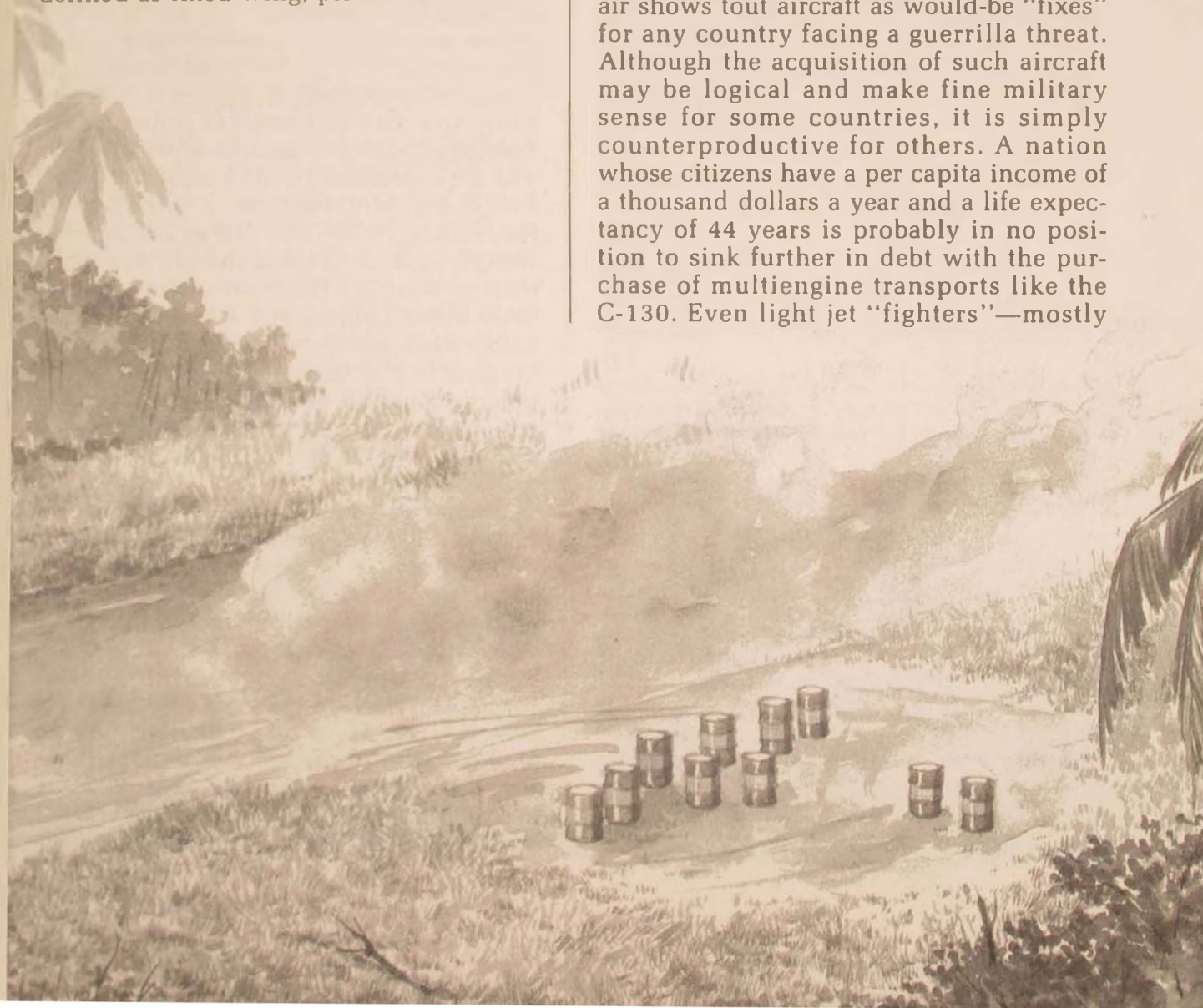
surgency (COIN) air operations. Additionally, writers for the *Airpower Journal* and other forums have advocated the maintenance of specially trained and equipped units.[4]

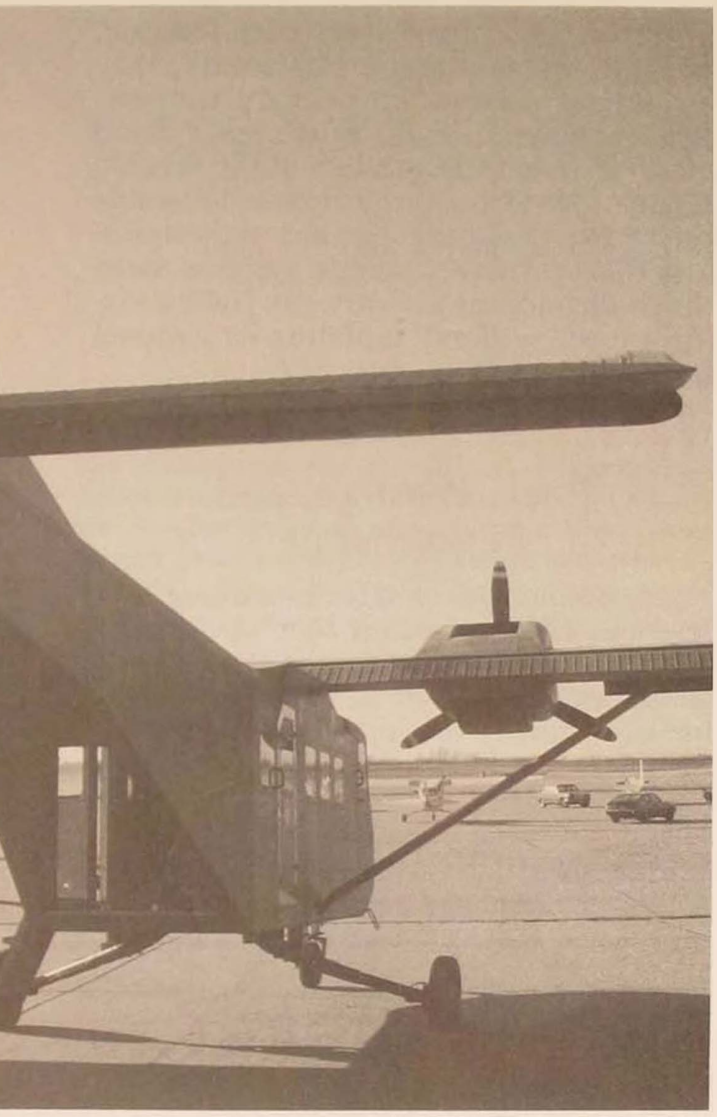
Little has appeared, however, regarding the operational employment and practicality of relatively inexpensive, low-performance fixed-wing aircraft in the COIN environment. This article discusses the possibilities of using low-technology aircraft in COIN operations. Further, we must realize that a solid relationship exists between technology and doctrine—one that holds true for nuclear submarines operating under the Arctic, for deployments to the Persian Gulf, or for "puddle jumpers" in a third-world bush war.

For our purposes, low-tech planes are defined as fixed-wing, piston- or turbine-powered, propeller-driven, single-engine, or multiengine aircraft. Commonly, they are armed versions of primary trainers, light transports, or utility airplanes based on civil designs. Regardless of the specific model, low-tech aircraft feature favorable operating and procurement economics, and their relatively simple systems mean that a developing country can field a viable air arm without depleting its national treasury.

Price, Prestige, and Performance

Magazines, glossy sales brochures, and international expositions such as the prestigious Farnborough (England) and Paris air shows tout aircraft as would-be "fixes" for any country facing a guerrilla threat. Although the acquisition of such aircraft may be logical and make fine military sense for some countries, it is simply counterproductive for others. A nation whose citizens have a per capita income of a thousand dollars a year and a life expectancy of 44 years is probably in no position to sink further in debt with the purchase of multiengine transports like the C-130. Even light jet "fighters"—mostly





Multirole aircraft such as the Skytrader Scout offer developing countries economical services, ranging from insect control during peacetime to reconnaissance flights during wartime.

armed versions of two-seat trainers—can severely strain a poor nation's resources and logistic capabilities.

Consider, as an example of the scope of finances involved, the 18 Italian-built jet trainers recently ordered by the Royal New Zealand Air Force for no less than $120 million.[5] Even jet equipment on the verge of antiquity does not come cheaply. Recently the air force of Ecuador purchased aging, refurbished T-33s outfitted for attack duties at a price of $1 million per airframe.[6] Buying aircraft—even modest ones—is an expensive proposition and must be carefully considered by nations faced with severe financial constraints.

Advanced, expensive aircraft require complex, expensive support. Strike jets and 76,000-pound transports demand long, paved runways; engine and avionic repair shops; petroleum, oil, and lubricants facilities; and numerous other support activities. The list can run from aerospace ground equipment to nondestructive inspection labs (i.e., labs whose procedures do not harm the aircraft under inspection). This support is not only costly, but also it provides a lucrative target for guerrilla attack. That is, expensive infrastructure may well require an air force to consolidate its assets at one or two major bases that insurgents will probably recognize and exploit. Such was the case with the A-37 jets of El Salvador's air force. Comprising most of that air arm's offensive firepower and stationed at Ilopango Air Base, these aircraft became a prime objective of the Marxist *Frente Farabundo Martí de Liberación Nacional*'s offensive in November 1989.[7] The fall of the airfield would have eliminated the government's ability to launch offensive air operations. Only bitter fighting and last-minute reinforcements prevented Ilopango from collapsing to the insurgents. The lesson is clear: unless an air force is dispersed, a concerted insurgent assault can destroy a government's air power in a single blow.

Writing these words is certainly easier than changing the attitudes of third-world military leaders in today's postcolonial era. After all, modern weapons—particularly combat aircraft—are considered symbols of nationhood in many developing states. A certain mind-set demands that jet aircraft—even a token formation—appear over the capital on independence day. Paradoxically, though, sophisticated equipment can negatively affect a nation's sovereignty. Debt and the reliance on foreign technicians, contractors, and others to help maintain advanced

aircraft can easily erode the very notion of nationhood. Thus, the acquisition of such equipment can be not only economically and operationally questionable, but also politically self-defeating.

Rather than the razzle-dazzle of screaming jets or giant transports, most developing countries need an air force tailored and equipped for COIN. Its aircraft must be operationally effective and affordable. To suggest that a puddle jumper is more effective than a multimillion-dollar aircraft is regarded by some people as nothing short of heresy. Nevertheless, the United States and its allies must improve their ability to cope with insurgencies by relying primarily on brainpower and only secondarily on firepower. Hence, an appraisal of low-tech aircraft and their considerable value in COIN air operations is long overdue.

The Aircraft

In his study of "Light Aircraft Technology for Small Wars," Jerome W. Klingaman advocates the development of armed, light surveillance aircraft for COIN applications.[8] According to Klingaman, rugged, inexpensive, simple aircraft are needed worldwide for sustained COIN operations from remote, forward airstrips. Developing such specialized aircraft is not really necessary, though. They are already available in abundance.[9]

For example, the Cessna Aircraft Company's Caravan I—designated the U-27A by the Department of Defense—is a single-engine, high-wing aircraft costing $825,000.[10] Its oversized tires allow operation from soft or unimproved fields, and its cabin holds up to 12 passengers. I had the opportunity to inspect the U-27A at Farnborough and found that it boasted various hardpoints for weapons, as well as a three-barrel Gatling gun that poked ominously from the port cargo door. A nearby wag quipped that such a flying contraption must certainly represent the unbridled optimism of both manufacturer and operator. Are such aircraft merely the products of slick marketing and wishful thinking, or do they represent a valid contribution to COIN operations? Let us reflect on their potential by establishing a hypothetical air force based on the U-27A.

Nation Building

To properly employ light, COIN aircraft, one must first comprehend the philosophy

Because older, surplus jet aircraft—like the T-33s shown here—are expensive and difficult to maintain, smaller air forces often buy cheaper, less complex aircraft to defend against threats.

of limited warfare as formulated by Mao Ze-dong and practiced ardently today by Communist and non-Communist alike. Because the grand scope of revolutionary warfare is beyond the purview of this article, let us just say that governments—if they are to withstand their opponents—must offer the people a better way of life than that promised by the insurgents. The people must see that their government will not wither when faced by an armed enemy but will continue to function at every level.[11] That is, police must remain on patrol, courts must function, and transportation must flow.

