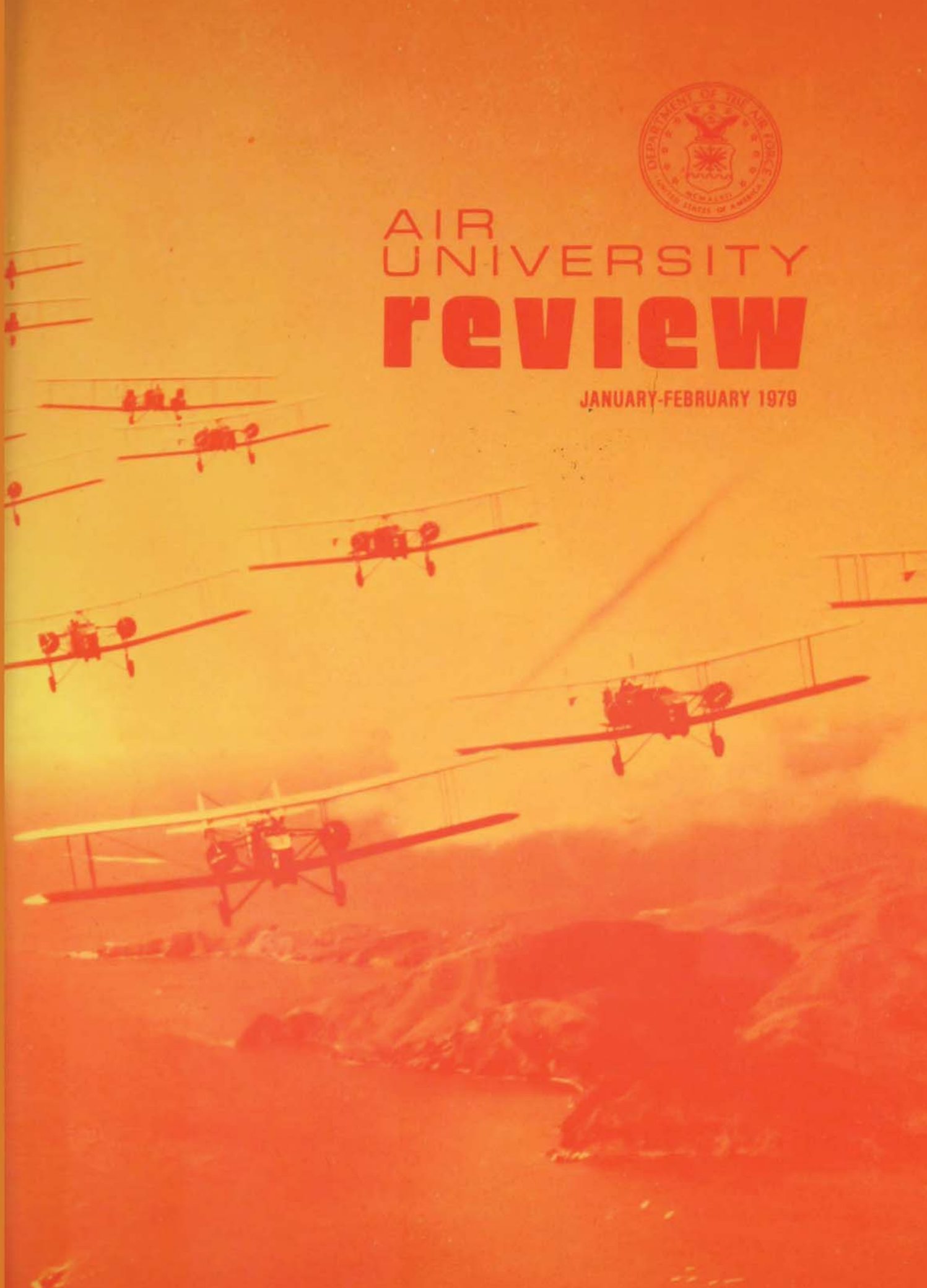
The Professional Journal of the United States Air Force



AIR UNIVERSITY review

JANUARY-FEBRUARY 1979

AIR UNIVERSITY
review

from the editor's aerie

One of the *Review's* stalwarts achieves a considerable feat with this issue: two articles in succession. Lieutenant Colonel Edd Wheeler provided "Women in Combat: A Demurrer" in our November-December 1978 edition, and he now shows his versatility with the lead article, "Prospects for the Manned Bomber: High Noon or Sunset?" Our cover relates to the early morning of the manned bomber's day as it depicts a "gaggle" of Keystone bombers over the Golden Gate—before the bridge was there!

Of course, reactions are encouraged—either an in-depth article to present in response or just a letter would be helpful. Although we do not yet have a Letters-to-the-Editor column, we have often printed comments and ideas, either in whole or in part, that come in through the mail.

Speaking of ideas, the generation of new ones is a principal purpose of the annual Air Power Symposium of the Air War College. The 1979 session will take place just as this issue appears, and it should be some encouragement to participants to know that three of the articles herein were originally presented at last year's symposium. Lieutenant Colonels Phillip Heacock and Roger Schell deal with related themes in "The Viability of Centralized Command and Control (C^2)" and "Computer Security: The Achilles' Heel of the Electronic Air Force?" Another symposium paper, related in a different way, is "The Airborne Forward Air Controller: Future Needs and Opportunities," by John Ellis of the Rand Corporation. Perhaps inclusion of these articles will stimulate other symposium participants to look on the *Review* as a potential outlet for their ideas.

Probing on into the world of military thought, David MacIsaac's review-article about Karl von Clausewitz introduces us to the theory of warfare through one of the masters. Don Hutchinson considers the same subject at another level as he discusses USAF doctrine in "A New Look at an Old Problem."

If any of the participants in the Air Power Symposium of 1979 (or other potential authors) would like to engage in this effort to stimulate new concepts but is uncertain as to how to get started, just write or call the *Review* for an author's guide. It may just give you enough on format and methods to clear away whatever inhibitions exist. Give us a ring at 205-293-2773 or Autovon 875-2773.

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articles

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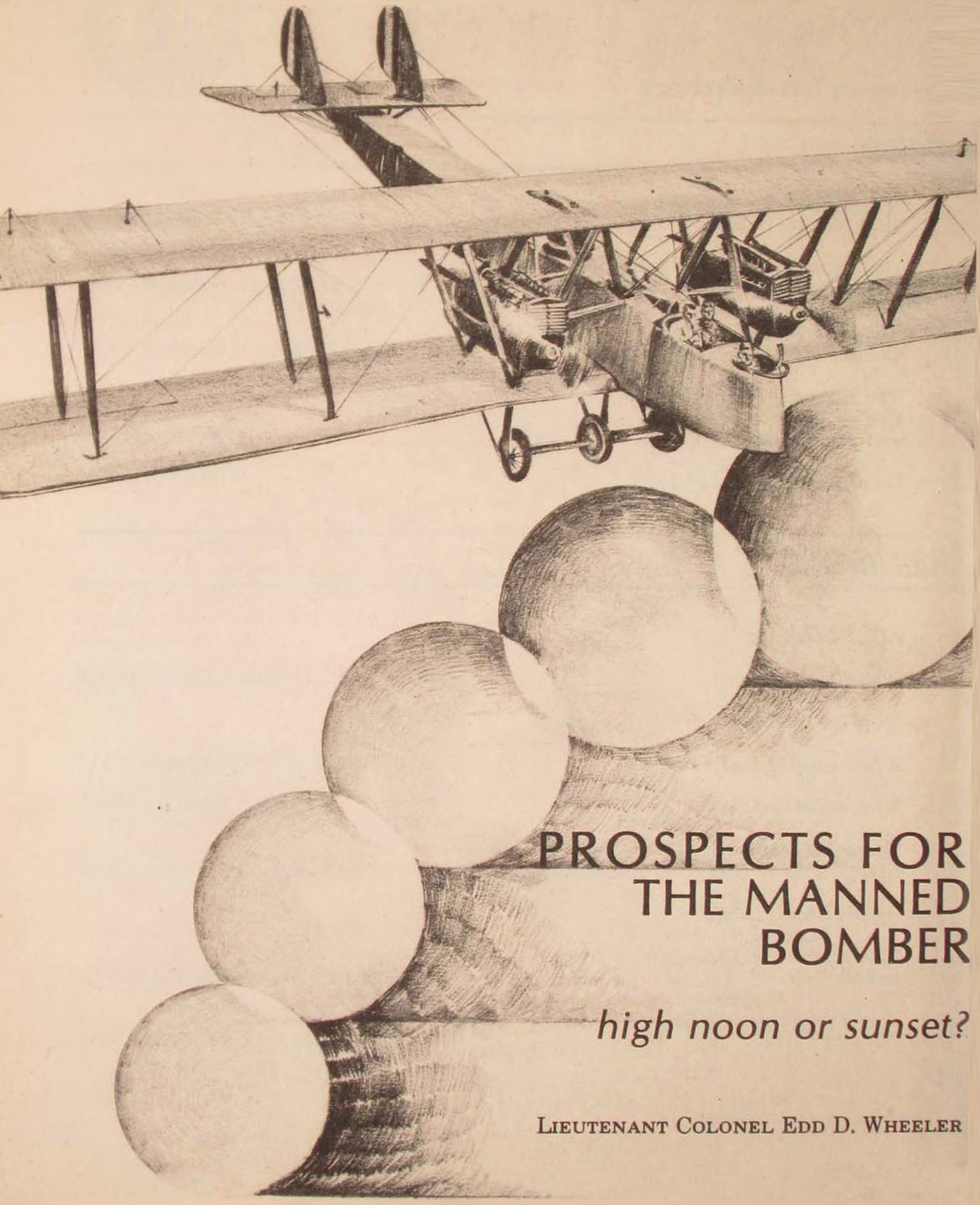


PROSPECTS FOR THE MANNED BOMBER

high noon or sunset?

LIEUTENANT COLONEL EDD D. WHEELER

WITH cancellation of the B-1 by the administration, the future of the manned bomber is uncertain. The bomber once enjoyed a position of unassailable supremacy among strategic forces. It *was* the strategic force. Romanticized names such as Flying Fortress and Stratofortress were indicative of the glamor and formidability attached to the aircraft. That has all changed, of course. The bomber has been brought down to earth. There are those who even seriously question its continued usefulness as an instrument of twentieth-century warfare.

I believe that the manned bomber can continue to play a valuable part in the projection of modern air power. But that role will be somewhat diminished, at any rate different from years past. The change will require accommodation in perceptions by both military and civilian defense planners. The Air Force, commanded largely by men with venerable — and venerated — flight experience, will have to accustom itself to an environment in which manned flight is no longer preeminent insofar as strategic air power is concerned. Civilian planners also must adapt. They should come increasingly to recognize that, though there are missions for which the bomber may no longer be ideally suited, there are other missions to which it brings impressive and needed capabilities.

The change in perceptions and expectations may be attended by a sense of anxiety, particularly for military leaders. Advocates of the manned bomber have lost an important round with the exit, at least for now, of the B-1. At best they seem to be fighting toward a draw. Criticism may intensify. Detractors of the bomber, fortified by collapse of the B-1 program, could line the streets. A final decision is still pending as to whether at some point in the near future a new bomber will be built. A shoot-out of sorts on this issue appears all but imminent. Many believe the clock to be climbing toward high noon for bomber advocates. Others believe, however, everything is settled about the decision except the dust. In their eyes, the bomber is flying toward its sunset.

Controversial Texture

The texture of discussion on manned bombers has usually been controversial and marked by uncertainty. For example, it has been more than 30 years since the U.S. Strategic Bombing Survey attempted to gauge the effects of World War II bombing on Germany, but scholars are still digging through the rubble. The case for strategic bombing was hardly helped by overstated claims in behalf of air power during the immediate postwar period. One authority even declared that a central reason for storming Fortress Europe by land was to divert German manpower from the Luftwaffe.[1] Still, it is incontestable that Allied bombing, through the vehicle of the manned bomber, was a major influence both in shortening the war and winning it.

Notwithstanding its combat achievements, the manned bomber has later encountered heavy flak. There was the matter of Vietnam, the evidence on which is predictably disputed. A Rand analyst, while acknowledging the intentionally limited scope of U.S. bombing, claims that it not only failed to make a dent in the North Vietnamese economy but also failed in its avowed objective of promoting a negotiated settlement.[2] Architects of the Linebacker II series later in the conflict would render, as might be expected, a different interpretation of the efficacy of bombing.

Once the dominant component of our national military power, the bomber now plays a more modest role. "Today," according to McGeorge Bundy, "it is a

supplementary guarantee against the madness of an attempted surprise attack, a diversifier that helps frustrate any Strangelove among Soviet planners."[3] As previously noted, there are those who would be less kind in their assessment of the bomber's decreased importance. For instance, many critics of the B-1 argued, rather spuriously, I believe, that not only was the program too expensive but that bombers have become altogether obsolete, twentieth-century dinosaurs.

Arguments against the bomber are usually articulated in terms of low capabilities and high costs. That is, the bomber is seen as slow, vulnerable, expensive, and, in a familiar phrase, not cost-effective. Let us examine these criticisms in the larger context, without which the criticisms themselves lose much meaning.

The Track Record: Laps Behind and Those Ahead

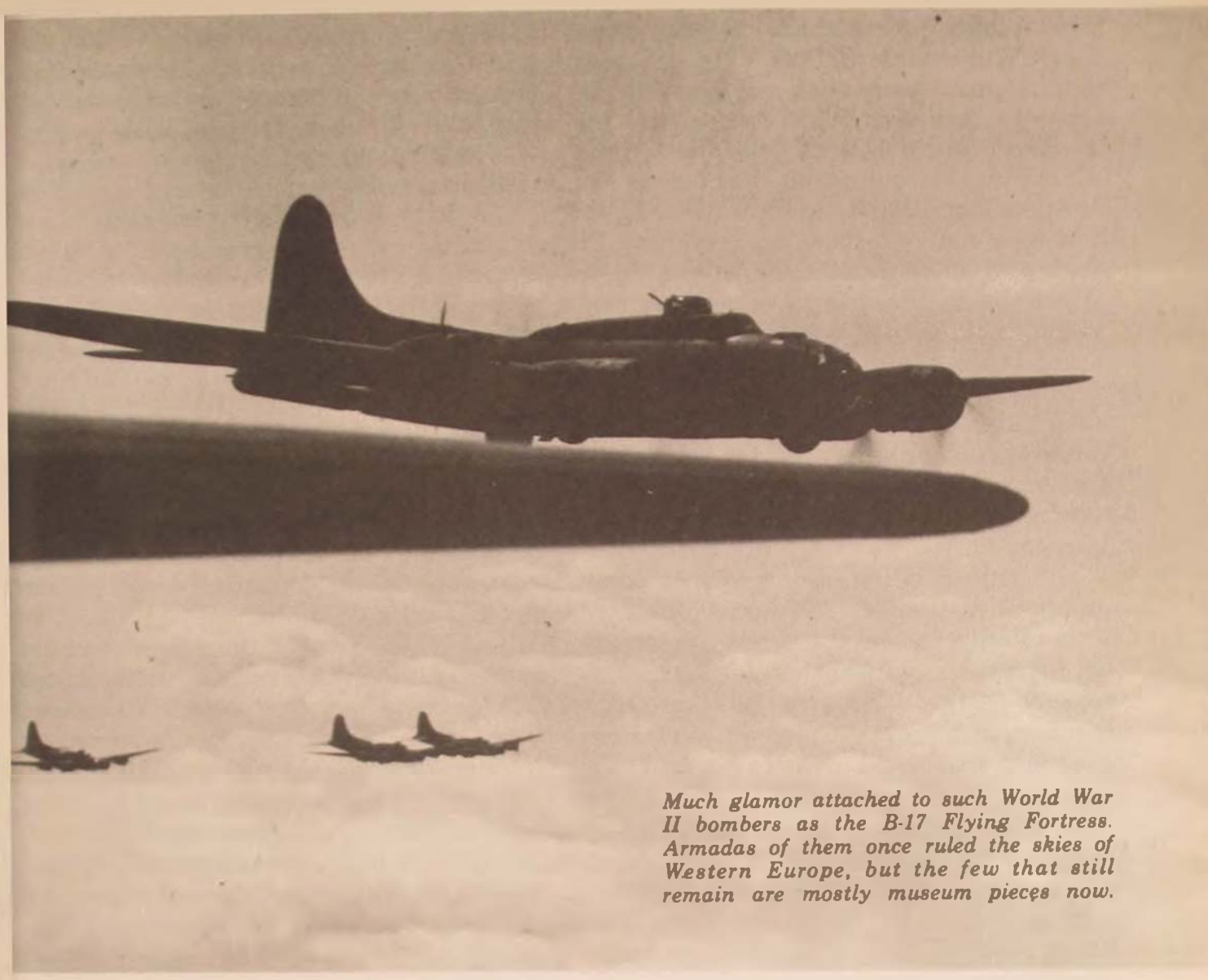
How fast is slow? The typical B-52 pilot might answer that it is 520 knots (600 mph); the typical analyst, that it depends; the typical critic, that it does not matter. Assuming that the last answer is not the most helpful one, what of the other two responses?

Six hundred miles per hour is not a terribly impressive performance characteristic. At that rate, it would take at least eight hours for the standard B-52 mission from the United States to reach the target. From an airborne alert posture well north of the United States, the time to target could be cut by perhaps half. Bombers penetrating to target at altitude would be subjected to attack from thousands of air defense systems, nearly all of which possess speed capabilities superior, many vastly superior, to the bomber itself. It should be noted, however, that most of these systems are susceptible to effective countering through use of defensive avionics. Even so, it must be conceded that bombers will not typically outperform interceptor systems with respect to velocity. That concession made, its meaning or relevance remains far from clear.

Speed alone, then, is not the strongest of points for the bomber, at least not for present subsonic bombers. Even the B-1, with its capacity for supersonic "dash," would not have done much better in terms of outdistancing the most modern of those Soviet fighters which, however fortuitously, happened to achieve interception. No aircraft, of course, will simply outaccelerate hostile missiles; though, a bomber in supersonic flight would present a much more difficult target than a slower one against antiaircraft artillery fire.

But the issue of speed is not one-dimensional. It transcends mere Mach number. Enter the analyst, who would be quick, sometimes too quick for those rooted in operations, to point out that speed should be measured in terms of getting away from the perhaps threatened home base as well as getting into the threatening target area. Aircraft caught on the ground are like mallards on the moat, relatively easy prey.

In that air bases may be subject to attack by intercontinental ballistic missiles (ICBMs) on notice of less than 30 minutes and by submarine-launched ballistic missiles (SLBMs) on notice of less than 15 minutes, it is sometimes argued that much of the bomber force could be destroyed on the ground by a surprise attack. Such an argument presents two difficulties. First, it seems to assume that bombers are destabilizing in that their bases present targets of opportunity to an adversary bent on offensive action. Yet it might be argued in return that a system which is based on sovereign territory and eight hours from potential targets is hardly as destabilizing as one which is only minutes away from its



Much glamor attached to such World War II bombers as the B-17 Flying Fortress. Armadas of them once ruled the skies of Western Europe, but the few that still remain are mostly museum pieces now.

targets. No irrevocable snap judgments are necessary with respect to deployment of bombers. They are not ideal first-strike weapons for strategic warfare. They are, in the phrase of one observer, "slow to take offense."[4] It would be curious, then, to cite their debility in this regard as provocative or destabilizing.

Second, and more important, an argument that points to the bomber's alleged susceptibility to surprise attack seems to ignore the problems which such an attack might precipitate for an aggressor. One is hard-pressed to imagine a scenario in which an enemy's first objective would be rapid demolition of our air bases. This folly could invite a devastating response by remaining U.S. forces. Even if one assumes, as is more likely, that a surprise attack would be against both our bomber and missile forces, the requirement for simultaneity in attack is very tricky. Should

bomber bases, for example, be struck first by SLBMs—while ICBMs were in-bound against other targets—it could provide the type of conclusive impetus necessary for massive launch of our missile force. On the other hand, an approach that strives for absolute simultaneity in attack could give adequate notice to bombers, resulting in the launch of most of those on alert. Either attack pattern would have to cope separately with the third leg of the Strategic Triad, the SLBM force. It is a grave defect to think of problems posed to an aggressor as insurmountable, but we may safely term them considerable in this case. Chances are great that aggressive attempts at orchestration would result only in cacophony.

The vulnerability issue presents some ambiguities. Bombers are more vulnerable than missiles in that they are not protected by structures capable of withstanding nuclear blasts. The fact, however, that bombers are not encased in protective systems may add ironically to their chances for survival. As accuracies and potential yields[5] increase for enemy missile systems, the danger will become more serious to stationary forces and those intended to "ride out" an attack. Any system locked into a second-strike posture from known geographic coordinates will be increasingly vulnerable. Modern bombers are designed to flush, not to be around when the damage occurs. This is a case in which comparative fragility may promote comparatively good survivability.

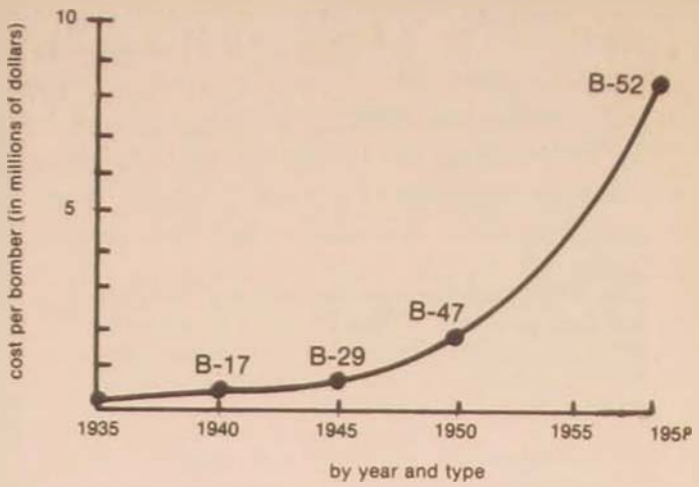
Bombers are mobile. In time of crisis, they can be dispersed to any number of diverse operating locations. This forte could be capitalized on to a greater degree in the future. The payoff in enhanced survivability seems to lie as much in thoughtful planning for dispersal contingencies as in such innovative, but limited, measures as quick-start engines. It may be that realization of a permanent satellite-basing arrangement for bombers would prove either too expensive or otherwise unattractive for a number of logistical reasons. However, there is little reason why difficulties cannot be resolved on a contingency basis, particularly since this resolution could vastly complicate an aggressor's task of targeting all airfields on which there might be bombers. At present the B-52 force is spread over approximately 20 bases in the continental United States. There are, however, many times that number of airfields within the country, civilian and military, that could readily accommodate B-52s during emergency situations. Although it generates obvious sensitivities and requirements for permission, the bomber force could also utilize airfields belonging to allied nations.

With strategic warning, the bomber force could be dispersed and move about freely among various locations. At a given time, bombers might be found on only a fraction of available airfields. An aggressor, though, would have to target all of the locations in order to counter the dispersal pattern. The only ones more put upon than parties implementing strategic dispersal are those attempting to counter it.

It has been said that bombers are too expensive. The lament is not new. A British observer in the late thirties wrote that "in 1934, first-line aircraft . . . being of comparatively simple construction, cost about £3,500 each," or some $17,000 in American currency of the time. The writer continues that by 1939 prices had "increased to as much as 800 percent of their cost a few years ago."[6] Between the thirties and forties, bombers evolved from canvas to aluminum. They also progressed from five digits to six digits in dollar-cost per aircraft. The B-17 was built for approximately $200,000 each; the B-29 for about $600,000.

At this point, the economist will begin to

issue dire warnings on the danger inherent in comparisons of then-year dollars. Duly cautioned of the rapids, let us follow this stream yet a bit further. Within five years of peak production of the B-29, the first B-47s were being added to our inventories at a cost of about $2 million apiece. The $8-million B-52 followed a decade later. The analyst, ever thirsting for a "knee of the curve" here or a leg up there, might be tempted to visualize it all as illustrated in the accompanying graph.



If one wished to risk disclaimers from analyst and economist alike, he might project the curve out even further, where he would find that the cost per bomber climbs quickly toward $100 million. This projection in fact approximates reality. The estimated cost of one B-1 bomber was just above the nine-digit dollar level at the time of program cancellation. All of which could lead to the conclusion that the cost of modern bombers is not so much outrageous as it is predictable. The price per bomber increased tenfold between 1940 and 1950, a decade of mass production and presumably of attendant economies. It is hardly shocking, then, that individual costs reflected another tenfold rise during the past 20 years.

All that rises, however, must necessarily neither converge nor climb toward the absurd. The most discouraging—and ultimately unacceptable—aspect of the projection shown is that it betrays no "knee" in the curve, no promise of leveling off. Most taxpayers would find it only partial balm for the economic wound to learn that one reason for this spiral is the fact that since the early forties industrial commodity prices, and with them prices in such areas as procurement and research and development, have more than quadrupled.[7] Increases in labor costs have been steeper still. Again, though, many citizens prove inattentive to primers on inflation. Their only concern—a concern to which the military must be sensitive—is that $100 million is quite enough to spend on any single weapon system, particularly so when it is announced that hundreds of such systems are necessary for mission requirements.

As evidenced by the apparent fate of the B-1 and by cancellation of high-cost naval vessels, the public and governmental moods are distinctly against programs involving very expensive individualized items. One should not attempt to establish $100 million as the absolute upper limit for a single aircraft. But one could predict confidently that, in the near term at least, any vehicle costing in this range is going to require justification and support of the most compelling type. The Secretary of Defense has stated that the B-1 would have been a more attractive option had it cost 30 percent less but that the technology of the cruise missile development played a larger part in its cancellation. The meaning of this experience with regard to future efforts seems clear: set up programs with discriminating price consciousness or fold them up and put them away.

The B-52 Stratofortress, mainstay of our present bomber force, eclipses the B-17 and other World War II bombers in its destructive capability. Yet for all its sleekness, the B-52, dating from the mid-50s, is an old aircraft.

A Juggernaut without Wire Wheels

The task in a sense is to build a juggernaut without wire wheels. Sporty systems by and large are not cost-effective. The pale of cost versus effectiveness has been the familiar territory of defense decision-makers for the past 15 years. It perhaps is an area more uncharted, however, than many imagine. There is not a little pseudoscience to it all. Nevertheless, the tendency is to look for some metric, a definitive standard or index, by which we can measure how much we can get for our money.

Measuring the cost-effectiveness of bombers is difficult and imprecise. In 1945 our air forces contained over 23,000 bombers of all types, representing an investment of at least $5 billion in aircraft alone. Today our bomber force, consisting of about 315 B-52s and 65 FB-111s, represents a sunk cost in the range of $6 to $7 billion. The meaning of such a comparison is not at all clear. Granted, the bombers of yore were "effective." Through a vast preponderance of power, they helped to win the war. Present bombers, though, are capable of projecting power and exacting destruction on an almost unbelievably larger scale. For example, two million World War II B-17s could not have carried the destructive power that a single B-52 is capable of delivering. Many descriptive adjectives, and some undescriptive ones, attach to present capabilities. One of these descriptions is the word "effective." Are bombers more effective today than before? Yes and no. Yes, they are awesomely more capable. No, they do not, as before, represent the last word in strategic systems.

But surely an investigation that compares only the old and the new is not very revealing. Far more interesting—and telling—is the question: How effective are bombers today? Are they still worthwhile?

There have been some takers on this lure of a question. The reviews, in a nutshell, have been lukewarm. Researchers at the Brookings Institution, after reporting that bombers receive "about 35 percent of all money spent on . . . strategic forces," manage only the mildest of endorsements in the appraisal that "there is some justification for retaining bombers as a hedge against the failure of other retaliatory capabilities."[8] If bombers are to be retained, the writers at Brookings go on to say, better to invest in wide-body transports, which could be modified to launch cruise missiles from standoff range.[9]

This recommendation seems to have been adopted in part by the administration. Production on the B-1 has ceased, though testing and research continue. Production funds are to be used to develop air-launched cruise missiles (ALCMs) for the B-52 fleet. The press has indicated that the administration, "in canceling the B-1, took the position that the manned bomber had been over taken by cruise missile technology."[10] That is not quite how the rationale for the decision was worded by the administration itself. The Secretary of the Air Force has gone on record that:

> The decision to stop deployment of the B-1 was a matter of relative effectiveness and costs of two different systems under certain sets of wartime attack conditions. In itself, the B-1 performance has been excellent and it has met or exceeded all Air Force requirements and is fully capable of performing its intended role. However, there obviously are alternative approaches to meeting threats to national security. Choosing between these alternatives involves a total analysis and appreciation of national priorities.[11]

Whatever the driving factors behind the decision to go with development of the ALCM, that system could be in production within two years. B-52s now operational

could be modified to carry the ALCM. It is possible that the cruise missile, carried by aircraft and sea-going vessels alike, could become a fourth and equal component of our strategic structure. The results would be something of a Tetrad, though perhaps the excursion into Greek for counting the number of components in various groupings has already outlived its value.

At any rate, given realization of cruise missile potential, the bomber's role will both increase and decrease. Its utility will increase as a platform from which cruise missiles might be launched outside an adversary's borders; it will decrease as a strategic vehicle designed expressly to penetrate to target. Since the total number of bombers is not likely to increase in the near future, the assignment of any significant portion of bombers to standoff missions means that the number identified as penetrators will decline.

The above is not to say that the fate of strategic bombers is on the skids. The manned bomber has to be taken seriously with or without a load of ALCMs. As the British continue to demonstrate, and our present Strategic Air Command as well, even older bombers are a force to be reckoned with when they come forth in numbers carrying nuclear arms. One might even apply this same observation to the cruise missile itself, a comparatively old head with new eyes and teeth, attractive not for singular performance but for its sheer multiplicity and nuclear bite. To add to their strength, many of our bombers recently have undergone extensive modifications, particularly in their countermeasures and navigational systems. Further modifications are ongoing or, as noted with regard to the ALCM, contemplated. One can improve and improvise on large aircraft to an extent not possible with smaller aircraft. The bomber force is not yet ready to be pitched out to the rag-and-bone man.

The coming of cruise missiles, far from undercutting the bomber's value, could provide needed stimulus. Indeed, the ALCM should lend prolonged life to strategic bombers, converting them into a future force that combines standoff and penetrator aircraft.

WHAT WILL be the makeup of this future combination of bombers? Some claim to see a place for what is termed the land-based, multipurpose aircraft (LMA). As visualized, such aircraft would be quite large, somewhere in the class of a modern 747. They would be subsonic and serve as mobile platforms for the employment of a great variety of weapons and sensors. An aircraft of this type could be assigned any number of roles where long endurance and massive firepower are at a premium. It might be called an "airborne heavy cruiser" of sorts.

The LMA would carry with it high payloads, high endurance, and a high price tag. The latter characteristic may be overlooked by futurists, but it is apt to receive a prolonged stare, if not the jaundiced eye, from many travelers of the present. The same features that make the LMA an attractive system make it also an expensive one, perhaps prohibitively expensive, and an attractive target. The LMA is not likely to be built in the foreseeable future for the same financial reasons that caused demise of the B-1. Exit the age of the behemoth; enter the era of the beneficiary.

Insofar as bombers are concerned, one of the beneficiaries of the future ought to be the fast, moderate-size, moderate-price aircraft. There is no conclusive reason to believe that the B-52 is the last of the strategic bombers. There is every reason to believe, however, that its eventual successor will represent a somewhat different concept: a no-frills strategic aircraft that

projects a power bulge without a fiscal one. It will probably be smaller than the B-52 but possess an equal or greater payload capacity.

In many ways, the bomber of the future will not be dissimilar from the proposed B-1. It will differ, though, in two important respects. First, the comparative cost of a future bomber should be less than that of the B-1. Second, whereas the B-1 was conceived primarily as a penetrator, the bomber of the future is likely to be consciously designed to fulfill both stand-off and penetrator roles. There is nothing, of course, which says it should not do both. That is, it may prove most advantageous to design an aircraft capable of launching a potent store of small cruise vehicles against stationary targets, for example, and then penetrating in order to seek out targets that are either mobile or for some reason resistant to attack by cruise weapons.[12]

Conventional Roles

In considering present and future roles for the bomber, one should not overlook the tactical mission. There are those who possibly shudder at the thought of huge, high-cost bombers cutting a path in the hostile skies over a battlefield. They may be right. But what if the skies are not so intensely hostile? And what of the enemy staging areas immediately to the rear of the battlefield? It is here that bombers might be of utility. For too long the bomber's role as a strategic system has overshadowed its potential application to tactical situations. The mission of the bomber is not to be sent instinctively toward the sound of guns; its mission should gravitate toward places where it can lend much-needed assistance.

Bombers could be sorely needed in Europe in a conventional conflict. If the West is to overcome its disadvantage there in terms of troops, artillery, and armored vehicles, it will have to make better than a fair showing in the air. Should allied air power ever be required to fill the breach, it must do so quickly, before opposing ground forces achieve a self-fulfilling momentum or occupy an unacceptable portion of friendly territory. Allied tactical air forces currently emphasize both readiness and flexibility. But the fact is that they will be called on not only to support ground forces but also to conduct an air fight for survival in which they themselves will be outnumbered. It is true that some aircraft (for example, the Air Force's A-10) will be used almost exclusively in ground support. Yet the calculus of one aircraft attempting to destroy one tank in one pass does not, in itself, necessarily add up to thwarting a fast-moving concentration of armored vehicles that may number in the thousands.

The argument here is not against ground-support aircraft. They will serve a vital role. The problem is that there has never been a land and air battle in Europe—or anywhere else—of the dimensions that a full-fledged engagement between east and west could yield. In case of such a battle, there are generally three possible results regarding the contest between allied tactical aircraft and advancing enemy armor: (1) allied air will help stop enemy armor through use of conventional munitions; (2) allied air will succeed through use of tactical nuclear weapons; or (3) allied air will be unsuccessful in assisting efforts to stop the enemy advance on land.

There can be little doubt that a full conventional struggle in Europe would require firepower output from allied air forces on a scale heretofore unknown. Bombers are suited for just such massing of firepower. Given that the second and third of the above possibilities are un-

desirable, it seems only prudent that all avenues should be explored in order to make the first possibility a probability. That bombers can survive and be effective over a modern battlefield is not certain. That use of bombers should not even be contemplated is certain foolishness.

Various problems, however, must be overcome before serious contemplation can be given to use of bombers in a scenario similar to that described above. First, planners should mentally erase many of the supposed lessons learned from the experience of B-52s in Southeast Asia. An air campaign in Europe doubtless would be of shorter duration and greater intensity. Targets would probably be military concentrations near the battle line or in proximate staging areas rather than industrial facilities or military complexes more to the rear; however, it is conceivable that bombers might also be used against airfields. Nevertheless, since every effort most likely would be toward control of escalation and containment of hostilities, it is doubtful that anything approaching a general interdiction campaign should be entertained. Even if engagements are restricted to forward areas, though, the attrition for bombers, as for all combat systems, will probably be higher in this most perilous of military environments than in Vietnam, where on the costliest of raids about three percent of attacking aircraft reportedly were lost.[13]

The counterweight to this grim prospect is that presumably it would take relatively few missions for bombers to strike decisively against massed (but fleeting) targets of opportunity and to achieve the desired resolution. Bombers have more effective systems for electronic countermeasures. Also, one would expect that as bomber strikes and various forms of ground suppression took their toll, the attrition rate would lessen for succeeding attacks.

Second, a fresh approach to implementation as well as to planning will be necessary if bombers are to be employed to advantage in a conventional role. There will be no time, as there was in the sixties, to structure a contingency force and to outfit and modify bombers for tactical use. New or improved munitions may be required. Something of a revolution has already occurred in the field of precision munitions. But given the occasional complexities and the relative high cost of precision weapons delivered by air as compared to those fired by ground systems, it appears that a reasonable course to follow, for bombers at least, is one of increased investment in area munitions. What is needed is something relatively simple, inexpensive, and capable of disabling heavily armored vehicles over a wide area. Such munitions tend to be large. Since they are best delivered in high numbers for extended coverage, it may prove more desirable to drop them from bombers rather than from smaller aircraft. Area weapons could prove especially effective against such targets as tank columns that are massing for attack.

