AIR UNIVERSITY review

JULY–AUGUST 1973

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review

THE PROFESSIONAL JOURNAL OF THE UNITED STATES AIR FORCE

Address manuscripts to Editor, Air University Review Division, Bldg. 1211, Maxwell AFB, AL 36112. Printed by Government Printing Office. Address subscriptions to Superintendent of Documents, GPO, Washington DC 20402: yearly $8.00 domestic, $10.00 foreign; single copy $1.50.

Vol. XXIV No. 5 July-August 1973

the cover

In "The Many Faces of the Space Shuttle," William G. Holder says that the shuttle is on its way but only after many years and many vicissitudes. The Air Force has been a prime mover in research and development of the shuttle technology and will play an important role in its launching and subsequent operation. The shuttle is being developed by National Aeronautics and Space Administration (NASA). Our cover depicts a shuttle engine configuration mockup.

U.S. MILITARY STRATEGY

Paradoxes in Perspective

MAJOR EDD D. WHEELER

IT IS difficult for the modern student of strategy to point to a cogent definition that rings with clarity and truth. Perhaps he will have to settle for a prosaic one even if somewhat less than profound.

Terminologists tell us, in language often not easily understandable, that strategy deals with the "development and employment of national power, including military power in peace and war, to secure national aims against antagonists in the international environment." [1] Although this statement may be true, it is hardly clear, for we are caught almost immediately in the ambiguities of precisely what constitutes national power and even more so in its elusive "development and employment." The rest of the definition does little to crystallize its meaning.

A common definition which is clearer, because shorter, but which does not seem entirely true, states that strategy is "the art of the general." One might reasonably argue, and many have, that strategy is both "art and science," thus implying that there is a good measure of method as well as imagination in strategy. Furthermore, it can be reasoned that, in order to transmit substantial meaning, the definition of strategy cannot be too generalized. Specifics are needed; indeed, most of history's great strategists were quite specific in addressing the subject. Napoleon, for example, formulated no less than 115 concrete maxims related to the realm of strategy.

Unfortunately, some definitions seem lacking in both clarity and truth. "Strategy," according to Prussian Field Marshal Count Helmuth von Moltke, "is a system of ad hoc experiments; it is more than knowledge, it is the application of knowledge to practical life, the development of an original idea in accordance with continually changing circumstances. It is under the pressure of the most difficult conditions." [2] Yet one might question why strategy should be considered experimental as opposed to systematic, or why more practical than impractical. After all, successful strategy is not necessarily experimentally practical; it might well be systematically impractical, especially if it is to achieve surprise.

Moltke was correct, however, in one important respect, for he seemed to sense that strategy is characterized by indefiniteness and difficulty. These two wrinkles, which actually might be considered one in that they run across the same seam, must be pressed upon and a working definition of strategy ironed out before we can turn specifically to the subject of U.S. military strategy.

As with most endeavors, strategy has become progressively more complex with the passage of time. Twenty-two hundred years ago, Scipio's strategy involved only breaking through Hannibal's front line of war elephants in order to win a complete victory at Zama. Two thousand years later, strategy had become more scientifically and mathematically oriented, as evidenced in detailed preoccupation with such matters as the geometry of marching formations and battle alignments. Even so, as late as the first

decade of this century it was possible for the dying Field Marshal von Schlieffen to capsulize what was to be the German grand strategy at the beginning of the World War with his direct dictum to "make the right wing strong."

Those relatively simple days now seem as dead as Schlieffen. The contemporary strategist must pick his difficult way through the sometimes opaque rhetoric of counterforce, controlled response, graduated deterrence, and the rest. Half the battle is involved in learning the new language of battle. The path is winding and too often windy.

Through the frequent heat and infrequent light, what then can be said? For my purposes, I offer that *military strategy is a plan of action for pursuing those objectives established by the government as being necessary to its best interests.* To amplify this definition, three caveats might be added:

- Military strategy is essentially a program for action, as opposed to inaction and commitment to the status quo.
- Military strategy takes into account not only military factors but all those which figure importantly in the nation's power, e.g., political stability, economic strength, and national resolve.
- In pursuit of national objectives through strength, it is imperative to consider the objectives and strengths of others, especially those of antagonists.

The Nature of War

Military strategy does not cause war. In fact, a lesson of history seems to be that war is more likely to ensue from a void in strategy or from the absence of sound strategy. Witness the results of the lack of British and French military preparedness in the face of Munich, or the threatening shadow of Armageddon cast by unsound Soviet decisions to base missiles in Cuba. Nonetheless, because war—or perhaps the absence of war—is the ultimate test of the success of military strategy, it is appropriate to address briefly the nature of warfare, especially modern warfare.

War is nasty business and exacts a dear price. The only question is how much one is willing to pay.

Lest this approach seem oversimplified, another perspective might be added. Thomas C. Schelling, who has the talent for ordering complex issues into simple form without being simplistic, says that "war has always, or almost always, been a bargaining process; and limited war in particular is a bargaining process. Today's kind of limited war involves two kinds of bargaining: bargaining about the outcome and bargaining about how the war itself ('the bargaining') is going to be conducted." [3] In light of both approaches, mine and Schelling's, what then can be said of limited war?

a bargaining contest

First, limited war is a bargaining contest. Bargaining involves give and take; price is not absolute. The parties are willing to negotiate in light of reason—never mind whose—and come to terms that are acceptable, though perhaps not equally so, to both. Yet it is important to remember that war, limited or otherwise, is a contest. It involves contestants who want somehow to win. The parties in conflict may not wish to throw away the rule book or to be penalized excessively, but each is looking for gain, almost always at the opponent's expense.

This lesson may glint cold to our eyes, but we should not fail to read it. In the cushioned and sometimes cushy language of international relations, we tend to overlook a hard fact: winners and losers still exist.

Another fact which should not be forgotten is that the winner achieves dominance (the word *victory* currently being somewhat passé) through superior force or threat of force.

Thus, limited war is a contest in which one forcibly drives the hardest possible bargain for gain which he believes the other side will find acceptable. Because the objective sought in all likelihood has definite limits, so does the injury one is willing to inflict—and the price one is willing to pay in doing so. Lest the whole business appear entirely callous and disgusting, it should be added that the objective sought might be something as selfless as assisting one's friends in time of honest need or peril.

Many friends of the U.S. have problems with insurgency, that form of active opposition by a group against the recognized government. Although it stops short of open rebellion, for such practical reasons as lack of adequate support or ripeness in timing, insurgency is generally armed, violent in nature, and entirely serious in its intention to achieve overthrow. It is difficult to define and probably all the more dangerous because of its absence of sharp definition.

the gardener will be subverted

To understand insurgency, it is helpful to investigate the writings of insurgents. Two notable experts are Mao Tse-tung and Vo Nguyen Giap. Their mastery of the art of insurgency or guerrilla warfare has been greatly influential in changing—and ravaging—the face of modern Asia. And they have caused us no small grief in the process. Mao, undeniably one of the great military strategists of this century, writes: "There is in guerrilla warfare no such thing as a decisive battle. . . . In guerrilla warfare, small units acting independently play the principal role, and there must be no excessive interference with their activities." [4] In contrast to Clausewitz, who believed that nothing short of "great and general engagements will produce great results," [5] Mao would choose initially to hit and run, to avoid decisive confrontation. Indeed, this decision is more the product of prudence than doctrine, for insurgency begins as a frail flower (or weed, depending upon the individual perspective). Time is needed for it to put down roots and nourish itself in the fertile soil of discontent and unfulfilled expectations. Care must be taken to avoid the gardener's pruning before the stalks are numerous and full grown. Yet in all this, Mao is merely biding his time, waiting for the moment when the insurgency can blossom forth and assert itself through open and superior strength. At that moment, when the weeds are deep-matted and the lilies festering, the gardener will be subverted.

Giap's dream

General Giap has also pitted his insurgent talents, with varying degrees of success, against the green thumb of the establishment. Of his successful campaign against the French, he writes: "There was no clearly-defined front in this war. It was there where the enemy was. The front was nowhere, it was everywhere." [6] This is a memorable statement and doubtless true of the early stages of guerrilla operations; yet Giap's most spectacular success was not "everywhere" but at one place in particular. It was at Dien Bien Phu, where he was able to pin down and overrun with brute power the flower of French forces in Indochina.

Giap has been much less successful against the Americans in Vietnam, largely because of their refusal to be pinned down. In fact, one of the key features of that war is the fact that Giap has been thwarted by powerful and highly mobile forces continually pushing him into defensive actions. The would-be hunter found himself hunted.

When Giap chose to violate his avowed belief in the diffuse front and launched large-scale offensives, as in early 1968 and the spring of 1972, the results were disastrous. In these two instances, Giap lost hundreds of thousands of men in an attempt to relive his glory at Dien Bien Phu. He got only nightmares for his trouble. There is every reason that Giap's sleep should be haunted by Phantoms, both the type that strike from the air and those that waver up from graves dug by his insistence that his version of history repeat itself.

counterinsurgency

The American experience in Vietnam has certainly not been an unqualified success. Nor should it stand as a model of how best to conduct counterinsurgency operations, if for no other reason, insofar as the United States is concerned, than that the future will not soon permit corresponding outlays of blood and treasure when our vital interests are not immediately at stake. But nations which hope to mount successful counterinsurgency operations, that is, operations aimed at defeating guerrilla actions, would do well to remember the following precepts, all of which are substantiated by what South Vietnam and the United States either did or failed to do:

- Keep the "weeds" cut: encourage social reform and programs aimed at reducing popular discontentment; failing that, begin vigorous pruning operations against insurgents as early as possible.
- Stay mobile and engage the insurgents only under conditions that are most favorable to your strengths.[7]
- Do not promise the boys "home by Christmas" or, for that matter, by the Lunar New Year—long duration is one of the few common characteristics of all counterinsurgent actions.
- Plan for high costs. (This is advice which, seen in the light of the war in Vietnam, needs no footnote.)
- Escalate deliberately, and if possible rapidly, and talk peace from a position of strength only when the sincerity of the opposition is unquestioned. Actions which fall short of this approach will probably be interpreted as weakness or lack of resolve.

the shark's mouth

Although awesome in its dimensions and fearsome to contemplate, general war is simpler to describe than limited war. It has the clean yet jagged, open, and terribly final simplicity of a shark's mouth. As for general war with nuclear weapons, Dr. Schelling points out that it is identified with language which speaks of destroying a nation as a viable society and that "for shorthand this is often taken to mean wiping out half the people or more." [8]

The objective of general war is to destroy the enemy's ability and will to continue with whatever resources and weaponry are available. It is difficult to envisage the price a nation would consider too high to pay for success when the price of defeat is total destruction and loss of national existence. The example in World War II of Germany's choice not to use her stockpile of chemical and biological agents is not wholly convincing to the contrary, since that decision was conditioned by questions as to the efficiency and decisiveness of those weapons and by the specter of a more massive retaliation in kind. It is a fairly safe assumption, therefore, that general war between two major powers possessing nuclear weapons will involve the use of those weapons. Only when one nation possesses a decided nuclear advantage over another might the smaller power decide not to use nuclear weapons, even in a general war, for fear of swift and utter destruction. For example, China

might not be anxious to introduce nuclear weapons in a general war with the Soviet Union. She probably would have little choice, however, for the Soviets would be likely to capitalize on their nuclear superiority.

Obviously, then, to speak of general war, especially with nuclear weapons, is to speak in terms of absolutes or near absolutes. So terrible are the consequences of general war between major powers that, in looking down into the abyss of nuclear possibilities, one might recall the heavy finality of Hamlet's last words, "The rest is silence."

Factors Influencing Military Strategy

It is impossible to speak of military strategy in isolation. Since military strategy is but a means of accomplishing national policy, that policy is, of course, the most influential factor in determining strategy. Thus, in a very real sense, strategy is influenced by all those elements that go into the making of national policy. Some of these, to list only the more obvious ones, are governmental doctrine and programs, public opinion, the slant of the media, pressure groups, individual genius, and, of course, what the other side does.

Yet to look at these several broad factors at one sweep leads to a rather amorphous view. I will, therefore, touch upon each separately, combining the second and third because of the contemporary—and disturbing—tendency of public opinion to be largely molded by the media.

doctrine and programs

What a government sees as its ideological commitments and the programs undertaken to meet those commitments obviously lie at the heart of military strategy. Most recently, the Nixon Doctrine has been of fundamental importance in shaping U.S. strategy. In fact, in its commitment to retrenchment and lowering the U.S. military profile abroad, the Nixon Doctrine has become the governmental policy most influential on U.S. military strategy during the last several years. In the magnitude of its impact, it ranks with such past policies as Truman's containment of Communism, Eisenhower's massive retaliation, Kennedy's flexible response, and Johnson's thrust into Southeast Asia. The Nixon Doctrine is paraphrased in the 1972 Republican party platform, which affirms "that America will remain fully involved in world affairs, and yet do this in ways that will elicit greater effort by other nations and the sustaining support of our people."[9] The President apparently intends to keep this approach as his main theme in foreign affairs during his second term of office. Barring some radical shift, it is likely that this doctrine will continue to be determinative of our military strategy through the mid-seventies.

Other concerns are also important, however. Governmental programs aimed at correcting domestic ills along with stabilizing the economy at home and abroad will remain high in priority and will obviously compete strongly for the budget dollar. We will be only as strong as we can afford to be, and in military appropriations Congress will probably be increasingly tightfisted. Not without reason, the nation may decide that a new transportation system is equally as important as a new generation of ICBM's. Whether talking guns and butter or missiles and margarine, the way to the national treasury may get slippery.

public opinion and the media

Also on unsure footing are recent relations between the military and the media. Not that relations have ever been particularly close. The early Civil War press, for in-

stance, ran a smear campaign in which General Sherman's sanity was called into question. Only slightly more dignified have been some of the charges leveled at senior military figures in the wake of the "Lavelle incident." American media have demonstrated an astonishing proclivity for hopping aboard any bandwagon that makes it a practice to throw eggs at passing generals. Such practice accomplishes two things: it may prevent the appearance of "the man on horseback," but it also makes it difficult for even the most skilled and deserving military leader to find a stable mount in times which call for bold and decisive action.

The American military has its roots among the people and the tradition of the citizen-soldier. Most of its greatest leaders have come from middle-class, often humble, origins, not from illustrious martial dynasties. The military is a popularly based institution, which needs popular support. Yet that support has been severely eroded, chiefly of late by the media, which have been less than kind and possibly less than objective. No matter. This is not the time for charge and countercharge. For current antimilitarism to be dampened and for the healthy growth of an all-volunteer military service that can attract its full share of capable (and noble) people, the military must find ways to re-establish salutary contact with the wellspring of power in a democracy, the people themselves.

pressure groups

Citizen Ralph Nader and a relatively small coterie of students and intellectuals have demonstrated the potency of a well-organized pressure group. They have taken on two of America's most powerful institutions, General Motors and the U.S. Congress, and have gained either major concessions or uncomfortable squeamishness that portends concessions. This is not to say that Nader & Company has been entirely aboveboard in its dealings; in fact, its tactics have sometimes approached shameless exhibitionism. The point, then, is not that the group has been correct but that it has been effective.

The military is subject to the same kinds of pressure. Groups that have recently stung the military into varying degrees of action or attentiveness include those advocating equal opportunity and environmental conservation. Future military strategists who fail to account for, say, minority group representation in the senior officer ranks or for keeping the oceans clean, however sound their conceptions otherwise, can expect to be subjected to questioning in a manner most rigorous. Whether one calls this phenomenon fairness or fad, he must, indeed, call it fact.

individual genius

It was G. Wilson Knight who said that we must "interpret an age in the light of its . . . men of visionary genius, not the men of genius in the light of their age." [10] He was speaking of the world of literature, but his words ring true for the world of military strategy as well. Men mold events as much as being molded by them. Without the advent of Napoleon's strategic genius, modern Europe would look vastly different today. Without the overlapping of Napoleon's career with that of a young Prussian staff officer by the name of Karl von Clausewitz, the development of strategy also would have been vastly different.

Napoleon was by far the more successful military leader, yet Clausewitz has probably exerted a greater influence on ensuing military strategy. This is so because Clausewitz, although presently more quoted than understood, was still gifted in writing down for posterity the full range of his understanding of strategy. Thus, with strategy as

with all other pursuits, not only is it important who gets born; it is also important who is successful in getting the deep impression of his thought recorded—through deed or word.

In this last sense, the example of American military strategy poses an interesting case. It is generally conceded that, with the possible exception of Alfred Thayer Mahan, America has produced no truly great military strategists. Why? Possibly because our brilliant military leaders—and they have been numerous—have been more concerned with action than with introspection. They essentially have been doers rather than thinkers. And few of the thinkers were inclined to record their most seminal thoughts on strategy in language that following generations have found compelling. The tradition of American military strategy has not entirely lacked great thinkers; it has lacked great writers.

the opposition

It would be fatal to forget a major reason why we have military strategy: because we have enemies. The fact that there is an opposing ideology with powerful armed forces capable of destroying our civilization within minutes demands our closest attention and vigilance. Without succumbing to national paranoia, we must remember that there are many thousands of talented opponents who receive great satisfaction, reward, and prestige in return for thinking up ingenious ways to insure that their way of life survives and, hopefully, prevails over ours. Necessity dictates that we consider their intentions in forming our own. In doing so, we should not fail to attribute to enemy strategists two important qualities: they are intelligent, and they are interested in and capable of doing the unexpected. The history of military strategy at least as far back as the Trojan War tells us that enemy actions are likely to be imbued with guile and surprise.

Although it seems somewhat hollow, the current enemy offer of peace in Indochina is probably not a wooden horse which they hope we will pull in through the gate. Rather, it is an acknowledgment that the approach used to pursue their objective, namely, overt force, has failed—at least temporarily. They admit to an error in method, not intention. The future almost inevitably will see the North Vietnamese pursue their self-interests in this area through other means. And those means, like the present gesture of peace, will conform not only to the strategy of Giap but also to that of either the Soviet Union or China, or both.

To confirm that the peace is not a wooden horse, we need not attempt, as Cassandra advised the Trojans, to burn it upon the plain. But neither should we in guileless confidence hurry to bring it within the citadel of our trust. We need to watch this "horse" for a while, to see if it is really capable of carrying us to where we want to be.

Current Military Strategy

Our current military strategy rests not only upon the Nixon Doctrine but also upon the President's announced policy that the United States is moving from "an era of confrontation to an era of negotiation." [11] In this context, no longer is it considered desirable that the other side blink first in an eyeball-to-eyeball encounter. Now we know that such a confrontation must not occur, especially when the cost of flinching or miscalculating is so prohibitively high.

the peace imperative

The President's policy actually voices a rather common sentiment: we want peace

with honor. Peace has become a bewilderingly difficult term to define, but what the President seems to be saying is that we want to avoid confrontation that might lead to a massive nuclear exchange. It is not so much an act of diplomacy as of necessity. This element of necessity is clearly recognized in Morton H. Halperin's observation:

> Whatever we may choose to call it, we are doomed to peaceful coexistence with our enemies because we live in a world in which war cannot be abolished, because there is no other means to settle issues that men feel are worth fighting for. But war—at least war in the sense of general nuclear war—can only lead to such complete destruction that in the final analysis, the war could not have been worth fighting. It is this central paradox which provides the challenge and the setting for discussion of the role of military strategy in the current era.[12]

Peace, or at least absence of general nuclear war, has become an imperative.

internationalism

Another necessary feature—and paradox—of our national military strategy is that it cannot be truly national. It must mesh with the military capabilities and doctrines of our allies. Despite recent tendencies toward scaling down abroad, the flavor of our military strategy, especially in Europe, is highly international.

Even where a formal alliance does not exist, as with Israel in the Middle East, our strategic commitments are clear enough to discourage attempts that might threaten the national survival of our friends. In Israel's case, there should be little doubt in anyone's mind that the United States would not stand aside and watch that nation destroyed. In the same vein, we realize that the Soviets, despite their recent involuntary retrenchment there, would not permit a similar fate to befall Egypt, although Cairo is a continent's distance from Moscow.

Modern military strategy has seen distances diminish. Continents have been condensed, and national concerns have become international. "Strategy today," commented one writer a generation ago, "is world strategy and it is no more possible to shape it merely to suit the limited interest of one particular country than to confine a typhoon to a potato patch." [13] In the years since, the storm has grown larger, the patch smaller, and the possibility of pursuing solely national interests more improbable.

intentional stalemate

It is also improbable that either the United States or the Soviet Union can achieve a dramatic shift in the balance of military power within the near future. Since World War II, both sides together have spent more than $2 trillion, with the result only "that with any conceivable or current or future deployment of nuclear weapons, neither side can expect to attack the other without receiving a retaliatory strike that would destroy the attacker as a modern nation-state." [14] For this reason, we have seen fit to begin the Strategic Arms Limitation Talks (SALT).

The key aspect of SALT, as it affects U.S. military strategy, is that it limits the number of our land- and sea-based missiles for up to five years. Under SALT, the United States will freeze the number of its ICBM's at 1054 and SLBM's at something less than 700; the Soviet Union will freeze its ICBM's at 1618 but possibly build the SLBM force to 950.[15] The United States will continue to possess more warheads but less total nuclear megatonnage than the Soviet Union. In the language of the strategist, these numbers translate into intentional stalemate.

We have decided to seek détente with the Soviets as an alternative to the possible destruction that would arise from head-on

confrontation. One voice that denounces the West's policy, hence strategy, of accommodation and stalemate is that of the great Russian writer Alexander Solzhenitsyn: "The timid civilized world has found nothing with which to oppose the onslaught of a sudden revival of barbarity, except concessions and smiles." [16] Should his criticism contain but a syllable of the "word of truth" which he seeks to express, it would indeed be no smiling matter.

Future Alternatives

Where we are going will be determined in large part by where we have been. Our near-term military strategy probably will not change overnight. Nor should it necessarily, for recent strategy has been something more than the chain of farcical errors which frenzied detractors might claim. As a nation, we have refused to allow ourselves or our allies to be manhandled. We have pursued our objectives and protected our interests vigorously—some would say too vigorously at times—without touching off World War III. We have managed to muddle through fairly well.

Yet we cannot afford smugness. One can hardly claim success merely because he has not yet blown himself into oblivion.

"After the first death, there is no other."

Studied avoidance of that oblivion must continue at the forefront of our strategic thought as we plot the future course. Nuclear war *must* be avoided. It would be extremely difficult to justify under almost any circumstances that did not imminently threaten a large part of our population or a vital national interest. We cannot identify precisely, nor should we try, what will or will not serve as adequate provocation for a nuclear response. Suffice it to say that provocation in the form of a concerted attack upon an American city or naked aggression against an area where our interests are clear and declared (Berlin, for example) would probably ignite the nuclear spark. The fire from that spark must be prevented if at all possible, for even if it did not rage initially, it would make future and larger nuclear fires more likely, and civilization itself might well be the tinder. After the first conflagration, the rest would follow much easier. In facing this possible precedent, we may be reminded of a line from the poetry of Dylan Thomas: "After the first death, there is no other."

action and responsibility

Let me hasten to add that it is far from my intention to call for the incorporation of alarmist or pacifist tendencies in our strategic plans. On the contrary, the necessity for courage and even boldness will be greater than ever. The spirit of Munich is more apt to precipitate than to avert war. There is need now for perpetuating an opposite kind of spirit, one which clarifies for all to see that there are certain principles and objectives which are the foundation for national greatness and which are worth protecting at any cost.

The United States must dedicate itself to a course of action that ensures its position on the plus side of any equation intended to compute strategic power. New policies, doctrine, weapon systems, and, indeed, ways of thinking will be needed. Except in time warps, one does not move ahead by standing still. And we cannot depend on science fiction to save us.

Some things, though—all eminently human—are never outdated and must never be discarded, namely, imagination, courage, and resolve. These are not mere words or abstractions. At their best, they can serve as program guides for action: we (the U.S., "us," the military) must have the imagina-

tion to determine what ought to be done, the courage to begin, and the resolve to see it through to favorable completion.

We must move forward, yet with care, playing always to our strengths, yet not with provocative abandon. To do either less or more would be immoral: anything less, immoral to those generations who have sacrificed much or all to establish our greatness; anything more, immoral to those generations yet to be born.

Udorn RTAFB, Thailand

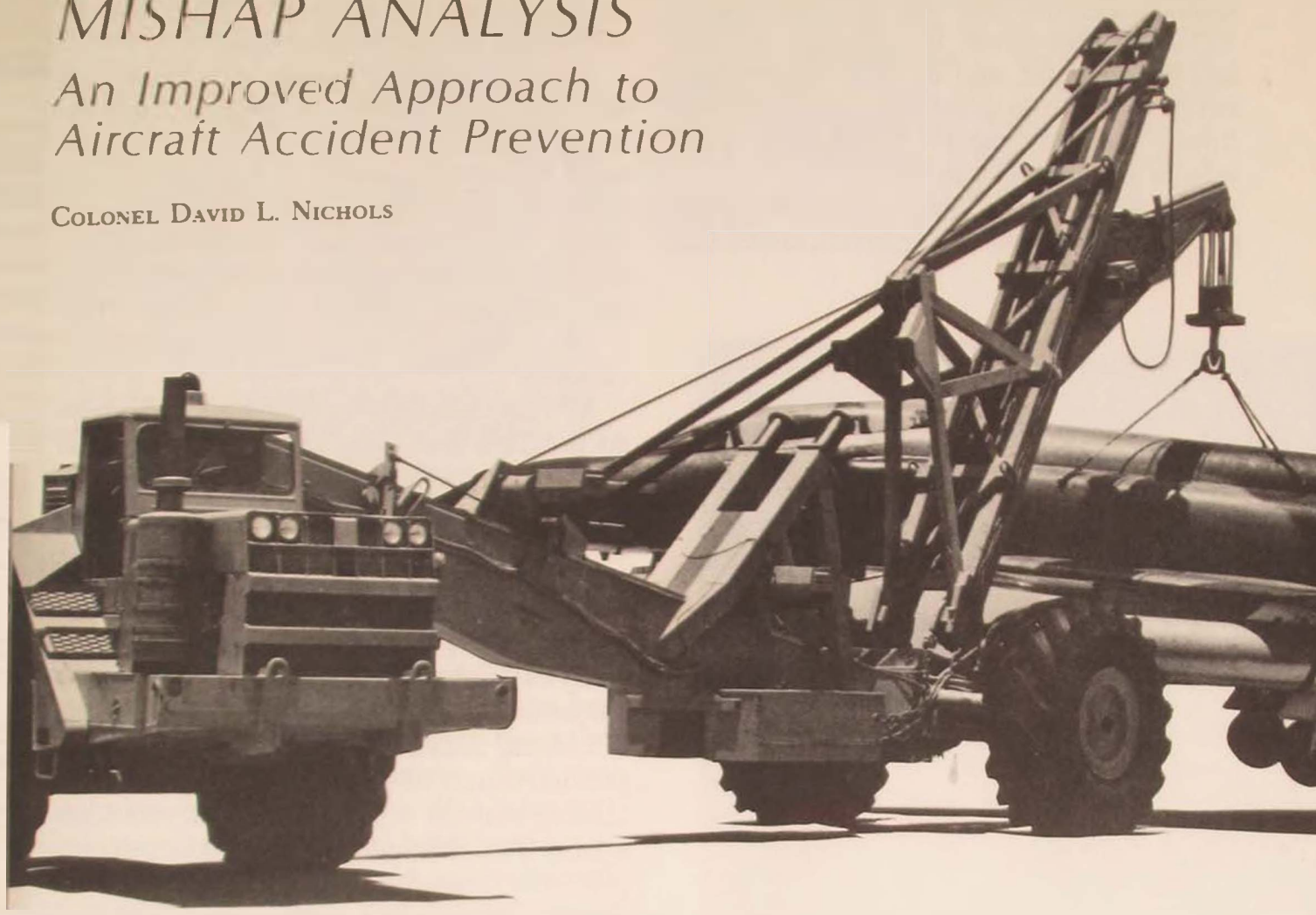
Notes

1. Urs Schwarz and Laszlo Hadik, *Strategic Terminology* (New York: Frederick A. Praeger, 1966), p. 94.
2. Quoted in Fred R. Brown, ed., *Management: Concepts and Practice* (Washington: Industrial College of the Armed Forces, 1967), p. 88.
3. Thomas C. Schelling, "Concepts of Limited Warfare," in *Military Strategy for Limited War* (Maxwell AFB, Alabama: Air War College Associate Program, 1971), Ch. 11, p. 3.
4. *Mao Tse-tung on Guerrilla Warfare*, trans. Samuel B. Griffith (New York: Frederick A. Praeger, 1961), p. 52.
5. Karl von Clausewitz, *On War* (New York: Modern Library, 1943), p. 208.
6. Vo Nguyen Giap, *People's War, People's Army* (Hanoi: Foreign Languages House, 1961), p. 21.
7. Machiavelli is relevant here with his axiom: "Good commanders never come to an engagement unless they are compelled to by absolute necessity, or occasion calls for it." *The Art of War*, trans. Ellis Farneworth (Indianapolis: Library of Liberal Arts, 1965), pp. 203–4.
8. Schelling, *op. cit.*
9. Quoted in "Issues in the Campaign: Foreign Policy," *Bangkok Post* (Special Report), November 5, 1972, p. 14.
10. G. Wilson Knight, *Shakespeare and Religion* (New York: Simon and Schuster, 1968), p. 294.
11. Quoted in *Bangkok Post*.
12. Morton H. Halperin, *Contemporary Military Strategy* (Boston: Little, Brown, and Co., 1967), p. 12.
13. John C. Slessor, *Strategy for the West* (New York: William Morrow and Co., 1954), p. 47.
14. "Peace, National Security, and the SALT Agreements," *Current News*, September 13, 1972, Part 2, p. 7-F.
15. *Ibid.*
16. Quoted in "'One Word of Truth,'" *Time*, September 4, 1972, p. 13.