In Aden (Yemen) during the 1920s and 1930s, the Royal Air Force (RAF) quickly recognized the importance of air power in maintaining governmental authority in the face of insurgency.[12] By using all of air power's resources, the colonial government maintained contact with the natives and improved their lives. Airstrips soon became a blessing to a destitute population. Air power was instrumental in establishing hospitals, building schools, carrying letters, and—above all—allowing civil servants to visit remote areas many times a year instead of once in several years.[13]

More recently, Thailand has waged a successful COIN campaign based on strengthening rural institutions.[14]

This aerial photograph shows the scope of the support system required to operate aircraft at a single USAF base. Acquisition of advanced aircraft calls for complex maintenance arrangements, which can drain the financial resources of a developing country.

Equipped with low-performance COIN aircraft such as Peacemakers, Nomads, and OV-10Cs, the Royal Thai Air Force has played an important role in reaching out and winning villages over to the government's side. Such success is possible only by understanding that COIN is primarily a civic affairs problem and secondarily a military conflict in the traditional sense. Therefore, one's air force must be equipped accordingly.

An aircraft such as the U-27A can contribute to nation building in ways that the RAF pioneers could scarcely imagine. Equipped with an optional spray system, the U-27A can apply pesticides to crops, thus improving agriculture and perhaps eliminating such disease-bearing pests as mosquitoes. Eradication of the narcotics trade is another possible mission for our hypothetical air force. Furthermore, a U-27A equipped with floats could access a nation's rivers, lakes, and coastal waters and help in fishery protection, antismuggling operations, and resource exploration.

Part of a U-27A squadron could also serve as a government-operated airline. Painted in civilian colors but operated by the air force, these aircraft could be used for chartered or scheduled flights to encourage tourism and assist developers in exploiting resources. Such a fleet could be an important source of revenue yet be rapidly remilitarized if necessary. Para-

The A-37—like this one at Bien Hoa Air Base, South Vietnam, in 1967—has played a major role in the counterinsurgency mission of several air forces.

military airlines have been successful for years and are common throughout Latin America.

Vast differences in capabilities exist among third-world nations. Many countries have at least rudimentary technological expertise, but others lack any semblance of an industrial or technological base.[15] The latter, however, still need weapons and equipment and usually acquire them through outright purchase, foreign credits, or barter of raw materials.[16] By procuring relatively simple aircraft for its air arm, a nation can establish an industrial infrastructure. That is, the manufacture of noncritical parts and spare components for these aircraft can evolve into licensing agreements to provide major structures and perhaps even complete airframes for export. Pakistan, for example, started as just another customer for the Swedish-designed Supporter COIN aircraft. From that beginning, the Pakistanis progressed to delivery of semi-knocked-down kits and eventually to full production of aircraft from raw materials. In brief, the effort to equip Pakistani armed forces resulted in training, education, and employment for the local population. Thus, our hypothetical air force could become an instrument for social development and an important contributor to the counterrevolution.

Such examples suggest that aircraft are indeed crucial to the well being of civilized government in the third world.[17] An air arm equipped according to its needs and national capabilities can not only contribute to nation building in the field, but also to the very foundation of the society it serves.

Airlift

Aircraft of even modest cargo capacity can provide critical support to a government's ground forces. The U-27A's ability to accommodate either a rifle squad or 3,835 pounds of cargo is well suited to COIN military operations, which are primarily small-unit infantry engagements.[18] Further, the airlift capability of today's low-tech aircraft is sufficient to transport small units of special forces—which can be either air-dropped or airlanded into contested areas—and to supply garrisons and long-range patrols. For example, the RAF sustained a column of 1,400 men and 850 animals on the northwest frontier of India in 1930 for two days with drops of supplies from old aircraft of "very moderate lift."[19] During 1962, Great Britain's air power supported ground forces in Kenya in their efforts to disarm rebellious Turkana tribesmen.[20] De Havilland Aircraft of Canada DHC-2 Beaver aircraft landing on primitive, short airstrips adequately supplied government patrols. Similarly, Great Britain successfully supported the sultan of Oman during the 1970s. Light, simple transports such as the Short Brothers Ltd. Skyvan and Pilatus Britten-Norman Defender effectively supported remote garrisons and government patrols during the Dhofar rebellion in Oman.

Arguably, airlift capacity is not as important as airlift *availability*, given the small-unit nature of COIN. Even aircraft with nominal cargo capacity, such as the MS 500 Criquet, proved effective in the hands of the French air force during its experience in Indochina. Because the French had few helicopters, this little two-seat aircraft's ability to operate from short airstrips proved invaluable for light-cargo and medical-evacuation missions.[21] The experiences of the US Army's liaison squadrons in World War II further illustrate the capabilities and potential of light aircraft. During July 1944 the 30 L-5 aircraft of the 47th Liaison Squadron in England flew 1,048 hours, transporting 172 personnel and over 10 tons of cargo, mostly from short, unimproved airstrips.[22] Considering the superior abilities of modern COIN aircraft, we can expect even better performance in contemporary COIN environments.

Because counterinsurgencies are won by ground soldiers, air power's primary mission is to support them to the maximum extent possible, as well as the needs of the

More than just another puddle jumper, the Cessna U-27A can be outfitted in reconnaissance, paratroop, or gunship configurations. Because the aircraft can use short landing strips near isolated villages, governments can also use it in their public health and welfare programs.

army, police, militia, and civic organizations. The most valuable contribution of our hypothetical air force is to move men and materiel rapidly from one operational area to another.[23] Again, we must think along these lines and equip ourselves accordingly.

Reconnaissance, Surveillance, and Psychological Operations

In *The Third Option*, Theodore Shackley explores the nature of modern insurgency and ways of defeating it.[24] Written from an intelligence officer's perspective, the book offers useful information to people who may someday have to plan, advise, or execute a COIN aerial effort. According to Shackley, an intimate knowledge of the terrain and the areas best suited for guerrilla bases is of critical importance.[25] The slow, low-flying aircraft of forward air controllers (FAC) in Southeast Asia were instrumental in acquiring information about the land and its inhabitants. Likewise, the French air force recognized the value of light aircraft during its involvement in that region. Its Morane Criquet became the cornerstone of the war in the air because it was the only aircraft that could "see" anything.[26]

Shackley reminds us that one of the key tasks of government forces is the identification and disruption of channels for arms and supplies.[27] By using long-endurance, slow-moving aircraft, a local air arm can patrol likely areas for such ac-

With some imagination, even crop-dusting aircraft such as this G-164 AgCat can play a part in COIN operations.

tivities, particularly coasts and borders. Our hypothetical air force can assist by using the standard-issue Mark I "human eyeball" or one of the low-cost surveillance systems on the market. These packages are light and relatively simple; further, they can include items such as low-light TV and infrared devices. Having an hourly operating cost of about $120, the U-27As in our force can provide a substantial, economical aerial presence.[28]

The same airframe can be used for aerial photography and mapping of insurgent base camps, freshwater sources, and crops. We don't need fast jets or SR-71s for these tasks. In most cases our modest COIN air force will do quite nicely.

Psychological operations are another important function of an air force. Loudspeaker broadcasts and leaflet drops from light aircraft can prove valuable in the COIN environment. In Malaya, for example, 70 percent of the guerrillas who surrendered said that their decision was influenced by the "sky-shouter" equipped Austers and Valettas of the RAF.[29] By delivering information, safe-conduct passes for surrendering insurgents, literature, posters urging the relinquishment of weapons, and "most wanted" leaflets, aircraft can make a substantial contribution to the battle for hearts and minds.

Air power alone cannot defeat insurgency. In fact, more often than not, the side with air power generally loses the conflict. Although this dismal showing is due largely to political factors, the misguided use of "traditional" air power certainly has not helped. Conversely, a properly equipped air force that keeps pressure on the enemy and provides mobile, direct

support of ground forces and civil authorities can be the equalizer in COIN operations.[30]

Forward Airfields

The minimal infrastructure required by the well-planned third-world air arm allows for the deployment of small units of aircraft throughout the bush. Although not a short takeoff and landing (STOL) aircraft in the strictest sense, the U-27A can still operate from fields 2,170 feet in length.[31] The establishment of a network of these bush landing strips can produce considerable benefits. First, they enhance government authority in rural areas: aircraft transiting a government-controlled village/airstrip provide visible proof of the regime's commitment to the area. For instance, medical-evacuation flights for the benefit of soldier and civilian alike have a positive influence on morale, and cargo flights enhance the local economy.

Second, since our aircraft has a cruising speed of only 180 knots, it should be stationed as near as possible to the ground forces to enhance the rapid delivery of supplies, personnel, firepower, and other aerial support.[32] Having air support in close proximity to the battle area is a distinct advantage.

Finally, the concept of forward deployment adopts the insurgent's own rules. The insurgent relies on minimal infrastructure, versatility, support of the population, and small-unit tactics; the COIN air force should respond in kind. Small detachments of versatile, readily

High-speed jet aircraft are often ineffective against elusive guerrilla fighters. The OV-10 Bronco, however, is a fine candidate for containing the spread of insurgency or deterring it altogether in certain COIN environments.

convertible aircraft can fly casualty evacuation on one mission and fire-support or psychological operations the next. The COIN air force should, in a sense, become a unit of bush pilots well attuned to the environment. It should rip a page from the guerrilla's own doctrine and take it above the treetops.

The air force of Rhodesia (Zimbabwe) effectively used forward airfields during that nation's long and bitter insurgency of the 1970s.[33] Equipped with an assortment of C-47 transports, a few aging jet fighters, light aircraft, and helicopters, this tiny yet professional air arm proved highly innovative in the face of a black-nationalist insurgency. Using the Lynx—a license-built version of the Cessna Super Skymaster or O-2—the Rhodesian Air Force operated a network of 12 forward airfields at the peak of the insurgency.[34] Most of these little airstrips had surfaced runways from 2,000 to 3,200 feet in length, complete with shelters for storing aircraft at night. Operated by a pilot and two multiskilled ground crewmen,[35] the Lynx carried quite a punch: two .30-caliber machine guns and two 37-mm rocket pods, as well as locally designed and manufactured napalm canisters.

Like any effective COIN aircraft, the Lynx was versatile. It could be used for casualty evacuation, flare dropping, and fire support of quick-reaction teams dropped by parachute from C-47s. With a flight endurance of about three hours, the aircraft also proved its worth in aerial surveillance of hostile borders, forward air control, and convoy escort.

We can learn much about the use of aircraft in a COIN environment by studying the Rhodesian experience. With a mission-capable rate of 85 percent and an exceedingly low man-to-aircraft ratio of 1:25, the seldom-studied Rhodesian Air Force warrants attention by any student of COIN air operations.[36] Indeed, by applying such knowledge to the selection of low-tech aircraft and the adoption of proper doctrine, we may well have air support *when* and *where* we need it.

Firepower

Although COIN aircraft should be able to carry armaments, we must not overemphasize the ability to deliver ordnance. Excessive firepower, real or imagined, can be detrimental to a government's position: dead civilians win few friends among the population. Such concerns restricted the use of British heavy bombers in Kenya and Cyprus[37] and led to the employment of AT-6 trainers armed with machine guns and 100-pound bombs during the Philippine Hukbalahap rebellion of the 1950s and the Portuguese colonial insurgency in Africa during the 1960s and 1970s. Similarly, the *perception* of massive air power, brutally used, greatly restricted US operations in Southeast Asia. Unsurprisingly, insurgents will readily make a government's air force the subject of a propaganda campaign. Most recently, the Sri Lankan Air Force was falsely accused by Tamil guerrillas of using carpet bombing against the civilian populace.[38]

Another reason for the restrained use of firepower is that most insurgencies do not offer targets suitable for fast, heavy-hitting aircraft. Insurgents traditionally maintain a minimal infrastructure that limits the potential for aerial attack. They also usually travel in small groups that are difficult to discover, much less strike. Perhaps most importantly, the insurgent's tactic of mixing with the population and then encouraging government attacks can result in civilian casualties and antigovernment sentiment among the people.

