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ATTENTION

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THE
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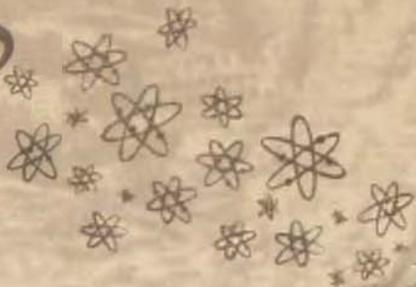
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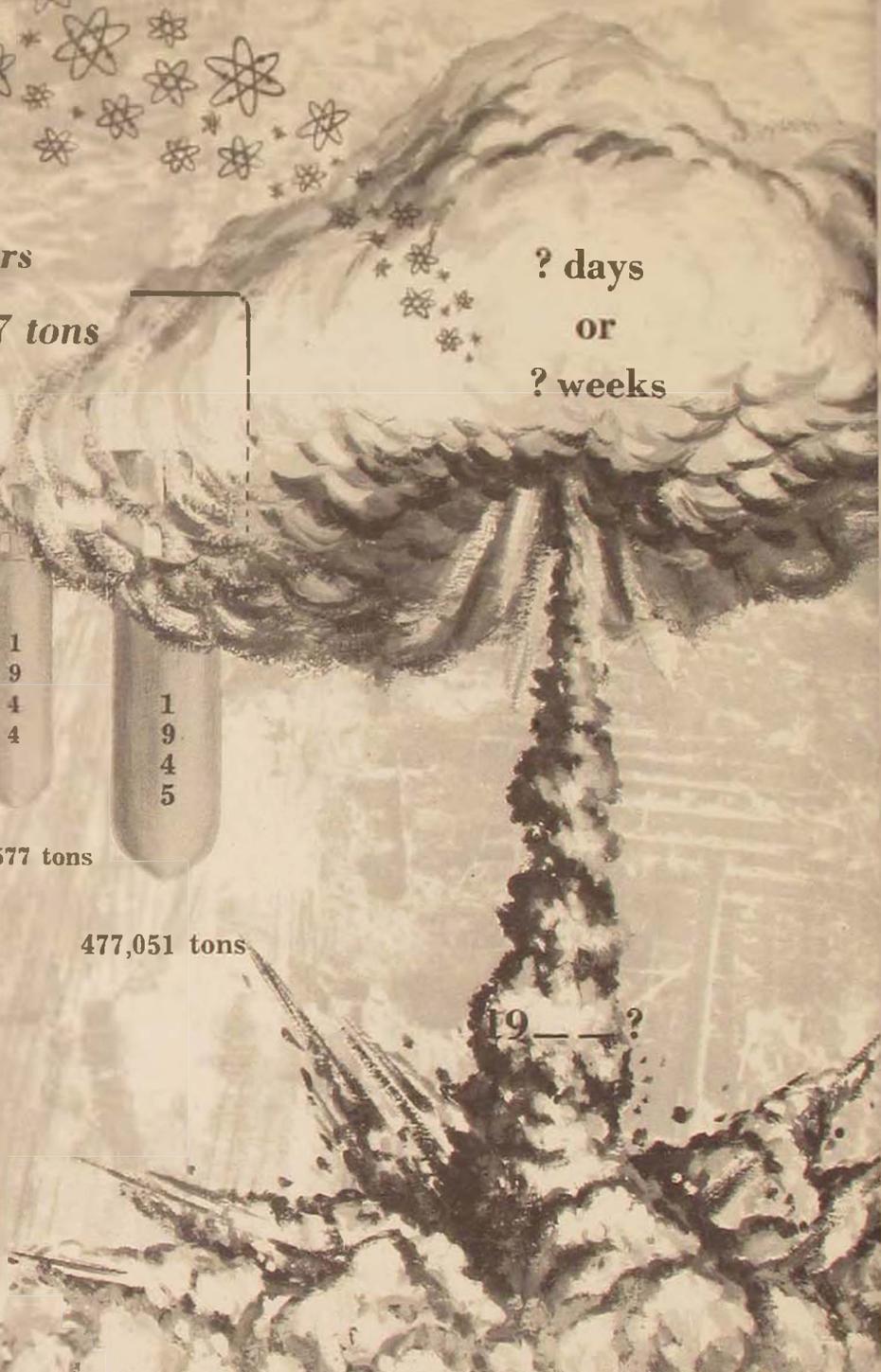
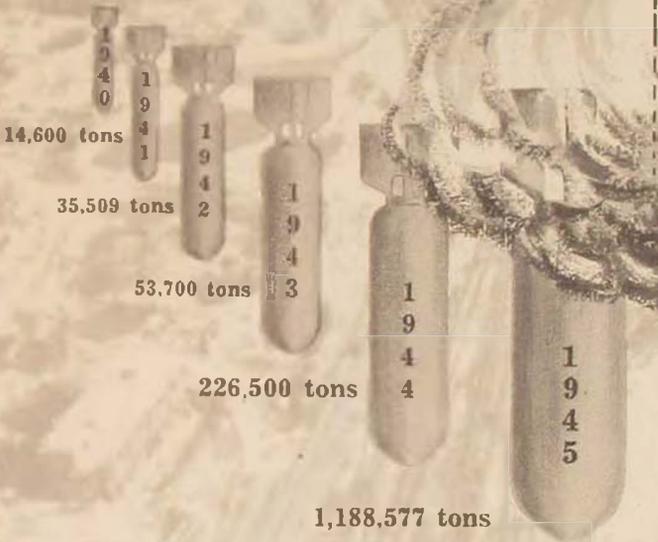
6 years

1,995,937 tons

? days

or

? weeks



19—?

The atomic clouds over Hiroshima and Nagasaki were the huge black exclamation points that ushered in the age when man could kill civilizations. As the day of "mutual atomic plenty" comes closer to reality, the bitter question of our age is "If World War III comes, what will be its form and how can we win it and survive in doing it?" The answer crucially involves the incredible reversal of the rate of destruction from World War II to atomic blitz. Nuclear weapons compel the strategist to face stark alternatives. The starkest is global war—all-out air atomic blitz to shatter a foe beyond ability to retaliate. This threat must be dealt with first. Some of its momentous implications are ably discussed by Colonel Robert C. Richardson III on p. 3 and by Dr. Stefan T. Possony on p. 43. The strategist who grasps the transcendent reality of the air vehicle-atomic bomb will see it not only as the ultimate deterrent and cataclysmic weapon of retaliation but as a highly flexible, decisively potent, and uniquely global instrument for preventing war and for rendering unprofitable all gradations of limited war. These latter aspects of air power will be treated in subsequent issues.—*The Editors.*

Atomic Weapons and Theater Warfare

COLONEL ROBERT C. RICHARDSON III

Part I: Will Nuclear Weapons Be Used?

THE YEAR 1954 ushered in the second phase of the atomic age. Nine years after Hiroshima and Nagasaki the public is being confronted not with an atomic or hydrogen bomb but with an *atomic weapons system*. Even more surely than the first nuclear explosion led to the perfection of the hydrogen bomb, it had to lead to a family of atomic weapons. One by one these weapons and the means of delivering them have been perfected and military units have been trained in their use. As the possession of one kind of atomic bomb revolutionized World War II concepts of strategic bombing in the years immediately after the war, so the possession of a rapidly widening family of atomic weapons, tailored to meet the variety of military requirements, has revolutionized doctrine, tactics, and requirements in every military activity.

It was of course inevitable that changes so sweeping in implication would be met with grave misgivings and with die-hard opposition. Today even a schoolboy would laugh at the idea of employing the machine gun in just the same way as the bow and arrow, simply because man had used the bow and arrow first. Yet the gap between the firepower of the bow and arrow and the machine gun is nowhere near as great as that between conventional ordnance and the atomic weapon. The impact upon strategy and tactics and equipment was bound to be staggering in its magnitude.

In the last year the ground swell of the great debate has begun to rise. The first shots have been fired, and the ammunition is not nearly exhausted. Among the first salvos was a theme which will reappear many times. One of the places it appeared was in the *New York Times* of 11 August 1954, in an article entitled,

"The Ability of U.S. and NATO to Win War by Non-Atomic Power Is Declared Vital." The theme was that "we must, paradoxically, maintain two fundamental capabilities—the capability of waging an atomic war unequaled in destructiveness by any opponent and the equally important capability of waging a victorious war without utilizing atomic weapons." The argument also included the often-heard assertion that "we should shun atomic warfare, primarily because such warfare would inevitably lead to total and unlimited war from which no 'victory' and no stable political results could be expected by anyone."

Such conclusions generally emerge from a first and shallow analysis of the contingencies of nuclear war. They stem from the normal tendency to assume, first, that all atomic devices are typified by the largest and most destructive of known models; and, second, that commanders in war will invariably strive for maximum indiscriminate destruction without regard to their objectives or to the aftermath. I submit that such views ignore the relationship of "cause and effect" and the selfish intelligence of man.

The eventual use of nuclear weapons in wars—even local conflicts—is inevitable under present conditions. It will remain inevitable unless, and only unless, the enemy's capability to use such weapons can be wholly and effectively eliminated by appropriate controls or other means.

To date, the relatively limited enemy atomic capability has not posed a threat to the whole panoply of military targets. When

Worst prospect confronting military planners of the atomic age is a global atomic war beginning with both sides expending their accumulated stocks of atomic weapons in awesome salvos. In such a conflict the range and speed of modern aircraft may preclude theaters of operations from fighting the virtually separate wars that made up World War II. But the theater will continue to be a frontline against the enemy. Like the homefront it must prepare itself for an entirely different war both on the surface and in the air. However preoccupied we may be with the new importance of the Polar air route and with massive retaliation, we must not forget the impact of the nuclear rate-of-destruction curve on a theater of operations and the implications of the growing versatility in the family of nuclear weapons. Colonel Robert C. Richardson III, of the Office of the Air Deputy, Hq SHAPE, presents the first two of five articles on *Atomic Weapons and Theater Warfare*. Assuming that each side might open the war with an atomic blitz designed to knock out opposing forces in a few days, Colonel Richardson outlines the drastic, sweeping revisions this assumption imposes on planning, strategy, deployment, tactics, and supply of surface and air forces in an overseas theater of operations.

atomic stocks were limited, both sides could safely be counted on to budget the weapons they possessed, reserving them for targets of a primary or decisive nature. As long as this condition existed, it was possible to choose between conventional and atomic war. The existence of the nuclear weapons had not as yet affected our conventional capability; atomic bombs were an addition to the Allied arsenal, not an essential component thereof.

As nuclear stocks in the hands of potential enemies increase and we approach an era of atomic plenty, two things occur. First, more and more elements of our military power—land forces, depots, communications, etc.—must face up to the possibility of coming under atomic fire. Major targets will no longer be the sole recipients of atomic attack. Second, combatant levels which heretofore could not aspire to the use of "priceless strategic weapons" can now begin to study and experiment with the atom in relation to their particular roles. The great mass of the forces on both sides is faced with the prospect of having to absorb atomic attacks and of having to be able to deliver atomic weapons.

The very existence of this atomic threat to Allied defenses must lead to the adoption of postures—organizations, tactics, dispersion, and weapons systems—that will give us a reasonable chance of surviving should the enemy choose to exploit his capability. Failure to readjust all potential targets so that they can absorb atomic attack would be criminally negligent. Indeed such negligence would attract war by offering the enemy the prospect of quick victory.

THIS brings us to the inevitable facts to be faced when we realize that a major war must now be atomic in nature. Even the minimum postures essential to the ability to absorb and survive atomic attack are incompatible, in many if not most instances, with the retention of a conventional capability. The very dispersion, mobility, concealment, and freedom from heavy logistic "tail" and from fixed installations which atomic survival dictates are the antithesis of mass, force concentration, and quantitative firepower employed in conventional war.

The military is thus faced with a dilemma. To ensure survival in event of atomic attack—a survival which if nothing else is necessary for its deterrent effect—there must be a progressive evolution to an atomic posture. This in turn leads to the inevitable use of such weapons when and where these postures cannot be reconciled with retaining a conventional capability. It is clear

War Equations

*conventional
employment* =



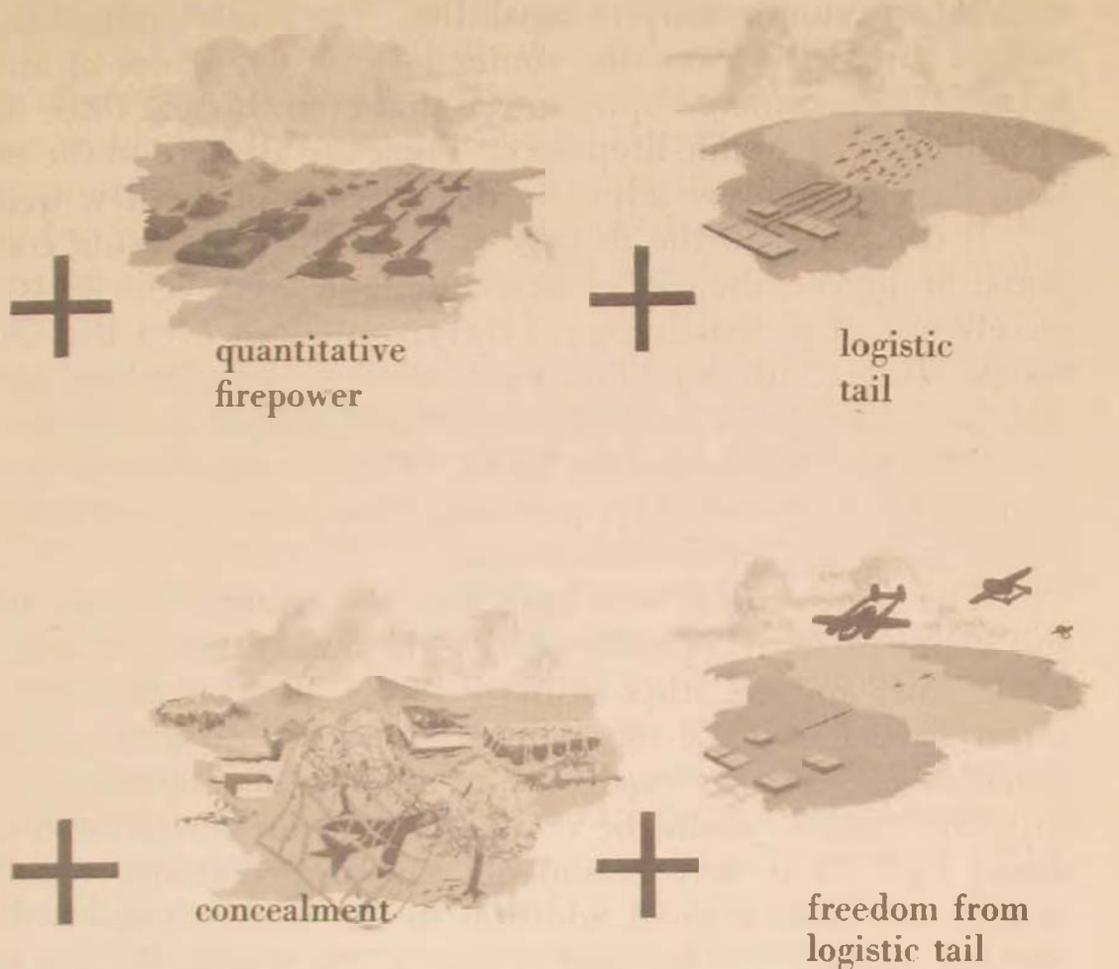
*atomic
posture* =



that when the advent of nuclear weapons imposes upon any force, arm, or weapons system a posture which parts company from that required to fight without the new weapons, there is no alternative, if war comes, but to engage in nuclear operations or accept defeat.

Faced with these alternatives, we are not free to choose whether or not we will fight with atomic weapons if we have to fight. Now the question for decision is how long we can afford, or even risk, retaining a progressively decreasing conventional capability, good only for limited use, in face of an increasing and more diversified atomic threat. This is not a new situation, nor have its implications only recently dawned on the strategists. Notwithstanding a rash of articles that would have one believe there has been a change of concept—a so-called "New Look" or "New Approach"—the evolution toward atomics has progressed smoothly since 1944. It did not result from any great decision

Old and New



but from an occurrence—the development of the first nuclear bomb.

The idea that we are today faced with a dire choice—to create an atomic army, navy, and air force or not to create them—is ridiculous. The choice was forced upon the world ten years ago. The current publicity arises from the fact that the atomic age is now passing out of its first developmental stage. Growing stocks of atomic weapons and resultant evolution of forces are just beginning to touch a level of military unit—land forces, tactical air, convoys, etc.—where they are suddenly obvious to the layman. This seems to cause consternation and is interpreted as a sudden change brought about by some recent “great” decision. I suggest we glance at the facts.

The evolution began at the end of World War II and was given impetus by the shocking implications of the atomic tests in

Soviet Russia. The size, organization, and equipment of our strategic air arm were oriented for an atomic war. Next came carrier forces. I doubt if one could seriously justify the cost of Forrestal carriers in terms of their feeble conventional effort and without any atomic delivery capability. The sorely strained British budget supported a bomber command of a few scores of aircraft because the considered opinion was that even this size force would be potent in its atomic firepower. These are all steps in the evolution; item by item we adjust to the presence of the new weapon.

If compared to the damage they could inflict using conventional firepower, the cost of new atomic delivery vehicles is completely out of proportion with the resources of even the United States. Intercontinental, or even tactical, missiles are in this category. In certain areas of aircraft and guided missile development this fact must soon be faced. These weapons will have to be built for atomic delivery purposes alone, with any conventional capability being purely incidental.

The same writers who state that we require both an atomic and a conventional capability divide the task between strategic air, for atomic, and all other military forces, for conventional. Nowhere have I seen the suggestion that we should have a conventional heavy bomber capability as well as an atomic one. Yet without it where would be the balance in our forces for conventional war? If it were reasonable to consider atomic capability as no more than a small addition to the conventional forces, a "special weapon" to be used or not at discretion, we should by now possess a force of several thousand heavy bombers in the U.S. and U.K., and our air defense effort should be limited to the small, elite force that would be the nucleus of a post-D-Day build-up adequate for a long, conventional interhemisphere war of attrition.

Opinion, opposition to change, and wishful thinking cannot change the inexorable march of evolution. The cause for atomic war is present—a capability in enemy hands. The effect will be gradual change and acceptance of the weapon as a normal addition to world arsenals. The danger in the stubbornness of human nature and resistance of vested interests to change is the waste of money and precious time. While these elements cannot stem evolution, they can blind a nation to the nature and direction of the evolutionary process until it is too late to recover the lost ground. By trying to be strong in both conventional and atomic capabilities during the transition, we may become weak in both. At best, money and time will be wasted on obsolete weapons

systems because of specious reasoning that atomic weapons will never be used.