MISHAP ANALYSIS

An Improved Approach to Aircraft Accident Prevention

COLONEL DAVID L. NICHOLS



> Commanders are responsible for using all Air Force resources effectively and judiciously to successfully complete assigned missions, and so contribute to the progressive achievement of overall Air Force objectives.
>
> —*USAF Management Process*[1]

ONE of the best manifestations of effective and judicious use of Air Force resources is reflected through the Safety Program. The goal of this program is ". . . to conserve the combat capability of the United States Air Force through the preservation of its personnel and materiel resources." [2] Each commander is directed to take action within means available (1) to prevent accidents, (2) to eliminate or minimize the effects of design deficiencies, and (3) to eliminate unsafe acts and errors that represent accident potential.[3]

To date, the Air Force has been most successful in aircraft accident prevention, as a brief look at history clearly illustrates. In 1947 the major

aircraft accident rate was 44 accidents per 100,000 flying hours. By 1953–54 the rate had been halved, and by 1959 the rate was below ten. The improvement gradually continued over the next twelve years to a low rate of 2.5 achieved in 1971.[4]

The Air Force is justifiably proud of this record, but an inevitable question arises: Can

the accident rate be further reduced? How far can we go? An answer to this question is unknown, but it is obvious that the Air Force has reached a point where continued improvement is increasingly difficult. Major General John D. Stevenson addressed this problem in 1960 when he stated, ". . . the accidents ahead of us are going to be the most difficult to prevent in our history, for the things that are easy to do have already been done by our predecessors." [5]

What he said has proven to be true, and the challenge will be even more difficult in the next decade. The Air Force cannot relax but must continue to explore and develop improved methods of preventing accidents. Old methods need not be discarded, but new methods must be innovated to meet the increased challenge effectively. This article reports on such an innovation: Mishap Analysis.

Mishap analysis is basically a trend analysis program that looks in detail at potential sources of accidents. Many flying units already have some form of trend analysis program, but in most cases they lack depth, timeliness, and credibility. The inadequacies of such programs will not meet future requirements. To be effective, a safety trend analysis program must incorporate three essential characteristics: (1) it must provide a realistic data base for analysis; (2) it must provide timely identification of accident potential; and (3) it must highlight problems arising from the materiel/maintenance complex—the primary source of today's accidents.[6] This article shows how these essential characteristics relate to mishap analysis.

realistic data base

Several years ago a waterfront community was threatened by an epidemic from unknown causes. More than a thousand residents became ill within a week, and one person died. An autopsy was performed and revealed that death resulted from uremia, probably aggravated by impure food. The circumstances indicated that shellfish were the cause. Armed with this information, the local authorities acted promptly to correct the shellfish problem. But unfortunately, several other persons became seriously ill before it was discovered that the first fatality

was not indicative of the real cause of the epidemic. The basic cause was not the shellfish but was, in fact, water pollution.[7]

This story brings to light several fallacies from which it is important to learn the following lessons. The first lesson is that isolated and/or spectacular cases do not provide the best guide for corrective actions. A second lesson is that a wrong diagnosis of cause factors usually results in the wrong remedial actions. And finally, the true source of a majority of ills is the best foundation upon which to base analysis.[8] Thus, while attacking the shellfish, one should not overlook the possibility of water pollution.

Today's Air Force is subject to three fallacies, too, and they impose limitations on the safety program.

Fallacy I. Today, relatively few problem areas are identified through accident investigation. One reason for this is that most causes do not reach the "accident" stage, because someone—usually the pilot—saves the aircraft. Airborne emergencies that are safely recovered belong in this category; they are events that could have been accidents. In reality, they should be considered as accidents, accidents that did not result in injury or damage. And it is here that a fallacy becomes apparent: these "accidents" will not be analyzed for accident potential because there was no injury or damage. They are ignored in much the same way as the polluted water.

The seriousness of this shortcoming was identified by H. W. Heinrich, a noted pioneer in the scientific approach to accident prevention, when he observed that ". . . for every mishap resulting in an injury [or damage] there are many other similar accidents that cause no injuries [or damage] whatever." [9] He reached the conclusion that, in a group of similar mishaps, 300 will produce no injury whatever, 29 will result in minor injury, and one will result in major injury. He emphasizes that the importance of an individual mishap lies in its potential for creating injury and not in the fact that it actually does or does not. Therefore, any analysis as to cause and remedial action is limited and misleading if based on one major accident out of a total of 330 similar accidents, all of which are capable of causing

injuries or damage. In other words, those who limit their study to isolated, spectacular cases—major aircraft accidents—are looking only at the tip of an ominous iceberg.

Fallacy II. Another reason many "causes" go undetected is that accidents are extremely difficult to investigate and analyze *accurately.* Often investigation boards have little more than a "smoking hole" for evidence;

consequently, it is easy to arrive at erroneous conclusions in spite of the most commendable efforts. A more critical observer reports that ". . . accident boards, forced by expediency, sometimes find it easier to assume pilot error than to prove materiel deficiency or maintenance error." [10] He supported his case with the following logic:

Over a nine-month period a fighter wing's mishap experience included 204 reportable and nonreportable incidents. In the same period the wing had six accidents. Analysis of the incidents revealed 9 percent were caused by pilot error, while 90 percent resulted from materiel failure and/or maintenance malpractice. However, pilot error was assessed as the primary cause in 83 percent of the accidents. Materiel failure was *proven* in only one case.[11]

A more recent twenty-month study in a different wing revealed 975 mishaps (accidents, reportable incidents, and nonreportable incidents). Pilot error was the cause of approximately five percent of the total.[12] This should indicate that pilots cause less than ten percent of the accidents. Yet during this same general period, Air Force-wide statistics reflect that pilots cause over 40 percent of the accidents.[13]

Do accident investigation boards fail to uncover true cause factors? If so, numerous problems have been neglected and hence will contribute to other accidents.

Fallacy III. Accidents do not occur frequently enough to establish trends, particularly at lower echelons of command. Unless a trend is established, commanders may be forced to treat the effect rather than the cause of accidents.

Air Force directives require reports on those incidents that are "almost accidents," and this is particularly useful information because the aircrew and equipment are intact for a logical and thorough investigation. Thus reportable incidents provide more accurate cause factors and a better data base for analysis and remedial actions than actual accidents.

So those who analyze reportable incidents as well as accidents are on somewhat firmer ground, but this also is only looking at the tip of a large iceberg. The tip, in this instance, allows study of both accidents and "almost accidents," but it ignores data from "could have been accidents." Moreover, this tip is still too small for trend analysis at wing level.

The most reliable source of information is that which includes all problems that could result in an accident. These problems will be found by studying the *mishap rate*, which measures accidents, "almost accidents," and "could have been accidents." A truer definition of the mishap rate might be *the record-*

ing of all unexpected events, occurring in flight, that did result or could have resulted in an airborne emergency.

timeliness

> For many years, . . . safety organizations have been doing a thorough job of investigating, analyzing, reporting, and taking corrective action after an accident, and in analyzing trends from records that are weeks, months, or years old. Important as this is to a safety program it is "after-the-fact"—too late to provide effective controls to prevent these accidents. It is apparent that we need the facts on our safety situation as of the moment. Therefore, we need a method to pinpoint the accident-producing, unsafe acts *before* the accident happens.[14]

What could be more useless to a commander than a thorough in-depth analysis of how to prevent an accident after it has already occurred? Any hint of increased accident exposure before-the-fact is without doubt more useful.

The central objective of mishap analysis is to get *early* identification of potential problems so that prompt corrective actions can resolve same *before an accident occurs.* To accomplish this, a properly managed accident-prevention program will have documentation that is accurate, timely, and up-to-date. When analyzed, it will provide trends or spotlight areas requiring attention. The program must not degenerate into history. It must be an active day-to-day program which points out problems that exist now.

This day-to-day program is therefore based at wing level. The mishap data are collected and reviewed daily, and a formal analysis is completed monthly. However, the daily reviews will bring to light potential problem areas; therefore, supplementary analyses are frequently required during interim periods to insure timeliness.

Also the program uses manual inputs and analysis rather than computer techniques. For a program of this scale, manual techniques are more desirable for many reasons: the inputs/outputs are more timely; the manager develops complete familiarity with the data; they are more responsive to the unprogrammed needs of accident prevention; they tend to be simpler and provide outputs that are not burdened by irrelevant data; they are less expensive; and they are available to all. This sounds like heresy in today's computer-oriented world, but this program is more productive when given the personal attention that is associated with manual operation. Possibly some future evolution of mishap analysis will fruitfully incorporate computers.

man versus machines

Mishap analysis concentrates more on the machine than the pilot because aircrews are the strongest element in preventing accidents.[15] Therefore, emphasis is placed on increasing aircraft reliability.

The safety philosophy has too often leaned upon the pilot by giving him the responsibility to cope with malfunctions rather than providing better equipment. Aircrews have done an exceptional job in accepting this challenge. A survey completed in 1960 illustrates this point. It showed that during a six-month period Air Defense Command had 681 in-flight emergencies due to maintenance or materiel deficiencies. Extraordinary aircrew performance overcame 659 of these. In the same period, ten accidents were attributed to pilot error. This means that pilots saved 66 aircraft for every accident they caused.[16]

Recently, a more detailed study was completed in a large tactical fighter wing equipped with several different types of aircraft. During a twenty-month period, 299 in-flight emergencies occurred due to maintenance or materiel factors. Four of these led to aircraft accidents, one of them attributed to pilot error. In this case study, pilots saved 299 aircraft compared with their one failure.[17]

Thus pilots do an exceptional job of coping with emergencies. But the fact remains that if aircrews did not have to cope with serious malfunctions, or at least such a large number of them, the accident rate would be greatly reduced. Therefore, a most fruitful area for increased attention relates to the machine—the product of the materiel/maintenance effort.

some general guidelines

The first step in a mishap analysis program is to establish priorities. Ideally, a commander would give each type of aircraft equal attention to prevent accidents; however, since resources are limited, priorities must be established. In other words, if one type of aircraft is well protected by the existing procedures, then additional effort should not be wasted. But if accident exposure is high, then normal procedures should be augmented with mishap analysis.

Next, the data base must be established for the type(s) of aircraft to be influenced by mishap analysis. The amount and type of information collected are critical; therefore, the first step is the collection of complete, factual data, without regard to severity or cause. This concept permits investigation of the entire iceberg rather than just the tip.

The data collection process could begin

in many ways; however, for ease of control and to insure complete coverage, the best starting point is the aircrew/maintenance debriefing that follows each sortie. At debriefing, a "description of occurrence" is completed on a mishap report work sheet whenever an unexpected event occurred that did result or could have resulted in an airborne emergency. If an emergency actually occurred, the work sheet description should be augmented by personal contact between the safety officer and the aircrew to be sure that all details are clear.

One copy of the work sheet is turned over to safety personnel during a daily pickup, and another is sent to Maintenance Quality Control for investigation. Quality control determines what system component failed and, if possible, how it failed. The completed report is then forwarded to the safety office, where it is evaluated against criteria in Air Force Regulation 127–4 for a reportable or nonreportable incident. Reportable incidents receive further investigation and are submitted to higher headquarters in accordance with directives. For nonreportable incidents, a cause factor is assessed based on the investigation by quality control. The wing then has available for analysis the causes of all accidents, "almost accidents," and "could have been accidents."

The next step is to record the data by methods that will provide early detection of problems. The information is shredded out by subsystems and cause factors. The subsystems are those in which a malfunction could lead to an accident: landing gear, engine, drag chute, flight controls, hydraulics, autopilot, fuel system, instruments, electrical, weapons, etc. The cause factors include aircrew, maintenance, materiel, and undetermined sources. When tabulated, this information provides the basis for trends in numbers and types of subsystem failures and causes of failures. The use of these data is limited only by the imagination of the safety officer. The information can be set forth in various types of graphs, tables, and charts to identify trends not only by subsystem but also by type of aircraft, by individual aircraft tail number, by squadrons, by maintenance sections, etc.

Detailed discussion of various graphs, tables, and charts is not within the scope of this article. Most methods in common use are quite simple. However, one technique that merits comment, because seldom used by the safety officer, is the control limit chart. It has unique value in that it gives a quick and simple summary of the mishap data. The chart can be constructed for many things, such as failure rates of subsystems, mishap rates for each type of aircraft, or an

overall mishap rate of all aircraft influenced by the program. The accompanying control limit chart, an actual chart used by one wing, represents the overall rate. (Figure 1)

The chart shows when mishap rates are normal (the grey area) and when rates deviate from normal. Normal experience is defined by the area within the "control limits." This area is derived by setting limits that are one standard deviation either side of the mean rate. Thus 68 percent of all mishap rates will fall within the control limits. Mishap rates that exceed one standard deviation are out of the control limits and require special attention. When mishap rates exceed the upper limit, accident exposure is excessive. The problem(s) should be ferreted out by analysis of mishap data presented in other graphs, charts, and tables. Conversely, when mishap rates fall below the lower limit, this must also be analyzed to determine *what is right*. With this approach, commanders can exploit those assets that are good and enhance safe operations. Therefore, mishap analysis capitalizes on positive as well as negative experiences to provide before-the-fact accident prevention clues.

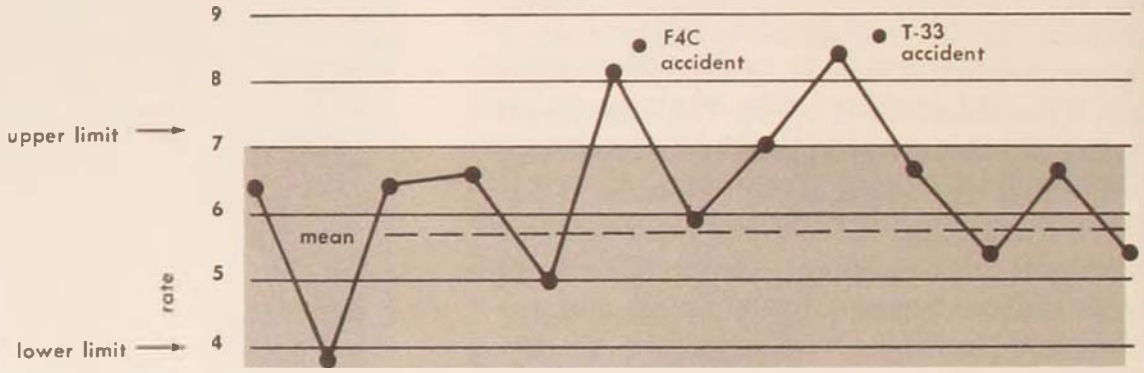


Figure 1. A control limit chart derived from one tactical fighter wing's mishap experience, the rate based on the number of mishaps per 100 sorties

Is it valid?

Has mishap analysis been tested? Is it worth the extra effort? The program has been used in two large fighter wings, but it is difficult to measure the degree of success. One seldom knows how many accidents were prevented in any situation. But the author, having managed both programs, feels that the degree of success was significant. The programs were also inspected and studied by many safety experts in all echelons of command from the Directorate of Aerospace Safety down through air divisions. In each instance, the program was praised as a strong deterrent to aircraft accidents.

There is another, less subjective way to evaluate mishap analysis through the use of Heinrich's theory. The theory states that investigation of any random sampling of 330

mishaps shows that the same set of circumstances will usually result. In this group, there will be 29 which produce only minor injury/damage and one which will produce major injury/damage. Heinrich's theory can be summarized in a pyramid, or as an iceberg structure.

The top blocks of the pyramid—the tip of the iceberg—directly relate to the Air Force reporting system of accidents and incidents. nothing that relates to the base of Heinrich's pyramid; therefore, we overlook the most promising source for trend analysis.

In contrast, the mishap analysis program appears to relate to all segments of the pyramid. The twenty months of data collected in one wing revealed three major accidents, 87 reportable incidents, and 885 nonreportable.[20] This is a relationship of 295 accidents with no damage or injury and 29 accidents

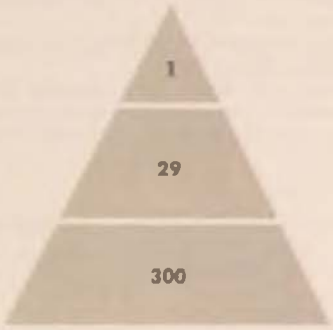


Figure 2. Heinrich's theory

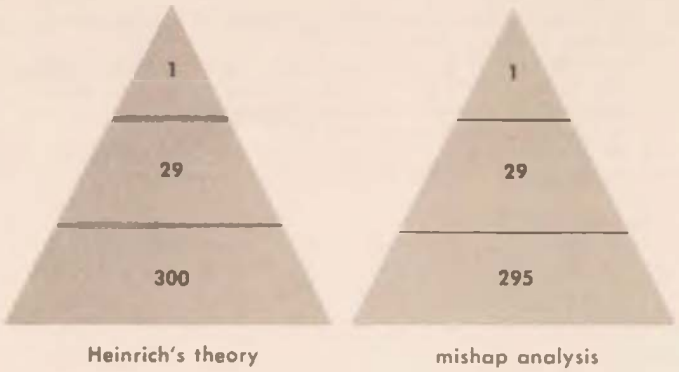


Figure 3. A comparison of Heinrich's theory with mishap experience

For example, in 1970 Pacific Air Forces Command suffered 60 major accidents and 1739 minor accidents and reportable incidents. Thus for every major accident there were 28.9 accidents of lesser damage. Heinrich says there should be 29.[18] Also in 1970, the Air Force experienced 200 major accidents and 5800 minor accidents and reportable incidents.[19] This represents exactly 29 accidents of lesser degree for every major accident. In other words, the findings of Heinrich and the Air Force are compatible as far as the top blocks of the pyramid are concerned. But the Air Force presently has with little damage for each major accident.

Admittedly, the sample is small, but the correlation is so close as to indicate that mishap analysis does fill in the gap and provide the needed data base for analysis. If this is true, the proposal is valid and worth the extra effort.

MISHAP analysis does not by any pretext establish the ultimate, but it does open a new avenue to accident prevention. It is an underdeveloped approach that is begging for additional attention.[21]

Such a program takes on increased importance during periods of austere funding and personnel cuts. Equipment is getting older and will be more prone to materiel failure; also manpower cuts increase the possibility of rising personnel factors in accidents. These must be countered with improved supervision, increased surveillance, and improved management tools. Mishap analysis is offered with these factors in mind, but it does impose an additional workload. However, when the cost of this effort is compared against the multimillion-dollar cost of most accidents, the expense is insignificant. It certainly represents an effective and judicious use of Air Force resources.

Air War College

Notes

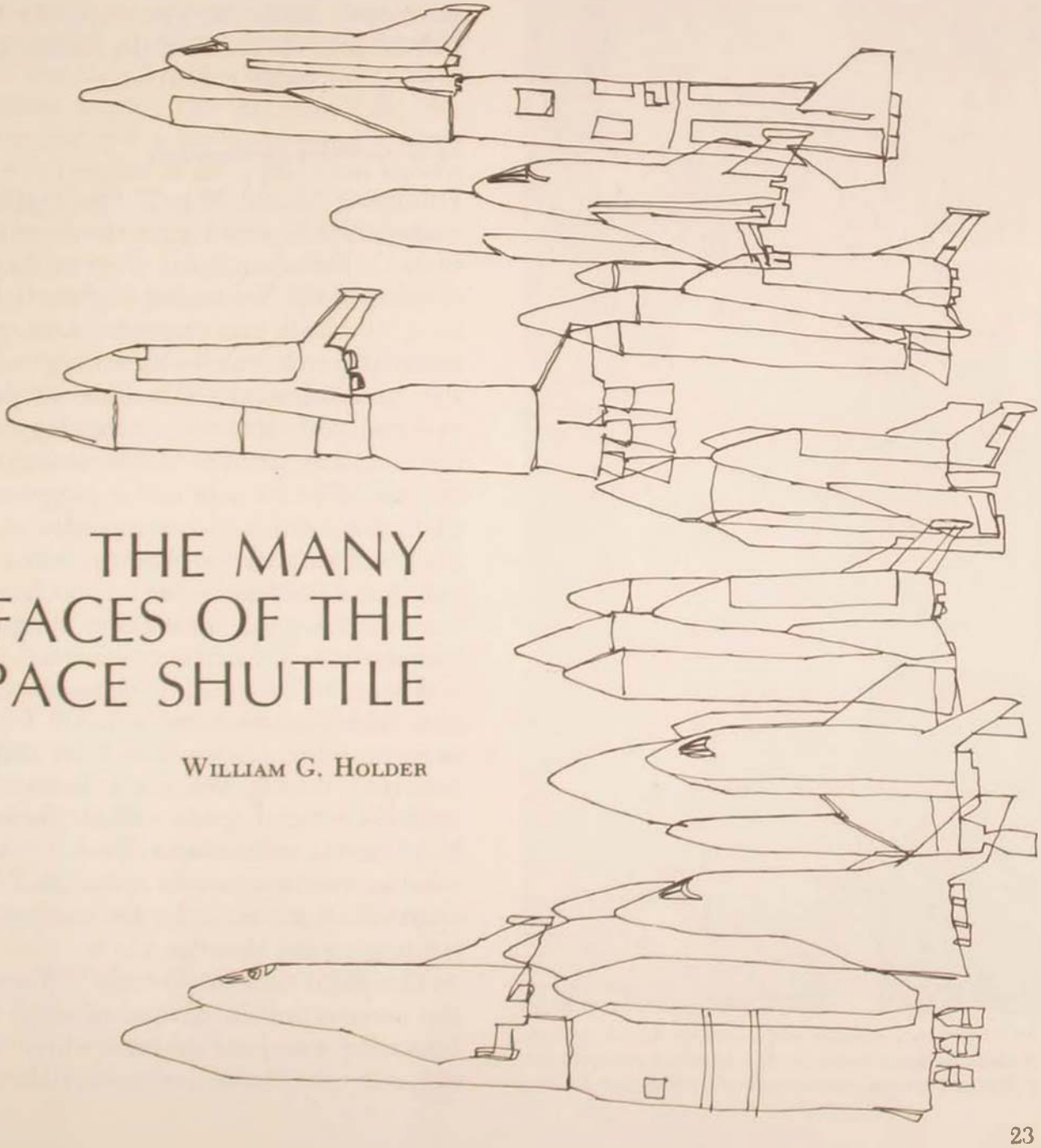
1. *USAF Management Process*, Air Force Manual 25-1, Department of the Air Force, 15 October 1984, p. 1.
2. *Responsibilities for the USAF Aerospace Safety Program*, Air Force Regulation 127-1, Department of the Air Force, 11 June 1971, p. 1.
3. *Ibid.*, pp. 1-2.
4. *USAF Aircraft Accident Summary 1971*, Directorate of Aerospace Safety, Norton AF Base, California, 1972, p. 2.
5. Major General John D. Stevenson, Commander, Western Air Defense Command, ADC, "Ideals and Realities," lecture presented to the First Annual USAF Safety Congress, Riverside, California, 12 September 1960.
6. *USAF Aircraft Accident Summary 1971*, p. iii.
7. H. W. Heinrich, *Industrial Accident Prevention, A Scientific Approach* (New York and London: McGraw-Hill, 1941), p. 29.
8. *Ibid.*
9. *Ibid.*, pp. 26-27.
10. Major John C. Fair, "Calculating the Risk," Professional Studies Paper, Institute of Aerospace Safety and Management, University of Southern California, Los Angeles, California, 16 December 1968, p. 4.
11. *Ibid.*
12. Analysis revealed cause factors assessed to materiel factor, 599 (61%); maintenance factor, 173 (18%); pilot factor, 14 (1.5%); and 189 (19.5%) were undetermined. A further analysis of the undetermined causes revealed at least 119 of these could not have involved pilot factor, whereas the other 70 could have derived from pilot, materiel, or maintenance factors. Assuming that all 70 of these were caused by pilot factor, the percentage for pilot factor increases to about 8.5 percent. Therefore, the actual pilot factor mishaps in this study fell somewhere between 1.5 and 8.5 percent of the total.—Extracted from XX Tactical Fighter Wing's Safety System Analysis data (a PACAF subordinate unit), September 1970–April 1971. Hereafter cited as *Safety Analysis, XX TFW*.
13. *US Air Force Accident Bulletin 1967–1970*, Directorate of Aerospace Safety, Norton AF Base, California, 1969-1971, p. 1.
14. Lieutenant Colonel Jack E. Bailey, "Safety Sampling Program," Professional Studies Paper, Institute of Aerospace Safety and Management, University of Southern California, Los Angeles, California, December 1966.
15. Stevenson, *op. cit.*
16. *Ibid.*
17. *Safety Analysis, XX TFW*.
18. "Unit Safety Officers Guide to Statistical Analysis," Headquarters PACAF, Safety Analysis Division, Hickam AF Base, Hawaii, 1971, pp. 5–6.
19. *US Air Force Accident Bulletin 1970*, Directorate of Aerospace Safety, Norton AF Base, California, 1971, p. 1.
20. *Safety Analysis, XX TFW*.
21. Within the past two years, Air Training Command has expanded its aircraft safety trend analysis program; however, that program is fundamentally different from the concepts set forth in this article. The author feels the most important differences are related to concepts of (1) appropriate data base, (2) timeliness, and (3) level of management.

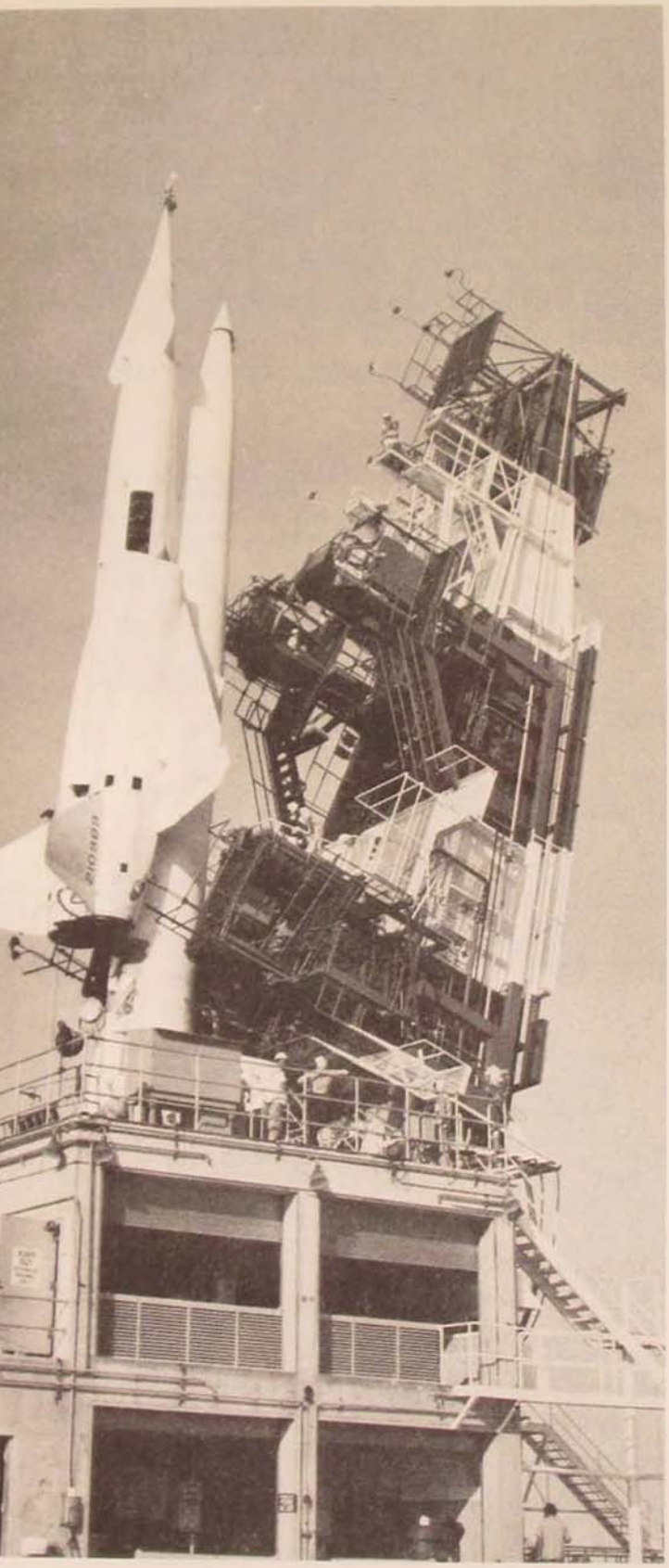
THE MANY FACES OF THE SPACE SHUTTLE

WILLIAM G. HOLDER

THE IDEA was not new. Engineers for the last two decades had realized the tremendous economic potential of a reusable space transportation system. Even from the beginning of the space program some fifteen years ago, the thought of dropping millions of dollars' worth of aerospace hardware into the drink after only a couple of minutes' use seemed utterly ridiculous. At last, the day of a reusable launch vehicle may not be too far in the future. The first hurdle has been passed and the space shuttle is on its way.

The shuttle, to be constructed by the North American Rockwell Corporation, will be a two-stage vehicle with the booster consisting of two large





The Navaho air-breathing cruise missile, based on German technology gained from V-2 rockets, was developed by North American Aviation for the Army Air Forces.

solid-fueled rocket motors. The payload-carrying orbiter will be the second stage and will carry up to 65,000 pounds of varied cargo into earth orbit. The shuttle blends the best of aircraft technologies and spacecraft know-how that American aerospace industry has acquired over the years from working on projects for the military and the National Aeronautics and Space Administration (NASA). It also relies on technology and ideas generated during the '50s and '60s. Many of these ideas were developed under Air Force sponsorship and helped provide much of the technical background for today's shuttle.

early Air Force developments

Following World War II, the real spur to rocket development was the German V-2 rocket. The Army Air Forces shipped a number of the V-2 rocket engines from Germany to North American Aviation, and this event precipitated that company's start in the rocket business. The first project that evolved with the new technology was an air-breathing cruise missile known as the Navaho. The vehicle had a piggyback configuration, which has reappeared in recent shuttle configuration studies. Some of the configurations resembled it so closely that one would have sworn the long-defunct Navaho missile had been reborn.

The Air Force's X-20 Dyna-Soar project also laid important groundwork for development of the shuttle. The X-20, which was canceled during the early sixties, was a manned winged space vehicle that was to be placed in orbit atop a Titan booster. The vehicle was designed to accomplish a high-angle-of-attack re-entry for an unpowered landing on the desert.

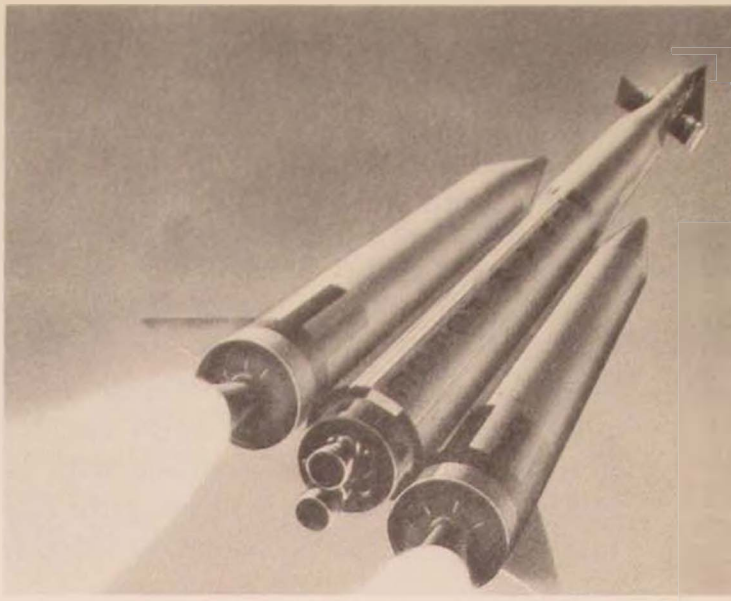
The X-20 in-orbit vehicle differed from the current shuttle orbiter, although its configuration was quite similar, in that the X-20 did not contribute any energy during the

boost period. Its other technologies, however, did not materially differ from those of the current configuration.