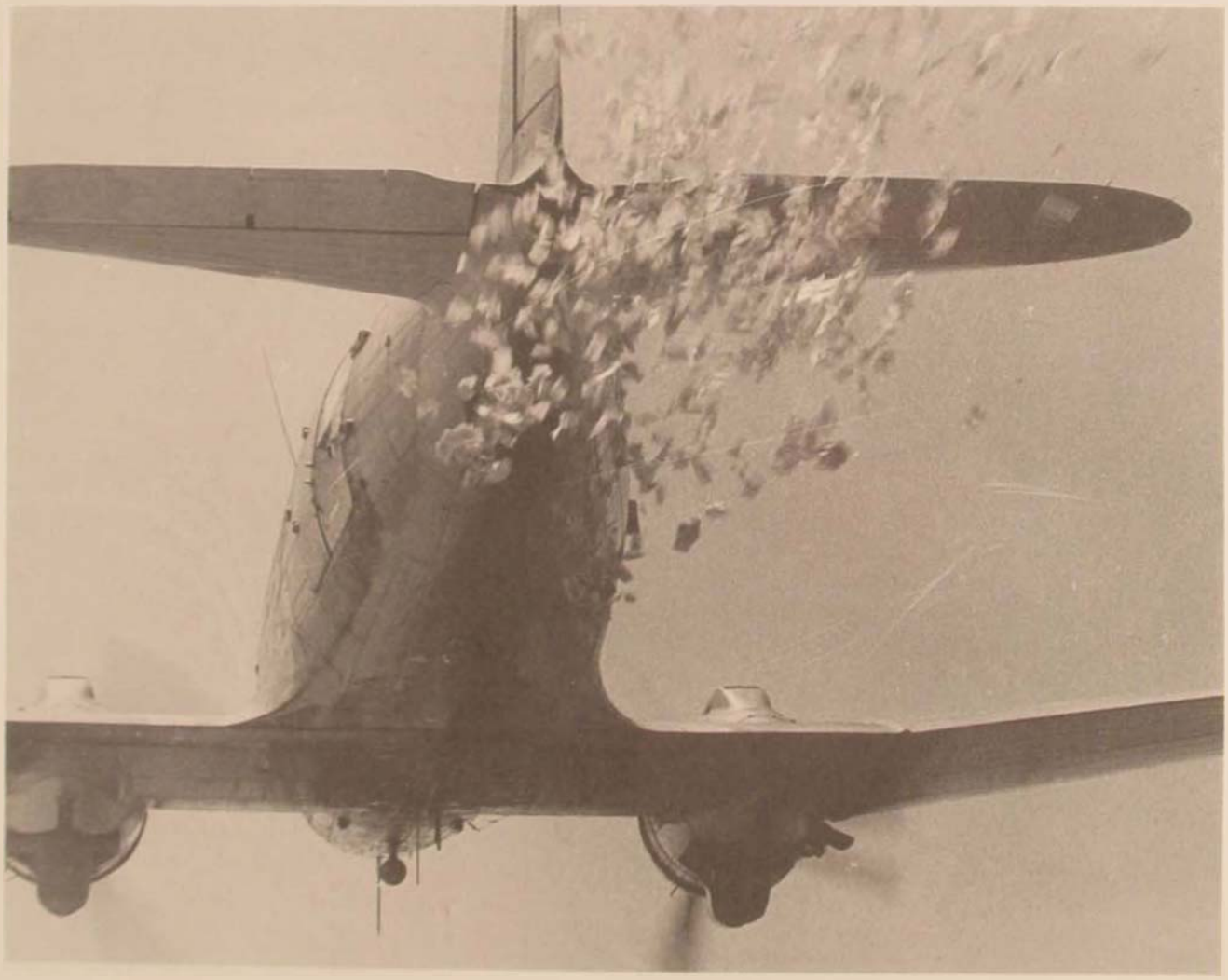
Firepower must be used judiciously and delivered with extreme accuracy. The very threat of aerial attack is often more effective than its actual occurrence.[39] Hence, our hypothetical air force of slow U-27As—with side-firing machine guns, light bombs, and rockets—provides the required accuracy and "bite" for most COIN scenarios. All of this is not to say that armed missions are useless or counterproductive. The appropriately equipped air force can perform such missions as forward air control, interdiction, light attack,

and armed helicopter and convoy escort. These missions must be planned carefully, however, for even one 100-pound bomb, poorly delivered, can unravel a government faster than 100 insurgents.

Conclusion

The use of light, simple aircraft in COIN operations is not new. The rationale for using such equipment, however, is often based on economic rather than tactical considerations. We have seen that simple,

The archetype of inexpensive, multipurpose aircraft, the legendary C-47 is shown dropping psychological-warfare leaflets over North Vietnam in 1966 (below) and—in AC-47 configuration—on the line at Pleiku Air Base, South Vietnam, awaiting another mission (right).



multipurpose COIN aircraft are not only affordable but also are often preferable to high-tech aircraft. The U-27A—representing the midrange of COIN aircraft presently available in terms of cost, complexity, and capability—illustrates the potential of such aircraft.

Taking the low-tech route does not have to be an all-or-nothing proposition. Low-cost air power can be a valuable supplement to a nation's more complex and costly assets. For example, a developing nation could replace some of its expensive, cantankerous helicopters with light, fixed-wing COIN units for armed escort and parachute deliveries. These same aircraft could also serve as control stations for remotely piloted vehicles and as command and control platforms.

Admittedly, such aircraft would meet with limited success in a COIN environment laced with radar-directed guns and surface-to-air missiles—witness the US experience in Southeast Asia, where 82 O-2 and 47 OV-10 aircraft were lost between 1962 and 1973.[40] Small wars are not necessarily easy wars. Nonetheless, a properly equipped air arm that serves its police, army, and civil authorities and that follows doctrine designed to offset the methods of unconventional warfare can assist greatly in preventing the growth of insurgency. Now is the time for many small nations to consider the possibilities, use some creativity, and constitute an appropriate air force. □

The near-vertical and/or short takeoff and landing turboprop version of the Skytrader Scout displays an impressive array of ordnance.

Notes

1. For an overview of contemporary insurgencies and other low-intensity conflicts, see Patrick Brogan, *The Fight-*

The O-2, responsible for the forward air control mission, suffered heavy losses against a determined foe in Southeast Asia.

ing Never Stopped: A Comprehensive Guide to World Conflicts since 1945 (New York: Vintage Books, 1990).

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3. Maj Richard D. Newton, "A US Air Force Role in Counterinsurgency Support," *Airpower Journal* 3, no. 3 (Fall 1989): 62–72.

4. Maj Kenneth M. Page, "US Air Force Special Operations: Charting a Course for the Future," *Airpower Journal* 1, no. 2 (Fall 1987): 58–69; Dr Sam C. Sarkesian, "Low-Intensity Conflict: Concepts, Principles, and Policy Guidelines," in *Low-Intensity Conflict and Modern Technology*, ed. Lt Col David J. Dean (Maxwell AFB, Ala.: Air University Press, 1986), 15–16; and Robert S. Dudney, "Low-Intensity: High Priority," *Air Force Magazine* 73, no. 6 (June 1990): 30.

5. "New Trainers for New Zealand," *Jane's Defence Weekly*, 20 January 1990, 115.

6. "'New' T-33s for South America," *Air Forces Monthly*, June 1989, 7.

7. Steve Salisbury, "Battle of Five Cities," *Soldier of Fortune*, September 1990, 52.

8. Jerome W. Klingaman, "Light Aircraft Technology for Small Wars," in Dean, 123–38.

9. Aircraft presently available for COIN operations include the twin-engine Pilatus Britten-Norman Defender, the Shorts Skyvan, and the Israel Aircraft Industries Arava. Single-engine aircraft include the SIAI-Marchetti SF.260W, the Pakistan Aeronautical Complex Mushshak, the Valmet Aviation Industries Vinka, and the Empresa Brasileira de Aeronautica SA Tucano. Space does not permit a complete listing of the many aircraft that are potential candidates for COIN operations, many of which are recently out of production, in production, or in developmental stages.

10. Quoted price of the basic aircraft as of 1990. A typically equipped aircraft (not including weapons) is approximately $950,000. William C. Hogan, Cessna Aircraft Company, to author, letter, 21 May 1990.

11. Lane and Weisenbloom, 36.

12. Air Commodore C. F. A. Portal, "British Air Control in Underdeveloped Areas," in *The Impact of Air Power: National Security and World Politics*, ed. Eugene M. Emme (Princeton, N.J.: D. Van Nostrand Company, Inc., 1959), 362.

13. Ibid.

14. Stuart Slade, "How the Thais Burnt the Books and Beat the Guerrillas," *International Defense Review* (editorial supplement), October 1989, 21–25.

15. Gowri S. Sundaram, "The Rise of the Third World," *International Defense Review*, March 1990, 223.

16. Ibid.

17. Portal, 362.

18. Michael J. Gething, "The Caravan of Surprises," *Defence*, September 1988, 640.

19. Ibid., 354.

20. "All My Senses Called 'Danger' ..." *Combat and Survival* 4, no. 76 (1988): 1521–22.

21. Jim Mesko, *VNAF: The South Vietnamese Air Force, 1945–1975* (Carrollton, Tex.: Squadron/Signal Publications, Inc., 1987), 7.

22. Ken Wakefield, *The Fighting Grasshoppers: U.S. Liaison Aircraft Operations in Europe, 1942–1945* (Liecester, England: Specialty Press, 1990), 61.

23. M. J. Armitage and R. A. Mason, *Air Power in the Nuclear Age* (Urbana, Ill.: University of Illinois Press, 1983), 224.
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29. Philip Anthony Towle, *Pilots and Rebels: The Use of Aircraft in Unconventional Warfare, 1918–1988* (London: Brassey's Defence Publishers, 1989), 91.
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32. Ibid.
33. Dudley Cowderoy and Roy C. Nesbit, *War in the Air: Rhodesian Air Force, 1935–1980* (Alberton, Republic of South Africa: Galago Publishing Ltd., 1987), 60–62.
34. "Cessna 337 Lynx Rhodesian Operations," *Warplane* 8, no. 85 (1987): 1681–85.
35. Ibid.
36. Peter Abbott and Philip Botham, *Modern African Wars: Rhodesia, 1965–80*, Osprey Men-at-Arms Series (London: Osprey Publishing, 1986), 33.
37. Towle, 4.
38. Ibid., 209.
39. Ibid., 210.
40. Rene J. Francillon, *Vietnam Air Wars* (London: Temple Press, 1987), 210.

Winter 1990

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THE ROLE OF TACTICAL AIR POWER IN LOW-INTENSITY CONFLICT

CAPT VANCE C. BATEMAN, USAF

THE creation of the Jungle Jim program in the summer of 1961 and its rapid growth into the Farm Gate operations of Vietnam marked a period during which the tactical air force (TAF) developed and employed doctrine and tactics to fight in a low-intensity conflict (LIC) arena.[1] Since the early 1970s, however, the TAF's capability to play a comprehensive role in LIC has been on a steady decline, to the extent that its operations are now limited almost entirely to direct applications of US military power. The US Air Force possesses few assets suitable for operating in a LIC environment. The ones it does have—including AC-/MC-/C-130s and several types of helicopters within the Air Force Special Operations Command (AFSOC)—are specifically designed and employed for direct action within the LIC spectrum.[2] TAF assets such as the F-111 and F-117, meant for direct application of conventional US military power, may be adapted to operate in LIC peacetime contingency operations (PCO) as the need arises, but they very rarely train for employment in this capacity.

The advent of AFSOC and the preparation of a revised multiservice doctrine for LIC are encouraging developments. However, they only highlight the fact that the USAF—not to mention the TAF—is not prepared to support foreign and US government policies in a LIC environment beyond short-term US contingencies involving direct military action. If the USAF is to participate across the *entire* spectrum

of LIC—specifically, in support of indirect applications of US military power—it must place greater emphasis on developing and applying TAF doctrine, tactics, and operational assets geared toward supporting foreign nations' requests for internal defense and security assistance. By more broadly applying TAF capabilities according to host-nation requirements under peacetime conditions, the US may avoid the necessity of direct military action in the future.

Low-Intensity Conflict

The term *low-intensity conflict*, as adopted by the Joint Chiefs of Staff (JCS), is defined as a

> political-military confrontation between contending states or groups below conventional war and above the routine, peaceful competition among states. It frequently involves protracted struggles of competing principles and ideologies. **Low intensity conflict** ranges from subversion to the use of armed force. It is waged by a combination of means employing political, economic, informational, and military instruments. **Low intensity conflicts** are often localized, generally in the Third World, but contain regional and global security implications.[3]

In a study for the Army-Air Force Center for Low Intensity Conflict, Col Howard L. Dixon applied risk and probability curves to a conflict spectrum ranging from normal diplomacy through strategic nuclear holocaust. Further, Dr Richard H. Schultz, Jr., author of an essay on low-intensity conflict in US policy, developed a graphic representation of the LIC spectrum. This graphic, combined with the risk and probability curves cited by Colonel Dixon (see figure), provides a useful model of the JCS concept of LIC.

Low-intensity conflict encompasses four categories: insurgency and counterinsurgency (COIN) operations, antiterrorism operations, peacekeeping operations, and PCOs.[4] These categories provide a framework for evaluating the USAF's ability to support US national security policy in a LIC environment.