Is the inevitable use of atomic weapons in war necessarily synonymous with the mass destruction of the population centers and cultural landmarks of civilization? Does the fact that a certain order of capability exists necessarily ordain that it shall be used to its fullest extent? I think not. I prefer to believe that the use of any weapons system against any given target complex in war will still be wholly dependent on whether it contributes to the objectives or aims of the user. Wartime errors in judgment are frequent, but seldom have weapons been used or targets destroyed when the instigator knew the act would work to his disadvantage.

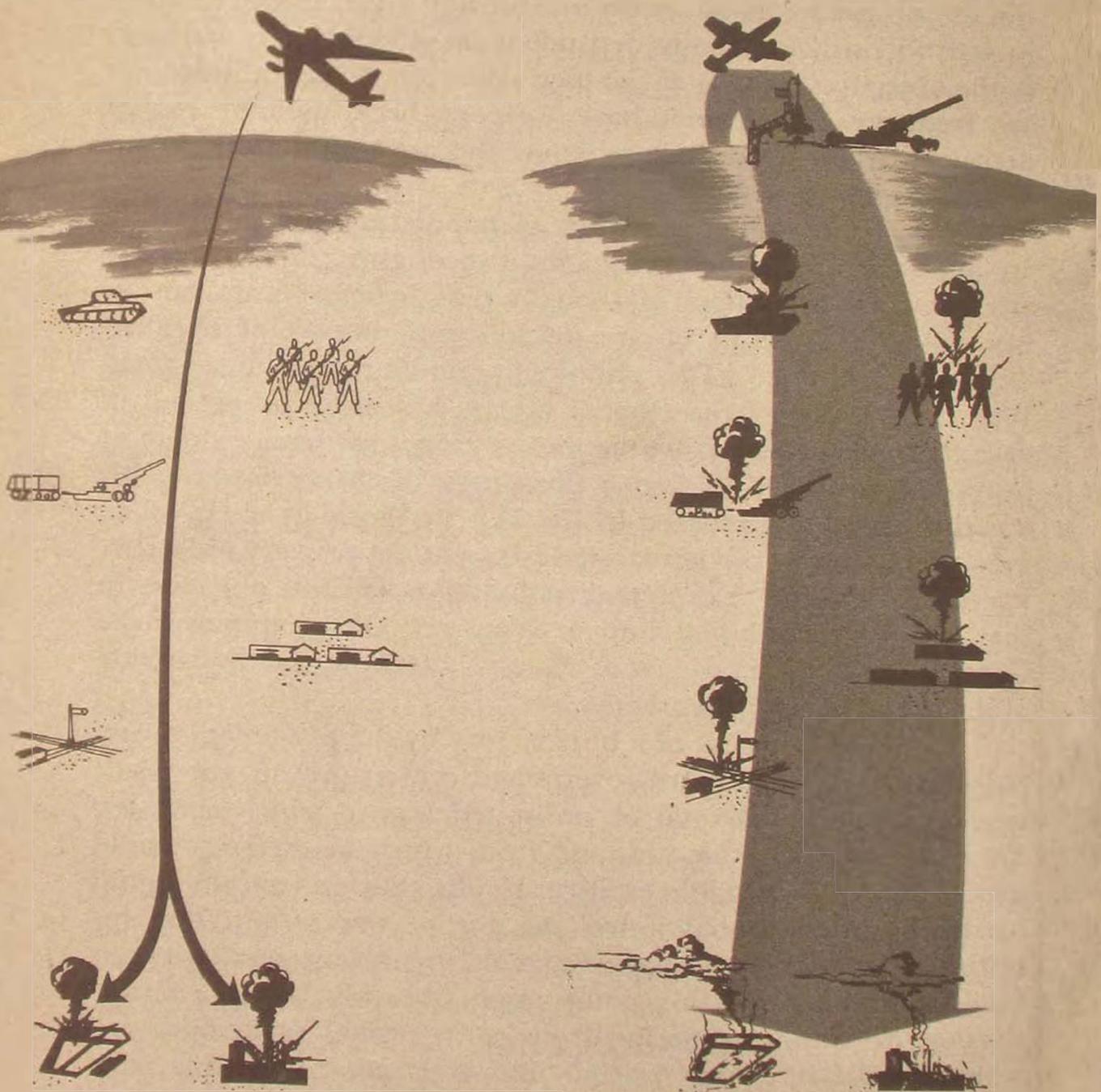
The assumption that centers of population and civilization are automatically atomic targets has two origins. First, it can be attributed to the school of thought that believed wars can be won solely as a result of the psychological impact of so-called "strategic bombing." This philosophy, which represents a World War II extension of the Douhet theory, has not been proved to date. Second, it stems from the more rational past employment of heavy bombardment to destroy the sources of enemy power. This was the philosophy adopted by the U.S. in World War II, where precision bombing of German industry was the primary objective. Even the bombing of centers of population had this objective in that it destroyed skilled human resources, thus paralyzing the German war potential almost as effectively as the actual destruction of the industrial facilities themselves.

Should the concept of a blitz victory by the psychological impact of mass destruction of government centers prevail, the result would approach the total or unlimited war to which the *New York Times* article referred, and from which neither side could expect "victory" or stable political results. Such a concept would hardly be implemented unless the author was certain that his initial blow would be so successful as to prevent retaliation in kind. Optimism on this point might possibly be entertained during the transition period from conventional to atomic war, where preparedness has lagged. But it is not compatible with any reasonable defense posture which included an immediate and secure ability to retaliate. We must anticipate that so long as both contestants can be expected to retaliate in kind, regard-

What are Atomic Targets?

in atomic scarcity

in atomic plenty



**decisive
targets**

**wide range of
military targets**

less of the damage sustained in the initial attack, it will not be in the interest of either one to rely upon a concept of sudden victory solely through the psychological impact of mass destruction of centers of population. This psychological-impact strategy also ignores the problems which such destruction would present to the victor in trying to capitalize on the peace. A series of population-destruction attacks powerful enough to be decisive could produce such physical and psychological chaos as to make useful reconstruction an impossible task.

We therefore return to the concept that strategic use of atomic weapons will, as in the case of conventional weapons, be primarily aimed at the destruction of the enemy's combat potential or power resources. In World War II these targets were composed primarily of industrial and production facilities, aircraft, armament, and petroleum products which, if destroyed, would have a gradual, cumulative impact on the ability of the combat forces to pursue hostilities. The same would no doubt be true in a future war of attrition. This poses two alternatives as to the nature of an atomic war: first, that the weapons systems available can be sufficiently selective so as to destroy the desired individual targets without necessarily entailing the mass destruction of the population centers in the neighborhood; or, second, that the nature of the war will be different and will not consist of a war of attrition.

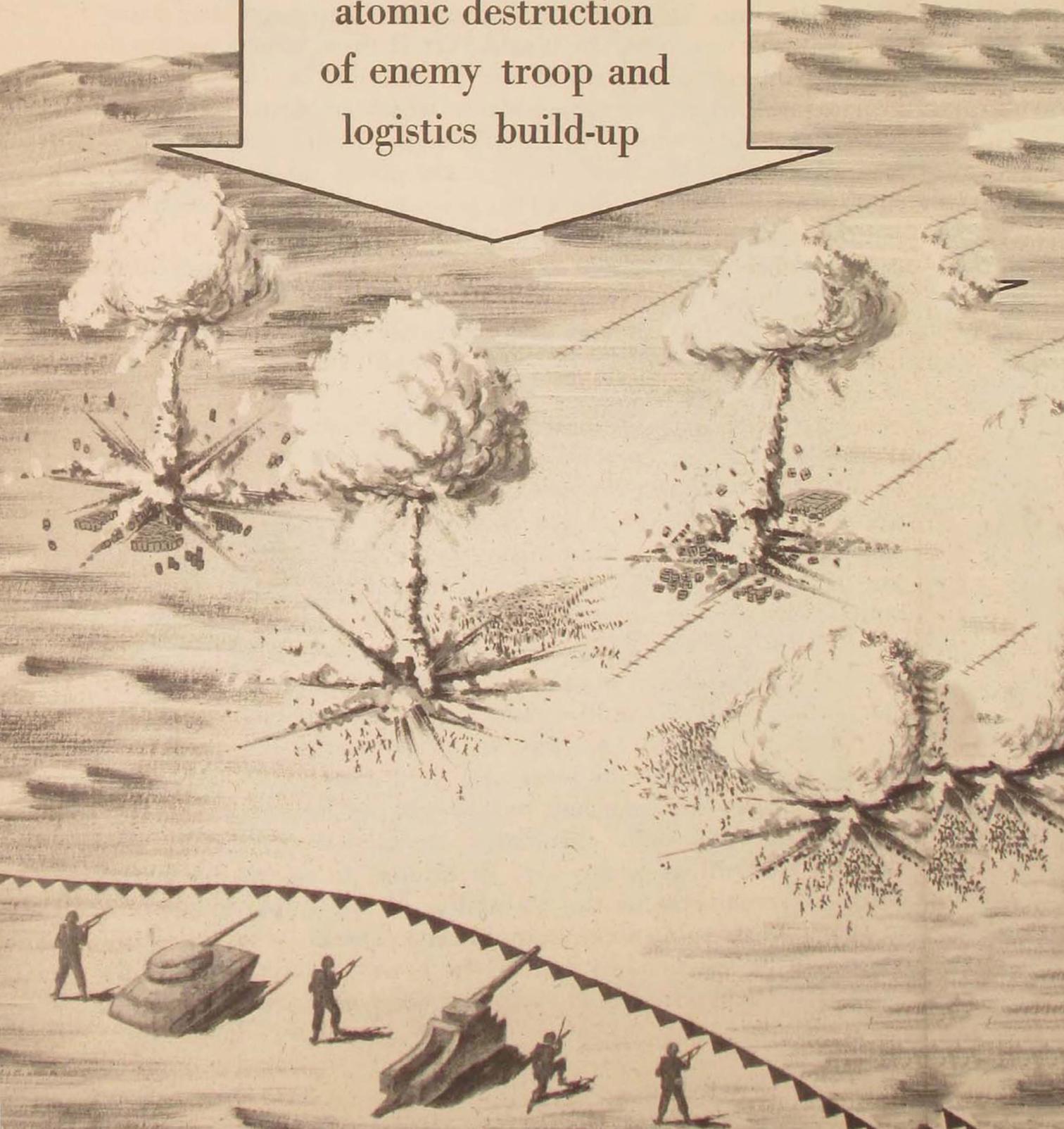
Now that atomic arsenals are becoming more and more diversified both in type and yield of weapon, it should certainly be practical to restrict the nature and area of destruction in most instances to the specific target to be destroyed, provided an effort is made to do so. But the limiting factor will be that an atomic war of the future will not be a war of attrition. D-Day will find both contestants armed with adequate stocks of destructive power to permit hope of an early decision if the power is properly employed. This situation points to a short conflict in which the primary target system would consist of "quick pay-off" objectives.

With the advent of higher-yield weapons the protection afforded combat forces by local cover and dispersion will steadily decline. Major land, air, and naval units can be included in our list of "quick pay-off," profitable atomic targets. When the enemy's land threat to any area of interest to us can be largely destroyed regardless of the formation of the opposing forces—in attack, in assembly areas, in mobilization areas, or on the road—there will be less need to destroy the power sources upon which these forces depend. Higher yield weapons would seem to decrease

Atomic War:

Not Attrition but Quick Payoff

atomic destruction
of enemy troop and
logistics build-up



decisive
atomic bombing
of selected
objectives



ATTRITION

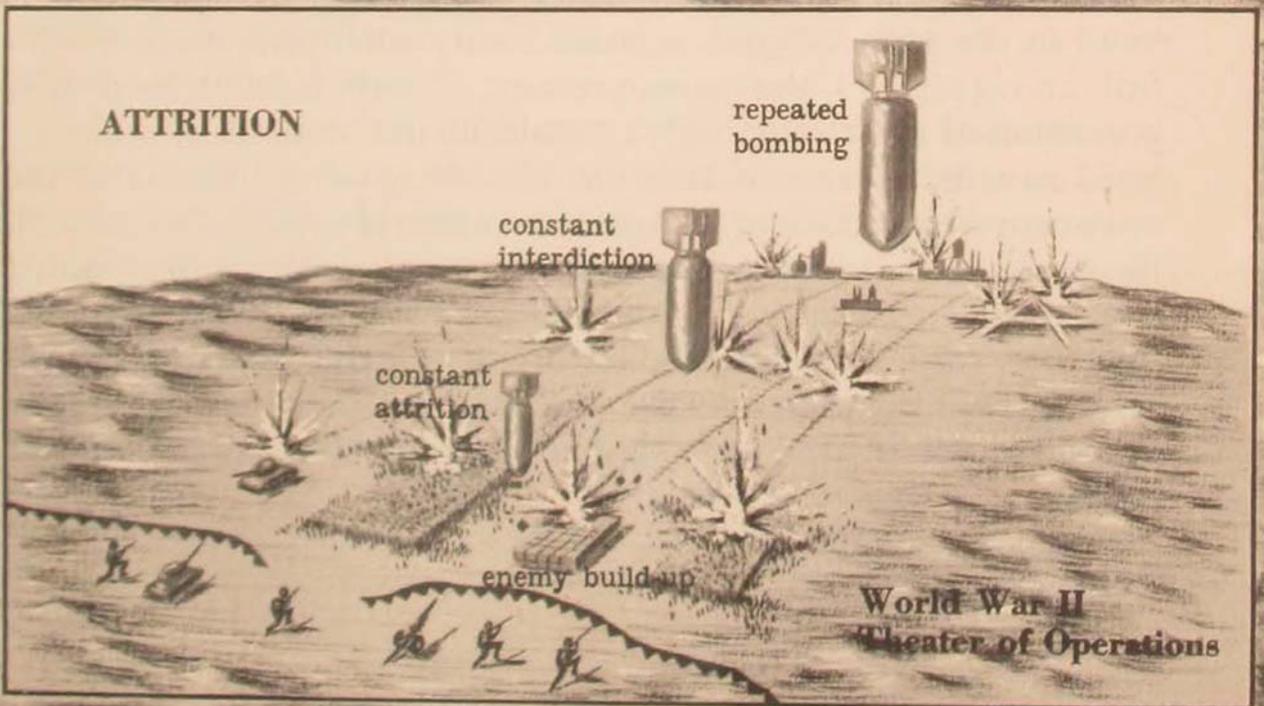
repeated
bombing

constant
interdiction

constant
attrition

enemy build up

**World War II
Theater of Operations**



the dependence of theater defenses on the indirect effects of destruction of enemy production facilities, because these weapons can now directly destroy the combat forces in the field.

In addition to the immediate military advantages of employing nuclear power against quick pay-off targets, and particularly combat forces, planners must henceforth give greater consideration to the problems of the subsequent peace. When wars are a lengthy affair of several years' duration, the primary objective becomes military victory. In these cases victory is usually equated with the most rapid and expeditious termination of hostilities. Atomic war promises to be a truncated affair, with the build-up and exploitation phases reduced from the customary months and years to a matter literally of hours and days. If wars of the future start with the decisive phase, the prospect of coping with the outcome is much more vivid to all concerned. More careful plans will then be laid to ensure that the combat phase is conducted to best achieve the ultimate peace objective and to prevent a situation of no gain to either side.

I BELIEVE that the increasing importance of quick pay-off target systems—especially combat formations of all arms and services—combined with the prospect of a shorter conflict—and hence the need for careful plans to shape and deal with the outcome—will mitigate against an irresponsible use of nuclear power which would devastate both sides with no gain to either. In no other field of human endeavor have people overplayed their hand to the point of suicide, particularly when they started with full knowledge of the consequences. There is no reason why possession of the atomic bomb should incline nations to premeditated suicide. A war of attrition is a thing of the past, and the attendant destruction of demographic centers should also go with the decrease in importance of targets whose “pay-off” is too gradual for the swift decision in atomic war. Likewise it may be presumed that the prospects of a quick victory, if not the fact, will lead to careful consideration of the subsequent peace and thereby minimize unessential or wanton damage during the atomic exchange.

Part II: Nuclear Weapons and War Strategy

IF WE accept the premise that the advent of atomic weapons will have an impact on the conduct of future wars, it behooves us to establish the reason why. Atomic war plans are currently called the "New Look." The question is: "What's new in the New Look?"

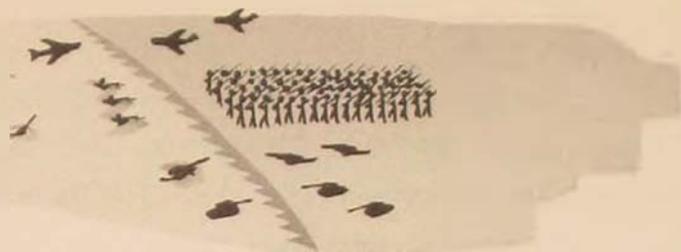
The availability of atomic weapons to both sides enhances combat capabilities. They provide an area-destruction capability that opens up whole new systems of profitable targets and new problems for the defense. They permit the desired degree of destruction to be achieved with a minimum delivery effort. But the greatest consequence is that they permit both sides to aspire to decisive results from the onset of hostilities and without awaiting the cumulative strength to come from production and mobilization.

The old concept of a three-phase war—the holding, build-up, and exploitation phases—is dead, and with it died the tempo of gradual increase found in the classic war of attrition. The basic "new" aspect of the atomic age is the ability to accumulate and store up destructive power in a form and quantity which permit its immediate application at the onset of hostilities. The war and the decisive phase will hereafter begin at the same time. The next, and last, phase concerns the consolidation of the victor's conquests in accordance with his objectives; it may or may not require military forces.

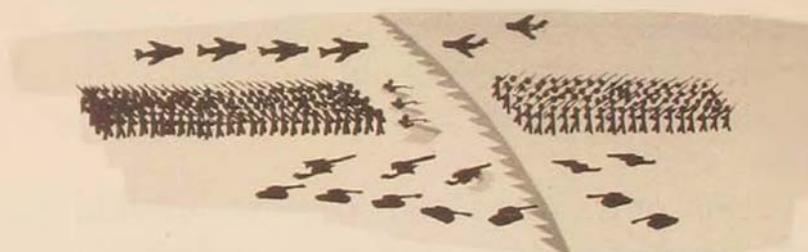
An atomic contest must start with both sides immediately discharging their accumulated nuclear stocks as rapidly as possible and against those objectives whose destruction promises a decisive advantage. Initial operation will strike directly for a decision. No other concept makes sense, because the instigator need not start the war until he feels reasonably confident that he has on hand the means of destruction necessary to give him the decision. His success will depend upon his delivery capability, his target identification and choice, and the enemy's defenses. The fact that he will strive for an early decision and will have the means to achieve it, if he has calculated the above factors correctly, cannot be contested.