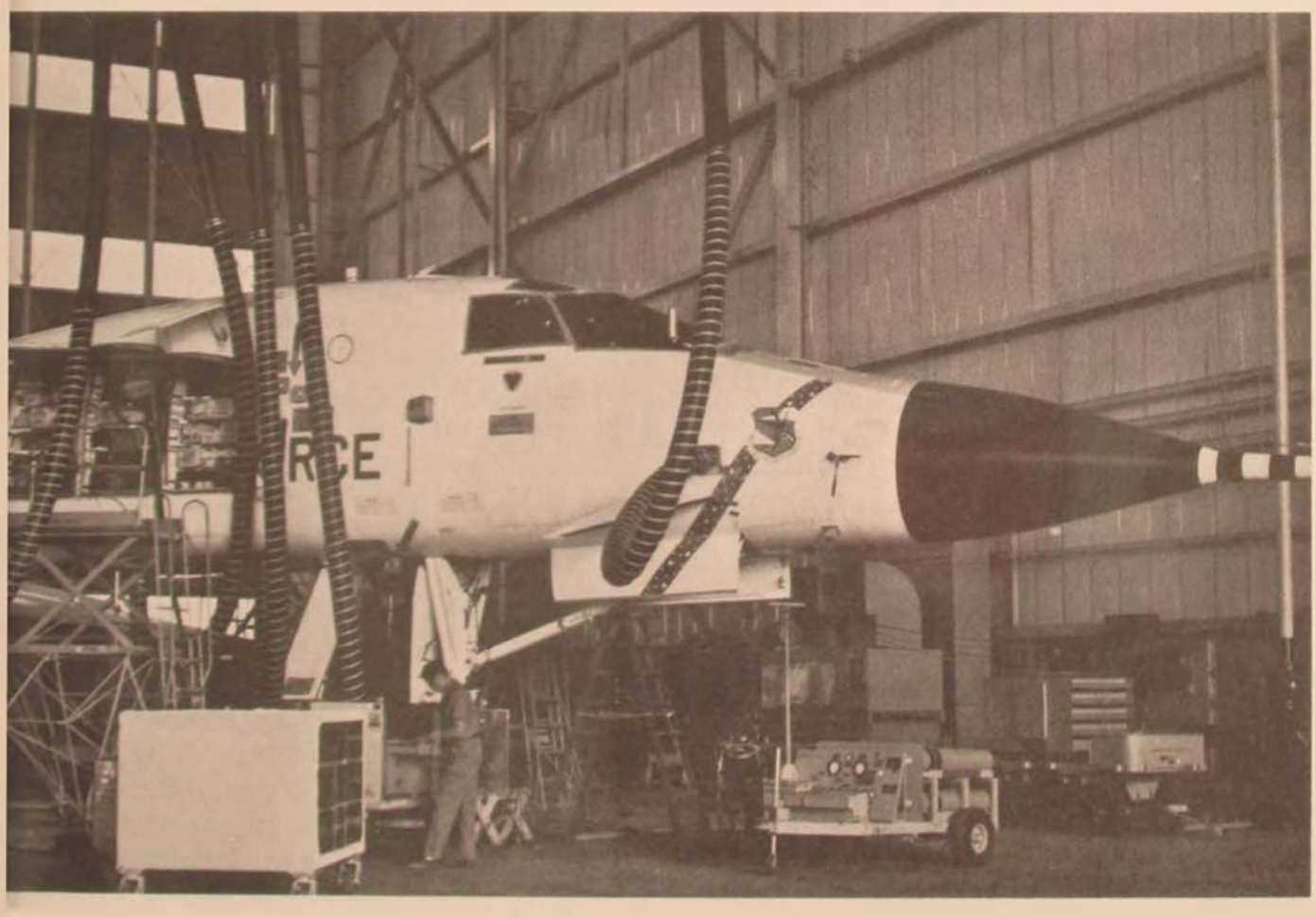
Bombers, as well as other aircraft, could employ precision munitions and traditional explosives against less concentrated targets or in rear areas, where one might wish to be very careful as to what was and was not an appropriate target for attack. Having significantly greater endurance than fighters, bombers are capable of loitering for hours well behind friendly lines, while enemy columns are in the process of forming or until such time as the enemy attack plan unfolds. They could be called in from their "orbits" on very short notice. The incorporation of bombers into air operations in this manner should maximize the effect of aerial firepower.

Bombers do not, of course, have to bring to bear firepower per se. I suggested earlier that it might be sufficient merely to disable

enemy armored vehicles, as opposed to destroying them, along with their human freight. Bombers are large aircraft and capable of delivering a variety of stores, some of which either have yet to be developed or receive even thoughtful consideration.

It is not my purpose to rely heavily on future technologies or explore futuristic weapons. But one should understand that future weapons need not necessarily be more *lethal* than present ones. In this vein, it is appropriate to point out that bombers conceivably can drop things other than high explosives from their bomb bays. For example, what if it were technologically feasible (or, equally significant, technologically desirable) to incapacitate as many as possible of the mechanical vehicles in an entire division through the careful delivery by a few bombers of a nonlethal substance? This might be done, say, through ejection of an ultrasticky resin compound or a thin foam that dries quickly to super hardness for some hours. Other payloads, more exotic or less, are possible. It takes but a brief flight of imagination to visualize being able to impede an opposing force without extensive loss of life. There are situations in which recourse to such weapons might be highly desirable, particularly as an

Production on the B-1 (here preparing for a test mission) has ceased, but testing and research continue.



indicator that the actor wished to avoid further escalation. The result would not bring a sense of humanity to warfare, but it could bring additional ways to stall aggressive behavior or to communicate reasoned intent.

In this perhaps idealized framework, it is possible even that the term "bomber" may become something of a misnomer—that the vehicle, capacious and ever susceptible to numerous innovations, could as readily become a platform for increased communication as for increased destruction.

Until the advent of the millenium, however, there will continue to be a run on pragmatism. The services should take under consideration possible ways to include bombers, where feasible, in contingency forces for conventional operations. There exists a wide area for expansive, as opposed to cloistered, military thinking. Means might be discovered to exploit the bomber's natural advantage in terms of range and payload. Increasing conventional capabilities remains a fertile subject for our best efforts. Topics of this nature are ripe for creative treatment in places such as the military's professional schools, particularly in the war colleges, estates which to date have not produced an especially large volume of substantial and vintage thought.[14]

One alternative that merits investigation is the possibility of assigning to the reserves some of the older B-52s now in service. These aircraft could be assigned perhaps to the reserves as part of the wherewithal to begin specialized training for conventional scenarios, with an eye toward Europe. One option that comes to mind is use of a portion or all of the 75 "D" models of the B-52, soon to pass into obsolescence anyway for strategic purposes, in order to have in ready reserve a carefully structured expeditionary force of heavy bombers. Bombers may figure importantly in countering concentrations of forces and materiel, including the more than 50,000 armored combat vehicles in Warsaw Pact inventories, in case of a conventional conflict in Europe.

Continuance and Continuity

Notwithstanding tactical applications, the bomber's primary role will continue to be a strategic one. Bombers presently stand with ICBMs and SLBMs in the constitution of the Triad. The manned bomber accounts for a sizable share of the partnership: a quarter of our nuclear weapons, over half the destructive power (megatonnage), and a third of the yearly budget for strategic systems. It might be said to carry its share of the load, literally and figuratively.

Bombers seem destined to maintain their viability on through the foreseeable future. Maintaining bombers avails us with multiple options and opportunities for flexibility, in addition to presenting an enemy with multiple problems of defense.

This is not an advocacy piece for an instant new bomber. The administration has made its decision against the B-1, and barring some unforeseen turn of events, such as a breakdown of SALT, that decision is not very likely to be amended. But decisions are based on conditions, judgments, interpretations, men. In short, they are based on factors that can and do change. Because a decision was made not to build a new bomber in this, the latter part of the eighth decade of the century, it does not follow that the issue is forever fixed.

I believe that the issue of a new manned bomber is neither dead nor moot. There is a requirement for a new bomber, one without frills or wire wheels. We need this system, not so much for what it will be but for what it could become. Few, if any, foresaw the B-

17, designed originally for coastal defense, becoming a high-altitude strategic bomber; or the B-52, designed for high-altitude nuclear delivery, becoming a bomber capable of low-altitude penetration for nuclear strike on one hand and a conveyor of massive conventional ordnance on the other. One need not trust in providence to have some sense of appreciation for the likelihood that, as with systems in the past, a new bomber would be able to accommodate change, often to advantage.

There is an inherent danger that any proposal for a barebones bomber will be seized on by critics as an absurdity, something similar to proposing a stripped down Cadillac. A new bomber should not be a Cadillac, large or small. It should not be a Maserati or even a Buick. It should be a vehicle capable of giving a comfortable degree of assurance that our strategic defenses will remain reasonably credible and balanced into the next century. Its potential applications, without pretending to exhaust the possibilities, range from use as a laser platform to a role in antinaval operations. It offers the promise of becoming a workhorse, with hopes for windfall on the side. There is sufficient precedent to support both expectations.

SOME SAY that it is high noon for the manned bomber. Others claim that the bomber is in its twilight. To still others it seems that in a sidereal world, where time so often surprises us, it is not out of the question that a new day may soon be dawning.

Hq USAF

Notes

1. General Carl Spaatz, "Strategic Air Power: Fulfillment of a Concept," *Foreign Affairs*, April 1946, p. 396.

2. See Oleg Hoeffding, *Bombing North Vietnam: An Appraisal of Economic and Political Effects* (Santa Monica, California: Rand Corporation, 1966).

3. "The B-1: A Long Look before Buying," *Washington Post*, May 13, 1976, p. A23.

4. See Francis P. Hoeber, *Slow to Take Offense: Bombers, Cruise Missiles, and Prudent Deterrence* (Washington: Center for Strategic and International Studies, 1977).

5. A national news article, which if of substance is also of profound importance, went largely unnoticed. It mentioned "concern that the Soviets are nearing a breakthrough in developing thermonuclear weapons 100 times more powerful than the largest current weapon. One possibility . . . is a Soviet attempt to build a 'gigaton' hydrogen bomb, whose explosive power would be equal to 1 billion tons of TNT." See "U.S. Officials Put Wraps on Soviet Physicist's Lecture," *Washington Post*, March 13, 1977.

6. *Encyclopaedia Britannica Book of the Year*, 1939 (London: Encyclopaedia Britannica Co., Ltd., 1939), p. 34.

7. *Economic Report of the President* (Washington: Government Printing Office, 1975), p. 305. Also see *Fact Sheet* issued by Office of the Secretary of Defense (Comptroller), "Department of Defense Deflators," January 11, 1977.

8. Alton H. Quanbeck and Archie L. Wood, *Modernizing the Strategic Bomber Force: Why and How* (Washington: Brookings Institution, 1976), pp. 1 and 9.

9. Ibid., p. 34.

10. Drew Middleton, "Some Doubts Persist over Cruise Missile," *New York Times*, July 12, 1977, p. 7.

11. John C. Stetson, "A Message from the Secretary of the Air Force," *Air Force Policy Letter for Commanders*, July 15, 1977.

12. We use the term "cruise" today because we are conditioned to it. Thoughtful students of weaponry, however, can predict that as the cruise missile is perfected it will not be limited to "cruise" speed. It is bound to get faster, probably much faster than the platform from which it is launched. The missile almost certainly will be improved to take evasive actions against ground systems while remaining compact in size. It may even succeed in becoming the first fullblown development of a system that has long enjoyed promise and suffered resistance, the remotely piloted vehicle.

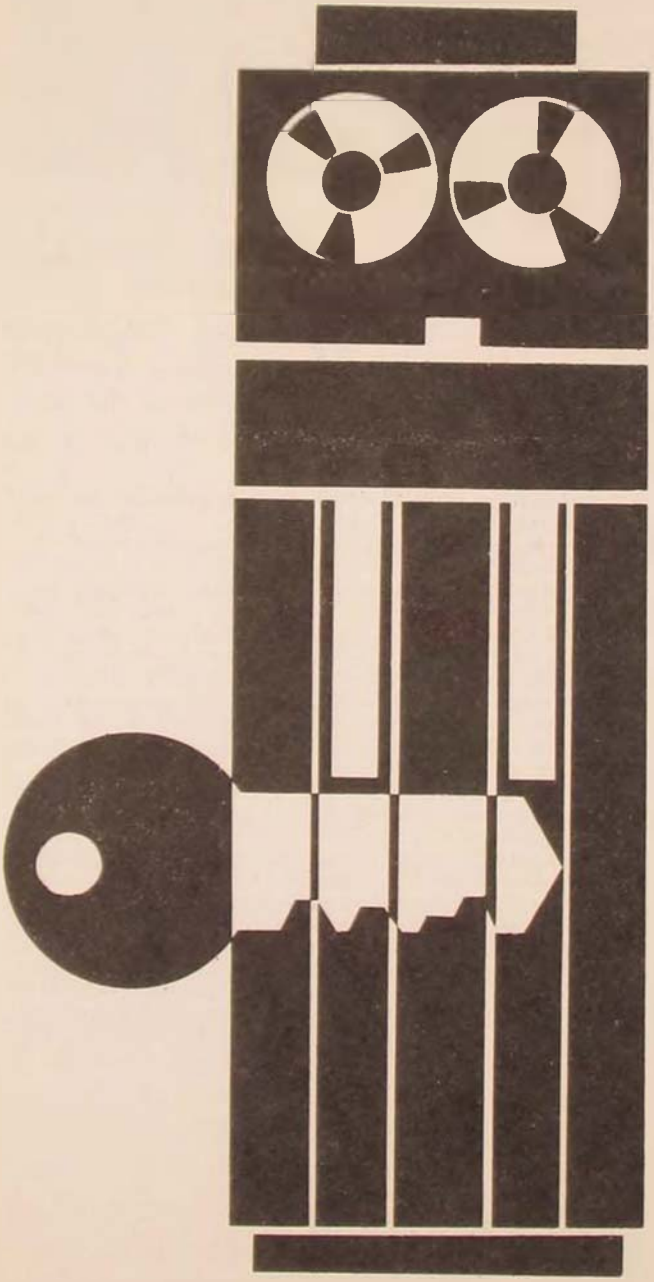
13. Quanbeck and Wood, p. 13. There are those who would place this figure higher, perhaps as much as three or four times higher, on infrequent occasions.

14. See, for example, John P. Lovell, "Apolitical Warrior or Soldier-Statesman," *Armed Forces and Society*, Fall 1977, p. 125: "The war colleges of course face an enormous problem because they endeavor to cover a vast array of subjects in a year's time, with students whose background preparation in the social sciences and humanities (especially) ranges from negligible to extensive. The 'cafeteria' or 'shotgun' approach to providing exposure to the large number of subjects deemed by war college officials to be relevant at this level in the professional career has been popular—and criticized repeatedly over the years." (fn. 4)

COMPUTER SECURITY

the Achilles' heel of the electronic Air Force?

LIEUTENANT COLONEL ROGER R. SCHELL



THE KGB officer addressed the select group of Soviet officials with his usual tone of secrecy but an unusual air of excitement:

> Comrades, today I will brief you on the most significant breakthrough in intelligence collection since the "breaking" of the "unbreakable" Japanese and German cyphers in World War II—the penetration of the security of American computers. There is virtually (if not literally) no major American national defense secret which is not stored on a computer somewhere. At the same time, there are few (if any) computers in their national defense system which are not accessible, in theory if not yet in fact, to our prying. Better still, we don't even have to wait for them to send the particular information we want so we can intercept it; we can request and get specific material of interest to us, with virtually no risk to our agents.
>
> The Americans have developed a "security kernel" technology for solving their problem, but we need not be concerned—they recently discontinued work on this technology. They are aware of the potential for a computer security problem, but with their usual carelessness they have decided not to correct the problem until they have verified examples of our active exploitation. We, of course, must not let them find these examples.

Your first reaction to this scenario may be, "Preposterous!" But before you reject it out of hand, recognize that we know it

could happen. The question is: Will we apply sound technology and policy before it does happen? To be sure, there are things we do not know about the probability of success of such an effort, but we can rationally assess the most salient controlling factors:

- The high *vulnerability* of contemporary computers has been clearly indicated in the author's experience with undetected penetration of security mechanisms. In addition, security weaknesses are documented in both military and civil reports.
- The *capability* of the Soviets (or any other major hostile group) to accomplish the required penetration is quite evident. In fact, no particular skills beyond those of normally competent computer professionals are required.
- The *motivation* for such an information collection activity is apparent in prima facie evidence. The broad scope and high intensity of Soviet intelligence efforts in areas such as communication interception are frequently reported.
- The potential *damage* from penetration is growing with the ever increasing concentration of sensitive information in computers and the interconnection of these computers into large networks. Through computer penetration an enemy could, for example, compromise plans for employment of tactical fighters or compromise operational plans and targeting for nuclear missiles.
- The *opportunity* for hostile exploitation of these vulnerabilities is increasing markedly both because of the increased use of computers and the lack of a meaningful security policy controlling their use. In the name of efficiency many more people with less (or no) clearance are permitted easier access to classified computer systems.

We have a problem and a solution in hand. Detailed examination of a hostile nation's (e.g., Soviet) capability and motivation in those areas is properly in the realm of the intelligence analyst and largely outside the scope of this article. However, it will trace the outlines of the computer security problem and show how the security kernel approach meets the requirements for a workable solution—although recent termination has nipped in the bud very promising work toward a solution.

What Makes Computers a Security Problem?

Although a certain appreciation of subtlety is needed to understand the details of the computer security problem, our objective here is to illuminate the basic underlying issues. To understand these issues, I will examine not only the capabilities and limitations of computers themselves but also their uses.

First, we take for granted the fundamental need to protect properly classified sensitive military information from compromise. Security has long been recognized as one of the basic principles of war, and throughout history security or its lack has been a major factor of the outcome of battles and wars. We can and do strictly control information when the dissemination is on paper. It is, therefore, illogical to ignore the fact that computers may disseminate the same information to anyone who knows how to ask for it, completely bypassing the expensive controls we place on paper circulation.

Second, we must appreciate that "exploitation of the phenomenal growth of computer science is a major area of technological emphasis within DoD."[1] We currently lack quantitative superiority (or even parity) in several force level areas, and computers appear to be able to provide the qualitative superiority we must have.

The need for these capabilities is clear when we realize that "good C^3 [command, control, and communications] capabilities can double or triple force effectiveness; conversely, ineffective C^3 is certain to jeopardize or deny the objective sought."[2] Indeed, we have in a very real sense become an "electronic Air Force"[3] with computers at our heart.

Finally, we need to recognize that some major vulnerabilities may accompany the substantial benefits of computer technology. Most decision-makers cannot afford the time to maintain a thorough understanding of explosively developing computer technology. But they can even less afford to be ignorant of what the computer can do and also of how it can fail. In particular, a commander responsible for security must ensure that dissemination controls are extended to computers. He must be able to ask proper questions—to surface potential vulnerability for critical and unbiased examination.

historical lessons in emerging technology

It is not new to find that an emerging technology is a mixed blessing. In particular, the threat facing computers today is illustrated in the evolution of military electrical communications—an earlier revolutionary technology. Our compromise of the security of Axis communications was fundamental to the outcome of World War II, and computers now offer our enemies the opportunity to turn the tables on us.

Military communication specialists early recognized the vulnerability of electrical transmission to interception, e.g., through wire taps or surreptitious listening to radio signals. The solutions were simple and effective but drastic: restrict transmission only to relatively unimportant (viz., unclassified) information or to transmission paths physically guarded and protected from intrusion. Likewise, for several years the Air Force restricted computer use to either unclassified data or to a protected computer dedicated to authorized (cleared) users. In both instances the security solutions limited use of the technology where most needed: for important information in potentially hostile situations, such as battlefield support.

The communication security restrictions gave rise to various cryptographic devices. These devices were to encode information into an unintelligible and thus unclassified form so that protection of the entire transmission path was not required. But (of paramount importance to us here) this dramatically changed the very nature of the security problem itself: from a question of physical protection to a question of technical efficacy. The effectiveness of the cryptographic devices was argued, based not on careful technical analysis but rather on the apparent absence of a known way to counter them. Presently, computer technology is in a position analogous with a similar argument for its effectiveness against unauthorized access to computerized information. In both instances, the arguments seem to offer an acceptable risk in spite of a de facto weak technical foundation.

Technically weak cryptographic devices found widespread military use because of false confidence and the pressing operational need for electrical communications. One notable example was the Enigma machine used by the Germans during World War II. Their high-level national command and control network used it for communication security throughout the war. As *The Ultra Secret* records, "the Germans considered that their cypher was completely safe."[4] Yet, before the war really got started, the British had in fact "solved the puzzle of Enigma."[5] The Air

Force is developing a similar dependency with each (formal or de facto) decision to accredit computer security controls. In either case policy decisions permit a technical weakness to become a military vulnerability.

Examples during World War II show how the tendency to defend previous decisions (to accept and use mere plausible techniques) assures the enemy of opportunities for exploitation. In Europe the broken Enigma signals (called Ultra) "not only gave the full strength and disposition of the enemy, it showed that the Allied [troops] could achieve tactical surprise."[6] In fact, General Dwight Eisenhower stated that "Ultra was decisive."[7] *The Codebreakers* describes a similar misplaced trust by the Japanese and notes that American cryptanalysts "contributed enormously to the defeat of the enemy, greatly shortened the war, and saved many thousands of lives."[8] To be sure, the Germans "must have been puzzled by our knowledge of their U-boat positions, but luckily they did not accept the fact that we had broken Enigma."[9] Similarly, the Japanese "hypnotized themselves into the delusion that their codes were never seriously compromised."[10] The Axis establishment, it seems, would not acknowledge its security weakness without direct confirming counterintelligence—and this came only after they had lost the war. As for Air Force computer security, the absence of war has precluded ultimate exploitation; yet, the lack of hard counterintelligence on exploitation has already been offered as evidence of effective security.

Although technical efforts led to these devastating vulnerabilities, it was nonetheless the technical experts like William Friedman who provided a sound technical basis: "His theoretical studies, which revolutionized the science, were matched by his actual solutions, which astounded it [the scientific community]."[11] Today our military makes widespread use of cryptographic devices with confidence. For computers, as for communications, the nub of the problem is the effectiveness of the security mechanism. Recent logically rigorous work has resulted in a security kernel technology. However, DOD is not yet applying this technology.

The thrust of this historical review is captured in the maxim, "Those who cannot remember the past are condemned to repeat it." The historical parallels are summarized in Table I. The main lesson to be learned is this: Do not trust security to technology unless that technology is demonstrably trustworthy, and the absence of demonstrated compromise is absolutely *not* a demonstration of security.

distinction between computation and protection

A given computer in one installation may securely handle sensitive data, and an identical machine may be totally insecure in another installation. The key to understanding the computer security problem is to distinguish when the computer provides only computation and when it must also provide security. These are two very distinct cases.

In the first case, commonly called "dedicated mode," the computer and all its users are within a single security perimeter established by guards, dogs, fences, etc. By the use of secure communications, this perimeter may be geographically extended to remote terminals. Only these external security controls are required to maintain the security of the system. Use of the computer is restricted so that at any time all the users, remote or local, are authorized access to all the computerized information. A potential attacker must overcome the external controls and penetrate the inner sanctum of cleared per-

Electrical Communications	Electronic Computers
Limited Use	
unclassified only	unclassified only
protected paths	dedicated facility
Plausible Security	
cryptographic technology crucial to security	internal security controls crucial
no known counter	no known penetration
weak technical foundation	weak technical foundation
Unwarranted Dependence	
false confidence in cryptography	false confidence in internal controls
policy acceptance	policy acceptance
Underestimated Enemy	
repeated and undetected interception	repeated, undetected, and selective access
advocates demand counterintelligence	advocates demand counterintelligence
Adequate Technology	
information theory	security kernel

Table I. Comparative evolution of security problems

sonnel. The computer provides only computation; no failure or subversion of the computer itself can compromise security because of the protected environment.

In the second case, commonly called "multilevel mode," the computer itself must internally distinguish multiple levels of information sensitivity and user authorization. In particular, the computer must protect some information from certain users. For multilevel mode, internal security controls of hardware and computer programs must assure that each user may access only authorized information. For multilevel security the computer itself must clearly provide protection as well as computation. For the potential attacker, simply gaining access to the peripheral users of the computer will suffice—if he can penetrate the internal controls.

Multilevel security controls function analogously to a cryptographic device; their effectiveness is central to information security. Because of the inherent structure of computers, a multilevel security weakness invites repeated exploitation. Furthermore, those security failures internal to the computer are almost certain to be undetected. In contrast to communications where enemy access to important traffic is a matter of chance, in a penetrated computer he has selective access, not only for extraction but also for modification of information of his choosing. All the worse, the processing power of modern computers provides this information rapidly and completely.

If we are worried about protecting our cryptographic codes, then we are indeed foolish to neglect our computers. And we must realize that multilevel mode can aid

the attacker unless the internal controls of the computer itself provide reliable protection.

evidence of weak security controls

The critical question then is this: Dare we trust the internal security controls of computer programs and hardware? The author's experience with security weaknesses indicates that contemporary computers do not provide reliable protection. Computers proposed as sufficiently secure to protect sensitive information were checked for security shortcomings. A formally sanctioned "tiger team" looked for weaknesses in these supposedly secure computers. (For accuracy the examples will be limited to those evaluations in which the author personally participated.)

The tiger team operated as a legitimate user with only limited access to a small part of the information in the system. The team objective was to penetrate internal security controls and demonstrate that unauthorized access could be gained. In every instance of the author's experience, serious security weaknesses were discovered after only a few hours or days of effort.

Passwords for the asking. A common element of protection is a secret password or key that the user must provide in order to receive services or information. To be effective the secrecy of the passwords must be preserved. An IBM 370 computer with the time-sharing option (TSO) had remote terminals in various uncontrolled areas; the secret passwords restricted the users' access. This particular computer contained sensitive Air Force procurement source-selection information with tightly controlled dissemination. The tiger team members found that they had merely to ask by name for the password file and the passwords for all the TSO users would be printed for them—without a trace that the passwords had been compromised. The designers had overlooked the relationship between security and the ability to print a file.

Good commercials not enough. In the Pentagon a General Electric system called "GCOS" provided classified (secret) computation for the Air Staff and others with secured remote terminals at selected locations. The manufacturer made an advertising thrust about his security. Air Force advocates proposed making a multilevel system by adding unsecured remote terminals, for unclassified uses, for better coordination and efficiency. Again, passwords were to protect the sensitive information. When a user presented his password to the computer, GCOS checked a list of passwords to verify the user's legitimacy. To make this check, GCOS copied part of the list into its main memory. Among other flaws, the tiger team found that GCOS left this copy of the passwords where it could be printed easily and without trace. The designers had overlooked the possibility of deliberate misuse of a necessary computer function.

Government designers not perfect. After the Pentagon penetration, some advocates claimed that government designers with a greater awareness of security could avoid such flaws. An organization that processed sensitive intelligence data spent a substantial effort "fixing" basically the same GCOS system. They were confident they could maintain multilevel mode security. The tiger team found that these "fixes" could easily be circumvented. In this case not only could any user get at any information in the system but also he could access the classified information in computers connected in a network with that computer!

A contract cannot provide security. Basically the same GCOS system was selected for a major command and control system. Advocates assured the users that

it would be made multilevel secure because security was required by the contract. An extensive tiger team evaluation found there were many deep and complex security flaws that defied practical repair—the computer was finally deemed not only insecure but insecurable.

The best security is not good enough. Honeywell Information Systems, with DOD sponsorship, modified the GCOS computer in an effort to improve several areas substantially, including security. The resulting Multiplexed Information and Computing Service (Multics) was widely touted for its security. The tiger team used an Air Force laboratory computer to evaluate Multics as a potential multilevel secure computer for the Pentagon. Although it had the best security design of any system encountered, the tiger team found several implementation flaws.[12] In one case Multics first checked a prospective user's authorization for access to information and, when the request proved valid, executed the request. However, the user could change the request after the validity check but before execution; Multics then executed the changed request, allowing unauthorized access. This penetration of Multics came from an implementation short cut made to improve efficiency.

Encrypted passwords retrieved. The Multics system internally encrypted its password list so that even if printed out the passwords were not intelligible. When a user presented his password, it was encrypted and then compared to the encrypted list. The tiger team used the penetration technique developed on the laboratory computer to access the encrypted password list of a large university and then broke the cypher to obtain all the passwords.

Trap door installed. The tiger team penetrated Multics and modified the manufacturer's master copy of the Multics operating system itself by installing a trap door: computer instructions to deliberately bypass the normal security checks and thus ensure penetration even after the initial flaw was fixed. This trap door was small (fewer than 10 instructions out of 100,000) and required a password for use. The manufacturer could not find it, even when he knew it existed and how it worked. Furthermore, since the trap door was inserted in the master copy of the operating system programs, the manufacturer automatically distributed this trap door to all Multics installations.

Audit record destroyed. Some have argued that a computer need not always prevent unauthorized access as long as it keeps an audit record of such accesses. The Multics system kept a protected audit record of access, and the tiger team's unauthorized accesses were recorded. However, the audit record was itself subject to unauthorized access. The tiger team merely modified the record to delete all trace of its actions, such as insertion of the trap door.

Even fixes have holes. Honeywell produced a new Multics computer that corrected all the implementation flaws reported by the tiger team. The tiger team used Honeywell's new computer at their Phoenix, Arizona, manufacturing plant and penetrated the security again.[13] This new flaw resulted from changes made to correct the previous ones! It was becoming increasingly clear that providing a multilevel secure computer was indeed difficult.

Trojan horse not dead. While some had recognized the problem, advocates in the Air Staff were commending an installation for their multilevel security solution on another computer. The solution consisted of programs to segregate the classified and unclassified information. There were no remote terminals, but users could submit unclassified jobs to the computer without security checks. From

an unclassified job the tiger team penetrated the underlying computer operating system and modified the solution into a Trojan horse, an apparently useful program that concealed harmful capabilities. The Trojan horse hid an invisible copy of classified jobs. A later unclassified job retrieved the hidden information, compromising security. Thus the security solution was not only ineffective but it actually exacerbated the security problem.

The obvious moral. Few if any contemporary computer security controls have prevented a tiger team from easily accessing any information sought. These examples are by no means exhaustive; they must not be used to infer predominance of certain flaws or to associate particular weaknesses with only a few manufacturers. Others have comparable security problems.

futility of evaluation by penetration

In a very real sense the Air Force has been fortunate that security is so poor in current computers—the greater danger will come when the argument that a computer is secure because tiger teams failed to penetrate it appears plausible. Indeed, evaluating internal computer security controls is a most difficult challenge. As with cryptography, there are basically two approaches.

If the security controls are based on a carefully formulated, sound technology, then they may be subject to rational analysis of their effectiveness. As already noted, this is generally not true of contemporary computers. The security kernel approach, which is subject to such methodical technical analysis, will also be discussed.

Alternatively, an advocate can simply search for ways to penetrate a computer's controls; failing to penetrate, he can plausibly argue there is no way to penetrate since none is known (to him). If a security hole is found, it can first be patched before arguing for security. Obviously, this argument suffers acutely from both theoretical and practical difficulties.

In principle, one could test all possible programs to find any that led to a security penetration. This method of exhaustion would be effective but is far beyond the realm of feasibility. For any substantial computer this would take so long that before the evaluation was finished the sun would literally have burned out! Thus, a realizable evaluation by exhaustion must be so incomplete as to be ludicrous.

In fact the effort spent in penetrating and patching yields poor marginal return in terms of security. The tiger team examples indicate some of the difficulties:

First, experience shows that new penetrators tend to find new holes—even after previous teams have found all they could. It seems unlikely that a real attacker will not involve new people.

Second, holes do not generally result from rank stupidity but from human oversight in dealing with a difficult design problem. Thus the fixes themselves are likely to be flawed.

Third, it does not take a highly specialized expert to penetrate security. It is true that most computer professionals do not know ways to penetrate the systems they use; they want to do a job, not interfere with it. Yet when given the assignment, even junior and inexperienced professionals have consistently succeeded in penetration.

Fourth, the exposure to attack is frequently much greater than from just the known system users. Commercial telephone connections to military systems are increasing and give worldwide access. Communication taps also give access to unsecured direct connections; microwave intercepts by the Soviets in the U.S., as

recently revealed by the White House, demonstrate this capability. Lack of strict security control on the submission of computer jobs allows attacks in the name of a legitimate user even for computers without remote terminals. Interconnection to other computers can add a large group of unknown users as well.

Fifth, the attacks can be developed and perfected on other than the target computer. A similar computer owned or legitimately accessed by the attacker can be used to minimize the risk of detection. Once perfected, the attack methods can be applied to the target computer.

Finally, to a hostile penetrator the trap door and Trojan horse approaches are probably the most attractive, and these deliberately created flaws in computer programs are the most difficult to detect. Most tiger teams concentrate on accidental flaws that anyone might happen to find, but the deliberate flaws are dormant until activated by an attacker. These errors can be placed virtually anywhere and are carefully designed to escape detection. Yet most military systems include programs not developed in a secure environment, and some are even developed abroad. In fact some systems can be subverted by an anonymous remote technician with no legitimate role in the system development. These errors can be activated by essentially any external interface—from an unclassified telegram to a unique situation set up for detection by a surveillance system.

ON BALANCE, penetrating and patching internal controls is not a promising security technique. Even without the prospect of trap doors and Trojan horses and without military security demands, "private companies have attempted to patch holes in so-called [secure] computer systems, and after millions of dollars and years of effort, they gave up in failure."[14] This approach is little more than a game of wits in which the designer must try to find (and patch) *all* the holes while the enemy need find (and exploit) but one remaining hole—a rather unbalanced contest.

The "bottom line" is simple. The commander responsible for security in a computer system needs an unequivocal answer to one crucial question: Is security dependent on internal controls? That is, is there any failure or subversion of the computer itself that could degrade security? If so, with contemporary computers he has a root inconsistency in the laxity about computer security within the military environment that normally has strict controls on dissemination of sensitive information.

Computer Security Alternatives

We have seen that in contemporary computers the internal controls are not only ineffective but also defy assessment. Yet obviously we can choose to follow the path of the German and Japanese cryptographic experience—underestimating enemy exploitation of the technical weaknesses. This is the chance we have taken in each of several Air Force decisions to operate contemporary computers in a multilevel mode.

If we lose this gamble, the damage depends on what the computer is protecting. It can range from violation of personal privacy to fraud, battlefield damage, or pre-emptive surprise attack. For example, it has been proposed that the Air Force dynamically retarget its strategic ballistic missiles; this supports the national policy of flexible response and would allow application of retaliatory weapons to the most lucrative military

targets. However, computers are at the heart of this capability; if they were penetrated, an enemy could retarget the missiles to impact on low-value or even friendly targets as part of a surprise attack!

We will not attempt to explore the numerous possible scenarios from dependence on weak techniques, but we will look at solution alternatives. Both technical and policy issues are involved. Basically, the Air Force has two alternatives other than to ignore the problem: either limit computer use or use available adequate technology to make the internal controls reliable.

avoid dependence on internal controls

The obvious alternative is to deliberately restrict computer use to a dedicated mode so that the internal controls cannot affect security. There are three common ways to avoid dependence on internal controls.

First, a separate computer can be dedicated to each level of classified information. This is particularly attractive for an on-line or real-time system where the information must be immediately accessible. This approach can lead to duplicate or inefficiently used computers.

Second, each level of classified information can be scheduled to use the computer for a different time period. This requires purging of information from all the system memory at the end of a scheduled period. This usually cumbersome manual procedure lacks responsiveness and wastes computer resources while the change in classification level is completed.

Third, various classification levels can be processed together. All communication lines must be protected, and all the users would need to be authorized access to all the information. Since the internal controls are not dependable, all output from the system is tentatively classified at the highest level. For information with a lower classification, a competent authority must manually review the output for contamination and downgrade it before releasing it at the lower level.

These use restrictions can support good security, but they result in a substantial degradation of capability in a modern computer.

Added expense. These security restrictions significantly add to the cost. Additional communication security measures are needed, and additional manpower is required for the manual review of output. There is also the cost of security clearance investigations for the users whose information the computer may contaminate with information of a higher classification. Other costs include those for duplicate equipment and for additional capacity to compensate for wasted resources. For example, when one major computer system failed to deliver the promised multilevel security, major Air Force sites had to clear many users and make multimillion dollar purchases of additional equipment.