The antiterrorism and peacekeeping operations fall more within the realm of entities such as the Central Intelligence Agency, Drug Enforcement Agency, and United Nations, but the Department of Defense bears the primary responsibility for insurgency/COIN operations and PCOs. JCS Pub 1–02, *Department of Defense Dictionary of Military and Associated Terms*, describes counterinsurgencies as "those military, paramilitary, political, economic, psychological, and civic actions taken by a government to defeat an insurgency."[5] FM 100–20/AFP 3–20, *Military Operations in Low Intensity Conflict*, adds that

> operations by US forces in support of counterinsurgencies will rarely be direct combat engagements. Normally they will provide indirect support in terms of security assistance, joint or combined exercises, and logistic support. Certain forms of direct assistance such as intelligence sharing, communication support, civic action, drug interdiction, opportune intertheater airlift, and tactical operations can also be employed.[6]

In supporting insurgency and COIN operations, "US policy recognizes that indirect, rather than direct, applications of US military power are the most appropriate and cost effective ways to achieve national goals."[7] Security assistance in the form of

training, equipping, and providing combat support to host nations is the principal US military instrument applied.

On the other hand—according to FM 100–20/AFP 3–20—PCOs are "politically sensitive military activities normally characterized by short term, rapid projections or employment of forces in conditions short of war which complement political and informational initiatives." They include but are not limited to

- shows of force and demonstrations,
- noncombatant evacuation operations,
- rescue and recovery operations,
- strikes and raids,
- peacemaking operations,
- unconventional warfare,
- disaster relief,
- security assistance surges, and
- support to US civil authorities.[8]

These operations are almost always directed toward aggressive actions against US national security that require an immediate response. Moreover, in contrast to insurgency/COIN operations, US policy on PCOs usually calls for the direct application of military power.

The Role of the Tactical Air Force in Insurgencies and Counterinsurgencies

An examination of the USAF's capability to support US policies in the LIC arena reveals a force structure capable of carrying out PCOs but virtually incapable of supporting insurgency or COIN operations. Five operations involving the use of military power within the LIC spectrum—most of them occurring within the previous decade—demonstrate this point: Desert One (Iran, 1980), Urgent Fury (Grenada, 1983), El Dorado Canyon (Libya,

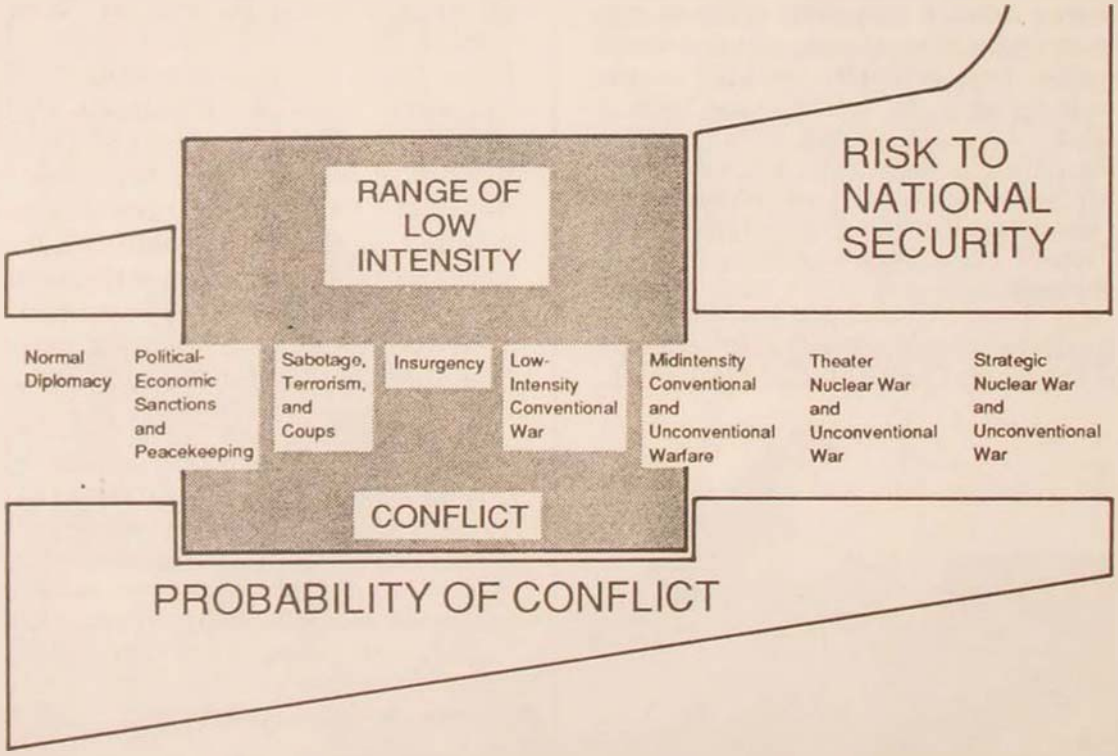

Figure. Risk and Probability within the Spectrum of Conflict. Adapted from Dr Richard H. Schultz, Jr., "Low-Intensity Conflict and US Policy: Regional Threats, Soviet Involvement, and the American Response," in *Low-Intensity Conflict and Modern Technology*, ed. Lt Col David J. Dean (Maxwell AFB, Ala.: Air University Press, 1986), 77; and Col Howard L. Dixon, *Low Intensity Conflict: Overview, Definitions, and Policy Concerns* (Langley AFB,Va.: Army-Air Force Center for Low Intensity Conflict, June 1989), 4.

1986), Just Cause (Panama, 1989), and Desert Shield (Saudi Arabia, 1990). Over the past 15 years, the USAF has concentrated almost entirely on equipping and training its special operations forces primarily for a few types of PCOs and for the unconventional warfare requirements of the theater commander. The USAF's capability to support LIC operations beyond direct-action, short-duration missions using AC-/MC-130s, MH-60/-53s, and F-111/-117s is far less adequate.[9] Furthermore, notwithstanding the value of these aircraft in such direct actions, most of their operational capabilities are superfluous to the demands of numerous other LIC situations, and their cost and complexity usually limit their employment flexibility.[10]

The picture is not entirely bleak. An excellent example of TAF assets employed in indirect application of US military power within a LIC environment is the use of Tactical Air Command (TAC) A-37s from the 24th Tactical Air Support Squadron (TASS) in deployment training exercises (DTE) throughout Central and South America. The mission of the 24th TASS is to provide maintenance assistance and certain aircrew training to nations that fly A-37s in US Southern Command's area of operations. Unfortunately, under current austere budget conditions, the days of TAC assets deploying to Latin nations for training purposes are in their twilight. DTE cutbacks could mean not only the degradation of flying proficiency among allied nations but also further diminishment of the TAF's capability to support USAF policy within the LIC environment.

Shortfalls in experienced personnel trained to operate and effectively employ USAF assets within a low-intensity conflict began with the demise of the USAF Special Air Warfare Center in the late 1960s. This deficiency had an adverse effect on our actions in Iran and Grenada, and it may also have affected our ability to shape the events leading up to the invasion of Panama in December 1989. Interestingly, a comprehensive Army/Air Force doctrine on LIC had not been published until that very month, even though Panama was an acknowledged LIC environment for at least two years prior. This fact further illustrates the apparent lack of attention to or understanding of the USAF's potential role within the entire spectrum of LIC.

Building from Past Experience: A Proposal

If the TAF is to participate more broadly in the USAF's role of supporting national strategy in the LIC arena, it must begin now to develop a clear doctrine that guides tactics not only for PCOs but also for insurgency or COIN operations through foreign internal defense (FID) programs. One option is to commit assets to a small force that can operate and develop experience in *low*-technology, *low*-cost environments.[11] The aircrew and support personnel of such a force could apply their experience to the aircraft and support environment of a nation seeking US assistance.[12] These personnel could also serve as a think tank on insurgency and COIN, and could test proposed weapons for foreign military sales (FMS) to third-world buyers.

The model for such a force exists in the 5th and 6th Fighter Squadrons of the early 1960s. The USAF could reactivate these twin fighter squadrons, making them components of AFSOC. The 5th would be dedicated to educating and training US and third-world air forces to employ air power in an insurgency/COIN arena. Not dependent on overseas military bases, this squadron would be permanently based in the United States, where third-world nations could send their military personnel for training in LIC flying doctrine and tactics. US pilots would develop tactics and provide flying instruction to meet the mission-specific needs or circumstances of a supported nation, rather than simply build their own experience by flying that country's aircraft.[13] The 6th Fighter Squadron would also be permanently located in the US but would deploy or tem-

porarily detach to locations worldwide to integrate and train with host-nation air forces. Thus, it would supplement FID efforts or security-assistance surges in support of US policies in the third world.

Both squadrons would operate light fixed-wing aircraft equipped for strike and/or visual reconnaissance; these planes would be inexpensive to produce, economical to operate, and easy to maintain. Some future possibilities for AFSOC aircraft include the following:

1. The Piper PA-48 Enforcer, a lightweight turboprop aircraft based on the P-51 Mustang. This aircraft completed several phases of aircraft weapons-development testing at Eglin AFB, Florida, and Edwards AFB, California, in 1984 and was placed in storage at Davis-Monthan AFB, Arizona, later that year. It is equipped with an ejection seat, is capable of carrying 5,500 lb of ordnance at 220 knots, and can take off in less than 1,800 feet. Armament capabilities include Mk 20 Rockeye bombs, Mk 82 Snakeye general-purpose bombs, and six launchers of 2.75-inch rocket pods.[14]

2. The Ayres Vigilante, a ground-attack aircraft derived from a crop duster. A proven aircraft (over 2,500 are in service in 65 nations), it can take off in less than 1,000 feet while carrying 4,200 lb of ordnance and stay airborne for seven hours on internal fuel. It can be fitted with a simple or complex forward looking infrared radar (FLIR), depending on country requirements. At a cost of about $1 million a copy, it could serve as an inexpensive, proven weapon system with a logistical support network already in place in many countries.[15]

3. The Sadler A-22, a light attack aircraft currently costing $100,000 each. This aircraft is equipped with Kevlar ballistic protection up to 7.62-mm penetrations and comes with four NATO hardpoints that permit 1,000 lb of ordnance or a 30-mm cannon. The power plant is a fuel-injected Chevrolet V-6, which gives aircraft with a full ordnance load a cruise speed of 195 knots and a short takeoff and landing (STOL) capability of 300 feet on a grass airstrip. The A-22 will also fold up and fit into a standard two-and-one-half-ton truck, giving it the capability to be moved covertly.[16]

The squadrons could also employ OA-/A-37s, OV-10s, and OA-/A-10s already in the USAF inventory. The A-37—whose life span extends well into the year 2000—is flown in 12 third-world countries, and over 150 are flying worldwide. Likewise, the OV-10 and A-10 will be increasingly available for FMS in the near future as USAF tactical air support squadrons begin to deactivate. In addition to these aircraft, the squadrons could possibly employ others, such as the Aermacchi MB-339C, the *Fábrica Argentina de Materiales Aeroespaciales* (FAMA) IA 58A Pucará, and the Embraer EMB-312 Tucano, which third-world countries could easily buy and maintain without necessarily relying on US suppliers.

Common Criticisms and Some Responses

The positive features of these aircraft notwithstanding, commentators point out that low-speed light aircraft are vulnerable to antiaircraft artillery (AAA) fire. Generally speaking, however, the aircraft mentioned above would not be employed against computer-controlled AAA or chassis-mounted surface-to-air missiles (SAM). Rather, the squadrons would use them in typical insurgency/COIN environments where one would expect AAA no larger than manually controlled 23-mm guns and portable instead of mounted SAMs.[17]

This point is clearly illustrated by the recent conflict in Panama, during which the large number of small arms posed a greater risk to aircraft than did the fewer, less mobile, and more easily neutralized ZPU-4 AAA batteries. One should also remember that Gen Manuel Noriega could have bought a far greater arsenal of heavier antiaircraft weaponry than most insurgent

Maintenance personnel from the 24th Tactical Air Support Squadron (Howard AFB, Panama) provide training assistance to crews of the 7th Aero Group, 711th Attack Squadron (Piura, Peru) during a deployment training exercise to Peru in October 1989.

guerrilla armies can field. Further, employment of fixed-wing assets by the El Salvadoran Armed Forces (ESAF) over the course of the decade-long conflict against the *Frente Farabundo Marti de Liberacion Nacional* (FMLN) guerrilla insurgency demonstrates the effectiveness of light aircraft in a LIC arena. Although threatened by SA-7 SAMs, the ESAF was able to effectively fly its A-37s without the advantage of high-technology infrared countermeasures. These examples show that if aircrews use proven tactics and procedures, they can successfully employ aircraft such as the A-1, A-37, and O-1 in COIN roles.[18]

Another argument against developing and employing fixed-wing aircraft in support of insurgency/COIN conflicts is that helicopters are better suited for such operations. Helicopters do indeed have a proven role in LIC, but their effectiveness is constrained by higher long-term costs and greater attrition rates. In general, operating and maintaining helicopters can be quite expensive because they require more specialized maintenance than light fixed-wing aircraft. Thus, most third-world countries cannot afford them.[19] The experience of three Central and South American countries—El Salvador, Guatemala, and Peru—illustrates this point. On average, these countries can maintain and operate only 30 percent of their total helicopter inventory at any given time. Helicopters are also considerably more susceptible to small-arms fire than are light fixed-wing assets, as was demonstrated in Panama. In situations where both helicopters and small, fixed-wing attack aircraft were involved in close-air-

support missions, only the helicopters received battle damage. Indeed, because helicopters sustained heavy losses flying strike missions in support of COIN operations in El Salvador, the ESAF reassigned them to armed reconnaissance and medical/counterguerrilla evacuation.