During the late fifties and early sixties the Air Force did several studies on a so-called aerospace plane. Its technology constituted some of the first thinking about reusable spacecraft, which were not to become a reality for some twenty years.

When NASA was thinking about its selection for the shuttle, every conceivable configuration and propulsion system was considered and then reconsidered. And once again an earlier Air Force program provided much of the data for one of the alternative possibilities. During the late sixties the Air Force carried out a program using a large pressure-fed engine in an application known as the Big Dumb Booster (BDB). Simplicity was the keynote of the concept, which used thick welded-steel tanks capable of withstanding extreme pressures. Boeing did a majority of the BDB work for the Air Force. Even though the pressure-fed engine concept failed to make the present shuttle configuration, its attributes received considerable attention in the deliberations.

As is now well known, the shuttle will use solid-fueled motors for its first stage. As of this writing, the exact size of the solids to be used has not been firmly decided, but apparently it will be in the neighborhood of 142 inches in diameter. It should be noted that motors of this size have never been used on a flight vehicle. It should also be noted that no manned spacecraft has ever been launched on a solid-fueled vehicle. But the USAF Titan III, which sports two 120-inchers, was designed initially to boost both the X-20 and the Manned Orbiting Laboratory (MOL) manned payloads. A 156-inch motor was developed and tested under Space and Missile Systems Organization (SAMSO) supervision, with the idea of its possible application as the motor to uprate the Titan III. Another possible application



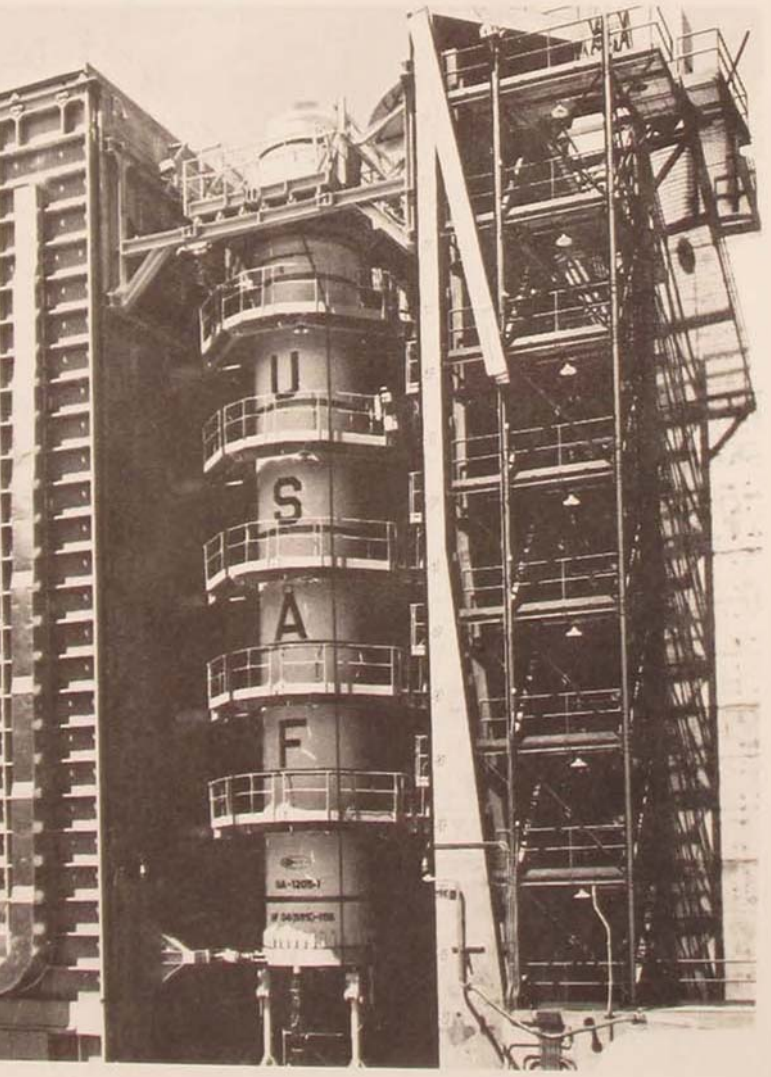
USAF's X-20 Dyna-Soar was to be boosted into orbit by a Titan rocket and re-enter for an unpowered landing on the desert. . . . A prototype Manned Orbiting Laboratory (MOL) was developed and tested under SAMSO, but the program was canceled for economy reasons. The MOL is fixed between a Gemini capsule and a Titan IIIC.

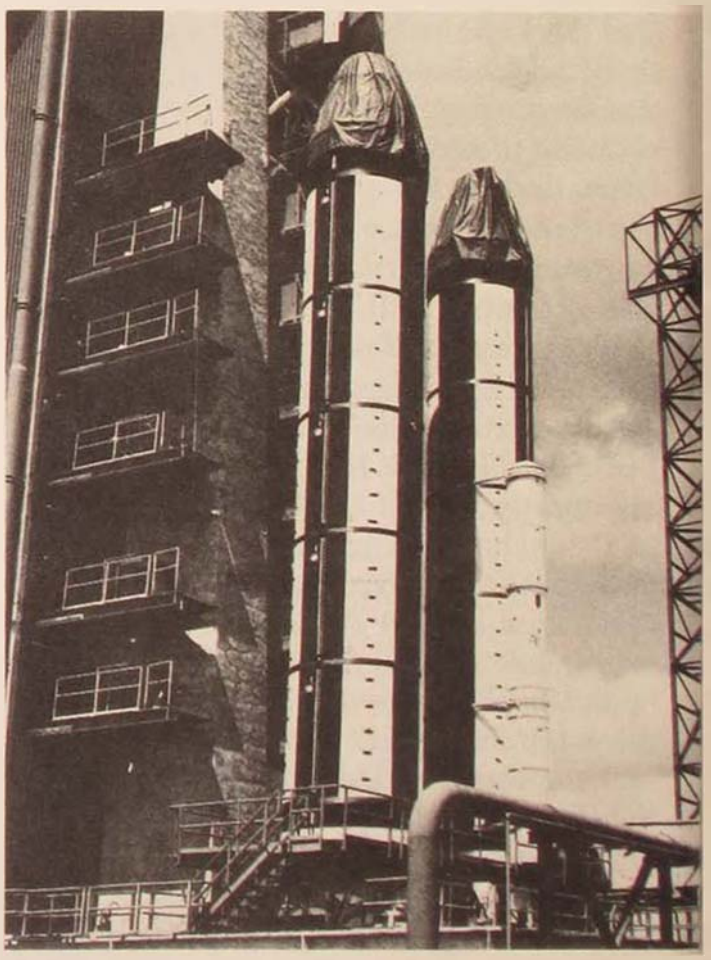
considered at the time was use as a boost engine in the three-million-pounds-thrust class. Lockheed and Thiokol have been involved in the testing of a 156-inch solid motor. In addition the Air Force and NASA have sponsored a small amount of work with a 260-inch motor.

Although no large NASA launch vehicle has ever used large solids for the prime boost propulsion (several Delta vehicles have used small solids for thrust augmentation), the Air Force experience with large solids is extensive and will be quite important during the shuttle booster development and certification, no matter which size of solid is finally selected. The Air Force has been launching the Titan IIIC from Cape Kennedy for a number of years, not to mention the solid-fueled Minuteman ICBM. This vast solid experience must not be overlooked.

initial shuttle development

During the late sixties, the basic shuttle ground rules were drawn, and the aerospace industry began analyzing every possible configuration. Clearly, with the scarcity of





The Titan IIIC solid 120-inch boosters and other large solid booster programs have given the Air Force valuable experience with solid motors similar to those that will be used to propel the space shuttle.

space funds, it was imperative that the right configuration be selected. There just was not enough money to reverse direction in mid-stream. But one point was clear from the start: the shuttle should be designed to replace all existing launch vehicles.

The initial ground rules stipulated that the shuttle's two stages would both be completely reusable. This would later be changed to a partially reusable system, but the initial configurations had both stages fully reusable.

The propulsion system ground rules remained rather stringent during this period. The same LOX/hydrogen propulsion system would be employed in different numbers in both stages. The upper-stage engine, however, would be equipped with an extendable nozzle, to increase the expansion ratio for vacuum operation.

Air Force influence in the design of this engine was also very significant. The Air Force during the mid-sixties had sponsored the Pratt and Whitney development of the XLR-129 reusable rocket engine. The engine used a closed combustion cycle that produced vacuum specific impulses of 444 seconds.

The XLR-129 contributed substantially to

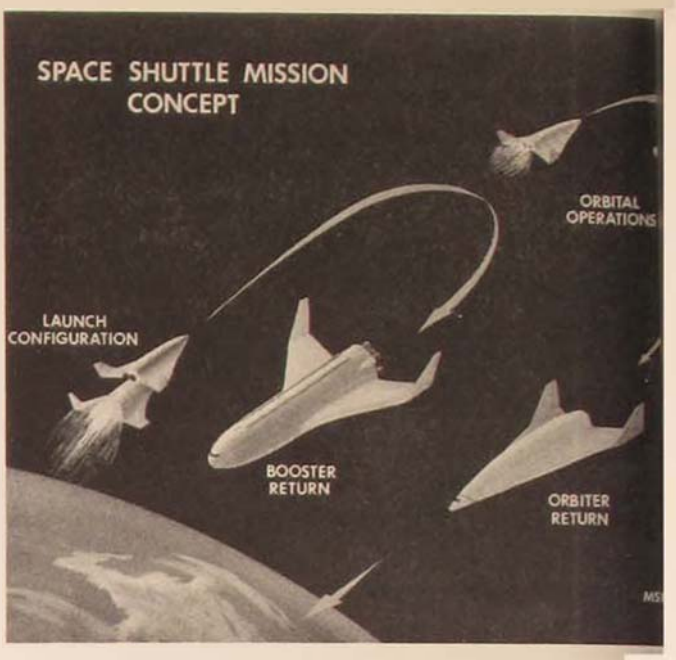
the staged combustion technology, which was provided to NASA and made available to all potential engine contractors. Rocketdyne's closed-cycle engine emerged the winner of the engine competition.

The completely reusable configurations studied were many and varied. General Dynamics studied a so-called "Triamese" concept. The advantage given for such a configuration was that its center of gravity remained on the center line of the vehicle at all times. Also, the aerodynamic shape of both stages was to be kept the same in order to reduce development costs.

The Martin Company suggested a fixed-wing, semi-ogee platform for the orbiter, which would provide an estimated hypersonic lift-drag ratio of 2.5 and a subsonic lift-drag ratio of about 8. The booster would be flown back by a crew located in the nose of the left-hand rocket stage, maintaining a high angle of attack until reaching subsonic speed, to minimize heating.

North American visualized a vehicle with outer wing panels that would fold downward from a vertical fin position to provide sufficient lift for the landing approach. Both the booster and the piggyback-mounted orbiter would have had the same shape.

Through the abundance of study concepts, NASA even looked at an air-breathing first stage for the shuttle. Advantages of such a system were that the vehicle could land at high speeds with a full fuel load following an aborted take-off, and it offered the ability to transfer to orbit planes not directly above the launch site. It is not at all inconceivable that a second-generation shuttle could be produced with an air-breathing booster before the end of the century.

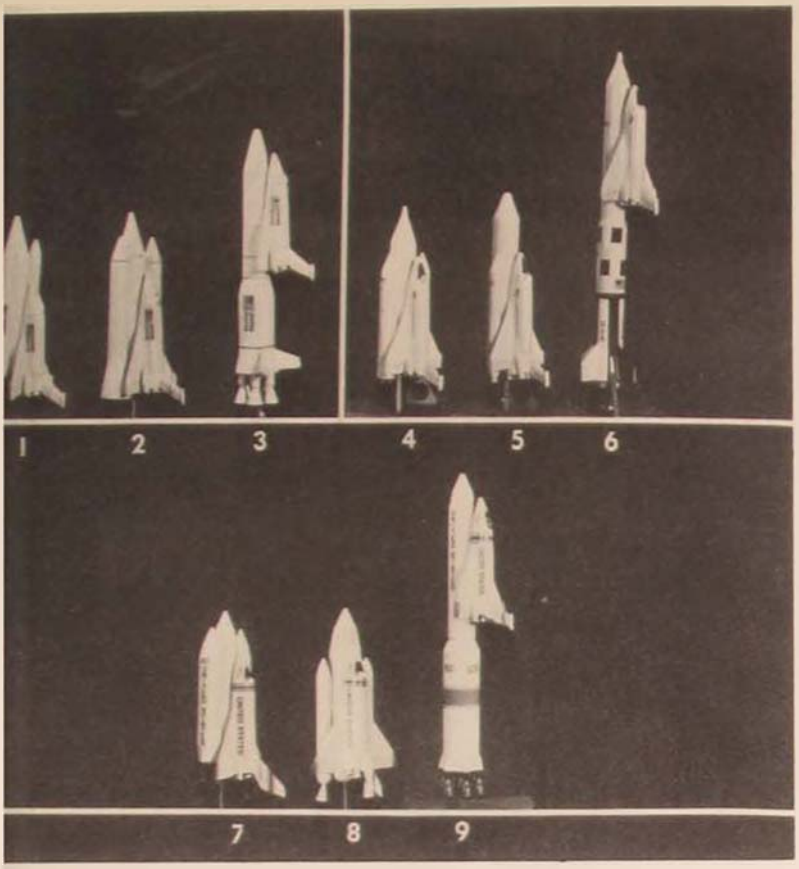


the expendable booster returns

The reusable configurations did not appear to be unreasonable from a technical standpoint, but the price tags made NASA stand back and take a long look. The cost was just too high to permit developing both the booster and the orbiter concurrently. In June 1971 NASA extended the study concepts to include a phased level of booster and orbiter development, with an expendable launch vehicle used to postpone the cost of developing a manned reusable booster.

The Air Force supported the extension of the study efforts because the phased-development approach offered the means to reduce early development risks and costs. The reusable orbiter could later serve as the second stage on a fully recoverable shuttle, but for its first years of operation it would be boosted to Mach 10 or more by a throw-away first stage powered by a large solid-fueled motor or inexpensive liquid-fueled rocket.

NASA asked the contractors to reposition the propellants of the orbiter in drop tanks located outside the orbiter. This redesigning in effect made the orbiter much smaller, since it no longer had to contain all the



In the launch and recovery profile of the initial space shuttle concept, booster and orbiter would return and be reusable. . . . Many different shuttle configurations were considered in the final deliberations.

propellants for boost purposes. The composition of the ultimate booster became a whole new ball game as the many expendable concepts were examined.

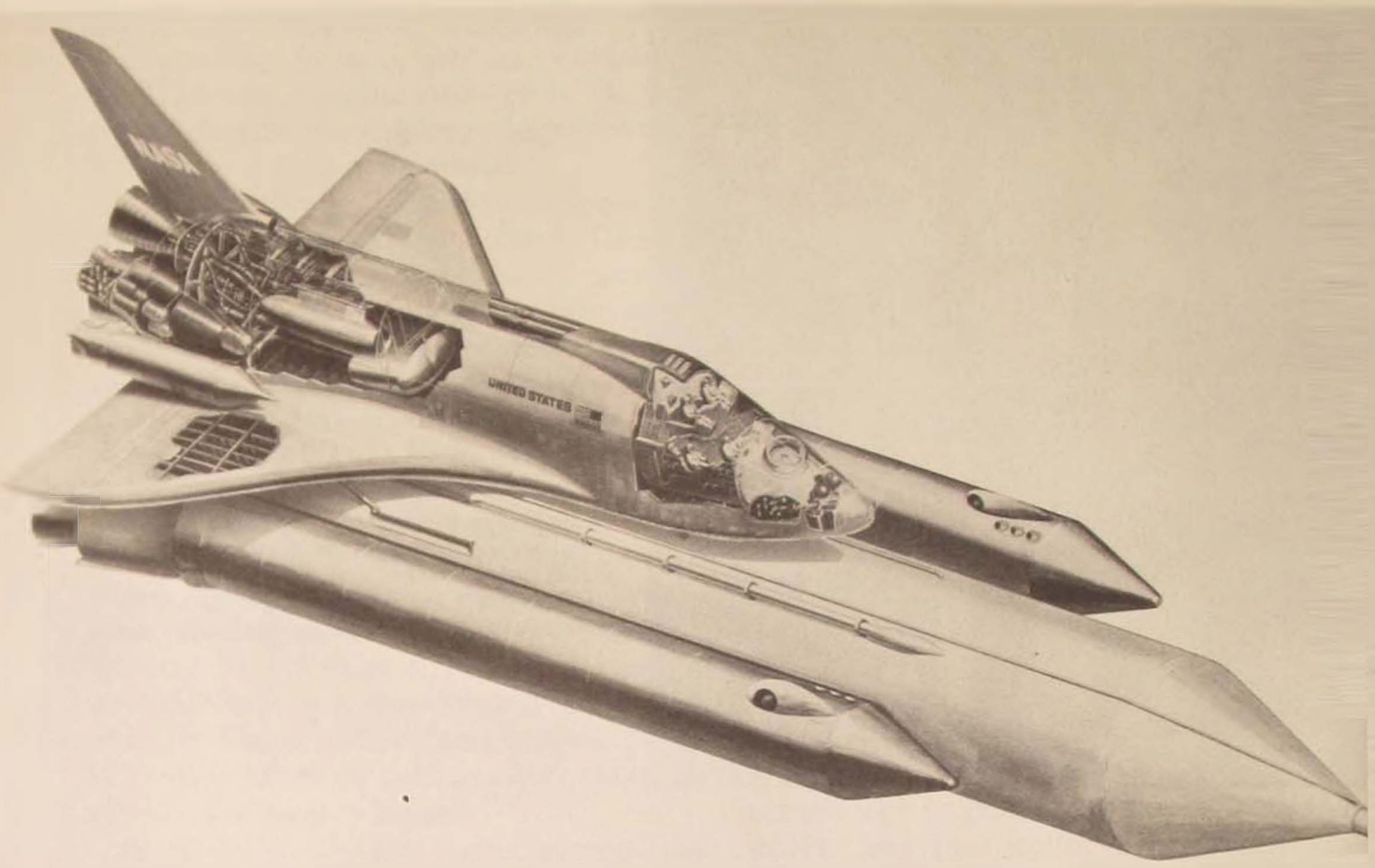
Both liquid pressure-fed and pump-fed propulsion systems were examined for the possible booster application. The pressure engines were given a good possibility of winning the competition. They were considered in both parallel and series burn configurations. In the parallel configuration, the boosters would have been attached to the orbiter's propellant tank. In the series configuration, the boosters were clustered below the now only single orbiter fuel tank, with the orbiter riding piggyback on the propellant tank. NASA felt that it would have been economically feasible to recover these pressure-fed boosters. To make them recoverable would have necessitated that they be heavy welded structures not unlike the Big Dumb Booster.

The Grumman/Boeing team also looked at a very interesting application of the Saturn V's first stage (S-IC). It was felt that the S-IC could be modified for water recovery at about half the cost of developing the pressure-fed boosters.

The S-IC would have been staged in series with the orbiter propellant tank. But the lower weight of the S-IC would have made it possible to add a retrorocket to the recovery system, thereby reducing the impact velocity below that possible with parachutes alone. It was also felt that the S-IC, which would have been equipped with wings, would sustain less damage and face less danger of sinking than some of the other concepts.

final configuration—the solids win

In March of 1972 the parallel-burn solid-propellant configuration was selected. In



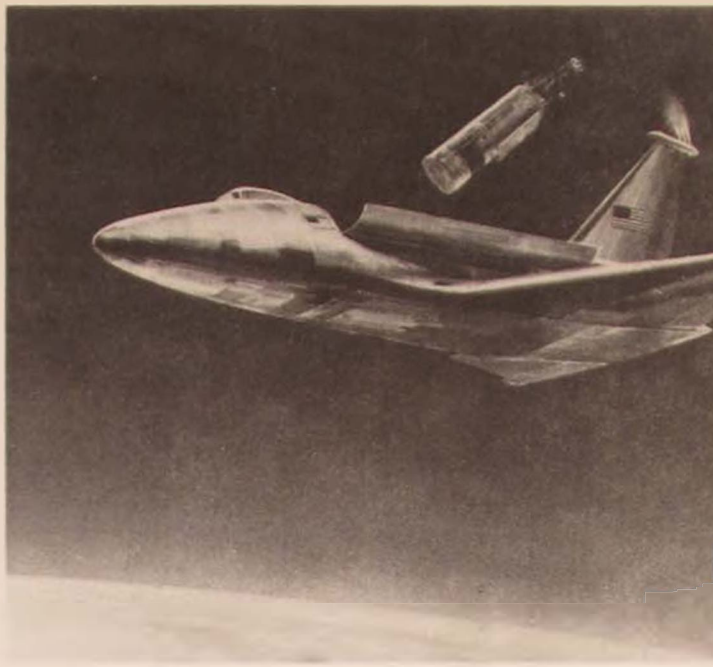
A cutaway view of the space orbiter as it rests on the propellant tank

this design the two solids that constituted the booster would burn in combination with the orbiter's propulsion system to provide the propulsive force for the initial portion of the flight. The orbiter propellant tank will be jettisoned just prior to orbit injection but will not be recovered. The solids, however, will be recovered.

There are problems when solid motor recovery is considered. By their very nature, solid motors use their combustion chambers as propellant storage space. As a result, there is a large hole in the back of the motor through which seawater can enter freely. Thus, the possibility exists that the booster might sink. NASA, however, has been looking into designs that would allow the burned-out case to take only a limited amount of water.

Several different concepts for recovering the solids have been considered. Goodyear Aerospace has proposed another possible

Orbiter in flight atop its fuel tank, a North American Rockwell conception



Orbiter opens cargo doors and sends to orbit an unmanned satellite.

technique using hot-air balloons. The balloons would be deployed after the booster was brought under control by a cluster of parachutes. Altitude of the hot-air ejection and inflation could be preset, radio determined, or controlled by an altimeter. Once stabilized and free floating, the booster would be lowered into the ocean with little or no damage.

The most likely recovery technique will use parachutes alone, probably ganged in threesomes. The chutes would deploy after booster separation and lower the booster to the water surface. The booster could be tilted to an upright position, the same technique that is employed in righting the returned Apollo command modules. Other concepts have considered retarding the rate of descent with retrorockets.

The booster recovery problem with the shuttle is not going to be an easy one to solve. While parachutes have been used to lower the Apollo crews safely into the ocean after each mission, NASA has not dealt with parachute loads as heavy as the solid boosters of the shuttle. Each is estimated to weigh about 100 tons. As each booster separates following the upward thrust phase, it will start the plunge back to the earth's surface and reach predicted speeds of more than 990 miles per hour before the parachutes check the descent. The booster will hit the water at about 45 feet per second.

the Air Force and launching the shuttle

The initial shuttle launch and landing site will be at the Kennedy Space Center, Florida. This site will be used for research and development launches expected to begin in the late 1970s and for all operational flights launched into easterly orbits. Facilities for all shuttle users at the Kennedy Space Center will be provided by NASA, largely through modifications of existing facilities that were built for the Apollo and other programs.

At a later time, it is planned that a second operational site will be phased in at Vandenberg Air Force Base, California, for

shuttle flights requiring polar inclinations. The basic shuttle facilities required at Vandenberg are to be provided by Air Force.

These decisions, which have been concurred in by the Department of Defense, were reached by the Administrator of NASA after nearly a year of study by a site review board. During the evaluation, the board reviewed data at all available alternatives, including 150 potential launch sites, and personnel associated with the evaluation visited more than 40 sites. Consideration was given to booster recovery, launch azimuth limitations, latitude and altitude effects on launch and landing performance, abort considerations, relative cost, environmental effects, and impact on present and future programs.

NASA Administrator Dr. James C. Fletcher stated that the board's studies showed that the Kennedy-Vandenberg combination has cost, operational, and safety advantages over any possible single site or any pair of sites in the United States.

Preliminary cost estimates for establishment of the development and operational facilities at Kennedy Space Center are about $150 million. This amount is a part of the total of about $300 million estimated by NASA for facilities required for the development, production, test, and initial operation of the space shuttle.

The operational facilities and equipment required at Vandenberg AFB are expected to cost about $200 million. This amount is compatible with the allowance for facilities in the estimates of future investment costs for shuttle operations included in the NASA and USAF studies, which concluded that the space shuttle will produce a substantial net savings in future civil and military space program costs.

Air Force stake in the shuttle

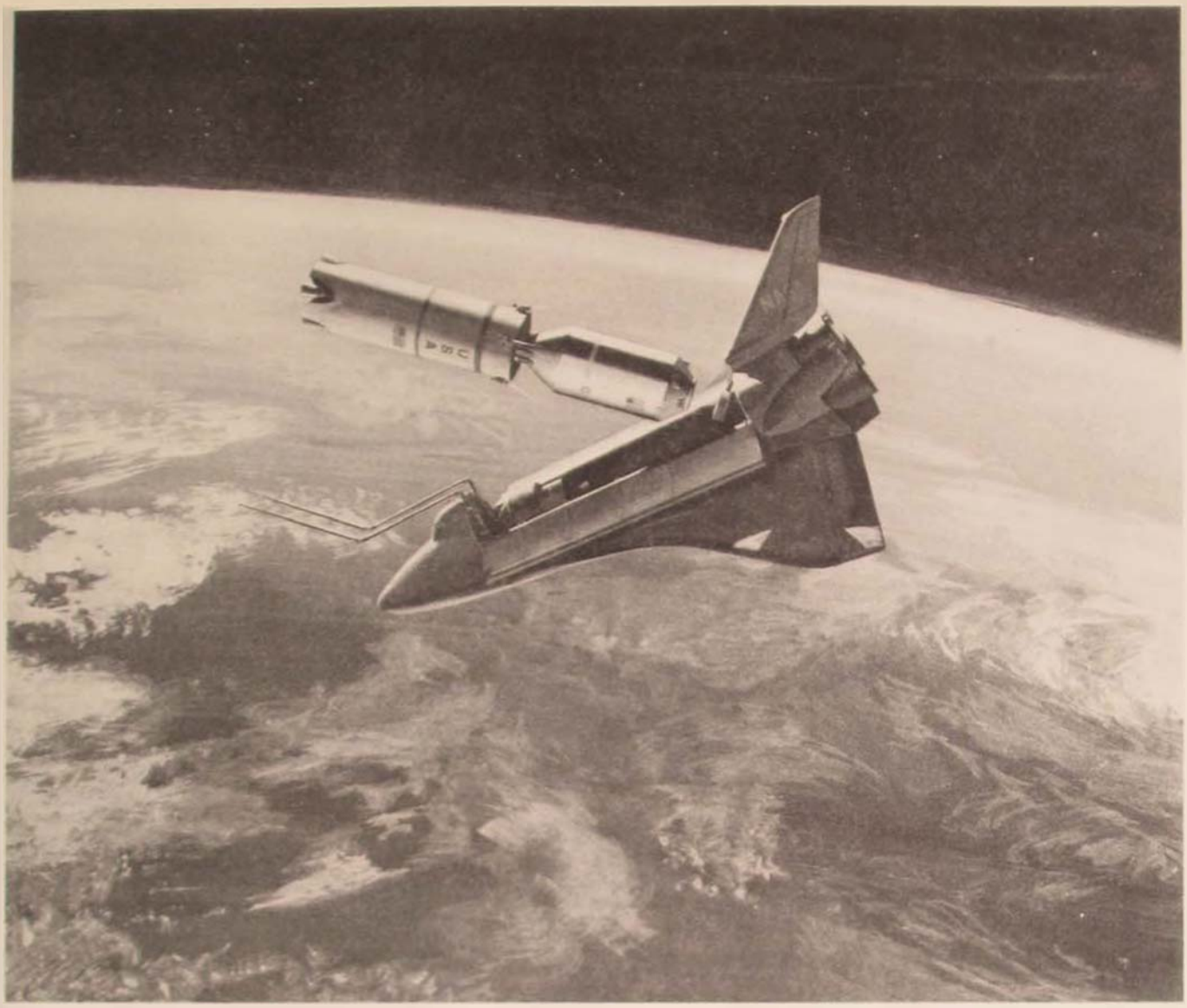
The Air Force's important stakes in the shuttle were typified in recent Congressional testimony by Secretary of the Air Force Robert C. Seamans:

> . . . the Air Force has been launching DOD satellites into orbit since 1959. Through these efforts we are now able to provide our forces with better communications, improved navigation, more precise maps, and better early warning.
>
> We are continuously assessing our military mission requirements against available technology and fiscal considerations. When space systems can best help us accomplish our military tasks, and are competitive in terms of cost and performance, we would expect to pursue their development. In the future, I anticipate that space systems will allow even further improvements in our defense posture.
>
> . . .
>
> I believe that the priority given to our space efforts should reflect the fact that our national security could be seriously jeopardized if another nation should move very far ahead of us in space technology.

To make better use of space systems, we must find ways to reduce the cost of operating in space and to improve our operational flexibility. Toward this goal, both NASA and the Air Force have conducted studies which show that cost reductions could be realized if boosters and spacecraft were reused, rather than discarded after a single use. From these studies we have also concluded that a properly designed Space Shuttle could permit the DOD and NASA to pursue promising space applications which are presently not feasible.

I would like to enumerate some of the ways a Shuttle could enhance our defense space operations.

The Shuttle could be used as an on-orbit test-bed to conduct development and qualification testing of new space systems and subsystems. On-orbit tests could allow our engineers to define potential technical problems and improve designs while in the prototype stage by testing under realistic operating conditions rather than in ground facilities built to simulate the space environment. This could offer significant savings by allowing us



The space shuttle orbiter delivers a satellite payload to earth orbit. The satellite is pulled away from the shuttle by a command-controlled space tug.

to prove the capability of a proposed system prior to undertaking the expense of developing an entire satellite.

Retrieval of payloads from orbit also offers the potential for refurbishment and reuse which could lead to more effective use of our space hardware.

Similarly, operational risks associated with the development of complex new space systems could be reduced. If a satellite should fail, it could be recovered by the Shuttle, returned to earth for diagnosis and repair, and operationally redeployed in a minimum of time with better confidence that the problem was resolved.

Also, by being able to better diagnose the causes of malfunctions that occur in space, we should be able to improve the design of future spacecraft.