Increased risk. In practice the dedicated mode leads to a major increase in the exposure of information. The lack of internal controls effectively destroys the compartmentalization intended to limit the damage from subversion. The greater number of people requiring clearance increases the chance of granting access to an untrustworthy individual. Manual purge procedures are prone to errors that leave classified memory residues which can be extracted by unauthorized users. Furthermore, the manual review of large volumes of computer output may in fact be a bureaucratic ruse to transfer security responsibility (liability) from designers to users; the reviewer has little chance of detecting unauthorized classified information that has been accidentally or

deliberately included in the output.

Foregone capabilities. Such security restrictions can seriously limit the operational capability of battlefield support systems. Modern weapons demand command and control systems with rapid access to a large base of current and accurate information. This (necessarily shared and integrated) data base will typically contain information ranging from unclassified through top secret. Since many people who maintain the less classified information have limited clearances, and the volume of information requires that computers be used, we have the classical multilevel computer security problem. Internal computer controls are crucial to information protection, and avoiding dependence on the internal controls will seriously limit system capabilities.

The problem is exacerbated by interoperability with its interconnected network of computers with a large, diverse, and geographically dispersed user community. Command and control system computer networks are a prime example. Yet one military official observed that because of poor internal computer security in one such network, its 35 large-scale, general-purpose computers would never truly be used for the purpose for which they were procured. The problem is even further intensified by the growing need for fusion of selected intelligence information (without compromise of sensitive sources) with tactical operations information.

In summary, the dedicated mode avoids many computer security problems but fails to meet the operational needs of a modern military force. These needs can only be met by effective multilevel protection in the computer itself.

apply adequate technology

Developing and applying reliable internal computer security are neither easy nor impossible. Although the need for multilevel operation is frequently recognized, the military has given only limited attention to developing the required technology. In fact, the Air Force recently directed termination of its multilevel security development program, the largest in the Department of Defense.[15]

Before we examine the technological progress that has been made, it should be instructive to identify some of the reasoning that surfaced in the recent Air Force termination. The pattern of thought reflects that computer security is not currently a major focus.

- The prospect of industry's solving the computer security problem is overestimated by concluding that industry has the same security problem as the military. However, the communications analogy indicates a difficulty. In the civilian sector, communication security violations are subject to legislation, not prevention; wiretapping is outlawed, and there is legal redress for loss. In contrast, the military must resort to prevention (e.g., military approved cryptography), since we cannot sue the KGB! The computer situation is similar; there are legislative thrusts but limited commercial success toward demonstrably effective internal controls. The wait for spontaneous industry solutions is likely to be a long one, and it is unlikely that they will ever meet military security standards in areas such as protection from deliberate subversion.

- Inadequate research and development (R&D) funding was allocated to continue one element of the program at an optimal level. Yet portions of the program with funds available were also terminated. Eight million dollars of work was successfully completed. About $10 million of work over four years remained to complete development of a full prototype and the associated general basis for competitive

procurement. Several estimates indicate that development costs could be recouped by avoiding the penalties of dedicated mode—not to mention the increased security and operational capability.

• The threat is minimized by seeking counterintelligence that is practically unavailable, e.g., actual examples of enemy agents caught in the act. The enemy may appear too ignorant for penetration, not interested in military secrets, or incapable of planned subversion and exploitation. A single number quantification of the probability of threat can implicitly assume a random incident rather than a planned penetration activity. This may indicate acceptable risk without an objective criterion of acceptability. These perceptions are generally not based on professional intelligence methods with "worked examples" (e.g., from communication security) of the methodology.

• Interest in developing solutions is limited by a lack of clear responsibility for the effectiveness of internal controls. Staff and policy offices can provide recommendations, guidance, and even approvals for computer security mechanisms without responsibility (liability) for any security compromise that might result. On the other hand, the security test and evaluation efforts and cost-effectiveness assessments of individual commanders are largely unrelated to the system's real protection. This is in marked contrast to military communication security where technical experts are responsible for certifying the security mechanisms.

• The computer security problem is difficult to recognize when policy does not clearly distinguish the cases where the computer simply provides computation and where the computer provides internal protection. Such policy focuses development on security controls that are "not necessarily certifiably perfect"—a rather ambiguous goal. In such a policy framework requirements analysis will not identify the need for internal controls. In fact, a computer may well satisfy all regulations and still be highly vulnerable.

• Confidence in weak controls grows from the assumption that expending resources on security will substantially improve security. In fact, the effort may be simply ineffective, as in the case of the penetrate and patch treadmill. Current policy enumerates computer design characteristics for internal security that are neither necessary nor sufficient for security.

• Attention to security gimmicks results in overlooking serious weaknesses. There are many mechanisms of minimal effectiveness in improving internal security controls—handprint analyzers, encryption of internal data, read-only memory for security information, etc. Some guidance has encouraged computer programs that sort out and label products by security level. Evaluation of these programs focuses on expected results with friendly users rather than on deliberate subversion of the programs or penetration of the underlying system. Pursuing such scattered efforts is frequently worse than doing nothing at all, since it gives a dangerous false sense of security.

THESE SORTS of issues caused the Air Force to characterize its Electronic Systems Division's (recently terminated) development program as "controversial." But our previous examination of the problem makes it clear that multilevel operation without adequate technology is a high stakes gamble. Most charitably, it is strangely inconsistent with established standards in other areas (e.g., communications) of military security that hypo-

thesize a deliberate, competent, and motivated hostile threat and respond with effective countermeasures. More likely it nullifies all other security measures, allowing damage limited only by the imagination of the enemy.

Security Kernel Technology

Fortunately, military R&D—in particular the recently terminated Air Force program,[16]—has made substantial progress toward adequate technology for multilevel security. A major step toward solution was the introduction in 1972 of the security kernel[17] technology, which provided a scientific foundation for demonstrably effective internal security controls. Although an explanation of the technical details is well beyond the scope of this article, one technical report summarizes the kernel approach this way:

> The approach to obtaining a secure system involves first defining the security requirements and then creating a conceptual design that can be shown to provide the required protection (i.e., a model). The model formally defines an ideal system (in our case one that complies with military security requirements), and provides a basis for testing a subsequent implementation. Once a [security kernel] that meets the requirements previously described has been implemented, computer security has been achieved. Of the software in the system, only the security kernel . . . need be correct. . . .The operating system proper and/or the application software can contain inadvertently introduced bugs or maliciously planted trap doors without compromising security.[18]

Under the Air Force program the security kernel demonstrated its technical feasibility, independent of any particular computer vendor or security policy. The kernel has also largely established its operational acceptability, with specific evidence for broad functionality, good efficiency, security certifiability, and supportability. In addition, the underlying technical requirements of the kernel have been successfully incorporated into military procurement specifications for both a commercial large-scale computer and an embedded weapon system computer. In short, the basic technology is well in hand.

scientific foundation

A security kernel is a small set of computer program instructions and associated hardware that controls all access by users (viz., through their programs) to information. A given security kernel is usually unique to a particular computer. A security kernel for computers is in many ways conceptually analogous to a cryptographic device for communications.

Security kernel design is derived directly from a precise specification (viz., a mathematical model) of its function. (The kernel model is analogous to the algorithm that defines the mathematical function of a cryptographic device.) This mathematical model is a precise formulation of access rules based on user attributes (clearance, need to know) and information attributes (classification). System parameters control an installation's specific use (e.g., for the DOD classification policy, privacy protection, etc.).

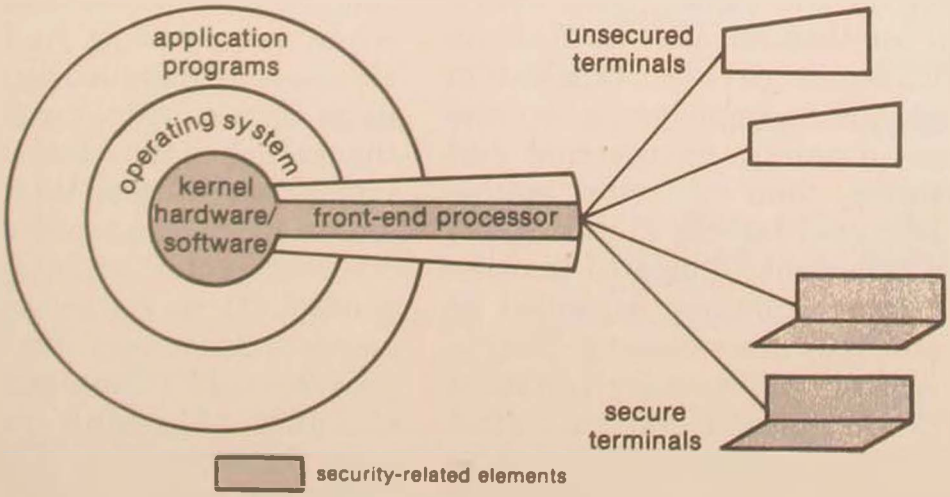
The chief distinguishing characteristic (from whence its name) of the security kernel concept is that a kernel represents a distinct internal security perimeter. In particular, that portion of the system responsible for maintaining internal security is reduced from essentially the entire computer to principally the kernel. Thus the kernel is analogous to a cryptographic device that removes most of a communication path from security consideration. To be a bit more technical and concrete, a typical security kernel has several (say ten to twenty) small computer programs (viz., subroutines) that can be

invoked by other programs (e.g., the operating system and individual user application programs). The kernel, and only the kernel, controls and manages all the hardware components that store and access information. All other (viz., nonkernel) programs must invoke the kernel (i.e., call on its subroutines) in order to access information—the kernel checks the user and information attributes and provides only access that is authorized. Yet, in spite of these checks, there is minimal user impact. Figure 1 conceptually illustrates this structure.

The technical breakthrough was the discovery of a set of model functions and conditions that are provably sufficient to prevent compromise for all possible nonkernel computer programs. Each function of the model determines the design for a kernel program. In addition, the model imposes security conditions that must be met by the design. Security theorems have been proved showing that (since the kernel precisely follows the model) the kernel will not permit a compromise, regardless of what program uses it or how it is used. That is, the kernel design is penetration-proof—in particular to all those clever attacks that the kernel designers never contemplated.

This foundation of mathematical completeness raises the kernel design and evaluation process above a mere game of wits with an attacker; this is analogous to information theory as a foundation for modern cryptanalysis. A dramatic effect is that the kernel facilitates objective evaluation of internal security. The evaluator need not examine the nearly endless number of possible penetration attempts; he need only verify that the mathematical model is correctly implemented by the kernel. In other words, the kernel provides the verifiably reliable internal controls needed for multilevel security.

Figure 1. Secure computer system



engineering feasibility

To be useful the kernel concept must be not only mathematically sound but also feasible to implement. Successful implementation is based on three engineering principles:

Completeness. A security kernel must be invoked on every access to data in the computer.

Isolation. A security kernel and its data base must be protected from unauthorized modification.

Verifiability. A security kernel must be sufficiently small and simple that its function can be completely tested and verified.

A laboratory security kernel for a commercial minicomputer (Digital Equipment Corporation model PDP-11/45) showed feasibility in 1974. The "virtual memory" hardware of this computer was a significant aid in ensuring the completeness and isolation of the kernel. This running kernel consisted of only about 1000 computer instructions. The experiment also established that it is much easier to introduce the kernel concept into an initial design than it is to retrofit it later.

The basis for the design (viz., kernel model) was mathematically verified. As with cryptographic devices, verification of the corresponding implementation was based more on careful engineering and extensive testing than on formal mathematics. Automated testing and program verification techniques indicated that the kernel implementation corresponded to the design. This laboratory prototype confirmed feasibility but was not oriented toward performance and efficiency evaluation. In passing, it is interesting to note that a tiger team tried and failed to penetrate its security.

performance

Performance was examined on a larger computer system. Negligible performance degradation (less than 1 percent) was experienced when the commercial Multics (for the Honeywell 6000 line) was modified to the kernel model. This Multics version was not implemented as a true kernel, i.e., the controls were distributed rather than collected into a small, verifiable entity; however, this version made all the security checks required in a kernel and thus confirmed that the kernel was not inherently inefficient.

The good security features of the kernel hardware were a major aid to performance, and these features are vendor-independent. The version was so successful that Honeywell included the resulting Access Isolation Mechanism in commercial Multics offerings for protection of privacy and business information. This system was used as the foundation for the terminated Air Force prototype; the prototype development was implementing a true, verifiable kernel.

functionality

A security kernel forces the computer user to be security-conscious but does not seriously degrade the capabilities of the computer. This was clearly demonstrated when the Multics modifications were successfully installed for those demanding users in the Pentagon: the constraints of the kernel design had minimal adverse impact on the users. Just as cryptography allows the secure use of standard commercial communication equipment, the kernel concept allows the secure use of standard commercial computer equipment and programs. The Pentagon facility with its classified processing confirmed the concepts for supporting a kernel-based computer in a total system security context.

Operational utility of the kernel was

further demonstrated with the initial minicomputer prototype. A demonstration showed the secure interface of operations and intelligence systems for fusion of tactical battlefield information. In addition, several military R&D efforts in various stages of completion have used major elements of the security kernel technology: a command and control network, a cryptographic controller, a nation-wide digital communication system, a large-scale "virtual machine monitor" system, a general-purpose minicomputer operating system, and a secure militarized minicomputer (based on the commercial Honeywell Level 6). Although they confirm the utility of the security kernel, none of these R&D efforts will lead to availability and operational use on a general basis.

security policy

Although the security kernel concept is not at odds with current policy, future policy must recognize and take advantage of kernel characteristics. Policy should recognize that the mathematical model provides a way to translate paper and pencil security rules into computer terms. In addition, a meaningful policy for multilevel mode would reflect the technological realities: either the entire system must be correct (not currently feasible) or else the security kernel must be used.

As with cryptographic devices, the kernel must be protected against subversion (e.g., insertion of a trap door) during its development. But protecting the kernel certainly involves far fewer people and a much more controlled environment than trying to protect all the computer programs of the system; thus, in contrast to contemporary systems, the kernel makes it tractable to protect against subversion. Furthermore, the evaluation (for certification) of internal computer security controls is a difficult technical task. The kernel approach to design and implementation makes such certification feasible, but this evaluation still requires highly capable

Table II. Commonality in security technology

	Cryptographic Mechanism	Security Kernel
threats negated rather than outlawed	wiretapping	penetration
standard commercial elements preserved	communications circuits	computers and programs
security sensitive portions limited	principally the crypto	principally the kernel
underlying basis precisely formulated	cryptographic algorithm	mathematical model
design evaluation criteria definitized	information theory	security theorems
implementation exactly meeting design	methodical engineering	verified programs
subversion controlled by physical security	manufacturing	programming
skilled experts needed for certification	cryptanalysts and engineers	computer scientists

technical experts—just as does the evaluation of cryptographic devices.

This approach conceptually parallels modern military cryptography. (See Table II.) Yet, development must be resumed and policy adjustments made if it is to be available on a general basis at any time in the immediate future. To be sure, there are competing demands for resources. Development of directly employable weapons (such as fighters) may always have higher priority than development of computer security, but as one observer put it: "How effective would those fighters be if plans for their employment were known in advance by an adversary who had penetrated the computer containing those plans?"[19] The security kernel is clearly the only currently available technology that can provide the security and operational capabilities we must have.

SECURITY often requires subjective judgments, and some may differ with the author on specific points. On balance it appears evident that a user who puts blind trust in the protection provided by computers for sensitive military information will seriously endanger security. In fact, most computers do not even include nominal features to support a military security system. Even when they do, the essence of the computer security problem is the technical efficacy of internal controls, and the evidence is clear that most internal controls are not dependable.

On the other hand, limiting computer use in order to avoid this problem is expensive and deprives us of vital operational capability. The effectiveness versus efficiency dilemma generates pressure for underestimating the threat and overconfidence in internal security controls. Unfortunately, these pressures have led the Air Force into a disturbing and increasing dependency on weak security controls even in the absence of evidence of effectiveness.

The Air Force recently terminated the single major DOD program for providing practical and scientifically sound internal controls—controls based on the security kernel concept. Past development has clearly demonstrated the feasibility, performance, and utility of this technology. However, because of lack of both a technical understanding and a meaningful policy, there is currently little official support for development of this promising capability.

Three basic actions must be taken to control the adverse impact of our computer security weakness:

- Promulgate a clear policy that distinguishes between dependence on external controls (dedicated mode) and internal controls (multilevel mode). It should not be possible to satisfy the policy without genuinely providing security. Multilevel mode without a technically sound basis should be expressly prohibited.
- Incorporate explicit military security controls in classified processing systems. These must be based on a precise specification of the required functions (as in the kernel model for the Pentagon Multics). This step is crucial to future introduction of multilevel security without complete system redesign. (In the interim this can also aid in the protection of privacy and valuable resources.)
- Resume security kernel development to provide technically sound multilevel security. As in the previous Air Force program, this should be oriented toward the competitive military acquisition process. Concurrently, policy must be changed to facilitate operational use of the kernel technology.

IT IS NOT easy to make a computer system secure, but neither is it impossible. The greatest error is to ignore the problem—a fatal mistake which obviously allows available solutions to remain unused. Failure in this one critical area introduces an Achilles' heel into our battlefield support systems—the cornerstone of the modern electronic Air Force.

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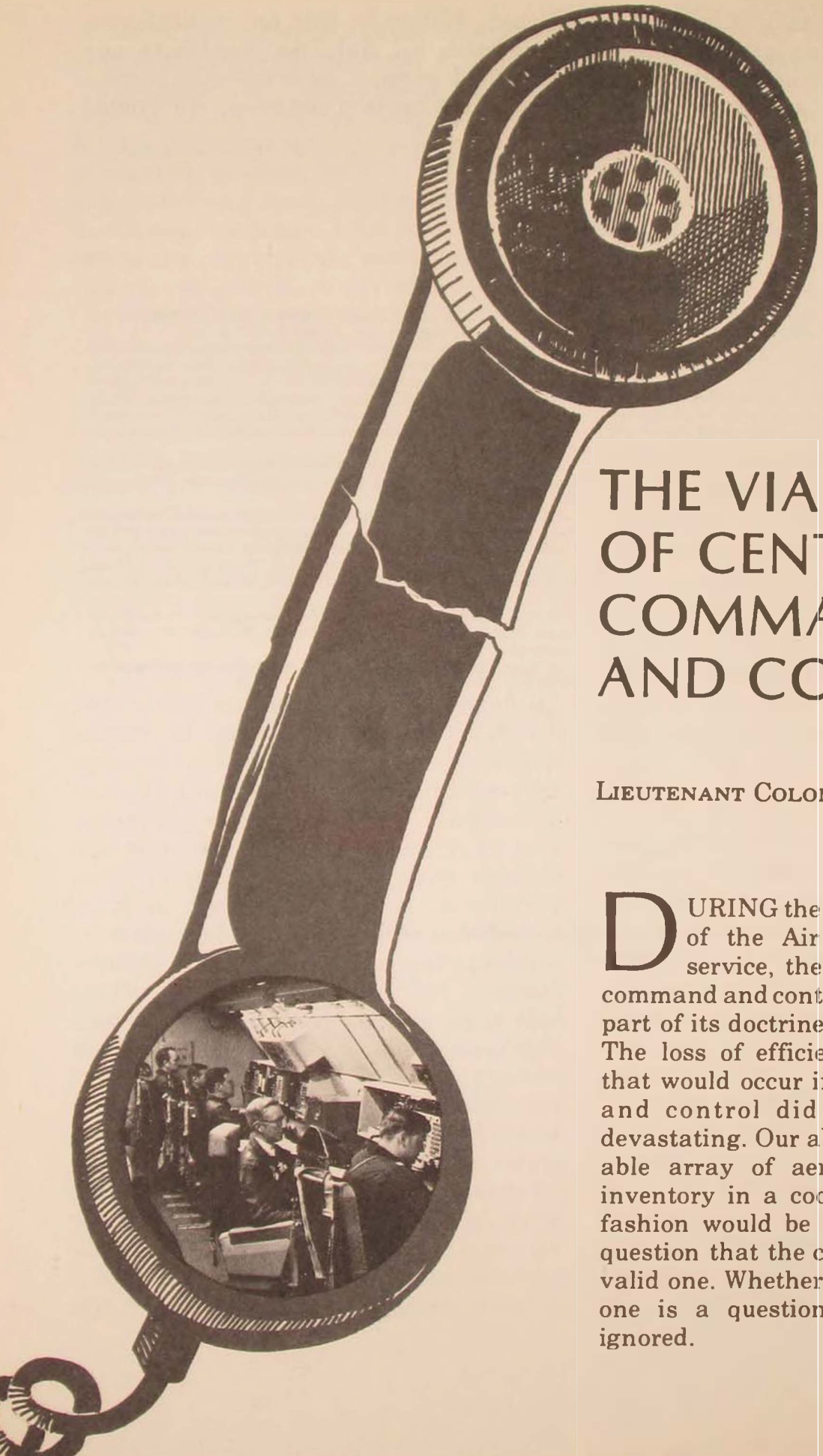
Notes

1. Malcolm R. Currie, "Electronics: Key Military 'Force Multiplier,'" *Air Force Magazine*, July 1976, p. 44.
2. Edgar Ulsamer, "How ESD Is Building USAF's Electronic Eyes and Ears," *Air Force Magazine*, July 1977, p. 40.
3. Importance of electronics to the Air Force is indicated in "The Electronic Air Force," *Air Force Magazine*, July 1977, p. 29, which notes that this is the magazine's seventh annual issue devoted primarily to this "fundamental Air Force concern."
4. F. W. Winterbotham, *The Ultra Secret* (New York: Harper and Row, 1974), p. 11.
5. Ibid., p. 15.
6. Ibid., p. 107.
7. Ibid., p. 191.
8. David Kahn, *The Codebreakers* (New York: Macmillan Co., 1967), p. 67.
9. Winterbotham, p. 85.
10. Kahn, p. 591.
11. Ibid., p. 392.
12. Thomas Whiteside, "Dead Souls in the Computer," *The New Yorker*, August 29, 1977, pp. 59-62.
13. Tom Alexander, "Waiting for the Great Computer Rip-off," *Fortune*, July 1974, p. 143.
14. Bonnie Ginzburg, "Military Computers Easily Penetrable, AF Study Finds," *Washington Post*, August 8, 1976, p. A6.
15. In August 1976 Air Force Systems Command directed termination of the Electronic Systems Division's ADP System Security Program. Termination was completed by September 1977, halting development (that was proceeding well) of a secure general-purpose prototype to fully demonstrate operational acceptability and the associated development of specifications, policy recommendations, and evaluation criteria for general use.
16. Lawrence Curran, "Air Force 'Kernel' Attains Computer Security Using Existing Technology," *Electronics*, September 30, 1976, pp. 59, 61.
17. The author initially hypothesized the security kernel concept and its mathematical basis. Subsequent sponsored research at the MITRE Corporation completed the detailed formulation, as described in *ESD 1976 Computer Security Developments Summary*, MCI-76—2, Electronics Systems Division, Hanscom AFB, Massachusetts, January 1977.
18. W. L. Schiller, *The Design and Specification of a Security Kernel for the PDP-11/45*, ESD—TR-75-69, (Bedford, Massachusetts: MITRE Corporation, May 1975), p. 9.
19. "Computer Security: A Case of Priorities," *Electronics*, September 30, 1976, p. 10.

Technological progress has merely provided us with more efficient means for going backwards.

ALDOUS HUXLEY



THE VIABILITY OF CENTRALIZED COMMAND AND CONTROL(C

LIEUTENANT COLONEL PHILLIP K. HEACO(

DURING the relatively short history of the Air Force as a separate service, the concept of centralized command and control has been an integral part of its doctrine—and for good reason. The loss of efficiency and effectiveness that would occur if centralized command and control did not exist would be devastating. Our ability to use the formidable array of aerospace forces in our inventory in a coordinated and decisive fashion would be lost. Thus, there is no question that the centralized concept is a valid one. Whether the concept is a viable one is a question that has long been ignored.

The doctrine of centralized command and control (C^2) has many origins—some rational, some emotional, some historical, and some based on technology. Not only is the doctrine logical and supportable from any number of standpoints but also it has been used successfully in many military encounters. One need look only as far as the nearest doctrinal manual to find the rationale for strong centralized C^2, normally with the proviso that the concept include decentralized execution. These same directives are intentionally vague, however, as to the level at which centralization should take place, saying only that it should take place at the lowest level where all information is available to make timely and accurate decisions on force employment. This provision is logical, albeit a bit ambiguous, if the full potential of the concentration of flexible aerospace forces is to be realized and exploited to the greatest advantage.

Historical and emotional antecedents of centralized C^2 doctrine parallel each other closely. As the capability of air power began to be realized during World War II, it was seen that single and separate control of air forces was necessary to use them most effectively—usually against strategic targets. From the lessons learned in North Africa in 1943, it was clearly no longer effective to tie air power inextricably to Army ground forces commanders. At the same time proponents of a separate air service saw strong centralization as an effective tactic in facilitating the eventual break from the Army. Centralization was a part of the revolution of independence that the advocates of a separate air arm waged during World War II. So, while the logical historical elements of the argument were able to stand on their own merits, the emotional elements were equally operative.

Technology has had its most compelling impact on the centralization philosophy in the last two decades and can be most closely associated with the advent of nuclear weapons, the computer, and high-speed data communications. With these latter two developments it is possible, with relative ease, to transfer, store, and manipulate large quantities of data at the speed of light. It is this capability that has enabled the complete disestablishment of entire levels of organization—trading off people for electronics—and further centralizing decisions that can more effectively be made at the higher echelon. Even the menus for the dining hall are handled centrally, not to mention pay and supply.

THE attributes of a centralized C^2 system have been touted widely. There are, however, arguments for and against extremely high levels of centralization, including concerns that highly placed commanders may not be able to have an accurate feel for a situation, notwithstanding the very elaborate command, control, and communications (C^3) systems which they might employ. There are also considerations that would transcend these apparent difficulties, which would argue for high centralization even with some loss of effectiveness. President Kennedy's strong personal control of the Cuban crisis is a good case in point, where there was real concern that we might blunder into a nuclear war. This kind of situation is not atypical. There have been and will continue to be other instances of crisis management where extreme centralization will be required at the highest level. However, these cases do not prove the rule, and a workable alternative is necessary under a broad range of options.

There are two fundamental reasons for exploring alternatives. The first and most significant is that in many more instances than anyone would like to admit, the

communications to support the centralized C^2 concept are just not going to be available, especially in a conventional war such as might be fought by NATO. The second and equally compelling reason is to provide the necessary flexibility to exploit the situation should it occur.

A fair differentiation can be made at this point between what is classically referred to as the strategic side of the problem versus the tactical side. Much attention and significant amounts of resources have been applied to provide for relatively survivable systems in the strategic arena. These will certainly be available in sufficient quantity and quality to support our objectives in the preattack, probably well into the transattack, and possibly even into the postattack phases of a general war. In the strategic area there has been much attention paid to hardening; and the post attack command control system (PACCS), emergency rocket communications system (ERCS), very low frequency (VLF), and extremely low frequency (ELF) systems are designed with one primary purpose in mind—survivability.

In a limited or conventional war, however, look out! Not only will communication systems of the various services not play well together, they are anything but survivable, they can scarcely be integrated into a coalition war situation, they are targeted, and they will be jammed extensively.

There are two reasons why we have been lulled into a false sense of security on this issue. Our Southeast Asia experience did not teach us about degraded communications generally. For reasons that will not be discussed here, the enemy never attacked them. Second, actual or even simulated degradation of communication systems under exercise conditions is not allowed to any extent even approximating realism. Why? Because to do so would preclude elements of our forces from practicing other aspects of the exercise. These two factors taken together have seriously deluded our thinking. To a large extent the communications part of C^3 just is not going to be there. This brings us to the second fundamental reason for looking at alternatives to highly centralized C^2 in a tactical theater of operations.

There is an old expression that "forewarned is forearmed." Given that there is a general realization that the concept of centralized command and control may not be viable under all circumstances, then it logically follows that we should prepare for that eventuality. There are probably a number of horror stories to show how a highly centralized structure has been less than effective, but these might be difficult to prove because normally every effort is made to hide mistakes and support higher authority's decisions. Certainly this consideration is present when doing post mortems on incidents such as the *Pueblo* and the EC-121 shoot down. There are others, but none makes the point very convincingly. Suffice it to say that our experience does not teach us what situation we are likely to find ourselves in should we get involved in a tough conventional war like that postulated in NATO scenarios.

So what should be done? We should clearly recognize this contingency in our doctrine. We should provide for each echelon a set of continually updated guidelines to follow should the systems that provide centralized C^3 be lost: not just who a commander should try to contact but what he should do with the forces he has at his disposal until effective communications can be restored. The way the system is now structured, there are probably a number of wing commanders who would do nothing until they could receive instructions, and thus would be of no value. As it stands now, it would be

based largely on the personality of the particular commander. I for one have a lot of faith in these hand-picked people, but they need to know that they are supposed to do something, and they should know generally what action would contribute most to the war effort at the time communications are lost.

This concept will require some careful planning and continuous updating, but it does not cost much and can be done immediately. Training on the options, especially at lower echelons, should be extensive, and simulation of "communications out" procedures should be exercised. This proposal does not deny in any way the desirability of the centralized doctrine developed and successfully used over many years. It does, however, exploit a degraded situation which will likely exist, and therefore ensures the use of resources that would presently be lost.

ALTHOUGH there has been—normally reluctant—recognition that command and control systems are tenuous, the corrective thrust has been much lip service and breast beating about enhanced survivability, redundancy, mobility, and the like. Basic joint as well as Air Force doctrine has always taken this approach. And since a fairly high degree of centralization is obviously preferred, attempts to attain improved survivability should never be rejected unless they prove not to be cost-effective. Unfortunately, there are just not enough resources to provide for the degree of survivability necessary to ensure continuous centralized C^2.

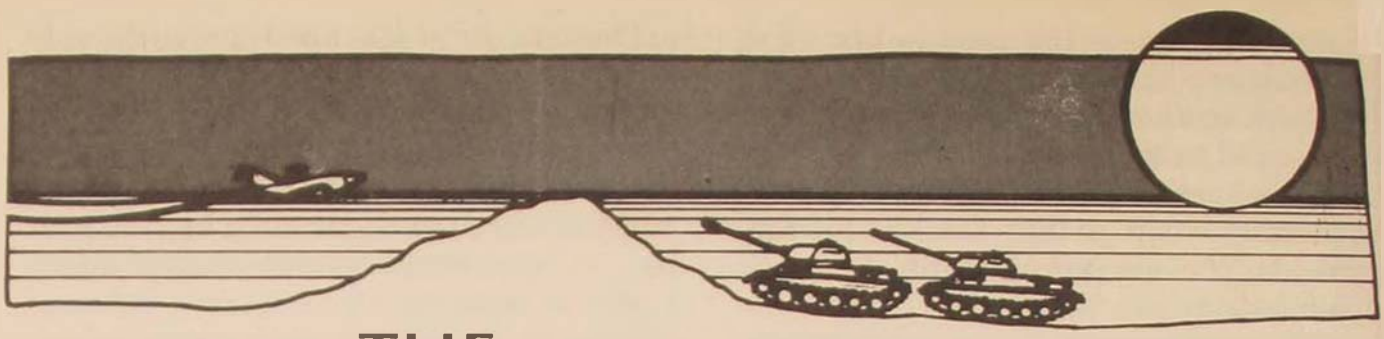
These facts of life are apparently only now being recognized in the new draft of AFM 1-1, which is being worked at the Air Staff. For the first time, this basic doctrinal manual asserts that "Command and Control procedures must be set up for use in the event the Communications systems fails [*sic*]."[1] This is a welcome change to the directive for reasons which should be apparent by now. Hopefully, planners will start thinking about what those procedures should be.

ALTHOUGH these thoughts may be considered heresy by some, I believe they need to be considered. Attempts have been made to avoid extreme emotional notions to make the case a plausible one and worthy of further study. In my view we must develop a new mindset based on a recognition of reality and a confidence in well-educated, well-trained, and resourceful low-echelon commanders. We will probably have to depend on them anyway. Why not anticipate this eventuality and give them techniques and plans to assist them? Let's not allow our preference for the clear advantages of centralization to blind us to the fact that we may not be able to support it with necessary communications in a conflict. We must face this issue squarely and plan accordingly—now!

Air War College

Note

1. *Functions and Basic Doctrine of the USAF* (draft), AFM 1-1, Department of the Air Force, attached to AWC (EDRS) letter dated 12 December 1977, p. 2-21.



THE AIRBORNE FORWARD AIR CONTROLLER

future needs and opportunities

JOHN W. ELLIS, JR.

PRESENTLY, and into the foreseeable future, close air support aircraft will require assistance in finding, identifying, and acquiring battlefield targets. Classically, this function has been shared by ground-based forward observers (FOs) and forward air controllers (FACs) and by airborne FACs. But even in some phases of the war in Vietnam, the strength of the surface-to-air defenses was becoming a serious consideration, and for some missions, led to experimentation with fighter-bomber aircraft in the "fast FAC" or strike control and reconnaissance (SCAR) role. These attempts to alleviate the survival problem did so, however, by means that were inherently unsuitable for surveillance and fire control in the unorganized and cluttered environment of the battlefield. With the continuing development of surface-to-air defense technology, as evidenced by the Israeli experience in the 1973 war, this situation has been exacerbated.

In each succeeding conflict of this century (World War II, Korea, and Vietnam), the contribution of tactical air

support has been reaffirmed. Even as the conditions on and over the battlefield have changed, so have the tactics and procedures of air-ground cooperation adapted, adding new techniques to keep pace. Consequently, aerial surveillance, target development, and fire support in the battle area are now well recognized as vital military capabilities.

There is no reason to doubt that the need for these functions should be any less pressing in the defense of NATO. But the developing Warsaw Pact ground combat and surface-to-air defense forces might well impose conditions that could drastically alter the requirements for surveillance and fire control and could force changes in the means employed to provide those functions. These are the circumstances that must be recognized in considering the future of the airborne forward air controller.

ALTHOUGH the post-Vietnam USAF force structure has continued to support a modest number of tactical air support squadrons (TASS) to provide forward air controllers to the tactical air control system (TACS), there is a growing uneasiness concerning their survivability over a modern battlefield because of the strength and effectiveness of modern Soviet battlefield antiaircraft (AA) gun and surface-to-air missile (SAM) defenses. These developments indicate clearly that, in future tactical combat, friendly air forces will face a technologically advanced and dense air defense system with redundant coverage, ranging from low to very high altitudes. In addition, the design trends have been toward mounting these weapons on self-propelled chassis to provide mobility consistent with the armored forces the defense units are intended to protect. Thus, through sheer numbers, AA weapons of smaller size and less distinctive shape combined with greater vehicular mobility result in battlefield defenses that are becoming harder to detect and to avoid or attack.[1]

Similarly, the new armored combat vehicles (ACV) introduced into the Group of Soviet Forces Germany have increased speed and battlefield mobility, a greater proportion of the artillery is self-propelled, and both ACVs and artillery are better protected.[2] Greater mobility means that combat forces are more readily dispersed and hidden. This places a premium on the NATO surveillance and firepower systems' ability to achieve short reaction times, approaching the ultimate of real-time surveillance and fire direction. Better protective armor indicates that supporting fires must be accurate to be effective; hence, target tracking or homing munitions may be necessary. Finally, because of the numerical superiority of the enemy, it would be important to be able to adjust fire continuously and to determine rapidly when a target had been killed, both to utilize scarce NATO firepower units efficiently and to ease ammunition resupply and conserve stocks. Consequently, the need for effective fire support for NATO ground forces is increasing at the same time that the enemy's battlefield defenses are becoming stronger.

FACING a numerically superior enemy, imbued with a relentless doctrine of the offensive and well equipped for mobile, armored operations, the NATO ground commander is confronted with a formidable problem in marshaling sufficient firepower to engage enemy targets at the rate at which they could appear. The likely hostile surface-to-air defense, which could militate against the extensive use of an airborne FAC over enemy forces, suggests

that the precise nature of the need for air support will not be perceived until the leading enemy elements come, at best, within line of sight of forward Army forces. In the absence of locally controlled aerial surveillance over the battlefield, the forward ground force commander, together with his USAF air liaison officer (ALO), is likely to be heavily dependent on Army forward observers in deciding when enemy strength threatens to exceed the combat capability of his organic and supporting ground firepower.