This point does not necessarily suggest that helicopters are not effective in a LIC environment. It merely distinguishes the US Army's air mission in LIC from the USAF's, within the context of (1) realistic funding for operations in the third world and (2) the inherent limitations of helicopters.[20] Through USAF training and assistance, a third-world nation could employ its own fixed-wing assets in concert with insurgent or counterinsurgent ground forces to effectively combat LIC problems without relying on direct US intervention.

Perhaps the most politically sensitive and frequently raised issue is cost. In the face of major budget cutbacks that threaten a 30-percent drawdown of forces, the suggestion of introducing two new units—the 5th and 6th Fighter Squadrons—may well seem untenable. Moreover, the proposed transfer of some TAF assets to AFSOC would meet considerable resistance. The economic and political aspects of the TAF's contribution to the USAF's role in LIC are beyond the scope of this article. However, the fact that LIC is the most prevalent form of conflict in the world today and the fact that the cost of our direct military involvement is steadily increasing—in terms of both money and lives—demand that we look beyond our more parochial concerns.

Captured Panamanian Defense Force (PDF) ZPU-4 antiaircraft artillery. All such batteries in the PDF inventory were quickly neutralized during Operation Just Cause (December 1989) and proved less of a threat than small-arms fire.

Conclusion

These are extremely turbulent times, characterized by the most sweeping changes in the balance of regional power since the beginning of the cold war. Remarkable developments on the international front, including new Soviet-US initiatives, the reunification of Germany, the disintegration of the Warsaw Pact, and destabilization in the Middle East, clearly signal a new era in East-West relations. These changes also call for a reevaluation of the "Fulda Gap syndrome," which has driven resource allocation as well as the doctrinal and strategic thinking of the military since World War II.[21] Meanwhile, long-term problems in the third world—such as narcotics trafficking, leftist insurgencies, terrorism, and national debt—will have increasingly grave implications for US interests over the decades to come.

In order for the USAF to support US national security requirements as they change, it must adopt new doctrine, tactics, and capabilities that combat such third-world problems. The USAF needs to resurrect its ability to train and equip the air forces of foreign countries so that those nations can handle LIC-related problems by more effectively using their own military resources. Thus, the USAF could avoid the costly direct-action operations that would be necessary to protect these countries when they are threatened. With creativity and relatively limited investment, the TAF could shift some of its manpower and flying assets to restore the capability that the USAF once possessed during the Jungle Jim days of the 1960s.[22] Bringing back the 5th and 6th Fighter

USAF A-37s over the Bridge of Americas, Panama. Eleven Central and South American air forces fly the A-37 in a tactical-air-support role and train with USAF pilots and support crews through deployment training exercises.

Squadrons and placing them under AFSOC authority would better equip the USAF to meet LIC challenges and would make a lasting contribution to combatting some of the most pressing problems of the next century. □

Notes

1. In April 1961, in response to President Kennedy's mandate to the Department of Defense to develop units capable of combatting guerrilla warfare, the USAF established the 4400th Combat Crew Training Squadron (CCTS) at Eglin AFB, Florida. Code-named Jungle Jim, the 4400th CCTS (later to become the 1st Air Commando Group) was tasked to learn and develop counterinsurgency tactics, using aircraft suitable to the conditions prevalent in Southeast Asia and Central America. Philip D. Chinnery, *Life on the Line: Stories of Vietnam Air Combat* (New York: St. Martin's Press, 1988), 11.

Within a year, the 6th Fighter Squadron, a component of the 1st Air Commando Group, was in Vietnam conducting Farm Gate operations, flying aircraft such as the T-28, B-26, and O-1. In the same time frame, another detachment was sent to Panama to fly similar aircraft for a similar objective—to deter guerrilla warfare by training foreign military forces in the techniques of counterinsurgency. Allan R. Scholin, "Air Commandos," *Air Force and Space Digest*, August 1962, 40–44.

2. Lt Col David J. Dean, *The Air Force Role in Low-Intensity Conflict* (Maxwell AFB, Ala.: Air University Press, October 1986), 107.

3. JCS Pub 1–02, *Department of Defense Dictionary of Military and Associated Terms*, 1 December 1989, 212.

4. Col Howard L. Dixon, *Low Intensity Conflict: Overview, Definitions, and Policy Concerns* (Langley AFB, Va.: Army-Air Force Center for Low Intensity Conflict, 1989), 28; and FM 100–20/AFP 3–20, *Military Operations in Low Intensity Conflict*, 1 December 1989, 1–10.

5. JCS Pub 1–02, 93.

6. FM 100–20/AFP 3–20, 2–40.

7. Dixon, 35.

8. FM 100–20/AFP 3–20, 1–2; 18.

9. Dean, 107–8.

10. Lt Col William F. Furr and Maj Ronald L. Zelms, eds., *Key LIC Speeches, 1984–1989* (Langley AFB, Va.: Army-Air Force Center for Low Intensity Conflict, 1989), 24.

11. The term *low technology* is often incorrectly equated with technological and military obsolescence. More accurately, low technology refers to weaponry that is proven, durable, and reliable; it may encompass high technology but rarely includes leading-edge technology. John E. Jordan, Jr., and Thomas C. Lobenstein, "Technology Overview," in *Low-Intensity Conflict and Modern Technology*, ed. Lt Col David J. Dean (Maxwell AFB, Ala.: Air University Press, June 1986), 108.

12. Maj Richard D. Newton, "A US Air Force Role in Counterinsurgency Support," *Airpower Journal* 3, no. 3 (Fall 1989): 70.

13. Ibid., 70–71.

14. John W. R. Taylor, ed., *Jane's All the World's Aircraft, 1984–85* (New York: Jane's Publishing, Inc., 1984), 478.

15. *Meeting Third World Needs with Security Assistance* (Langley AFB, Va.: Army-Air Force Center for Low Intensity Conflict, 1989), 44–46.

16. Ibid., 48–50.

17. Jerome W. Klingaman, "Light Aircraft Technology for Small Wars," in Dean, *Low-Intensity Conflict and Modern Technology*, 133.

18. Ibid.

19. Ibid., 128–29.

20. Ibid., 129.

21. Fulda Gap syndrome is the tendency among military planners over the past few decades to build future war scenarios entirely on the assumption that the next war would occur on the European plain, with the Soviet Union launching its primary attack through the Fulda Gap on the former East German border.

22. Newton, 72.

Ricochets
continued from page 3

tasks will be to support those interests, what kind of armed forces it will take to meet national commitments, and—finally—how the Air Force can best provide the air power to this new equation.

It would seem clear that the correct use of air power will be as important as ever in this new environment. The challenge will be to structure our Air Force so it can best do the job it will be called on to perform. Our new Air Force will be smaller, tougher, more combat ready, more mobile, and even more motivated—as well as being on fewer bases and on a higher readiness status—than the Air Force of today.

Perhaps one of the most critical features we must build into our Air Force is a return of operational command to lower levels. We are not going to have either the funds or the manpower to pile commanders and their staffs, one on top of the other in multiple levels, with the complex communications structure that such an organization demands. Further, the wide range of geographic and climatic conditions to be faced and the diversity of operational chores to be accomplished will dictate smaller mission packages and more flexible planning procedures and operational concepts than exist today. A careful study of the composite wing structure is in order.

We are fortunate that General McPeak is in a position to implement some of his forward-looking ideas. Certainly, looking into an organizational structure that will permit a wing commander to meet a broader spectrum of operational problems without having to call for outside help should have a high priority.

Lt Gen James V. Edmundson, USAF, Retired
Longboat Key, Florida

PROMOTION SYSTEM REPRISE

After reading "How to Get Promoted" (Spring 1990), I resisted the urge to write in dismay at the beliefs and sentiments it contained.

After reading the letters from Lt Col Tim E. Moreland, Jr.; Lt Col Paula A. Bernard; Lt Gen Otto J. Glasser; Lt Col Donald O. Ross, Jr. (a superb letter); Col Ronald N. Jackson; Capt Kelley C. Westenhoff; and Maj Howard W. Moffatt, Jr., I am writing to express my joy at their reactions. As usual, leave it to the troops; they know better!

Lest there be any doubt, I must tell Col Michael E. Heenan that the last sentence of his letter—"The frightening thing is he [Gen Dale O. Smith] may be right"—expresses a nonconcern. After 37 years of military service—all of it involving the training and selection of good and great people—combat in three wars, and 13 years in the Pentagon, I'm sure the author was not and will not be right.

I'll bet on the system taking the likes of Moreland, Bernard, Ross, Jackson, Westenhoff, Moffatt, and Heenan up as far as Air Force needs and vacancies permit. In General Glasser's case, it did—and his neck was out all the way, backed up with brains, guts, hard work, and fierce independence.

Bet on the system, troops—it isn't perfect, but it's yours. Work your heart, mind, soul, and body 100 percent to improve it; and build better aerospace power for US security with it—in the magnificent company of a host of fine people. And don't give con artists, in or out of uniform, the time of day. Leaders, worth a damn, are lonely for people like you to work with them and for them.

Gen Robert J. Dixon, USAF, Retired
Fair Oaks Ranch, Texas

PROFESSIONAL DEVELOPMENT CONCERNS

Hurray for Lt Col Bruce L. Ullman's article on "Officer Professional Development for Lieutenants" (Fall 1990). He accurately stated what I have felt during my first three years on active duty. It's true—I don't really feel like an officer. I feel like my superiors expect me to be a scientist in uniform. The careerism attitude has annoyed me so much that I'm considering separation. Hopefully, things will change.

1st Lt Alexander L. Holder, USAF
Edwards AFB, California

AIR BASE DEFENSE AND PME

This letter is in response to a letter written by Army SSgt Scott E. Rogers, published in the Spring 1990 issue of *Airpower Journal*. I could not agree more with SSgt Rogers' assessment of the Air Force's air base defense problems.

I've been in the Air Force for almost six years. During that time I've been stationed at missile bases in the United States. Admittedly, the chance of coming into contact with enemy forces on those bases is unlikely, but this should not lessen the necessity of being pre-

pared. The tactics and weapons training that most officers receive is slim to none. To illustrate this point, I'll use myself as an example. Since joining the Air Force, I have been trained to use two weapons—a .38-caliber handgun and intercontinental ballistic missiles. I have shot the handgun every year for four years, shooting between 50 and 100 rounds each year. I have not received any training on other weapons or tactics. I thought this would change when I was selected to attend Squadron Officer School. I couldn't have been more wrong. Like many of my classmates, I came back to my unit disillusioned about professional military education (PME).

The Air Force had an excellent opportunity to teach us tactics and the use of weapons, thus increasing our professional knowledge. Instead, they increased our knowledge of what many of us learned during our precommissioning training. PME should increase our expertise in the management of violence. It's time PME was used to train us in weapons and tactics—something that our units don't have the time, money, or expertise to accomplish.

Capt Keith A. Hackett, USAF
Vandenberg AFB, California

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net assessment

The Training of Officers: From Military Professionalism to Irrelevance by Martin van Creveld. New York 10022: Free Press, 1990, 134 pages. $19.95.

Van Creveld's purpose in *The Training of Officers* is to provide a historical and comparative overview and critique of the preparation of military officers for midlevel and senior-level command and staff positions. The book is fairly evenly divided into historical overview and contemporary comparisons on the one hand and critique and recommendations on the other.

The historical overview sketches the preparation of military commanders from classical times through the eighteenth century. This section, with the exception of one paragraph on military leadership in the Bible, is confined exclusively to European examples. As van Creveld points out, not until the sixteenth century did officer preparation include anything beyond that provided by practical experience on the battlefield. It was not really until the early nineteenth century that technological advances and the introduction of what is now called the operational level of war demanded a professional officer corps. This, in turn, required the maintenance of military capabilities in peacetime and, hence, the establishment of professional military education.