Conventional War

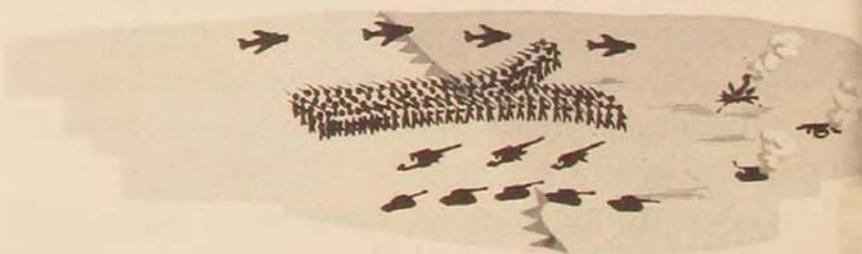
1. holding phase



2. build-up phase



3. exploitation phase



DECISION

after

3-4 years

of war

All new aspects in military planning stem basically from the presence of these accumulated stockpiles. Our past thinking was tied to a gradually intensifying conflict. Each day saw a few more units committed and a little more ammunition expended until all forces were in combat and a climax was reached. Then the decisive phase began.

In atomic war we will have a situation akin to one where two small children have built up large stocks of snowballs. As soon as the fight begins, they will throw their snowballs as fast as they possibly can. Having done this, they can never hope to attain

Future destructiveness will rise immediately, or start out, in the case of the attacker, at a maximum. The rate can only decrease in intensity as the accumulated stocks of weapons are expended and availability depends more and more upon new production.

At first glance this change of tempo in war may not be impressive. Ironically, because the period of peak destruction or atomic exchange is so short, there is a tendency to gloss over it and then get ahead with planning the rest of the war on a more conventional basis. Many wish to believe that the initial massive atomic exchange concerns primarily the air people. Others hope the airmen will get it over quickly so all the rest can forget the short bad dream and carry on the real war in the traditional manner. This dangerous illusion exists today in many circles.

Assuming a minimal exchange of atomic fire at the onset of war, simple calculations will show that both sides could sustain greater destruction than resulted from all wars fought in modern history. Is it rational to assume that this has been absorbed without effect? Can one seriously believe that conventional warfare of the past will follow without change of form or intensity? Such an assumption seems utterly unrealistic, yet we daily see evidence of plans relying on normal production and mobilization beyond D-Day, on the use of mothballed equipment, on the commitment of reserve formations, etc.—all of which seem to count on a “business as usual” economy and military establishment.

Notwithstanding the almost unlimited destructive capabilities in the hands of both contestants at the start of a future conflict, we still do not accept the formidable evidence that the initial phase will in all likelihood be decisive. We are still diverting a great deal of effort to the build-up and maintenance of forces which may never enter the fight until after the basic decision has been reached. It may be too soon to assume that the conflict will be completely ended as a result of the atomic exchange. But it does seem clear that whatever form war may take in the subsequent stages, it will not be that of the classical war of attrition. The very idea is untenable that so much destruction can be exchanged without far-reaching effects.

THE advent of the atomic era therefore suggests that the strategy for the conduct of any future war be divided into two separate and distinct phases: first, and in first priority, a strategy

Requirements for Atomic War:

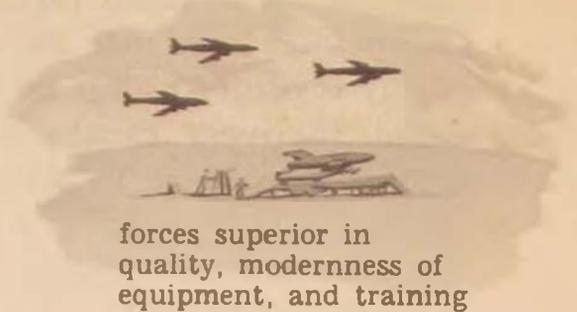
Decisive Phase

1. Gaining a favorable decision in the atomic exchange



superior planning

and



forces superior in quality, modernness of equipment, and training

to produce



superior employment of stockpiled atomic weapons

2. Surviving the atomic exchange



superior active defense

and



superior capacity to absorb atomic attack

to produce



maximum invulnerability to enemy's atomic attack

that offers the best promise of a favorable decision in the atomic exchange; and, second, a strategy or alternate strategies to pursue our ultimate objectives under conditions which might be expected to prevail following the exchange.

Survival of the first phase is a prerequisite to a favorable outcome. The rapid incidence of the destruction rate points to certain measures that are obvious parts of a survival capability: D-Day readiness; alert and warning systems; reconnaissance and atomic delivery capabilities; and, last but not least, disaster measures to ensure, insofar as humanly possible, that the inevitable damage to both forces and facilities will not destroy our command and administrative control over the situation or our recuperative and retaliatory ability.

The over-all strategy in the first phase of an atomic war will emphasize the ability to deliver and absorb atomic attack. The ability to deliver will be a prerequisite to achieving our objectives. Since the initiative may not rest with us, it is also obvious that survival will be equally prerequisite—both to the ability to deliver and to the ability to pursue hostilities in the second phase. When the stockpiles and delivery systems of both sides are relatively equal, or reach a level of relative plenty, the greatest advantage will fall to the side that can best absorb attack. This means that an atomic strategy must envision a progressive modification in the organization, tactics, and posture of Allied forces for survival purposes—a modification which must take place more rapidly than a similar modification on the part of any potential enemy.

The offensive strategy in the first phase must ensure delivery of atomic weapons to the desired target systems, notwithstanding losses or defenses which might be erected against us. This being a primary objective, the accompanying defensive strategy should logically emphasize the protection of our atomic striking and delivery forces. Technical considerations, coupled with the size of the offensive made possible by the enemy's accumulated atomic stocks, make it doubtful that active defense can provide adequate protection, particularly in theater areas where the prime military elements are close to enemy bases. Our forces must therefore develop an ability to absorb attack. In the case of atomic weapons, this means that vital formations must not be allowed to present themselves as a target; or if they must present a fixed target, particularly on D-Day, they should not be on the target at the time of the attack.

An objective of our defensive strategy should be to impel the enemy to increase the number of weapons he will have to

deliver to achieve a decisive effect. The greater the number required, the more difficult becomes his delivery problem, and the less likely his ability to achieve any useful degree of surprise. Pursued to its logical conclusion, this strategy enormously complicates the enemy's problem. He will have no fixed target system whose attack can be preplanned. The decisive elements of our theater forces become so many and so diversified that a much greater effort would be required to inflict decisive damages upon them even if they could be located.

When we have achieved this goal, the primary consideration of an enemy offensive will be to locate the targets rather than to penetrate to them. He will have resort to the massive employment of reconnaissance forces. This in turn may well bring back attrition-type active defense as a useful capability, not against the delivery element but against the reconnaissance necessary to locate the target before an attack can be made. Both in peacetime and in wartime whenever minimum warning is available, a strategy of progressive dispersal and decentralization of forces is essential if we are to survive the first phase of an atomic conflict.

THE strategy of the second and final phase—which may begin in a matter of days or at most a few weeks after D-Day—will depend upon the outcome of the atomic exchange. It is unlikely that it will be solely or even primarily based on military considerations. In essence it would seem that the application of the massive atomic effort by both sides should have “cleared the roadblock” in the first phase. After that the course to be followed, with or without substantive military assistance, must depend upon the national objectives—objectives which must go well beyond that of “military victory” if they are to permit the peacetime preparation of the means to accomplish our over-all aims. We can only speculate upon the nature of the second phase but several alternatives present themselves for consideration:

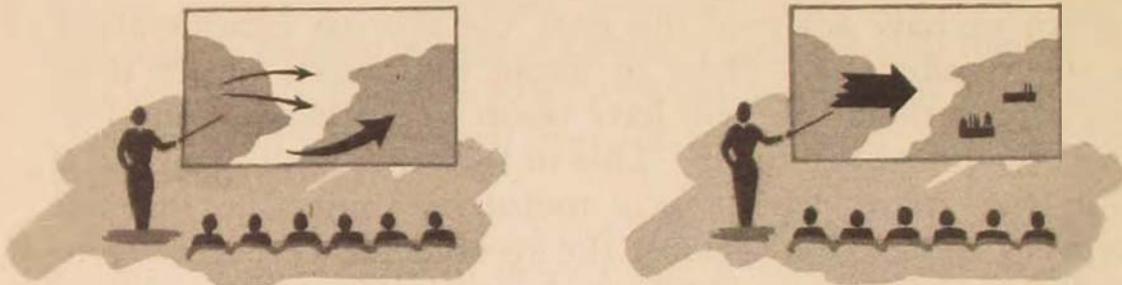
- First and foremost is the possibility that the war might be over, that active conflict on one side or the other has ceased. In this case an in-being strategy to achieve and consolidate the post-war objectives will be required.

- Second, we may find ourselves in a position to exploit an advantage gained during the atomic exchange even though this be with seriously reduced forces or with fresh forces mobilized

Requirements for Atomic War:

Consolidation Phase

1. If the atomic exchange ends the war, an in-being strategy will immediately be needed for the consolidation of military peace in terms of post-war aims



2. If the atomic exchange (a) leaves the enemy broken but unconquered or (b) is so effective that no organized agency is left to make and enforce the surrender, fresh forces from outside the theater or from the theater reserve must move in to enforce surrender



3. If the atomic exchange is unfavorable to the Allies, the surviving forces in the theater must be immediately withdrawn to peripheral areas for regrouping



or deployed to the theater after the period of peak destruction. Plans must therefore contemplate the objectives of such an operation.

● Lastly, caution dictates that planning take into account the possibility that the exchange in any theater of operation will be to our disadvantage. We would then be faced with the need to extract to a peripheral area or the Western Hemisphere as much useful military potential as possible and pursue the war under those circumstances.

One interesting aspect of the possible alternative strategies of the second phase is the likely prospect of being faced with a military decision or at least a termination of active hostilities, very quickly after D-Day. This immediately points to the need for pre-war planning on the post-hostility objectives of the conflict. There will no longer be time during hostilities to develop post-war plans. Also a war starting with the decisive phase precludes consideration only of achieving "victory" without regard to the effect of the actions exploiting the so-called "victory."

Increased planning in peacetime with respect to post-hostility objectives in turn should produce guidance as to the targets or target systems that can be destroyed versus those that should be spared during the first phase. The tendency may well be for both sides to adopt a first-phase strategy which shies away from the type of destruction associated with long wars of attrition, the sole goal of which is the unconditional surrender of the enemy without regard to the subsequent impact on the peace. Thus we again see that the often expressed cliché that atomic war will automatically entail the destruction of civilization or mutual suicide of nations does not adequately consider that such action may not further the plans and objectives of either side.

It is also possible that in any given theater of operations the initial atomic exchange will end with one side or the other delivering the *coup de grâce* by a limited military exploitation. This could happen where the magnitude or manner of destruction was not adequate to gain completely decisive results. It could also come about if the results were so decisive that no organized agency remained to deal with. Then exploitation in the sense of going in and establishing some form of administrative and command control over the loser's government and territory would be required. This type of operation would seem to demand fresh forces—forces arriving from the Zone of Interior shortly after D-Day and which have not been subjected to atomic attack, or

forces which had been successfully protected in strategic reserves. For this contingency some built-up reserve should be retained.

It seems unlikely that an early exploitation could draw upon mobilized resources, particularly if these had to be mobilized in the area which sustained a fair portion of the initial attacks. The outcome of the first phase of an atomic war is quite unpredictable, but the best course seems to be to retain a ready capability, adequately protected, and available for exploitation either to firm up a decision or to bring one about if the initial destruction did not quite achieve the desired effect. A reserve of ready force would also be valuable should the enemy find himself in a position to exploit his attack in any sector and thus force us to withdraw to peripheral areas. It could then assist in establishing adequate beach-heads for a withdrawal or in diverting pressure.

IN the broad sense, the introduction of nuclear weapons in theater warfare tends to create two separate and different wars: an initial short, completely military, and perhaps decisive war which will involve the exchange of atomic stockpiles; a subsequent conflict situation which may entail additional combat operations on a reduced scale but which will more likely consist of politico-military maneuvers to obtain the post-war objectives.

Although it is too early to determine the strategy to be employed after the initial phase—the short war—a great deal of evidence points to the likelihood that the nature and scope of any subsequent phase may be very different from anything we are familiar with. A great deal of study will be needed before we can hope to see a little more clearly and prepare our forces and our national policies accordingly.

The basic new aspect of atomic war strategy stems from the reversal of destruction rates over those in previous wars. The fact that peak destruction occurs almost immediately after D-Day, with a decrease in tempo as accumulated stocks are expended, is directly the reverse of the gradual increase in destruction that existed in past wars of attrition. This tremendous shift in rate of firepower will change the very nature and time phasing of the conflict. Our future planning and operations must accept this one basic fact as a point of departure if they are to provide sound force requirements, plans, and organizations for atomic war.

Paris, France

The Air Academy and Tomorrow's Heritage

The Liberal Arts for Air Officers of Parts

DR. C. HARVEY GARDINER

FOR a time the selection of a site for the United States Air Force Academy attracted intense jockeying for the consideration of many locations. And with some one state—more precisely one community—destined to be the ultimate recipient of an installation that spelled long-range popularity and prosperity, such an atmosphere was understandable. But finally a calm decision was reached and the flurry died down. Later on Superintendent Harmon spoke of the new academy's proposed curriculum. No second flurry has had to subside for the simple reason that the curriculum announcement has created no stir. The most minor politicians seemed concerned about the location of a hundred-million-dollar installation, but the nation's highest professional educators have ignored the curriculum proposals. General Harmon's ideas may have been sent up as trial balloons to evoke reaction. Or perhaps they were simple press releases of well-nigh irrevocable plans. In either case they deserve a measure of attention not yet accorded them.

Certain of the basic concepts outlined by Superintendent Harmon demand evaluation.

Aside from the technical professional aspects of the Air Force Academy program, the proposed curriculum will (1) deviate drastically from the usual pattern for teaching foreign languages, (2) integrate the subject-matter of such separate disciplines as history and literature, and (3) place greater emphasis on the liberal arts than is presently the case at either West Point or Annapolis. In this age of increased emphasis upon the technical specialist, why this heavy underwriting of liberal education?

THE general public obviously does not know it—quite possibly even the Air Force itself does not fully recognize it yet—but the foreseeable future suggests that, officer for officer,

the Air Force will play a more significant role in peacetime international relations than will either the Army or Navy. This development will occur as inevitably and as completely as did the obvious ascendancy of naval officers over army officers in American international relations during the past century. This future role of the Air Force is so significant that its counterpart in our already-recorded history deserves brief comment.

Speaking in terms of generalities—total services rather than occasional individual geniuses—history demonstrates that naval officers had opportunities superior to those afforded army officers in the development of international-mindedness and participation in peacetime international life. The average West Point graduate with thirty years service and a keen desire to exchange his eagles for a brigadier's star knew long unbroken tours of duty in his homeland. But the average Annapolis graduate with three decades of duty and the desire to attain flag rank had known innumerable cruises into and out of foreign ports. The naval officer's extended physical arena of service thrust added sophistication upon him.

This neither ignores nor underestimates the exploring and survey achievements of army officers like Fremont, Cooke, Emory, and others in the American West. Yet after matching such peacetime achievements with the explorations and surveys of Page, Herndon, Wilkes, and others in the rivers and seas of the world, the naval story looms larger.

Our first treaty with Turkey, our initial contacts with Siam, the opening of Japan, agitation for the annexation of Samoa—these and countless other activities saw the peacetime Navy, not the Army, supplying leadership. In fact volumes have been written on the diplomatic contributions of naval officers as executive agents of our government. Equivalent publicity cannot be accorded army officers simply because they did not make such contributions. It is no accident that out of the circumstances which made navy officers aware of both peacetime and wartime worlds, the greatest

The next few years will see many debates on every aspect of the curriculum of the new Air Force Academy. The Air Force and the nation would be the losers if this were not the case. Perhaps only the present staff of the Academy appreciates the difficulty and complexity of the task of creating full-blown a sound academic institution tailored to the specialized needs of a rapidly changing Air Force. Dr. C. Harvey Gardiner, Associate Professor of History, Washington University, St. Louis, offers a stimulating appraisal of nontechnical aspects of the Air Academy's curriculum. A Navy intelligence officer in World War II, Dr. Gardiner has done considerable research on means of furthering inter-cultural understanding.

writings ever produced by a uniformed American concerning the components of American power on the international scene were penned by an Annapolis man, A. T. Mahan. No one denies the brilliant records of the Army's Leonard Wood in Cuba or Douglas MacArthur in Japan, but these exceptions only prove the rule.

In this year 1955 officers on routine duty with the Air Force are offered opportunities fantastically beyond those the Navy afforded its officers that induced its superior international-mindedness. Today we have air bases in the heartland districts of many nations. If increased awareness of the international scene came to naval officers through limited contacts with port areas, how much greater the opportunity for the air officer stationed in central England, Okinawa, southern Spain, or coastal Morocco. American strategic concepts suggest that airmen will continue to have these full-time contacts with foreign places and foreign cultures long after armies of occupation have been withdrawn.

Imbalance exists in this matter of peacetime roles to be played by the armed services, whether we like it or not. In the future the Air Force will displace the Navy as the most internationally minded of the American armed forces. Willy-nilly the Air Force will constitute a block of unofficial American ambassadors on reasonably permanent foreign assignments. So the significance of the educational program of the Air Force Academy must be evaluated not only in its technical standards but also in its relationship to the diplomacy that its graduates can and must support.

THE intention of the new academy to offer foreign languages with primary emphasis on conversation, especially during the last year for selected students, can be both good and bad. Good in that it is a positive approach to language use and not simply a dead-end process of language learning. Too often language courses are notably *logical* and systematic in their approaches to the teaching of the language and notably *illogical* and unsystematic in the demands they put upon students learning the language. Some of the illogical demands thrust upon a student often arise because of confusion regarding the reason behind this study of the foreign language. Too often the case for the teaching of foreign languages is multipurpose. Languages are exercises in mental discipline (one of the elusive and endless quests of educators). Or they are means to the end which will permit one to

appreciate foreign literatures. Sometimes learning a language is an end in itself in the training of yet another generation of fellow language teachers. Since these purposes frequently operate together, they promote the endorsement and use of middle-of-the-road, compromise techniques that serve no single end well. With single-track simplicity of reason for teaching its future officers a language the Air Force should avoid the confusion and compromises that attend much of our language instruction.

The Air Force approach to foreign languages can profitably employ techniques widely used and much publicized during the Second World War. It is well known that a child hears a language before he learns to use it. In the eventual use of language he speaks it long before reading and writing come to embroil him in the endless complexities of patterns of grammar and forms of verbs. The realization that language learning involves the ear and the voice as well as the eye and the mind has led to an integrated, intensive method of language instruction which is rather inaccurately termed the "Army System." It means that the student goes off to the laboratory and sits and listens to recordings of natives speaking the language. The resultant sharpening of the ear seems to help loosen the tongue and greatly facilitates his conversational conquest of the language. This multi-front assist to language learning actually was established by leading civilian institutions before the label of "Army System" was pressed upon it in the 1940's. Unhampered by generations of hoary tradition, possessed of a clear-cut reason for offering languages, and able to plan without giving primary consideration to financial implications and unsympathetic administrators—combinations of which have caused many colleges and universities to shun obviously superior language-teaching methods—the Air Force Academy is capable of charting and pursuing a bold yet known course.