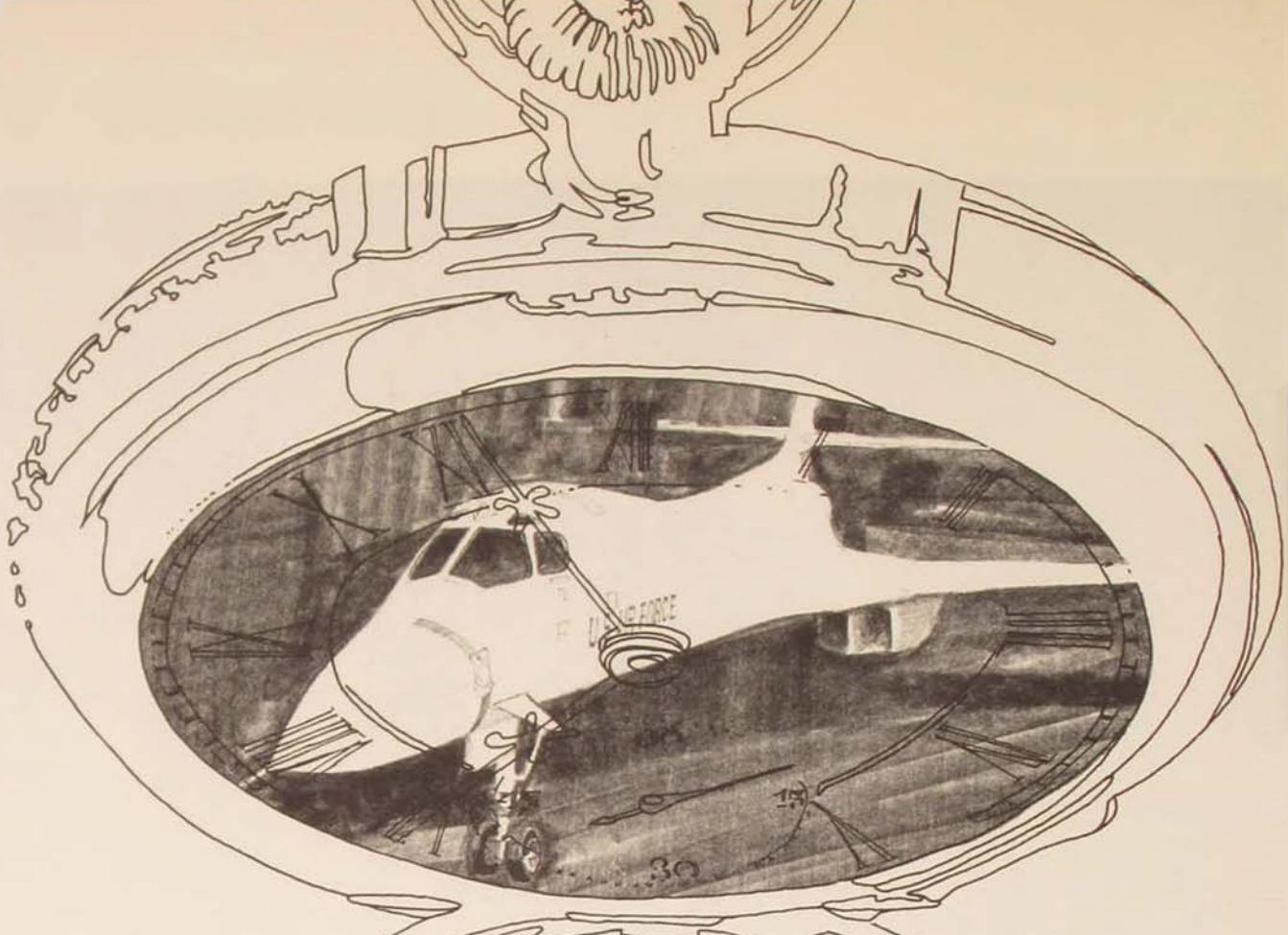
From an operational standpoint, the Shuttle will be designed to significantly reduce prelaunch checkout time with improved reli-

A test pilot "flies" a space shuttle simulator at North American Rockwell. . . . Lockheed engineers in a mockup of a space cockpit (far left) study film of airplane landing, to foresee problems shuttle pilots may meet.

ability and less dependence on ground support. This would allow a rapid response capability which could be invaluable during certain crisis situations.

So, ready or not—the space shuttle is coming! The Air Force has played an important part in developing it and will play an important part in launching it. Those in the Air Force interested in being a part of future U.S. space programs had best learn all they can about this one because it's going to be shuttling between earth and space for a very long time!

Integrated Systems Division,
Foreign Technology Division, AFSC



THE LEAD-TIME PROBLEM

Theory and Applications

LIEUTENANT KENNETH C. STOEHRMANN

AFTER years of hard work, a man decides to build his dream house. It is to be the most modern house imaginable, with all the latest innovations. After the design is approved, the contract is let, and ten months later his home is ready. Then a peculiar situation develops. All the innovations incorporated in the house have been either upgraded or superseded by newer, technologically superior innovations that have been developed during the ten-month building period. In short, the house is outdated because it took time to build it. The man vows that next time he will plan ahead to anticipate innovations not yet on the market. But how can anyone plan for innova-

tions or inventions that do not exist at the time of planning? How can anyone build something "modern" if it is planned for months or years in advance? This is the lead-time problem.

Be it a new house, a modern submarine, or a new generation of aircraft, the lead-time problem is always present. In the defense sector, the lead-time problem is essentially one of how to plan a weapon system today to be built tomorrow and to be effective against enemy threats, present and anticipated, the day after tomorrow. For example, the new Air Force B-1 bomber can handle most air defense missions to counter threats present today, but can it handle as yet undiscovered future threats? The new TRIDENT can be a well-nigh invulnerable launch platform today, but what about in the future if new antisubmarine warfare (ASW) techniques are developed by our enemies? And finally, can ICBM's be further hardened to withstand future overpressures from as yet unknown-sized hydrogen bombs?

The problem focuses around planning, both present and future, yet it is much more than that. The problem can be broken down into distinct parts, each of which is fraught with assumptions, probabilities, and possibilities. This is not to say that the problem is unsolvable if handled with care but rather to suggest that it is similar to trying to erect a building on a sand base; a shaky foundation does not give one much to start with. Nevertheless, the parts of the problem can be isolated into 1) planning, 2) speculation, 3) time constraints, and 4) research, development, testing, and evaluation (RDT&E). Of the four, speculation is by far the most crucial and least scientific, while time constraints are sometimes determined by RDT&E, and planning sets the stage for the entire

process. Analysis of each of these parts clearly shows the complexity and difficulty of the overall lead-time problem.

Speculation, or assessment of the future vis-à-vis the system under consideration, is the "sand foundation." Without going too deeply into the discipline of futurology (Herman Kahn's Hudson Institute, the Club of Rome, etc.), suffice it to say that this aspect of the problem is coming under increasing scientific rigor. Probabilities are traded for certainties as trends are analyzed to predict future postures. As pertaining to the lead-time problem, though, assessment of the future presents a curious paradox, mainly because such assessment involves predicting the future of a potential enemy. The uncertainties involved are not hard to handle since

> . . . there are simple techniques for dealing with uncertainties which make it possible to point out the major ones for the decision maker and indicate their significance. In fact, rather than conceal uncertainties, a good analysis will bring them out and clarify them. A best guess, of course, is not the same as certain knowledge. It is desirable to examine the available evidence and determine the bounds of uncertainty.[1]

The area of concern is with the enemy. Assume the United States is developing a new aircraft to counter Soviet air defenses. Obviously, American scientists and planners do not have access to the Soviet files on air defense R&D, future deployments or developments. Therefore, the United States can only predict what the Soviets will have as a defense against a new aircraft by analyzing the only air defense R&D files available: its own. This means that U.S. assessment of future Soviet air defense is done by making an assessment of the future American air defense system. This line of reasoning is based on one crucial assumption: that Soviet R&D and American R&D are proceeding at approximately the same rate. This assumption is quite defensible as it concerns the two superpowers.[2] It would come into question, however, if a nation such as China, with inferior technology, assessed a potential enemy, say the Soviet Union, in this manner.

This instance aside, the paradox is still present. With the United States making its assessment of Soviet air defenses based on America's air defense future, the paradox emerges. An American counterpart to the aircraft planner in air defense is trying to analyze the future of the Soviet aircraft in the same manner, i.e., based on American R&D in aircraft survivability. In other words, as the aircraft planner assesses American air defense of the future, he designs an aircraft to counter these defenses. The air defense counterpart sees this new American aircraft and tries to design a new air defense to counter it (a counter to a counter, if you will). The chain grows ad infinitum. Thus, in assessing a potential enemy, one must consider the possibility that the new system will be outdated before it is even built. Proof of this is evident in the appropriations by DOD where an increase in spending on offensive weapon systems is often coupled with an increase in spending on the specific defensive system concerned with negating the offensive system.

The problem is further compounded by the same paradox on the Soviet side, so the task of ever designing an aircraft to penetrate future Soviet defenses is even harder. Yet somewhere in this circular maze a decision must be made to go ahead with RDT&E on a system that the planners and analysts feel is worthwhile. From here on, the die is cast and a commitment has been made.[3] In actuality, the problem now becomes one of cost-effectiveness. When is it cost-effective? When is it cost-effective to proceed with RDT&E instead of holding out and trying to speculate on future threats? This is the hardest decision that must be made. The effects of these decisions are numerous and bear

directly on the overall arms race spiral.[4]

With speculation proving to be a very tricky area of concern, the time constraint factor is another that requires assessment, namely, how far into the future a planner should try to assess the threats to the new system. This becomes a function of, among other things, the time needed from the drawing board to operational readiness (the RDT&E split into R&D time and T&E time) and the life expectancy of the new system. Using the new aircraft example once again, a planner must decide the limits of these two factors and add their sum to the date at which the decision to begin RDT&E is made. In other words, if the RDT&E time of the system is 8 years[5] and its life expectancy is 20 years, the assessment period should be for at least 28 years. A problem arises with this in that the time between the beginning and end of the assessment period is lost. Obviously, since this lost time must be taken from either the RDT&E or life-expectancy portions of the system's life, the shorter the assessment period, the better chance the new aircraft has of countering future air defense threats. The problem can be overcome somewhat by adding the assessment period to the RDT&E period, but this now requires another assumption concerning the length of the assessment period. The whole lead-time problem is now compounded further by another speculation factor.

The time constraint part of the problem is not one that cannot be overcome, and it is crucial to the entire lead-time problem. How long is RDT&E? That could easily be a function of how different (both quantitatively and qualitatively) the new system is from the previous one. Existing technology as well as new advancements also plays a major role. How long should life expectancy be set at? Again, it is a function of many things, not least of which is the state of the technology being used to build the new system and the assumptions (again!) made about future technology (e.g., whether the new system can be modified in the future as was the F-104G for West Germany). So now, besides making assumptions about future Soviet technology (and hence its potential as a threat) based on American technology, the planner must question American technology itself as it applies to the RDT&E and life-expectancy aspects of the new system.

The time constraint contains the seeds of a paradox in the circular nature of the assumptions concerning technology. In using technology to assess both Soviet threats and American capabilities, the temptation is to use a double standard in trying to measure this technology. Here the problem arises. A planner might want to be more liberal in his assessment of technology vis-à-vis the threat (i.e., it is probably better to assess a threat that does not materialize than fail to assess one that does). Such liberal tendencies should be avoided when assessing American technology in building and maintaining the new system (i.e., if technology cannot produce the new system, the planner has wasted time, money, and security). Here is the paradox: to be liberal in one area while being conservative in another in assessing the same thing (in this case technology) is logically impossible while maintaining a single standard.[6]

The third part of the lead-time problem is that of RDT&E. Even though an estimate can be made on the time allowed for RDT&E, this estimate is subject to numerous pressures that can force its alteration. If alteration does occur, the extra time needed for RDT&E would have to come out of the only phase of the system's time constraints not yet utilized, the life expectancy of the system, possibly causing the entire project to be non-cost-effective. A classic example of this is the F-111 (or TFX as it was originally designated). After being designed as a Navy fighter, it was modified numerous times to fit a variety of needs against an expanded number of threats.

The aircraft was built along the accepted line of thinking in the early 1960s that

> projects were approved on the basis of a given technology. Then new technologies evolved. These were swiftly perceived as new opportunities for greater "performance" and as making the preexisting techniques obsolete. Changes were approved, and with them higher costs, delays and unforeseen technical problems as the new techniques were merged with the rest of the system.[7]

The result was a simple case of trying to make one system do too much (hence the Navy's cancellation), which resulted in the increased costs and delays. Even though the FB-111 is now operational, its life expectancy has been shortened to the extent that it will become technologically obsolete in the near future. It is not that the FB-111 is a bad aircraft. Rather, by trying to make it suit too many tasks, RDT&E was stretched out to such an extent that that period almost coincided with the life expectancy of the aircraft.[8]

The RDT&E aspect is further complicated by the paradox discussed under time constraints. The use of technology for two purposes (to build a system and evaluate the future enemy threat) means that RDT&E in one area feeds on the RDT&E (mostly R&D) of the "opposing" section.[9] Breaking out of it to build a system requires more RDT&E (now mainly T&E), the lessons learned here supposedly being applied to the next-generation system in that particular category under RDT&E as well as to the opposing system. Thus, if a new aircraft is T&E'd and something new is found to counter it, air defense planners will immediately begin their own RDT&E to exploit this new weakness in the aircraft, hoping that the Soviet counterpart aircraft has this weakness too. Only careful planning, the final area under analysis in this study, can prevent planners from becoming trapped in this circle to such an extent that a new system is justified solely on "technological response" grounds. As one opponent of the B-1 has stated in stressing this point,

> The United States is now almost committed to a new strategic B-1 bomber, justified in large part in response to projected Soviet air defense improvements it is now very plausible to expect will never arise—and which makes little difference in any case.[10]

Thus planning, the final area of consideration, is a somewhat catch-all phase that requires a special characteristic absent in many present-day decision-making apparatuses, common sense. In planning, the overall lead-time problem is most apparent. The time periods of all other facets of the program are summed up to produce the overall "time line" of the new system. The immense space between the beginning of the idea and the operational readiness date is the lead time even though the assessments made must take into account the life expectancy of the new system. If a planner can't see the forest for the trees in this overall planning facet, it is easy for him to jeopardize the entire system by centering on one particular facet, hardening parochial views and dooming the system to failure. Each facet must be viewed in the context of the entire lead-time problem. The planners who can do this are probably the most worthwhile assets to the entire system.

Even though common sense overshadows the entire problem, there are specific aspects of planning that must be coordinated and applied to the overall political/economic/military situation that the nation finds itself in. Furthermore, planning must be closely in tune with that most crucial area, financing. Simply stated, it is hard to convince anyone, much less a Congress skeptical regarding defense matters, that system X is needed to counter future threats A, B, C, and D when A, B, C, and D do not exist. This of course involves the political/economic/military aspects of those systems as

well as their effects on future political/economic/military situations. Arguing that a new aircraft is needed against as yet undiscovered and possibly nonexistent threats is easily countered with the argument that these future threats will not be developed by the enemy if we do not develop an aircraft that can counter present threats. Leaving aside for the moment the idealistic and moralistic assumptions implicit in that counterargument, one can easily see that neither side has a solid case. Ultimately the problem rests on the issue of trust: if "we" do not build something to counter present threats, "they" will not build new threats. This means that our force is vulnerable to present threats, i.e., we are at a strategic disadvantage. To be at an advantage, we must build the systems needed, thus putting them at the disadvantage. Without delving into philosophy (Why do we need the advantage anyway?), suffice it to say that the entire idea of a "zero-sum" game is extremely complex and crucial to the entire planning facet of the problem. Most officials in both the military and the government are not willing to accept being on the "short end" of the advantage-disadvantage spectrum. Much can be said, however, for the cooling effect if both sides should adopt the idea of "strategic sufficiency."

If a planner can convince the Congressional powers who control DOD appropriations for defense projects to allocate money for a particular system, a new question arises: How do the planners disburse it? In the overall plan for a new system, the factors of speculation, time constraints, and RDT&E have been integrated to produce a linear scale of time. The money given to each factor can greatly affect the pace at which the system moves along this scale. For instance, small amounts of money alloted for R&D would slow the process of developing the system from the drawing boards to the metal-cutting phase, thus forcing other parts of the time scale to be shifted downwards along the line. Since the final point on the scale (the end of the system's life expectancy) is fixed during the initial assessment period, the lengthening of the R&D time necessarily shortens other areas, usually the life expectancy of the system, unless growth considerations are a part of the planning and design. As mentioned previously, the entire system might now not even be cost-effective. A similar argument can be made for each section of the time spectrum. As will be seen in the following analysis of two weapon systems, even the best planning cannot make up for fluctuations in funding and shifts along the time line.

This analysis of the theoretical issues involved with the lead-time problem does not attempt to offer solutions to the problems raised. Rather, it is to serve as a basis for the following study of two current advanced strategic systems, the B-1 bomber and the TRIDENT, and the attempts to cope with the problems. Because of their ongoing nature, the 20/20 hindsight analysis often found in assessing such systems is not currently available. What can be analyzed is the daily complexity of these problems and the steps taken so far to combat the many issues mentioned in this theoretical overview.

Practical Applications

The four areas previously discussed as comprising the lead-time problem are all present in the specific instances of TRIDENT and the B-1. While different methods have been used to treat these problems, it is obvious at this time in their respective development stages that the handling of these systems is radically different from the handling of previous defense contracts.[11] Consequently, optimistic predictions concerning costs and performance are being proliferated throughout the defense establishment. The

reasons for such statements lie in the treatment given to the lead-time problem.

In the area of speculation, planners of both TRIDENT and the B-1 have been careful to stress general enemy defense characteristics rather than specific threats. Therefore the development of each of these systems is geared towards a variety of improvements over its predecessor, the Polaris and B-52 bomber respectively,[12] to incorporate technological advances that have also been used to increase the enemy's ability to counter the older systems. These assessments of technology are being made on the assumption of equality in technological advances between the United States and the Soviet Union. This seems to be a safe assumption, as Dr. John S. Foster, Jr., realized when he remarked, "The United States can no longer feel assured that it has unquestioned technological superiority over the Soviet Union."[13] Finally, the paradox mentioned previously concerning the use of American technology to assess Soviet threats is indeed present, but, as explained, it offers the only basis for study. Uncertainty still exists, but careful analysis has reduced it as much as possible.

The second area of concern is time constraints. In the B-1 and TRIDENT examples, these restraints are already present although no prototypes have yet been built or tested. The double-standard problem is present (as one writer has maintained, the entire lead-time problem is a problem of using two sets of assumptions about one's technology in order to make different cases[14]) although, as already mentioned, the use of general threat analysis rather than specifics has decreased use of the double standard. What is somewhat disturbing is the contention that American technology can build these new systems without any trouble.[15] This, of course, means that specific time tables for RDT&E have been set up, such as the following one put forward by Secretary of the Air Force Robert C. Seamans, Jr., for the B-1:

> We propose to continue with that activity, a developmental activity; more wind tunnel testing, much more structural testing, and much more engine testing leading to the construction of three prototype aircraft. We anticipate the first flight in April 1974, following which we plan to flight test these aircraft for a year's time, before making a production decision, if one is made.[16]

Such schedules are not inherently bad, but they do add a sense of rigidity to the overall time spectrum and could force Congressional appropriations to waver if the schedules are not adhered to. While no statements have been made as to the life expectancy of either system, it still remains a truism that increased RDT&E times will necessarily cut into life expectancy of each system. Undoubtedly, former Deputy Secretary of Defense David Packard's "fly-before-buy" idea is indeed an improvement in system acquisition, but careful planning is needed to assure that T&E is not stretched out to such an extent that the new system is effectively outdated when the decision concerning procurement is finally made.

This, of course, cuts into the third area of the lead-time problem, that of RDT&E. Unfortunately, neither system is in the T&E stage of development yet, and R&D is continuing under a great deal of secrecy. Thus, not much concrete specific evidence can be added to the overall Packard dictum.[17] One facet has emerged in the B-1 program that might serve to set the pace for future endeavors in RDT&E. Contrary to the RDT&E of the F-111, the B-1 is attempting to use proven equipment as part of the total system, thus cutting down RDT&E quite significantly.[18] This means that dependence on new technology to produce the new systems as well as test and evaluate them is not as strong as in previous systems. This is occurring without sacrificing the needed improvements that the systems will incorporate. Finally, RDT&E continues to feed the "counter" forces in the

defense of such systems as discussed previously.[19] In sum, it would seem that TRIDENT and B-1 development is taking a new approach to RDT&E, one that cannot be objectively evaluated until the systems become operational.

The final area in the lead-time problem is planning. In both TRIDENT and the B-1, planning has been very thorough and detailed so as not to incur the wrath of Congress through cost overruns, delays in procurement, and legal battles.[20] It is in this stage that the greatest improvements in combatting the lead-time problem can be seen. Planners with common sense seem to be in control, as both systems now reflect concerned and deliberate planning in order to ensure continued Congressional support and introduction of these systems into service on schedule.

At present, the overriding problem in the planning of both systems is Congressional funding. The political/economic/military issues are being hotly debated in Congressional committees every day as the Defense Department asks for increased monies to spend on TRIDENT and the B-1. The issue of trust has become central to the entire discussion, as many Congressmen feel that "the concept of strategic mix, like so many other doctrines, seemed to evolve after the technology was developed rather than before." [21] Conflicts arise between military leaders and Congressmen as to whether the United States needs to have the advantage in the "zero-sum" game. These debates continue even though money is appropriated by Congress for the systems.

The present status of TRIDENT and B-1 financing continues the trend of increased funding over the years, but many less well-known facets of such financing are important. Both systems have incorporated inflation factors into their cost estimates.[22] Both systems continually revise cost estimates (and in the case of the B-1, RDT&E estimates too) to keep unit costs as near to the original estimates as possible. Finally, both systems have already set out monetary allocations for each stage of the time spectrum so as to

	Prior to FY70	FY70	FY71	FY72	FY73		
TRIDENT	$105	$10*	$44**	$110***	$942	unit cost	$1000 - sub + missiles $750 - sub only

* $20m was originally asked for.
** Actual funding was $45m.
*** This has since been updated to $140m.

remarks

- FY73 costs include $400m for construction and procurement.
- Accelerated TRIDENT program adds $1.0 billion a year in costs.
- Total system cost is estimated at $15.0b for 20 boats.
- Funding beyond FY73 is approximately $13.8b.
- Ten-year operating cost is estimated to be $2.3b.

Figure 1. Funding of TRIDENT strategic system in millions of dollars

be able to keep each facet of the spectrum to its original length. These allocations are of a specific nature.[23]

One particular aspect of the TRIDENT program points out quite graphically the powerful effect that finances have on systems being developed. There has been talk of accelerating the TRIDENT program to put the first systems into operation in 1978 instead of 1981. This switch was approved by Secretary Laird and reflects a decision taken after careful overall planning.[24] This accelerated program cuts off three years in the RDT&E and assessment stages and, at an average cost of $1 billion per year, puts the system into service.[25] Obviously it is wrong to equate the time decrease to the money spent, but the relationship between the two does exist to some degree and should not be lightly disregarded.

FROM this analysis it is clear that 1) the lead-time problem is present in actuality, not just in theory, and 2) it is being handled by present planners and analysts in various ways, all designed to bring about a cost-effective weapon system. The two examples have shown how the problem is being handled, but one should not forget that

> a decision by the Secretary of Defense to develop, procure, or operate a weapon system affects not only the current defense budget but future budgets as well, the latter far more than the former as a rule. When he decides to begin the engineering development of a new system, with procurement presumably to follow, he initiates a stream of expenditures which can eventually include development, procurement, and operating costs and maintenance costs of the completed system.[26]

With world and national resources becoming scarcer, the United States must order its priorities. This obviously will involve the defense establishment and its problems and policies. Successful understanding and coping with the lead-time problem, inherent

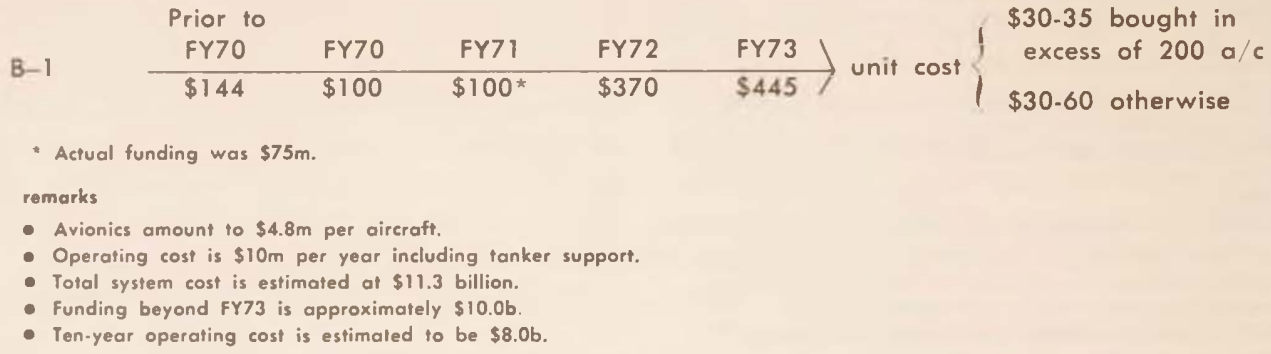


Figure 2. Funding of B-1 strategic system in millions of dollars

in development and acquisition of every DOD system, can only serve to fortify DOD's case and increase its strength in the overall bureaucratic maze that American government has become.

Fletcher School of Law and Diplomacy

Notes

1. Alain C. Enthoven and K. Wayne Smith, *How Much Is Enough?* (New York: Harper and Row, 1971), p. 70.
2. See statement by Dr. John S. Foster, Jr., concerning this issue in U.S. Congress, Senate, Subcommittee of the Committee on Appropriations, *Department of Defense Appropriations, FY73, Department of the Navy*, 92d Cong., 2d sess. (Washington, 1972), pp. 693–94.
3. See Dr. Foster's critique of the B-1 in this regard in U.S. Congress, Senate, Subcommittee of the Committee on Appropriations, *Department of Defense Appropriations, FY73, Department of Defense*, 92d Cong., 2d sess. (Washington, 1972), p. 690.
4. See comments on this by General Otto Glasser, DCS/R&D, Hq USAF, in U.S. Congress, Senate, Subcommittee of the Committee on Appropriations, *Department of Defense Appropriations, FY73, Department of the Air Force*, 92d Cong., 2d sess. (Washington, 1972), p. 686.
5. See Andrew Pierre, "Nuclear Diplomacy: Britain, France and America," *Foreign Affairs*, vol. XLIX, January 1971, p. 289.
6. Not all agree that assessment of an enemy should be liberal. "Overestimates do not necessarily lead to insurance and safety; they may lead to the pricing of important capabilities out of the market and to strategies of despair." Enthoven and Smith, p. 70.
7. *Ibid.*, p. 28.
8. F-111 costs have risen 280% from $2.8m to $8.0m per unit. Members of Congress for Peace Through Law, *The Economics of Defense* (New York: Praeger, 1971), p. 79.
9. See Melvin R. Laird, *Defense Program and Budget for FY73* (Washington: U.S. Government Printing Office, 1972), p. 68.
10. Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, DOD*, p. 1154.
11. See Charles Murphy, "The Pentagon Enters Its Era of Austerity," *Fortune*, December 1972, pp. 144–50.
12. Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, DOD*, pp. 420–21.
13. *Ibid.*, p. 688.
14. Enthoven and Smith, pp. 232–33.
15. Laird's comment concerning TRIDENT: "We have not built one of these submarines, but I can assure you . . . that we have the technology and the capability to do it." Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, DOD*, p. 413.
16. Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, Air Force*, p. 69.
17. Murphy, "Era of Austerity," p. 144.
18. Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, Air Force*, p. 75.
19. Funding for ULMS increased from $140m in FY72 to $942m in FY73 while ASW funds increased also. The B-1 funding went from $370m in FY72 to $445m in FY73 while air defense funding rose from $348m in FY72 to $695m in FY73. See Laird, *Defense Budget and Program*, FY73, p. 68.
20. Such a legal battle is developing over the Navy's F-14 and Grumman. See "Grumman v. the Navy," *Time*, December 25, 1972, p. 68.
21. *Economics of Defense*, p. 101.
22. Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, Navy*, p. 106, and *DOD Appropriations, FY73, Air Force*, p. 73.
23. See Admiral Zumwalt's discussion of ULMS in Subcommittee of the Committee on Appropriations, *DOD Appropriations, FY73, Navy*, p. 106.
24. *Ibid.*, p. 1439 gives the history of ULMS.
25. Charles Schultze *et al.*, *Setting National Priorities, The 1973 Budget* (Washington: Brookings Institution, 1972), p. 98.
26. Enthoven and Smith, *How Much Is Enough?* p. 48.

This article has been adapted for *Air University Review* by Lieutenant Stoehrmann from a paper prepared as part of his academic work while assigned under the Air Force Institute of Technology program to the Fletcher School of Law and Diplomacy, Tufts University, Medford, Massachusetts.

INTELLIGENCE AND INFORMATION PROCESSING IN COUNTER-INSURGENCY

DR. CHARLES A. RUSSELL
MAJOR ROBERT E. HILDNER

THROUGHOUT the history of warfare, from Biblical times to the present, accurate and timely intelligence has been of singular importance in the conduct of military operations. Most successful military leaders have clearly acknowledged the contribution intelligence can and does make to the achievement of victory.