Further, even under the best of meteorological conditions, the FO cannot be expected to acquire targets more than a few kilometers in advance of his location. This means that the limited time and space available to bring the enemy under fire will severely inhibit the rate of application of available firepower, air or ground. Nor is it at all certain that an FO will always be in the right place at the right time, particularly since the defensive posture adopted by NATO gives the choice of the timing and location of attacks to the Warsaw Pact forces. Even if he were initially positioned advantageously, the FO, with his limited ability to change vantage points quickly, could have his performance degraded by enemy use of obscuring smoke and the inevitable battlefield haze, dust, and smoke from exploding rounds. Under these circumstances, the full capabilities of supporting artillery and of air strikes cannot be realized. Both suffer from the restricted range of vision of ground-based observer's into the enemy rear. As a result, beyond the limited range of the FO, artillery is able to engage effectively only relatively static area targets, and without aerial surveillance, air support would have to look to its own self-contained target acquisition capabilities.

Most, if not all, of these targeting and fire control difficulties can be alleviated by the use of a mobile aerial platform. In accomplishing the necessary tasks of surveillance, targeting, fire control, and damage assessment, there are obvious advantages to be gained from applying man's memory, reasoning, and decision-making capabilities. Similarly, it is clearly beneficial to be able to observe from a low, slow, maneuverable vehicle that is able to stay close to the intended target, thereby greatly reducing the deleterious effects of poor weather, terrain, vegetation, and localized battlefield smoke and dust.

Thus, the desirability of real-time aerial surveillance and control of firepower to exploit the full range of artillery and to enhance the utility of air strikes in direct support of the ground battle seems, clearly, still to be with us. But in view of the increasingly hostile ground-to-air defense environment, neither the airborne artillery spotter nor the airborne forward air controller, as we have known them in the past, is the solution—he is the problem!

Two aspects of the problem of providing adequate fire support to defending NATO ground forces stand out. One is that both Army and Air Force fire support systems need aerial surveillance and fire direction and control to obtain the best results. The second is that the vulnerability of the kind of manned system (low and slow) that can do the job is likely to be intolerable, given the Warsaw Pact ground-to-air defense environment. Moreover, even if the ground-to-air defense threat could be suppressed sufficiently, the essential air-to-ground and air-to-air voice communication links could be severely disrupted by enemy jamming with the airborne FAC located in the forward battle area.

To surmount these two types of vulnerability, the USAF has considered alternatives to the classical airborne FAC operation, now mounted in OV-10 aircraft. One suggestion being considered is the use

of two-place tactical fighters. While undoubtedly providing some increase in survivability, although at the expense of what could turn out to be a serious decrease in the ability to accomplish the surveillance and control mission, it is not at all clear that a sufficiently large increase in survivability would result, given the capability of modern battlefield air defenses, nor that the effect of enemy ECM would be diminished. A second suggestion is to retain the OV-10 aircraft but withdraw its operating location to the rear a distance sufficient to minimize the air defense and jamming threat. By so doing, the surveillance and strike control functions would be largely abdicated, leaving them to the ground FAC, while retaining only the battle management function. Neither of these alternatives appears to be a satisfactory solution to the problem as a whole.

The Army faces a similar situation in attempting to provide the tactical ground commander (e.g., brigade or division) with surveillance of threatening activity to the desired depth in the enemy rear areas and for over-the-hill target development and fire control for artillery (particularly for Copperhead rounds).* The limited range of vision of the FO on the ground and of the scout helicopter flying nap-of-the-earth along the FEBA indicates the need for some form of elevated vantage point in the battle area. For these purposes, the Army has embarked on a systems technology demonstrator program called "Aquila" to explore the technical feasibility and operational utility of a mini-remotely piloted vehicle (RPV) system.[3]

The efforts of TAC and TRADOC to develop joint air-ground procedures and tactics are based on the premise that air support of ground forces must truly be a joint effort to be successful. As described above, the congruence of Army and Air Force needs for aerial surveillance, target development, and fire control in the battle area argues strongly for a joint solution. Further, to preserve the irreplaceable capability of man involving his reasoning and understanding of the combat situation, he should be removed from an environment that leads to working under stress. The latter often leads to errors on nonroutine tasks, induces fatigue that limits his powers of observation, and slows his reflexes or, on the contrary, induces jumpiness or overreaction. What is required is an instrumentality that can perform the necessary functions, will permit removal of man from the hazardous environment over the battlefield, will be sufficiently survivable (either through proliferation or reduced vulnerability), and can serve two masters simultaneously—the Army and the Air Force. It would appear that a suitably designed, organized, and controlled RPV system could satisfy these requirements.

The basic components of such a surveillance and fire control system might be as follows:

1. An unmanned vehicle equipped with suitable sensors and a laser rangefinder/designator.
2. A data link (vehicle status, command and video).
3. A ground control station with access to the Army air-ground system (AAGS) and artillery fire direction center (FDC).
4. A data link (relay) from the ground station to an appropriate point in the Air Force TACS.

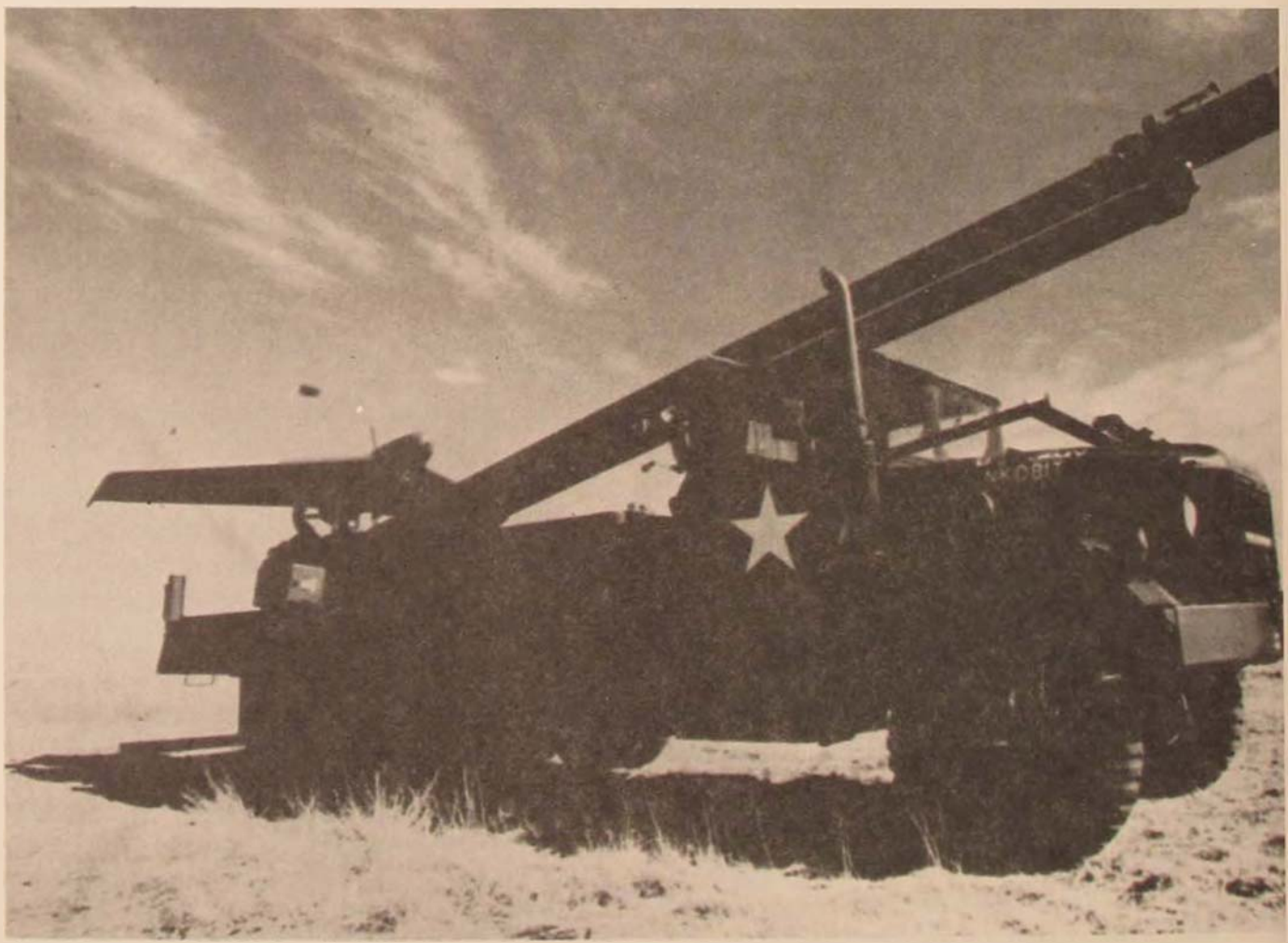
With the exception of the link to the Air Force TACS, prototypes of equipments matching these needs are included in current Army developments. The Aquila mini-RPV program, after overcoming early difficulties, has demonstrated the feasibility of the launch and retrieval and

*Copperhead is a 155mm semiactive laser-guided artillery round with a shaped charge warhead.

in-flight control of a small, unmanned vehicle on typical operational-type mission profiles, largely under the preplanned, automatic control of the ground station. Under a separate program, a jam-resistant data link has been tested successfully in an RPV at Fort Huachuca, Arizona, and now is entering engineering development.

If these efforts progress successfully, the resultant system could make a major contribution toward overcoming the Army surveillance and firepower limitations noted above. Also, they could assist in more closely coupling the USAF close-support capabilities to the real needs of the ground battle without placing FAC pilots at high risk. Neither of these advantages can accrue, however, unless the appropriate level in the Air Force TACS (e.g., the battalion or brigade tactical air control party) can be linked directly to the Army echelon that receives the data-linked surveillance video from the mini-RPV. If

The Army's XMQM-105 Aquila program investigates the technical feasibility and operational utility of a small remotely piloted vehicle (RPV) system. The launcher (below) projects the RPV (facing page) over the desert firing site.



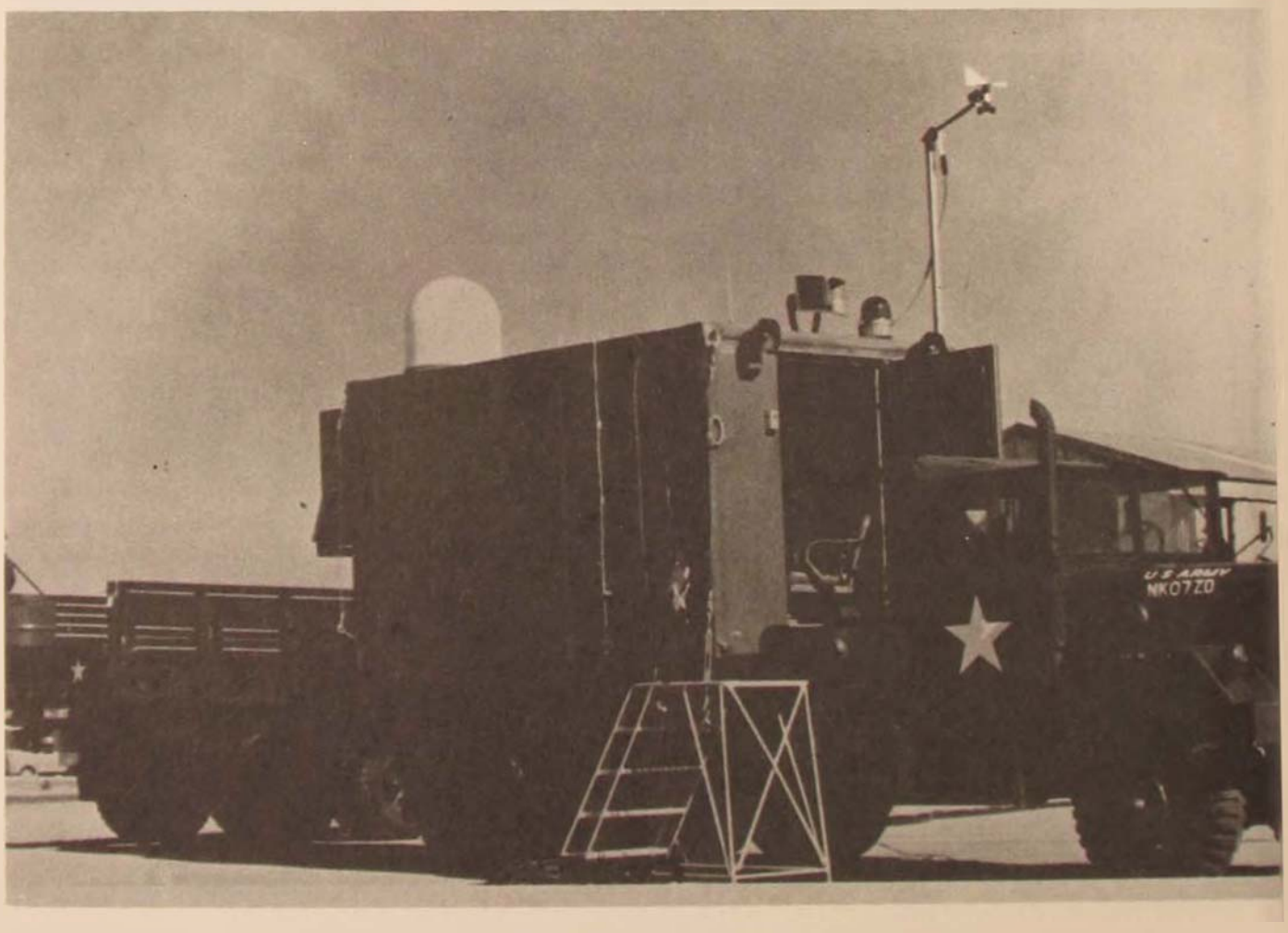
this were to be done, the tactical air control party (TACP) FAC would be able to observe the combat area as if he were airborne over it (within the limits of sensor fidelity, field of view, etc. that are technically and operationally feasible) and could then perform his assigned duties in accordance with existing doctrine.

IS such a joint battlefield surveillance and fire control system feasible and practical? Technically there seems to be little doubt that it is. Doctrinally, at first glance, there would appear to be serious questions: How would the mini-RPV be fragged and controlled so that the Army and Air Force each have an appropriate share of the available mission time? But considering the current drawing together of the Army and Air Force on joint fire support problems, this question may recede in importance, particularly when it is recognized that both organic fire

support by the Army and close air support by the Air Force are necessary to enhance the performance of the ground forces in battle.

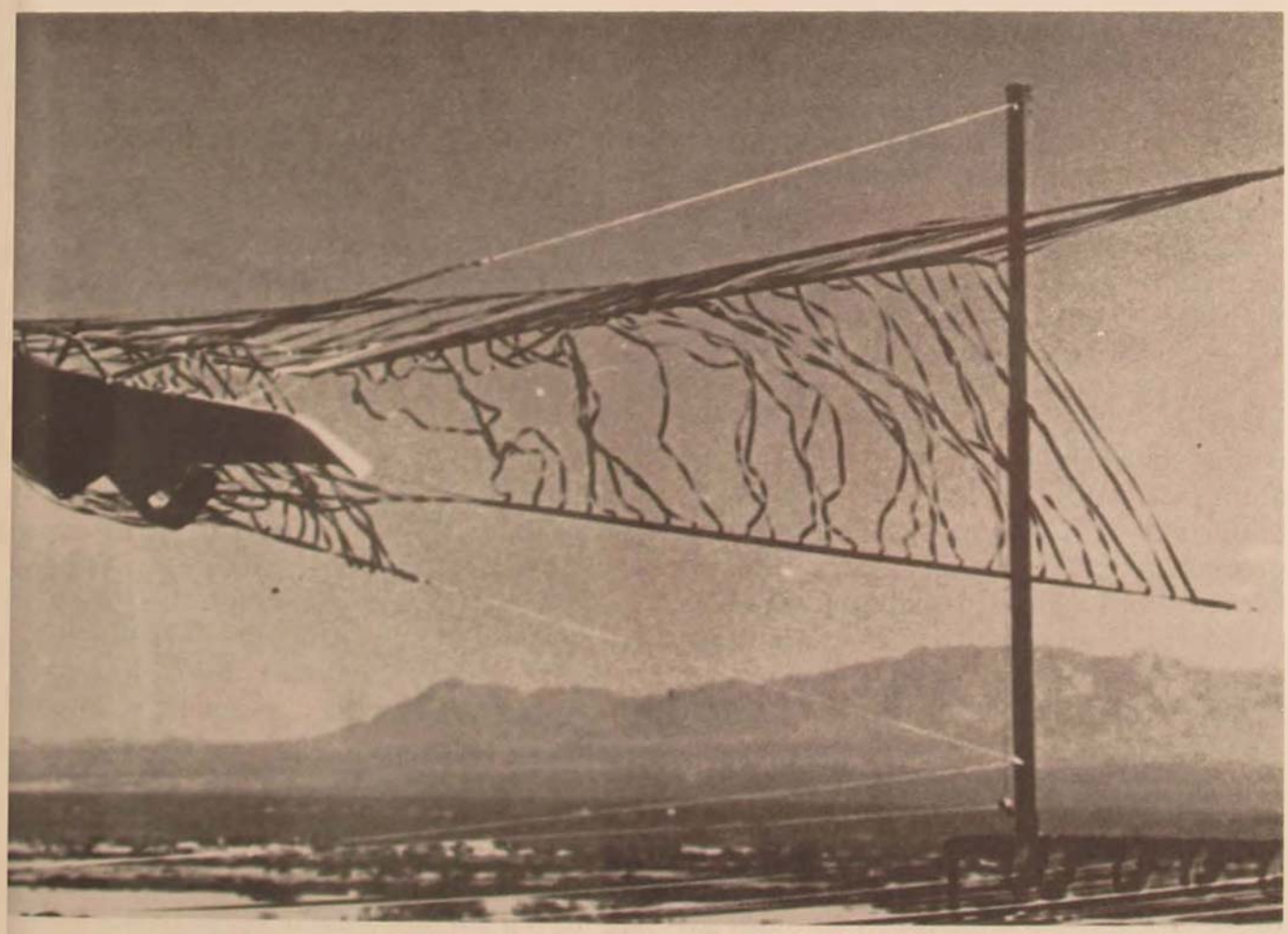
Operationally, a potentially troublesome feature is matching the number and location of the RPV control stations in, say, a brigade to the number and location of the ALO/FAC personnel with the TACPs assigned to that brigade and its subordinate units. Although an even one-on-one match might be worked out organizationally, it might not prove advantageous to locate each FAC with an RPV control station (even though desirable for easier access to the surveillance video) rather than at his assigned ground unit command post where he can be privy to the ground commander's assessment of the tactical situation and where the necessary communications already exist. Alternatively, if the TACP in question were manned by both an ALO and one or more FACs, the former could remain with the command post as the ground commander's air adviser, while the FACs could deploy to RPV ground stations for direct access to the surveillance video. In this

Missions of the Aquila program include target acquisition, artillery adjustment, and target damage assessment. The ground control station (below) directs the RPV until it reaches the vertical ribbon barrier recovery system.



case, all RPV ground stations would have to contain additional necessary display equipment to permit the FAC to work along with the Army intelligence and artillery personnel. Also, the normal TACP communication equipment would have to be provided to allow the FAC access to the Army tactical nets and to the Air Force air request and air-to-air nets.

Instead of adding to the size and complexity of the RPV control station and tying a FAC down to it, another possibility would be to place the FAC in an aircraft (to which the RPV ground station would relay the video) that could then work with any of the RPV control stations operating with the ground unit to which the FAC is assigned. The mobility and flexibility of employment would be welcomed as it would then match that of the attack aircraft themselves (at least over those battle areas where RPV surveillance units were deployed). In this configuration, the airborne operation might take on more of the character of a miniature airborne battlefield command and control center (ABCCC) than that of simply a FAC as it would be conceptually possible for several



RPV stations to be passing video to the same airborne post. By flying relatively low and over friendly territory, sufficient immunity to enemy jamming and surface-to-air defenses should result.

Suppose that appropriate hardware, organization, procedures, and tactics could be worked out to provide a joint surveillance and fire control system over the battlefield. What advantages would result? Several come to mind immediately.

By expanding the horizon of the real-time reconnaissance and surveillance available to the front line ground commander, he should be better able to identify the tactical plan of the enemy attack, thereby allowing him to deploy his defensive forces to best advantage. At the same time, the depth of the killing zone for his supporting artillery fires can be extended to the full range of the guns, permitting a greater volume of fire to be delivered prior to enemy forces closing to engagement range. Also, the accuracy (hence, effectiveness) improvement from the use of Copperhead will allow the engagement of point targets, such as armored combat vehicles and forward command posts, at these longer ranges. Similarly, the quantity and quality of close air support opportunities should be enhanced as a result of the improved target development capabilities and the effectiveness of the missions flown increased by the ability to designate targets for homing munitions well beyond the range of the ground FO. Moreover, the prolonged exposure of fighters attempting the same task with self-contained surveillance and designation systems could be avoided.

The sharing of a joint battlefield surveillance and fire control system could provide the Army and the Air Force with a valuable means for coordinating ground and air supporting fires so as to be mutually supporting. For example, for those fire missions assigned to close air support aircraft, Army artillery could be employed to provide simultaneous suppressive fire on known or suspected enemy ground-to-air defense forces in the area. While not a new idea, having been employed in 1952 during the war in Korea,[4] it is not a standard joint procedure, either. But with the increasing ground-to-air defense threat, the use of artillery for battlefield suppression should become increasingly attractive.

Recent TAC/TRADOC efforts to develop cooperative tactics for the employment of scout/armed helicopter teams and A-10 aircraft have not only pointed up the critical role played by an on-the-spot battle manager, but his vulnerability, if located in the air close enough to the combat area to do his job properly. The concept of an RPV surveillance and fire control vehicle appears to offer the opportunity to remove the battle manager to a less hostile environment and retain the indicated benefits to be derived from the cooperative employment of helicopters and close air support aircraft.[5]

IN SUMMARY, the addition of a joint surveillance and fire control RPV system to the air-ground team could substantially increase the volume, rate, and effectiveness of both ground and aerial supporting fires by bringing the enemy under more accurate fire, beginning at greater ranges from friendly positions, than is now feasible. At the same time, the need to place men in positions of high risk (i.e., the airborne FAC and the air-or-ground FO) would be sharply reduced. The technology now exists to permit remotely manned systems to perform the needed tasks in many combat situations and environments. However, flexible, innovative planning and experimentation are still needed to exploit the potential capabilities of RPVs for battlefield surveillance and

fire control. The Army has taken a giant first step with the Aquila program. The TAC and TRADOC joint efforts are moving in the right direction and, if pursued appropriately, could lead to the development of sound doctrine and effective organizational, operational, and support procedures that could make an airborne surveillance and fire control RPV a fully integrated member of a joint tactical air-ground fire support system. Let us hope that the potential contributions of remotely piloted vehicles will not be inhibited by the same lack of imagination and flexibility exhibited by an anonymous Army spokesman who, having observed the first successful aerial bombing trials in 1911, commented that, "the continuation of such schemes can serve no practical purpose whatsoever."[6]

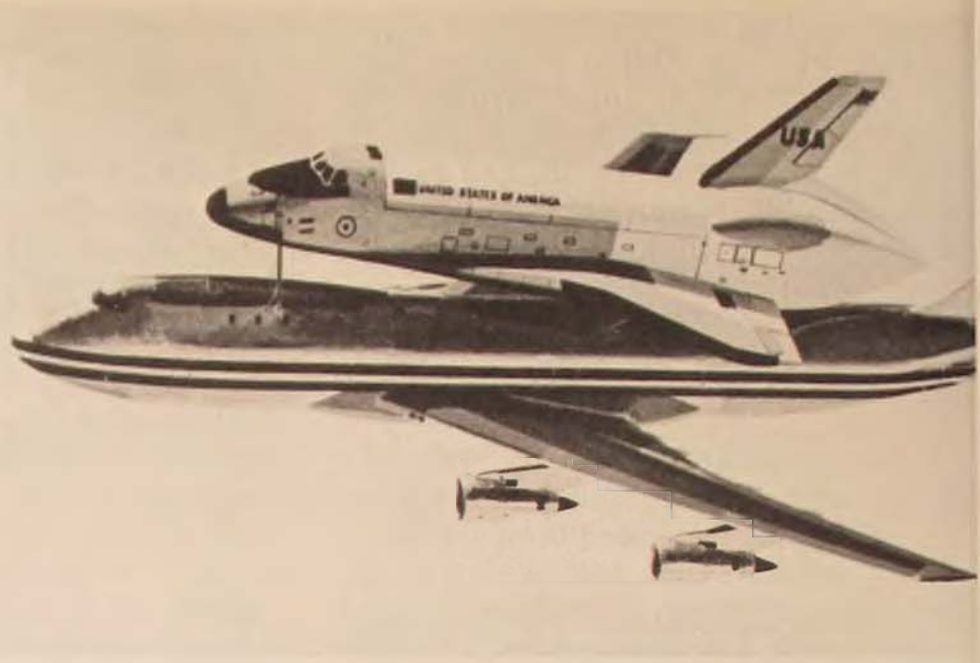
Rand Corporation
Santa Monica, California

Notes

1. Daniel K. Malone, Colonel, USA, "Air Defense of Soviet Ground Forces," *Air Force Magazine*, March 1978, pp. 78-83.
2. "The Military Balance 1977/78," as printed in *Air Force Magazine*, December 1977, pp. 118-26.
3. F. David Schnebly, "The Development of the XMQM-105 Aquila Mini-RPV System," *Proceedings, Fourth Annual Symposium*, June 5-9, 1977, National Association for Remotely Piloted Vehicles. Figure 1 is adapted from Schnebly's article.
4. Robert Frank Futrell, *The United States Air Force in Korea, 1950-1953* (New York: Duell, Sloan and Pearce, 1961), p. 506.
5. "A-10/AAH Together Pack More Punch Than Separately, TAC/TRADOC Find," *Armed Forces Journal International*, June 1977, p. 18. See also "A-10 Helicopter Tactics Prove Effective," *Aviation Week & Space Technology*, February 6, 1978, pp. 217-18.
6. Not content with this unequivocal decision, the same Army spokesman continued: "Any dream of aerial conflict is merely the product of a fertile imagination, a malady often encountered in younger men with insufficient service to recognize certain things as manifestly absurd." See Aaron Norman, *The Great Air War* (New York: Macmillan Company, 1968), pp. 21-22.

Information is the most essential link between wise leadership and purposeful action.

GENERAL THOMAS D. WHITE (1959)



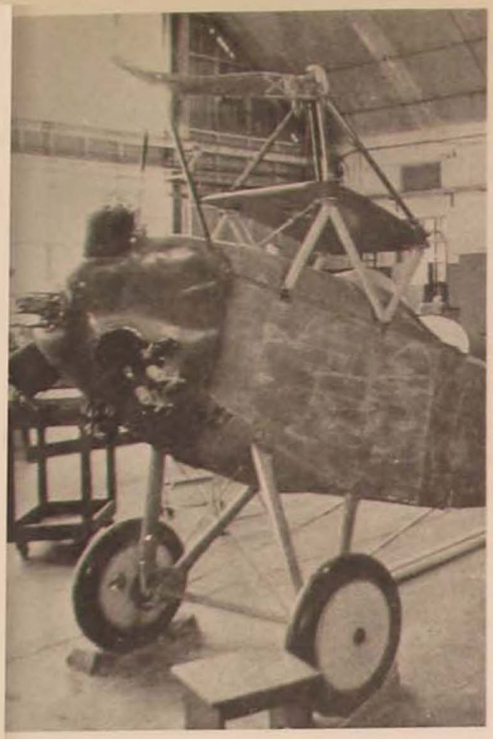
The space shuttle orbiter in its carrier ferry mode atop a 747 for cross-country transport and flight tests

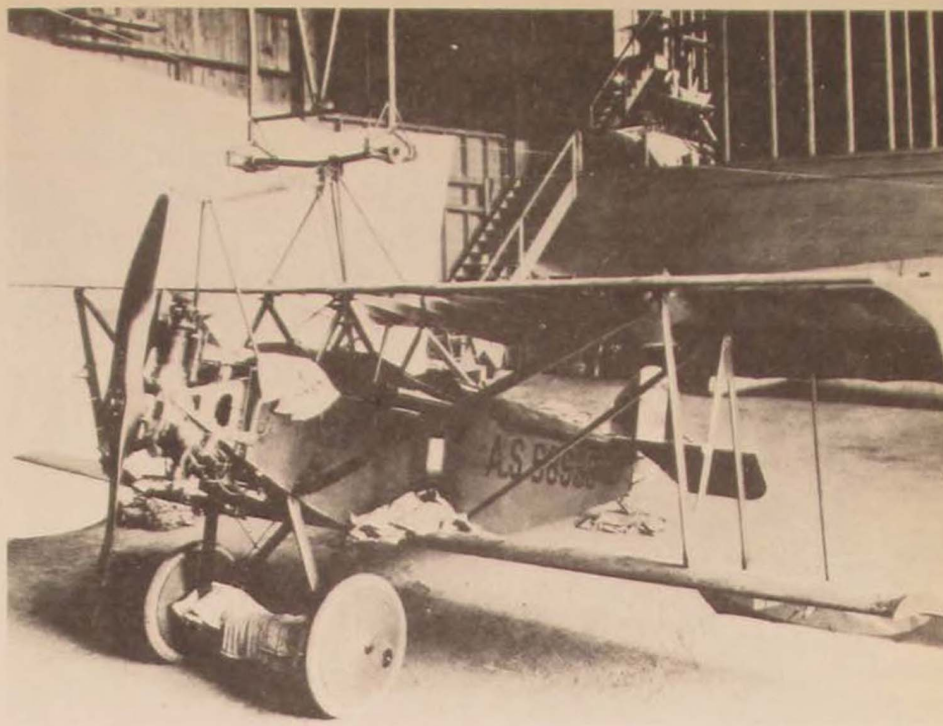
GOING ALONG FOR THE RIDE!

William G. Holder

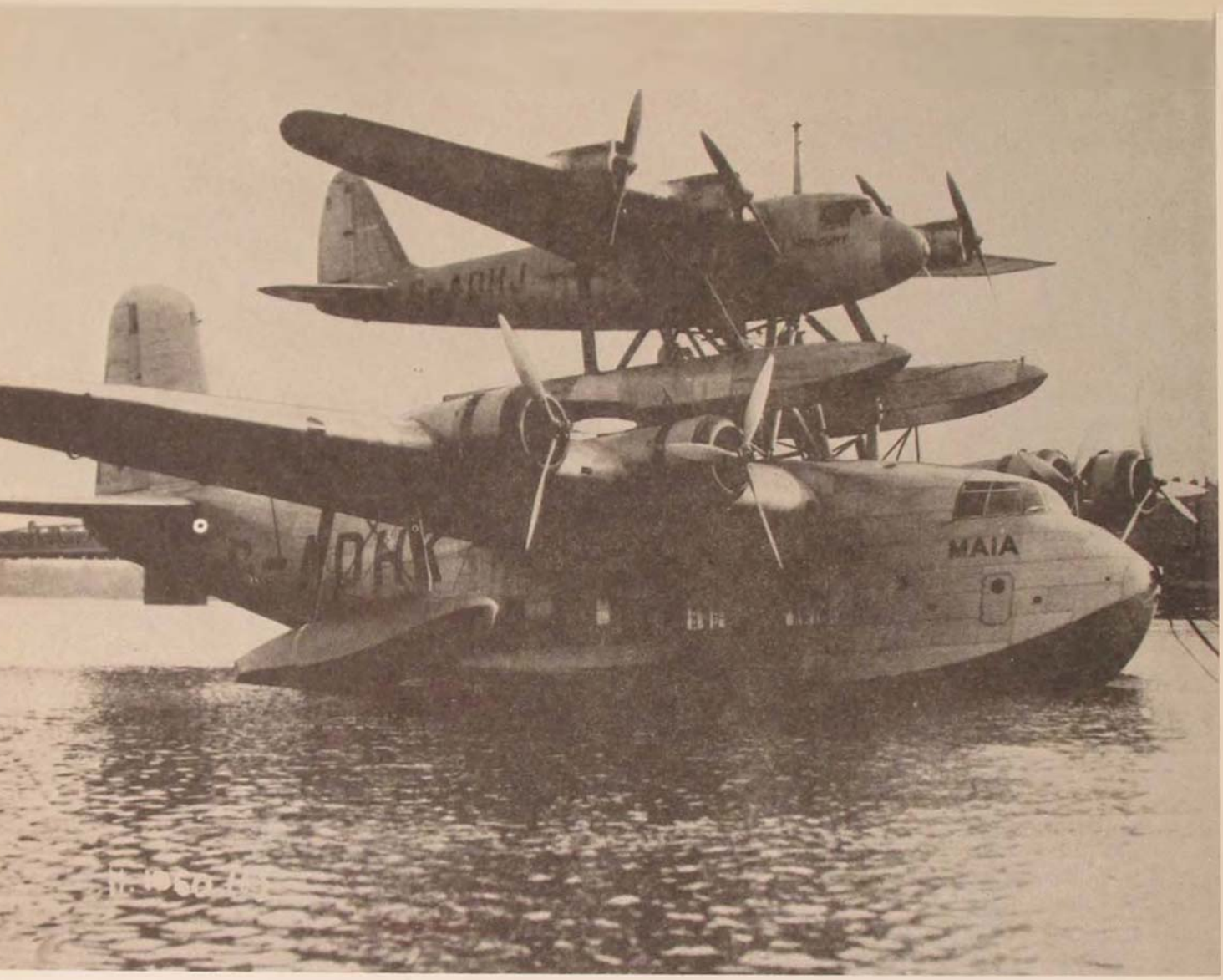
THE CONCEPT is not new. The idea of carrying one vehicle aloft with another began during the earliest days of powered flight. There was one basic conceptual difference in those early piggyback configurations, however. Instead of one aircraft mounted on another, the mother ship was a balloon. Several other "parasite" concepts existed during World War I, including the Fieseler Fi-103 and some drone aircraft experiments. During the mid-1920s, the British carried out a series of airship experiments with the de Havilland Hummingbird.

In the United States, at old McCook Field, Dayton, Ohio, in 1922, the concept was reintroduced with an airship once again serving as the airborne platform. The experimental work evolved around the Army's tiny Sperry Messenger biwing aircraft and was carried out by Lawrence Sperry, who volunteered to test the feasibility of hooking on to the airship. Keeping the propeller out of the airship's dangling trapeze grappling system proved to be the major operational problem during the tests. The little Messenger joined the airship by a hook that was mounted on its top wing. The hook was designed to open when a 2-mph speed differential was experienced; its supporting structure was carried forward to form a unique





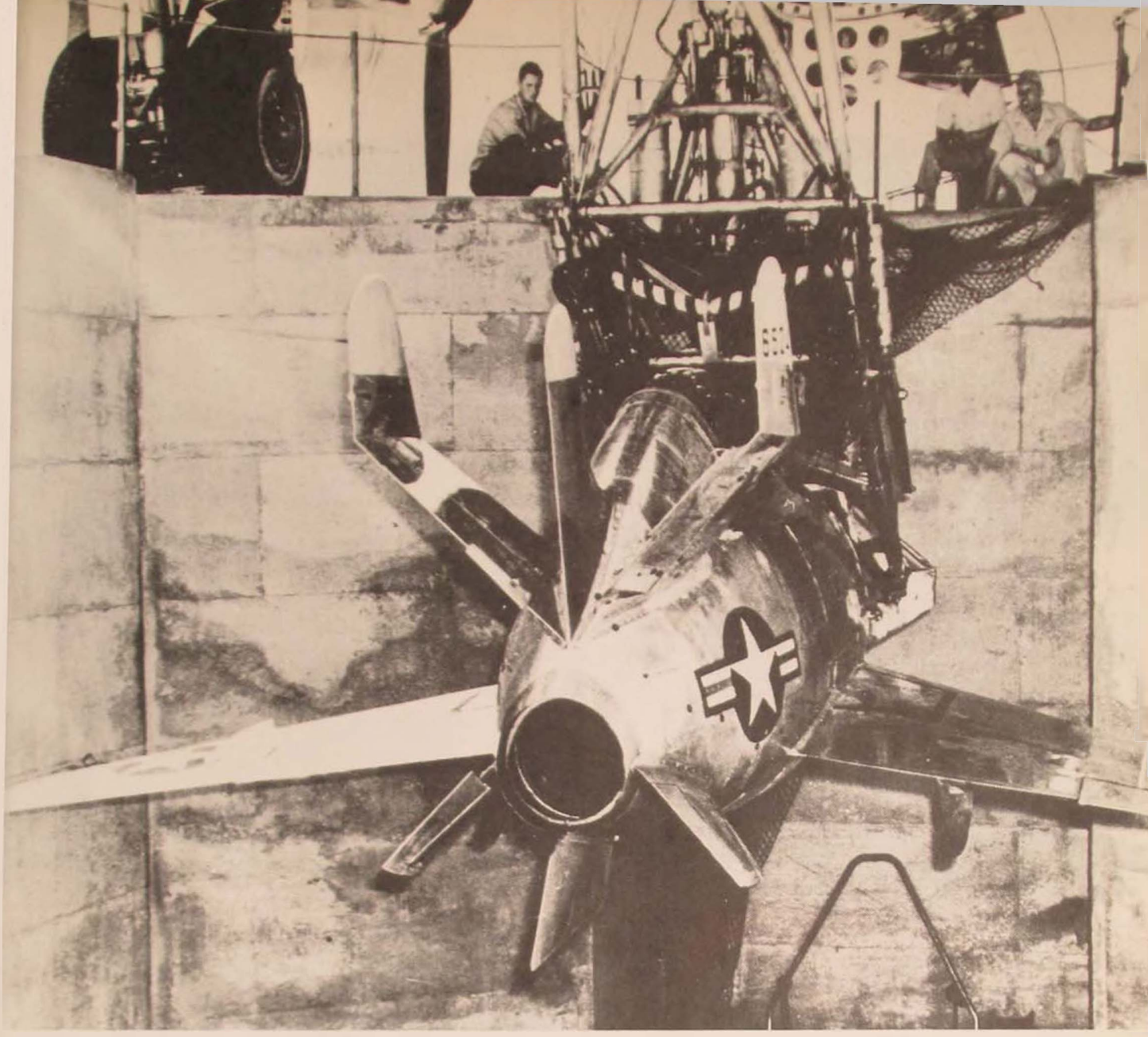
U.S. experimentation with the piggy-back concept dates to the 1920s, when the Sperry Messenger, (shown above during two stages of restoration) was tested at McCook Field, Ohio. The hook on the top wing engaged a trapeze grappling apparatus hanging from an airship. . . . In the early 1930s the Navy's Sparrow Hawks (right) attached to the dirigibles USS Macon *and* Akron, three of them being destroyed in the Macon *disaster on 12 February 1935.*



Just prior to World War II the British experimented with the Short-Mayo composite, to assist a heavily loaded seaplane into the air. In July 1938 the Mercury-Maia *team flew mail and newspapers nonstop from Ireland to Montreal, and they were operating between Southampton and Alexandria, Egypt, when the war began.*

propeller guard. Shock absorbers were fitted to the rigid airship trapeze to ease the jolt of contact.