Van Creveld presents a fairly detailed description and comparison of the preparation for midlevel and senior-level officers of Prussia/Germany, France, Britain, Russia/the Soviet Union, and the United States from the early nineteenth century. Each description includes relevant information on the military institution within each society and on national characteristics and predilections. Included in each description are tantalizingly short comments about the impact of officer preparation on actual performance in war. For example, van Creveld notes that in World War II, Americans excelled at the strategic level of war rather than at the operational level. Germans, on the other hand, excelled at the tactical and operational levels of war but failed at the strategic level. This section of the book would be improved if these comments were expanded by analysis of the relationship between officer preparation and fighting effectiveness.

The second half of the book (problems, conclusions, and recommendations) is not quite up to the quality of the first half—nor is it the caliber of van Creveld's previous books: *Supplying War* (1977), *Command in War* (1985), or even *Fighting Power* (1981). The quality of *The Training of Officers* is uneven, not unlike that of *Technology and War* (1989). In failing to consistently differentiate between training and education, van Creveld confuses preparation for leadership at the tactical level of war and preparation for leadership at the operational and strategic levels. This half of the book, which concentrates on professional military education (PME) in the United States, includes comparisons with other countries' PME systems. Although somewhat dated, an extended description of the Soviet Union's PME system is particularly good.

Van Creveld's identification of shortcomings of American PME is conventional. For example, these shortcomings have been consistently identified for 40 years at Air University. He concentrates on questions of faculty qualifications, curricula, examination and research requirements, passive and active involvement in the education process, length of courses—all valid concerns made time and again by a variety of observers. There is really no argument that these issues have not been addressed (with the exception of the reforms of Adm Stansfield Turner in 1972 at the Naval War College). These shortcomings, however, are symptoms of the problems, not their sources.

What is lacking in *The Training of Officers*—and what is greatly needed—is an objective analysis of why corrections have not been undertaken. Possible areas for research regarding why the United States has not developed a truly professional officer corps include (1) the attitude of the highest US military authorities regarding the value of PME in professional development, (2) the impact of not having been defeated in general war, and (3) the preeminence of US strength in the postwar world. In this regard, van Creveld does mention that the perception of war itself has changed. War, which once meant the violent struggle between

rival societies to attain competing political objectives, now means maintaining large armed forces. Therefore, bureaucratic and budgetary matters dominate—perhaps even displace—"military matters."

For American armed forces, van Creveld recommends downplaying civilian graduate academic degrees, focusing on practical training at the staff colleges, and consolidating the four war colleges into one national war college. These and other of his recommendations seem to ignore the civil-military mix in the US military establishment, the problems associated with specialization in the larger society and in the armed forces themselves, the absence of a clear-cut professional expertise common to all officers, and so forth.

Van Creveld also is convinced that the problems he has identified will solve themselves if PME institutions grant graduate degrees—because they will have to be accredited by civilian institutions. This attitude may have some merit, considering the quality of civilian-accredited graduate degrees granted by the Defense Intelligence College, Naval Postgraduate School, Air Force Institute of Technology, and Army Command and General Staff College. (Van Creveld, who does not mention any of these programs, confines his discussion of mid-level and senior-level officers to the PME programs of the staff and war colleges.) On the other hand, PME is not necessarily doomed to mediocrity merely because academic degrees are not granted.

The extensive bibliography is disproportionately weighted toward the historical (which is only half of the book), whereas sources for problems, conclusions, and recommendations are underrepresented. For example, although van Creveld includes such evaluations as the 1946 (Lt Gen Leonard T.) Gerow report, he does not include the (Deputy Secretary of Defense William) Clements reports (1975–76) or the (Rep Ike) Skelton report (1988).

Training of Officers is useful for anyone wanting an excellent, short description of nineteenth- and early twentieth-century European and American staff and war colleges. In addition, the book provides a compilation of conventional—but basically incomplete—criticism of American PME. Nevertheless, this criticism is of value to readers who are not acquainted with the shortcomings of American PME, as well as those already acquainted with the shortcomings. The latter, however, probably would expect a more in-depth, insightful analysis from one of the foremost military historians of our time.

Col Jeffrey C. Benton, USAF
Chanute AFB, Illinois

Air Power: Collected Essays on Doctrine edited by Group Capt A. G. B. Vallance. London: Her Majesty's Stationery Office, 1990, 122 pages.

Air Power is a collection of essays dealing with the state of air power doctrine in Great Britain, the United States, France, Germany, the Soviet Union, and Australia, edited by the director of defense studies for the Royal Air Force. It is an important and timely book. Unfortunately, it will probably not attract the attention it deserves because doctrine, as the various authors state, deals with the mind and is not an exciting subject to aviators, who prefer to consider themselves "doers." Partly because of this attitude, airmen worldwide are having difficulty adjusting to a rapidly changing world. The underlying theme of this book is that air power is at a crucial crossroads and that clear vision is needed to choose the correct path.

As in most such collections, the essays are of uneven quality: two are excellent, three are interesting, and three are forgettable. Oftentimes, anthologies also lack a unifying theme; to some extent this one is no exception. Some essays are philosophical, discussing air power in the broadest sense, while others—the chapters on France, Germany, and the Soviet Union—deal with operational considerations peculiar to those nations. Nonetheless, common threads tie the book together: all stress the unique aspects of air power—its speed and flexibility—and the need to centralize air assets to maximize these capabilities.

The authors admit that, beyond these broad premises, airmen agree on little else. Aircraft have been a major factor in war only since the start of World War II; thus, there are few clear lessons concerning the employment of air power. In addition, most airmen see little relevance in history and prefer to look ahead, not back. This forward gaze is reinforced by a technological bent—aviators like gadgets instead of books. Moreover, and most damning, those people who are inclined to think about air power are, by and large, "a relatively inarticulate lot."

This blunt comment is made by Col Dennis Drew of Air University's Airpower Research Institute, in one of the book's two outstanding essays. Drew maintains that air power's "age of

prophecy" ended with World War II but that the doctrines of the 1930s lived on to provide the military framework of the postwar era. The Vietnam experience, in which air power was unable to achieve a quick victory, left deep scars on the Air Force psyche. Judging from the essays here, the air arms of other countries were similarly affected. As a consequence, what had previously been regarded as fundamental truths were questioned and then discarded. The diminution of the Soviet threat has furthered the turbulence, since force structures, technology, and doctrine have been to a great extent based on the "European scenario." Airmen have thus been left without an intellectual anchor. Since they themselves are unsure of air power's capabilities—and limitations—they are unable to influence the other services, the public, and political leaders. In this era of fiscal restraint, such confusion could be fatal. New ideas are needed, and they are needed quickly.

The other outstanding essay is by Group Capt Brian L. Kavanagh and Group Capt David J. Schubert of the Royal Australian Air Force. For political, economic, and geographic reasons, Australia—like the US—needs to project military power over great distances quickly and without the cost and risk of inserting ground forces. Air power is the logical tool to meet these needs because of its ability to conduct three separate campaigns simultaneously. First, aircraft gain air superiority by defeating an opponent's air force, allowing more effective use of military force. Second, air power plays a major role in surface operations, complementing the activities of soldiers and sailors. Lack of air cover is certainly not something our Army and Navy care to envision. Third, and most importantly, air power can conduct a strategic campaign against an enemy's centers of gravity—command and control networks, industry, and infrastructure. This campaign is the most controversial but also the most crucial. If such independent air operations were not possible, there would be little justification for an independent air arm. "Unity of command" would dictate that supporting air forces be placed under the control of the ground commander, as is Marine Corps air. Conducting independent strategic operations is therefore a critical element to our Air Force. Far more importantly, however, such a capability is essential to our national interests. To reiterate, the ability to conduct these three separate campaigns *simultaneously* makes air power both unique and vital.

Another provocative and timely issue raised by Kavanagh and Schubert concerns the conflicting pressures of "jointness" and the "indivisibility of air power." Most air leaders support the concept of centralized control and decentralized execution. Because of the range, speed, and power of aircraft, they should be massed to provide theaterwide effects. (One could argue that the USAF's "theater" is the entire globe.) Parcelling out airplanes to corps or flotillas would be as foolish as issuing artillery to an infantry platoon. One does not assign long-range assets to forces operating with short-range objectives and vision. The problem, however, is that air power is so essential to surface commanders that they are sorely tempted to covet and divide air assets to achieve their own, limited objectives. Attempts to resist these efforts and consolidate air power so as to mass for greater effect are, however, often seen as parochial. The fact that we all must wear purple seems to argue against the concept of independent operations. Striking the proper balance between independence and jointness is a thorny and controversial issue that American air leaders also need to address.

One must note that while all the authors list the traditional strengths of air power, they also cite its commonly held limitations: the inability to hold ground and the necessity of fixed overseas bases. But while airmen contemplate how the traditional strengths of air power can best be used in the changing world, they should also reevaluate traditional charges of air power's weaknesses. Underselling air power can be as harmful as overselling it. First, it is possible that the need for occupying and holding ground is an outdated concept. Rather than always occupy territory, one need only deny its use to the enemy, and air power *can* often deny. Bombing rendered the Ruhr useless to Nazi Germany long before it was overrun by Allied ground forces in 1945. Second, all forces are dependent on overseas bases to project power, as Operation Desert Shield confirms. Although land forces are the most dependent, naval forces are tied to the umbilical as well—supplying a fleet in the Indian Ocean from bases on the East Coast would be impossible. Real constraints on air power do indeed exist, but we must rigorously examine all aspects of what our medium can and cannot do, and then perhaps reevaluate and revise our old assumptions.

Overall, this book is very important reading. All of its essays should be *read* closely, and the

two mentioned above should be *studied*. The time has come for airmen of all ranks to begin grappling with the fundamental principles of air power. What is it, and how can it be used in this new world? How can we then articulate those capabilities to our leaders and the public? We as a service have certainly not done well in this regard over the past two decades. The viability of our profession, as well as our national interests, demands such an examination.

Lt Col Phillip S. Meilinger, USAF
Washington, D.C.

The Battle of Britain: The Greatest Air Battle of World War II by Richard Hough and Denis Richards. New York 10010: W. W. Norton, 1989, 397 pages, $29.95.

Written to commemorate the 50th anniversary of the Battle of Britain, Hough and Richards' book also serves to underscore why the battle is still considered one of the great turning points in World War II. With detailed maps, appendices, and illustrations, the authors graphically describe how the Royal Air Force (RAF) survived the cutbacks of the 1920s, how an effective air defense system emerged over the years prior to the war, how state-of-the-art fighters developed and entered service, and how Fighter Command—the strength of the RAF—emerged within a hostile interservice arena. Further, they show how Great Britain stemmed the tides of domestic conservatism and international instability to prepare for and ensure, from the second week in August through the closing days of September 1940, its "finest hour."

As a pilot of fighters and fighter-bombers between 1941 and the summer of 1945, Richard Hough knew aerial combat firsthand. He also uses his expertise as a biographer of the Mountbatten family and author of *The Longest Battle: The War at Sea, 1939–45* to produce an enjoyable account of the Battle of Britain. Denis Richards' three-volume official history of the *Royal Air Force, 1939–1945* and his biography of the wartime chief of air staff, *Portal of Hungerford*, establish a solid foundation for his collaboration with Hough. *The Battle of Britain* sheds new light on the well-known decision urged by Sir Thomas Inskip to reduce funding for Britain's bomber force and serves as a historical example for today's Air Force leaders who must make decisions similar to those made by RAF leaders prior to the Battle of Britain.

For example, in light of lessons learned in the Battle of Britain and our current thaw in the cold war, should current Air Force leaders support a drastic reduction in the acquisition of the B-1B/B-2 or other strategic forces? If America chooses such a radical approach, what about the long-term consequences? Industrially, can we respond to an immediate conventional threat from a major political antagonist? Politically, have international treaties and favorable relations led the world into the peace that so many sought in the Locarno Pact in 1925? Currently, Air Staff planners must determine the proper balance of strategic and tactical forces to defend the United States in a constantly changing international environment. Simultaneously, they must battle Congress for appropriations to maintain the economic stability of their military plans. This is essential if we are to avoid the tragic mistakes, graphically illustrated in *The Battle of Britain*, which led many political leaders prior to World War II into a seemingly uncompromising position with Adolf Hitler. Indeed, in the wake of cries for a peace dividend to bolster domestic programs, shouldn't the Air Staff—for short-term planning purposes—follow British history by restructuring strategic and tactical forces in light of immediate political circumstances? At the same time, staff members could use long-term planning to maintain the infrastructure for a possible conventional buildup in more troubled times.