In the years following World War II, intelligence assumed added importance with the outbreak of insurgency in many areas of the world, either as a result of the exploitation (frequently by Communists) of political, economic, and social injustice or because of the rise of nationalism and the concomitant disintegration of prewar colonial empires.[1] Faced with the task of combating an elusive and often shadowy enemy deeply submerged in the indigenous population, governments and their military/internal security forces quickly realized that if they were to identify, locate, and destroy the insurgents, an efficient and effective intelligence service was essential. All too often, however, the government and its internal security forces had neither an intelligence system nor the basic framework upon which one could be built. By the time an effective intelligence network was created and operating, the guerrilla movement was firmly established, and the task of isolating and neutralizing it was not only extremely difficult but time-consuming and costly as well.[2]

Those governments that were able to create effective intelligence organizations and use them efficiently were normally successful in their counterinsurgency efforts. This was particularly true of the British campaign in Malaya from 1948 to 1960 and the Philippine operations against the Huks from 1946 to 1954.[3] In both instances, accurate and timely intelligence was a crucial factor in defeating the insurgents. On the other hand, inadequate intelligence was a significant weakness in the French campaign against the Viet Minh in Indochina.[4] By contrast, a much-improved French intelligence effort in Algeria was an important element in successful French operations against the Algerian National Liberation Front (FLN).[5]

Thus, in many of the popular writings on counterinsurgency that have emerged in recent years, intelligence is regarded as the *sine qua non* of success. Sir Robert Thompson, a leading exponent of the value of intelligence in counterinsurgency, perhaps expressed it best:

> If subversion is the main threat, starting as it does well before an open insurgency and continuing through it and even afterwards, it follows that within the government the intelligence organization is of paramount importance. In fact I would go so far as to say that no government can hope to defeat a communist insurgent movement unless it gives top priority to and is successful in building such an organization.[6]

Although intelligence is recognized as an integral and indispensable element of counterinsurgency, the major focus of its application has been against rural-based guerrilla movements. This is a natural consequence of the modern experience in counterinsurgency, which has been derived primarily from combating insurgency centered in the countryside rather than the cities. Yet there is increasing evidence, particularly in Latin America, to indicate that the focus of insurgency may be shifting from a rural to an urban environment.[7] Should this shift continue, it will not only have a marked impact on current counterinsurgency strategy and tactics, virtually all of which have been formulated in response to rural insurgency, but also will place unprecedented demands on intelligence.[8]

The increased demands on a government's intelligence/internal security apparatus stem from the very nature of urban insurgency itself. Lacking the need for the rural

guerrilla's conventionally organized military forces, the urban guerrilla instead depends, at least initially, on much smaller core groups of dedicated and well-trained "political revolutionaries." Maintaining no fixed base and operating relatively independently of any centralized command structure, the urban guerrilla surfaces more briefly, strikes more swiftly, and disappears more quickly than does his rural counterpart.[9]

Using readily available commercial and public facilities to satisfy his basic survival and operational need for food, clothing, shelter, transportation, and communications, the urban insurgent relies on the anonymity inherent in the urban environment, coupled with tight security and rigid compartmentation, to protect him and his organization. Under such conditions, unless the urban guerrilla is engaged in some form of overt activity clearly and directly in support of his revolutionary goal, such as robbery, kidnapping, or assassination, he is invisible to both the police and the intelligence/internal security apparatus, and his organization is virtually impenetrable.

Despite these advantages, the urban guerrilla knows full well that a small group, no matter how dedicated, is unlikely to succeed in overthrowing the government. In order to succeed, he must expand his organization, not only in numbers but also throughout various segments of the society. At this point the urban insurgent movement becomes vulnerable to penetration by the government's intelligence service. To achieve penetration, however, requires a massive intelligence network extending throughout every segment of the society or at least those segments likely to prove fertile ground for recruiting by the insurgents.[10] A massive intelligence network is needed not only to insure that the intelligence service knows when the recruiting begins but also to insure that a sufficient number of the intelligence service's agents are recruited into the insurgent movement. A large number of penetration agents is essential because of the security practices, particularly compartmentation, employed by most guerrilla organizations. Without extensive penetration, it is extremely difficult to obtain a comprehensive picture of the insurgent's organization, capabilities, plans, and objectives and to identify its leadership core.

Effective intelligence, however, requires far more than the mere acquisition of information. As Nathan Leites and Charles Wolf, Jr., point out:

> The ingredients of effective intelligence organization and operations are numerous and complex. An effective system requires not just collection of information from multiple sources (some degree of redundancy is essential) but also processing, classifying, evaluating, storing, and retrieving information. Indeed, modern technological progress in information processing and handling is probably more important for counterinsurgency than are changes in weapons technology.[11]

Thus, the speed, accuracy, efficiency, and effectiveness of information processing, particularly the collating and retrieval aspects, are of critical importance not only to the success of the intelligence effort but also to the overall success of the counterinsurgency program itself. The reasons for this importance are threefold.

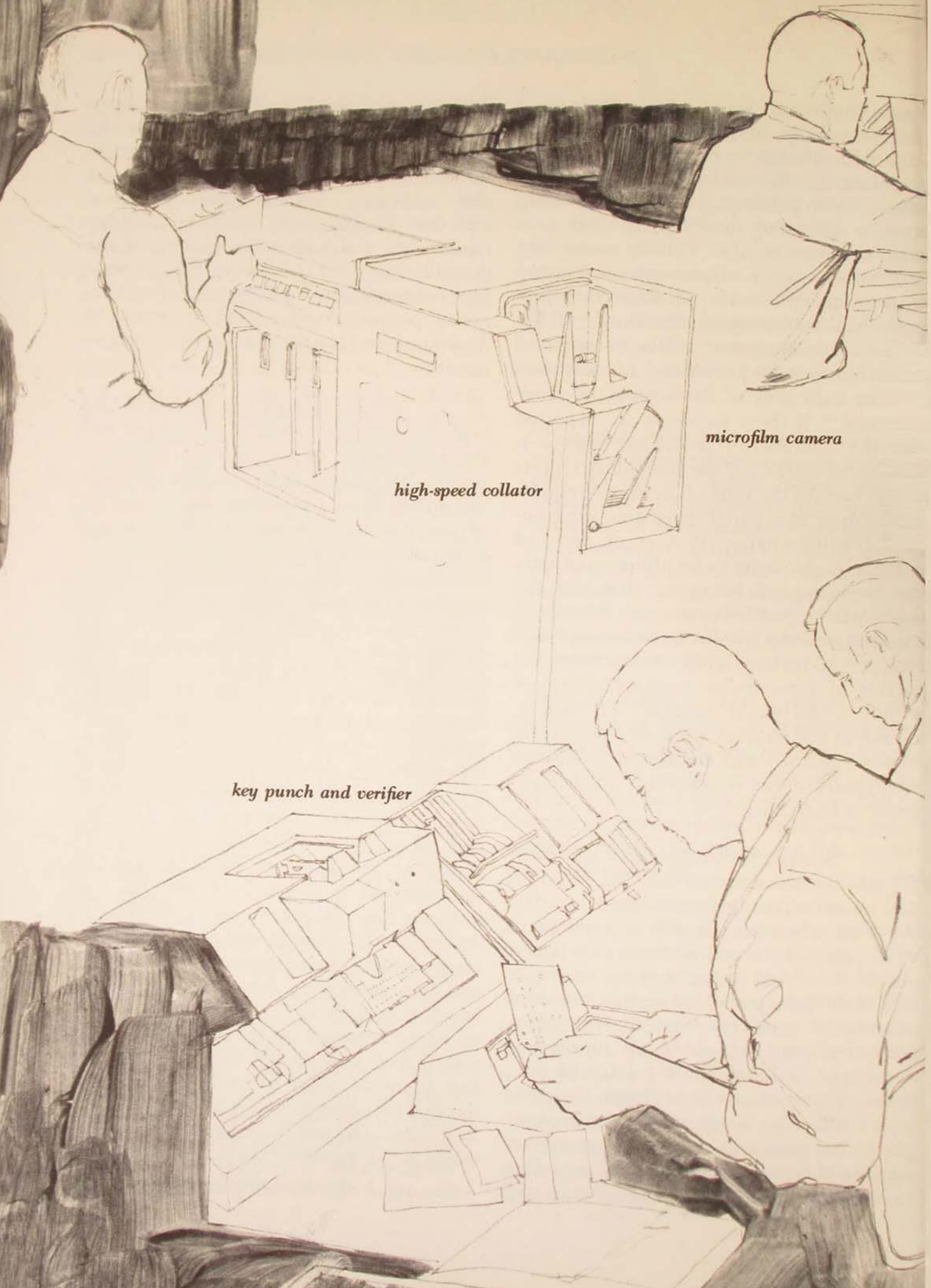
• First, historical experience has shown clearly that the longer it takes to detect the existence of an insurgency, the larger the forces required to combat it and the lower the probability of success in defeating it.[12] Conversely, the earlier an insurgency is detected, the less costly and more effective will be the effort to control or defeat it. The information processing system can make a significant contribution to the early detection of insurgency by its ability to highlight "indicators." Since the insurgent leaders, because of their organiza-

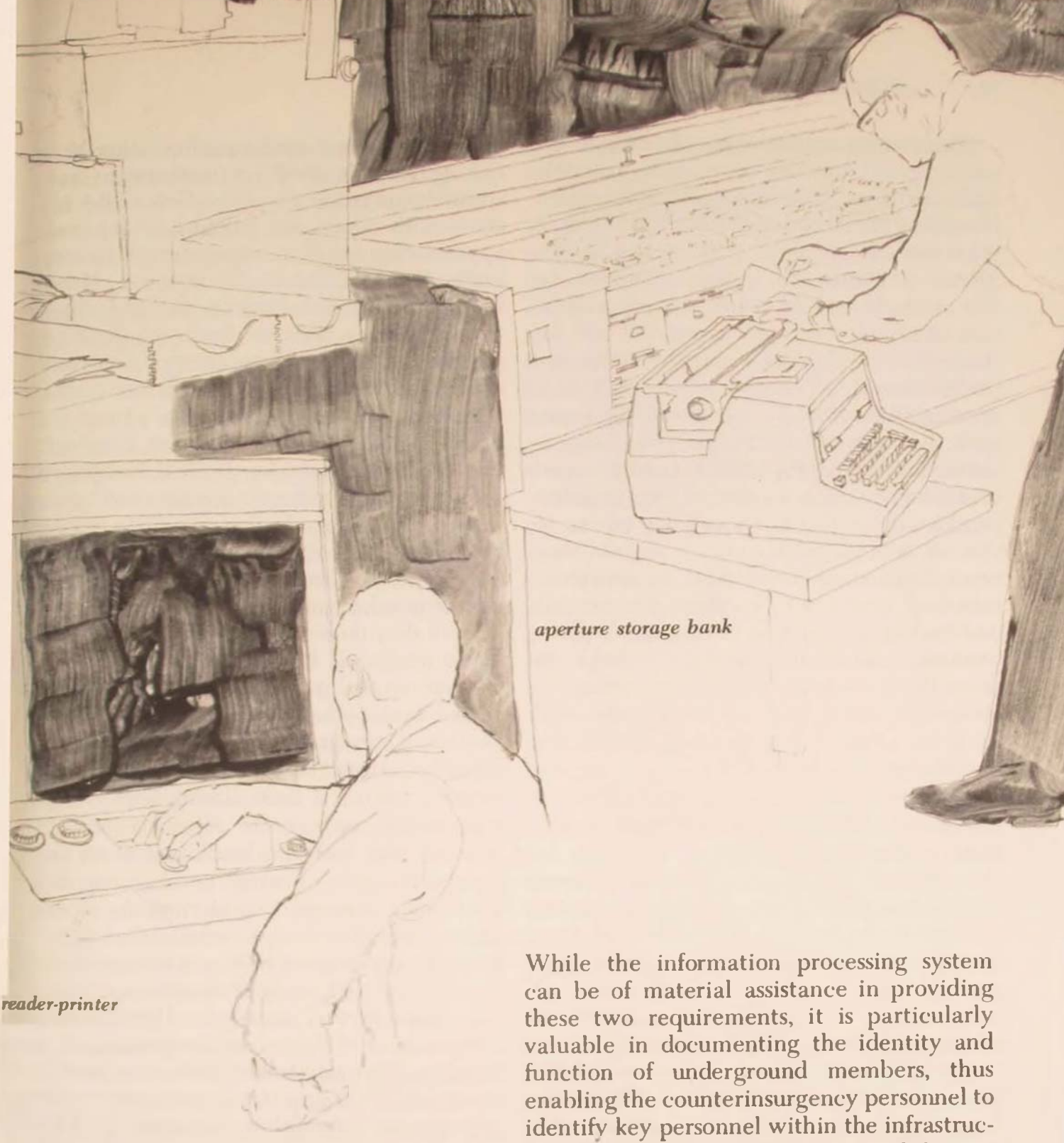
tion's small size, cannot achieve their goals single-handedly, they must engage in some form of overt activity that will prove to the populace that the insurgents are capable of effectively challenging the government, thereby attracting the support and new members they require. This overt activity may take the form of propaganda, limited work stoppages, raids on isolated police posts, bank robberies, assassinations, and the like, which may appear relatively commonplace, but their frequency and intensity may well be indicative of the beginnings of insurgency.[13] If these incidents are reported and the information processing system is capable of retrieving the individual reports on the basis of the type of incident, frequency, location, etc., and if the system can compare the information to that of previous periods, it can assist in identifying not only the beginnings of insurgency but also the areas where possible insurgent activity is concentrated. An inordinate and unexpected increase in certain types of incidents, occurring in a particular geographic area or within a particular segment of society, should, at a minimum, increase the government's vigilance and dictate an intensified intelligence effort to ascertain if an insurgency is beginning.

• Second, no matter how extensive the intelligence network may be, information about an insurgent movement, particularly an urban one, usually is acquired in small bits and pieces like those of a jigsaw puzzle. To obtain a clear and accurate picture of the insurgency, the various pieces of information must be fitted together in a number of patterns, which are adjusted or rearranged (collated) on the basis of continuous inputs of new information. In order to do this, the intelligence service must possess an information processing system capable of retrieving information according to differing criteria or characteristics and "arranging" that information in various patterns for study and evaluation. Unless the intelligence service has in operation an information system that makes this retrieval and "arranging" feasible in terms of time and cost, it may never obtain a truly accurate and comprehensive picture of the guerrilla movement. Without this accurate and comprehensive picture, counterinsurgency programs and resources cannot be developed or focused to achieve maximum results.

• Third, in addition to facilitating both the early detection of insurgency and the compilation of an accurate and comprehensive picture of the movement itself, the information processing system can be of singular value in the identification and subsequent neutralization of the insurgent infrastructure, that is, the underground organization which embodies both the central leadership core and those elements that support and sustain the entire insurgency. It is the infrastructure which constitutes the insurgent movement's heart and lifeblood. It provides the ideological underpinning and political direction of the insurgency, determines strategy, controls the employment of the armed forces, and furnishes the men, money, supplies, communications network, and intelligence that are necessary if the insurgency is to remain viable. Unless this infrastructure is attacked successfully, it is unlikely the insurgents can be defeated.[14] As long as the underground organization remains intact, the insurgency remains alive and is a continuing threat to the government, regardless of the number of military successes achieved by the counterinsurgent armed forces. Normally the insurgent will find it much easier to replace his armed forces if his underground structure continues to survive. The one thing he cannot replace easily is the structure itself.[15]

To attack the infrastructure successfully


microfilm camera
high-speed collator
key punch and verifier



aperture storage bank

reader-printer

and cripple the insurgency effectively, the counterinsurgent forces, particularly the intelligence service, must possess both an accurate picture of the underground's organizational structure and a thorough understanding of the interrelationships of the component elements within that structure.

While the information processing system can be of material assistance in providing these two requirements, it is particularly valuable in documenting the identity and function of underground members, thus enabling the counterinsurgency personnel to identify key personnel within the infrastructure so that they may be targeted for apprehension. This is achieved through what is known as a "dossier-building" capability, that is, the capability to link and retrieve fragmentary or nonsubstantive information concerning an individual which, in the aggregate, can constitute unmistakable evidence of membership in the insurgent infrastructure.

This documentation of membership in the underground structure is extremely valuable and important. Unless the counterinsurgent is certain that those individuals arrested or otherwise detained as part of the underground structure are, in fact, members, he can never be certain of the true progress he is making in his attempt to root out and destroy the infrastructure. Furthermore, apprehension of only those individuals whose membership or involvement with the insurgent underground is extremely well documented guards against indiscriminate arrest of civilians, which is likely to be counterproductive to the government's efforts to win or hold popular support. In addition, neutralization of bona fide infrastructure members provides excellent propaganda material to illustrate the government's effectiveness against the insurgency; helps to deter those contemplating either joining or otherwise supporting the insurgents; and provides a basis for proceeding against the apprehended underground member according to existing law, thus contributing to the legitimacy of the government's entire counterinsurgency campaign.

In spite of the contribution that modern information processing technology can make toward strengthening the ability of less-developed countries to resist internal subversion and insurgency, very little use has been made of it by intelligence and internal security agencies in those countries. As a result of discussions with police and intelligence and counterintelligence officers in Latin America, sub-Saharan Africa, and Southeast Asia, we believe modern information processing is probably the least understood and one of the most neglected areas of intelligence and internal security operations.

There seem to be several reasons underlying the failure to adapt this technology to internal security and counterinsurgency uses. First, a basic ignorance exists regarding the manner in which modern information processing can be used for intelligence and counterinsurgency purposes. Few of the officers with whom we talked had any real appreciation of the improvement it can make in operational effectiveness. Many viewed it, at least initially, as "gadgetry" that might be nice to have for prestige reasons but not really necessary for mission accomplishment. A second reason is the very strict financial constraints placed on the operations of the agencies involved. Forced to compete for limited budgetary resources with other agencies and with existing programs, there is very little money available for an information processing system. Even if sufficient funds were available for the purchase of a system, many agencies believe they do not have personnel with sufficient technical knowledge or aptitude to operate or maintain it. When it was suggested that perhaps the system in use by another government department or agency could be adapted for intelligence or internal security use on a time-sharing basis, there was almost unanimous objection on the grounds that such use would entail an unacceptable risk of compromising ongoing operations, sources of information, operational techniques, and overall capabilities. In view of the very nature and mission of intelligence and internal security agencies, this point is well taken. Intelligence and internal security agencies can perform reasonably effectively in the face of many obstacles or handicaps, but there is a very real question as to whether they can perform with any degree of effectiveness at all if their own security has been compromised. A risk of compromise of this nature is one which no such agency is willing to accept or can afford to take.

Considering, then, the problems and objections associated with the in-

troduction and use of modern information processing technology by those intelligence and internal security agencies faced with the task of combating an actual or potential subversive insurgency, it would appear that two basic steps should be taken. First, a maximum effort should be made to educate the leadership in both the application of this technology to normal operations and the benefits in terms of increased effectiveness that can be derived from such application. This education could be achieved, at least in part, by affording greater emphasis to the use of information processing systems in those U.S.-sponsored or -conducted training programs for foreign police officials and military personnel assigned to intelligence and internal security agencies or units in their respective countries.

A second step would be the design and development of a low-cost, relatively unsophisticated, highly efficient, secure, and dependable information processing system for use by these agencies. This is essential, since it would be rather pointless to convince one he needs to improve his information processing capability and then be unable to provide a realistic means whereby that capability can be improved.

One information system which may be ideally suited for counterinsurgency is that currently being used by the Air Force Office of Special Investigations (AFOSI). It was designed and developed in 1964 for the Acquisitions and Analysis (A&A) Division of AFOSI's Directorate of Special Operations. The A&A Division, among other things, exercises staff supervision of AFOSI's worldwide counterintelligence collections program; prepares analyses, estimates, and special studies on organizations and activities of counterintelligence and security significance to the Air Force; and acts as the central repository for all collection reports generated by AFOSI field elements throughout the world as well as those reports furnished AFOSI by other intelligence and counterintelligence agencies.

Prior to development of the AFOSI system, all such collection reports were filed and retrieved manually, a process that was not only time-consuming but made recall ability and response time erratic and unsatisfactory.[16] In addition, the space available for storage of these reports soon would be exhausted. It was evident that a more efficient information processing system was needed, and needed quickly, if the A&A Division was to continue meeting its responsibilities.

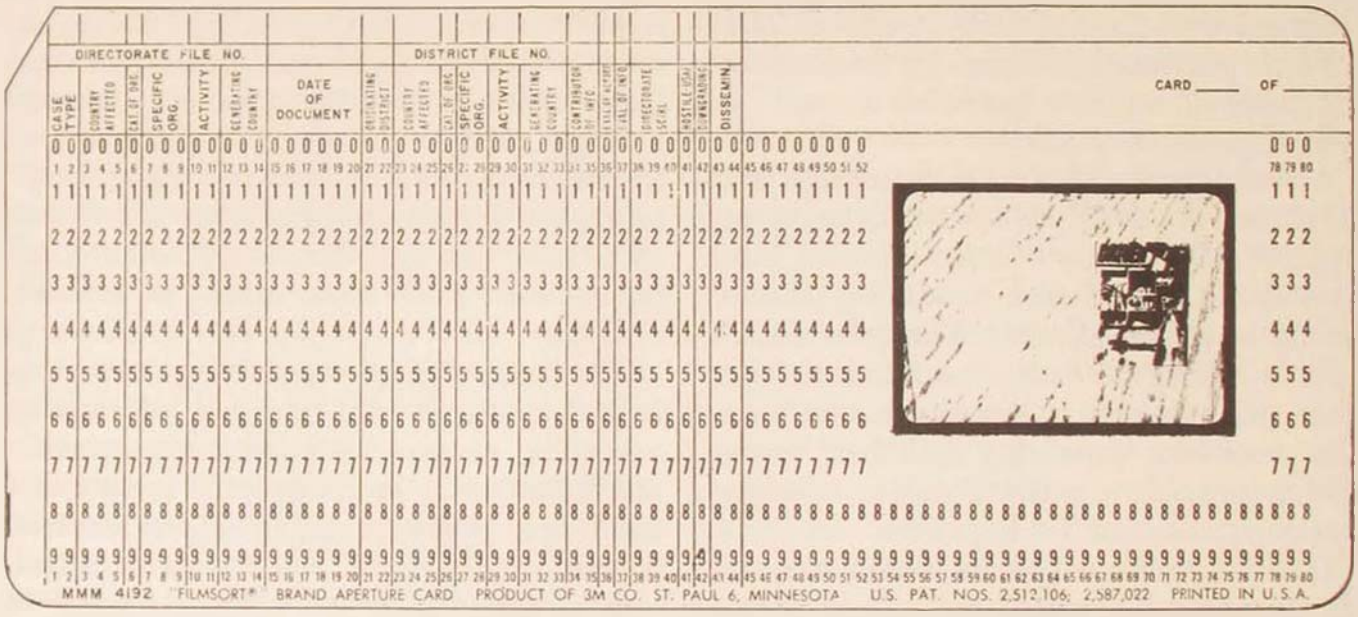
The current AFOSI system emerged following an extensive study of the A&A Division's requirements and the capabilities of existing commercially available information processing systems. Its major purpose is to provide a single integrated system capable of retrieving individual reports as well as facilitating the detection and analysis of patterns and trends through the rapid collation of reported information according to variable criteria.

The basic principle underlying the system is the classification of reported information according to preselected criteria or characteristics, such as geographic location of incidence, group or organization involved (if known), type of activity or incident, source, date/time, etc., the assignment of simple numerical codes to each preselected characteristic, and then the use of these numerical codes, either individually or in combination, as the basis for storage and retrieval. The information or individual report itself is microfilmed on an aperture card identical in size to the standard IBM card. Each aperture card will have a microfilmed copy of as many as four 8- by 10-inch pages. By means of a key punch, the numerical codes are transferred to the aperture card, and retrieval is effected through the use of a collator programmed to sort out those cards bearing one or more assigned code numbers. Under this system,

then, it is possible to retrieve not only a specific report dealing with a particular incident, organization, or activity but also all the reports regarding any specific organization, type of incident, or form of activity in any particular location or locations during any designated time frame. For example, the system is capable of sorting out within minutes all the reports dealing with antigovernment propaganda countrywide by month as a means of determining trends or patterns of activity. Similarly, any individual report dealing with a particular propaganda incident could also be retrieved in minutes. As another example, the system can be programmed to retrieve all the reports dealing with some aspect of a particular organization or its activities such as organizational structure, membership, finances, communications, recruitment techniques, security practices, and the like. This capability is particularly valuable in dealing with a known insurgent group when periodic reviews of available information are necessary for either analysis or targeting of intelligence resources.

Another feature of the AFOSI system is its capability to store and retrieve biographic or "dossier" data on individuals through the use of combined alphabetical and numerical coding. With this feature, it is possible to retrieve all reports in the system concerning a particular individual or the names of all individuals known or suspected of involvement in a particular type of activity. For example, within the counterinsurgency context, the system can be used to retrieve the biographic data cards on all persons either known or suspected to be part of some element of the insurgent infrastructure. Thus

The aperture card of AFOSI's intelligence system, containing microfilmed copy of up to four pages, enables electronic processing, storage, collation, and retrieval of data collected worldwide.



it would be a simple matter to retrieve the names and accompanying biographic data of persons suspected of being couriers or intelligence agents or financial supporters of an insurgent movement.

The information system now in use by AFOSI uses off-the-shelf equipment readily available through commercial sources. The basic components are a microfilm camera that produces the microfilm aperture card, a reader-printer for either viewing the aperture card or printing a readable paper copy of the microfilmed report should one be needed, a standard key punch, a key-punch verifier that cross-checks the keypunched coding on the aperture card, a high-speed collator, and a 315,000-card-capacity storage bank.

One of the major attractions of this particular system is its low cost, both in terms of equipment outlay and operating costs. Total equipment costs are approximately $19,000, which can be reduced even further if some of the components are rented rather than purchased. Based on an annual input of 15,000 aperture cards into the system, yearly operating costs, exclusive of manpower and overhead, are about $1500.

Manpower requirements for system operation will vary according to the individual user's needs, such as the number of hours the system is operated and the number of inputs fed into it. With the annual input of 15,000 aperture cards and operation of the system on a six-day, 48-hour week, four people are required on a full-time basis.

No special technical or educational qualifications are required for operating the system other than an ability to learn key-punching. Training time is also minimal. Experience has shown that to become fully qualified, the average person will need about 16 hours of classroom instruction and 24 hours of supervised on-the-job training, exclusive of key-punch instruction and training.

Two other aspects of the system are also worth mentioning. First, because it is a self-contained unit and no outside facilities are used for any of its functions, such as microfilm processing, security is particularly good. Second, although the AFOSI system is designed and used primarily for intelligence and counterintelligence information, it can readily be adapted for storage and retrieval of criminal incidents and investigative information as well. This feature would be particularly useful to an urban police department or other internal security agency responsible for both counterinsurgency and the exercise of the police function, since a single system would be able to handle all its information processing needs.

In the more than eight years the AFOSI system has been in operation, it has proven to be remarkably efficient, dependable, and trouble-free. The number of analyses, estimates, and special studies prepared by the A&A Division has increased more than 50 percent, research time required for preparation has been reduced by more than 60 percent, and response time has been cut by approximately 70 percent. In terms of storage space, the improvement was even more significant, with a net reduction of nearly 84 percent in the number of square feet required for file storage. In addition, downtime because of component mechanical failure has averaged less than 30 minutes per month.

There are, of course, a number of commercially available information systems that can be adapted for use by intelligence and internal security agencies. Our purpose here has not been to advocate the system in use by AFOSI but rather to illustrate that a relatively simple yet efficient and dependable system can be developed at reasonable cost to enhance significantly the effectiveness of intelligence and internal security agencies in coping with internal subversion and insurgency. It is not important which particu-

lar system is used; it is important that those agencies recognize the very real contribution that modern information processing can make to mission effectiveness and that serious consideration be given to its adoption. To quote Leites and Wolf once more,

". . . effective counterrebellion requires that [the counterinsurgent force] improve its capacity to collect, store, collate, evaluate, retrieve, and use information." [17]

Hq Air Force Office of Special Investigations and Air Command and Staff College

Notes

1. For a broader discussion of the origins and types of insurgency, see P. Kecskemeti, *Insurgency as a Strategic Problem* (RAND Corporation Memo RM-1560-Pr, February 1967), pp. 15–19. For a more detailed treatment of the root factors generating insurgency and the influence of Communist ideology, see also Charles A. Russell and Major Robert E. Hildner, "The Role of Communist Ideology in Insurgency," *Air University Review*, XXII, 2 (January-February 1971), 42–48.

2. Major Edgar O'Ballance, "Thoughts on Countering Communist Insurgent War," *The Army Quarterly and Defence Review*, October 1966–January 1967, p. 73.

3. D. M. Condit *et al.*, *Challenge and Response in Internal Conflict*, Vol I: *The Experience in Asia* (Washington: American University, Center for Research in Social Systems, February 1968), p. 464. An in-depth account of the role played by intelligence in the anti-Huk campaign is related in Napoleon D. Valeriano and Charles T. R. Bohannon, *Counter-Guerrilla Operations, The Philippine Experience* (New York: Frederick A. Praeger, 1962), pp. 44–64. See also Uldarico S. Baclagon, *Lessons from the Huk Campaign in the Philippines* (Manila: M. Colcol & Co., 1960), p. 17.

4. John J. McCuen, *The Art of Counter-Revolutionary War* (Harrisburg: Stackpole Books, 1966), p. 115. See also Otto Heilbrunn, "Counter-Insurgency Targets: A Question of Priorities," *The Army Quarterly and Defence Review*, October 1966–January 1967, p. 204.

5. Major Edgar O'Ballance, *The Algerian Insurrection 1954–62* (Hamden: Archon Books, 1967), pp. 65, 68–69, 76, 80–81; and Constantin Melnik, *The French Campaign against the FLN* (RAND Corporation, Memo RM-5449-ISA, September 1967), pp. 70–72.

6. Sir Robert Thompson, *Defeating Communist Insurgency: The Lessons of Malaya and Vietnam* (New York: Frederick A. Praeger, 1966), p. 84.

7. Charles A. Russell and Major Robert E. Hildner, "Urban Insurgency in Latin America: Its Implications for the Future," *Air University Review*, XXII, 6 (September-October 1971), 55.

8. *Ibid.*, pp. 59–60.

9. A detailed description of the tactics and techniques of the urban guerrilla is contained in Carlos Marighella, "Mini-Manual of the Urban Guerrilla." Written in June 1969, the Mini-Manual received widespread attention when it was published in the January-February 1970 edition of *Tricontinental*, the official organ of the Havana-based Organization of Solidarity of the People of Africa, Asia and Latin America (OSPAAAL). Marighella had broken with the Brazilian Communist Party and established the National Liberating Action (ALN), an urban-based terrorist group. He was assassinated in São Paulo, Brazil, in November 1969.

10. Andrew R. Molnar, *Undergrounds in Insurgent, Revolutionary, and Resistance Warfare* (Washington: American University, Special Operations Research Office, November 1963), p. 10.

11. Nathan Leites and Charles Wolf, Jr., *Rebellion and Authority: An Analytic Essay on Insurgent Conflicts* (RAND Corporation, Report R-462-ARPA, February 1970), pp. 135, 140.

12. Dr. Michael C. Conley and Joann L. Schrock, *Preliminary Survey of Insurgency in Urban Areas* (Washington: American University, Special Operations Office, 5 February 1965), p. 11.