The first Messenger hook-up attempts were undertaken in 1924 at the Army Airship Base at Scott Field, Illinois. On the first two passes of the initial test, the 850-pound Messenger missed contact and then broke its propeller on the third. The tests were conducted directly over the field with just such an eventuality in mind. But in December, success was finally realized with the first solid hook-up accomplished.

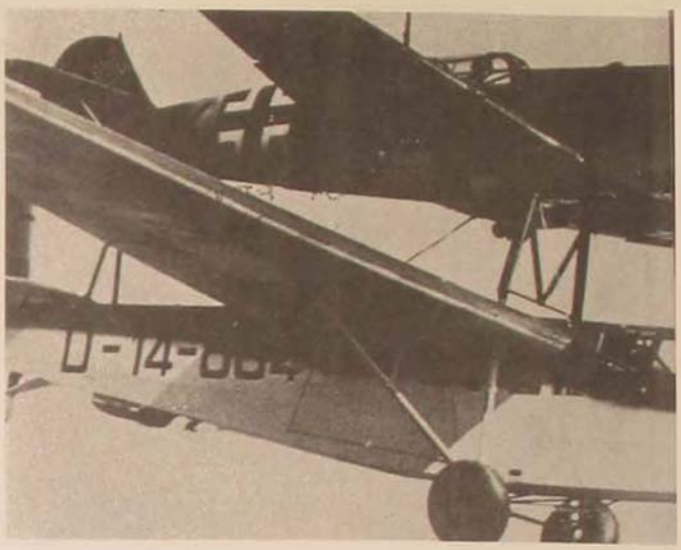


The McDonnell XF-85 Goblin, the first piggyback fighter, was air-launched from a B-29 in 1948, but only two of them were built.

The airship was moving at a blazing 62 mph when the hook-up was made, and the Messenger was released within the current highway speed limit, 51 mph!

But the promising Messenger concept proved to be very short-lived, since all the tiny aircraft became surplus in 1926. Fewer than 50 of the model were built. The lone remaining example of this plane can be seen at the Air Force Museum, hanging from the ceiling on a simulated trapeze.

But the Messenger was probably not the best known of the U.S. balloon parasites. That distinction undoubtedly belongs to the Navy's Sparrow Hawk project. Officially designated

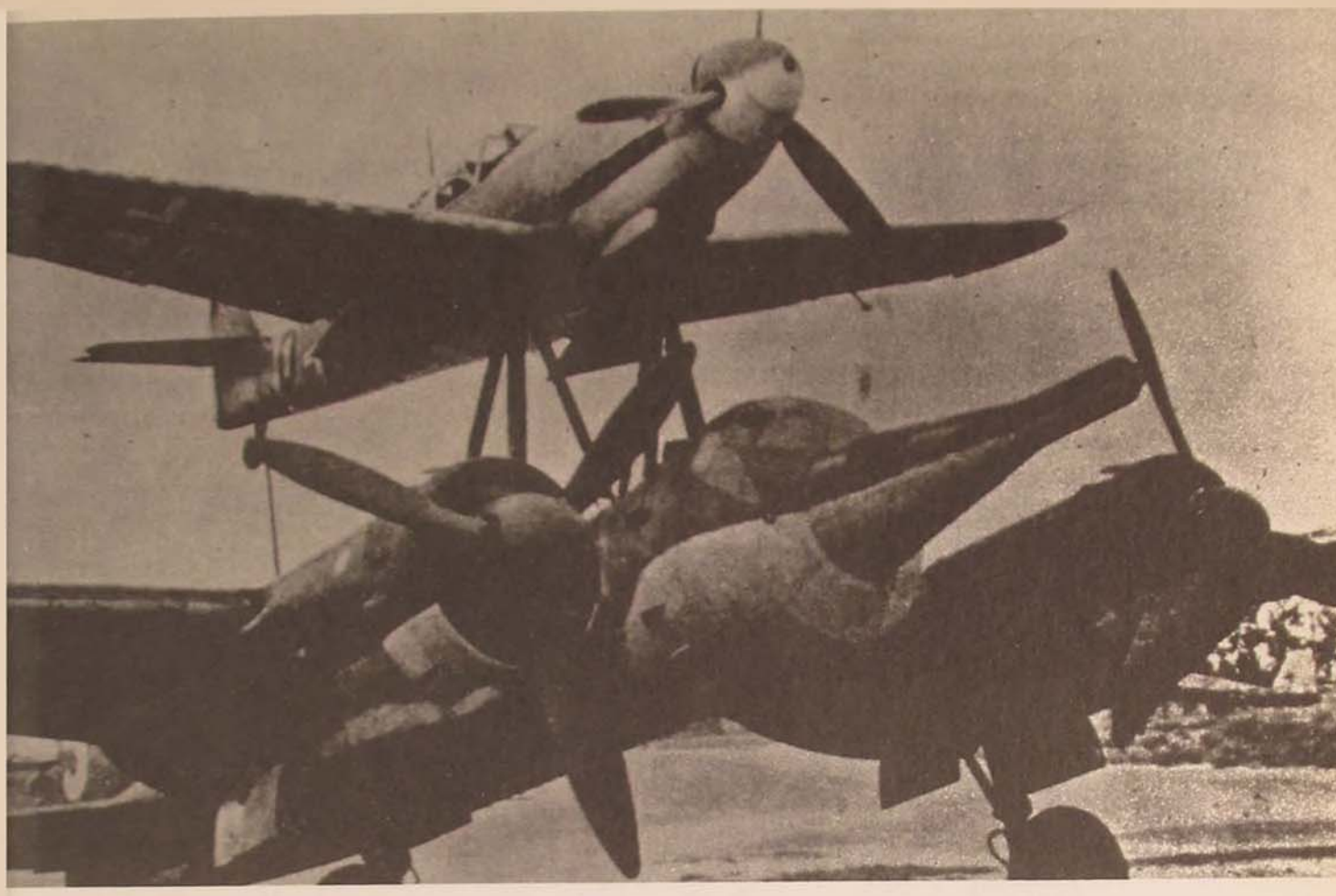


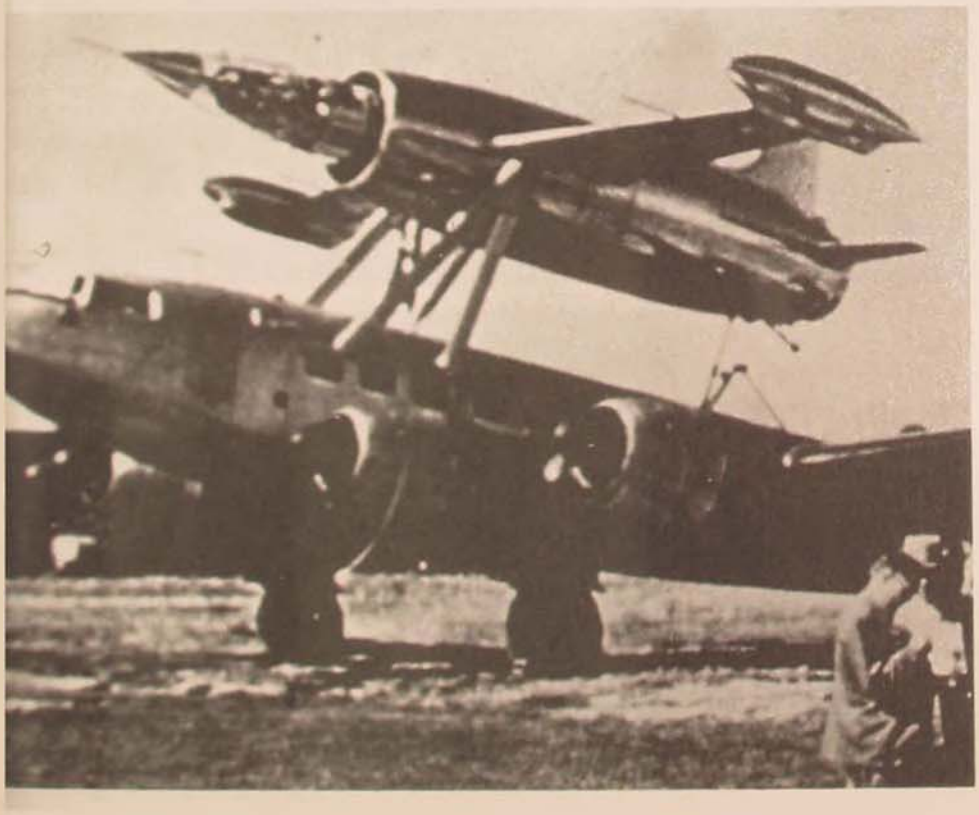
During World War II the Germans used several different piggyback configurations: the Focke-Wulf FW-190 with an unmanned Junkers Ju-88 (above left) and the Messerschmitt Me-109 with the DFS-230 Troop Glider (above right). . . . The Mistel composite consisted of an unmanned Ju-88 (opposite above)loaded with 7700 pounds of explosives and either an Me-109 or an FW-190. The Ju-88 would separate and impact with its bomb load. . . . Following the war the French experimented with piggybacking Leduc 010s, but the program was abandoned for lack of support

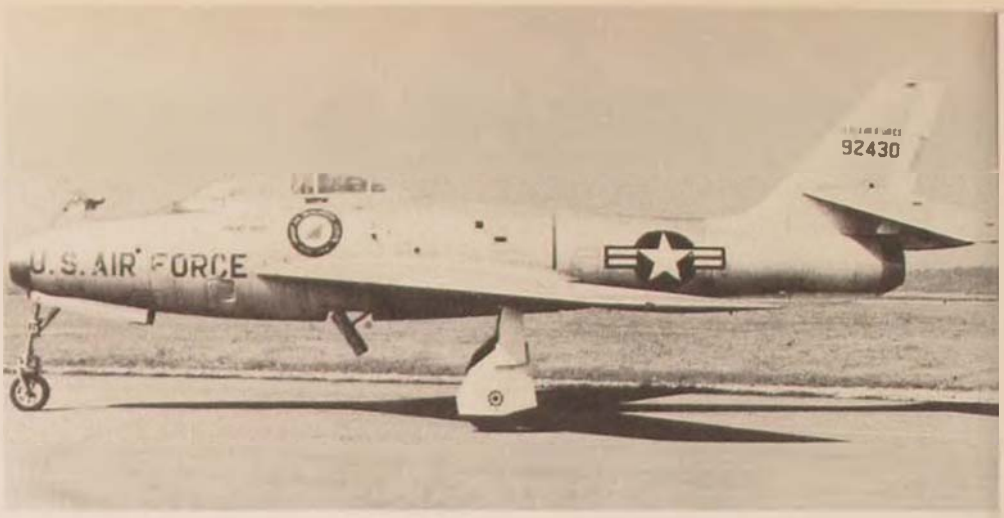
the XF9C-2, the Sparrow Hawk biwingers received wide publicity in their association with the Navy dirigibles—the USS *Macon* and the USS *Akron*.

The hook-up configuration of the Sparrow Hawk was not unlike the Messenger rigging. The program was carried out during the early 1930s, but on 12 February 1935, disaster terminated the program when the USS *Macon* went down with the resulting destruction of three attached Sparrow Hawks. During the next few years the remaining Hawks faded into oblivion.

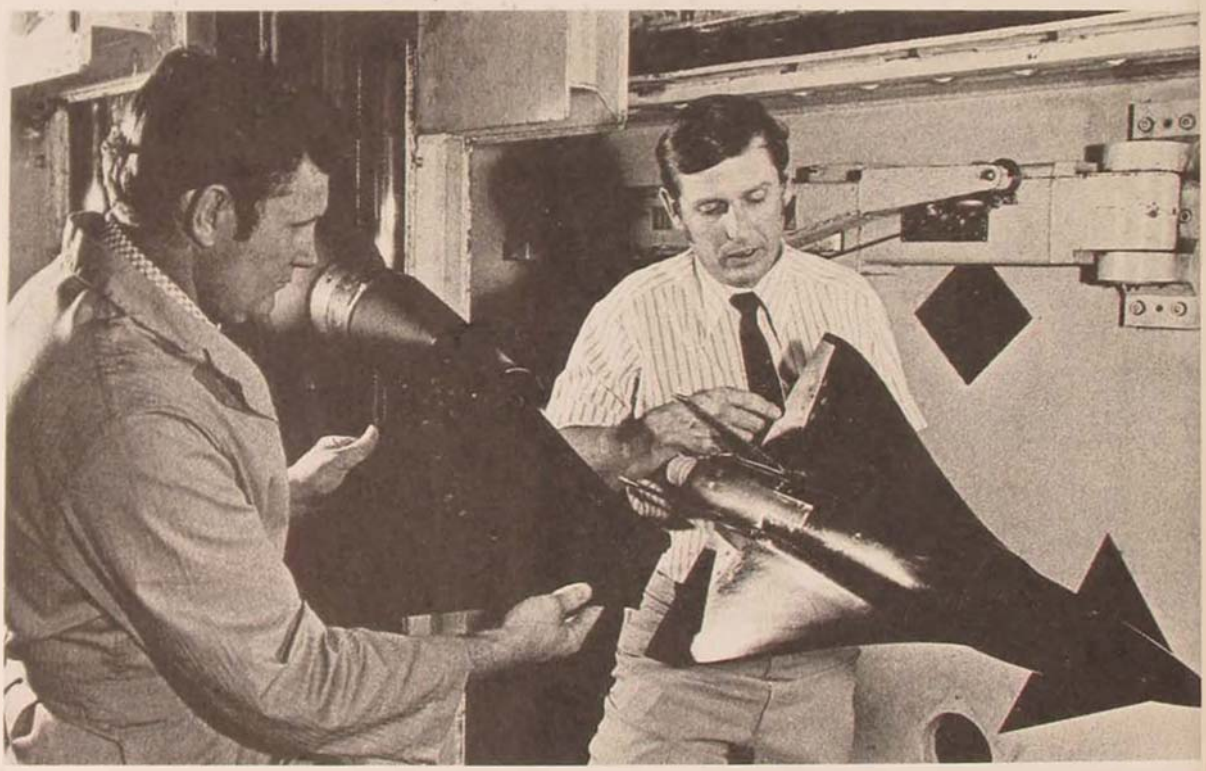
With that the practice of balloon-lofting aircraft seemed to become a thing of the past. Yet today—some 40 years later—the balloon concept has taken on some strange new forms. One of the strangest offshoots that has been recently studied is the so-called "Megalifter" concept, in which a lighter-than-air vehicle would serve as an airborne launcher. Only in the Megalifter concept, the hanger-on might be not only an aircraft but possibly an air-launched missile. The concept may or may not ever materialize, but it certainly shows that the old balloon idea is not dead. Recent U.S. Air Force studies have also concerned themselves with the feasibility of balloon-lofting small pilotless strike and reconnaissance







In the 1950s the fighter conveyer concept, FICON, combined th intercontinental-range B-36 bomber and a modified F-84 (above)



Small air-launched, air-recoverable fighter aircraft have been experimented with and tested in the wind tunnels at Arnold Engineering Development Center, Tennessee, in recent years. The Air Force Flight Dynamics Laboratory sponsors these programs.

vehicles. And then another recent experiment, the concept of an aircraft-borne ballistic missile, leads into the more recent, better documented parasite concepts with the carrier vehicle being another larger aircraft.

During the 1940s, the carrier vehicle switched from balloon power to prop power, and a multitude of interesting conglomerations evolved.

Initially, the British employed the concept as a means for getting a heavily loaded seaplane airborne. The mother flying boat, the *Maia*, carried a smaller seaplane, the *Mercury*, on a pylon. The first separation flight was accomplished in 1938. Then, in July of that year, the strange twosome flew nonstop from Ireland to Montreal.

The two four-engine aircraft made numerous composite flights with separations, including one 6000-mile flight—a record distance for seaplanes that still stands today.

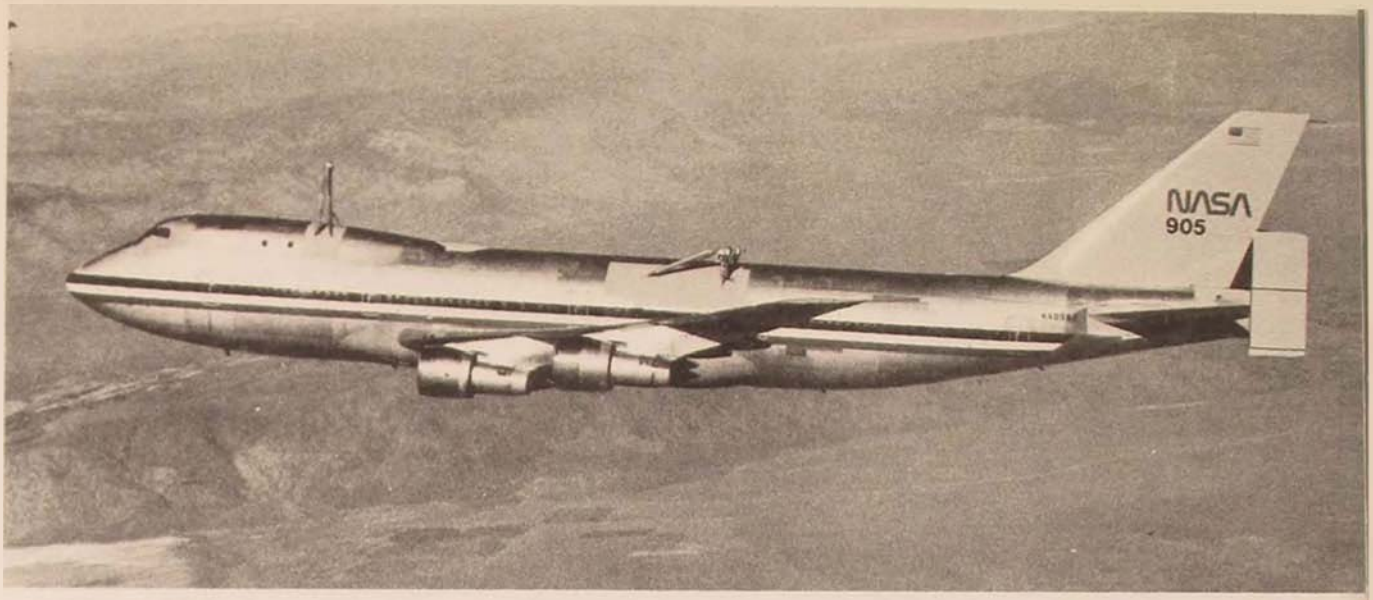
Maia and *Mercury* were operating between Southampton and Alexandria, Egypt, when World War II began. *Mercury* was scrapped in 1941 after serving with a Dutch seaplane squadron attached to the Royal Air Force. *Maia* was destroyed by a Luftwaffe bomb in May 1941.

The idea and realization of a need for aircraft-borne fighters probably came about early in World War II when B-17s had to traverse a major portion of Axis bombing missions unescorted. P-51s and P-47s with drop tanks eventually solved this problem, but with new bombers on the drawing boards, the worry about fighter defense intensified. Project MX-472, called the "unconventional fighter," occurred in December 1942. But the fighter that was to evolve from MX-472 would never see the fire of combat.

Some six years later the first parasite fighter, the bulbous XF-85, would take shape. The McDonnell aircraft was powered by a 3000-pound thrust J-34 turbojet with fuel enough for about a half hour's flight time. The squatty Goblin sported eight control surfaces, including two drooping front wings and six tail surfaces. Only two prototypes were built, with the initial air launch taking place in 1948 from a B-29 mother ship.

The initial attempt at hooking up with the B-29 proved unsuccessful as the XF-85 fought the resistance of the air being compressed between the two aircraft, although later tests proved moderately successful. But the concept was losing favor with the Air Force. Even a McDonnell proposal for a Mach .9 version with alternative delta and swept wings failed to generate any interest. Shortly thereafter, the XF-85 program was terminated with only 2 hours 19 minutes of flight time accumulated between both aircraft.

Probably the next attempt at parasiting occurred in the late 1940s, when a so-called "wingtip coupling" concept was introduced. The idea was brought to Wright Field after World War II by two German scientists, Bernard A. Hohmann and Dr. Richard Vogt. Their unconventional theory implied that smaller aircraft could be hooked onto the wingtips of larger aircraft, thus creating an increased wing span and a more efficient wing.



The Boeing 747 Type 2 as modified to carry the space shuttle orbiter

The scientists explained that the improvement would allow the smaller planes to be carried along with practically no drag penalty. There was a small amount of Air Force interest in the concept, and some coupling experiments were accomplished.

The Germans in World War II evolved some interesting mutations of the piggyback concept. The best known concept involved the use of an unmanned Junkers Ju-88 twin-engined bomber loaded with explosives. Mounted on struts above, and attached to the Ju-88, was a Messerschmitt Me-109 fighter. The pilot of the fighter controlled both the joined aircraft and, when near the target, cut the Ju-88 loose and guided the bomb-laden bomber to the target. The innovative Germans also investigated integrating an Me-109 above a DFS-230 Troop Glider.

The piggyback concept was used in a test function by the French at the end of World War II. The purpose of the test setup was to acquire the necessary speed to fire the piggyback vehicle's ramjet engine. The test program lasted into the early 1950s, when it was abandoned because of the lack of official support.

The last dual concept actually to fly carried the acronym "FICON," for fighter conveyer, and was experimented with during the early 1950s. FICON was a unique way of integrating the intercontinental range of the B-36 with the then high-performance capability of the F-84 Thunderjet. The initial design of the concept looked extremely promising so 25 modified F-84s were ordered. The planes sported a modified horizontal stabilizer and a special hook-up mounting forward of the canopy. This

arrangement allowed the F-84 parasite to be retrieved and retracted into the bomb bay of the B-36.

The modified F-84s assumed an operational status at Larson AFB, Washington, to become the only FICON squadron in the Air Force. Regular operations using the modified F-84s commenced in early 1956, but almost immediately a series of hook-up problems caused cessation of the operations and termination of the concept. The special FICON equipment was removed, and the Thunderjets were converted back to their original configuration.

TODAY, after a stand-down of more than two decades, the parasite concept may be coming back again in the 1970s. The wind tunnels at Arnold Engineering Development Center, Tennessee, during 1974, tested a tiny fighter design coined the "microfighter." The tests concentrated on new shapes and configurations for a small air-launched, air-recoverable fighter aircraft. Several different body-canard-tail combinations were examined. A number of the aircraft could have been carried and launched from a wide-body transport of the C-5 or 747 class.

And now the old piggyback mode has made one more appearance. First, it was the balloon era, then the aviation era, and now the space age. With the advent of the space shuttle, the piggyback concept was again called on for what may be the final time. The unpowered space shuttle orbiter was carried aloft from a perch atop a specially modified Boeing 747. Following a 747 pitch-down maneuver, the orbiter was released for a series of free-flight landings onto the Edwards Air Force Base rock-hard sand.

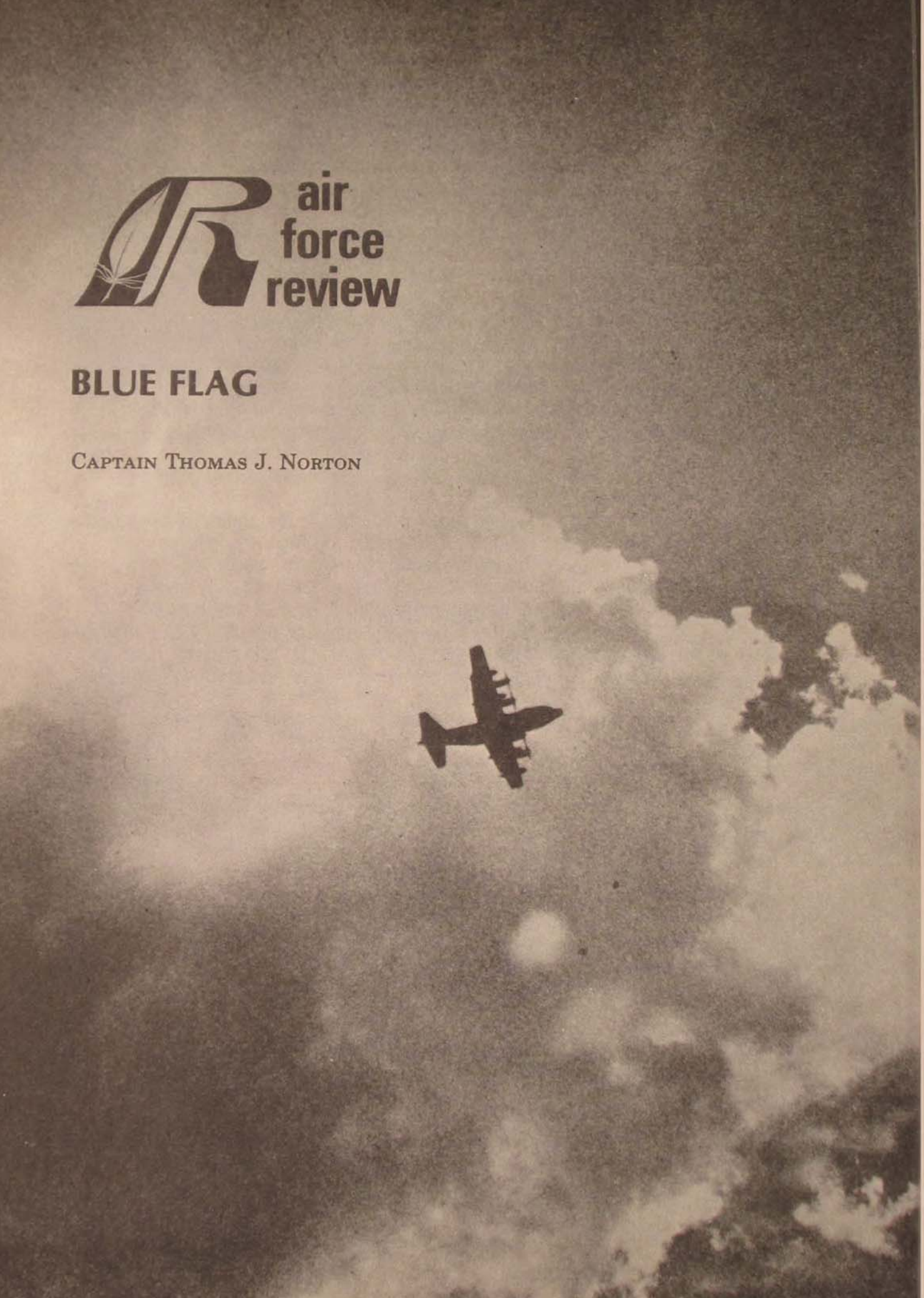
The old two-for-one game had still proved it could get the job done!

Dayton, Ohio

air force review

BLUE FLAG

Captain Thomas J. Norton



A sudden coup has overturned the government of a small country and installed a new regime. The country had long been friendly with the West, but the new leadership is openly hostile to the United States and its allies. Conditions have steadily deteriorated for Americans living in the country; open incidents have increased, and the new government claims to be powerless to protect the lives and property of U.S. citizens against its own irate populace. Americans residing in the country, including the diplomatic contingent, have been moved to a small airfield remote from the capital, and a small force of troops loyal to the previous government has moved onto the airfield and is helping to protect the Americans there. The new government has agreed to allow the U.S. to send in aircraft to evacuate the Americans from the airfield. Then, for no apparent reason (except perhaps a suspicion that the U.S. plans simultaneously to evacuate important loyalist leaders), the first inbound C-130 is shot down, and the remaining aircraft turn back. Troops of the new government move into positions near the airfield, threatening to overrun it. Washington has ordered the local theater commander to get the Americans out, using whatever force is necessary but no more.

You are that commander. What would you do?

ANY RESEMBLANCE of this scenario to past, present, or future real-world possibilities is purely intentional. This hypothetical crisis was used as the foundation for Blue Flag 77-1, the first in a series of new training exercises run by the USAF Tactical Air Warfare Center (USAFTAWC) at Eglin AFB, Florida. Blue Flag was established by Tactical Air Command (TAC) as a complement to Red Flag—a realistic air combat training operation for aircrews conducted under the management of the USAF Tactical Fighter Weapons Center at Nellis AFB, Nevada. Combat experience has shown that most losses occur during a pilot's first eight to ten combat missions as he becomes accustomed to the combat environment. By realistically simulating that environment, the potential exists for reducing those losses should a real crisis occur. But what about the commander and his staff? Without efficient command and control, adequate communications, and complete and current intelligence, even the best efforts of the most highly trained aircrews would be wasted.

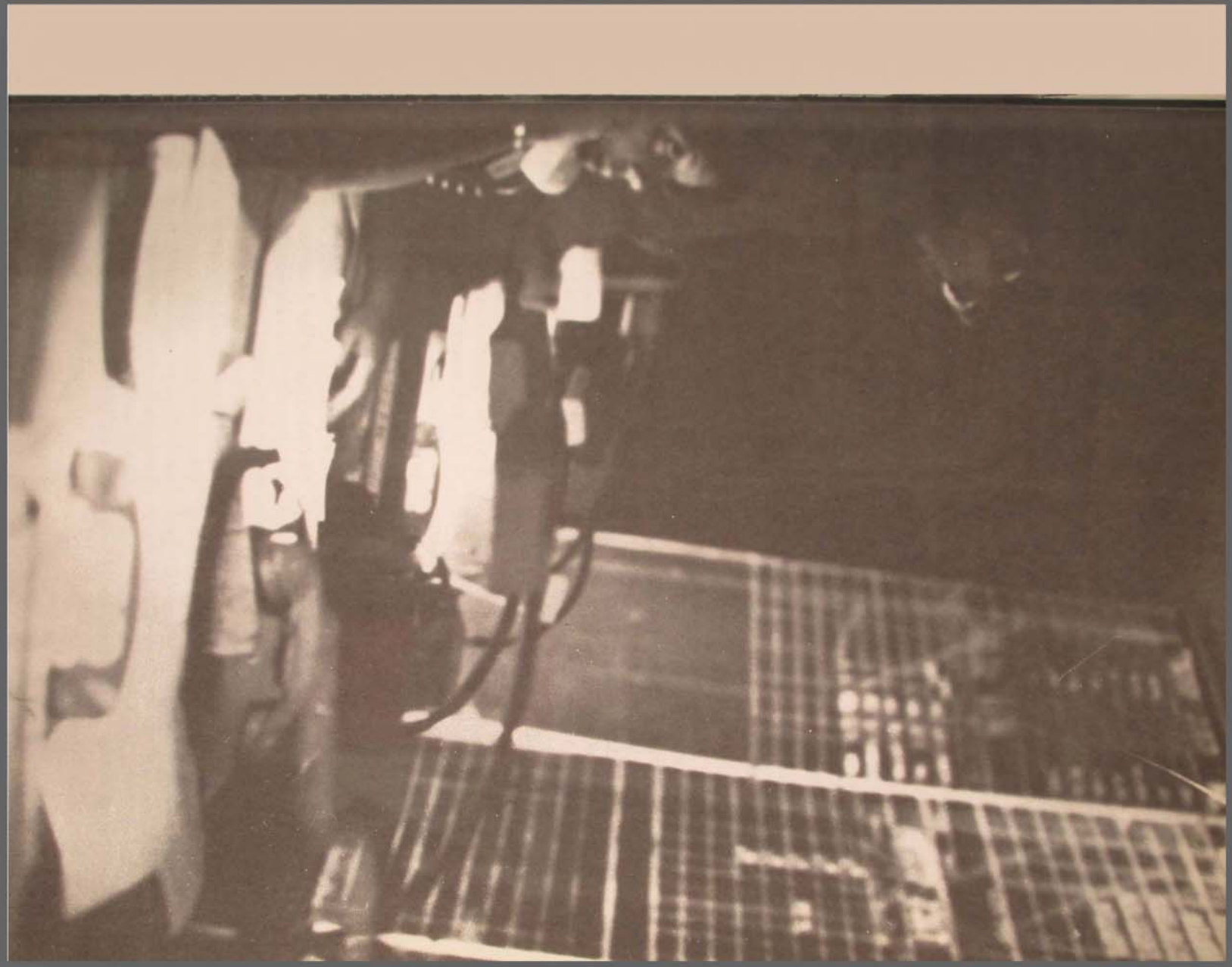
Blue Flag was created to fill that gap. The choice of a location had to be made, and Eglin Air Force Base was ideal. The nearby Eglin ranges with their threat radars—radars capable of providing the same cockpit combat information to the aircrews as they would receive from real enemy tracking radars—were a prime factor in the decision. Equally important was the availability of individuals with extensive combat experience assigned to USAFTAWC at Eglin. In addition to its important mission of managing and conducting operational tests and evaluations, tactics development and evaluations, and TAC's weapon system evaluation program, managing the aircrew training devices acquisition program, and developing individual weapon systems concepts as directed by TAC, USAFTAWC has long been the primary TAC agency

Active and reserve units participated in Blue Flag 77-2 at Eglin AFB, Florida, bringing their personnel and equipment with them, including the F-105 from George AFB, California (right). . . . The Tactical Air Control Center (TACC) closely monitored the status of both the live and simulated airborne aircraft. Decisions made at the TACC (facing page) had rapid impact on success or failure of the operation.

involved in evaluating joint exercises. These functions provided the expertise required to operate Blue Flag. A new unit was created within USAFTAWC to handle Blue Flag operations, the 4441st Tactical Training Group (TTG).

In refining current and future command, control, communications, and intelligence procedures, equipment, and tactics, Blue Flag has a unique advantage over large, highly structured joint exercises. That advantage is free play. In most exercises, because of their size and complexity, the battle staff is forced to hold to a time-phased scenario, controlling decisions and events to meet predetermined training objectives. In Blue Flag, though objectives are established for each exercise, it is the job of the control team, acting as higher headquarters, to input scenario events, react to the commander's decisions, and generate new inputs to cause events to develop in a manner consistent with flying safety and training objectives. The commander has considerable latitude in the plans he submits to higher headquarters; the relatively limited size of a Blue Flag allows the control team a great deal of flexibility in responding to the commander's inputs. Unlike most exercises, in which many of the events are known in advance, players in Blue Flag are free to react to the various situations they are given in any feasible manner. Their task is to assimilate all the intelligence information, analyze the situation, create a plan of action in minimum time using the forces available, disseminate the plan and intelligence to all those who need it, and execute the mission.