With significant percentages of Air Force Academy graduates destined for immediate tours of foreign duty, the cadets will have more incentive for mastering another language. The average West Point graduate can normally expect his earliest tour of duty to be in the States. The young ensign fresh from Annapolis can look forward to an initial assignment consisting mostly of sea duty. Both of these assignments give the young officer minimum opportunity to employ a foreign language and maximum opportunity to forget it. But the average Air Force Academy graduate can expect an early assignment that may exploit his language skill.

The fusing of language study and language use will mean that the Air Academy will be in an unusually strong position to

refine rapidly every detail within its language program. No civilian institution offering language instruction has known such a made-to-order opportunity for evaluating the effectiveness of its language instruction. And by the nature of the tours of duty of young army and naval officers the other service academies are similarly hampered. The unusually close relationship between instruction and use of the languages will permit the Air Academy to run a series of evaluations that could be a boon to college language instruction in general. When, in addition, such an academy possesses certain peculiar advantages in the relationships between student and administration—an enforceable design wherein students either measure up or clear out—it is evident that the Air Academy can institute and insist upon very high standards of student achievement in language study. It is not inconceivable that from controlled experimentation with its language instruction program, the new academy might stimulate all language instruction with challenging standards and demonstrated results.

Still, all is not good if only students with real aptitude and an obvious desire to learn are assigned foreign language study. (General Harmon implies there may be students without that aptitude and desire.) If the Air Force will but appreciate the potential peacetime contribution of linguistically prepared officers—and no one will even seriously question the wartime importance of their mastery of language—it will conclude that foreign language study is such a foundation stone of its nontechnical program that it must be exacted of every student at the Academy. Such an educational experience, that may well stand as a common denominator of the potential of the future officer, should not be offered on an optional basis. On 12 September 1954 General Harmon indicated the Academy would seek the well-rounded man of the Rhodes-scholar type. This statement implies the right to expect every man to possess linguistic aptitude. Calamitous indeed can be the scholastic outcome if, in its eagerness to enroll an impressively large first class, the Academy institutes a set of mediocre standards.

If the Air Force Academy will face the maximum opportunities and responsibilities thrust upon its graduates in peacetime as well as wartime, it might well insist that entering students have linguistic aptitude and that all students at the Academy pursue language study during their last year. Unless such uniformity is required, a dangerous initial wedge is driven between broad education and mere technical proficiency. Every service has a right to expect more than wartime proficiency of its career officers.

THE Harmon proposal to arrange such subjects as literature and history "horizontally," so that both aspects of the record of a people can be studied at the same time, is highly commendable. In essence this idea is related to the "area study," another Second World War educational concept, emphasizing simultaneous study of various parts of a total culture. After all, the officer in Spain will not get introduced to the Spanish economy, reminders of Spanish history, the Spanish theater, etc., in separate and unrelated experiences. The American officer abroad is forced to meet head-on the complete and highly complex culture of the foreign scene. The artificial and oversimplified presentation of a foreign way of life through one isolated course after another is a disservice to the future officer and to the nation he serves.

The customarily disjointed approach to a foreign culture, considering but single facets of its life—economy, government, political history, or language—is most disastrous in that it promotes the bitter final result of cultural snobbery. The person who knows too little of a foreign culture cannot admire it. In mistaking limited knowledge for complete understanding he concludes that the foreign way of life is insignificant and totally inferior to his own. Such faulty fractional understanding of our friends is mean. Such misunderstanding of our enemies is dangerous. The little learning that is synonymous with the pot-shot approach to an alien culture can be a dangerous thing. But one-subject, over-simplified approaches to international-mindedness, with the smug complacency provoked by a false sense of superiority, can be replaced by a broader approach to the complexity and dignity of foreign ways.

Appreciation of the complex life of another nation is in itself a healthy step toward gaining the mutual respect essential in intelligent international relations. The promise that the new Academy will dovetail the study of the history and the literature of specific foreign peoples, far from being all that may be necessary to understand a foreign nation, is at least a sizable step in that direction. International life is a particularly complex phenomenon in this mid-twentieth century. There can be no oversimplified approach to educating men whom fate will thrust repeatedly upon the international scene.

The heavy emphasis the curriculum places upon the liberal arts is to be commended for many reasons. In addition to the significance of the air officer to our peacetime diplomacy, still other reasons emerge. Any young service must necessarily experi-

ence a period of growing pains. Often with early independence comes brashness of conduct—it happens with young governments as well as young military services. However some of that brashness within the newest American military service has been part and parcel of the overwhelming dependence upon technical proficiency in Air Force programs to date. Too many training programs were so intent upon having young men master pilot's controls, bomb-sights, and navigational instruments that no effort was made to produce anything other than efficient fighting men. Unfortunately a technically proficient, young, and inexperienced officer often can grow older and more proficient technically without becoming aware of the fundamental values which might stamp him as a mature citizen of the Republic. Compounding the crudity of many too narrowly educated Air Force officers—a crudity of prolonged intellectual immaturity—has been the easily adopted devil-may-care attitude that comes with realization that theirs is a service wherein the chances of becoming a casualty are rather high.

The technical emphasis and the eat-drink-and-be-merry attitude, both of which are obstacles to thinking and mature citizenship, can and will be reduced greatly by the language, the literature, the history, and the other liberal arts content of the Academy curriculum. Officers who have sampled more fully the products of civilized man—his literature, his art, his music, and the historical verities of his way of life—are more dependably balanced individuals. They are men with reasons for living as well as patriotism that can embrace dying. Well-educated pilots, navigators, and bombardiers will, with their added maturity, possess added reason for serving and added reason for living.

So it is that General Harmon's proposed curriculum for Air Force Academy cadets is, in its nontechnical aspects, a boldly imaginative educational undertaking. The curriculum should do much to mature and sophisticate a young service. It should produce officers who can and will strengthen the conduct of American peacetime international relations. It should employ new and tested techniques for producing broadly educated men, with results that will be viewed with interest by many professional educators. Future Air Force officers should be a tower of strength in American life, in peace and in war, abroad and at home, on the ground as well as in the "wild blue yonder." Today's program is a prelude to tomorrow's heritage.

Mobility in the Jungle



World War II air envelopment in Burma . . .

. . . flexibility in local war

TWICE since 1950 the cold war between Communist and free world forces has thawed briefly and violently into open fighting—once in Korea and again in Indo-China. On both occasions it was the Communists who administered the blowtorch. To many Western observers these actions indicate the pattern of Communist aggression for the next few years. It would seem that the Communists, shrinking from the cataclysmic test of global atomic war, have for the time being settled on a series of small local wars at times and places where their strengths and free-world weaknesses can best be exploited. Such conflicts are calculated gradually to expand the Soviet sphere and to keep the free-world forces off balance.

Where the Reds may stage the next local war—Thailand, Malaya, Burma, Indo-China, Indonesia—is anyone's guess. But almost certainly it will involve one of the politically unstable or underdeveloped nations rimming the Communist empire in Asia. This area, a crossroads of ancient civilizations, restless in its poverty and inequalities among nationalities, seething with unguided nationalism, has been designated by Communism as the soft underbelly of the free world's defenses. Distant from the power sources of the free world, psychologically ripe for any revolt against Western "imperialism," Southeast Asia attracts the Communists as a battleground. Indo-China proved how well Communist Chinese guerrilla tactics were adapted to use against regular troops in the terrain of Southeast Asia.

The land area in this section of the world consists of vast stretches of virtually uninhabited terrain composed of rugged, steep-sloped mountains

and covered with dense tropical jungle. Communications are poor. All-weather roads are so few that every curve masks a potential ambush. Navigable waterways are scarce. Airfields are practically nonexistent.

Airborne Techniques of Wingate and Cochran

FORCES combating guerrilla aggression in such areas must be highly mobile. Since the rugged topography rules out or limits the effectiveness of mass overland movements of forces, some other means must be found to achieve the mobility needed to bring the guerrillas to battle and to harass them into disorganized collapse. An interesting precedent for successful air-ground operations in this kind of terrain is offered by the World War II campaign in Burma, when the Chindit and Air Commando force of Wingate and Cochran flew troops over the Japanese lines and established airheads in the enemy's rear areas.

Isolated from the outside world by forbidding mountain chains, covered by some of the world's thickest jungle, Burma is one of the worst conceivable areas for ground operations. Surface communications consist almost entirely of cart-trails, paths, rivers, and the narrow-gauge railway running from the port of Rangoon north through the heart of the jungle to the inland town of Myitkyina. No highways have ever been built between eastern India and Burma. Surfaced roads hardly exist outside the delta regions around Rangoon and Mandalay.

Each year from May to October the monsoon rains sweep in from the Bay of Bengal, drenching southern Burma and India with from 150 to 250 inches of rain and the northern mountains with 100 inches. For months at a time the jungles alternately steam and drip. Minor depressions become major lakes and the trails turn into canals and bogs. Malaria rates skyrocket in the summer and mite-typhus and other local diseases take their toll of human life throughout the year. Even during the "dry" season heavy rains occasionally fall. Large-scale land maneuvers would have been difficult in the extreme even without the opposition of a large and tenacious Japanese army entrenched in the jungles for a desperate foxhole-by-foxhole defense.

Progress of the war in Burma at the time of the Wingate and Cochran venture in early 1944 was in marked contrast to Allied successes in Europe and in the Pacific. The Japanese were being routed in the South Pacific. The United States fleet had swept westward, had split the outer ring of Japanese defenses in the Pacific, and had struck at the enemy base of Saipan in the Marianas, some 1500 miles south of Tokyo. Key Japanese defensive islands had been captured or bypassed by the Army and the Marines, and forces were being made ready for the invasion of Guam. In Europe the Allied invasion of Italy was well under way. The RAF and USAAF were bombing Germany with devastating regularity. The China-Burma-India theater was the only active theater where the Allies had not mounted a major offensive.

At this time Japan held all Burma (except for isolated border sections)

and was preparing an extensive campaign against Allied positions along the frontier of India. With Burma in Japanese hands overland supply was choked off to U.S. air forces in China and the Chinese armies that the air forces were supporting. The Allies had two immediate objectives: to decrease the effectiveness of the Japanese threat to India and to increase the flow of supplies into China. The latter objective could be accomplished only by building up the airlift across the "Hump" from India to China or by opening a new road through Japanese-held northern Burma.

Air strategists favored the build-up of the Hump operations, while the Army championed an India-based overland campaign into Burma to clear the way for the building of a road from Ledo in northeastern India to connect with the Burma road. A ground assault would also force the Japanese to divert some of their units preparing for the assault on the frontier of India.

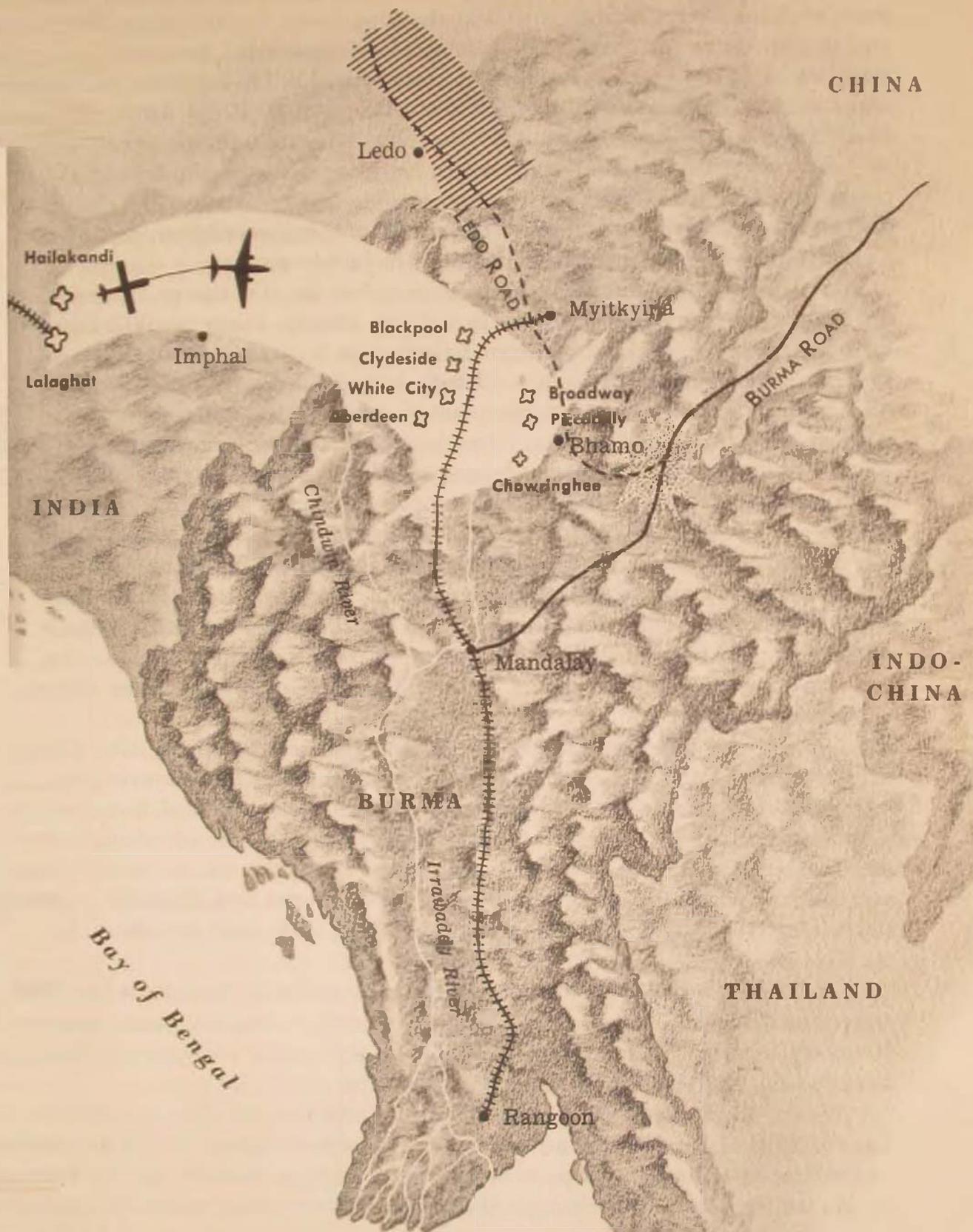
The city of Myitkyina in northern Burma was the key to both of these strategies. Occupation of Myitkyina would provide an advanced air-transport base from which the air tonnage into China could be increased. Myitkyina was also a most important link in the proposed Ledo Road, which would connect with the Lashio-Bhamo route of the Burma Road running to Kunming, China. And it was the center of Japanese operations in northern Burma.

In December 1943 Lt. General Joseph W. Stilwell's command of Chinese-American troops pushed off from Ledo in India on the tortuous jungle march south to Myitkyina. They pushed the Japs back and constructed the Ledo Road as they advanced. To relieve the pressure against this main advance, plans had been adopted to send long-range penetration groups behind enemy lines for ground operations patterned after tactics tested by British Brigadier Orde C. Wingate during the spring of 1943. Army Air Force Colonel Philip G. Cochran was assigned to organize and train an air task force for the airlift, supply, air protection, and evacuation of Wingate's long-range penetration forces.

D-Day planning called for the combined units of Wingate and Cochran to take to the air from Lalaghat and Hailakandi in India and land in the heart of northern Burma. Once on the ground, Wingate's troops were to cut the Mandalay-Myitkyina railroad north of Indaw. Strategists felt that such tactics would disrupt the main line of Japanese supply and weaken the Japanese 18th Division then opposing Stilwell's forces advancing from the north. To re-establish their communications the Japanese would have to detach troops to deal with this menace behind their fighting front.

The British force consisted of half a dozen brigades of highly trained jungle fighters who had already made daring overland forays against enemy communications deep in Burma. These "Chindits" (named after the canine statues—Chintheas—seen at Burmese shrines) had "invaded" Burma under Wingate in March 1943 and had operated for several weeks behind enemy lines. Entirely supplied by air, they had slashed Japanese communications without ever being caught by a sizable enemy force. Allied military leaders felt that with air transportation as well as air supply the Chindits could sustain another assault on the enemy rear, possibly even long enough to force the Japanese abandonment of all northern Burma.

Airborne Spearhead: March 1944



In March 1944 all Burma was in Japanese hands. General Stilwell's Chinese-American army (shaded arrow) was slogging its way southeast from Ledo, building the road that was to connect India with China when the juncture with the Burma Road was effected at Bhamo. The white arrow shows the path of the Wingate-Cochran air envelopment, which interposed between the new road and the main Japanese forces to the west and south. The *Quarterly Review* is indebted to Mr. Leslie Anders, Engineer Historical Division, U.S. Army Corps of Engineers, for photographs of the air landings and information on the intrepid part played in the campaign by the engineer detachments.

As planning progressed and the scheme began to widen, the decision was made to deliver the Chindits as well as the supplies to the key points by air and to provide an air cover. The special "Air Commando" force was to be made up of 13 C-47 transports, 12 C-46 transports, 150 GC-4 gliders, 100 L-1 and L-5 aircraft, 75 TG-5 gliders, 6 YR-4 helicopters, 30 P-51A fighters, and 12 B-25H medium bombers. But by the time Wingate's troops were ready to jump off in March 1944 the Air Force had gone considerably beyond this commitment and had assigned a photographic reconnaissance detachment and an engineer aviation company to provide the engineering support vital to the coming Anglo-American experiment in jungle warfare.

With less than two months' joint preparation the all-airborne campaign, the first of its type ever attempted in military history, began at 1812 hours on 5 March 1944. Taking off from Lalaghat in transport-towed gliders of Cochran's Air Commando force, a Chindit brigade and a construction party of American engineer equipment-operators made a 250-mile flight to an isolated jungle clearing known as "Broadway," situated west of the Irrawaddy River about midway between Mogaung and Katha, and 100 miles behind Japanese lines. Despite hazardous landing conditions and some wrecked equipment the Air Commandos' engineer force had a landing strip cleared for transports by the afternoon of the same day. The following night 70 C-47's, landing with radar and radio assistance, brought in over 500 men and 33 tons of equipment. Within the next day or so another entire brigade of Chindits had been flown into the jungle clearing by the Air Commandos, and the campaign against enemy railway and road communications north of Mandalay had begun.

On the evening following the departure for Broadway the Air Commandos airlifted another group of Chindits and engineers to "Chowringhee," a jungle clearing across the Irrawaddy and some 50 miles south of Broadway. This strip was to be a secondary base for the developing ground offensive in the Indaw-Katha region. When Chowringhee soon proved too tough an assignment to be handled by the handful of engineers and Chindits, reinforcements were quickly flown in from both Lalaghat and Broadway and the field was built.

Of 54 gliders flown by the Air Commandos in the D-Day operation, 37 arrived at Broadway, eight landed in friendly territory, and nine came down in enemy territory. Almost all the 17 gliders that failed to reach the field were victims of tow lines that snapped along the route.