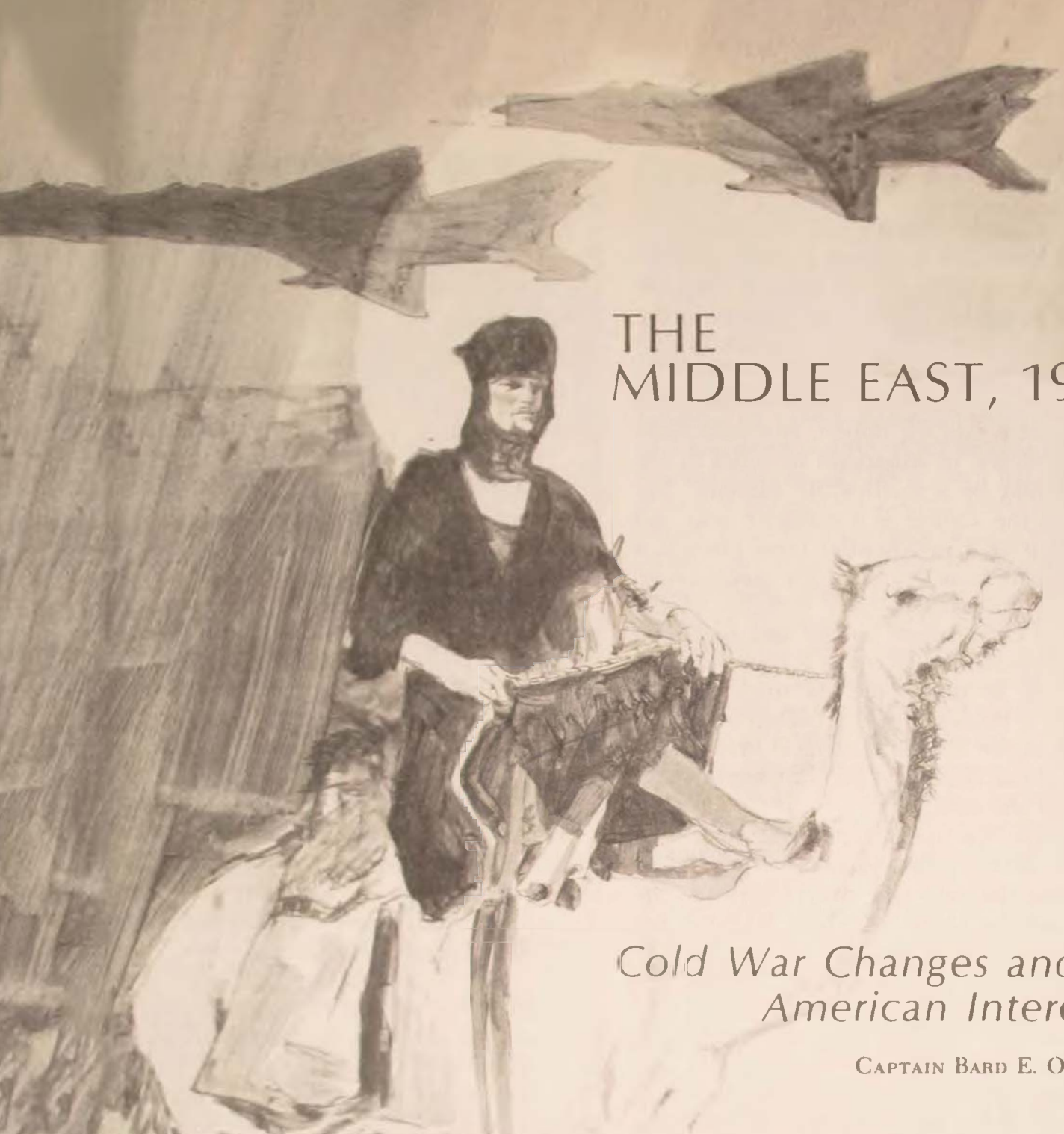
13. *Ibid.*, p. 8.

14. Sir Robert Thompson, *No Exit from Vietnam* (New York: David McKay, 1970), p. 166.

15. Leites and Wolf, pp. 78, 84.

16. The ability to retrieve relevant documents is referred to as "recall ability." "Response time" is the period of time between initiation of a search for a particular document or documents and the retrieval of that document and its delivery to the requestor. See F. Wilfrid Lancaster, *Information Retrieval Systems, Characteristics, Testing, and Evaluation* (New York: John Wiley & Sons, 1968), p. 55.

17. Leites and Wolf, p. 135.



THE MIDDLE EAST, 1973

Cold War Changes and American Interests

CAPTAIN BARD E. O'NEILL

THE year 1972 was, without doubt, one of the most active in American foreign policy. Happily, most of the major developments—President Nixon's trips to Moscow and Peking and especially the SALT agreements—were oriented towards the creation of a more pacific and stable international atmosphere. In the midst of such encouraging trends, however, one area remained turbulent and pregnant with the possibility of future conflict—the Middle East. Unfortunately, with both the United States and the Soviet Union involved in the region, the potential for superpower confrontation was an ever present reality that precluded a posture of "benign neglect" by either side. Even the expulsion of most of the Russian military advisers by

Egypt's President Sadat in July 1972 did not completely alter this picture, for Moscow retained a substantial investment in Egypt, only later adopting a policy of cooling relations with Cairo. In fact, Moscow sought to further solidify its position in the area by increasing its military and economic assistance to Iraq and Syria.

Given the potentially explosive nature of the Middle Eastern milieu, it would seem that a review of American interests in the area might be a worthwhile exercise. Not only do the ending of a calendar year and of a four-year presidential term provide a convenient time for such an undertaking, but the anticipated close scrutiny of the Defense Department budget and American commitments abroad make it especially appropriate at this point. As might be expected, a reassessment of United States interests in the Middle East must briefly take into account the Soviet and Chinese involvement in the area.

Perhaps the most significant aspect of United States policy since World War II has been the cold war rivalry between the U.S. and the Union of Soviet Socialist Republics (U.S.S.R.). Indeed, it was the perceived Soviet threat to Greece, Turkey, and Iran in the aftermath of World War II that inspired the Truman Doctrine, reinforced the general policy of containing Communism, and set the stage for the American backing of the Baghdad Pact of 1955, the Eisenhower Doctrine of 1957, and the intervention in Lebanon in 1958. Such an American stance was not unusual in light of the general consensus, which persisted until the early 1960s, that the Communist system was monolithic and the Soviet Union was an expansionist power whose actions were largely informed by ideological motivations. With the increased visibility of the Sino-Soviet dispute in the 1960s, however, a number of these assumptions were sharply questioned, and the answers that were given had new and important implications for American foreign policy.[1]

As Sino-Soviet differences escalated and eventually produced a general military buildup along their common border, the assumption that the Communist system was monolithic and directed solely by the Kremlin became untenable.[2] This was all the more true in light of the intensified rivalry between Peking and Moscow throughout the world, which led the United States, in some situations, to side with one Communist power or the other (e.g., the American and Chinese condemnation of the 1968 Soviet invasion of Czechoslovakia).

The other assumption of American foreign policy, that the Soviet Union was an expansionist power primarily motivated by ideological imperatives, also came under attack. It became increasingly evident that Moscow would sacrifice ideology for the sake of state interests. Nowhere was the latter more evident than in the Middle East.

Although Russia had been involved in the Middle East for centuries, its interests were largely focused on the northern tier states, Turkey and Iran, where the interests of several major powers—Britain, France, Germany, and Russia—converged and often clashed. When in 1955 Premier Khrushchev bypassed the northern tier and involved the U.S.S.R. in Egypt, by supplying arms (via Czechoslovakia) and assistance in constructing the Aswan Dam, there were fears that the Kremlin was making a bid to establish its ideological hegemony in the area. With the passage of time, however, the Soviet Union found that the strong nationalist orientations of Arab leaders, especially Gamal Abdel Nasser, militated against the Sovietization of the Arab world. On several occasions Nasser made it trenchantly plain that he opposed Communism and then proceeded to incarcerate members of the Egyptian Communist party.[3]

The situation was not much better in re-

gard to Moscow's left-wing friends in Syria and Iraq. While welcoming Soviet aid and military assistance, the Ba'thist leaders in Damascus and Baghdad took a fiercely independent stance, asserting their national aspirations and periodically purging their domestic rivals, the local Communist parties. Although the Soviet leaders showed their chagrin over such developments, in the end they always swallowed their pride and overlooked the assaults on proletarian internationalism, no doubt concluding that their investments and newly won positions of influence were more important than support from the fledgling Communist parties in Egypt, Syria, and Iraq.

Given the Soviet decision to sacrifice ideology on the altar of state interests, there seemed to be two implications or possibilities for the United States: to scale down its involvement in the Middle East or to maintain an active role. It is the purpose of this article to explore this choice with reference to the situation in 1973.

WHAT, then, are America's interests in the Middle East at present? First of all, it seems clear that earlier suggestions that Middle East oil would gradually lose its importance have proven to be misleading.[4] Recent calculations, in fact, reveal an increased rate of oil consumption by the United States (by West European industrial states and Japan as well), the projection being that by the end of the decade the United States will purchase abroad 12 million barrels of oil (50 percent of total consumption), 8 million of which might be needed from North Africa and the Middle East.[5] In short, it seems that Middle East oil will become more rather than less important as the needs of both the United States and its allies increase.

In addition to the oil issue, the United States will have a continuing interest in the maintenance of air and transit rights, given the geopolitical significance of the Middle East as a crossroads between Europe, Asia, and Africa.

Of course the overriding interest of the United States in the Middle East is peace between Israel and the Arab states. Hence, the United States has aimed for a military balance of power between the two sides and has worked with other nations and the United Nations and on its own initiative to secure a permanent peace. Although these efforts have thus far been not entirely successful, the risks of escalation involving the superpowers, which are inherent in any new round of violence, make it imperative that the search for peace continue. A major consideration in this regard is, of course, America's interest in the continued existence and viability of Israel. Besides being an important factor in domestic politics in the United States, Israel is significant because the United States has, through its previous policies, assumed a moral commitment to that country's survival.[6]

The last major interest of the United States in the Middle East is a less direct one. Since the area is part of NATO's southern flank, the United States has tried since World War II to maintain an effective military presence there. Whether the United States should continue to view the region in this light is, however, linked to the question concerning the changing nature of the Communist world and whether or not such change should drastically alter American policy. It is my contention that the new perception does not leave the United States without adversaries. What has happened is that the old cold war confrontation, along with its heavy ideological overtones, has been transformed into a more traditional competition between nation-states. While this is clearly a more stable situation because the states involved tend to calculate

more conservatively and take fewer risks, the competition continues as the major powers jealously guard and sometimes seek to expand their influence incrementally.

If there are any doubts about the Soviet inclination to pursue a policy of power politics, surely they are dispelled by the increased Soviet naval presence in both the Mediterranean Sea and, more recently, the Indian Ocean, plus the acquisition of port privileges at such points as Port Said, Alexandria, and Latakia.[7] Because of this evident Kremlin decision to increase its capabilities and influence in the area, it would seem that the United States should seek to maintain the present balance of power while at the same time supporting nonviolent resolution of the conflicts that plague the region. In a more specific sense, what does this mean concerning American interests in the Middle East?

First of all, the United States cannot afford to abdicate its presence in the area because, in a context of continuing nation-state competition, alliances such as NATO remain important. Since the Middle East does occupy NATO's southern flank, a substantial improvement of the Soviet position in the area, coupled with a weakened American role, could further erode NATO's strength, something that would hardly be wise on the eve of very important negotiations with the U.S.S.R. over mutual and balanced force reductions (MBFR) in Europe. Indeed, a retrenchment of the American military presence in the area at a time when the Soviets are increasing their naval deployments would not seem conducive to buttressing the confidence of the United States's alliance partners. Moreover, it would remove an important bargaining chip before negotiations even commence and thus could make efforts to further stabilize East-West relations more difficult.

NATO aside, the more general strategic balance between the two blocs could be adversely affected if the U.S.S.R. were to gain a position of clear ascendancy in the Middle East. As John C. Campbell has suggested, the whole uncommitted world would see the handwriting on the wall.[8] In other words, it involves a phenomenon that Charles Wolf has called "psychological-political interdependency."[9] That is to say, other nations, if they should see the Middle East fall under dominant Soviet influence, might perceive the winds of change as blowing in an eastward direction and thus seek the best deal they can obtain while they still have some bargaining leverage. A study of the diplomatic ability of Thailand to tack with the political winds is instructive in this regard, witness its accommodation with the Japanese in World War II, its alliance with the United States in the 1950s, and its present renewal of contacts with Hanoi and Peking in the wake of the Nixon Doctrine. It is shifts such as this which could be replicated in the Middle East should Soviet influence greatly increase in that region. As a consequence of such developments, the Soviets would be in a position to align a greater number of states on their side respecting issues in other parts of the world. Going one step further, one could envisage the Kremlin using its position of influence in the Middle East for bargaining leverage in negotiations and conflicts elsewhere. The Cuba-Berlin linkage in 1962 bears remembering in this regard.

The American capability to pursue its interests vis-à-vis the oil and Israeli questions could also be severely undercut if the Soviet Union were allowed to become the predominant power in the Middle East. If, for example, Russia should be able to create a network of Arab states that were dependent on her for economic and military assistance, she might be able to use her position to extract oil concessions that, in turn, would substantially increase the cost of oil or perhaps even deny part of this

valuable resource to the United States, Western Europe, and Japan.[10]

The Soviet role in the Arab-Israeli dispute is familiar to everyone. Suffice it to say that a precipitous withdrawal of the United States from the area might encourage the Kremlin to modify its present restraint in favor of giving more active support to the Arab effort to "liberate" the occupied areas. In other words, without the United States to consider, the Soviet Union could decide to change its present relatively unaggressive posture in the Middle East to a more aggressive one in the hope of increasing its influence in the Arab world by sharing in any success the Arab states might achieve.

The reverberations of a decreased American involvement in the Middle East could also be felt in the northern tier, where the Soviet Union might seize the opportunity to realize age-old ambitions by pressuring the Turks to renegotiate the 1936 Montreux Straits Convention, which specifies, among other things, what kinds of warships can transit the Dardanelles. Essentially, what the Soviets would seek to do is restrict the entry of American ships carrying nuclear weapons into the Black Sea.

Yet another danger associated with an American disengagement would be the possibility that the Soviets would decide to reemphasize their ideological mission and become more involved in the revolutionary movements in the area. Such a development would serve Soviet interests and increase Moscow's influence if its protégés were successful, especially in the oil-producing states.

It is in regard to the last-mentioned point that the United States must consider China's posture in the region. Although Peking does not have the capability to be a major actor in the Middle East in the foreseeable future, it has sponsored and assisted various revolutionary groups. While this tendency has decreased since the end of the cultural revolution, it is not inconceivable that China would step up its revolutionary involvement in response to an American withdrawal and a concurrent Soviet re-emphasis of its revolutionary commitments.[11] Seen in this light, such a move by China would be a reaction to both the partial power vacuum created by the United States and a Soviet attempt to assert itself as the leader of international Communist interests.

To SUM UP, although the nature of American-Soviet-Chinese interaction has become less ideological and more similar to traditional nation-state competition, the rivalry among the three powers continues, especially in the already turbulent Middle East. Given the continuing and projected American interests vis-à-vis oil, transit rights, peace, and defense of NATO's southern flank, a lessened American involvement in the Middle East could become a destabilizing force, which might result in a return to a less desirable past. Conversely, by maintaining its present involvement in the region, the United States can hopefully continue to pursue its interests in an atmosphere that is more pragmatic.

As for the military implications of this analysis, the United States must maintain a capability to deploy its forces, especially air forces, as adjuncts to diplomacy when crises arise. The symbolic movement of forces, in particular the Seventh Fleet and Air Force units, during the September 1970 Jordanian civil war was instructive in this regard. In that instance the movement of military forces underscored and made more credible the American warning to Syria to desist in its invasion of Jordan. In fact, as the record shows, the Soviet Union was greatly concerned about the movement of American military forces, and this no doubt influenced the Soviets to bring pressure to bear on Damascus to withdraw.[12]

Put simply, the point is that if the United States perceives that it has important interests in the Middle East and if it wishes to maintain and protect those interests in a stabilized environment, it must have adequate capability to do so. While it may be true, as some scholars suggest, that the cold war is dead, it is by no means clear that nation-state competition is dead. Recognizing this reality is the beginning of wisdom when one is assessing American interests throughout the world in general and in the Middle East in particular.

United States Air Force Academy

Notes

1. On Soviet-American relations since World War II and the alterations of the American perceptions of the Soviet threat, see Adam B. Ulam, *The Rivals: America and Russia since World War II* (New York: The Viking Press, 1971) and Ulam, *Expansion and Coexistence* (New York: Praeger, 1968), pp. 378–752. For an account of Soviet-American relations in the Middle East see Walter Laqueur, *The Struggle for the Middle East* (New York: The Macmillan Company, 1969).

2. An excellent work that summarizes the numerous factors underlying the Sino-Soviet dispute is Klaus Mehnert, *Peking and Moscow* (New York: Mentor Books, 1963).

3. For a concise account of the sometimes turbulent relationship between Nasser and Khrushchev see Peter Mansfield, *Nasser's Egypt*, rev. ed. (Baltimore: Penguin Books, 1969), chapter 5.

4. See, for example, William R. Polk, *The United States and the Arab World* (Cambridge: Harvard University Press, 1965), p. 289.

5. R. M. Burrell, "Producers and Consumers of the World Unite!" *New Middle East*, September 1972, pp. 32–33. This projection of American needs takes into account the Alaskan, Canadian, and North Sea discoveries, oil shale possibilities in Utah and Wyoming, and other sources of energy, such as nuclear power, all of which entail high costs of extraction and/or production.

6. On United States–Israeli relations, see Nadav Safran, *From War to War* (New York: Pegasus, 1969), especially chapter III and pp. 409–20.

7. See T. B. Millar, "The Indian Ocean—A Soviet Sea?" *New York Times*, 13 November 1970, p. 35M.

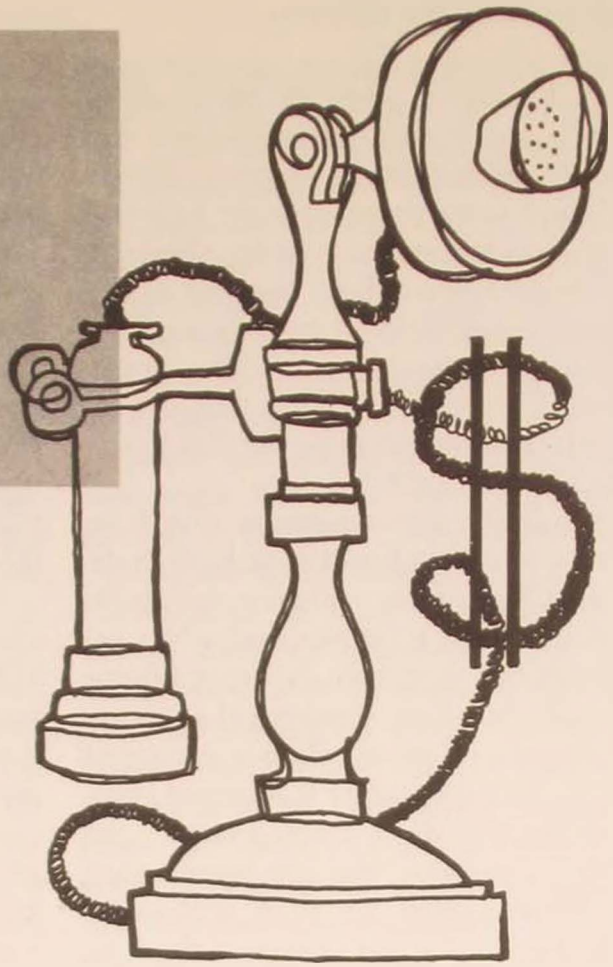
8. John C. Campbell, *Defense of the Middle East* (New York: Harper and Row, 1958), p. 131.

9. Charles Wolf, Jr., *United States Policy and the Third World: Problems and Analysis* (Boston: Little, Brown and Company, 1967), pp. 17–20.

10. Campbell, pp. 131–32.

11. Ulam, in *The Rivals* (p. 389), notes that the absence of a clear American foreign policy might "offer an irresistible temptation even for the usually prudent Soviet leadership to indulge in adventurism, to initiate or exacerbate small and local crises, one of which might sooner or later ignite a major and world-wide conflict."

12. For an account of the U.S. role during the Jordanian civil war, see Benjamin Welles's article in the *New York Times* of 8 October 1970. On the Soviet Union's concern with possible U.S. involvement and its attempt to persuade Syria to terminate hostilities, see *Pravda*, 29 September 1970, as cited in *Mizan*, Supplement A, No. 5, September-October 1970, p. 5, and *New Middle East*, November 1970, p. 45.



MODERN COMMUNICATIONS, A WISE INVESTMENT

MAJOR GENERAL PAUL R. STONEY

THE importance of the close relationship between command and control and its supporting communications has been recognized in Air Force doctrine for so long that it has become axiomatic. So long, in fact, that in our decision-making process we automatically assume that responsive, reliable communications will be available whenever and wherever needed. Until now, this has been a reasonable assumption because as long as even the most stringent command and control needs could be met with a dedicated teletype or telephone circuit or single-sideband radio there was no real problem. This type of support was economical and technologically simple.

But the heretofore reasonable assumption that our communication services will be adequate to meet tomorrow's requirements may no longer be so reasonable. High-frequency radio and teletype already fall far short of answering present demands, not just for command and control but for everyday management as well. And our customers are increasing their use of our services at a truly alarming rate. We will find ourselves in serious trouble unless we recognize the staggering implications of these demands and move quickly to accommodate to them. Although I am only one of four military service communicators, I feel

the rising impact of this problem more acutely than my counterparts because the Air Force Communications Service (hence the Air Force) provides well over half the Defense Communications System services. I am unable to foresee how the Air Force will produce the additional resources called for in current defense planning. The implications are of such significance that a general awareness of the problem by Air Force senior officers is essential.

Our communications resources might be illustrated by a candle burning at both ends. Inflation and the dollar squeeze are melting away our resources at one end while increasing customer demands are using up our capabilities at the other. Command and control is no longer a relatively simple matter of HF radio and teletype; today it requires computers, high-speed data transmission, and secure voice networks. We are bombarded with urgent demands for such expensive services that we can no longer afford to provide commanders with exclusive systems, however desirable they might be. These persistent demands are consuming our present capability faster than we can expand to meet them. And while our resources candle is fast burning away, Air Force Communications Service is being ordered to reduce manpower, to trim operations and maintenance costs, to curtail technical training, and to withdraw from our isolated mountaintop radio stations all over the world. This is not new to us; the appropriations laws for the past several years have been consistently critical of rising communications expenditures. Although we have managed to cope to some degree with tightening budgetary limitations, we have been laboring under a strain that is fast approaching the breaking point. The time is now upon us when AFCS will no longer be able to carry the load being placed upon our resources by the insistent, multiplying customer demands.

One major fact that accounts for the increasing demand for our services is that communications and automatic data processing equipment are replacing people and even entire intermediate management levels and headquarters. It is easy to understand that considerable savings accrue to the command which eliminates a whole management level within its organization by automating; what is not so easily seen is the opposite effect: the increase in the communications budget necessary to finance this new capability.

No one would deny that the advent of computers and the development of jet air transport contributed markedly to the elimination of our overseas supply depots over a decade ago. Unfortunately, it is less easily seen that the Automatic Digital Network (AUTODIN) and high-speed data circuits play an equally important role. It is my purpose here to demonstrate that savings elsewhere in a command's budget are necessarily countered to some extent by an increase in communications costs.

Upon examination of pertinent trend relationships, it is apparent that the demands being placed on our communications services are not proportional to changes in the total Air Force population. The USAF strength has declined about 30 percent in the last nine years, but data traffic in the AUTODIN system, for example, is five times greater today than in 1967. There are many more transoceanic circuits operating today than four years ago. It is important to realize that AFCS reacts more to demands placed upon the total communications environment than it does to organizational trends in the Air Force itself. The overwhelming fact is that the military machine today is almost totally dependent upon communications for command and control as well as day-to-day management. A very high price must be paid for tightly centralized control of a global military force, and the time

has come for us to understand this.

An important point: just talking about *more* communications does not tell the whole story. Far more critical to the eventual solution of this problem is recognition of a need for a new kind of communications, *digital systems.*

Man has always lived in an analog world, a world of sight and sound through the medium of sine waves. But we have now emerged into the space age, in which we must communicate with digital expressions. As is well known, digital communications is not a new concept or a revolutionary technique. Earlier military communications systems—telegraph, Morse code, heliograph, teletype—were digital. These are all forms of electronic transmission whereby information is sent by an "on" or "off" signal impulse, or, as in the case of the digital computer, a "one" or a "zero." We communicate digitally today over our worldwide analog structure by inefficient conversion techniques.

Much of the basic management structure of our modern Air Force is dependent upon computers and automated communications (our personnel, finance, and supply systems, to name a few). Certainly there is no turning back now. For obvious military reasons we must secure our communications. Because digits are the language of computers, because they are easier to encrypt, and because they are simpler to package, sort, and switch, digital techniques are the most practical means available to meet the growing communications demand. For reasons too technical to explain here, greater volumes of communications traffic can be handled best if everything is converted to digital form. But it is at this point that laws of physics come to bear: digital systems are vulnerable; they will not tolerate *noise.*

There are immutable rules of science that govern men in nearly every field of endeavor. Aviators are bound by the lift/drag formula, missilemen by thrust/weight. A communicator's first law is signal/noise. My problem, in a word, is *noise*, ordinary (and sometimes not so ordinary) sound. A crashing thunderbolt is the most dramatic example of noise. But noise comes from many sources, from solar flares to automobile ignition. Much of the noise I must contend with is generated right in our own radio and electronic equipment. In many respects my problem is more difficult to overcome than the aviator's or the missileman's because their elements remain comparatively constant whereas the electronic noise level in our society is steadily rising. Thus my problem is ever changing.

The best way to describe the effects of noise on the digital world is to show how it affects our present analog systems. Every day each of us encounters and overcomes noise, or static, on our telephone (analog system). We shout, or repeat ourselves, or use the marvelous computer between our ears to sort the message from the noise. The error rejection ability of the human brain is fundamental to the success of analog communications. There are, of course, certain electronic techniques for correcting or compensating for some kinds of noise-induced errors, but they are not nearly so efficient as the human brain, and far more expensive.

As long as the human brain remains an integral part of the system, we will be able to detect and correct error. We can continue trying to keep garbled teletype messages out of everybody's reading files, but we cannot catch them all; the recipient must perform the simple if annoying task of sifting "signal" out of "noise." As long as the transmission speed is slow and the human being is a link in the chain, we can live with the errors induced by noise in our systems.

However, it will not be that easy when we increase the speed of digital transmission,

which we must do in the future. A teletype carries data at a rate of 75 bits, or separate impulses, per second. A secure voice network pulses at 2400 bits of data per second, and the human being is no longer in the chain. Since noise is totally disruptive of digital systems, a noise-induced pulse is transmitted and recorded as a valid message by the computer. Sometimes this can be more than a mere error. Last year an automobile struck a power line pole several miles from one of our switching centers, and the resulting electrical "spike" shot so much noise into the computer that the entire memory bank had to be reloaded. That switch being out of service for several hours cost both us and our customers plenty.

When an Air Force commander outlines a general automation requirement, usually he has little idea of the specific impact it will have on communications. For example, one stated requirement for general voice communications stipulated: establish all calls in five seconds or less; encrypt all voice traffic; guarantee full audio understanding, to include recognition of the individual voices; be able to conference up to 30 parties at a time. The only way we can provide these services will be to speed up the data bit rate to the absolute maximum capability of the present system.

Of course our AUTOVON service today falls far short of these goals, but we are working hard to achieve them—and many others—by seeking new and better ways to extend the limits of our system capabilities while at the same time improving the quality of our communications. It is going to require a great deal of money, because the vast majority of the present equipment inventory was designed to operate in the analog world, and it cannot do the digital job we are demanding of it without extraordinary effort and expenditure.

Our training programs, our tech data, our test equipment—all are proving grossly inadequate. We are being forced to rewrite the book. We are revising maintenance procedures and conducting our own training to develop the specialists this unique job requires. In 1972, AFLC bought us millions of dollars' worth of special test equipment heretofore not needed outside of the depot. And all this was necessary just to keep our present equipment running at the peak performance demanded for digital traffic. It is a very difficult and expensive job that requires top professional talent. Already, 25 percent of the 1600 communications-electronics officers in AFCS are electrical engineers. All of this is barely keeping our heads above water. We are going to need considerably more in the future than just more test equipment and more engineers.

The increasing reliance of the Air Force on vital automated communications lifelines is forcing us to set very high goals. Our assignment is clear: we must be able to send one million bits of data over a 12,000-mile circuit and misplace no more than *one* bit. During the Vietnam war we learned how to send recon photos halfway around the world in near real time; now we are being asked to do it even faster, with better resolution, and in living color. The technology is available, but, again, it will cost.

Just how much it is going to cost can be projected. A recent DOD-wide forecast of demands for voice communications suggests there will be a relatively moderate increase through 1985. However, it is not the need for more voice communications but the monumental task of handling high-speed data that is giving us our biggest headache. This is predicted to multiply to over fifty times today's volume, i.e., to three trillion bits per day.

There are three approaches toward meeting this goal. One is to get the maximum performance from our present equipment and manpower resources. We have already been doing this, and we are now beginning to

lose ground with the demands. The second way is to lease more hardware and services from commercial companies. However, that would mean a direct, out-of-pocket, rising, and continuing O&M cost, and we have already been ordered to reduce our commercial leases by ten percent this fiscal year. Such specific restrictions against leased communications demonstrate that there needs to be a better understanding of the Air Force's very great dependence on commercial communications for command of our forces. It is difficult to see how we can approve millions of dollars for sophisticated automated command and control and management systems and then argue about the communications necessary to hook them up. Certainly the next generation of computers will be nearly ineffectual unless they are connected into high-speed communications networks.

I have mentioned two approaches that we might take toward preparing for the future. But since we already are getting the most out of what we have now, and since there will be continuing pressure to hold leased costs at present or lower levels, there is only one alternative left: we must operate under a carefully designed long-range plan to replace much of our present analog communications equipment with specifically designed digital hardware.

In research and development, this will cost just about double the amount we spend today. Worse, communications-electronics procurement costs only five years from now must be *five* times greater than the current level. But this does not tell the whole story because it is only for strategic communications. Tactical communications are converting to all-digital, too. Office of the Secretary of Defense has established the Tri-Service Tactical Communications Office to plan our joint tactical communications systems for the future, and those costs have yet to be projected.

Will these additional funds materialize? I certainly hope so, because, as a result of the influence of many economic factors, we have decided to put most of our eggs in one basket. We in the Air Force have committed ourselves to centralized control of globally dispersed forces through automation and high-speed data communications. By making this commitment, we have also grossly overtaxed our present resources and necessitated the projection of an investment program far beyond our present communications spending levels.

Where our communications needs fall in order of importance compared to new Air Force weapon systems I will not speculate. However, I do argue that whatever weapon systems emerge in the coming years, they cannot operate without appropriate and adequate communications systems to provide their command and control.