If it were possible to run an exercise without any constraints, the commander would be given a crisis situation, convene the battle staff, then request any additional forces he considered necessary. He would arrange for refueling support, establish communications, and receive whatever other assistance he might



require. He would have priority in the use of all these assets on extremely short notice.

In a peacetime exercise, however, such procedures would cause a severe disruption of other commitments. Forces, communications, operating locations, and facilities must all be arranged in advance. The quality of these advance preparations will ultimately determine the success of each Blue Flag exercise. The 4441st TTG begins preparations for a Blue Flag months in advance; in fact, work often proceeds simultaneously for two Blue Flags. A detailed scenario must be written that is compatible with the available forces and which reflects the objectives established by Headquarters TAC for that particular Blue Flag.

As WAS mentioned earlier, the first Blue Flag represented a hypothetical crisis situation in a fictitious country. Building from this and reflecting TAC desires to expand Blue Flag to improve real-world readiness, succeeding Blue Flags have grown from a limited crisis concept to encompass a wide range of potential worldwide trouble spots. Real-world locations have been used for subsequent Blue Flags, and, though all the activity took place in the Southeast U.S., every effort has been made to simulate as realistic an environment as possible by utilizing actual locations, names, targets, and plans, and exercising appropriate security procedures to safeguard the sensitive information that must be used in such a scenario. Future Blue Flags will cover a broad range of real-world locations and situations.

In each Blue Flag, the commander is given a realistic mix of forces with which to operate. These forces are sized to reflect the resources that are available to a commander in the location played in the scenario and modified, if required, to meet specific training objectives. These resources are a mixture of real and simulated forces. The use of real forces in Blue Flag provides participating aircrews with exposure to dense electronic warfare threats in a realistic command and control environment. In Blue Flag 77-2, F-4s from Moody AFB, Georgia, and Eglin; A-7s from England AFB, Louisiana; F-105s from George AFB, California; RF-4s from the Alabama National Guard at Montgomery; C-130s from the 1st Special Operations Wing at Hurlburt Field, Florida; rescue aircraft from the 39th Aerospace Rescue and Recovery Wing at Eglin; and C-130 airborne battlefield command and control aircraft from Keesler AFB, Mississippi, participated. Refueling support was provided by KC-135 aircraft from Seymour Johnson AFB, North Carolina, and four Air National Guard units. Over 100 sorties were flown on the Eglin ranges during the two and one-half days of actual flying operations. Hundreds of individuals participated; aircrew members, maintenance personnel, wing staffs, and, of course, the commander and his staff, which alone numbered more than a hundred individuals. Twelve simulated enemy radar sites in various locations on the Eglin ranges provided the threats for participating aircraft. All friendly forces operated from home station except the F-105s that deployed to Eglin. F-106 "aggressor" aircraft of the Jacksonville, Florida, Air National Guard, launched from Tyndall AFB, added to the realism by attacking friendly aircraft during their most vulnerable periods. F-105 and F-4 aircraft, rendezvousing off the Eglin coast, participated in joint missions to "destroy" simulated enemy radar and missile sites on the Eglin range. A-7 and rescue aircraft performed simulated search and rescue (SAR) missions, some with actual "survivors" in place on the ground. Those

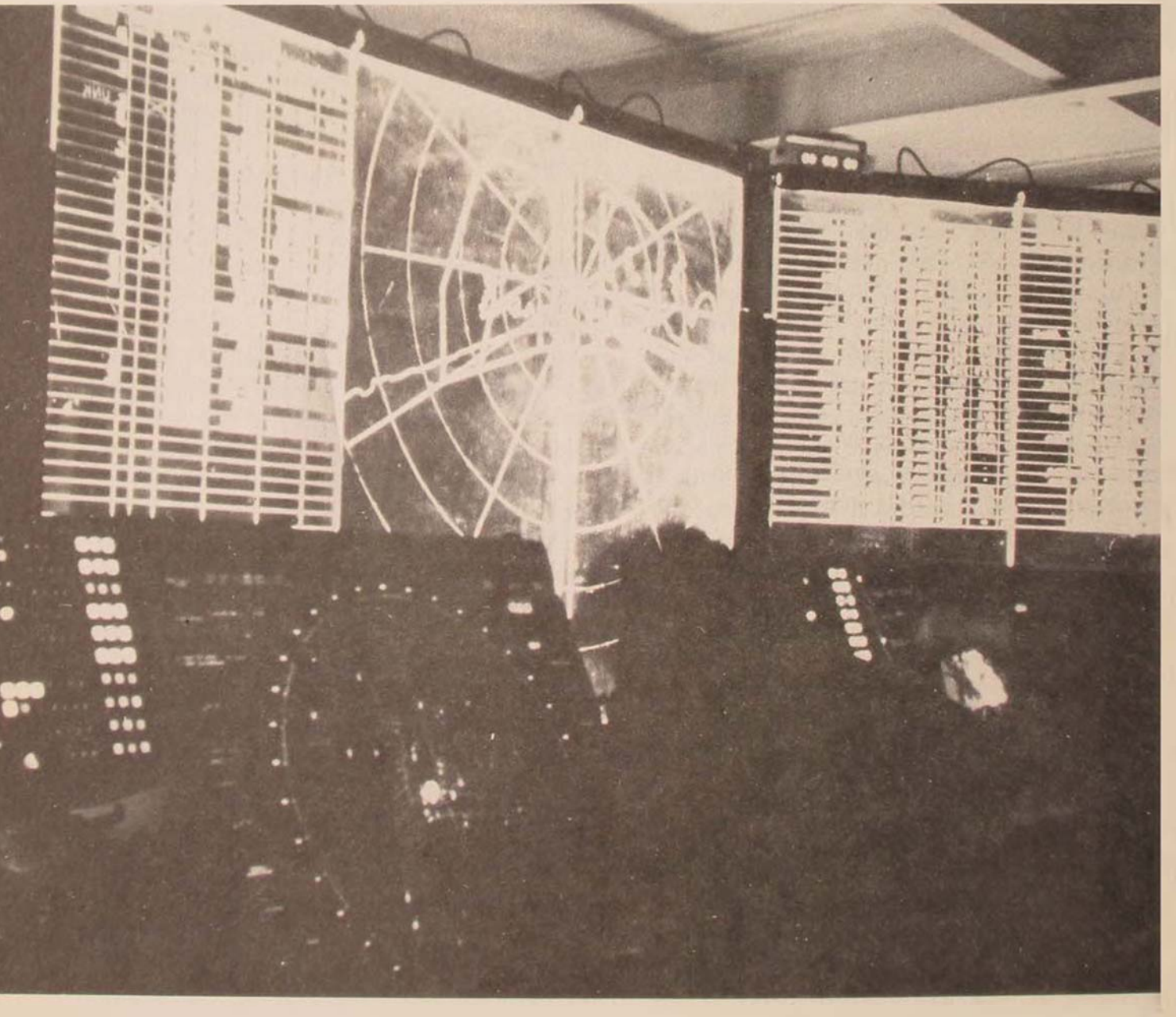
involved in these operations were greatly impressed by their training value, often feeling a sense of urgency never experienced in other, more structured exercises.

THE undeniable value of Blue Flag training for aircrews and the sense of realism that live flying imparts to battle staff play make live flying an integral, critical part of Blue Flag. But whereas in Red Flag aircrew training is the end, in Blue Flag it is part of the means to the end. The bottom line in Blue Flag is training the battle staff and increasing the cohesion between the commander, planners, and the forces under their control. To train that staff properly, a force of appropriate size must be provided. The size of the live force that can be made available in any exercise is limited by many constraints, not the least of which is fiscal. Therefore, in addition to the live flying operations, simulated aircraft (or to use the current terminology, *constructive* forces) are used to develop a force of appropriate size.

In Blue Flag, hundreds of simulated sorties are "flown" daily, sorties that could not possibly be flown live without a vast expenditure of resources. Simulated sorties are inexpensive, but they tend to place far fewer demands on the command and control structure than do real sorties. In Blue Flag, a special effort has been made to ensure that the decision-makers devote a proportional share of their attention to the simulated sorties. The tactical unit operations centers (TUOCs) are required to schedule crews for the simulated sorties, monitoring crew rest, crew qualifications, and all other factors that would be considered in the scheduling of any mission. Aircraft are scheduled by tail number with realistic turn times (the time required to refuel, reload, and launch it on another mission). To further heighten realism of the simulated sorties, an aircraft simulation team was established as a part of the Blue Flag control team. Direct telephone links to the TUOCs provide this team with "takeoff times" for the simulated sorties. After a delay time corresponding to the aircraft transit time to the target area, members of the simulation team, acting as aircrews, make actual radio contact with the live airborne battlefield command and control center (ABCCC), a C-130 aircraft acting as the commander's on-scene command post. Receiving instructions from the ABCCC, the simulated aircrews "proceed to the target" and contact the ABCCC again outbound, with mission results. Hundreds of daily sorties are generated in this manner, with the radio traffic putting a heavy load on the ABCCC; stressing the ABCCC and its communications was, in fact, one of the objectives of Blue Flag 77-2.

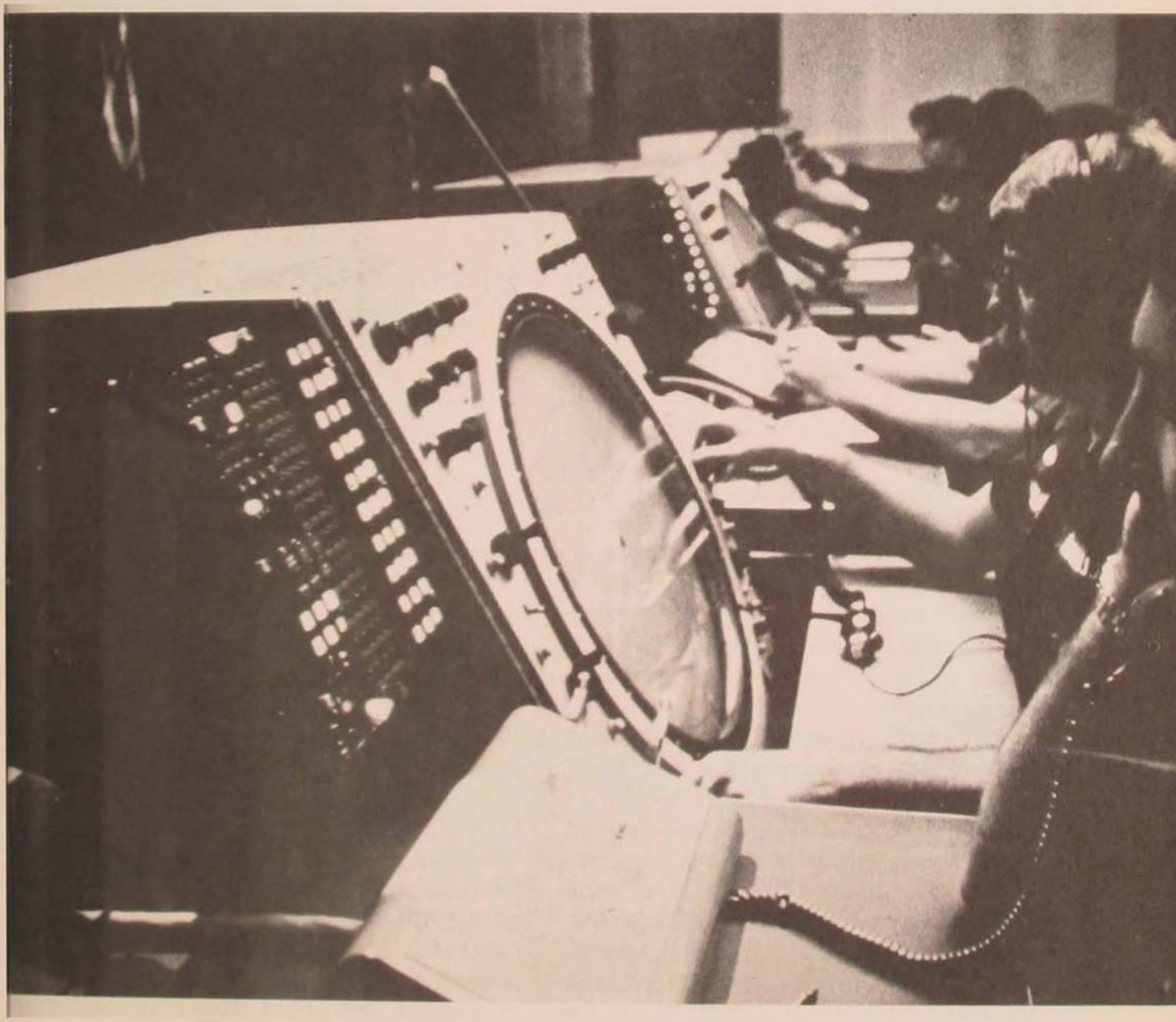
Employing the ABCCC as a direct air support center (DASC) has also been evaluated in Blue Flag. The DASC is normally a ground facility coordinating close air support requests from the Army; its destruction is simulated early in the exercise, and the ABCCC takes over its duties. Collocated with the aircraft simulation team at Eglin are simulated tactical air control parties (TACPs). These TACPs submit preprogrammed close air support requests to the ABCCC/DASC by radio. These requests are carefully tailored to progressively increase the load and help determine the capacity of the ABCCC to function as a DASC. The importance of the DASC's role is significant; it is through this facility that close air support requests are passed to support ground troops that may be under fire and in immediate need of assistance. If the ground DASC is knocked out of operation, there must be a backup facility to take over its duties. The ABCCC is the clear choice to perform this task; its proximity to the battlefield and available communications allows it to take over

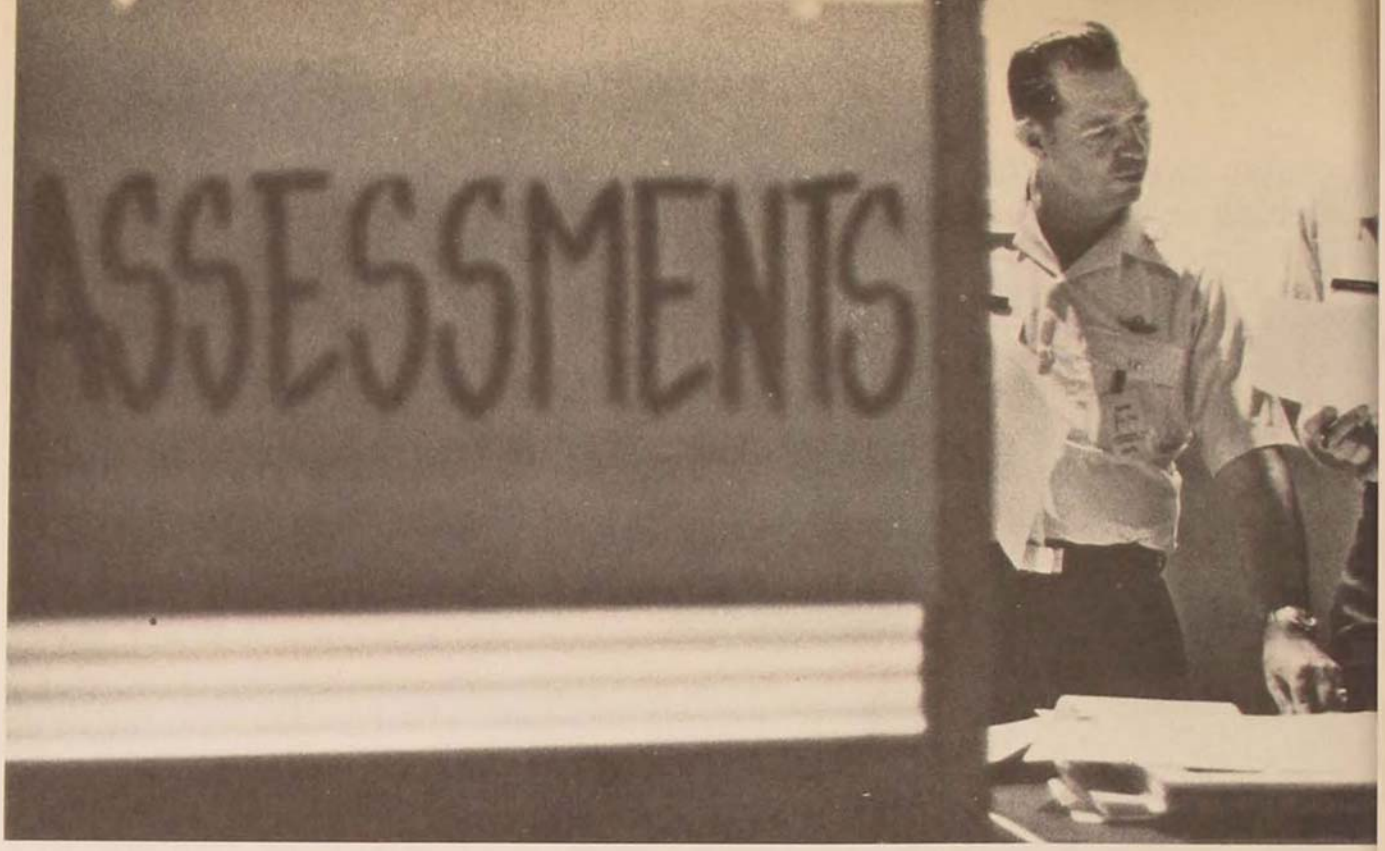
The control team (right) interfaces with the players to provide preplanned scenario inputs, monitors the progress of the operation, and generates new inputs as required.... Below, the Air Defense Weapons Operations Center (ADWOC) coordinates all the ground-based enemy missile and antiaircraft radar threat emitters, providing the simulated threat to friendly aircraft operating in Blue Flag airspace. . . . On facing page the ADWOC controllers generate the enemy ground-to-air threat, using scope displays that depict the Eglin ranges and the friendly aircraft operating there.



rapidly. The ABCCC has performed extremely well in this role in several Blue Flags.

The center of any command and control network is the battle staff itself, and Blue Flag is geared to provide maximum training for this important element. The control team exercises its authority only to keep the operation directed toward the accomplishment of the training objectives and to make those decisions that would normally be deferred by the commander to higher headquarters. Beyond that, the commander and his battle staff are free to exercise their initiative to get the job done. There is no school solution, no one right answer. As in any real-world problem, a number of solutions present themselves, any one of which has its pros and cons. It is the job of the commander and his staff to





provide a variety of solutions and select the one that, in their judgment, will be most effective.

TO ASSESS the accomplishment of the objectives and subobjectives established for each Blue Flag exercise, assessment personnel record data during on-the-spot observations of critical events. Because of the massive amount of activity during each exercise, it has been found to be most advantageous to place assessment emphasis on certain pre-established stress situations. Incorporated into the scenario, these situations enable the assessment team to concentrate its efforts in areas that will yield the most useful information. Communication outages, search and rescue activity, and jamming and intrusion are examples of stress situations that have been used in Blue Flag exercises.

Following each exercise, a mass debriefing is held with representatives from each participating unit. This debriefing is an important and integral part of Blue Flag; each unit has the opportunity to critique its performance and the overall operation. Information from this debriefing is consolidated with data gathered during the exercise by the assessment team. These, combined with each unit's after-action report, form the raw material from which the Blue Flag assessment team assembles its final report.

In Blue Flag, not only are answers being sought to some very important questions in command and control but we are also coming up with answers for questions we did not know existed. To be of maximum value, the questions answered and lessons learned in Blue Flag must be disseminated throughout the Air Force, especially in those specific areas having immediate interest in command, control, communications, and intelligence. No matter how many Blue Flags are run, it is impossible to train directly more than a small percentage of potential commanders. An important part of the Blue Flag operation

Assessing Blue Flag progress and results is an important function of the Assessments Division of the 4441st Tactical Training Group. The commander (opposite) is briefed on the status of the exercise. . . . Rescue units (left) performed live land and water pickups on simulated search and rescue missions. . . . Another important Blue Flag exercise was a live airdrop (below) via C-141s from Fort Bragg, North Carolina.

must therefore be quantification and dissemination of the results. Efforts are currently under way to give the results of each Blue Flag the widest possible exposure. The lessons learned in Blue Flag must be learned not only by those who participate directly in the exercises but by individuals throughout the Air Force.

Blue Flag began as strictly an Air Force operation, run by TAC with the cooperation and assistance of many agencies and organizations from outside TAC. Army participation has gradually been incorporated and will certainly increase. As Major General Malcolm E. Ryan, former Commander of the USAF Tactical Air Warfare Center, has stated,

> Blue Flag is not just an Eglin AFB event or a TAC training event, although TAC and Air Force problems are being stressed in initial Blue Flag operations. . . . We look to the future, to joint operations, to better centralized control, better overall command and control of all combat forces engaged in air-land battle against a powerful enemy equipped with modern weapons. . . . Blue Flag's goal is to enhance overall combat effectiveness by bringing the right people together to get the job done.

THE FUTURE of Blue Flag holds a great potential for exercising new systems, tactics, and leadership techniques across the full spectrum of tactical air operations. The challenges for USAFTAWC and the 4441st TTG will be to realize this potential, impart to all military services the experience and knowledge gained, and keep Blue Flag from becoming highly structured and predictable for the participants. The strength of Blue Flag lies in its flexibility, in its free-play atmosphere that gives the battle staff the opportunity to exercise judgment, make the critical decisions, and make mistakes now—"on the field of friendly strife." When the next crisis occurs, Blue Flag will have performed an important role in increasing our capacity to fight effectively and win!

Eglin AFB, Florida

> Who desires peace, should prepare for war . . . no one dare offend or insult a power of recognized superiority in action.
>
> From the Latin of Vegetius
> *Military Institutions of the Romans*

in my opinion

A NEW LOOK AT AN OLD PROBLEM

LIEUTENANT COLONEL D. L. HUTCHINSON

EVER since its creation as a separate service, the Air Force has found it difficult to put its basic doctrine down on paper. As early as 1947 efforts were under way at Air University to record basic doctrine, but the task was not to see completion until April 1953 when the Air Staff published the first *USAF Basic Doctrine* manual (AFM 1-2). Many factors contribute to Air Force difficulties in this area, but in this article I will develop what I consider to be the current cause. First, however, let me offer a broad yet simplified definition of doctrine and briefly discuss its purpose.

When the fancy wrappings are removed from the various official definitions of doctrine, two important and critical points remain. One is that doctrine is what we believe. There is active discussion concerning the process by which we arrive at this belief—whether it is derived from distilled experience or hypothesized in an analytical manner—and whether, based on the process, the belief is worthy to be titled doctrine. But that is the subject of another article. The second point is that doctrine is what we teach. This includes both formal and informal instruction as well as the learning acquired through socializing. Therefore, doctrine, in a nutshell, is what we believe and teach.

But why should we have a doctrine? What purpose does it serve? Is it worth the effort to record it? I

hold that doctrine is essential to any military institution if it is to function effectively in crisis—and in the broader sense to any organization that has more than one member. Doctrine defines the basic beliefs of the organization. It frameworks decision-making so that, in the absence of directions, members can act independently but in consonance with the organizational goals. It also enables the rank and file to identify more closely with the organization and reduces confusion that could arise from ignorance of fundamental values. The value of doctrine is obvious. But its effectiveness can be seriously impaired if careful attention is not paid to its timely recording and effective communication.

Why, then, has the Air Force found it so difficult to record its basic doctrine? I suspect the difficulty stems from one underlying cause—our inability to deal with the concept of varying levels of abstraction in our beliefs. To explain, let me give an example. At the highest level of abstraction, the Air Force believes in centralized control of all air assets. At a lower level of abstraction, the Air Force believes that the tactical air control system (TACS) is the best method to centralize control of tactical air assets. And, at the lowest level of abstraction, the Air Force believes the PRC-41 is the best radio for the ground forward air controller to use in communicating with close air support aircraft. While this is an obvious example of varying levels of abstraction, other determinations are not so obvious.

To me the most difficult task encountered by the recorder of doctrine is the establishment of the various levels of abstraction into which the beliefs of the organization will be classified. An equally difficult task is the grouping of beliefs that are on similar levels and then integrating these groups into the established hierarchy of doctrinal abstraction. It should be noted that this hierarchy of beliefs is a continuum and flows from the most abstract "truths" (basic doctrine) to very concrete notions (procedures). In the Air Force, we have failed to label beliefs at these lower or more concrete levels as doctrine. We call them "tactics," "techniques," "standard operating procedures," "office policy," or some other well-intended name. They all have one thing in common, however. They all reflect what we *believe* is the best way to accomplish a specific task and can, therefore, be considered doctrine. In fact, the other services do consider the lower level beliefs as stated in "How to do it" publications as doctrine. It is interesting that they do not engage in the nebulous and often frustrating activity of trying to record something called "basic doctrine." Why the Air Force has arbitrarily chosen to limit doctrine to what is written in 1- or 2-series manuals is unknown to me, but it has led to a belief on the part of the average officer that doctrine is something that is the concern of only the highest levels of command and has no relevance to him. If asked when he last dealt with doctrine, the average officer would probably answer that he cannot remember. In fact, he deals with doctrine, in the broader sense, every day.

This arbitrary limitation on what we label as doctrine is really inconsequential as long as we understand that doctrine guides our daily activities, and only levels of abstraction differentiate between what beliefs we term doctrine and what beliefs we term something else. It is this lack of articulation of these levels of abstraction that has created the difficulties we have had in recording our doctrine.

I refer to the recording of doctrine as opposed to the development of doctrine because I think that staff agencies, regardless of level of command, do not normally *develop* doctrine but merely *record* the lessons learned or the ideas

developed by the users and doers in a particular activity. This is not to say that staffs cannot develop doctrine, because they can; but the function is usually performed by others. The recorder's job is to gather all pertinent information in a particular area and then, by a process of inductive reasoning, remove the essence at the appropriate level of abstraction to satisfy the needs of the organization. This is an extremely challenging task and gets progressively more arduous at the higher levels of abstraction.

Our problem today is that we have failed to elevate the level of abstraction of our basic doctrine high enough to satisfy the organizational requirement. We have continually allowed the level of abstraction to drop to a point where there is legitimate disagreement as to what we believe to be the best way to do things. At these lower levels this is not only desired but required if our doctrine is to remain healthy and adaptive, but as basic doctrine it fails to satisfy the organizational requirement. Basic doctrine must be so general that it can command wide agreement and still give latitude for command initiative. Of what value is it, then, if it is so vague to accommodate all? I suggest that it keeps us all going in the same general direction as opposed to striking off on 360 different paths. Let me draw an analogy. I recently reviewed the Bill of Rights, the first ten amendments to the Constitution. The simplicity of that document, after close examination, astonished me. Most of the amendments are one or two line statements at a level of abstraction that permits the agreement of all Americans. But, on the other hand, our legal libraries contain volume after volume of interpretations that have been drawn from just those short statements. The interpretations have adapted over time as the social, political, and economic environment has changed to satisfy the requirements of our country, but they have kept our country headed generally in the direction of a democracy as opposed to the many other directions we could have taken.

Basic doctrine should play this same role in the Air Force, but for some reason we have elected not to pursue the recording of our basic beliefs at that level of abstraction. Rather we have agonized over trying to get agreement on beliefs at a less general level, which has led to the inclusion of material to satisfy various special interests. As a result, we have written something we call "basic doctrine" that is really a compilation of many subjects of which only one is doctrine. Such a manual serves many purposes, but it is not specifically designed to satisfy the purpose of doctrine as stated earlier.

Why have we done this? Perhaps because a more abstract document limited to doctrine would be too difficult to produce, or perhaps we perceive it as having no utility—"Everyone knows that sort of thing." Then, too, we may have perceived the need to inform influential members of our government about the purpose of the Air Force in an effort to defend our existence as being a more urgent need than the recording of our basic beliefs.* I do not know what the correct answer is nor do I know what a document similar to the one I have described would say, but I do believe that it would be as useful to the Air Force as the Bill of Rights is to the United States.

FORTUNATELY, we have a ready-made solution to our problem in the very structure we have created for our doctrinal manuals. All that is required is that we adhere to a rigid discipline in writing them. I am referring, of course, to the fact

*The Air Force was only six years old when the first *USAF Basic Doctrine* manual was issued

that whether by design or not we have established a three-level framework of abstraction in our 1-series (aerospace doctrine), 2-series (aerospace operational doctrine), and 3-series (mission employment tactics) manuals. However, even a casual survey of the existing manuals reveals a lack of consistency in levels found within a given series, and they sometimes appear to overlap those found in more familiar ones such as those in the 55-series (operations). This lack of consistency can lead to confusion and often blurs what should be a clear, concise thread running from the highest level of abstraction to the lowest.

It is understandable, however, when one traces what appears to be the unplanned development of this three-tiered structure. The 1-series (aerospace doctrine) Air Force manual was created in December 1951 to accommodate the newly developed manual entitled *Joint Action Armed Forces.* This was the predecessor of what we know today as Joint Chiefs of Staff Publication 2 (JCS Pub. 2), although at that time it was a joint publication with the Air Force designation of AFM 1-1. Then, in April 1953, AFM 1-2, *USAF Basic Doctrine*, was added. During 1954 a number of manuals (AFMs 1-3 through 1-11) were added. These dealt mainly with operational doctrine. In August 1965, the 2-series (aerospace operational doctrine) was created, and eventually all of the 1-series manuals with the exception of *USAF Basic Doctrine* (which had now been redesignated AFM 1-1 after the publication of JCS Pub. 2) were revised and published with the new 2-series designation. In February 1966, the 3-series (mission employment tactics) was created. However, this series was never very popular and even today encompasses only six manuals, five of which apply exclusively to tactical forces.

From this review of the historical origins of our doctrinal structure, I have concluded that there was no coordinated, well-thought-out plan to create the now well-established hierarchy. It was a pragmatic response to conditions, and that is why there is little consistency in the level of generality within and between series. The point is further substantiated by the revision history of the various series. Ideally, the higher the abstraction level of a manual, the less frequently it would have to be revised. This is true because changes in the environment would have less effect on a more abstract belief. Looking first at AFM 1-1, we see that there have been seven editions issued in the 25 years since 1953. That averages a revision every three and one-half years, and, in keeping with this average, the most current draft revision to replace the January 1975 edition is in final coordination at the Air Staff. If we look at the 2-series manuals as a whole, we see that as of this writing, the average age of the 20 manuals in this series is 94 months (almost eight years old), the oldest published in December 1965 (AFM 2-31) and the newest in February 1977 (AFM 2-6). The 3-series with its six manuals is only one-half month better with an average of 93.5 months. The oldest in that series is March 1966 (AFM 3-5), and the newest is July 1974 (AFM 3-2).

This analysis was done merely to point out that we do not make optimal use of the structure that we have created. Historically, we have changed our basic doctrine more than twice as often as the more specific operational doctrine. Should not a change in basic doctrine result in a refinement in operational doctrine? Presumably yes, but it has not worked that way. The absence of change in subordinate manuals suggests that there is no real thread running through our doctrinal work. We should correct this deficiency if we are to have a sound doctrinal program. Our manuals must lead us logically down the levels of abstraction if they are to

achieve maximum utility. Thus we must establish first appropriate abstraction levels for our 1-, 2-, and 3-series manuals and then discipline ourselves to adhere to those levels by writing in such a way as to produce a common link throughout all our publications. Finally, neglect in updating these manuals would necessarily weaken the credibility of the entire procedure.

As an example, our tactical airlift doctrine (AFM 2-4) was last revised in August 1966. That was before our experience at Khe Sanh and An Loc or the reassignment of tactical airlift forces to the Military Airlift Command.

This lack of discipline within our doctrine program has detracted from its utility and will continue to do so unless we take some positive action. I am not referring solely to the staffs or recorders of doctrine but also to the users and doers who develop doctrine. It is our responsibility as professional officers to ensure that the lessons we have learned and the beliefs we have accumulated are recorded promptly and accurately so our organization can properly benefit from our experiences. A logical and viable doctrine program, from the highest level of abstraction to the lowest, is everyone's business.

Air Command and Staff College

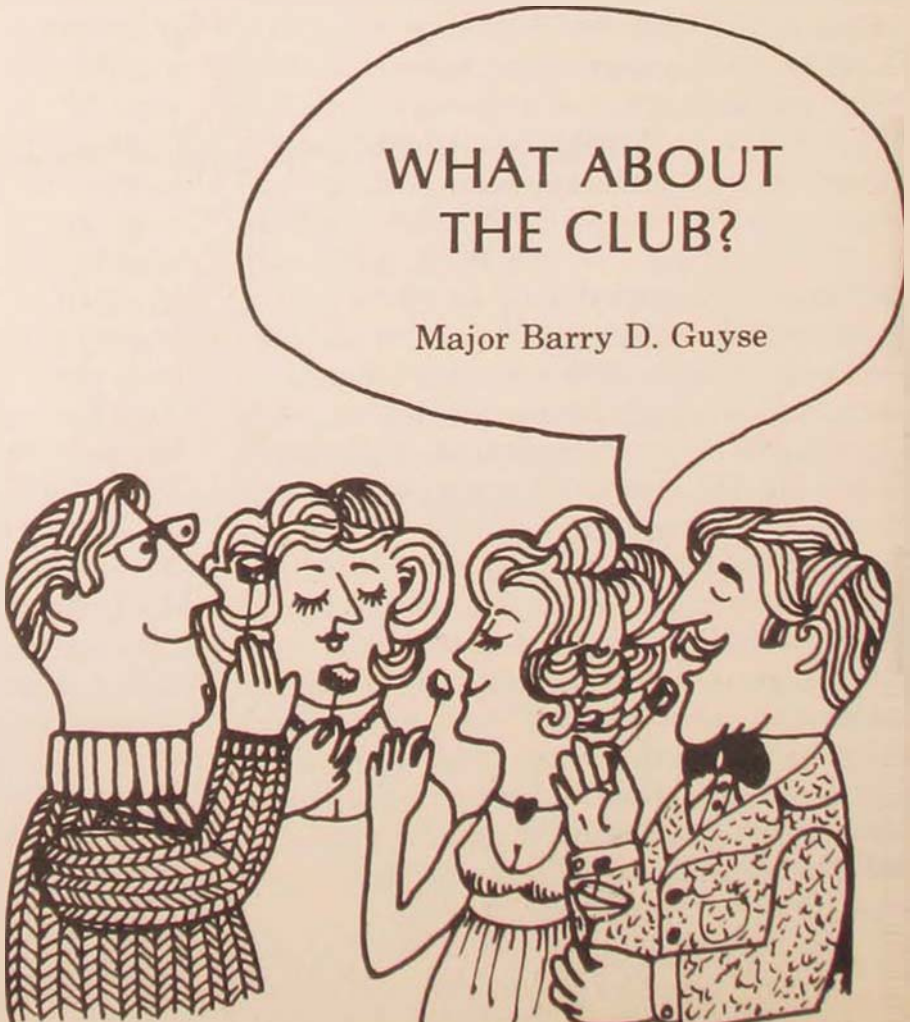
Overheard in the halls of the Pentagon: "Peace is too important to be left to the civilians."

WHAT ABOUT THE CLUB?

Major Barry D. Guyse

ARE OFFICERS' and noncommissioned officers' (NCO) clubs in our Air Force future? Can the open messes afford to remain relatively static in an ever changing environment? Will members continue to pay increasing dues to subsidize operating losses? Are the major commands (MAJCOMs) going to allow clubs to operate even if monthly losses continue? This article deals with the difficult question concerning club operations of the future and suggests one long-term solution. The question is, "Can the clubs survive?" My answer provides an affirmative response and seemingly achieves the statistical impossibility of gaining more for less.

During the past few years, we have been experiencing a less for more malignancy in clubs at many Air Force bases. Members continue to pay more in dues, and prices increase, while the quantity and quality of the services deteriorate. At overseas bases, the loss of slot machines was a severe blow to the financial stability of clubs. Pay comparability and continuing increases in wages have also increased operating expenses. Complex operations require extensive accounting systems, which are labor intensive or involve costly mechanization and computer time.



Entertainment is usually the first thing to go. It is a very visible expense that may not seem to have a significant impact on club participation. Next, the cost of labor must also be reduced. As in all sectors of the economy, labor is becoming the most expensive input to club operation. So now we have one bartender instead of two or fewer waiters in the dining room on a Saturday night. Customers become dissatisfied with the poor service and eventually take their business elsewhere. The club responds by continued work force reductions until reaching the logical conclusion of no customers and no employees. Meanwhile, dues are increasing to offset operating losses.