By the third night (7 March) Broadway and Chowringhee reported a total of 84 C-47 sorties with no major damage. Chowringhee, having served its purpose as a jumping-off point for Wingate's troops, was evacuated. The figures for the total airlift through D-Day plus six were impressive:

	<i>Personnel</i>	<i>Ponies</i>	<i>Mules</i>	<i>Stores</i>
To Broadway	7023	132	994	444,218 lbs.
To Chowringhee	2029	43	289	64,865 lbs.
Total	9052	175	1283	509,083

From their air-established base at Broadway the Chindits hastened westward in early March on their mission of interdiction, blocking the Burma railway near Mawlu. Pushing toward this Chindit force was another British penetration team in immediate contact with Stilwell's right flank in northern Burma. To furnish this group food, ammunition, and reinforcements, the Air Commandos were ordered to airlift an engineer force to a point about 70 miles southwest of Broadway to prepare a new strip, "Aberdeen."

Construction of the landing strip at Aberdeen was a race with time. Since the tactical commanders felt certain that word of the initial landing would filter through the hills to the Japanese within a day, the engineer unit had to ready the airstrip in record time so that the two incoming Chindit brigades could land and make the area safe for base operations. The race was won by two hours—the time it took the Chindits to make contact with the enemy after landing on the newly-built operational airstrip.

The establishment of the railroad block at Mawlu forced the Japanese high command in Burma to call various battalions away from crucial areas such as the Mogaung Valley and Salween fronts as well as from the force attempting to invade India by way of Imphal and Kohima. The consequence of Japanese anxiety for the railway line of communications was a series of frantic assaults on the Chindit brigade holding a hilltop strongpoint covering the railroad near Mawlu. The Air Commandos attempted to bolster the Chindits' hilltop defense by air-dropping supplies to them but the situation there grew so desperate that it became imperative to construct a transport strip for supply and evacuation.

And so again, on 4 April 1944, the Air Commandos went into action with one of their engineer teams. Five gliders loaded with engineers and engineer equipment were airlifted to Mawlu. There the engineers extended and graded a makeshift dirt airstrip known as "White City." Built within a period of less than 24 hours, this airstrip funneled in supplies and reinforcements that enabled the Chindits to resist the Japanese assault and to hang on at Mawlu for another month until the monsoon came.

With the rains due in May, General Headquarters in India prepared to recall the main body of the Chindits from Burma. Before the campaign began the British had laid down the rule that long-range penetration groups could be effective in the Burmese jungles for only about three months at a time.

The three-month period was nearly over. By the beginning of May the main striking force of Chindits, with constant Air Commando support, had made its way up the Burma railway as far as Namkwin, within 30 miles of Mogaung. From this point the evacuation would have to begin. To make this evacuation possible, the group of engineers flew their last mission with the Air Commandos in early May 1944. One detachment flew to Pinbaw to lay out a strip named "Clydeside." At Namkwin the Air Commandos landed another engineer construction party under enemy fire to build the field known as "Blackpool." By 25 May all of the Chindits except one group engaged in the Myitkyina-Mogaung area had been flown out of Burma by the Air Commandos. The first all-airborne invasion in history was ended.

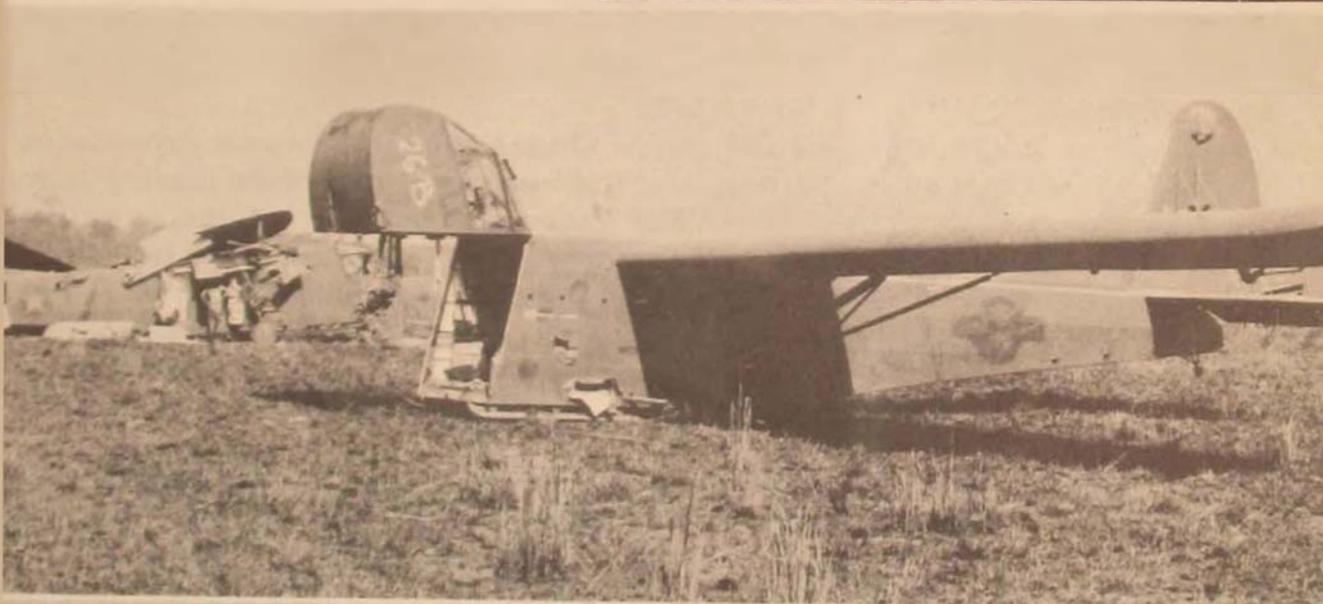


The Airborne Invasion

An all-airborne troop landing, resupply, and evacuation operation had never been attempted until the Allies leapfrogged 100 miles over Japanese lines in Burma. Two months after planning began, British Brigadier Orde C. Wingate and AAF Colonel Philip G. Cochran (top) briefed the Air Commando pilots. On 5 March 1944 the C-47's, gliders in tow (below), swung onto the runway at Lalaghat, India, and took off toward the isolated jungle clearings in Burma. There the gliders landed engineer troops to carve out airstrips so that C-47's could land the main body of troops.



Wavering fretfully at the ends of long tow ropes, the gliders full of engineer troops and their equipment were pulled over the jungle-crusted China Hills (right), the natural barrier between India and Burma and the location of the Japanese front lines. Of the 17 gliders lost when their tow-lines parted, eight landed in friendly territory, nine behind enemy lines. Plans called for initial landings at two clearings, "Broadway" and "Piccadilly." A last-minute reconnaissance flight showed logs had been scattered in the Piccadilly clearing. A landing would have met with disaster. All flights were diverted to Broadway. This greatly increased the landing hazards. Most of the gliders landed safely (center), but the density of traffic caused a number of collisions (bottom) that cost lives and wrecked precious equipment.





Once landed, gliders were expendable. Those not destroyed in landing were put to every use that the operation required. The glider in the top photograph was draped with camouflage netting and became the radio station. Within 18 hours of the initial landing, the engineers and the Chindit troops had converted the jungle clearing (left) into an airstrip suitable for transport aircraft. In the afternoon and night of 6 March C-47's brought in over 500 men and 33 tons of equipment. Two days later the Air Commandos had flown an entire Chindit brigade into the jungle clearing 100 miles behind enemy lines. The campaign against communications systems south of Myitkyina began at once.



Was Airborne Invasion Successful?

IN post-war interviews Japanese generals in charge of the North Burma campaign agreed that the airborne operation decisively weakened the Japanese offensive against Imphal. Japanese lines of communication from the south had been disrupted. Some Japanese troops earmarked for the Imphal offensive had to be recalled to deal with the Chindits. Japanese headquarters, engrossed with the unexpected crisis arising from the invasion from the sky, had been hesitant to provide vitally important coordination and control to the units in action against the British along the frontier of India.

The Japanese force defending the Myitkyina-Bhamo area against the Chinese-American offensive was hamstrung by the Chindit stronghold on the railroad at Mawlu. The peril created by the airborne forces greatly agitated the Japanese high command in Burma and, according to Japanese testimony, "eventually became one of the reasons for the total abandonment of northern Burma."

While this airborne long-range penetration may have fallen short of the optimistic goal of forcing the enemy into immediate withdrawal from northern Burma, it was not because of any failure in air support. A larger force of Chindits in all probability would have compelled the enemy to liquidate his position north of Mandalay within a short time. In any event the slim margin by which this airborne invasion missed total success suggests tremendous possibilities for the future.

Two weeks after the initial landing, Broadway boasted two runways, one 4000 feet long, the other 5000. At the lower edge of the clearing can be seen the tracks made by the gliders in the original landing. While five additional airstrips were constructed in the course of the campaign, Broadway remained of central importance. Here C-47's landed the Chindit forces and the supplies that made possible the successful blockade of the railroad. First to be constructed, Broadway was the last airstrip evacuated late in May when the impending rains of the monsoon did what the Japanese had not been able to do—end the air envelopment in central Burma.



Mobility and Modern Equipment

IN the years since 1944 vast changes have taken place in transport aircraft and in techniques of air supply. Most of the World War II planes are no longer used in airborne missions. The glider, then the mainstay in air-ground penetration operations, has been replaced by large, short-landing-run transport aircraft and by improved heavy-drop techniques. Much of the Army's equipment has been streamlined with an eye to air transportability. This means that the variety of equipment and the amount of firepower available to such a force today is tremendously greater than it was in 1944.

Air transports today fly farther and faster and carry more men and equipment than ever before. The extent of advances in transport aviation since World War II may be indicated by such incidents as C-119's carrying bridges to the beleaguered United Nations forces in northern Korea late in 1950 and the giant C-124 Globemasters in 1953 carrying bulldozers from Thule Air Base in Greenland to a floating ice-island air base 800 miles away in Arctic waters. When compared with the Hump Airlift of World War II, the Berlin Airlift of 1948-49 and the global cargo missions performed during the Korean conflict graphically testify that air logistical support has come a long way in just over ten years.

If Cochran's Air Commandos had only possessed the equipment available today, the three-month operation could well have had more immediate results. Or perhaps if the tactics of Wingate and Cochran were adapted and applied with today's more modern equipment and methods of operation, the long-range penetration might offer the success envisioned by the planners in Burma over ten years ago.

The USAF has the equipment, the personnel, and the know-how to develop the techniques of the all-airborne invasion. Vast territories of the world with terrain matching that of Burma are potential areas of military operations. All cannot be covered in sufficient strength to deter would-be aggressors. But surely there is value in a hard-hitting, mobile force ready for instant deployment to isolated trouble spots.

Air University Quarterly Review

Communism and Air Power

A Survey of Possible Communist Air Strategies

DR. STEFAN T. POSSONY

MARX and Engels died before the advent of aviation. Lenin did not show much interest in military air power. Stalin's pronouncements on the subject are rather negative and highly reminiscent of the somewhat prejudiced statements made in the United States by World War I generals and admirals to the Congressional committees investigating military aviation in the 1920's. It is therefore quite true that there is no such thing as a Communist "doctrine" on air power and that Communist military experts have shown little interest in, or understanding of, the problems of aerial warfare. Not surprisingly, many military analysts in the West have concluded that Soviet military leaders do not ascribe as much significance to strategic air warfare as do American and British strategists.

We should not be too hasty with such deductions. Soviet strategy is not necessarily planned in strict accordance with the *orbiter dicta* of late Communist redeemtors or their living apostles. There may be many reasons, including security and deception, why Soviet military writers do not want to talk about nuclear air war or are content with plagiarizing statements by Western pre-atomic soldiers. Rather than deal with Soviet "doctrinal" writings, we should look at what the Soviets actually have been doing. Two important facts stand out:

(1) Since the early twenties Soviet military leaders, including the celebrated Marshal Tukhachevsky, have shown great interest in air power. If they did not succeed in building strong strategic air forces before 1945, it was not for want of trying but for lack of industrial and technological resources.

(2) Since the end of World War II, and particularly since the emergence of a truly productive aeronautical industry in Russia, the Soviets have made great strides in the development of their air forces. Never before in history has an air force developed so fast and on so vast a scale. It is also probably true that, relatively

speaking, the Soviet Union is devoting more resources to air power than any other major nation. There is a possibility that even in absolute terms their investments in air power are currently the largest in the world. The growth of the Red air forces has been particularly rapid in the last three or four years, during which time they have acquired modern jet aircraft in all combat categories. It is inconceivable that the Soviets would have undertaken their gigantic aerial program if they did not "believe" in the overriding future importance of air power.

Regardless of the dogmas of the dead, the Soviet strategic position has undergone a profound change since 1945. Until the defeat of Germany and perhaps until the Communist conquest of China, the primary mission of the Soviet armed forces was to prepare for operations on the Eurasian land mass. Surface operations in Europe and Asia still are a most important Soviet security interest, and ground forces must continue to play a key role in their military thinking.

But since 1945 or 1946 Soviet leaders have chosen to consider the United States as their main opponent. Accordingly they must develop a weapons system with which they can prevent the United States from threatening the Soviet Union with nuclear air attack. It is a fact that the United States could exert exceptionally strong military pressure against the vital centers of the Soviet Union. Therefore unless the U.S.S.R. develops a weapons system that presents an equally strong threat against the vital centers

Realistic appraisal of our own position in the atomic age must contain the best possible assessment of the avenues of atomic warfare open to the enemy. Only when we have examined these probable courses of enemy action, both in their unilateral capability for attack and again in modification for what the enemy must allow for in our retaliatory capability, can we arrive at a valid estimate of the shape of a future war. Few are better qualified to consider the atomic alternatives facing the Soviet Union than Dr. Stefan T. Possony, Guest Professor of Political Science at Georgetown University, long a student of military and political relations, and specialist for the Directorate of Intelligence, Hq USAF. In reviewing the prospects for victory in atomic war from the Kremlin's point of view, Dr. Possony sees three broad patterns of atomic warfare open to the Soviet Union:

● an atomic blitz, inevitably provoking massive atomic retaliation and ending in mutual suicide for the nations involved;

● the lulling of the West into disarmament, followed by an atomic blitz to finish off the West's by-then debilitated retaliatory capability and ending in victory for the Soviet Union;

● a series of local atomic wars, in which possession of the initiative enables the Soviet Union to attrite the West's retaliatory capability to a point that global atomic war could be launched without excessive risk to the Soviet Union.

of American strength, it would be in a significantly inferior strategic position. In fact the Communists would be allowing the United States to threaten them with *unilateral* atomic warfare. As long as the United States is able to destroy Baku or Sverdlovsk, the Russians must be able to destroy Pittsburgh or Houston.

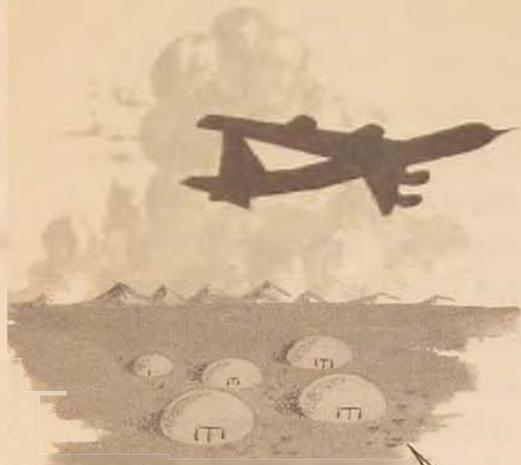
Even the most ardent believer in surface force must realize that there is no practical way for the U.S.S.R. to put real pressure on the United States and at the same time extricate itself from a dangerous threat to its international aspirations, except by creating intercontinental air power. Moreover distances, the size of American cities and industrial installations, and the firepower requirements to destroy such targets render nuclear weapons indispensable. Without them the Soviet Union can present no real military threat against the United States. The development of intercontinental *nuclear* air power is thus an ineluctable necessity for the U.S.S.R.

It is certain that the Kremlin has analyzed its strategic problem in these or similar terms. That it has is borne out by the manner in which the U.S.S.R. has been developing military aviation. But this does not necessarily mean that the Soviets must adopt strategic air power as their one and only weapons system or that they must emulate American air strategy. The Soviets have great faith in the efficacy of their traditional conflict technique. They have gone on record time and again that *combined* weapons systems are far more powerful than any single "master weapon," however devastating. A large nation does not build a weapons system by beginning from scratch but integrates the new arm with existing forces and techniques. This must be particularly true in the case of the Soviets who, in their combined military and nonmilitary weapons systems, possess a unique conflict tool, the value of which they have never doubted. We can deduce, therefore, that they will make every attempt to integrate their new aerial weapons with their existing Communist conflict machine, both to increase the power of air operations and to improve the effectiveness of their older capabilities of conflict and conquest.

War of Coextermination

It seems inevitable that the Soviet leaders have decided, first, to go all out for the development of nuclear air power and, second, to combine their aerial weapons system with their other

Nuclear Air War: Pattern I, Coextermination



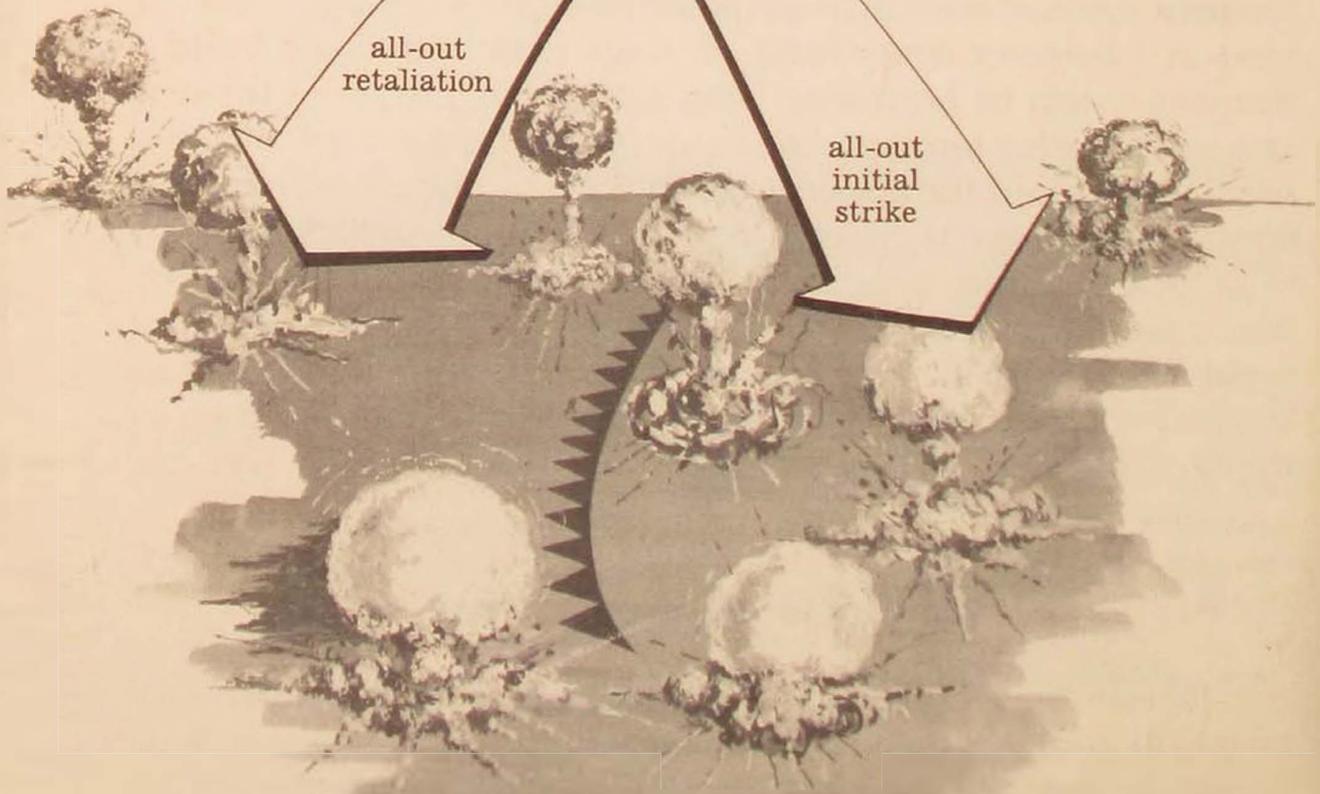
"A" builds up
nuclear air strength
to knockout capability

"B" builds up
nuclear air strength
for knockout retaliatory force



all-out
retaliation

all-out
initial
strike



mutual destruction and mutual suicide

organizations for conflict, particularly with the international Communist apparatus. But having made these two decisions, a third problem must loom large in their minds. Since the United States now operates under a policy of avoiding war, the Soviet Union has the capability of launching the initial strike. In the nuclear age the belligerent who attacks first holds an overwhelming strategic advantage, far superior to the frequently decisive advantages which surprise-aggressors possessed in past wars. The nuclear aggressor stands an excellent chance of reducing his opponent's capability to counterattack or retaliate.