Regarding the Inskip decision, the authors convincingly suggest that it did not lead to increased fighter production at the expense of Britain's bomber forces. In fact, because of the country's limited production capabilities in the years prior to the 1940s, fighter production rates remained constrained. On the other hand, the Inskip decision signaled a major shift in strategic doctrine. From a predominantly offensive strategy—utilizing bombers to protect the island by striking deep within enemy territory—Britain moved to a defensive strategy by integrating its fighters, radar, antiaircraft guns, and home-defense resources with its offensive bomber forces. An invaluable resource and a joy to read, *The Battle of Britain* serves two masters. Make it an important addition to your professional library.

Capt Roy F. Houchin II, USAF
Tinker AFB, Oklahoma

America's Secret Eyes in Space: The U.S. Keyhole Spy Satellite Program by Jeffrey T. Richelson. New York 10016: Harper & Row, 1990, 375 pages, $24.95.

Jeffrey Richelson's newest book is the latest installment in a series detailing the activities of the American intelligence community. In this study, the author chronicles American space-based reconnaissance development from World War II to the present day. Although the United States did not formally admit to having photoreconnaissance satellites until 1978, Richelson provides a truly fascinating glimpse at the full story.

Unfortunately for the informed reader, *America's Secret Eyes* reveals very little new information. Writers such as Philip Klass, Curtis Peebles, and William Burrows have mined this area extensively. However, Richelson's book is the most up-to-date—witness the inclusion of information on the recently launched Lacrosse system. Citations from the ever-talkative *Aviation Week & Space Technology* magazine support his remarks about the system's newness.

Perhaps the most interesting part of the book is chapter 11, entitled "Still Secret after All These Years." Richelson makes an eloquent plea for greater military and public access to the information gathered by reconnaissance satellites. He points out that the effectiveness of unclassified systems such as the French Spot satellite reduces the need for secret systems. His conclusion regarding this issue is worth quoting:

> U.S. satellite reconnaissance has played a crucial role in preventing Cold War from turning into nuclear war. As capabilities have advanced, the ability to monitor and perhaps ameliorate crisis situations has increased dramatically. It will continue to play a vital role in a changing world—with respect to national security concerns, economic affairs, environmental concerns and disaster prevention and relief. But it could play an even more vital role if it were less secret. (page 271)

Although American reconnaissance capabilities supposedly remain a closely guarded secret, Richelson provides a tremendous amount of data. His book is extensively documented and includes a lengthy bibliography for further study. He also includes a chronology of events and extensive launch data for each US reconnaissance satellite alleged to exist.

In summary, this well-written book is for anyone interested in intelligence, as well as military and political events. The impact of space-based reconnaissance systems cannot be overestimated. Richelson's material is well researched and referenced, and his conclusions are well supported. An interesting companion to this volume would be Curtis Peebles's *Guardians: Strategic Reconnaissance Satellites*, which covers both US and Soviet systems.

Capt Joseph H. Murphy, USAF
Colorado Springs, Colorado

Wing to Wing: Air Combat in China, 1943–45 by Carl Molesworth. New York 10022: Orion Books, 1990, 199 pages, $24.95.

The Chinese-American Composite Wing (CACW) taught American aviation techniques to members of the Chinese Air Force. The rationale of the US Army Air Forces was that its teaching efforts would best be served by putting Chinese and American aviators together rather than using lectures and demonstrations. This concept was the forerunner of the internship program so prevalent in today's universities.

Soon 50 years will have passed since these young men flew through the hostile air over China. Many of them did not survive the experience. Interestingly, Molesworth points out that inclement weather and unfamiliar terrain were responsible for as many—if not more—casualties as actual combat. Indeed, contemporary readers would have difficulty imagining the harsh conditions in which those pilots, crew members, and ground-support personnel operated. It goes without saying that these youthful warriors, Chinese and American alike, served well under difficult circumstances.

Wing to Wing devotes most of its attention to relating the personal recollections—some exciting, others routine—of the people who participated in CACW's air strikes. At the same time, however, Molesworth does not overlook important details that—in comparison to the personal narratives—might seem mundane. For example, he delves into the concepts and objectives that informed the creation of the wing and describes the types of equipment to be found in the unit.

Because of the author's tendency to dwell on personal recollections, however, readers seeking a better understanding of strategy and tactics in the air war over China might be disappointed. Even the personal narratives are limited to those of the ordinary airman—there are no tales of the personal vendettas among generals that were so rampant in the China-Burma-India theater. Although the author's perspective may be restricted, he covers his chosen subject well.

Dr Peter C. Unsinger
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The Black Watch by Ernest K. Gann. New York 10022: Random House, 1989, 210 pages, $18.95.

In *The Black Watch*, the well-known author of *Fate Is the Hunter*, *The High and the Mighty*, and *The Aviator* explores the high-flying American U-2 reconnaissance aircraft. Although his book is subtitled *The Men Who Fly America's Secret Spy Planes*, Ernest K. Gann distills reality and fictionalizes persons and events to convey an idea of what it is like to fly in a contemporary operational U-2 unit. The narrative is interesting and insightful, provided the reader is willing to look past three endemic problems.

First, Gann cannot substantiate many of the events he describes. This dilemma stems not only from the classified nature of his subject, but also from the undocumentable, personal nature of the problems that pilots have in trying to reconcile family life with extensive temporary duty abroad (over 140 days a year). This shortcoming hinders the thoroughness of this work as a history.

Second, the characters and actions do not gradually build to a single, dramatic focal point. This flaw appears to result from the author's attempt to incorporate a maximum number of real events and from his disinclination to manipulate reality in the service of dramatic structure. Books about creative writing identify this trait as a classic barrier to the construction of the successful novel.

The third problem is the careless use of artistic license. For example, Gann refers several times to an enlisted Air Force female as a "blonde corporal," when in reality there is no such Air Force rank. In another instance, a pilot is "astounded" to discover his aircraft climbing at a 60-degree angle, although the thoroughness of Air Force mission briefings would preclude such a possibility. Still another instance is his reference to the U-2 as a *spy* plane, despite the fact that *reconnaissance* is legally recognized as an entirely different endeavor. Certainly, the purpose of the first example was to accentuate gender (rather than use the term *airman*), just as the second sought to startle and the third, to romanticize. Nevertheless, they lessen Gann's credibility with military readers. To alter reality in a persuasive, purposeful way is one thing, but to change it in a frivolous, distracting way is something altogether different.

One of Gann's serious insights is his description of flying as an "obsession." Whether the Air Force eventually decides to allow its pilots to "just fly airplanes" and forsake administrative duties (as Gann recommends), this matter of obsessive flying is important in understanding a pilot's motivation for staying in or leaving the service.

Certainly, the U-2 mission is realistically portrayed in terms of the physical realities of flying a somewhat unforgiving aircraft at high altitude while wearing a pressure suit and helmet. However, one U-2 pilot, insisting on the routine nature of U-2 flights, accused Gann of glamorizing the flights by emphasizing their exciting aspects. A second pilot disagreed, referring to a classified file of mishap reports that all U-2 pilots must periodically review. He stated that it is common to hear pilots repeatedly exclaim, "Oh, no!" or "This can't be!" (or their uncensored equivalents) as they read the file.

Thus, real U-2 flying might be even more exciting than Gann depicts. Next to wearing USAF pilot's wings and landing a U-2 assignment, *The Black Watch* is interesting and, by default, the best way available to gain a glimpse of high-altitude operational flying in the U-2 aircraft.

Maj Thomas C. Blow II, USAF
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Red Revolution: Inside the Philippine Guerrilla Movement by Gregg R. Jones. Boulder, Colorado 80301: Westview Press, 1989, 360 pages, $26.95.

The growth of the New People's Army (NPA) in the Philippines in recent years has led to increased study of that country's Communist insurgency. One of the latest works to emerge is Gregg R. Jones's *Red Revolution*, a look at the Philippine revolution through the eyes of the Communist rebels. Although Jones asserts that the NPA is still far from overthrowing the established government of Corazon Aquino, he maintains that the rebels are gaining support from both the peasants and established institutions in Filipino society. Strengthened with this support, Jones believes that the guerrillas are consolidating in the strategic defensive stage of revolutionary warfare and are preparing to advance to the strategic stalemate phase wherein the rebels will take on government forces in conventional operations.

Jones's credentials are those of a free-lance journalist who spent five years in the Philippines covering the downfall of Ferdinand Marcos, the rise of Aquino, and the growing rebellion in the countryside. Despite the fact that

he has developed a firm grasp of the current political situation in the Philippines since his arrival in 1984, he fails to demonstrate an in-depth knowledge of Filipino historical and cultural traditions. Consequently, the majority of his analysis consists of current developments he has garnered, mainly through interviews, periodicals, and some recent documents. He spends little time researching the roots of insurgency in the Philippines.

Much of *Red Revolution* repeats work covered in earlier studies. Jones sheds little new light on the formation of the NPA from its modest beginnings in the late 1960s, nor does the majority of his analysis of the rebellion's rise during martial law or Aquino's election differ significantly from previous interpretations. Like William Chapman in *Inside the Philippine Revolution*, Jones investigated the guerrillas' infiltration of the peasantry through a representative barrio. By living with the villagers of Barangay Rose in Quezon province, he was able to gain their confidence. The Filipinos soon began to open up to him, explaining how they saw the NPA as a more effective government than that of Aquino. By meting out revolutionary justice to their oppressors and providing for the needs of the barrio, the NPA was winning the allegiance of the people.

Further, Jones reinforces the contention of earlier studies that the NPA is making inroads into legitimate areas of Philippine society. He cites specifically how the landed aristocracy, businesses, the Catholic church, and even the government bureaucracy have elements that may not have actively supported but at least tolerated NPA influence. Jones points out that while much of the assistance given the rebels stemmed from shared ideology, a great deal was also garnered through intimidation, coercion, and extortion. Although the author does an adequate job of explaining the issues, he uncovers little new material when discussing these areas.

The book does, however, offer three major revelations about certain aspects of the revolution. The most provocative assertion is that the infamous 1972 Plaza Miranda bombing, the event which ultimately led to the declaring of martial law, was indeed perpetrated by the Communists and not by agents of the Marcos regime as many have surmised. The Communist party's motive was to provoke the government to overreact, thus increasing party membership. In this they were successful. Jones also writes of a Communist Party of the Philippines (CPP) delegation spending 15 years in the People's Republic of China (PRC) in order to secure aid for their Filipino comrades. This endeavor resulted in disappointment and frustration. Finally, Jones relates the successful efforts of anti-Communist vigilantes in rooting out the NPA infrastructure in Davoa on the southernmost island of Mindanao. Previously, discussion of these areas has been either lacking or incomplete.

The main problem with Jones's analysis of these important subjects lies with verifying his sources. While some of his information came from documents of the Communist party, he tends to rely on interviews, often citing his source merely as "founding member of the CPP" or "member of the Chinese delegation." Admittedly, it would be difficult for any loyal CPP cadre to go on record, but such vague citations make for a shaky case, especially when CPP founder Jose Maria Sison has consistently denied that his organization had any role in the Plaza Miranda bombing and has failed to acknowledge a relationship between the CPP and the PRC. In addition, Jones provides little corroborative evidence through either Philippine or Chinese government sources. His most convincing evidence of Filipino involvement with the PRC, for instance, is a single photograph of a CPP cadre in a Hunan commune. Given his experience and limitations, Jones appears to have utilized his available support satisfactorily and presents arguments too compelling to ignore. Adminicular sources, however, would have strengthened his case considerably.

To the scholar of the Philippines, *Red Revolution* is an important addition to the study of that country's current insurgency. His evidence may be somewhat weak, but Jones opens new doors deserving further study. One should bear in mind, however, that the book deals with contemporary issues from the rebels' point of view and should not be considered an overall study of the revolution. *Red Revolution* is merely one work that addresses an expanding interest in rebellion in the Philippines.

Capt John F. Farrell, USAF
USAF Academy, Colorado

Admiral Arleigh Burke: A Biography by E. B. Potter. New York 10022: Random House, 1990, 440 pages, $24.95.

"Thirty-one-knot Burke" is the subject of E. B. ("Ned") Potter's latest biography of a leader of the air war in the Pacific during World War II. Like his previous works about Fleet Adm

Chester W. Nimitz and Adm William F. ("Bull") Halsey, Potter's book on Burke is eminently readable and gives interesting insights into the man and the wars he fought. Air Force officers and aviation enthusiasts will find the book worthwhile for its information about air warfare, the problems of leadership, and the unexpected turns a military career can take.