We have reached a major milestone in the evolution of communications in the Air Force. We have more demands than we have capability. A monumental decision is before us, which is actually more a question of *when* than *if*. There is no choice; the Air Force must accommodate to the pressure of the growing critical needs for high-speed digital communications. We must only decide when we will begin and how we will go about doing it.

The picture is not so bleak if viewed from the right perspective: we can and should regard much of the increasing communications costs as a wise investment. However, if we fail to perceive the extent to which the Air Force depends on communications to do its job, and if Air Force Communications Service fails to continue to provide those communications, then our command and control capability will be sorely limited. We cannot afford *not* to afford the best possible communications.

Hq Air Force Communications Service

In My Opinion

ORGANIZATIONAL DEVELOPMENT

Can It Be Effective in the Armed Forces?

LIEUTENANT COLONEL PETER E. LASOTA
CAPTAIN ROBERT A. ZAWACKI

New times demand new measures and new men; the world advances, and in time outgrows the laws that in our fathers' day were best; and doubtless after us, some purer scheme will be shaped out by wiser men than we, made wiser by the steady growth of truth.

—JAMES RUSSELL LOWELL

THE United States Air Force is indeed in new times, and a new measure for the new times is organizational development. Organizational development (OD) is a little-known management tool that has been utilized in complex organizations since 1957, when the late Douglas McGregor implemented a program to deal with creative change at Union Carbide.[1] Although limited, OD has begun to raise its head in military circles during the past two years. The United States Navy now has a Human Resources Development Command, which is tasked with evaluating this technique called command development for command-wide usage. The Naval Academy and Air Force Academy have more limited research programs in their respective commandant areas.

What is organizational development? There are many definitions, but perhaps Wendell French's definition is best:

> Organization development is a long-range effort to improve an organization's problem solving and renewal processes, particularly through a more effective and collaborative management of organization culture—with special emphasis on the culture of formal work teams—with the assistance of a change agent or catalyst and the use of the theory and technology of applied behavioral science, including action research.[2]

In short, OD is a way of looking at the whole human side of organizational life. This human technology "... accepts as inevitable the conflicts among the needs of individuals, work groups, and the organization, but advocates openly confronting these

goals using problem solving strategies. Its goal is to maximize the use of organization resources in solving work problems through the optimal use of human potential."[3]

Organizational development has many focuses. Two that are of significance to managers today are *managing change* and *directing human energy toward specific goals*. What do we mean by this? Have you ever heard such complaints as, "Supply doesn't know its ass from first base," "Personnel never keeps us manned," "Intelligence is out to lunch"? The target of these complaints could be the system or its manager. Where is the breakdown in communication between the complainer and his target? Is there any communicative link between the two parties involved? Can the problem be solved through improved communication? The complaining is a complete waste of energy. In fact, it can hurt the organization even more by turning other people off. The problem is how to get the complainer to direct his energy toward something constructive rather than expending it to do further harm in the organization. The practical application of one or more organizational development concepts can focus on problem-solving, improved communication, or building a staff into a team—maybe all three.

Although the objective of OD will vary according to each specific diagnosis of organizational problems, some typical objectives are the following:

a. To increase the level of trust and support among organizational members.

b. To increase the incidence of confrontation of organizational problems, both within groups and among groups, in contrast to sweeping problems under the rug.

c. To supplement the authority associated with role or status with the authority of knowledge and competence.

d. To increase openness of communication.

e. To increase the sense of ownership of organizational objectives throughout the work team.

f. To increase the level of self and group responsibility in planning and implementation.

g. To create an open problem-solving climate throughout the organization that finds synergistic solutions to problems with greater frequency.[4]

Underlying the above objectives are the values and beliefs of behavioral science change agents. The primary value which OD represents is the humane and nonexploitative treatment of people in organizations.[5] All other values relate to this basic value. They include:

a. Trust and openness—An open and nonmanipulative sharing of data is required for effective problem-solving.

b. Leveling—All team members should tell it like it is!

c. Feedback—Feedback is a communication skill for checking out the accuracy of assumptions and data. Feedback must be shared in a helpful and nonaccusatory manner.

d. Confronting conflict—Conflict is a natural occurrence between people on work teams and it should not be "placed under the rug."

e. Risk-taking—The ability to take an unpopular stand on an important issue.[6]

With this background of OD objectives and values, let us next discuss some components of an OD package.

recognizing a need

How does any organizational development program get its start? Are there signals to indicate that OD is necessary? Naturally, there is no one answer to these types of questions; the answer will vary according to the organizational setting and management styles. However, there is normally one element that is present in originating OD

programs, and that is *pressure for change.* The pressure for change normally will show up as a felt need on the part of management. The felt need in civilian institutions can vary from a cry for increased profits to problems with excessive personnel turnover. In the military, it can be anything from problems in productivity and sortie rates to low re-enlistment or high drug-usage problems. These are but a few examples of identifiable (tangible) types of problems that are often mere indicators of internal disorder or people problems which have been festering within an organization for undetermined time periods.

As increased technology causes more problems with job satisfaction of subordinates, the supervisor needs to become more aware of how his people feel about their jobs—their level of job satisfaction. If one is *not* concerned about this facet of his management job, he may soon find himself confronted with problems and publicity such as the U.S. Navy recently had in the race relations aboard some of its frontline warships.

What can OD do to help solve the types of problems or improve the situations just described? We feel the one technique that is most applicable to Air Force problem-solving and improved communication is team building. The form that will be outlined is commonly called the family group, i.e., a manager and those directly under him. Team building is a super staff meeting in some senses, but it differs in that it is longer, the atmosphere promotes open communication, a third party (change agent) is often present, and the agenda is jointly formulated.

Although the design for team building varies, a typical outline is as follows:

1. Formulate meeting objectives—normally done by the manager, group representatives, and the third party.

2. Information collection—the third party collects information by interviewing, by questionnaire, or both.

3. The team-building meeting—can last one to three days, third party reports on information collected, an agenda is formed, issues are discussed, and, hopefully, action items are identified.

4. Follow-up—review agreements, report progress on action items, and insure that openness continues.

5. Renegotiation—follow-on team building of a shorter duration.[7]

Perhaps the issues and plans have taken on new perspectives and need to be rediscussed.

third party

In the foregoing discussion, we have used the terms "change agent" and "third party." Who are these people and what are their functions? Perhaps this aspect should have been discussed sooner, but certainly we cannot proceed beyond this point without a few details on this subject. The third party, to be effective, is not the Inspector General; it is a behavioral scientist. Basically, three major change agents or third parties have been identified:

a. The change agent who is completely outside the organization.

b. The change agent who is internal to the organization and serves functional areas other than the functional area to which he or she is assigned.

c. The change agent who is internal to the organization and serves various units of the system of which he or she is a part.

All three types must be trained in the behavioral sciences, organizational psychology, organizational theory, and/or management. Change theory, process, and strategies must be part of "his bag."

An internal change agent has advantages over the external change agent, such as: (1) familiarity with local jargon and proce-

dures, (2) the fact that his expenses are less than an external agent's, and (3) knowledge of some of the "blocks" to organizational effectiveness. However, there is no Santa Claus, and the disadvantages of an internal change agent are that (1) he may be part of the problem; (2) he may not see the forest for the trees; (3) regardless of his courage and independence to hold to a position, he is still rewarded or punished by the organizational unit he is trying to change; and (4) his fellow team members may perceive him as a spy or the tool of the boss. Therefore, he may never gain the support or trust of the OD participants.

We recommend that the initial OD effort be managed by a change agent who is external to the organization. Fordyce and Weil state it this way: "The Third Party in Organizational Development is often called in by a group to help it explore its everyday conduct and to assist it in defining how it wishes to change and how it will go about making the change." A second purpose "is to guide the parties toward more self-sufficient behavior in solving their problems, not to make them dependent on him for decisions." [8] As the program develops, then an internal change agent may be appointed to coordinate the program. In industry, the internal agent is typically under the supervision of the director of personnel or may even be the director of personnel.

Given this background and theory, just what are the military applications of organizational development?

military applications

There is no doubt in the authors' minds that the Navy is the armed forces frontrunner in applying behavioral sciences to the management of personnel resources. Under the direction of Admiral Elmo Zumwalt, the Navy has formulated its Human Resources Development Command (HRDC) at the Naval Station, Newport Beach, Rhode Island. This is the first of four such centers to be located on both seacoasts of the United States and in Hawaii.

The HRDC is responsible for command development (CD), interracial education, and drug and alcohol rehabilitation. In fiscal year 1972, approximately $410,000 was invested in an operational and consultation budget. In FY 73, approximately $217,000 is earmarked for consultation and training contracts. The Navy runs its own CD workshops at Newport Beach. Destroyer Flotilla 2 is currently the target group for research on the applicability of CD techniques in the operational environment.

The U.S. Naval Academy has been working on a program for improved communication and human relations skills development for its brigade officers and personnel within the brigade. The program is under the direction of Commander Warren Newman, and the National Training Labs (a nonprofit organization that conducts OD workshops) of Washington, D.C., are the consultants.

With funding assistance from the Air Force Human Resources Laboratory, the Air Force Academy is conducting research on the application of OD in the commandant's area. Their basic approach is improved communication and team building at the air officer commanding and cadet wing levels. Although the OD experience in the armed services is limited, what does the future hold?

the future

It appears the military services are beginning to investigate the applicability of organizational development to management techniques and problem-solving at various levels. Except for the Navy effort, however, all attempts at OD have been very limited and somewhat token or halfhearted attempts. If one believes that survivability

in the seventies is predicated on management of technological and personnel (human) resources, then he must investigate new methods of dealing with his subordinates.

What can the Air Force do to improve personnel management techniques? The problem must be attacked from two directions: The first is to orient and train existing leaders in this area. This can be done at the senior service schools and NCO academies. At the same time, the management of personnel resources should become a subject for the leaders of tomorrow at the Air Force Academy, Reserve Officer Training Corps, and School of Military Science (Officers).

IN CONCLUSION, organizational development is a tool that can assist a commander and his staff in sorting out the interpersonal conflicts that reduce the productivity of his organization. Despite the misconception that a tough-minded manager can become soft and that the responsibility and force of the manager are reduced with the advent of group consensus, OD has progressed in many of our large corporations and institutions today. The Maytag Company, Honeywell, Inc., Jones and Laughlin Steel Corporation, Charmin Paper Products, University of New Mexico, Western Electric, Ontario, Canada Department of Education, Human Resources Development Field Command, U.S. Forest Service, and G. D. Searle and Company are among the organizations represented at one recent National Training Laboratory Workshop.

The successful manager or commander of the future must insure that the maximum of human energy expended is focused on specific goals. The higher the mutual trust and openness in his organization, the more free a manager is to act without being misunderstood and the more ready he will be to manage crisis situations.

Each Air Force officer, NCO, and civilian supervisor, regardless of his level of supervision, should have some knowledge of organizational development skills. OD is here to stay in the Air Force of today and the future!

We have not succeeded in answering all our questions. Indeed, we sometimes feel we have not completely answered any of them. The answers we have found only serve to raise a whole new set of questions. In some ways we feel we are as confused as ever. But we think we are confused on a higher level and about more important things.

—ANONYMOUS

United States Air Force Academy

Notes

1. Douglas McGregor, *The Professional Manager* (New York: McGraw-Hill, 1967), pp. 106–10.

2. Wendell French and C. H. Bell, *Organization Development: Behavioral Science Interventions for Organizational Improvement* (Englewood Cliffs, N.J.: Prentice-Hall, 1973).

3. Lyman K. Randall, "Common Questions and Tentative Answers Regarding Organization Development," *California Management Review*, vol. 13 (Spring 1971), p. 45.

4. Wendell French, "Organization Development Objectives, Assumptions, and Strategies," *California Management Review*, vol. 12 (Winter 1969), p. 23.

5. W. Warner Burke, "A Comparison of Management Development and Organization Development," *The Journal of Applied Behavioral Science*, vol. 7 (1971), p. 576.

6. These values are a modification from Randall, pp. 47–48.

7. For a detailed discussion of the strategy in OD, see the Action Research Model in French, "Organization Development Objectives, Assumptions, and Strategies," p. 26.

8. Jack K. Fordyce and Raymond Weil, *Managing with People* (Reading, Massachusetts: Addison-Wesley Publishing Co., 1971), p. 20.

SYSTEMATIC RESOLUTION OF SOCIAL PROBLEMS WITHIN THE MILITARY

Captain Jon M. Samuels

CONTEMPORARY headlines dramatize the military's painful quest for internal social harmony. Millions ponder the national security implications of this or that incident. Congressional committees investigate and pundits speculate. Buffeted by these pressures, the service professional must contend simultaneously with angry minorities, an inveterate institutionalized resistance to change, and pious demands by "above-the-battle" superiors for the immediate resolution of those "embarrassing" confrontations.

Threatened, confused, and apprehensive, this normally pragmatic individual has chosen increasingly to abandon systematic problem-solving technique in favor of an emotion-dominated approach to social controversy. He often has drawn broad social conclusions from a few highly publicized but possibly unrelated events. Frequently his faulty inductions have obscured local issues, confusing fact, fancy, policy, and prejudice.

This pattern need not be accepted as preordained. Human relations questions are not unique. The inclusion of nonquantitative variables such as race, sex, age, guilt, fear, and anger does not place this class of problem outside the normal management spectrum. Often, in fact, leaders who have ignored basic managerial doctrine in favor of intuitive solutions have found that the heat generated in these incidents can stampede them into economically and psychologically disastrous courses of action.

If the supervisor is to avoid this unfortunate fate, he must consciously prepare himself and his organization for the tension that inevitably accompanies social unrest. He must culturally sensitize himself and his subordinates. Each must realize that he cannot be color-blind, sex-blind, or any other blind. People living and working in large groups must be capable of identifying and empathizing with different life styles and the value systems associated with them.

The modern manager, for example, learns to approach a black ghetto youth differently from a white middle-American. He does not mistake the former's superficial preoccupation with the gratification of present needs as an indication of faulty motivation or lack of intelligence. Today's sophisticated leader understands that the black's attitude is as much future-directed as that of his white counterpart. If he has read, as he should, Elliot Liebow's classic study *Talley's Corner*, he realizes that

> the difference between the two men lies not so much in their different orientations to time as in their different orientations to . . . their different futures. The future orientation of the middle class person presumes, among other things, a surplus of resources to be invested in the future and a belief that the future will be sufficiently stable both to justify the investment (money in the bank, time and effort in a job . . .) and to permit its consumption at a time, place and manner of his own choosing and to his greater satisfaction. But, the ghetto-dweller grows up and lives in a sea of want. He does not, as a rule, have a surplus of resources either economic or psychological. Gratification of hunger and the simple creature comforts cannot be long deferred. Neither can support for *one's flagging self-esteem.* [Emphasis added.] Living on the edge of both economic and psychological subsistence, the poor man is obliged to expend all his resources on maintaining himself from moment to moment.[1]

Our supervisor understands that, despite the service's vaunted "equal opportunity," the habits developed by young men raised in extreme poverty can leave them incapable of capitalizing on any opportunity. Thus, the supervisor will employ a personalized management approach that recognizes inherent individual differences. The key word in this equation is *individual.* Our supervisor does not, for example, automatically equate the behavior patterns of the disadvantaged with all nonwhites. He thinks of people as individuals, not groups.

This sensitizing process is continuous. Military personnel often experience difficulty in objectively evaluating new ideas. This is a failure of command, for it is commanders who are responsible for providing the atmosphere, references, and group experiences that encourage the open exchange of information. People at all levels must be taught to winnow common goals from apparently contradictory points of view. Carefully planned "rap sessions," films, and speakers with well-defined messages, controlled immersion in culturally alien situations, and role playing are but a few of the many tools available to the supervisor who is determined to create a change-oriented organization that profits from the different tastes and outlooks of its membership.

One cannot overestimate the importance of this basic step—the establishment of an environment that fosters a factual scientific approach to human relations—in the eventual resolution of social conflict within the organization. If this step is left incomplete, it will hamstring any further efforts, leaving the organization resembling a group of Americans told to play cricket without being instructed in the rules of the game.

If they are to succeed, supervisors must realize that cultural sensitivity represents a threatening concept for some individuals and certainly a change for many. Attempts to effect any change are difficult, but attitudinal and behavioral changes provide the most difficult challenge of all. Alfred Zander, in his article "Resistance to Change—Its Analysis and Prevention," outlined several reasons why people are reluctant to alter either their schedule or their mental outlook:

> 1. *Resistance can be expected if the nature of the change is not clear to the people who are going to be influenced by the change. . . .* There is some evidence to support the hypothesis that those persons who dislike their jobs will mostly dislike ambiguity in a proposed change. They want to know exactly what they must do in order to be sure to avoid the unpleasant aspect of their job. . . .
>
> 2. *Different people will see different meanings in the proposed change. . . .* We tend to see in our world the things that we expect to see. Complete information can just as readily be distorted as incomplete information, especially so if the workers have found discomfort and threats in their past work situations.
>
> 3. *Resistance can be expected when those influenced are caught in a jam between strong forces pushing them to make the change and strong forces deterring them against making the change. . . .*
>
> 4. *Resistance can be expected to the degree that the persons influenced by the change have pressure put upon them to make it, and will be decreased to the degree that these same persons are able to have some "say" in the nature or direction of the change. . . .*
>
> 5. *Resistance may be expected if the change is made on personal grounds rather than impersonal requirements or sanctions. . . .* Many administrators can expect trouble in establishing a change if it is requested in terms of what "I think is necessary" rather than making the request in light of "our objective." . . .
>
> 6. *Resistance may be expected if change ignores the already established institutions in the group.* Every work situation develops certain customs in doing the work or in the relations among the workers. The administrator who ignores institutionalized patterns of work and abruptly attempts to create a new state of affairs which demands that these customs be

> abolished without further consideration will surely run into resistance.[2]

Management's task will be infinitely more difficult if these observations are ignored. Once the commander is satisfied that he and his subordinates are involved in a meaningful sensitivity program, he can expect that a systematic problem-solving mechanism will function. All members of the organization will have confidence in the system's objectivity and will expect justice as its natural product. These two assumptions are vital if this scientific approach is to compete with the emotions aroused when social controversy is present.

The problem resolution system itself is simply designed.

First, rules must be established and observed. The supervisor must be certain that equal opportunity and fair treatment programs flourish in his department. His subordinates must have clear human relations guidelines to follow, and the manager must insure that these directives are strictly observed. Paper programs are more destructive than no program at all; they involve the organization in a revolution of rising expectations. Unfulfilled promises and dashed hopes are the parents of group disintegration.

Next, when problems do arise, the manager must gather all the facts available. He might begin by taking official statements from the people involved and then initiate an inquiry just as he would for an accident or other unusual event. At this stage, it is essential that value judgments be totally suppressed. No one is lying, at fault, or a troublemaker. Everyone is a source of information.

Third, the facts must be tested for validity and relevance. The supervisor wants the answers to two basic questions: What really happened? What do people believe happened? He must deal with both. Mere discovery of the facts is not sufficient. What the participants think and feel must also play an important role in deciding what course of action to pursue.

Fourth, the supervisor should list and explore all possible alternative solutions. The strengths and weaknesses of each must be carefully examined. The circumstances under which each possibility would operate most effectively should be outlined.

Fifth, the commander must determine which alternative will best resolve the problem. He must also select a method of communicating his decision that will not alienate any faction. If corrective action is required, it should be couched, as far as possible, in positive terms. Public recrimination must be limited. Unless disciplinary action is a pivotal point in resolution of the conflict, it should be handled privately. The operative principle in this area coincides with Zander's observations concerning the greater effectiveness of change predicated on "impersonal requirements or sanctions" than change based on personalities.

Sixth, individuals at every level should be assigned personal responsibility for actions in support of the commander's decision. They must translate the directive into terms applicable to their operation. For example, if a base were ascertained to have been remiss in the employment and training of Mexican-Americans and a decision made to correct the situation, its commander would set certain goals. An example might be "the hiring, training, and placement of 75 Mexican-Americans by 1 July, 10 percent of whom are to be placed in supervisory positions." Each subordinate manager would then be responsible for identifying a given number of positions to be made available, developing a training program, and selecting the people needed to fill these jobs.

Finally, the manager must follow up his directives to determine the efficiency of the corrective action taken. It is vitally impor-

tant that he use measurements that accurately reflect the real situation. If, for example, he merely counts supervisory positions filled by the Mexican-Americans hired during the stated time, he might fail to note that these individuals had been assigned to supervise only Mexican-Americans. While the numbers might be correct, the spirit of his equal opportunity directive would have been subverted.

The following factual case—*not* a theoretical exercise—demonstrates perceptive human-relations management in the daily job environment.

A squadron training NCO asked his commander to nominate Sergeant Jones, a white, for the Airman's Medal. Jones was credited by this NCO with pushing A1C Smith, a black, to safety when a weapon malfunctioned and exploded. Jones received superficial injuries in the incident. Smith was unhurt. Smith then went to the commander and alleged that the accident did not happen as the NCO said it had. "The weapon jammed, I called Jones, he took it, and while he was examining it, it exploded. He didn't save me, I don't need any man taking care of me, and I don't like being made a fool of by him saying so." The commander asked the training NCO about the incident and he said, "It's just those blacks, Sir. They don't want a white to get credit for anything. If Jones were black, they'd want him nominated for the Medal of Honor." In the past, individuals in the squadron had received the Airman's Medal for incidents as questionable as this one. The three witnesses to the event are black and support Smith.

For purposes of analysis, it is assumed that equal opportunity programs were alive and well in the unit and that the problem represented a momentary failure. Again, if this is a false assumption, any problem-solving method employed will do little in relieving the tension aroused by incidents such as the one described.

The first task facing the commander was to gather the available facts. Step one in this process was the taking of official statements. Such a course had no negative implications, as statements were required for the ground accident report that had to be submitted regardless of whether a nomination for a decoration was made. During this phase of his inquiry the commander discovered these "facts":

1. The witnesses had been unaware of the incident until they heard a muffled explosion. Up to that point they were looking down range and firing at their own targets. When their attention was drawn to Jones and Smith, they observed Jones on the ground, hands covering his face, the weapon lying a few feet away, and Smith standing slightly to the rear of Jones and reaching toward the injured NCO.

2. The training NCO had not witnessed the event but had interviewed all the participants. Based upon that and his knowledge of weapons and range procedures in use the day of the incident, he had reconstructed the event. Jones, he pointed out, had an excellent record and no reason to lie. Smith and the other blacks were mediocre airmen and known to be close friends. "They all stick together you know!"

3. Jones could remember little of the event. "It all happened so fast." He had seen Smith raise his hand, indicating a weapon malfunction. He had moved down the firing line and was told by Smith that the weapon had misfired. He took the weapon to examine it. "Here things are a bit fuzzy," he said. "I realized the problem and the danger, shielded Smith with my body, and pointed the weapon down range. The next thing I knew I was on the ground covered with blood."

4. The medical report showed Jones's injuries to be concentrated in the facial and upper chest areas.

5. The armaments section indicated that

the accident was caused by a "cook-off" (a round fired by the heat of the weapon rather than by operating the trigger). This report further stated that at the time of the cook-off the breach was open.

6. At the time, proper procedure in misfire incidents involving the M-16 rifle required the instructor to remove the magazine and point the weapon down range for at least 10 seconds before opening the breach to clear the weapon. Cook-offs during normal firing rarely occurred.

7. The squadron policy on decorations was unclear. Supervisors interpreted the manuals in their own way, and generally the commander had approved their recommendations without comment.

8. To earn the Airman's Medal, one must consciously risk his life to save that of another.

The commander's next step was to evaluate these "facts."

It was obvious that while the three witnesses could accurately describe events just after the explosion, they had no real knowledge of what happened prior to that time. The fact that they were black and also friends of Smith was irrelevant. The commander did note the implications of the training NCO's statements about blacks. As soon as this inquiry was completed, he examined the possibility of prejudice being introduced into the squadron's training programs consciously or unconsciously by this NCO. In view of real evidence provided by the armory and the medical reports, the training NCO's reconstruction of the event was discounted.

The injuries sustained by Jones and the armory report seemed to confirm that the breach of the weapon had been opened and an exploding round had blown back powder and shell fragments into the instructor's face.

Jones was interviewed again and asked if he had complied with proper range procedure, specifically, waiting ten seconds or more before clearing the weapon. He was also asked if he expected a cook-off. He answered that he could not remember opening the breach, and while he wasn't expecting a cook-off, he did realize something was wrong. "Knowing that, did you push Smith to safety?"

"Maybe not push," he replied, "I stepped in front of him, though."

Smith was then called in and asked about the open breach and the "push to safety." He could not remember whether the breach was open because Jones was between him and the weapon. Had Jones stepped in front of him?

"I can't remember, but I know I wasn't pushed."

Based on this investigation, the commander produced his own reconstruction. Smith's weapon had malfunctioned, he raised his hand, and Jones came over to determine what was wrong. Realizing something was amiss, Jones took routine precautions. He took the weapon and pointed it down range. After a time, he opened the breach. The round inside cooked off. The blowback injured Jones. Whether he waited 10 seconds or not was irrelevant; cook-offs under this circumstance are rare and can occur after the ten-second waiting period. In the mind of the instructor, he honestly thought he had pushed or shielded the student. Confused by the rapid chain of events, Smith did not realize that this was Jones's intention when he took the weapon.

The commander now had to consider his alternatives.

1. He could follow the previous awards policy and nominate Jones for the Airman's Medal. If forwarded in the same form it was originally reported, the nomination would probably be approved. This alternative would improve the career potential of Sergeant Jones, an excellent young prospect, and reassure the squadron's career NCO's

about their commander's faith in their judgment. Without further clarification, however, it would alienate all or some of the squadron's minority members, who would probably see it as the word of one white man taken over that of four blacks. This impression possibly could be mitigated by explaining that while he realized the real circumstances, he was taking this action because in the past people had received this medal for like incidents. This policy would continue in the future and would benefit both black and white careers.

2. He could reject the nomination. The hard feelings engendered by alternative number one would be reversed: this time it would be the white faction that would feel their word was worth less than that of a minority airman. "The old man won't stand up to a black" would probably be a popular refrain. He could help his cause by calling in his NCO's and explaining his findings and the bad psychological impact the nomination would have had on Smith, hoping they were knowledgeable enough to accept the situation.

3. He could take no action on the award but reassign the training NCO because of his conscious or unconscious prejudice. While in the long term this NCO might have to be removed, to do so at this time would complicate the present matter. It might also be interpreted incorrectly by other supervisors as a warning not to oppose minority airmen on any issue. This course, however, would solve the immediate problem, leaving the commander time to deal with the unpleasant aftereffects.

4. He could take no action at all presently. This is a judgment call based on the premise that the incident is a minor one of little interest outside the immediate circle of those involved. In time, when tensions had eased, he could approve or disapprove as he saw fit.

The commander discarded alternatives three and four immediately. Firing the training NCO in the middle of a controversy would completely obscure the questions posed by the original problem. The commander would also lose the opportunity to show that his equal opportunity program was capable of objectively resolving problems. Doing nothing at all risked adding a misunderstanding to what might become multiple misunderstandings such as had previously provided the fuel that ignited major confrontations.

After some thought concerning the realities of promotion competition in the Air Force, he also rejected the hypocrisy of alternative number one.

He now had to determine what was the best method of communicating his decision to reject the nomination. He felt he had to center his message around clarification of the original misunderstanding that led Smith to protest the nomination. The theme would be "no villains, just people with part of the picture." He also felt that reformation of the squadron awards program was an imperative and that this act had to be linked to the problem solution. After all, simply stated, Jones had not earned the medal for which he had been nominated.

The commander prepared a written report of his findings, which he discussed with his airmen at the monthly commander's call. Here he again emphasized his theme. He also called a special meeting with all supervisory personnel, at which he explored in depth all the human relations ramifications of the incident. At both these meetings the actual incident was used only as a starting point for a discussion of communication problems. The commander also announced that the operations officer had been tasked with the responsibility of preparing clear guidelines on the new awards and decorations program.

After initiation of the new program, the commander made spot checks to insure that nominees had fulfilled the requirements for

the decoration for which they had been nominated. He also charged the superintendent (the senior NCO in the squadron) with the responsibility of insuring that deserving airmen were being nominated. He revised the squadron's human relations training curriculum, introducing additional hours devoted to interpersonal communications. After about a month, he interviewed the training NCO in depth and discovered the man had been unable to shed the prejudices he had learned early in life. He was reassigned to a nonsupervisory position. The commander then directed the operations officer to review carefully all training records to determine where this prejudice might have restricted the progress of any squadron member. In all cases, the benefit of the doubt was given to the airman involved, and remedial programs were developed to enable him to catch up with his peers.

Obviously, one cannot present all the details in this illustrative example. Hopefully, however, the reader can follow the problem-solving technique as the commander systematically worked through the case. Most important, it should be noted that at no point did he allow himself to be swayed by unwarranted emotion. Initially he branded no one a liar. He refused to be influenced by remarks about "those blacks" or the anger displayed by Smith. He looked for the facts and then made a decision based upon his findings. This subjective decision was made only after he had factually reconstructed the incident.

WHEN DEALING with social problems, one may not always have enough time to make a full investigation before making a decision. But one can always ask, "How do you know that's true?" One should always strive to distinguish fact from opinion. Finally, one should engrave on his mind the words of Lieutenant General William McBride, Commander of Air Training Command: "Equal treatment is not always fair treatment."

Anyone who is a supervisor must work with people. He must view them as individuals and develop management systems that respect their differences. When conflicts occur, he cannot abandon these systems. If he does, only the most powerful or the most raucous voices will prevail. In such circumstances, justice will seldom be satisfied.

Lackland AFB, Texas

Notes

1. Elliot Liebow, *Talley's Corner* (Boston: Little, Brown and Co., 1967).
2. Alfred Zander, "Resistance to Change—Its Analysis and Prevention," quoted in George Henderson, *To Live in Freedom* (Norman, Oklahoma: University of Oklahoma Press, 1972).