But the same power of atomic weapons which confers on the aggressor this dividend in strength paradoxically may vitiate his strategy of nuclear blitz. If only a fraction of a retaliatory force can strike back at him, devastation could be large enough to destroy the cohesion of his social fabric. The advantages gained from surprise initiation of the conflict through massive atomic attack thus may prove quite illusory, irrespective of the possibility that the destruction in the attacked country might exceed the devastation in the aggressor nation. This is particularly true in a hypothetical war between the Soviet Union and the United States. By and large, Soviet industrial targets are more vulnerable than targets in the United States, and the Soviet government is far less assured of popular support than the United States government.

Accordingly the Soviets cannot adopt a strategy which would lead to a nuclear duel, nor *any* strategy in which they would be the recipients of a substantial number of atomic weapons. Whether 500 or 5000 nuclear bombs would be required to terminate the life of the Communist dictatorship is immaterial. Soviet leaders must consider the grave risk that the survival chance of their regime would be diminished if Russia were subjected to nuclear bombardment on *any* significant scale. They cannot hope to fight a war without loss or risk; however since the destruction of the United States is not an objective in itself but merely the most important step toward their goal of world conquest, they must try to wage war in such a manner that Communist power will be increased rather than diminished in relation to that of third nations. The mutual extermination of the United States and the Soviet Union may leave the military power of other nations intact—including some which today are considered weak. Regardless of the political and material fate of the United States, the strength of many surviving or neutral nations could then be adequate to overcome whatever Communist power might remain

in the ruins of Soviet Russia. Hence the Communist strategists cannot accept a war concept which would entail the destruction of the primary base of the world revolution. The question arises: how can the Soviet Union defeat the United States without being destroyed even in victory?

Soviet Strategic Concepts

To a Western mind the problem of victory with survival may seem like the traditional one of squaring the circle, but to Communist conflict thinkers, with their long experience in revolutionary operations, the problem is hardly novel. For many generations Communists have grappled with the task of overthrowing a government vastly superior in power to their revolutionary organizations. While fighting its more powerful foe, the Communist Party had to make every effort to avoid destruction at the hand of a government which, had it only willed, could have exterminated the revolutionaries.

Logic and experience have indicated that successful revolution is the result of three distinct factors:

1. **Freedom of Action.** A strong and determined government, especially of the autocratic or dictatorial type, can suppress any significant revolutionary activities. Against such a government sustained subversive operations are possible only in the form of propaganda from exile, that is, only in preparatory efforts. The establishment of effective revolutionary forces and the acquisition of revolutionary striking power can occur only *after* oppositional and revolutionary activities have been legalized and when the bulk of these activities is being protected by political and constitutional means against repression. Hence the first requirement of the revolutionary is the acquisition of freedom of action.

2. **Simultaneous Pressure.** The gradual growth of revolutionary strength within the framework of a state granting political freedom does not by itself enable the revolutionaries to seize the government. It is conceivable that by evolutionary means revolutionaries may acquire ever more influence on the state and society and ultimately send their representatives into the government. The danger of relying exclusively on such a process of gradual advance and frequent stops, however, is that it lasts too long. The cohesion and resolve of the revolutionary movement may falter; its motivation may fall out of tune with the times. As revolutionaries reach cabinet status, their fervor abates—it happened

to the socialists of the Second International—while the rank and file revolutionaries grow old and contented and become opposed to strife and risk. While building up their organizations and strongholds revolutionaries must at the same time exert pressure, submit to counter-pressure, precipitate events, and ultimately seize the government and smash it—as Lenin told them. The existing order must be destroyed, not merely modified or usurped. But before the revolution gets to that point, the state machinery, and in a broader sense the entire social structure, must be fatally weakened and disintegrated, either through inner decay or by termite tactics.

Moreover, both as a result and as a cause of social disintegration, deep-seated dissatisfaction and wide-spread disaffection must exist among the populace of the nation. This disaffection must manifest itself in such rebellious activities as mass strikes, large-scale passive resistance, disobedience, desertion among the military, and during the last phases of the process of decay, in the appearance of large rebellious crowds and insurrectional and terror bands in the streets. Until rebellious movements assume a truly mass character and while the government is still able to put down rebellions and uprisings, the state has not yet been disintegrated. In a truly revolutionary situation either the government no longer dares to use its security forces, or else the security forces themselves have become utterly undependable. Also in a revolutionary situation the rebellious masses no longer fear repression but continue to demonstrate, rise, and attack, regardless of casualties.

The emergence of such a situation is the condition *sine qua non* of a revolutionary seizure of power. Communists have succeeded often in gaining freedom of action, setting up "class warfare organizations," and equipping subversive forces. But in most instances those forces fall short in their insurrectional undertakings simply because the government attacked had not been paralyzed and disintegrated before the rising. Experience has shown that economic or routine political crises, such as a world depression of the 1932 magnitude or even the runaway inflation in Germany during 1923 (when currency fell to one trillionth of its value) are not "disintegrators" of sufficient effectiveness to produce genuine revolutionary situations. Such situations can come about only as a result of war, with its incident heavy devastations and casualties, and, more specifically, as a result of a resounding military defeat.

The Russian Revolution is a child of military defeat. The

Chinese Revolution resulted from many years of dislocating wars and numerous piecemeal defeats. Accordingly the Communists have recently preferred, unless in exceptional cases, to forego the classical nineteenth-century strategy of revolutionary insurrection and to gain power primarily through military and paramilitary means. This does not suggest that they do not employ other means as well. Diplomatic pressure, propaganda, evolutionary build-up of strength, and insurrections will be used where opportunity permits. It does mean that these short-of-military-pressure techniques have become subsidiary weapons designed to enhance the effectiveness of the main, the military, weapons system. The Communists do not expect to defeat major opponents except with maximum power and violence, regardless of cheaper and easier strategies which might occasionally be successful against weaker enemies.

Since the Soviets consider the United States the chief obstacle on their road to world dominion, they must be considering ways and means to remove this formidable roadblock. Unquestionably the United States can be harmed by many tricks and techniques, but the point is to paralyze and dominate its total power. Such an ambitious objective can be reached only through a decisive military defeat, presumably on American soil, or through a completely successful Communist revolution. In Communist thinking war and revolution are closely linked in the sense that revolution can take the place of war or that revolution follows a war which has produced a revolutionary situation. Since it is very unlikely that the United States will fall victim to a revolutionary situation brought about by crises short of war, this means that America must be subjected to war, devastation, and defeat if it is to be eliminated. If revolution in the United States can be counted on at all, it can be conceived only as a terminal phase in a major military conflict, as a short-cut to physical and forceful occupation but not as a substitute for a Communist *military* victory. It does not require much imagination to see that atomic weapons could be the greatest "dislocators," and hence producers of revolutionary situations, that history has ever known. The atomic weapon thus fits in closely with the Communist conflict doctrine.

3. Exploitation. Once a revolutionary situation has arisen, it can be exploited by actual seizure of power in the conventional organized insurrection or, in the more modern version, by gradual political conquest culminating in a coalition government* which

*In Communist parlance this is a government in which Communists and crypto-Communists hold cabinet rank—usually controlling propaganda and at least a portion of the security forces—and in which the placing of militant Communists in key positions is allowed throughout the nation's administrative, military, economic, and social structure.

can be transformed step-by-step into a Communist dictatorship, or, perhaps in a future conflict, by means of airborne military forces supported by native revolutionaries.

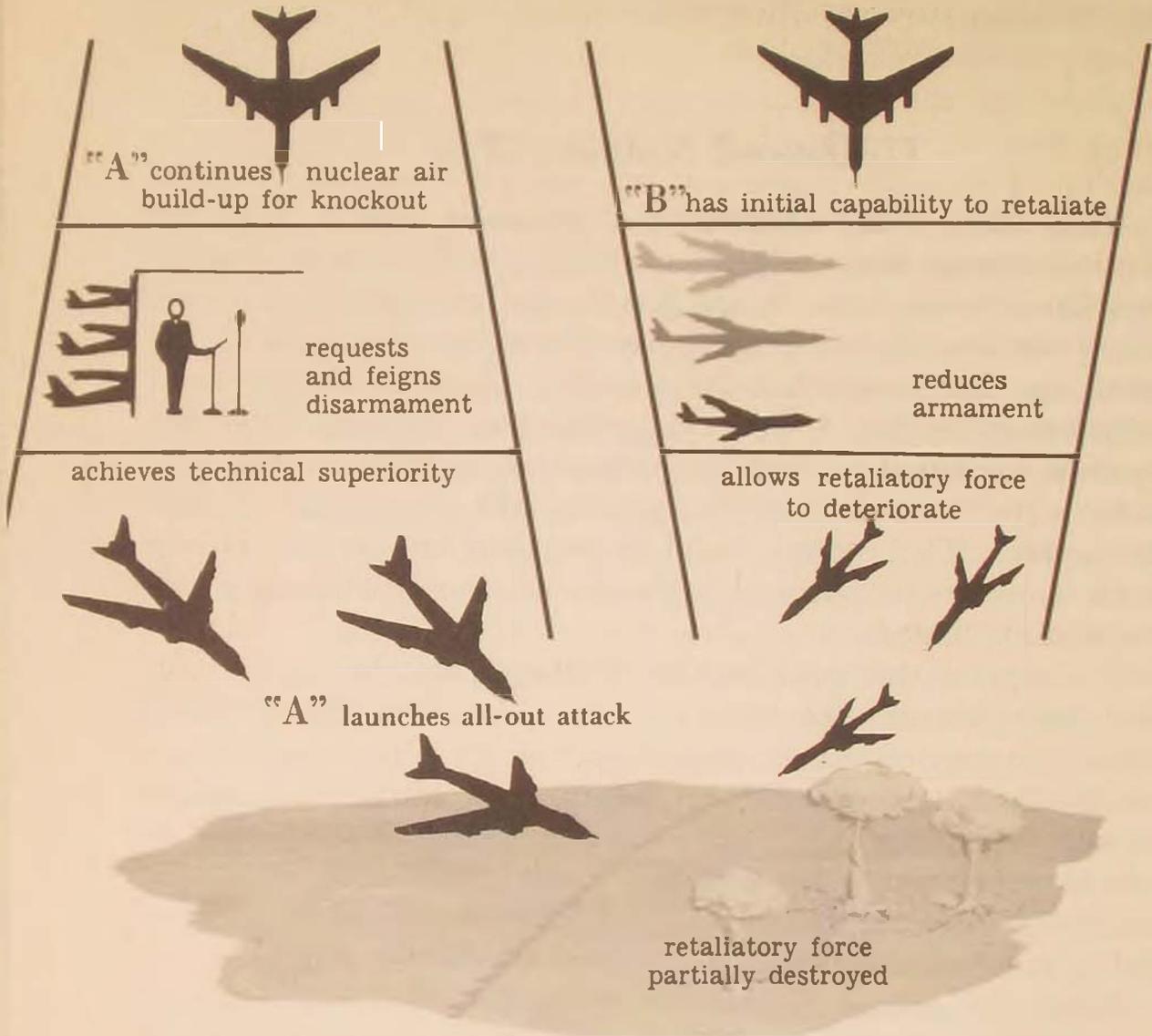
Unilateral Nuclear War

This, then, is the established Communist conflict doctrine. We must suppose that it applies to a situation wherein nuclear air forces have become the "main force" of the revolution. If so, we may deduce that to prepare revolutionary conquests in the nuclear age the Soviets first must seek to bring about situations in which their nuclear air forces enjoy freedom of action. Secondly, they must exploit this freedom to create revolutionary situations which, in the third phase of the process, will allow them to seize state power. Their single most important task is to achieve nuclear freedom of action against the massive nuclear strength of the United States.

To express this problem in another way: the purpose of Soviet strategy must be to create a condition in which they can drop nuclear weapons on American targets but in which the United States has been deprived of its capability to employ its own nuclear weapons. The purpose of such a *unilateral* nuclear war would be to produce a revolutionary situation or perhaps destroy this country altogether. At the same time the U.S. would be inhibited from creating revolutionary situations within the Soviet orbit.

There are several conceivable methods by which a situation of unilateral nuclear war could be set up. One easy method would be to induce the United States and its allies to disarm and to destroy their atomic stockpiles, on the strength of Soviet promises, which would not be kept, to do likewise. As a variant the Soviets might agree to accept some kind of mutual control to keep the United States disarmed and, through secret methods which would escape the attention of the Western powers, continue to produce their own atomic weapons. As another variant the Soviets might concentrate their propaganda proposals not on nuclear weapons but on delivery vehicles and try to accomplish aerial disarmament, perhaps by means of pressures operating against the American budget-making structure. There are some who think this disarmament scheme is too naive and that the Soviets would not be able to get away with it. The fact remains that they have been untiring in their efforts to induce American disarmament by diplomatic maneuvers in the United Nations, by the creation of a strong

Nuclear Air War: Pattern II, Unilateral



"A" demands surrender



"B" either



accepts, is defeated

or



fights unequal war,
is destroyed and defeated

“peace” movement, and by psychological efforts against nations allied with the United States. But let us assume that these efforts will fail. The problem still would be to achieve unilateral war, despite the fact that the United States will have retained its arsenal.

Developing Nuclear Freedom

There are essentially four methods which a revolutionary aggressor has at his disposal to create the prerequisites of unilateral nuclear war:

Create Technical Superiority. For the first ten years or so of the nuclear age the United States possessed a technological unilateral war capability against the Soviet Union. In the future such a capability may emerge in the form of a monopoly possession of an atomic *delivery system* which the opponent cannot stop or of an attack system which strikes so rapidly that the defender will be crippled before he is able to retaliate. Technical superiority also could be achieved through an aerial defense system which is so effective that the opponent cannot carry out his retaliatory attacks as intended. In short a technological imbalance would be developed, allowing the aggressor to deliver his atomic stockpile while inhibiting the defender from doing likewise.

Achieve Tactical Surprise. A second method of fighting unilateral atomic war would be to achieve full tactical surprise, especially with respect to the timing of the initial blow, the direction and targets of the strike, and the tactical procedures adopted for the operation. History has shown that tactical surprises have more often succeeded than failed, provided they were undertaken by a resourceful military leader acting with the support of an aggressively resolute government. If tactical surprise were successful, it too would mean that the attacking forces cannot be halted and that they can cripple the opponent's capability for counterattack before the retaliatory blow is struck.

Paralyze Retaliatory Forces. Another method would be to incapacitate the retaliatory forces on the ground by sabotage and infiltration or by an open, violent assault by insurrectional forces timed so that the retaliatory forces will be paralyzed temporarily—at the very moment when they are needed most.

Expand Power Orbit. A fourth method would consist in the continued and rapid build-up of Russia's industrial and technological strengths, the acquisition of key geographical positions, especially in the Arctic, the development of an integrated political and military orbit strength, and the open or camouflaged absorp

tion of many "uncommitted" nations. Expansion of the Communist power orbit would be accompanied by attempts to isolate the United States and weaken it from within. The purpose of this two-pronged operation would be to create a substantial superiority of military, industrial, psychological, and political power wherein an American victory may seem to be impossible of achievement, with the result that the U.S. might hesitate too long before ordering the atomic forces into battle. While the effectiveness of each method employed singly may be questionable, a four-barreled undertaking along these lines could be quite effective.

Capability vs. Watchfulness

Nevertheless the success of such techniques depends on the aggressor's capability as well as on the defender's lack of watchfulness and moral stamina and on his gullibility. For example, while the determined leader can demand of his staff that they achieve clear-cut and substantial technical superiority, the ability to comply with the request is another matter. It is highly probable that the aggressor will allocate vast resources to the achievement of technical superiority. Still, success may be delayed. The technological race may be won with too narrow a margin. Or, while the technological race may be won in a fashion, the production and deployment race may be lost. Most responsible military commanders undertake major efforts, as a matter of course, to achieve a strong surprise posture and to protect their forces against the various forms of surprise. But only the act of war will reveal the extent of their success. In the nuclear age the smallest slip-up may be deadly—and can it reasonably be expected that there will be no slip-up at all?

This naturally is also true in the political and economic fields. The Communists may be able to build additional "positions of strength," and by the development of their orbit and their political actions against the West may achieve a *statistical* superiority of power. This is by no means certain; in fact in the light of the continued industrial expansion of the United States, the gradual consolidation of the free world, and the strains within the Soviet orbit, it is highly improbable. But the point is precisely that in the nuclear age "statistical" strengths, or "war potentials," have lost much of their significance and that even a vastly stronger Soviet bloc scarcely could escape devastating attack—unless, of

The Morality of Retaliation

BRIGADIER GENERAL DALE O. SMITH

IT IS dangerous to underestimate an opponent. Our tendency to belittle the technical progress of the U.S.S.R., for example, is a weakness in our thinking which we must overcome. The shortage of plumbing fixtures and good roads in Russia may have little to do with that country's ability to wage successful war. Plumbing never has been a critical war ingredient, and in the air-atomic age good roads are losing their significance.

It is equally dangerous to anticipate that an opponent will subscribe to the Marquis of Queensbury rules in a future conflict. In fact it would be to his advantage to have us think this and to have us subscribe to such gentlemanly conduct. Then he would, in his inimitable way, behave unscrupulously, with political success his sole objective.