This is an oversimplified, possibly exaggerated, view of clubs. However, the hard realities of clubs at one typical small base suggest some disturbing predictions for the future. Except for an occasional small profit in the NCO club, neither club has enjoyed a monthly profit for the past two years. During some months, the losses were as much as $2.00 per member in the NCO club and $10.00 per officers' club member. New requirements have increased accounting costs by 100 percent since December 1975. Hourly wages increased approximately 8 percent during a recent six-month period. Labor costs also increased as a result of the requirement for local wage comparability, evening and night shift differentials, holiday and Sunday premiums, retirement and leave programs, and severance pay accruals.

These factors led to continued centralization of common club activities until a recent decision combined the dining operations of both clubs into the NCO club facility. This joining of facilities changes the traditional concept of a self-sustained, two-club operation; however, its effect seems to be only short term. Even if the predicted small profit is realized, the black totals at the end of the financial statements will soon turn red with the next increase in labor costs. Nevertheless, we are still talking about less for more, whereas I promised a reversal to more for less.

A quick review of a typical open mess operation usually shows that the dining room is, at best, breaking even but usually experiencing a continuing monthly loss. At the same time, lounge operations are enjoying sizable monthly profits. At one club, located on an overseas base with a relatively small military and civilian population, the dining room lost over $1000 per month in FY76, while the NCO club experienced a $1500 monthly loss. During FY76, the monthly lounge profit averaged approximately $1400 in the officers' club and $5000 in the NCO club. Some traditional reasons for this dichotomy are the following: (1) higher gross profits from liquor and beverage sales, while dining rooms must operate on a much tighter profit margin to remain competitive; (2) dining rooms are labor intensive, but the labor costs in the lounges are minimal; (3) inventory control costs are high in the dining room, while lounge inventory is relatively easy to manage; (4) kitchen equipment is expensive to procure and maintain, but bar equipment requirements are insignificant by comparison.

To achieve long-term improvement, the focus of our problem-solving attention should be directed to the club dining facilities because these are the traditional losers, particularly at small bases. Then we must broaden our perspective and look at all factors in the environment, not just specific aspects of club operation. The environment includes the base population, all dining facilities on base, the surrounding community, and restaurants off-base. By identifying and addressing only club dining room problems such as labor costs, cost of goods, and gross sales, our

managers have overlooked one significant factor in the environment. That factor is *competition!*

At the same small base referred to previously, there are 4500 possible dining room customers, including all assigned military, civilians, and their dependents. At the same time, three major nonappropriated fund food-serving facilities—the officers'club, the NCO club, and the Army & Air Force Exchange Service (AAFES) cafeteria—compete for business. In addition, there are appropriated fund dining facilities for enlisted personnel and numerous restaurants in the civilian community.

The clubs have not been effectively competitive. The AAFES cafeteria was getting about 80 percent of the food sales business while the clubs were splitting the remaining 20 percent. A closer look revealed that the competition really was not fair. While the AAFES cafeteria can draw its business from the whole base population, the clubs must restrict their sales to members only. In our example, officers'club membership ranged from 175 to 185. Virtually, all officers were members, while approximately 50 percent of the eligible U.S. civilians joined the club. The NCO club membership was significantly higher; however, only 55 percent of the enlisted population were club members.

The average number of dependents per assigned military member and employed U.S. civilian is 1.5. Assuming that this average also applies to the club membership, the total of 1000 members of both clubs have 1500 dependents. As a result, the possible customers for both club dining rooms are about 2500 people, as opposed to the 4500 that the AAFES cafeteria draws from. The officers'club with a full dining room staff of eight employees, operating six days a week, obtained food sales business from an approximate total of 440 potential customers.

sales	18,085	
cost of goods sold (average = 53%)	9585	
gross profit		8500
labor		8500
profit/loss		-0-

Break-even analysis for monthly operation

A simple break-even analysis clearly points out the problem. We can establish a typical labor cost and cost of goods sold from past experience and determine the amount of sales necessary to break even during a one-month period. The calculation includes the sum of both club dining room operations. According to the preceding computation, it requires combined monthly sales of $18,085 to break even in the dining rooms. An average of last year's actual total dining room sales for both clubs was $14,084, $4000 less than the amount required to break even.

A skeptic may say, "That's an easy problem to solve—just cut labor or raise prices or both!" Probably both would be necessary to make up the $4000. But how high can prices go before you price yourself out of the market? On the other hand, the number of employees seemed to be at a minimum to operate two dining facilities for six days a week. A reduction in labor below the undefinable magic minimum reduces service and sales. So the cutback in employees becomes counterproductive.

An answer to the problem seems to be in gross sales; however, competition is also a major factor. If we include the gross sales of just the AAFES cafeteria in our model, we find that the clubs have not been very competitive. As previously mentioned, the cafeteria has been claiming about 80 percent of the monthly food sales, while the clubs split the remainder. The cafeteria income averages approximately $55,000 on a monthly basis. Moreover, the cafeteria makes approximately 5 percent to 10

percent profit from their sales, while the clubs lose money each month.

I PROPOSE to solve the problem by eliminating the competition! First, close the AAFES cafeteria at its present location. Then convert the dining room in the NCO club to an AAFES cafeteria, and establish a more formal AAFES dining operation, such as a "steak house," in the officers' club facility.

Of course, these changes will require some structural redesign in the officers' and NCO clubs. A partition must be constructed in each club facility to enable AAFES and the club to share the same building. The partition must clearly separate food service from liquor sales because all base personnel and dependents would be eligible to use the AAFES dining rooms, while the "club" lounges would be restricted to members only. Separate entrances are also desirable; however, some club layouts may require joint use portions of the building. For example, both AAFES and club customers may be required to share a common entrance to the building, latrines, and coat closets.

The cost of partitioning the facilities to separate club and AAFES operations should not be excessive. Usually, it would require construction of a sound resistant wall and some doors; however, the AAFES renovation could be more extensive. Internal remodeling would probably be necessary to comply with AAFES requirements for a cafeteria or steak house operation. Responsibility for funding the partition may be established through mutual agreement, but cafeteria and steak dining room remodeling should be funded by AAFES.

The impact of this proposal affects numerous base activities. It addresses problems that have been unresolved for years and provides many advantages to AAFES/officers'/NCO clubs and the base community. Some of the many potential advantages of this proposal are as follows.

Competition is limited. Now AAFES will be the sole provider of prepared foods through major nonappropriated fund food serving facilities and will generate business among the total population of possible customers. Some may say that this is a disadvantage because monopoly means price fixing, price escalation, and poor service. This may be true under normal circumstances; however, the AAFES organization will still be competing with on-base appropriated fund and off-base food service establishments. As a result, AAFES prices and customer service will be driven by this competition. If they are not competitive, customers will be lost to other establishments. AAFES can also adjust its operating hours to take advantage of business peaks at either of two different types of food serving facilities. For instance, the cafeteria would probably stay open extended hours while the steak house operation may be profitable only on a three- or four-day-a-week-type plan. Regardless, there are no longer three completely separate operations trying to compete for business within a very limited population of possible customers.

• *Club lounges equal profit.* When AAFES begins to operate food service, the clubs will be reduced to a lounge only operation. Traditionally, dining rooms have been losing operations in open messes, while the lounges have either completely or partially subsidized the dining rooms to reduce the amount of total loss or to allow the club to make a profit. With the lounge only operation, the clubs will be in a continuing profitable position and, as a result, can start providing more services to members, rather than the traditional raising of dues while cutting services and entertainment.

• *The officers'/NCO club consolidation trend is reversed.* Besides allowing AAFES to be sole provider of nonappropriated fund food on base, this proposal is advantageous because lounges and food serving facilities will be collocated. Recent discussions on open mess operations point to the possibility of consolidating clubs that are not making profits. In some cases, consolidation of dining rooms leaving lounges operating at separate locations results in liquor service without a collocated food operation. Although this possibility has the advantage of consolidation while still providing separate facilities for both officers and NCOs, it leaves one open mess or the other without a dining room. Now there is another problem because members are not given the opportunity to purchase food with liquor. My proposal maintains the traditional concept of separate clubs for officers and NCOs while providing food service in each facility.

• *Administrative charges.* Many administrative expenses associated with operating an open mess are directly related to the dining room and kitchen. For instance, depreciation and other dining facility support expenses are normally charged as administrative costs. With a lounge only operation in the club, these expenses will be eliminated and administrative charges should be significantly reduced.

• *Labor costs.* The dining operation in the open mess is normally labor intensive because waiter service is usually provided. The cost of this labor is one of the factors that usually makes the dining room a losing activity. With the implementation of my proposal, labor costs will be significantly reduced because a lounge operation is not labor intensive.

• *Accounting costs.* An analysis of the clubs previously used as examples indicated that the joint officers'and NCO club accounting costs ranged between $3000 to $3500 per month. A review of the support provided by the Nonappropriated Fund Financial Management Branch (NAFFMB) indicated that a lounge only operation in both open messes would enable NAFFMB management to release as many as three employees. In addition, the accounting costs for NAFFMB would be reapportioned among all service activities. A realistic analysis showed that the portion of the accounting costs shared by the clubs would be reduced from 37.5 percent to approximately 10 percent.

• *Catering.* This factor is an advantage or disadvantage, depending on the relationship between base representatives and AAFES management. In the past, catering for parties has not enabled the clubs to generate profits; however, it is a lucrative aspect of this proposal for AAFES. They will be obtaining a monopoly in an area that has traditionally been closed.

WITH ANY new concept, there are disadvantages along with the advantages; however, an analysis of this proposal indicates that the benefits significantly outweigh the drawbacks. Inasmuch as a realistic approach must evaluate the disadvantages, the following factors are considered negative aspects of the proposal:

• *Loss of control.* Control of club dining operations by the commander would be reduced while control by the membership would be eliminated. This disadvantage requires extensive investigation because the degree of control over the traditional club operation is questionable now that MAJCOMS and the Air Staff have directed that open mess operations must be financially self-sustaining. The membership has lost control to a great extent, while the commander is tied to the bottom line of the financial statement. From one

perspective, the implementation of this proposal could provide more alternatives to the commander. If the clubs operate lounges only, the profits will enable commanders and members to have more influence because decisions will not be based on the fear of experiencing a loss at the end of the month.

• *Employee placement.* In some overseas areas, appropriated and nonappropriated fund activities must operate within a no reduction in force (RIF) environment. As a result, the employees in the dining operations cannot be casually discharged. Instead, similar positions at the same pay rate must be found for these employees in either the AAFES operation, appropriated fund organization, or other Morale, Welfare, and Recreation (MWR) Division activities. Although a problem, it is manageable and jobs can be found for these employees.

• *Wine and beer sales.* AAFES would be allowed to continue beer sales in the cafeteria and beer and wine sales in the more formal steak house operation; however, the sale of mixed drinks would be limited to the club activities. This arrangement is necessary because the AAFES-operated portion of the facility must maintain its individual integrity, and the normal products sold by AAFES should not be restricted. The procedure is not viewed as a serious disadvantage to the club operations because business in the lounge would continue and probably increase with the collocated dining facilities.

THIS PROPOSAL has many advantages and some disadvantages; however, it seems to be a desirable alternative to either consolidating open mess operations or closing the facilities completely. On small bases, consolidation is only the first step toward at least elimination of the dining operation. An analysis of a plan for consolidation indicated that even with optimistic income projections, the club would hardly be able to maintain a meager monthly profit. This profitable position would be quickly changed with the next pay increase or employee benefit.

Abbreviated income statement/ project club operation (monthly)

income		
gross profit	$ 14,206	
amusement machine and concessions	773	
		$14,979
expenses		
personnel	$ 5000	
Nonappropriated Fund Financial Management Branch	750	
entertainment	3300	
material	347	
other	183	
nonoperating	500	
		$10,080
profit before dues		$ 4899
dues income		$ 2166
total profit		$ 7065

By reducing competition through this proposal, the AAFES organization will be able to increase its business significantly, and we will enter a new era of prepared food service at Air Force bases. For the club member, this proposal changes the past trends and starts providing more for less rather than vice versa.

The big benefit is observed in the following projected financial statement of actual officers' and NCO clubs with consolidated administration and no dining rooms. This conservative projection shows a net profit of about $5000 before any dues are collected. Rather than requiring the high dues rates common in recent years, a nominal charge of $2.00 for enlisted personnel and $3.00 for officers

would bring the profit to more than $7000. With this type of operation, more benefits could be returned to the members. Entertainment could become a new attraction, and money would be available for club facility renovations and nice-to-have items.

Aviano Air Base, Italy

The Air Force Military Personnel Center made these comments regarding Major Guyse's article, "What about the Club?"

The article paints a generally bleak picture of escalating dues, higher prices, declining financial health, and poor customer service in the open mess program. It is true that dues and prices have increased somewhat over the past few years and will probably creep upward in the future, but this cannot be avoided completely. Open messes are not immune to the inflationary trends being experienced by commercial enterprises—and the Exchange Service. Costs to club members are still very reasonable. For example, monthly dues for NCOs and officers average $2.93 and $9.54, respectively.

Viewed as a whole, Air Force open messes have about $3.30 in current assets for each $1.00 of current liabilities, which indicates their financial solvency is healthy. Furthermore, total earnings were approximately $2.8 million in FY77, and dining room sales increased by $2.5 million over the prior year. While some of these gains represent increases in costs to patrons, they also reflect customer acceptance and satisfaction with services and products offered.

The open mess program has as its objective more than just providing a food outlet. Food is offered, but its presentation is not restricted to cafeteria or the standup counter service normally found in Exchange Service outlets. On the contrary, open messes provide a wide range of food activities, from snack bars, to cafeterias, to elegant dining rooms (with full table service). More important, open messes exist to provide an integrated program of food service, beverage service, and membership activities, including entertainment and social events. Unit esprit de corps is fostered through open mess dining and other social experiences. Open messes are also focal points for base/community relations activities. In short, open messes are the "social institutions" of the Air Force community and demonstrate that the Air Force is a total way of life.

UP-OR-OUT AGAIN

a skeptic's view

COLONEL ORIN C. PATTON

UP-OR-OUT is one of those issues on which virtually everyone has a ready opinion, and most of them seem to show up in print. The July-August 1978 *Air University Review,* for example, had an interesting commentary by Lieutenant Colonel Robert O. Heavner making a case for retention of technical officers beyond the normal up-or-out tenure expectations.

Unfortunately, most discussions of up-or-out approach the problem piecemeal and focus on a limited range of the shortcomings or virtues of the promotion/tenure principles it implies. It often seems that up-or-out is a narrow, tunnel-vision fix for a broad-gauged set of problems. It appears clear, at least to this observer, that this is the time to back off to look at the overall personnel systems. Let's determine what we really are trying to

accomplish with the promotion and tenure policies and whether up-or-out is consistent with these or if cost-effective. Piecemeal analysis, as opposed to a broader perspective, can lead to false dilemmas and an erroneous necessity for either/or choices. In fact, it may be possible to have our cake and eat it.

It is widely recognized, and correctly so, that up-or-out is rooted historically in the reactions against evils of a strict seniority promotion system that led to leadership problems in the U.S. Army. These occurred in the early days of World War I and World War II with an officer corps in which top leaders were "over-aged" and "unprepared for the physical and mental strain of actual war," while younger, more capable officers were denied the opportunity to gain experience in senior positions. Up-or-out was instituted after WW II to ensure a "flow-through" system in which stagnation could not occur. It is in these general terms that up-or-out is customarily defended, with the additional objectives of ensuring a set of incentives for officer performance.

The amazing thing about the historical argument is that it overlooks so much, as usually stated, and deflects the "solutions" to the wrong problem areas. As generally understood, up-or-out applies to the promotion boards and uncertain futures facing captains through lieutenant colonels; promotions to general officer are generally not included in the discussion. The most critical problems of the two world wars, however, were found precisely at the colonel and general-officer levels. It was the prewar captains, majors, and lieutenant colonels who led many of the successful combat campaigns. The only impact up-or-out (as we now think of it) would have had on those situations would have been for a *bottom* fraction of the prewar officer corps to have been eliminated at each promotion step. But what effect would that have had on the problem area that was found at the *top* of the colonel and general-officer ranks? The only difference would have been in the marginally improved opportunities for experience in senior positions through the forced attrition from the bottom. Top positions, however, went to top contenders at the upper levels, and presumably the top performers in any given peer group of rising officers would have been little affected by up-or-out in these positions.

General Eisenhower's views after WW II seem to have been more concerned with lock-step promotion and an inflexible seniority system than incentives. His concerns were problems that up-or-out treats only indirectly. It appears that more precise solutions to the WW I/WW II syndrome would have focused on actions such as selective accelerated promotion, emphasis on combat readiness rather than administrative routine peacetime responsibilities, and enforcement of physical readiness standards. Up-or-out is virtually irrelevant in this context and is badly misdirected. It is not inconceivable that top battlefield leaders would have fared poorly under peacetime up-or-out criteria and procedures. It was simply an easily implemented mechanical approach, enacted in an era in which the managerial responsibilities of the officer corps were much more simple than now, and the services enjoyed the luxury of knowing that the Congress would provide whatever levels and types of manpower the military thought it needed. Times have changed.

In the contemporary environment, it is highly preferable to direct personnel policies more precisely at the problems they are supposed to solve. It would seem that the more efficient approaches to the questions of promotion, tenure, assignments, fitness, and readiness would be more closely aligned with actual realities and difficulties and be more adaptable to

contemporary diversity than simplistic up-or-out solutions.

Elimination of poor performers, for example, should focus on elimination of those who are performing poorly in current jobs rather than speculations regarding fitness for promotions and future jobs. To this observer's knowledge, it has never been shown that the best wartime supply captain is necessarily the man who wants to be a supply staff officer as a major. It is my observation that the heavy emphasis on an up-or-out "flow through" implies that an officer is always a transient in his current position and there is little point in learning, in depth, a job that he will soon depart. Superficiality of expertise is an inevitable result. If I were a wing commander committed to combat, I would much rather have the seasoned, expert captains in my unit than have it populated with ambitious and bright but inexperienced transients (for example, in avionics, communications, or aircraft maintenance).

We undoubtedly need a healthy share of hard-charging, bright-eyed generalists, especially in operations and closely related areas. The further removed one gets from current operations and plans, however, the greater the desirability of more expertise in depth and experienced tenure in the technical and specialized aspects of the job. Many of the functions are analogous to those of the civilian community: logistics, computers, research, managerial policy, etc. These are areas where a career captain or lieutenant colonel (30-, 35-, or 40-year careers), with extensive experience in that function, may make a great deal more sense than transients, good or bad.

If we simply promote on the basis of excellence, eliminate on the basis of marginality, assign on the basis of qualifications, and enforce fitness and readiness standards, we will build a force much more attuned to real needs than one built from force-fed, flow-through up-or-out. A strict up-or-out, after all, would have required the permanent retirement of Douglas MacArthur when he stepped down from the Chief of Staff, U.S. Army, in the 1930s.

The basic problem with up-or-out is that it substitutes a blunt, relatively indiscriminate policy tool, with hidden assumptions regarding a wide range of personnel policies, for precise, perceptive policies targeted at specific problems. Accordingly, it will unavoidably miss the target often and cause a great deal of avoidable collateral damage. Why not think through the particular problems and identify them more accurately—maximum useful age, incentives, elimination of poor performers, selective accelerated promotions, retention vs. training cost, recruiting pools of the future officers, benefits of technical expertise vs. high personnel turnover, etc. Up-or-out is simply an old-fashioned tonic that cannot treat all problems equally well.

Fort Collins, Colorado

books and ideas

MASTER AT ARMS

Clausewitz in full view

LIEUTENANT COLONEL DAVID MACISAAC

War's very object is victory . . . .

General of the Army Douglas MacArthur to a joint session of Congress, 19 April 1951

The object of war is the attainment of the goal of [national] policy. . . . There are many ways to this object and the defeat of the enemy is not always necessary.

Major General Karl von Clausewitz, *Vom Kriege* (1832), Bk. I, Ch. 2

Soldiers usually are close students of tactics, but only rarely are they students of strategy and practically never of war.

Bernard Brodie, *War and Politics* (1973)

EXCEPT for a few years at the Air Corps Tactical School in the 1930s—when Clausewitz's remarks about the significance of defeating the enemy's *will* were found convenient as introductory material for the course in bombardment aviation—Clausewitz's writings have rarely attracted the attention of Air Force officers. (The recent decision to incorporate Clausewitz in the 1978-79 curriculum at the Air War College may change all this, but only time will tell.) The reasons for our service's traditional neglect of his writings are many, a partial list of which would have to include all of the following:

- His tactical prescriptions, though still not without relevance to army officers, are of no value to airmen of the late twentieth century.
- His views on military strategy are so hopelessly entwined with the larger question of national policy, as in his insistence, for example, that the two can never be separated without producing "a senseless thing without an object," that any serving officer who takes Clausewitz at his word runs the risk of crossing clearly established demarcation lines underlying the American military tradition.
- Whether speaking of tactics, strategy, or policy Clausewitz *gives the appearance* of having precious little to say of interest or concern to junior officers (whether of the military or the foreign service); because he includes heads of states in his audience, many—this reader once included—come to feel that he writes of things beyond their purview.
- A soldier by chosen profession, he nonetheless stood in the first rank among the intellectuals of his day, in a class with Herder, Fichte, Schiller, Humboldt, Kant, and Hegel to name a few, and his writings are often equally difficult for Americans to understand.
- Until only very recently there has been very little available in English by way of interpretation, informed analysis, or biography.
- And finally, his principal work, *On War*, quite literally defies condensation or abbreviated presentation. There is simply no way a military academy or staff college instructor can put together a 50-minute lesson plan on Clausewitz that will do anything more than befuddle the victims to whom it is applied.

No brief essay such as this can make any appreciable headway against the difficulties suggested above. Some of those difficulties, indeed, like Mount Everest, are

simply *there.* It *can* make an attempt, nonetheless, to explain some of the foregoing assertions, if only in an effort to defuse the implications of some of them; and it can describe in broad outline the new opportunities for reading and understanding Clausewitz that are now available in English.† The reader should be forewarned that in attempting to do so I shall violate the normal format of a review essay, presenting under that guise what is in fact an ill-disguised plea for the contemporary relevance of Clausewitz.

ON WAR was originally published in 1832 and first became available in English in 1874—the so-called Graham translation, after British Colonel J. J. Graham. This translation was revised and republished in 1908 with a new introduction by Colonel F. N. Maude and subsequently reissued in 1911, 1918, 1938, 1949, and 1962. Other translations have been: (1) in 1943, by O. J. Matthijs Jolles, for The Modern Library, more accurate but based, like Graham-Maude, on what Peter Paret calls "the corrupt third German edition"; (2) in 1962, by Colonel Edward M. Collins, USAF, actually a series of selections amounting to less than 15 percent of the complete text, entitled *War, Politics, and Power;* and (3) in 1968, a Pelican Classics edition, edited by Anatol Rapoport, which turned out to be nothing more than a severely abbreviated version of the Graham-Maude translation. Each of these previous appearances in English is unsatisfactory for one reason or another: Graham-Maude for inaccuracies and not being based on the first German edition; Rapoport for being a severely truncated version of Graham-Maude; Jolles for not being based on the original text; and Collins for including so little of the text (although it must be admitted that Collins did include the majority of what this reviewer would call those elements in Clausewitz of value to a very wide audience, one including far more than merely serving officers).[1]

The wholly new translation by Michael Howard and Peter Paret, over a decade in the making, is among that rare breed of books that is recognized as a classic as it comes off the press. It is now, and seems destined to remain, as close as we shall ever see to a definitive English translation. The scholarly reputations of the three-member Anglo-American consortium responsible for this new edition—Michael Howard, Peter Paret, and Bernard Brodie—are unimpeachable; each in his own right has established a record of excellence in teaching and writing that is the envy of all who know their work: as a team, they shall likely remain unbeatable.

The volume opens with three introductory essays: (1) Paret's "The Genesis of *On War,*" (pp. 3-25); (2) Howard's "The Influence of Clausewitz," (pp. 27-44); and (3) Brodie's "The Continuing Relevance of *On War,*" (pp. 45-58). Each essay is adequate to the task at hand, even if it is also true that the evident embarrassment of the authors at having interjected themselves in front of the master's words has led them to an admirable if nonetheless regrettable brevity. The most noticeable lapse occurs in Howard's essay, in which he has virtually nothing to say

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†Karl von Clausewitz, *On War,* edited and translated by Michael Howard and Peter Paret (Princeton, New Jersey: Princeton University Press, 1976, $18.50), 711 pages.
Peter Paret, *Clausewitz and the State* (New York: Oxford University Press, 1976, $18.95), 467 pages.

about Clausewitz's influence in Russia, a topic of major significance given the importance attached to Clausewitz's work by Engels, Marx, and Lenin. (To be fair to the contributors, however, each has addressed his assigned topic on numerous previous occasions,[2] and the reluctance to repeat oneself must be judged a merit among academics, a breed often not noted for restraint in that respect.) For the reader who is new to Clausewitz, the three essays taken together represent the best available introduction.

On War, one must always bear in mind, is an unfinished work, compiled from his various drafts and notes by Clausewitz's widow. Many editions of the book fail to make this clear, but here the text begins with four prefatory notes by Clausewitz (two written between 1816 and 1818, when he first set to work, and two from the period between 1827 and 1830, when he had completed a first draft). These notes carry an important message that might be freely paraphrased as follows:

> Should this work be interrupted by my death, then what I have written down so far would deserve to be called a shapeless mass not yet brought into form. I regard only the first chapter of Book I as finished; all the rest [124 more chapters making up eight books; pp. 90-637 in this edition] must be thoroughly reworked once more. And yet, despite the present imperfections, I believe a reader may nonetheless find in all this some ideas capable of bringing about a revolution in the theory of war. [I say this because] it was my ambition to write a book that would not be forgotten after two or three years, one that might be picked up more than once by those who are interested in the subject. . . . Perhaps it is not too much to hope that a greater mind will soon appear to replace these individual nuggets of mine with a single whole, cast of solid metal, free from all impurity.

So much for the inconsistencies so often complained of by later critics; ditto for the occasional charges of intellectual arrogance.

But if intellectual arrogance can be rule
out, sustained intellectual rigor certain
cannot. He demanded it of himself, and h
work demands it of his readers at eve
turn. He knew himself, and he knew oth
men, whether in the study or under fire; h
also recognized the weaknesses of earli
attempts to explain the nature of warfar
Earlier writers had tended to stress a
decisive *either* the objective elements i
war (material phenomena, measurab
quantities, given tactical principles, etc.-
what we might look on as the McNama
inversion) *or* the subjective elements (th
courage of the commander, his sel
confidence, the moral strength of an arm
the role of chance, etc.—consider th
mystique of MacArthur's command style
Recognizing in himself the tendenc
inevitably to systematize, along with th
foolhardiness of arguing in the face
recorded history that all wars can
explained by the dominance of either th
objective or subjective elements, he s
himself the task of overcoming th
difficulties inherent in outlining a *gener
theory* of war, one that recognized th
dynamic nature of the interactions amon
many parts, one that would accept with
its limits of explanation any known pa
war and any likely future one. As th
following paragraph makes clear, such
theory would inevitably be out of place
the battlefield, but crucial both to the pri
preparation of the commander and to th
unending need for clear ideas and th
ability to show their connection with eac
other.

> All great commanders have acted
> instinct, and the fact that their instinct w
> always sound is partly the measure of the
> innate greatness and genius. So far as acti
> is concerned this will always be the case.
> Yet when it is not a question of acting ones
> but of persuading others in discussion, th
> need is for clear ideas and the ability to sho
> their connection with each other. So fe
> people have yet acquired the necessary sk

> at this that most discussions are a futile bandying of words; either they leave each man sticking to his own ideas or they end with everyone agreeing, for the sake of agreement, on a compromise with nothing to be said for it. (p. 71)

The search for a general theory led Clausewitz into many difficulties, a fact he acknowledged in his prefatory notes (pp. 63, 69-71), but he was not a man for halfway measures. The full extent of the revolution in warfare between 1775 and 1815 simply *must* be defined, he felt, if soldiers and statesmen of the future, especially those of his beloved Prussia, were not to repeat the errors of the past. Any such attempt at definition had to take into account the totality of the revolution, not merely its constituent elements, each of which in turn had to be seen as only one part of a greater whole. (And yes, he would agree, the total effect was greater than the sum of the parts!) Given such a goal, it is especially regrettable that so many future readers would place *On War* in competition with the Holy Bible as a source for quoting out of context.

The difficulty begins at once in Book I, Chapter 1 (pp. 75-89) when Clausewitz, after the philosophical fashion of his day, asks "What is war?" and begins his answer with an explanation of war's peculiar essence—violence. Here, grouped together in compelling proximity, we find such thoughts as: War is an act of violence to compel our enemy to do our will .... physical force is the means; to impose our will is the object .... in the purely abstract sense there can be no limit to the force that is applied to bring about this object; [cf. "War is an act of violence pushed to its utmost bounds."] . . . to introduce any principle of moderation into the theory of war itself would always lead to logical absurdity....

These opening thoughts have caused countless difficulty, *despite* the fact that they are for all practical purposes discarded on the fourth page of the opening chapter when Clausewitz reminds us that it is only in the field of abstract thought that the inquiring mind cannot rest until it reaches the extreme. "But move," he writes, "from the abstract to the real world, and the whole thing looks quite different." (p. 78) He then identifies a number of factors that remove war from the realm of pure speculation and make it more a calculation of probabilities, more like a game of cards. ("No other activity is so continuously or universally bound up with chance.") The art of war, he reminds us, has to do with living, moral forces; it therefore follows that it can nowhere approach the absolute.

The remaining 551 pages of *On War* represent the finest attempt yet made to spell out the meaning of conflict. (Unlike other seminal thinkers—Adam Smith for one example—Clausewitz has had no successors.) Much of it is hard reading, and in this respect Bernard Brodie's 71-page "Guide to the Reading of Clausewitz" (pp. 641-711) will be especially appreciated. Arranged sequentially following Clausewitz's divisions into books and chapters, these pages will help smooth over many of the rough spots. [Two other (far less sophisticated) guides are offered in the boxes on pages 90-91 of this article. While I have written earlier that Clausewitz defies condensation, "One Man's Version of Clausewitz in One Page" is said to have been of some help to students at both the Air Force Academy and the Naval War College and is offered despite the howls of protest it is likely to evoke from those familiar with the subject. Similarly, the selections recommended in the box on page 91 can be criticized, if not for what is included then certainly for what is left out. My intent, however, if not already all too evident, is to persuade the reader to an examination of the master's words;

experience with the difficulties inherent in doing so leads me to fly in the face of Bernard Brodie's stern dictum that "to slip in and out of a subject like Karl von Clausewitz is to betray an undue note of bravura."]

FOR THE reader who can find both the time and the mental energy requisite to the task, Clausewitz has much to offer. As a guide to introspection—whether for the young officer drafting an operations order or the beltway bandit bent on reassessing U.S. strategy in general—he has no equals. Especially is this so in an age (or service) in which many are led to the conclusion that weapons (and other technological tools) can be more potentially decisive than the motives for their employment. By motives I refer to assumptions, rationales, expected or hoped-for outcomes, and expectations relative to impact—calculations we too often arrive at almost in vacuo, as though the human elements of response or reaction can somehow be overcome, or overruled, by displays of technological virtuosity deftly applied. Murphy's Law, Clausewitz repeatedly warns us, awaits at every turning, and is particularly perverse when not anticipated. "Everything in war is simple," he writes, "but the simplest thing is difficult." This is no conundrum but rather a simple though inconvenient fact too frequently ignored in our allegedly sophisticated analyses.

The *complexity* of warfare situations is Clausewitz's persistent theme, and it is for this reason above all that he appears at first glance to have little to offer the practitioner in the line of fire. It is for this reason also that most precommissioning and professional military education programs have traditionally found little room in their curricula to consider his thoughts. Some would argue that this is as it should be. A line officer, after all, has more urgent things to do than rightly to understand the war in which he engages (rather than take it for something, or try to make of it something, which by its very nature it can never be). This is true all the way from the lieutenant platoon leader on the ground to the F-4 wing commander at, say, Udorn whose primary concern becomes taking out targets assigned to him (or, in less happy circumstances, maintaining a sortie rate superior to that of his "rival," the skipper of the *Kitty Hawk* off Yankee Station).

Similarly, the practitioner in the line of fire would be ill-advised to spend too much time pondering Clausewitz's dictum that there are many ways to the object in war and that, indeed, the defeat of the enemy forces in the field is not always necessary. The object of war, after all, is not *his* concern, let alone responsibility to determine. Does this mean, then, that only statesmen and senior generals should read Clausewitz?

The answer, in one man's opinion, must be a resounding no, for the simple reason that when a man attains to a position of high responsibility he will inevitably find that it is too late to play catch up ball, that the demands on his time will overpower any inclination he might have to refurbish his education in accord with newly assigned responsibilities. The British naval historian Captain S. W. Roskill put it this way:

> It is well known among scientists that a climax of accomplishment [getting that Wing, Division, Air Force, Joint Staff job—whatever] comes in life, for most of us between forty and fifty years of age, when education and experience combine to bring a person's gifts to the full fruition of which he or she is capable. The leader should therefore recognize the need to continue [on his own] his education right up to that point, so fitting himself for the time when, in a fighting

> service, he may be called on to shoulder the heavy and lonely responsibility of high command.[3]

The education of which Captain Roskill wrote includes more than keeping up with developments in one's particular field or specialty, important and time-consuming as that alone can be. In fact it is an education that leans heavily in the direction of what were once referred to as the humane studies—the study of man, and of particular men, and their struggles, some successful, some not, with problems involving other men and their beliefs, hopes, dreams, and expectations. *These* sorts of problems, after all, are the ones that engage the great majority of *any* commander's (statesman's, president's) time and energies. And if there is a list of books, or of authors, that one could compile—by way of filling the sort of mental knapsack that Roskill had in mind—then Clausewitz is among those who could be most profitably included.

The theory being expounded here encompasses, however, a far larger group than those who will rise to high command. It extends to all those who would serve—even as majors, lieutenant colonels, or colonels—at theater level or above, and particularly in Washington where we excuse so many of our failures by reference to the imperatives of bureaucratic politics, whether within a single service or among several. Lieutenant General Daniel O. Graham (USA, Ret.) has written of a "decline of strategic thought in the United States," the root cause of which he sees in the increasing domination of programs over purpose in the Pentagon, the domination of program managers over strategists.[4] As one example he cites the fierce competition among various individual hardware programs to the detriment of big-picture thinking. To be sure, selfish career (careerist?) concerns play a part in such things, and supervisors exert certain pressures that the jaded among us come to take for granted. And yet another reason for the problem may well be that many officers have not prepared themselves, in Roskill's sense, for so-called big-picture thinking—or "blue sky thinking" as Hap Arnold called it in his decidedly nonsectarian way. To the extent that this charge might be true, it will be argued, certainly a book written a century and a half ago is not the place to look for help. The two best rejoinders I know to that argument are Brodie's introductory essay (pp. 45-58) and an article ("Clausewitz in the Nuclear Age," *Journal of the Royal United Services Institute for Defence Studies* [London], September 1977, pp. 81-82) by Group Captain R. A. Mason, Director of Defence Studies for the Royal Air Force.

Brodie, whose influence on nuclear strategic thought in this country has been as great as anyone's, firmly believes that Clausewitz is as "pertinent to our times as most of the literature specifically written about nuclear war." Why? In the first instance because Clausewitz strove always to get to the fundamentals of each issue he examined, beginning with the fundamental nature of war itself. This is important, says Brodie, because "war, as Clausewitz asserts in one place, *is different from anything else*. Thus, however much it may change within itself from one era to another, its essential character remains distinct from every other pursuit of man," a circumstance not always apparent to those whose skills lie in "systems analysis and related esoteric disciplines" (or, as Mason puts it, to those who sometimes seem to believe that "in the beginning was The Bomb"). Brodie's second major reason may be more simply stated (and may be safely accepted on faith alone): "Clausewitz is virtually alone in his accomplishment. His is not simply the greatest but the only truly great book on war."