Burke was a "destroyer sailor" who won reknown as a fighter of surface battles during actions in Empress Augusta Bay (Bougainville island) and off Cape Saint George (New Ireland, New Guinea). Although he had no aviation experience, he was made chief of staff to Vice Adm Marc A. ("Pete") Mitscher, the taciturn commander of the Navy's Fast Carrier Task Force 58, which swept the Japanese fleet and its air arm from the Pacific. It was not an easy task for Burke—a nonaviator—to serve with Mitscher, one of the best and most demanding of commanders. According to Potter, though, he did it well.

After the war Burke briefly returned to surface ships and then went to Tokyo and Korea on staff assignments. In Tokyo he helped lay the keel for the Japanese Maritime Self-Defense Force and was a member of the team that helped negotiate the Korean cease-fire. Subsequently, he was made officer in charge of OP-NAV 30, the Navy's Strategic Plans Division.

In 1955 President Eisenhower "went deep" down the list of flag officers and chose Burke to become the chief of naval operations (CNO). As such, he helped build the nuclear Navy by seeing the carrier USS *Enterprise* and the cruiser USS *Long Beach* down the ways. Serving an unprecedented two more terms as CNO, Burke handled the Navy's ends of the Suez crisis, the 1958 crisis in Lebanon, and the ill-starred landing in the Bay of Pigs, as well as seeing the solid-fueled Polaris missiles placed aboard submarines.

After his retirement, the widely known and greatly respected Burke became active in business affairs and rendered singular service when he helped found and guide the Center for Strategic and International Studies, an important, Washington-based think tank. The symbolic capstone of Burke's career came on 19 September 1989 when his wife Bobbie christened the Navy's guided missile destroyer 51 USS *Arleigh Burke*.

When confronted with the enormous quantity of Burke's papers, Potter chose not to write the definitive biography of the man but to tell his story in a succinct and entertaining way. The author succeeded in his task because he writes like he speaks—engagingly, enthusihastically, and authoritatively. He makes Burke come to life as a man of prodigious energy, character, and willingness to stand behind his own judgment.

The book is well illustrated, contains valuable maps, and has unusual chapter notes—unusual in that they do not contain full citations of every book and article referenced. By using a comprehensive bibliography and short citations in the notes, Potter saves the reader a bit of money.

Admiral Arleigh Burke compares favorably with two recent biographies of Air Force leaders—Col Phillip Meilinger's *Hoyt S. Vandenberg* and David R. Mets's *Master of Air Power: General Carl A. Spaatz*. Potter's study makes good reading for the professional aviator.

Dr Lawrence C. Allin
Tinker AFB, Oklahoma

The Hollow Army: How the U.S. Army Is Oversold and Undermanned by William D. Henderson. Westport, Connecticut 06881: Greenwood Press, 1990, 165 pages, $39.95.

Most students of war agree that Vietnam took its toll on the US Army. Besides the obvious loss of self-respect and public esteem, the Army suffered in more concrete ways. Poor discipline, blatant drug abuse, intellectually marginal combatants, racial antagonism, and a myriad of other problems were symptomatic of an institution in the latter stages of decay. According to the official story, by the late 1980s all this had changed—the Army was transformed into "the best ever." Top-quality youth were entering the service, training was revamped and made highly effective, and the soldiers' morale surged. Thanks to the all-volunteer force and the Army's determination to change, the system made a successful recovery. It was a place where young Americans of all races, nationalities, and creeds could again come together, test their mettle, define opportunities, and "be all that they could be."

William Henderson's *Hollow Army* refutes this image. A retired infantry colonel and former instructor in leadership and military psychology at West Point, he argues that the concept of this new, extremely proficient army rising from the ashes of its crumbling predecessor is more myth than fact. Developed by a concerted marketing effort, the story has been largely accepted by the Congress, the American

public, and—perhaps more insidiously—the Army itself. At present, the Army could not win a major war, and—in light of budget cuts and force reductions—the Army's belief in its own "sales talk" could well reinforce this ill-formed image.

For Henderson, much of the problem lies in an archaic personnel system that places more emphasis on bureaucratic efficiency than on war fighting. Over the years, this system engendered a mentality that disliked bad news, was slow to listen to criticism, and rarely made tough decisions. Moreover, few agencies outside the military are concerned about the institution's manpower, personnel, and training issues: Congress and leading think tanks seem more interested in strategy, weapon system development, and force structuring. As a result, personnel problems are left to those people entrenched in organizational beliefs and caught up in a maze of dysfunctional policies.

Furthermore, the Army's manpower, personnel, and training system already has eroded the institution's primary mission by de-emphasizing the role of combat soldiers and noncommissioned officers (NCO). Much of the problem, according to the author, is due to the creation of a huge, centralized personnel bureaucracy that required many new jobs (administration, supply, public relations, etc.) both to maintain itself and to handle jobs once performed at the unit level. These new, unnecessary occupations severely undercut the traditional roles of the NCO (i.e., to train soldiers, lead men into battle, and provide technical advice) and established a role of its own—that of the bureaucratic junior staff officer.

These new, bureaucratic functions siphoned off many top-quality NCOs and soldiers, placing them into career paths that made management and organizational training more important than combat experience. Moreover, centralization took away power from unit commanders and NCOs. Policies of centralized rotation undermined unit cohesion, while the introduction of officer-like enlisted career policies placed precedence on "right" assignments, nonmilitary education, fire-walled evaluations, and high-level endorsements. Policies like these created an institutional culture that emphasized self-maintenance over mission.

The book is not without flaws. It is repetitive and heavy on jargon. Additionally, too much statistical data is derived from secondary sources. The reader needs to know the reason for choosing a particular data set and something about the context for which it was originally used. Otherwise, the reader is not certain about the statistical basis Henderson is using for comparison. Is he comparing apples to apples or apples to oranges? Finally, the book assumes that the failings in the Army's personnel system are a recent phenomenon (a product of the end of the draft and the emergence of the all-volunteer force). I would suggest that their roots extend back to late World War II, when all of the services were forming postwar plans. Sound reasons existed for the evolving centralization of personnel functions in the 1940s and 1950s, but today's new strategic climate may render those reasons untenable. If so, *The Hollow Army* will prove to be an indispensable guide for policymakers seeking direction.

Capt Mark R. Grandstaff, USAF
Washington, D.C.

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American Society of Mechanical Engineers Symposium

The New Mexico section of the American Society of Mechanical Engineers is sponsoring a symposium from 21–22 May 1991 on arms control and verification. Interested parties may contact Milt West at P.O. Box 5392, Albuquerque NM 87185 or call (505) 845-4452.

USAFA Instructor Opportunities

The Military Studies Division at the United States Air Force Academy is seeking highly qualified captains for instructor duty in the summer of 1991 and beyond. This duty involves motivating and teaching cadets in university-level courses that stress air power, the art of war, military theory, doctrine, and force employment. Since its inception in 1980, the curriculum in professional military studies has evolved into one of the most interesting and demanding areas of study at the academy. A master's degree is required of all applicants. Preferred degrees for military studies instructors are in history, military history, political science, and international relations, or in area studies of the Soviet Union, Eastern Europe, or the Middle East. Experience in tactical or strategic operations or in operationally related specialties is highly desirable. The division can sponsor a few highly qualified applicants with the appropriate background for a master's degree through the Air Force Institute of Technology (AFIT), with a follow-on assignment to the Military Studies Division. Applicants should have three to seven years of commissioned service, an outstanding military record, and impeccable military bearing and appearance. Interested individuals should consult chapter 8 of AFR 36–20, *Officer Assignments*, for applica-

tion procedures or write Capt Bob Angwin, Headquarters USAFA/CWIS, USAF Academy CO 80840-5421 or call DSN 259-3257/3248.

Historical Research Center Grants

The United States Air Force Historical Research Center (USAFHRC) announces the availability of research grants to encourage scholars to study the history of air power through the use of the center's US Air Force historical document collection, located at Maxwell AFB, Alabama. Applicants must have a graduate degree in history or related fields, or equivalent scholarly accomplishments. Their specialty should be in aeronautics, astronautics, or other military-related areas. Residents of Maxwell AFB are not eligible. Topics may include—but are not restricted to—Air Force history, military operations, education, training, administration, strategy, tactics, logistics, weaponry, technology, organization, policy, activities, and institutions. Preference will be given to those proposals that involve the use of primary sources held at the center. Applicants may request an application from the commander, USAF Historical Research Center, Maxwell AFB AL 36112-6678. The deadline for submission of application is 31 October 1991.

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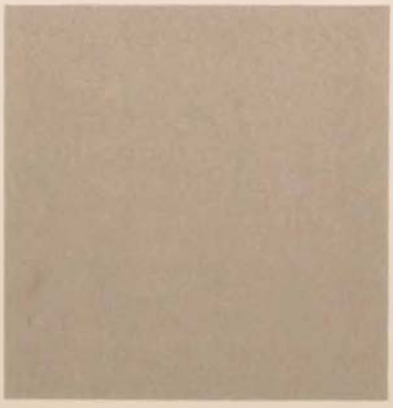

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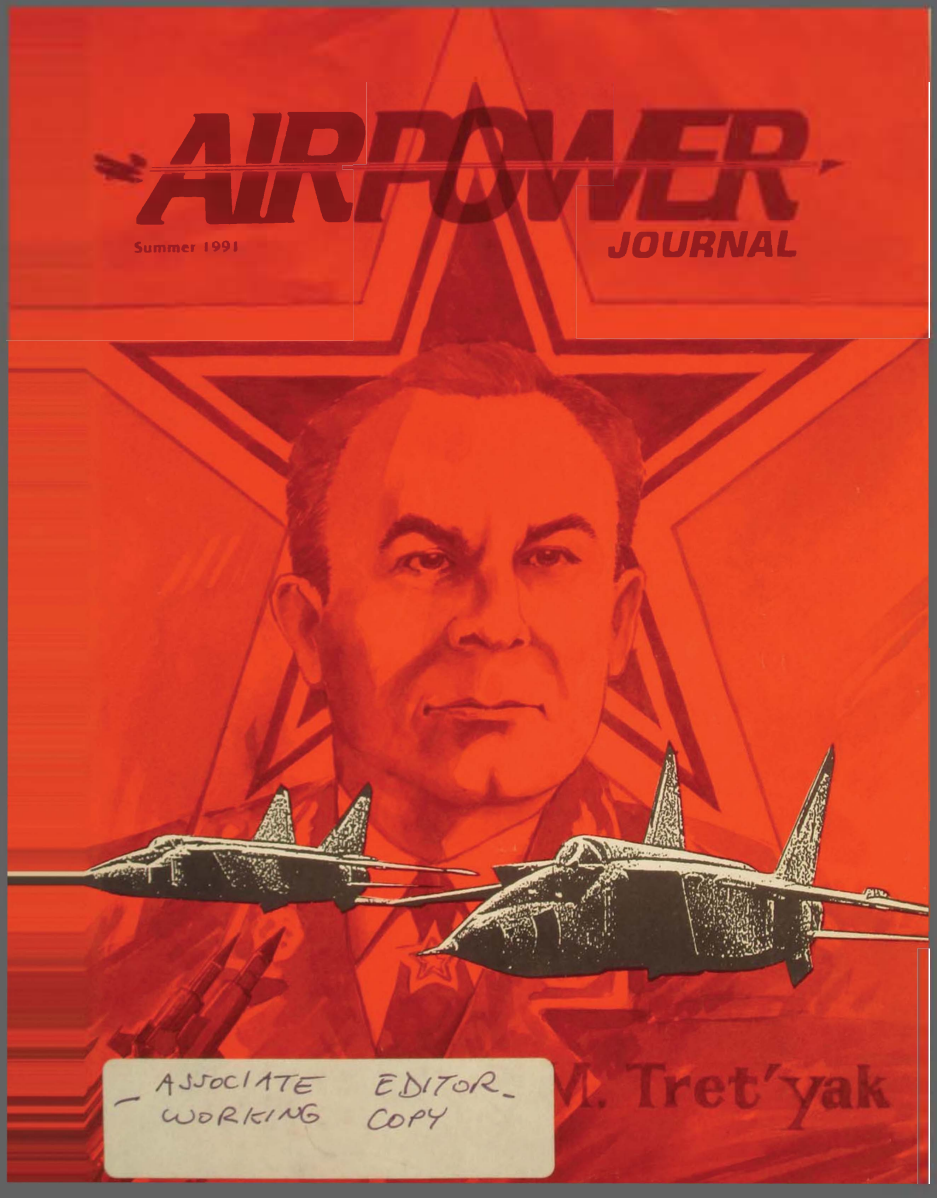
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