We can never afford to underestimate the ability of our antagonist to digest technical progress in his huge military machine. He is striving to increase his learning, for example, by an unprecedented emphasis on education. Within his air force the outstanding officers are offered two years more service schooling than is the comparable USAF officer.

The Soviet ability to invent and manufacture atomic explosives has been somewhat underrated. In 1946 Professor Harold C. Urey wrote, "Most scientific and technical men who helped to produce the bomb guess [that Russia will have the atomic bomb in] between five and ten years. . . ." but the optimistic tendency was to estimate the higher figure. Using the lower figure, we could have expected to detect a Russian explosion in 1951. Actually the first Russian explosion as announced by President Truman occurred in September 1949.

Estimates had been made that the Soviets would not master the hydrogen explosion theory before 1954 ("Defense Strategy," *Fortune*, December 1953). Since our own first experimental device was set off in April 1951 the detection of a highly efficient Russian thermonuclear explosion in August 1953 becomes conclusive evi-

Material for this article was drawn from General Smith's forthcoming book, *U.S. Military Doctrine*, to be published by Duell, Sloan and Pearce and Little, Brown & Company, 17 May 1955. The views expressed are those of the author and are not to be construed as reporting official or unofficial policies of the United States Air Force or the Department of Defense.

dence that the technical gap in this field is rushing to a close. In fact the Chairman of the Atomic Energy Commission, Lewis L. Strauss, has said that there is good reason to believe that the Russians had started work on a hydrogen bomb substantially before we did.

Nor is Russian air power standing still. The abundance of MIG-15's, a type that in the Korean War outperformed all first-line U.N. fighters except the F-86 (and this was not available in the theater when MIGs appeared) attests to the amazing Soviet progress. In 1950 General Vandenberg spoke of a long-range intercontinental bomber being developed in Russia, and at the May Day review of the Russian Air Force in 1954 one of these intercontinental jet bombers was observed.

Addressing the National Security Industrial Association on 15 October 1953, General Thomas D. White, Vice Chief of Staff of the United States Air Force, said that the Soviets now have "a fleet of long-range bombers comparable in numbers to our own Strategic Air Command. They have a stockpile of atomic bombs that is at least sufficient to justify the experimental exploding of several. They are now producing better and bigger planes along with more and more bombs."

This is all disturbing evidence that the Soviet government has likewise made a shift in emphasis to air power and that the shift is backed by a construction program which may well excel ours. To retain our tenuous technological lead, it appears that we must extend every effort to translate our new military policy into reality by constructing the military establishment which will correspond to the new policy.

In the words of General Otto P. Weyland, "Our opportunities and vulnerabilities, our capabilities, and our war objectives must always govern the strategy of employment." This is the theme of the military policy enunciated by John Foster Dulles in a speech 12 January 1954. We shall emphasize our military advantages. The Korean War represented a step in the use of air power as a persuasive force to attain limited objectives. Subsequently a bolder and more confident step has been taken by our national leaders. Again in the words of the late General Vandenberg, "Air power alone does not guarantee America's security, but I believe it best exploits the nation's greatest assets—our technical skill."

With knowledge of the hydrogen bomb, the problem of weapon morality has been resurrected. When an enemy is dedicated to destroy us by any means, it seems perfectly moral to utilize any conceivable weapon against him in self defense. To

do less would in itself be immoral. If an armed maniac should attack one's family, would it be moral for the father to turn his back because he did not believe in the use of force? If a pistol were handy, would it be moral for him to reject it because this pistol, this cold, inanimate object, was conceived by him to be an unfair weapon to use against an armed maniac? Would it be more moral for this father to take halfhearted measures in defending his family, knowing full well that he would be overcome and his family ravished and murdered?

The discovery of atomic explosives did not change mankind. Only human beings are moral, and unfortunately, immoral. If the moral forces reject the use of atomic weapons, an open invitation is tendered to the immoral forces to take over. Not until a supranational authority can definitely assure the moral elements that no nation has the capacity to employ atomic weapons can there be any sensible restrictions to their use. Even then the moral forces will be handicapped. For technical warfare fosters peaceful pursuits, whereas the warfare of multitudes fosters a nation in arms and a totalitarian militaristic government. Both the maniac and the father are then without firearms. If the maniac is a brute who outweighs the father, has the father made a moral agreement in giving up the weapon that could have saved his family?

We cannot flirt with suicide by burying our firearms on a gentleman's agreement with a non-gentleman. "It is now the policy," Secretary Dulles said in an address of 30 March 1954, "not to exchange United States performance for Communist promises." And if we retain our arms, and the aggressor retains his, who shall win when the home is threatened? Each will have the technical capacity to kill the other, as in gun fights of the Old West. *But he with the fastest draw and the surest aim will survive.* Superior tactics will determine the outcome. Thus the application of atomic power becomes the most salient factor in the survival equation. The accent is on *speed and quality*.

Those who speak of massive retaliation as being "purposeless destruction, wasteful militarily and indefensible morally" are putting out the welcome mat for international desperados. If they bomb New York and Washington, should we not retaliate massively? Indeed it would be the ultimate of immorality not to take every step possible to defend our homes and our country, and Dwight Eisenhower considers it his solemn duty to do just this. If any President should fail to act vigorously to save his country, Mr. Eisenhower believes he should not merely be impeached, but hanged (*Time*, 29 March 1954, p. 15).

Only a perverted sense of morality could consider it evil to defend one's country by the most effective means available from a ruthless nation that has no compunction in keeping twelve million of its own population in slave labor; that has deliberately starved four million men, women, and children in an economic experiment of collectivization; that has killed or uprooted millions from formerly free and independent nations such as Estonia, Poland, and China. Such non-atomic killings in time of peace will hardly be exceeded by a wartime atomic retaliation in self-defense. And the consequences of failure are written plainly.

All people would like to confine war to the battlefield, and it would be a boon to mankind if this were possible. A precondition for this is that the whole world fully understand the certain consequences of the defeat sure to follow upon the loss of air superiority. Before the age of steel and steam, armed merchantmen had a chance to fight off sea raiders, and so the merchantmen fought. When armored cruisers appeared in the last century, merchantmen had no chance whatever. Yet for decades the merchantmen fought in the ancient custom as if they had a chance. Finally it struck home that resistance was worse than useless. Now a mere shot across the bow stops the merchantmen. A similar realization of the overwhelming power of air forces must come about before nations will succumb when they lose air superiority.

It is conceivable that knowledge of atomic and hydrogen bombs is reaching all people; in fact Russian newspapers have recently contained items of this sort. With such knowledge war may possibly again be confined to the battlefield, *but in this case it would be the battlefield of the air.*

Never can we be certain of this, however, and nations may yet have to suffer devastating air attacks. Whichever condition maintains, we can be certain that, in the words of Churchill, air power is "the supreme expression of war."

Any readjustment of force levels on the chance that atomic weapons will be outlawed, either legally or implicitly, would be as foolhardy as to become duped by the moral argument. War may occur when atomic weapons will not be employed, as in Korea. But only the fear of full atomic employment will keep such wars within limits. When objectives of a war are unlimited, involving stark national survival, no weapon restrictions, legal or implicit, can be counted upon to go unbroken.

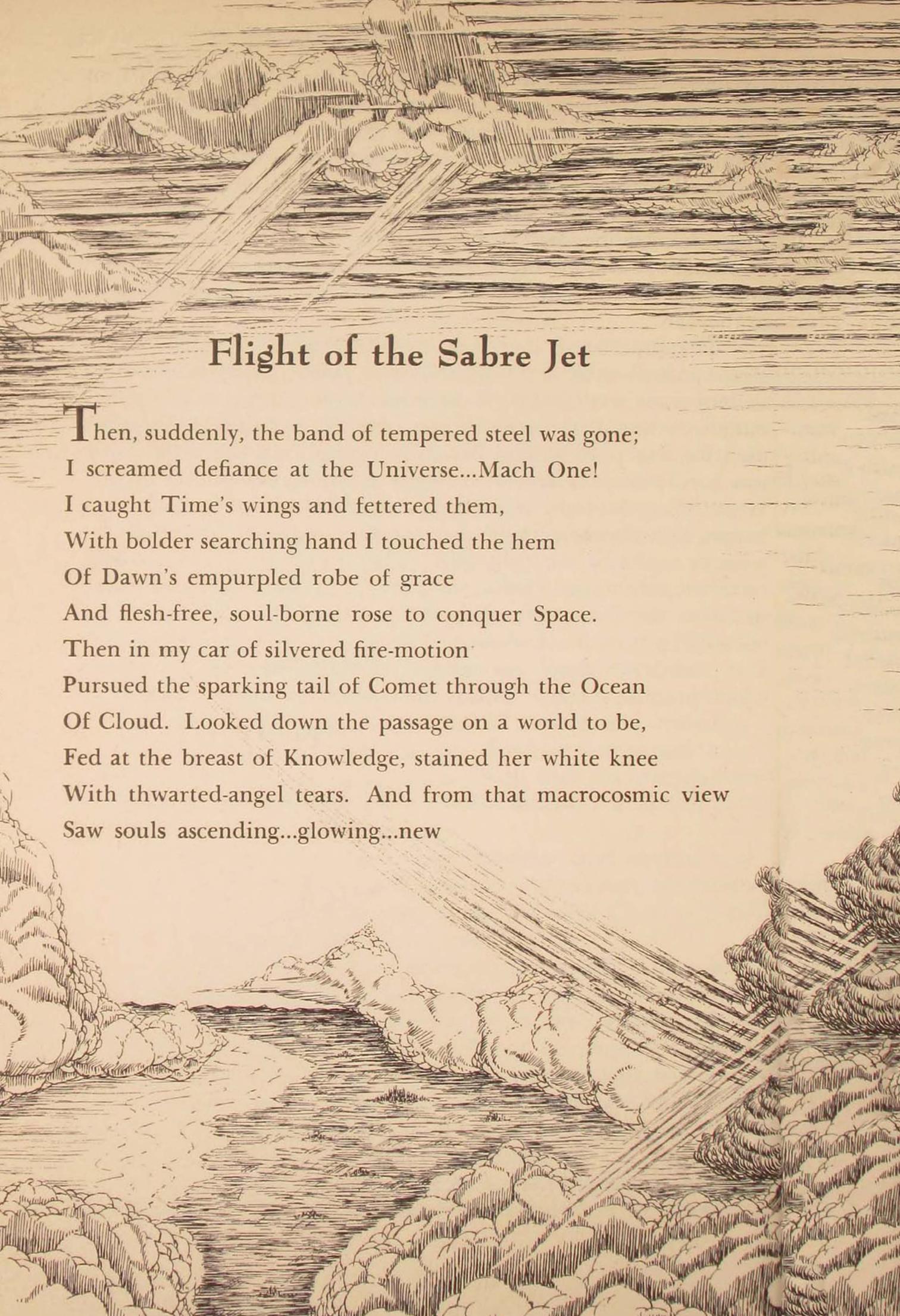
Perhaps those who point to the example of poison gas being implicitly outlawed in the last war fail to consider: that gas effec-

tiveness was a function of delivery and that delivery ability in any quantity rested with air superiority; that when the Allies had achieved air superiority, the enemy threat had been so diminished that the Allies did not need to use it and the Germans dared not because of the consequences of retaliation.

History provides examples of outlawing the use of cannon, but when cannon became truly effective, the ban was forgotten. Bombing of cities was outlawed before the Second World War, yet one thing led to another until both sides were paying little heed to the ban.

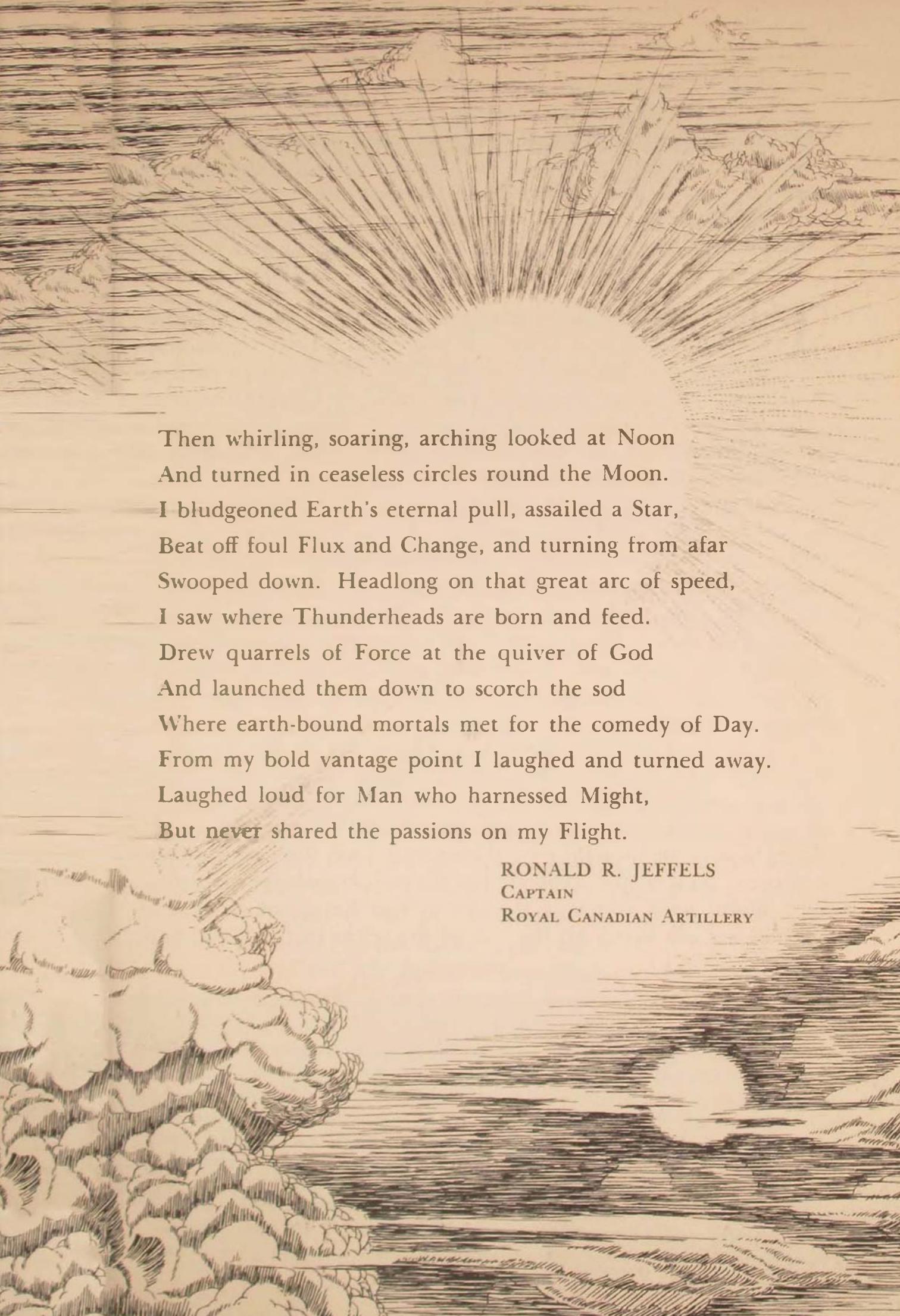
The superlative power of atomic weapons puts them in a class by themselves, and comparison to poison gas leaves us open to dangerous conclusions. Submarines were banned as commerce raiders by the Washington Treaty of 1922, but since submarines used for this purpose had decisive implications, the prohibition was hardly given a second thought at the outset of the Second World War. Military necessity has tended to dictate the choice of weapons, and when their use becomes habitual, questions of weapon morality are forgotten. The course of wisdom would be to prepare to use atomic weapons to the limit, with lightning speed on the draw. We all pray for that day when war can be reduced in fury or eliminated. But until then we must be ready and poised to defend our country through the use of weapons which promise success. This is the course of a higher morality.

Washington, D. C.



Flight of the Sabre Jet

Then, suddenly, the band of tempered steel was gone;
I screamed defiance at the Universe...Mach One!
I caught Time's wings and fettered them,
With bolder searching hand I touched the hem
Of Dawn's empurpled robe of grace
And flesh-free, soul-borne rose to conquer Space.
Then in my car of silvered fire-motion
Pursued the sparking tail of Comet through the Ocean
Of Cloud. Looked down the passage on a world to be,
Fed at the breast of Knowledge, stained her white knee
With thwarted-angel tears. And from that macrocosmic view
Saw souls ascending...glowing...new

A woodcut-style illustration of a sun with rays shining over a landscape with clouds and a body of water. The sun is a large, bright circle in the upper center, with numerous thin lines radiating outwards. The sky is filled with horizontal lines and some larger, textured clouds. In the foreground, there are more clouds and a body of water with some ripples. The overall style is that of a woodcut or linocut print.

Then whirling, soaring, arching looked at Noon
And turned in ceaseless circles round the Moon.
I bludgeoned Earth's eternal pull, assailed a Star,
Beat off foul Flux and Change, and turning from afar
Swooped down. Headlong on that great arc of speed,
I saw where Thunderheads are born and feed.
Drew quarrels of Force at the quiver of God
And launched them down to scorch the sod
Where earth-bound mortals met for the comedy of Day.
From my bold vantage point I laughed and turned away.
Laughed loud for Man who harnessed Might,
But never shared the passions on my Flight.

RONALD R. JEFFELS
CAPTAIN
ROYAL CANADIAN ARTILLERY

A Better Mousetrap

Planners Must Be Sellers

BRIGADIER GENERAL H. W. BOWMAN

TODAY'S high-pressure advertising had never been envisaged by the author who wrote: "If you build a better mousetrap than your neighbor, the world will make a beaten path to your door." If he had been raised on Hopalong Cassidy, the prize value of cereal box-tops, and "give-away" programs, he would probably have changed the old saw to read: "No mousetrap is any better than its salesmanship."

Good salesmanship is just as vital to the Air Force as it is to the breakfast food manufacturer. In our democracy we are dependent upon *acceptance* of ideas for the success of our mission—acceptance by Congress; by the American people; by the boss in the "front office;" yes, and by the people down under who call us "the Old Man." The degree of our success depends largely upon the understanding and enthusiasm with which the ideas are accepted both by those who make decisions and those who implement them.

The filing cabinets of every headquarters in the Air Force are crammed with good ideas that will never see the light of day because they weren't properly sold; because the originator assumed that the world would recognize quality and beat a path to his door; because he thought a good idea would sell itself, or someone else could do it better. Nobody has as much *knowledge* or *enthusiasm* about your tidbit of wisdom as you have, and those two ingredients are worth all the rest of the tricks of the trade com-

Despite the wonders of electronics, man yet faces the basic difficulty of communicating ideas from one person to another, from one group to another. The difficulty is compounded if the idea is new and involves changes in familiar patterns and habits. In the Air Force, where adjustment to science and world conditions must be endless, much encouragement is offered for independent thinking. Care must also be given to the means of selling the idea that has been produced. Unless accepted, an idea is useless. Beginning with the necessity for salesmanship because of the resistance to change engrained in human nature, Brigadier General H. W. Bowman, Deputy for Plans, Headquarters United States European Command, offers some realistic advice and useful tips on how to make a new idea interesting.

bined. A few simple rules of salesmanship, applied to Air Force procedures, and some careful planning plus willingness to try, will put it over, *if you do it yourself*. Here are a few basic rules of salesmanship applicable to anyone, whether you are a master planner or a GI with a better monkey wrench; whether you are trying to put across a new idea to the boss, indoctrinate the troops, present a suggestion through channels, or just persuade the world you're a fine fellow.