Recommended Readings

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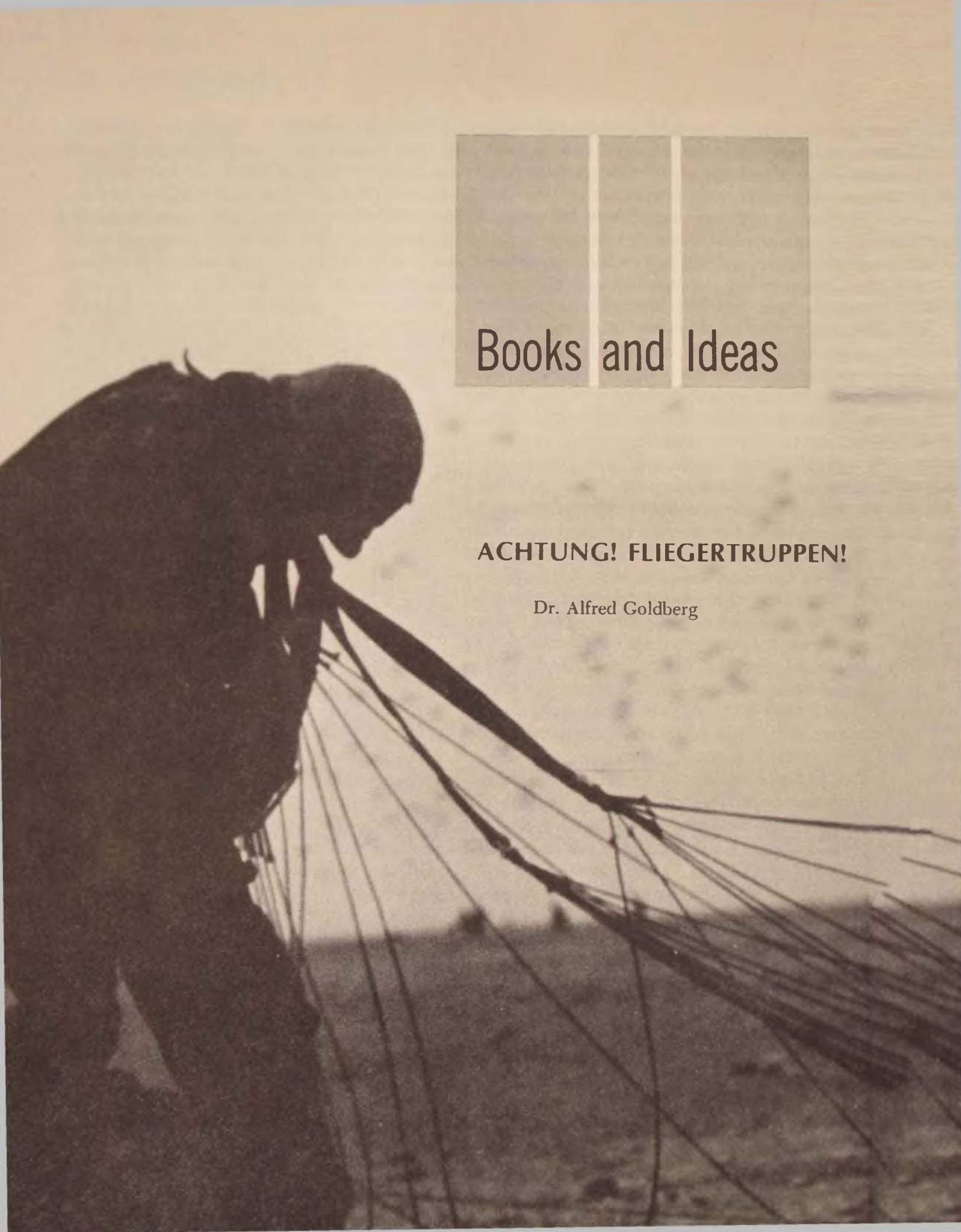
Books and Ideas



ACHTUNG! FLIEGERTRUPPEN!

Dr. Alfred Goldberg

TO THE countless Belgians and Hollanders who watched with awe and anticipation that morning of 17 September 1944, the skies must have seemed filled with an endless stream of airplanes and gliders flowing steadily and majestically eastward. First came a thousand B-17 and B-24 bombers and escort fighters of the U.S. Eighth Air Force from Britain, to clear a corridor for the troop carrier aircraft through the thicket of German antiaircraft defenses in the Low Countries. Hundreds of British and American fighter planes followed immediately afterwards to sweep the areas selected for dropping the Allied paratroopers and landing the gliders filled with more troops and equipment. Finally came the troop carriers and gliders, escorted by hundreds of fighter planes, flying in splendid V-formations towards their destinations. In all, nearly 4700 transports, gliders, fighters, and bombers passed overhead within the space of a few hours. And beginning shortly after 1300 hours, some 20,000 American and British soldiers parachuted or landed by glider within one hour and twenty minutes in good order behind enemy lines. "In those first minutes it looked as if the down-coming masses would suffocate every single life on the ground," wrote a German reporter who was there.†

Operation MARKET, the airborne invasion of Holland in September 1944, was the greatest airborne operation ever mounted. It is likely to remain unsurpassed in our time and maybe longer. Over a period of six days, almost 35,000 Allied soldiers—they constituted most of the First Allied Airborne Army—dropped or landed in the battle areas along a corridor linking Eindhoven, Nijmegen, and Arnhem in southern Holland. MARKET was the climactic airborne operation of World War II, representing the culmination of the enormous Anglo-American endeavor to master a new way of warfare. It was the best planned and most skillfully executed large-scale airborne operation of the war up to that point. Moreover, in many ways it was a "remarkable and spectacular success," but not an unqualified one. The failure to secure the main objective of the mission, the vital bridges over the Lower Rhine at Arnhem, may well have prevented General Eisenhower from ending the war in Europe in 1944. Still, MARKET remains the historical high-water mark of airborne operations involving masses of paratroops and glider-landed forces.

During the course of World War II there were many other spectacular airborne assaults. All the major combatants mounted operations employing troops landed by parachute, glider, and transport airplane. Although the Russians had been the first to develop regimental- and division-size airborne units during the 1930s, they did not achieve any important successes in airborne warfare between 1941 and 1945. The piecemeal commitment of forces in their major landings in the Vyazma and Kiev areas, the consequence of insufficient transport aircraft, minimized their contribution to the big battles.

The Germans achieved spectacular airborne successes during 1940 and 1941 in Norway, Belgium, Holland, and finally Crete —by far their greatest airborne assault of the war. It cannot help surprising us today, especially in the light of the enormous Allied airborne operations in 1943–45, how small were the airborne forces employed by the Germans to gain such remarkable successes. At least in part, the successes may be attributed to the exploitation of a high degree of surprise in most of the operations that seemed to shock and numb Norwegians,

† James A. Huston, *Out of the Blue: U.S. Army Airborne Operations in World War II* (West Lafayette, Indiana: Purdue University Studies, 1972, $10.00), xi and 327 pages.

Belgians, and Dutch so much that they were incapable of effective response. A single parachute regiment in Norway in April 1940 provided the key to German success. A mere 4000 German parachutists jumped in Holland in May 1940 and gained control of vital points that helped open the way for the ground armor and infantry divisions that overwhelmed the Dutch defenses. A handful of gliderborne troops—fewer than a hundred in all—landed on top of the mighty Belgian border fortress of Eben Emael early in the morning of 10 May 1940 and seized this single most important anchor in the Belgian defense line. More than three years later—in September 1943—the Nazi adventurer Otto Skorzeny used gliders to put a few dozen men down on a mountaintop at Monte Corno in Italy to snatch Benito Mussolini from his Italian captors.

The largest and most spectacular German airborne assault of the war, the conquest of Crete in 1941, was also the turning point for the Germans: thereafter they never mounted a tactical paratroop attack of more than battalion size. The loss of 4000 men

Strafed by U.S. fighters at a desert landing ground in North Africa, a German troop-carrier glider becomes a casualty.

killed, most of them paratroopers, dampened German ardor for such assaults. Without the element of surprise and against good British, Australian, and New Zealand troops, the Germans could not win their usual quick and cheap victory. Hitler later told his paratroop commander, General Student: "Crete proves that the days of the paratroops are over." Hitler seems to have believed at the time that the Allies also would draw the same conclusion from the costly attack on Crete and would not attempt the use of airborne forces on a large scale. He was wrong, for the Anglo-Americans regarded Crete as a remarkable demonstration of successful employment of airborne forces. Crete seemed to reinforce rather than diminish arguments within the U.S. Army and the British Army in favor of creating a large body of parachute and glider troops. Eventually, the United States formed and deployed five airborne divisions, each with a strength of approximately 8500 men, and the British formed two airborne divisions.

In addition to the MARKET operation, Anglo-American airborne forces mounted major assaults in Sicily in July 1943, Normandy in June 1944, and across the Rhine in March 1945. Smaller airborne landings occurred in North Africa in 1942 and in the Pacific: the Nadzab (New Guinea) operation in 1943, the dramatic long-range operations in Burma by Wingate's Raiders in 1943 and 1944, and the highly successful parachute drop on Corregidor in February 1945.

It is only in recent years that we have been getting military history that shows us what lies behind the big battles and campaigns that are the payoffs. Combat is, of course, the culmination of the whole military process and is by far the most dramatic and compelling element in that process. But it is also the tip of an enormous iceberg, most of which is rarely exposed to the public eye because it lacks the sweep and the excitement of violent conflict.

James A. Huston, in his forthright presentation of the U.S. airborne effort in World War II, has attempted to strike a balance between combat airborne operations and the "rather more pedestrian matters of conception, organization, and training" which exercise such a vital and deterministic influence on the battle payoff. The book is, as he puts it in the Preface, "perhaps . . . more of a history text book for airborne operations than a sweeping narrative." But if he has not presented a "sweeping narrative" (and the accounts of the airborne assaults are concise and well done), he has produced a study comprising the broadest contextual presentation on the creation of U.S. airborne forces in World War II.

The debates within the U.S. military establishment over the concepts, doctrines, organization, training, research, management, and plans for the employment of U.S. airborne forces, as presented by Huston, reveal the enormous complexities and difficulties encountered in giving birth to a new mode of warfare. It is important that we understand and appreciate what lies behind, or, perhaps more appropriate, what precedes, the actual employment of troops in combat. The mistakes and lack of vision of the organizers, trainers, and planners are inevitably visited on the troops who go into combat. The uncertainties, conflicting views and attitudes, thorny issues, and agonizing reappraisals which throughout the war beset the U.S. Army leaders and planners concerned with airborne troops—such men as Leslie J. McNair, Matthew B. Ridgway, Maxwell D. Taylor, Joseph M. Swing, James M. Gavin, William D. Old, William C. Lee—emerge from Huston's account, lending it a tone of down-to-earth reality and a depth of perception that greatly enhance it.

Today's practitioners of modeling and gaming in the national security community engage in analyses of current and future problems, seeking to establish a measure of

merit by which their outcomes may be assessed. Such measures of merit have always been applied to the great events of history but often with little more success than the modelers of the future achieve. Still, we continue to analyze and speculate about what happened and what might have happened if _____. Thus, we are inevitably confronted with such questions as whether a particular effort was successful or justified. The airborne effort of World War II is no exception to this tantalizing game.

What contribution did U.S. airborne troops make to the overall victory in World War II? Might the resources devoted to the airborne forces have been used more effectively in other ways—e.g., for more ground or armored divisions or more bombers and fighters? Or should some of the resources that went into ground divisions and strategic bomber forces have gone into airborne divisions and troop carrier units? Such questions are, of course, unanswerable, since we can never be sure about what might have been. Nevertheless, they hold an eternal fascination for military professionals and amateurs alike, and many, including this reviewer, are not deterred by the need to resort to subjective arguments to support their opinions and judgments.

Although there was often contention and poor coordination within the Army in planning, organizing, training, and equipping the airborne forces, Huston seems to feel that the most important problem grew out of differences between the Army Ground Forces and the Army Air Forces; that the heart of the differences lay in the consistently low priorities accorded the troop carrier units, which were indispensable to the airborne effort in every phase and indeed served as a major limiting factor on the size and scope of the overall airborne force and its operations. The AAF developed no specialized aircraft for the mission; it did not assign its best pilots and communications men to troop carrier units; it did not provide self-sealing tanks for the troop carriers; it failed to coordinate training adequately with the airborne divisions; it diverted troop carrier aircraft to other missions, such as hauling cargo for the ground units and the combat air units; it sent troop carrier units to some theaters where no airborne units were present. Huston concedes that priorities obviously had a great deal to do with who got what and when, but he flirts with the question of whether the priorities were right. And his quarrel seems to be not so much with priorities within the ground forces as with priorities within the Army Air Forces and between the AAF and the AGF.

Huston says that General Henry H. Arnold, the commander of the AAF, was "an airborne enthusiast" but that of greater importance "he was more of a strategic bombardment enthusiast." (p. 254) This is undeniably true. Huston suggests that a higher priority for the troop carriers might have been

> just as effective as a policy which massed impressive totals in bomber sorties, hours flown, and tonnages of bombs dropped but which, though carrying the appearance of violent activity, had relatively little effect on enemy war-making capacity until the last months of the war. In addition to contributing a consequential strategic threat, a policy of holding out troop carriers might have permitted a perfection in airborne training and technique which would have rendered airborne operations considerably more effective in breaking the enemy will to resist than were many heavy bomber missions in achieving that result. (p. 254)

Huston is aware that the troop carriers were often hurried overseas to provide badly needed airlift of cargo and men within theaters and that when they were diverted from airborne operations it was usually to serve the needs of ground units rather than air units. The thrust of his thesis seems to be

that there should have been more transport aircraft to meet both troop carrier and cargo airlift requirements and that the resources for the additional transport planes could have been gotten by reducing the programs for the strategic bomber forces. This is an argument on behalf of the airborne forces that was previously made by such distinguished writers as Walter Millis and J. F. C. Fuller in behalf of the tactical air forces and the ground forces in general at the expense of the strategic bombers. They too

Glider parts are assembled for the invasion of France.

found the results of the strategic bombardment of Germany not to have justified the expenditure of men and treasure. It is an issue that is obviously not susceptible to definitive resolution, but this makes it all the more appealing.

The contribution of strategic bombardment to the defeat of Germany in World War II has been a bone of contention ever since the war, but rarely, if ever, has the bomber been looked at in the context of a trade-off with the troop carrier. And yet

it is in this context that the bomber probably looks best, contrary to Huston's view. Even among those who regard the strategic bombardment campaign against Germany's industry and urban areas as a waste of resources, there is recognition that the campaign made a major and indispensable contribution to the success of the Allied armies in Western Europe, including the Normandy landings and all that followed, and therefore to the defeat of Germany. The strategic bombers and their escort

A Douglas C-47 tows a paratroop glider from an airfield in the United Kingdom. . . . Allied paratroops prepare to board C-47 transports in England for airborne landings in Nazi-occupied Holland. Strong forces of the First Allied Airborne Army, under command of Lieutenant General Lewis H. Brereton, landed in Holland on a Sunday afternoon, 17 September 1944. More than a thousand tow planes and gliders took part in the operation, escorted by swarms of fighters, including a Dutch Spitfire squadron, to knock out flak batteries and keep the Luftwaffe out of the skies.

fighters smashed the Luftwaffe and destroyed its fighter arm as a major opponent in the great air battles over Germany in the winter and spring of 1944, the four months preceding D-Day in Normandy. It was the deliberate interim objective of the Combined Bomber Offensive to neutralize or destroy the German Air Force, this as an indispensable prerequisite to the invasion of Western Europe and the strategic bombing of Germany. The official U.S. Army historian of the Normandy invasion has stated: "The German Air Force had been defeated by the Combined Bomber Offensive in the early months of 1944. This victory the Allies were sure of. This knowledge was the most important ingredient in the final decision to go ahead with OVERLORD." [1]

The absence of the Luftwaffe in any significant strength from the skies over the beaches of Normandy on 6 June 1944 was the surest indication of the success of the Allied air forces, particularly of the U.S. Eighth Air Force. Moreover, when the thousands of troop carriers and gliders in Operation MARKET flew over the Low Countries to Arnhem and Nijmegen in September 1944, they were little molested by German fighters because the Luftwaffe was too weak to attempt an effective response. And in subsequent airborne operations over Europe the Allied airborne forces could count on friendly skies. Most of the aircraft losses in European airborne operations in 1944–45 came from antiaircraft fire and crashes.

It is doubtful, probably unlikely, that the Luftwaffe could have been so severely diminished as a fighting force (the loss of its best pilots had the greatest effect) by any other means than the daylight strategic bombing campaign. The Germans had every reason and every intention to husband their fighter aircraft resources for use against the Allied invaders of Western Europe. Only the massive attacks on Germany itself could induce them to commit everything they had to the air battle before the invasion itself. It was Eisenhower's opinion that "OVERLORD was going in with a very slim margin of ground superiority and that only the Allied supremacy in the air made it a sound operation of war." [2] The history of OVERLORD, then, might well have been very different had a powerful German fighter force been present in the skies over Normandy on 6 June 1944. And the history of U.S. and Allied airborne operations in Europe would most certainly have been very different.

In current terminology, was the airborne effort cost-effective? The nub of the matter is whether the results of the use of airborne forces compensated for the much higher cost of creating and maintaining them. An airborne division cost as much to equip as an infantry division, which had about 75 percent more manpower. To this must be added the cost of the "airplanes and gliders required [together with their trained manpower], the extra resources and time for training, and the extra shipping space needed for overseas movement of airborne troop carrier units." (p. 255) In all, an airborne division might well have cost two to three times as much per man as an infantry division. Huston concludes: "Whether or not the effect of airborne troops in specific operations and their effect on enemy dispositions as a force in being was worth the cost is a matter of judgment." (pp. 255–56) His omission of a final opinion or judgment on the question, after his thorough and detailed study of the airborne forces, is perhaps the best indication of what a stumper it is.

There were, of course, differing opinions as to whether the airborne forces had been worth the cost. Many of the severest critics and most persistent doubters were to be found in the Army. But the U.S. Army's judgment after the war was that the effort

had paid off, and the Army retained substantial airborne forces in its structure thereafter.

Two U.S. regimental-size airborne drops occurred during the Korean War. In the 1960s the Army adopted the airmobile concept, in which helicopters came to be substituted for troop carrier planes and parachutes in assault landings. The helicopter came to be the distinctive and important feature of the war in Vietnam, to the total exclusion of parachute troops. It seems possible that such paratroop forces as the Army retains in the future may be reserved for highly specialized long-range strategic operations. For the shorter-range tactical assault operations, the Army appears to have committed itself to the helicopter. When the history of airmobile operations in Vietnam is written, definitive answers for these difficult questions will likely be as hard to come by as for World War II airborne operations.

Arlington, Virginia

Notes

1. Gordon Harrison, *Cross-Channel Attack, United States Army in World War II* (Washington, D.C.: Government Printing Office, 1951), p. 180.
2. *Ibid.*, p. 272.

A COMMUNITY WITHIN "A NATION OF STRANGERS"

Colonel Andrew J. Dougherty
Marjorie M. Dougherty

DURING the past year over 700,000 U.S. Air Force individuals or families enjoyed, suffered, or otherwise went through a permanent change of station. For many it was a time of excitement and anticipation; for others, sadness and frustration. But for the majority, it was probably a mixture of all these emotions.

Until fairly recently, the military was the group most often identified as the gypsies or nomads of society. Many who have spent a tour in the civilian community have had a sneaking suspicion that our civilian counterparts were starting to enjoy—or suffer—the kind of transience that had previously typified mainly the military.

suspicion confirmed

Vance Packard, in his recent book, *A Nation of Strangers*,† has explored for the first time the true breadth and depth of the recently evolved mobility patterns and fragmentation that have become a new way of life in American society.

While many have suspected that movement had increased, the phenomenal amount of the increase and, more important, the far-ranging impacts are cause for concern. Mobility in the civilian community is rapidly approaching that in the military in terms of frequency. Packard estimates that more than 25 percent of the population moves annually. Given the continuation of technological and societal changes now in play, there is reason to believe that this trend in the civilian community will not only continue but, in the short term, accelerate. Forces are simultaneously at play within the military to decrease the number of permanent changes of station (PCS). Air Force permanent changes of station are programmed to decrease in each of the next four years. It is altogether possible that in the near future the military will become one of the more stable and less transient groups in society.

a descriptive and prescriptive study

Mr. Packard has done a truly impressive job, first, in defining the dimensions of the new mobility; second, in assessing the societal impacts; and, third and more important, in suggesting methods by which the undesirable impacts of the phenomena of mobility and fragmentation may be minimized. Mr. Packard employed unique approaches to ferret out the facts about mobility, a primary method being the number of telephone disconnects. The explanation of the methodology leaves little doubt as to the fidelity and interpretations of the data.

In the descriptive treatment, Mr. Packard pulls together a massive array of data from some of the most thoughtful and serious writers on the subject of mobility. He simultaneously explores such diverse but related aspects as the impact of the change on towns and cities, on retired people and their life styles, and on the way people behave. Finally, the book treats methods of reducing the fragmentation that usually results from the changes occurring. It is toward this final prescriptive portion of the book that the rest of this discussion will mainly be directed.

previously solved Air Force problems become new problems for society

The Air Force has been forced to come to grips in the past with the kinds of problems that are just beginning to concern the rest of society. The doctrinal charter of the Air Force demands a capability and flexibility, coupled with a certainty peculiar to an armed force. Fighting or preparing to fight in a global context has caused Air Force members to be historically a highly mobile group.

Personnel planners are charged with the responsibility of providing a technologically intensive array of human resources. The men and women of the Air Force are the product of long lead-time procurement and training cycles prior to productive utilization. The selective retention of the appropriate numbers and skills is as essential as recruitment to force vitality and ability to deliver. The mobility and fragmentation problems described by Mr. Packard are precisely those addressed by Air Force planners over the past twenty-five years with a high

† Vance Packard, *A Nation of Strangers* (New York: David McKay Co., 1972, $6.95), 368 pages.

degree of success. Success can be measured in only one substantive way; we possess the numbers and skills required. We have fought well in the most unpopular war in history, and, above all, the total fibre of our force is intact, vital, and reliable.

Given, then, that the Air Force has previously encountered to a significant degree the problems now confronting the greater society, and further given that the Air Force has addressed these problems with some degree of success, it might be well to examine Mr. Packard's thesis in terms of where the Air Force has been, where it is, and future implications.

inside "Life on the Nuclear Frontier"

"Life on the Nuclear Frontier" is the title of the chapter in which Mr. Packard examines the role of the federal government in the changes confronting society, with particular attention given to Department of Defense and space activities. The chapter examines a variety of towns where the various services and defense-related activities have a large impact. The study focused only on the civilian-military interface and attendant trauma, with occasional personal "horror stories." The point largely missed was the existence of a true military community, a community which has been forced by the necessity of physical and emotional survival into a series of intricate and unique mutually supportive relationships. The kinds of activities and programs which Mr. Packard would have found in these military communities largely address the developing societal problems which he identifies.

The final portion of the book, entitled "Toward Reducing the Fragmentation," pursues two central themes: the first, "recovering a sense of continuity," and the second, "approaches to a sense of community." These two themes represent the distillate of the rest of the book. They therefore represent an excellent point of departure for discussing the means and methods by which Air Force members have managed through the years to maintain an identity, a sense of continuity, and a sense of community while undergoing the severest of stresses. Such an examination must be preceded by a selective look at those who comprise the Air Force.

What is an Air Force?

The nature of the Air Force population and the relationships which emerge are central to any examination of the Air Force community. An initial parameter is established in the recruitment of Air Force people. While there are occasional overtones of draft motivation, it would be fair to state that the majority of Air Force members are true volunteers. They purposefully sought out and joined the Air Force. They compete to remain members. They are people willing to accept a commitment in what they must perceive as a team effort.

The myriad of available attitudinal surveys tells us much more about our Air Force in terms of how we think and feel. Of particular interest are the elements of the job and life style that are perceived as most important in making career decisions.

A recent survey focused on factors related to the military job that are of primary and secondary importance. When presented with such an array and asked, "Which one is of the greatest importance to you?" and an equally searching second question, "Which is the second most important?" the percentages selecting each factor are shown in the accompanying table. These data paint an interesting picture of our Air Force. Note particularly the preponderance of responses addressing the first three factors plus that of "opportunity to learn" and the relatively minor interest displayed in geographical location, physi-

cal conditions, and other "hygienic" conditions of work.

Two points need to be made. First, there is little concern with the transiency of life. Our men and women are concerned with *what* is going on rather than *where.* These interesting implications suggest two forces at work: people are selecting the Air Force life style and work while the Air Force is selecting them; and simultaneously the Air Force is being shaped by its members as the Air Force community shapes its members. Above all, these responses and the responses to subsequent questions indicate a reasonable degree of satisfaction. An example of the ongoing mutual shaping and fitting relationship within the Air Force is the cited survey, which is carefully studied by personnel planners. Survey results become the basis for future programs and actions.

The second point to be made concerning the data is the probable universality of the responses. While the question stipulated *military* job, we must consider a wider contextual application. The *job* in the Air Force does not exist as and cannot be portrayed as an independent variable separate and distinct from life style. We are, therefore, reasonably safe in assuming that the responses largely reflect a cluster of attitudes responding to Air Force life in a general way.

Other surveys characterize Air Force members as wanting to travel and having a deep concern for other people as well as their nation. Given their even normal statistical variations, those who comprise the Air Force are not a true cross section of the population. Rather, they represent a more finite universe of competent, task-oriented, ambitious, and concerned individuals.

The results speak cogently of men and women who seek and are largely finding a sense of community and continuity in a life style typified by transience. Air Force mem-

	Airmen		Officers	
	Greatest Importance	*Second Most Important*	*Greatest Importance*	*Second Most Important*
Kind of people with whom I work	23.9	23.8	17.9	24.8
Challenging work	22.7	14.3	50.2	17.6
Recognition for my work	11.3	14.2	8.8	15.5
Pay	13.3	14.5	7.8	12.6
Geographical location of my work	7.2	8.8	5.7	8.5
Physical conditions under which I work	4.1	6.3	1.7	4.0
Hours of work	4.3	8.3	1.4	2.4
Opportunity to learn	13.1	9.7	6.5	9.8
Other	—	—	—	4.7
	100.0	100.0	100.0	100.0

Significant sources of career satisfaction in the Air Force

bers vote with their feet: if they don't find what they want, they leave. Yet they are staying.

continuity and community—Air Force style

Mr. Packard tells a frightening story of what is happening in society. After stating that "rootlessness seems clearly to be associated with a decline in companionship, a decline in satisfying group activities, a decline in mutual trust and a decline in psychological security," he proceeds to state:

> Man needs a community; he needs continuity. Being a full-fledged card-carrying member of a community is not incompatible—as some assume—with being a free full-fledged individual. It can be, since community functions through cooperation, consensus, and regulations, but it need not be. The community by encouraging interaction between people can contribute greatly to the individual's sense of self-respect and can provide opportunities for self-fulfillment. Both contribute to an individual sense of identity.

This, we submit, is a summary treatment of the community, Air Force style. Each of us views the Air Force from a separate vantage point of personal identity. To each of us, like the blind men describing the elephant, the Air Force community represents something different.

Most Air Force members, on reflection, would probably concede that they are in fact members of the Air Force community.

The single element that has created and now perpetuates this community is need. The single statement that best represents the philosophical underpinning of the Air Force community is "The Air Force takes care of its own."

The meaning of this statement is individual and personal. To those thousands of families who have a child with a learning disability or physical or psychological impairment, it means Children Have A Potential (CHAP). It means a guarantee that the family will be assigned to an area where the child can get the special education he or she needs in order to be part of the academic mainstream. To those with extraordinary or even ordinary medical problems, it perhaps means CHAMPUS (Civilian Health and Medical Program of the Uniformed Services). To the tens of thousands of families who have had personal tragedies and requested and received preferential assignments, it means humanitarian transfers. To a minority group member, it means equal opportunity. To each individual who receives PCS orders and a letter from his commander and sponsor with a package of base, housing, and community information, it means the Sponsor Program. To the same family on arrival at a new station, using the lending cabinet, indoctrination, and other arrival services, it means Family Services. To all members of the Air Force community, there are certain common meanings. In a majority of cases there is a certainty of a wide array of base facilities, which we tend, often, to take for granted but for which our civilian counterparts would give their eyeteeth.

Most important is the process of community, which is the true fabric of continuity. In the process of participating, sharing, creating, and using the facilities, programs, and services, a series of intricate interrelationships is created that is the Air Force community.

Mr. Packard draws on a study by Dr. Robert S. Weiss, who worked extensively in a research project at the Harvard Medical School. Weiss focused on the lives of people who had been uprooted by broken marriages, by retirement, or by moving considerable distances. He concluded that people do indeed have needs that can only be met within relationships with other people. He then identified five relationships most generally required in order to have a sense of well-being: the opportunity of

parents to nurture children, knowing people who share our concerns, knowing people we can depend upon in a pinch, having one or more really close friends, and knowing people who respect our competence.

Perceptions of the Air Force community are individual and personal. It would serve no purpose to editorialize further on Weiss's findings and what they should or should not mean to the individual reader. Perhaps many members of the Air Force community will find on reflection that Dr. Weiss's listed relationships are fully or substantially satisfied through the Air Force community. What Mr. Packard seems to be talking about mostly is the quality of life in society. Upon examination, it appears that the quality of life within the Air Force has much to recommend it, especially in terms of the problems steadily mounting in the greater society.

Read Mr. Packard's book. He has a powerful message concerning a society in flux. The Air Force community is not, nor should it ever be, separate from the greater society. We cannot and should not be insulated. The impacts Mr. Packard describes will reach us. We need to be aware of them.

Washington, D.C.

AIR UNIVERSITY REVIEW AWARDS PROGRAM

Dr. Ralph E. Strauch, a senior mathematician with The RAND Corporation, has been selected by the Air University Review Awards Committee to receive the annual award for writing the outstanding article to appear in the *Review* during fiscal year 1973. His article, "Winners and Losers: A Conceptual Barrier in Our Strategic Thinking," was previously designated the outstanding article in the July–August 1972 issue.

The awards program provides payment to eligible authors, a $50 award for the outstanding article in each issue, and a $200 savings bond for the annual outstanding article. The award winners also receive a plaque.

The bimonthly winners for the past year were Dr. Ralph E. Strauch, "Winners and Losers: A Conceptual Barrier in Our Strategic Thinking," July–August 1972; Lieutenant Colonel Edward Stellini, USAF, "Defense Dollars for Deterrence: A Matter of Priorities," September–October 1972; Major Michael A. Nelson, USAF, "Soviet Policy in Latin America," November–December 1972; Major Richard Zock, USAF, "Resource Management, Economic Analysis, and Discounting in the Department of Defense," January–February 1973; Lieutenant Colonel Richard D. Besley, USAF, "The Need for Military Officers as Strategic Thinkers," March-April 1973; Captain Raymond S. Blunt, USAF, and Captain Thomas O. Cason, USAF, "Realistic Doctrine: Basic Thinking Today," May–June 1973.

The Contributors

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AWARD

The Air University Review Awards Committee has selected "Realistic Doctrine: Basic Thinking Today" by Captain Raymond S. Blunt, USAF, and Captain Thomas O. Cason, USAF, as the outstanding article in the May–June 1973 issue of *Air University Review*.

ATTENTION

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UNITED STATES AIR FORCE AIR UNIVERSITY REVIEW