One man's version of Clausewitz in One Page

War is a logical, sequential, measurable thing *only* if we consider it in the abstract. Think, now: use only your mind and forget any particular incidents. In this way you conceive of war as a duel between two combatants. Obviously, if one of the two is to win, he must overcome the other—and certainly the surest way to do this is absolutely to crush (kill) the other. Thus war, considered in its *essence*, logically requires violence pushed to its utmost bounds. To introduce any thought of moderation is surely to endanger the aim—which is to *win*. OK, that said, so much for war in the abstract or "war on paper."

Now let us turn our minds back to reality, to the world around us, to particular places and people and incidents. Now we quickly perceive that war in fact never has nor never can approach the picture we had *in our minds*. At the simplest level, too many people are involved for us ever to have all of them all at the same time absolutely directed toward the same thing. In addition to people there are such other things as shortages of weapons, fear, difficulties of terrain, faulty information (Intelligence), vagaries of weather, changes in goals dictated by the government. All these limiting or modifying factors—things that make real war different from war on paper—I group under the heading Friction in War. This Friction, in one form or other and in always varying degrees, is always present.

How can that Friction be overcome? Probably in two ways only: First, by the habituation of the army to war; and second, by the application of those traits exercised by commanders that I group under the heading Genius in War. These traits are courage, superior intellectual ability,* *coup d'oeil*, resolution, great force of will, staunchness. It is the harmonious combination of these qualities that alone will allow a commander to overcome the four components in which war moves, *danger, physical effort, uncertainty,* and *chance*.

Having begun thus, I devoted the rest of my book to analyses of more particular and less general aspects of war. There are chapters on strategy, the effects of battle (*never* absolute, but *always* important), the elements to consider when weighing a decision for or against battle, fortresses and so forth. Throughout I was careful to stress that warfare must never be looked upon as a thing in itself, but rather as one possible result of political decisions and political goals, and that its conduct must *always* be governed by *political* calculations. War indeed, I tried to point out, does have its own grammar (and this I sought to define as best I could)—*but* it does *not* have its own logic.

In the end, what did I accomplish? Certainly less than I had hoped—if I am to judge by the degree to which my warnings have gone unheeded, *especially* the one adjuring both statesmen and generals that the first, the grandest, the most decisive act of judgment required of them is rightly to understand the particular war in which they engage, not to take it for something, or try to make of it something, which by its very nature it can never be. And perhaps in some cases not what I intended. By stressing the roles of uncertainty and chance I irritated those like Baron Jomini who were concerned to show the measurable aspects of war. And by beginning my book with a discussion of abstract war I thoroughly misled those among us who often fail to read beyond the first chapter. On the other hand, by stressing the interrelationship between war and politics, I think I can lay claim to having introduced the systematic study of civil-military relations; by stressing the important role of battle in warfare, I reminded generals that *decisive* results were not to be found in manoeuvre alone or in parade ground deployments—and yet note that at the same time I did not *hurry* them into battle, but warned them of its dangers and argued forcefully that a defensive battle, carefully arranged and well-conducted, could in itself produce decisive results. But above all note this—that I treated my subject in such a way that mere technological advances would not obviate the value of my reflections. Like Thucydides, I looked upon my work as being "a product for all time."

*"If we ask what kind of intellect is most closely associated with military genius, then a glance at the subject as well as experience will tell us that searching. . . . comprehensive minds (rather than such as pursue one special line); cool, rather than fiery, heads are those to which in time of war we should prefer to trust the welfare of our brothers and children, the honor and safety of our country."

The Key Pages

Book I, Chapters 1-8 pages 75-123	The nature of war, both in the abstract and as modified in practice; the elements of military genius; roles of danger, physical effort, information (Intelligence), and "friction."
Book II, Chapters 1-6 pages 127-74	Having shown how, in practice, things are likely to be different from the abstract picture of them, Clausewitz returns once again to theory to see what lessons it might offer for improving practice.
Book III, Chapters 1-18 pages 177-222	The elements of strategy (moral, physical, mathematical, geographical, statistical) that affect battle. Chs. 3-7 (pp. 184-93) are crucial to illustrating that the element we call morale is almost everywhere and always decisive.
Book IV, Chapters 7-9 pages 240-52	Decision in battle, stressing the psychological effect of the commander's moral stamina.
Book VI, Chapter 1 pages 357-59	Relative advantages of attack and defense.
Book VI, Chapter 23 pages 456-59	Scathing attack on theorists who entrap themselves in concepts and labels at the expense of reality.
Book VI, Chapter 26 pages 479-83	"The People in Arms," based on the resistance in Spain, 1808-1814; for us, this is Clausewitz's 'Vietnam chapter.'
Book VII, Chapter 22 pages 566-73	The culminating point of victory; further thoughts on means vs. ends and on the importance of knowing when to stop.
Book VIII, Chapters 1-9 pages 577-637	On war plans, limited and unlimited war, and the primacy in all of the political (or policy) object.

Group Captain Mason is more pointedly pragmatic. One who doubts the relevance of Clausewitz's major concepts in an age of thermonuclear confrontation should turn first to Sokolovsky *(Military Strategy: Soviet Doctrine and Concepts,* p. 18) who, after referring to the views of Western strategists that "atomic war has lost its meaning as a tool of politics," writes:

> It is quite evident that such views are the consequence of a metaphysical and anti-scientific approach to a social phenomenon such as war, and are a result of idealization of the new weapons. It is well known that the essence of wars as a continuation of politics does not change with changing technology and armaments.

With this warning in front of him, and a reflective reading of Clausewitz behind him, Group Captain Mason argues, the modern strategist might then profitably ponder certain crucially important questions relating to a war in Central Europe. Among the questions suggested by Mason are the following: What is the Warsaw Pact's "center of gravity"—is it the Soviet armies, the Soviet government, or the Soviet heartland? When senior officials undertake either to initiate or evaluate a peacetime exercise, do they take fully into account the likely effects of "friction"? What are the alliance implications of fighting tactical nuclear warfare on friendly territory? Could NATO forces ever afford to wait for the advantages accruing from "a culminating point"? Is Western strategy in fact based on a "correct appraisal of how much of our resources must be mobilized for war" and an accurate assessment of "the character and abilities of our own government"? Are we in fact recognizing war as it is likely to be, or war as we would like to have it?

The essence of these arguments is that "the nuclear input to war" (as a sublimely confident U.S. Air Force Academy cadet once casually phrased it) has not rendered irrelevant all prior experience with war. And certainly our *actual* experience with war since August 1945 clinches the argument. In Michael Howard's words, the armed forces of the Western powers

> have certainly been trained in an autonomous professionalism which excludes popular passions (these get knocked out of conscripts on the barrack square) and which until the Second World War took little account, save at the very top, of political control. But in the nuclear age, and indeed the age of popular insurrection, the element of political control has been as dominant in Western armies as anywhere else. They may not have political commissars attached to them, but none the less American forces in Vietnam, British forces in Northern Ireland and NATO forces in Western Europe have hardly been able to move a unit without the hot breath of their political masters breathing down their necks. We are all Clausewitzians now.[5]

FINALLY, on the off chance that these remarks have convinced a reader or two that they want to know more about Karl von Clausewitz, let me suggest that the best single source to which they should refer is Peter Paret's *Clausewitz and the State.* This is a biography and then some, treating as it does both the man and his times. Readers unfamiliar with the course of European thought in the late eighteenth and early nineteenth centuries may find the going difficult now and then, but not if they keep their eyes to the mark—to Clausewitz himself and the development of his thought over the period from 1805 to his death. In this respect, the section on "studies in policy and theory," (pp. 147-68) will be especially helpful.

Some aspects of Clausewitz's personal life may come as a surprise—in particular the high circles in which, even as a young man, Clausewitz moved. And those whose mental image of the man conjures up a pure scholar, only tangentially in uniform,

will find Paret's account of the battle of Grossgörschen (1813) enlightening. There, Clausewitz, along with the other senior Prussian generals and their staffs,

> . . . having no share in the overall conduct of the action, could do little else than encourage the troops by fighting in the first rank. He himself was unharmed, although at one point he found himself in the middle of a French battalion, warding off "a small Frenchman with a bayonet." But Blücher suffered a contusion, Grolman was slashed by a bayonet, while Scharnhorst had one horse killed under him and a second wounded, bullets pierced his hat and coat, and in the early evening his leg was struck below the knee [a wound that became infected and led to his tragically early death the following month]. (p. 239)

THE APPEARANCE of this new translation of *On War*, together with both Paret's biography and another important new study by Raymond Aron in France,[6] may well mark the beginnings of a renaissance of Clausewitzian studies. If any reader still thinks such a situation inexplicable in view of how removed in time we are from Clausewitz's day, he would do well to call to mind that those involved in the effort to produce this new opportunity include Michael Howard, Bernard Brodie, and Raymond Aron, three of the most influential scholars in the entire field of national security studies since World War II. There is no way they can be wrong in unison.

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Notes

1. For a discussion of translations into various languages, see Peter Paret, "Clausewitz: A Bibliographical Survey," *World Politics*, January 1965, pp. 272-85; and *Clausewitz and the State*, pp. 441-59.

2. For some examples see, by Peter Paret: (1) the article cited in note 1; (2) "Education, Politics and War in the Life of Clausewitz," *Journal of the History of Ideas*, XXIX (1968), pp. 394-408; (3) "Clausewitz and the Nineteenth Century," in Michael Howard, editor, *The Theory and Practice of War* (London: Cassell, 1966), pp. 23-41. Bernard Brodie: (1) "On Clausewitz: A Passion for War," *World Politics*, January 1973, pp. 288-307; (2) *Strategy in the Missile Age* (Princeton: Princeton University Press, 1965), pp. 22-23, 27-29, 33-38, 43-45, 66-69; (3) *War and Politics* (New York: Macmillan, 1973), pp. 1-11, 440-53. Michael Howard: "The Military Philosopher," *The* (London) *Times Literary Supplement*, 25 June 1976, pp. 754-55.

3. S. W. Roskill, *The Art of Leadership* (London: Collins, 1964), p. 29.

4. "The Decline of US Strategic Thought," *Air Force Magazine*, August 1977, pp. 24-29.

5. *Times Literary Supplement*, 25 June 1976, p. 755.

6. Raymond Aron, *Penser la guerre, Clausewitz*, 2 vols. (Paris: Gallimard, 1976).

WORLD PEACE AND THE SOVIET MILITARY THREAT

Captain Steven E. Cady

FEW THINGS in this world are as certain as change, and certainly our world has changed irreversibly since World War II. Yet, as the Frenchman said: *Plus ça change, plus c'est la même chose* ("The more things change the more they are the same.").

World peace, for example, continues to depend on American supremacy, and that supremacy is a function of the development and deployment of highly advanced weapon systems. A possibly moot point, in this connection, is the nature of the Soviet threat to world peace. What are the intentions of the Soviet Union? Has our assessment of its intentions and capabilities been realistic? If the Soviets, as a result of their intentions and massive arms buildup, pose an active threat to the United States, will our present stockpile of nuclear bombs and "conventional" missiles be sufficient deterrent to Soviet power? Are the current SALT talks leading to a weakening of American military power relative to the Soviet Union, and, if so, will such a weakening act as a stimulus to Soviet aggression?

These and related issues are discussed in three recent books about the Soviet Union. For a realistic insight into the nature of Soviet thinking, Marshal A. A. Grechko's *The Armed Forces of the Soviet State: A Soviet View* provides a detailed picture of the worldwide goals and ambitions of the Soviet Union in relation to its military and political policies. William T. Lee, a U.S. specialist in Soviet military and economic affairs, published two similar publications in 1977: *Understanding the Soviet Military Threat: How CIA Estimates Went Astray* and *The Estimation of Soviet Defense Expenditures, 1955-75: An Unconventional Approach.*

Soviet Intentions

The true intentions of a nation can be assessed in terms of its stated intentions and its overt activity. Grechko's work, which was written when he was Minister of Defense of the U.S.S.R., serves as a major source for stated Soviet intentions. Marshal Andrei Antonovich Grechko joined the Red Army in 1919, took part in subsequent civil war campaigns, and became a member of the Communist Party in 1928. After graduating from the Frunze Military Academy in 1936, he entered the General Staff Academy, graduating in 1941, just as Hitler attacked the Soviet Union. When hostilities ended, he was General-Colonel (three stars) and commander of the 1st Guards Army. By 1955 Grechko was General of the Army, soon becoming Marshal of the Soviet Union (1955). He later became Minister of Defense, Commander-in-Chief of the Soviet Ground Forces, First Deputy Minister of Defense, Commander in Chief of the Joint Armed Forces of the Warsaw Pact nations, Minister of Defense, and finally a member of the Politburo of the Central Committee of the CPSU. Grechko died on 27 April 1976, but his statemen

†**Marshal A. A. Grechko, *The Armed Forces of the Soviet State: A Soviet View*, translated under the auspices of the United States Air Force (Washington, D.C.: U.S. Government Printing Office, 1975, $3.20), 349 pages.**

can still be considered as fully representative of Soviet thought.

Grechko viewed all mankind as moving inevitably toward socialism and communism. He felt that only a socialist system, such as that of the U.S.S.R. could have an army with a just goal: the defense of "the revolutionary achievements of the working people." (p. 2) He regarded the Soviet armed forces as possessed of a "great liberating mission." According to Grechko, the army fulfills an "international duty," and the goals of the Soviet army are also adopted by the armies of other socialist states, all of them assisting the peoples of nonsocialist nations in "fighting for their social and national liberation." Countries such as the United States are pictured as controlled by "reactionary imperialists" who have "not given up their aggressive schemes." Various nations are accused of hindering the policy of peaceful coexistence by differing social systems. This is a curious assertion in view of Grechko's unqualified condemnation of all systems that differ from that of the Soviet Union. The capitalist nations are charged with disseminating lies, slandering socialist countries, and unleashing anti-Soviet hysteria at any cost while continuing the arms race. Grechko concludes that the U.S.S.R. must, therefore, strengthen the combat power of the Soviet armed forces, supplying them with "modern weapons, combat equipment and other supplies." His sequence of chapters documents this viewpoint.

IT IS HARDLY surprising, then, that William Lee, in *Understanding the Soviet Military Threat*,† depicts the Soviet Union as pursuing a policy of political expansion based on military forces that are developing more rapidly than those of the United States. As its title implies, Lee (formerly with the CIA) finds fault with certain CIA estimates of Soviet military power. The U.S. formerly relied on these estimates in reacting to the Soviet military threat. In the Foreword, Eugene V. Rostow points out that Soviet spokesmen frequently talk of a projected military expansion program designed to achieve complete superiority in every category. On that basis, the Soviets feel that they will "determine the direction of world political development." (p. 2)

Rostow emphasizes that the American intelligence community has resisted accepting these facts. Its conception of the Soviet Union is interpreted by Rostow as a government seeking parity with the United States rather than dominance. Thus, the U.S.S.R. is seen as a developed nation interested in maintaining the status quo, and the usual strategic and conventional weapons, sufficient to deter Soviet expansionism, are adequate for U.S. defense.

Defense Expenditures

Lee cites Soviet defense expenditures that have grown steadily since 1958, with 14 or 15 percent of the Soviet gross national product allocated to defense. The Five-Year Plan for 1976-80 continues the trend, with perhaps 18 percent of the 1980 budget allocated for defense. Included are an increasing number of weapon systems—much more accurate MIRVed ICBMs/SLBMs, for instance—able to

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†William T. Lee, *Understanding the Soviet Military Threat: How CIA Estimates Went Astray* (New York: National Strategy Information Center, Inc., 1977, $2.00), 73 pages.

reach U.S. targets from Soviet coastal waters, as are new aircraft with larger payloads and greater potential for penetrating hostile airspace. These capacities, Lee feels, are consistent with the "well-documented Soviet objective of achieving superiority over the United States and its allies in military power." The Soviets have achieved, or will soon achieve, numerical parity or superiority in almost all important types of weapon systems, Lee asserts. Although they may still be lagging qualitatively in weapon technology, their intention of becoming both quantitatively and qualitatively superior in all weapon systems is potent.

Lee believes that the continuing power buildup can be accounted for partly by its political utility: the Soviet Union holds that peaceful coexistence, or détente, exists largely because of its superior (or supposedly superior) military power. Increasing Soviet military budget outlays through 1980 indicate an expectation of further political gains resulting from military power.

Lee contends that the current trends in Soviet priorities are made possible with the help of the Western nations—technological and otherwise.

CIA Estimates

William T. Lee's *The Estimation of Soviet Defense Expenditures, 1955-75: An Unconventional Approach*† was published in collaboration with the General Electric Tempo Center for Advanced Studies, which solicited the cooperation of Soviet analysts and economists in its preparation. The author describes the uncertainties and data gaps existing in the CIA's direct-costing approach to estimating U.S.S.R. defense expenditures. Because of various hidden expenditures suited to the political "cosmetics" practiced by Soviet leaders, the CIA adopted the direct-costing method, which estimates the amounts in each military program, then applies estimated individual prices to each quantity. Only recently has the CIA admitted that it underestimated the Soviet defense budget by a factor of two in 1970 and possibly by a factor of three at present. Lee analyzes this error in an in-depth review of various methodologies used to estimate U.S.S.R. national security expenditures (NSE), providing an alternative way of estimating NSE "based entirely on published Soviet industrial output, budgetary, and national income data, while accepting the limited coverage of the 'Defense' and 'Science' budgets." *(The Estimation*, p. 2) The author lists the advantages of this approach: it is derived directly from Soviet data, in rubles; it is not subject to the index number effect of applying U.S. prices to Soviet weapons and technology; it does not depend on estimated ruble-dollar ratios; it reveals resource allocations in each Soviet annual and Five-Year Plan; it is an alternative to the direct-costing method and provides an aggregative check on the results of that approach; and it provides an approximate picture of U.S.S.R. NSE as Soviet leaders see it. While admittedly not perfect, Lee offers his approach as one resulting in a better estimate of the Soviet NSE.

As to why the CIA estimates went so wrong, Lee lists a number of reasons in *Understanding the Soviet Military Threat.* The first was its emotional rather than analytical response to the initial overreaction to the intelligence communi-

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†William T. Lee, *The Estimation of Soviet Defense Expenditures, 1955-75: An Unconventional Approach* (New York: Praeger, 1977, $25.00), 358 pages.

ty's early overestimation of Soviet heavy bomber production and Soviet ICBM deployment. Some consequences were U.S. expansion of heavy bomber production and ICBM/SLBM forces far beyond what the U.S. might otherwise have considered necessary. A second reason was the fear of strengthening bureaucratic Soviet military forces and nuclear overkill on both sides.

Lee points to the Cuban missile crisis as proving that the U.S. advantage in bombers and missiles was effective in curbing Khrushchev's adventurism, without risk of war. Lee maintains that, in response to the bomber and missile "gaps" of one kind or another existing between Soviet and U.S. forces, "The prevalent reaction was some apparent institutional guilt for having contributed to a perceived overreaction by the United States, plus a widespread belief that the Soviets had opted out of the intercontinental missile competition, and a determination not to overestimate again." *(Understanding,* p. 29)

The Soviet Union envisioned the threat to itself as being through Europe, so that Eurasian strategic requirements came first in its priorities. The United States, according to Lee, expected the Soviets to manufacture several hundred heavy bombers and first-generation ICBMs in the 1950s. Instead, the Soviets manufactured several thousand medium bombers and 700 IRBMs. When the U.S. produced 41 strategic missile submarines, the Russians constructed some 57 (41 of them nuclear-powered), but many of these carried cruise missiles designed for operations against naval targets. "We simply did not understand Soviet strategic concepts; hence we misjudged Soviet priorities." (Ibid., p. 30) Lee concludes that Soviet political leaders want a great deal more than minimum deterrence and that they have made no secret of their aspirations.

Lee mentions another error in American strategic thought—the so-called "mirror imaging" based on the implicit or explicit assumption that Soviet aims are similar to ours, that they react as we do to common problems and experiences. American strategists equate "strategic" and "intercontinental," whereas the Russians interpret strategic considerations to encompass their very borders. Lee feels that the threat of civilian and city destruction is no deterrent in Soviet thinking; they think in terms of the destruction of military, industrial, and administrative targets rather than worrying about how much of the population will die. "All the indicators suggest that the Soviets will not accept assured destruction in the future unless there are stark changes in the political leadership." (Ibid., p. 32)

What many observers in the U.S. do not understand is that the Soviets have their own brand of propaganda, difficult for Westerners to comprehend. "Actually, it is probably more ritual than rhetoric as we now use the latter term. Such ritual does not really involve factual or intellectual credibility; it is required dogma in the Soviet system." (Ibid., p. 34) One must look beyond the ritual to find the real message, making distinctions between Soviet doctrine, strategy, and "operational art." Failure to do this has caused some American analysts to dismiss genuinely informative statements by Soviet leaders as pure rhetoric—statements that are factual and which are taken seriously.

Proposals for the Future

In view of CIA and other underestimates of Soviet military strength, Lee makes a number of proposals for improving intelligence studies and estimates. First among them is giving credence to the obvious: exploiting unclassified information. Not only should the statements of the regime's

spokesmen to their people be taken at face value but also greater use can be made of the large quantity of unclassified information leaking out of Russia. Despite the great secrecy surrounding military matters, the Soviets have been willing to discuss their objectives and various of their programs. "The time of these programs, the choice of system designs, and the integration of the new weapons into the forces, all suggest a well-conceived plan guided by doctrine, strategy, and lessons drawn from the Vietnam and Middle East wars." (Ibid., p. 39)

Lee also suggests that efforts be made to simulate the effectiveness of Soviet weapons and forces and that a more realistic historical perspective be adopted. Knowledge of past trends can help us understand how new trends in Soviet planning reflect Russian objectives and requirements. Ranging from the opportunistic tactics of Russian revolutionaries in the nineteenth and early twentieth centuries to Grechko's updated statement of policy, every added bit of historical evidence helps American analysts acquire a realistic view of Soviet thought and ambition. The evidence suggests strongly that the U.S.S.R. understands and respects power. Negotiations are not likely to succeed unless U.S. representatives can speak from a position of unquestioned power, especially military power.

The U.S. has engaged in disarmament or arms limitation conferences with the Soviets for decades, and may continue doing so at the cost of tempering military preparedness in deference to the seemingly interminable but hopefully fruitful negotiations. In the meantime, the United States has been weakened militarily in relation to the Soviet Union. In view of William Lee's analysis of the situation, realistic thinking suggests that American negotiators are not likely to impress the Soviet planners except from a position of military strength. Where social, political, and economic vacuums have existed, the Russians have usually moved in to fill them. A major reason for their retreat in the Cuban affair was their unwillingness to test American military might at that time.

One consequence of such realism is a military program costing many billions of dollars. Such a cost may very well be the price Americans must pay for the survival of their institutions. Skimping on programs on which our survival depends could amount to committing national suicide.

However, an adequate defense program need not increase the overall United States defense budget alarmingly. At the present time, more than 60 percent of our defense budget goes for financing personnel costs. Cutting manpower is not inconsistent with maintaining a defense posture. A manpower reduction would leave us with sufficient conventional forces, permit greater recruitment selectivity, and release the funds needed to finance the exotic new weapons required to counter the Soviet threat.

In any case, a crisis in decision-making now exists. One realistic alternative is to develop, manufacture, and deploy weapon systems on a scale the magnitude of which will impress the Soviet Union. If this alternative is pursued, the stagnating arms limitation talks will become more meaningful and likely to produce results much sooner.

Loring AFB, Maine

POTPOURRI

rpower in Three Wars by General William W. Momyer, USAF (Ret). Washington, D.C.: U.S. Government Printing Office, 1978, 358 pages, $4.50.

What I offer in this book, as fairly and as clearly as I can, is an account of the way airpower looked to me from the perspectives I think will matter most to airmen. I don't record these views in the hope that airmen, even my friends, will approve them. In fact I hope that all of our airmen who examine them will do so critically. We mustn't rely entirely upon yesterday's ideas to fight tomorrow's wars, after all, but I hope our airmen won't pay the price in combat again for what some of us have already purchased.

With these words General Momyer sets out to cord his perceptions of the employment of air ›wer in World War II, Korea, and Vietnam, ıd our collective body of professional knowl-lge is richer for his efforts. Few airmen have ıd the opportunity to see air power employed om the vantage point of the young fighter lot, the air component commander, and the any and various positions in between. eneral Momyer has had that opportunity, but ıe lion's share of the book is devoted to his :rception on the employment of air power in ietnam, especially during the period when he as the Commander of Seventh Air Force (July 966-August 1968). His reflections on World 'ar II and Korea are included primarily to ıarpen the focus on Vietnam experiences and ›ntrast and compare major concepts of nployment.

Airpower in Three Wars is not written as a 'pical memoir but more in the style of a istorical document, even if slightly biased by ıe author's personal involvement in the events ıat took place. However, these biases are :cognized by the author, and he makes a onscious effort to remain objective. For ıstance, he advises the reader to see a lepartment of the Army study for a different valuation of helicopter operations during the ietnamese incursion into Cambodia (Lam on 719).

In his documentation, General Momyer overs subjects ranging from the decision-aking process at the highest levels to the tactics employed by a four-ship flight ingressing to the target. He handles this divergent level of authority by organizing the book into five general subject areas: strategy, command and control, counter air operations, interdiction, and close air support.

In these pages he records many of the lessons learned by airmen in combat as well as his assessment as to why we operated the way we did in Vietnam. Also revealed are many of the interservice and political controversies that affected our conduct of the air war in Vietnam. All this is done in a professional manner with the author pointing out where his personal judgments differed from the decisions of the day.

While some of the material covered can be found in other sources, there is much to be gleaned from this book, and, hopefully, its contents will do more than just warm the hearts of those who flew the missions described in the chronicle. General Momyer sums it up by stating:

> In short, airpower can win battles, or it can win wars. All commanders since Pyrrhus have been tempted at one time or another to confuse the two, but few distinctions in war are more important. The future airman's right to insist that such distinctions be made is, I believe, one of the things our airmen purchased so dearly in Vietnam.

The book is a must as a primary source document in any library fully covering the Vietnam conflict and concomitant growth of employment doctrine of our tactical air forces. All serious students of command relationships and all officers needing a review of air power in three wars will benefit from General Momyer's work.

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Public Constraint and American Policy in Vietnam by Bruce Andrews. Beverly Hills, California: Sage Publications, 1976, 64 pages, $3.00.

Professor Bruce Andrews surveyed American public opinion during the first part of the Vietnam War. He used several public opinion polls to examine early opposition on Vietnam. He insists that this opposition was apparent, but the policy-makers either did not or refused to recognize it.

Andrews lays the blame for the weakness of action in Vietnam directly on the policy-makers. He dispels the myth that public opinion forced the intervention in Vietnam and argues that public opinion was extremely hard to ascertain. Because of this, decision-makers used only evidence that supported their own preferred policies.

These leaders believed that disengagement in Vietnam would incite a right-wing backlash from the disgruntled hawks, who would force everyone out of office. President Kennedy, especially, feared a conservative reaction. Thus, it was much easier to go along with the hawks rather than alienate them further.

Andrews also tells us that "elections tend to be poor gauges of policy preferences and equally poor mandates." He maintains that there are too many variables that affect elections, and, hence, the results can certainly not be used as true indicators for foreign policy decisions. He states that President Johnson felt the election of 1964 was a clear mandate from the people to continue his policies. Through the use of various polls, Andrews shows that this was not the case and that support was clearly lacking. Johnson chose to ignore this and continued to escalate the effort in Vietnam.

For those who enjoy clear writing, this book is not recommended. However, it has several good ideas that shed more light on a very troubled time.

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The Arabs in Israel by Sabri Jiryis. New York: Monthly Review Press, 1976, $12.50.

The Arabs in Israel is a sobering, dispassionate book. Written by Sabri Jiryis, an Israeli Arab, and prefaced by Noam Chomsky, the well-known linguist and anti-Zionist, the book questions the cherished Zionist belief that the "redemption" of Palestine has led to an improvement of the status of Arabs in Israel.

Jiryis's thesis supports the opposing point of view. The author contends that redemption is a myth. Zionism, it is true, introduced into Palestine intensive agricultural and technological capital and, over a period of time, raised the productive level of farming in the country. However, the Zionists did not find the wasteland they would have us believe was there and, moreover, they did not cause the deserts to bloom again. What the Zionists did find was a well-established, traditional Arab peasantry who were systematically dispossessed and alienated from their land by a series of land tenure laws, the object of which was to make available large tracts for the exclusive use of Jewish cooperative settlements. To the author, redemption is synonymous with conquest, expropriation, and colonization.

To prove his point, Jiryis demonstrates how the military government of Arab areas, under which the minority Arab population suffered until the middle sixties, cooperated with the civil authorities to close off the land to its Arab owners in preparation for Jewish colonization. The military used Article 125 of the Defense Regulation Code, a version of the original British mandatory statutes governing terrorism, to evict or forbid Arabs to return to their farms or villages because they were deemed a security risk. He further states that even in the event that the harsher provisions of the regulations could occasionally be mitigated by legal appeal, the Israeli Army did not hesitate to seize land outright with no apparent justification.

These are not the only travesties of human rights the author reveals in his book. He devotes particular attention to the sociopolitical position of Arabs in Israeli society. The questions he raises about the quality of education and social services provided the Arab minority can be answered, he claims, by understanding the way in which Arabs are politically represented within the state. Jiryis notes that from the beginning the Zionist political parties, with the exception of the Communist party, have co-opted their token Arabs into the establishment in order to delay the development of a purely Arab party with nationalist, and by extension, anti-Zionist proclivities. These Arabs were chosen to stand for parliamentary elections for their family connections and were rewarded with patronage to distribute in the Arab villages and towns. The author contends that these maneuvers fit perfectly with the traditional Arab political mentality and were, therefore, a convenient substitute for the articulation of Arab demands on the level of mass participatory politics.

In his discussion of these points, the author is scrupulously fair to the Israelis and documents efforts to change the system by conscientious Zionists from both the left and right wings of the political spectrum. To those whose political or emotional convictions do not allow them to

accept the author's thesis, it must be added that his sources are all drawn from official Israeli papers. This book has the ring of integrity. For the individual concerned with an appreciation of the other side of the story, Sabri Jiryis's book should be mandatory reading.

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The Battle for North Africa, 1940-43 by W. G. F. Jackson. New York: Mason/Charter, 1976, 402 pages, $15.00.

In his book, *The Battle for North Africa,* Sir William G. F. Jackson, of the British Army, provides a lucid and informative account of the entire North African campaign from both the political and military views. Four major themes prevail throughout his book. The first theme is that in the early days of the campaign the British and their Commonwealth allies were *too* successful against the Italians! This early success caused concern in both Rome and Berlin and resulted in the Germans' being drawn into the campaign to bolster their sagging Italian allies. Had the British carried on at a slower pace, Hitler may have well been too far involved in his other operations to spare any troops for the African campaign, thus enabling the British to achieve victory at a much lower cost instead of facing the German-Africa Corps. Second, neither the Germans nor the British were to be absolute masters of the desert. Both adversaries were to learn their lessons in the proverbial school of "hard knocks," and this included both the famed "Desert Fox" and Montgomery. The role of "Generalissimo" Churchill provides yet another theme. In this case, the author points out both the negative and positive aspects of Churchill's leadership (depending on how one views it) in attempting to find a commander who had charisma and who would also pursue a quick victory in North Africa. As Churchill once said, "I like to make things happen." This personal involvement would create havoc with the British command structure. Finally, not to overlook the American contribution, Jackson cites the crucial importance of early American arms shipments, which helped the British withstand Axis forces. While General Stuart's and General Grant's tanks were not ideally suited for desert warfare, they did provide an important contribution. Conversely, Jackson's appraisal of American forces is less flattering, especially taken in light of our early misfortunes. However, Jackson's criticism is well-balanced, and it should not result in *too* many cries of outrage.

All in all, this is an excellent book. Ample maps and illustrations are provided, which should enable even the novice to visualize major battles such as Tobruk, Kasserine Pass, and Gazala. If any criticism can be mounted, it would be that the author attempts to cover too much in 400 pages. In this regard some specialists (e.g., American air power buffs) may be less than satisfied. However, the book will satisfy most and will certainly provide an excellent introduction for anyone interested in studying the North African campaign.

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The Art and Science of Psychological Operations: Case Studies of Military Applications, two volumes, edited by Ronald De McLaurin et al. Washington, D.C.: Department of the Army (Pamphlet 525-7), 1976, 1167 pages.

A team from the American Institute for Research has produced in these two volumes a valuable compendium relating to psychological warfare. Almost two hundred articles, reports, and papers relating to aspects of psywar are skillfully grouped, edited, and presented. The two volumes supplement and update Morris Janowitz and William Daugherty's *A Psychological Warfare Casebook* (1956).

No short review can begin to portray the richness of the material presented. In presenting this mode of warfare, the articles combine insights of mass communications, anthropology, psychology, political science, history, and military affairs and discuss specific mission applications on all continents. The casebook balances theory and application, and it should give commanders a feel for what psychological operations can contribute to our military and diplomatic efforts.

The volumes reflect a certain malaise, however. A theme mentioned in passing by many of the writers is the reluctance of the United States to develop the psywar instrument of policy or to give meaningful priorities to such "cloud nine" stuff. Robert Delaney of

the Naval War College places this reluctance in perspective in the opening essay of the casebook, which discusses America's "innocence," idealism, and technological orientation. These all inhibit a hardheaded evaluation of the potential of psychological operations and the development of a doctrine for their use.

It is undeniable that the unique American character influences how we prepare for and fight our wars. Officers who seek to understand the manner in which this occurs—so that they might better anticipate the problems the nation will have in future conflicts—would do well to study these volumes and consider what the oft-ignored psywar experience portends for the nation.

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Betrayal in Vietnam by Louis A. Fanning. New Rochelle, New York: Arlington House, 1976, 256 pages, $8.95.

Following the First World War, a significant portion of the German officer corps felt that victory had been nearly at hand when their government betrayed them with the surrender of November 1918. This "stab-in-the-back" theory obsessed officers like General Erich Ludendorff who became the Nazi candidate for president in the elections of 1925. Adolf Hitler used the betrayal theme to turn much of the officer corps against the fledgling Weimar Republic, thus sealing the fate of German democracy.

Louis A. Fanning's book *Betrayal in Vietnam* offers a similar theme. Fanning writes, "The major thesis of this study is that it was not the Hanoi Communists who won the war, but rather the American Congress that lost it." There is danger in the appeal of this betrayal theory, for if the American military leadership accepts it, then they will never feel compelled to identify the mistakes made by themselves and their civilian superiors that led to the debacle in Vietnam.

In Fanning's view, the Democratic Party, along with a few liberal Republicans, "cast the South Vietnamese people into Communist slavery." He condemns liberals like Senators George McGovern and Eugene McCarthy for their antiwar campaigns while claiming that the opposition of actress Jane Fonda was prompted by a love of communism and hatred for America. Fanning fails to consider that these individuals might have been motivated by a sincere belief that our course in Southeast Asia was morally and politically wrong.

The author accuses liberals of using "stale, tired arguments" to support positions running from the naive to the treasonous. However, he should realize that among the most trite and threadbare of arguments are the single-factor conspiracy theories such as his own thesis in this book.

Fanning gives scant attention to the myriad of social, political, geographical, and military factors that contributed to the demise of the Republic of Vietnam. He did not ask why the American military, during a decade of fighting in the south and bombing in the north which consumed over $100 billion and 50,000 American lives, failed to prepare the South Vietnamese to protect themselves against subversion and aggression. Fanning gives no credit to the impressive military performance of the North Vietnamese Army or to the unshakable tenacity of the enemy's political leadership. Furthermore, he does not analyze the important role of the jungle-covered mountains bordering South Vietnam to the west, which the Communists used to hide their forces and supply routes. Instead of examining these important factors, he labels the United States Congress as the sole executioner of South Vietnam.

As a polemic, Fanning's book is no better than the tirades of the Left that condemned American efforts to stop Communist aggression and indicted the U.S. military for perpetrating war crimes against the Indochinese. The simple solutions provided in *Betrayal in Vietnam* do not satisfactorily answer the questions that must be asked. What the American public deserves and its military establishment needs are objective histories and level-headed analyses of the American experience in Southeast Asia that slice through the mythological mist to provide a better understanding of what went on—and where we went wrong—in Indochina.

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AWARD

The Air University Review Awards Committee has selected "Increased Air-to-Air Specialization Training: An Alternative" by Major Donald J. Alberts, USAF, and Captain Leroy Mock, USAF, as the outstanding article in the November-December 1978 issue of the *Review*.

attention

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