Check List of Good Salesmanship

1. *Perfect* the product
2. *Know* your product
3. *Pinpoint* and study the customer
4. *Plan* the sales approach
5. *Close* the sale
6. *Follow up*

Salesmanship Upward

The requirement for good salesmanship upward through the heavy-handed channels of resistance is more easily recognized than in the downward stream. As ideas flow from bottom to top, busy executives are not forced to listen. The little man down under often sees his masterpiece disappear forever in the dead waters of military inertia. The general attitude at the grass roots level is that the Air Force organization has been carefully designed for defense in depth so far as new ideas are concerned. Far too often the originator is given a quick brush-off with no expression of appreciation for having tried, and frequently never even receives the courtesy of a reply as to final decisions which may have been made. He may even learn months later through some Air Force publication that the Air Force is doing what he proposed but someone else has received the credit.

Fortunately the Air Force is becoming increasingly aware of its obligation to encourage suggestions and to recognize those who initiate them. Good ideas *can* be successfully promoted if we apply our simple rules of salesmanship to the Air Force.

Perfect the Product

A good flow of words, exaggerated claims, or a good coat of whitewash may put over your brainchild temporarily. It will be easier to sell if it is good, and only a product of high quality has

“staying power.” Your best sales force is composed of your satisfied customers. An example of this factor lies in the management improvement program of the Air Force. Public confidence is being steadily increased, not just by more tons of publicity hand-outs but by the practice of *better management*.

Know Your Product

Learn all you can about the thing you’re going to sell. You must become the voice of authority. Your knowledge, your confidence, your enthusiasm, and your good advice on how your customer can use your gadget for his benefit are vital factors in selling.

Pinpoint the Prospective Customer

Put yourself in *his* shoes. Get *his* viewpoint and frame of mind. Ask yourself, “*Who* wants it? What does *he* want?” Not “What do I want him to have?” Remember the old adage of successful businesses, “The customer is always right.” Take plenty of time to get your product ready. A false start or a series of corrections may generate lack of confidence at a time when first impressions are vital. A failure at the start, temporary though it may be, can become a washed-out bridge on the road to success.

Here are a few factors that are given serious consideration topside. If your product will contribute to any or all of these factors, you have ready-made sales points well worth emphasis.

- Will it increase efficiency? Will it do the job better? Why and how?
- Is it cheaper? How much will it save the Air Force in dollars? If it costs more money, then you must thoroughly prove that it will win battles and will, therefore, be worth the price.
- Will it increase safety in the air or on the ground?
- Will it improve morale or the acceptability of the Air Force as a career? Will it encourage reenlistments, reduce disciplinary problems, or prevent AWOLs?
- Will it improve public relations? Is it politically expedient?
- Will it increase flying hours or maintenance effectiveness?

There is a tendency to criticize “the little man in a big job” in higher headquarters for his impractical, head-in-the-clouds,

star-chamber attitude on the assumption that he doesn't understand the problems down under. As a salesman it is your job to *make* him understand them. Don't criticize him for failure to get the worm's-eye view. He is being paid for his ability to see the big picture. It is your responsibility to put yourself in *his* shoes. He's the one who must find the money, answer the budget questions, justify his decision to the public and the press, and establish a program for successful implementation of the idea if it is worth while. A summer-weight field jacket may be desirable at Sagebrush Air Force Base but is it in strong enough demand, Air Force wide, to justify millions in cost? It is far better for him to have a broad viewpoint with possibly some loss of the common touch than for him to have your viewpoint at the sacrifice of hilltop perspective.

Plan the Sales Approach Carefully

When your idea or your gadget has been perfected, start winning friends and influencing people.

Human beings are creatures of habit. There is always built-in, psychological resistance to anything new. Organize your thoughts and your presentation, even if it's oral. If you rush breathlessly in to the boss with nothing but enthusiasm to support your premature proposal, he'll tell you to go back after the facts. You have done nothing but create resistance to your next try. Make your approach as one of our leading national magazines claims for its publication, "curt, clear, complete."

There are two general types of salesmanship upward: the informal, oral presentation and the more formal, written package. Usually the methods successfully used are similar, and often both approaches are necessary.

The man who makes important decisions is busy. He is geared to think and act fast. Save his time. Don't beat around the bush. Tell him right off why you're there. Be clear as to need, means of implementation, results expected, and responsibility for accomplishment. If he is impressed with the thoroughness of the plan and all his questions are answered logically and briefly, the first hurdle is successfully negotiated. He will be particularly pleased if your presentation is so made that his time is not wasted by verbosity or immature wanderings.

Since it is normal procedure for a staff to consider problems prior to presentation to a commander, he will be reluctant to accept your proposal whole-heartedly without their advice and

concurrence. It is, therefore, important that you determine in advance who his advisers are and sell them first. Give the project complete coordination and obtain concurrences prior to consideration at the point of decision.

The "staff-study" method of presentation is by far the best guide to use, since it follows the logical thought process of a busy individual. In this method, you state the problem, discuss the facts bearing on the case, propose and test solutions, draw conclusions, and recommend specific action. This method should be followed religiously in every presentation whether a two-minute oral job or a five-pound stack of paperwork complete with drawings and exhibits. It is a "must" in salesmanship upward.

The following tips may help you:

1. In making an oral approach, careful planning and organization of your thoughts are just as important as in a written presentation—perhaps even more so. "Staff-study" type of oral selling is highly impressive to the listener because he immediately knows that you have been thorough, logical, and conclusive. It makes it easy for him to say "yes." He is pleased because you are saving his time.

2. Your opening remarks are important. Nothing will do more to put your listener into a stubborn, critical frame of mind than to make him try to guess why you are there or to give him the impression that you're merely adding to his burdens. Give him the feeling that you are helping him solve his problems—not creating more. Suppose you are a staff officer who desires clarification or decision on the commander's policy on a certain item. You, as the expert, have ideas on the subject and know what you hope he will say. How often have you walked into the front office and said, "What's your policy on this?" The chances are the boss is not going to admit he has given it no thought and has no policy on the subject. He will probably give you one off the cuff. He messes up your work, embarrasses himself later on when the results are seen, and gets credit from you and others for being stupid. If you are a good staff officer, you will again use the staff-study approach. As the expert you should present the problem, discuss it, and offer him a recommendation in such a way that a nod of the head or a signature will put it into effect with responsibility clearly defined. Whether he accepts your proposals or not, he has been given the basis for guiding you by a decision or further instruction.

3. The power of expression, both oral and written, is vital to good salesmanship. It can be developed by anyone who is willing to try.

4. Avoid a "take it or leave it" approach. The burden of proof is on you. The better mousetrap will not sell itself but will depend upon your power of persuasion and your persistence in putting it over with minimum discouragement. Don't give up.

5. Make it easier to accept than to deny. If you have anticipated all possible objections and answered them in your discussion, if you have sold the people who influence the boss, and if you have so carefully prepared the approach that approval makes accomplishment automatic, it will be difficult for a commander to say "no."

6. Use plenty of props. Charts, graphs, photographs, models, illustrations, and demonstrations help tremendously in your efforts to make your presentation "curt, clear, and complete." An old newspaper adage is that "a picture is worth a thousand words."

7. Make the credit lines clear. Don't hesitate to give credit where it is due, including both yourself and others without either undue modesty or credit-grabbing. Give others their share. That does not detract from the credit due you, but actually enhances it and helps you to develop the support of the rest of the team. You may need their help to put it across.

8. Confidence breeds confidence. Before making your presentation, be sure that you have thoroughly perfected the product, tested it against possible objections, considered all the opposing arguments, and have concluded that it is still sound. This gives you conviction and the authoritative, enthusiastic frame of mind which is vital to successful salesmanship. Enthusiasm is contagious. If you lack confidence either in your product or yourself in the process of selling it, you start with two strikes against you. Practice your presentation on your wife, your staff, or your dog. You may get some friendly kidding but it will reduce the blood pressure and increase your own ability.

9. Have the courage to *try*. Air Force Secretary Harold E. Talbott tells us, "We must find better, faster, cheaper ways of getting the job done. 'More Air Power Per Dollar' is more than a slogan—it must be one of the daily drives of all personnel, both military and civilian. Your idea power *can* mean more air power." The greatest strength of a democracy lies in the right of each

individual to think and to express himself. With a million Air Force people generating ideas and trying to put them across, dictatorships cannot compete with us in progress and development. If only one out of ten of your new ideas is acceptable, it has still been worth the effort to you and to your Air Force.

Close the Sale

Obvious, yes, but so important and so often neglected as to be worth stressing. Watch the techniques of the realtor, the insurance agent, or the automobile dealer. Only the name on the dotted line pays off. Everything he does is leading to the psychological moment when he says, "All you have to do is sign your name. We'll take care of everything." All you have to worry about is paying the bills for the next ten years. In the military we call it "completed staff work." A nod of the head or a simple signature, like a simple touch on the controls of the good ship *Robert E. Lee*, starts the whistles blowing, the propellers churning, and the crew operating at top pitch.

Follow Up

One sale or one man persuaded isn't enough. Good will ensures continued and increased volume. You have heard it said that "nothing succeeds like success." You have seen many times the slogan of a leading car manufacturer, "Ask the man who owns one." The upward cycle will continue in the right direction just as long as past and present customers are satisfied. Your own reputation and pride demand that you ensure continuing success of your project. Even though someone else may have the responsibility and share in your credit, you will be closely associated with any failure.

Salesmanship Downward

The greatest need today for understanding and applying more effectively the principles and techniques of good salesmanship lies in the *downward* direction in all echelons of command. Why? Because of the tendency to substitute authority for salesmanship. It is all too easy for a busy staff officer to assume that the command line will automatically create understanding and enthusiastic acceptance on the part of all the underlings on the receiving end. While it is granted that a thoroughly prepared

directive may generate acceptable statistics in periodic reports, charts do not necessarily prove success. Compliance both in "letter and in spirit" is a "must," for full implementation of a directive. If the spirit is missing and only lip service is applied, you can be assured of only mediocre results.

The same basic principles that we have discussed above will be recognized in the following discussion of salesmanship downward.

The higher the echelon of command, the more difficult it is to realize that the poor little fish at the bottom of the sea is under constant pressure of the entire ocean. There are literally tons of directives, regulations, manuals, letters, SOPs, etc., all carrying command-line authority which press deep into the partially trained and overstimulated mind of the man at the bottom responsible for results. In today's austerity program where all echelons are making conscientious efforts to "do the mostest with the leastest," where assigned strength and experience level are below par, there is terrific competition for men's time, attention, and interest. It has been well said that you can buy a man's time but you cannot buy his loyalty, enthusiasm, or his willingness to give his all in a coordinated effort of the team as a whole. That extra dividend is basically the difference between a mediocre outfit and the best.

A good example of topnotch salesmanship downward was to be found in General George Patton. He had the ability to so inspire—yes, mesmerize—his army that every individual believed himself to be personally responsible to the boss for victory or defeat. The prevailing attitude at the bottom was "Me and General Patton are going to win this war." A prime example of a salesmanship vacuum was the Airmen's Information Program, when first formally established. There is no doubt whatsoever that in a democracy men must know why they fight and be willing to sacrifice everything for their ideals. This vital need was recognized early in World War II, and simple directives were issued. They were a dismal failure. Such a high degree of resistance was built up against the program that we have never overcome the apathy that developed. A small portion of the millions of man-hours devoted in sincere efforts to overcome this resistance might better have been expended in planning, preparing, and selling the program originally.

The good farmer does not wait until his corn is choked out by weeds before he starts fighting them. He carefully selects his

seed, he irrigates, cultivates, fertilizes, and nurtures the plants and then takes great pride in harvesting a bumper crop.

Likewise a good staff officer does not merely scatter his good ideas at random to let nature take its course. If a project is worth the time and effort of hundreds of "little guys at the grass roots," it is certainly worth the time and effort required for preparing the soil and creating the environment for success.

In applying our basic principles to salesmanship downward through channels, the following suggestions are offered:

1. Put yourself in the place of the man at the receiving end and ask yourself these questions: Will the need be obvious and easily understood? Will it be enthusiastically accepted without special emphasis? Is it clear why the project is necessary and why high-quality performance will produce better results for the individual or for the Air Force? If not, what are the most effective methods to show the need and generate enthusiasm? Sometimes discussion conferences can lay the ground work, giving participants full voice and a feeling that they themselves have helped to create the plan. It has been said that nobody will ever go along with a decision with 100 per cent effectiveness and enthusiasm unless he has had a part in making that decision. Obviously the Air Force would grind to a halt if a million people had to be consulted at each step. But whenever participation is practicable, it ensures an increase in acceptability. Watch "audience participation" work on TV and radio shows. Try it in staff meetings, airmen's councils, and management groups. Another effective method is to give the problem to responsible people and let them come up with the answers. This certainly will give you *their* viewpoint.

2. Try your ideas out on others. Test them on a few selected customers or those who will provide the resources.

3. Make sure the capability exists. Provide the where-withal. It is typical of the man down under, at any echelon, to feel that the specialist from higher up the line demands far too much by way of resources, attention, and perfection, whereas those who control those resources are just as extreme in withholding the tools needed. One staff section is responsible for setting the goal; the other for paying the bill; "and never the twain shall meet." The man with the job to do feels like the recruit on a big dinner date just before payday when his beloved orders filet mignon. He who would *give* responsibilities to lower echelons should assume the responsibility to fight out the questions of

availability of resources *at his own level* or higher, rather than demand that which is impracticable. Coordination does it. All too frequently over-zealous staff specialists develop such a narrow enthusiasm that they are tempted to absorb more than their share of lower-echelon production capacity. The issuance of directives beyond practical capabilities merely causes frustration and increased resistance. If special training, additional personnel, money, or other resources are required, are they provided at the right time and place? Special courses of instruction may be necessary. Possibly a guide for on-the-job training can be provided. If the necessary resources cannot be furnished for a high degree of success, it may be necessary to lower your sights or drop the gun entirely.

4. Anticipate points of resistance and make every effort to overcome them in advance. The following clichés should be used sparingly, because they are built-in, high-ohm resistors, well known at all levels:

Overworked Quote

"This will be an additional duty for the
-----"

"Locally available funds will be used."

"The officer responsible for this function will be given no additional duties."

"A weekly report will be submitted."

"This is a command responsibility."

"Commanders will personally - - - -"

Typical Locker-Room Reactions

"If an additional space authorization is not justified or available, just say so and leave it up to the commander concerned to get it done."

"Often necessary, but watch the smoke when the commander gets burned for dropping something else to get the money."

"Wanna bet?"

"An unjustified luxury."

[The usual comments by the working man are not appropriate for quotation in this publication.]

"No kiddin'. What isn't?"

"Why don't those guys attend the management school? Just try to delegate!"

"All personnel will be indoctrinated - - -."

"Pretty obvious. Guess the Old Man could have figured that one out himself." "What—another speech?"

"Authority is delegated - - . You will submit plans for review prior to implementation."

"Could this be a new definition of delegation?"

"Report action taken to comply - - -."

"They sure trust us."

There are times, of course, when the above quotations are necessary and logical. But all of them have in the past been so misused and over-used as substitutes for completed staff work that they often create resentment whether justified or not.

5. Stick to essentials. Mr. Average GI feels that he is being "nibbled to death by ducks." In our efforts these days to "cut the fat" from the Air Force, resources have been reduced without a commensurate reduction in the workload. Thus the competition for men's time, attention, and enthusiasm has greatly increased. With it, resistance to new ideas and more "maximum effort" has soared. Probably 25 per cent of the directives considered at unit level to be least important are being neglected because of lack of time, know-how, interest, resources, or emphasis. If a new project is only *desirable* rather than *necessary* and cannot be sold successfully to lower echelons without excessive expenditures of supervisory effort, then perhaps it should be considered a luxury item.

This is a very simple test you can use to determine the success of your downward salesmanship. Drop in and see a few of the people responsible for accomplishment. Are they merely generating statistics for your benefit, paying lip service and getting by with the minimum of effort, or are they willingly and enthusiastically striving for perfection? If they are doing the former, perhaps you should reconsider your selling techniques or eliminate the requirement.

What Can Commanders Do About It?

Commanders themselves in all echelons have a great opportunity not only to enhance their own success by the application of good principles of salesmanship but to stimulate in others the same capabilities. There are several areas in which commanders will find their efforts richly rewarded:

1. Demand from your staff the habitual practice of completed staff work and the "staff-study approach." Every presentation to you, whether oral or written, should follow the logical outline, "Present the problem, analyze it, draw conclusions, and make recommendations." Staff officers must never be permitted to indulge in sloppy preparation or vague, disorganized thinking. They are there to save your time. If you let them pass the buck to you to do their work for them or if you accept low standards in their presentations, you are doing a disfavor to them, to yourself, and to the Air Force. Insist that their staff work be "curt, clear, and complete."

2. Give maximum stimulation and encouragement to the flow of ideas. Suggestion boxes, Airmen's Councils, management committees, and the command structure itself are all excellent media through which these ideas can pass. But it takes more than a river bed to provide irrigation to the farmer's corn patch. If no water flows through the canal, the farm remains parched. It takes a great deal of thought, planning, and continuous effort to encourage people to feed their ideas into this system. You must reduce to a minimum the resistance, red tape, and lackadaisical attitudes under your control which slow down the processing of these ideas. The rewards—in whatever form—must be prompt and positive. Every idea must receive a quick response with an expression of appreciation for trying regardless of value received. The first try may be no good. The tenth one may save millions. Far too often, new ideas which flow upward through channels end up in somebody's wastebasket or with someone else taking the credit and the originator never knowing by a courteous reply that his efforts were appreciated.

3. Encourage improvement in the art of expression, both oral and written. People are not just born with this ability—it is developed by study and practice. *Leadership* is nothing more nor less than *influence*. Influence depends to no small degree upon the ability of a person to transfer his thoughts to others persuasively. You cannot have truly effective leadership without the power of expression. Perhaps the most effective means of developing the power of oral expression in the armed forces today is through Toastmasters Clubs. Are you familiar with this organization? *Toastmasters International* has more than 1500 clubs throughout the world (including 25 in the Air Force), and they are adding new ones at the rate of one a day. These clubs meet weekly around a dinner table, and while good friends are having fun, they are learning to speak on their feet. The transformation of mem-

bers from stumbling, halting, reluctant mumblers to dynamic speakers is spectacular. If you are interested in forming a club, drop a line to Toastmasters International, Santa Ana, California. They will be glad to tell you about it.

4. If you would decrease sales resistance to a project or program, make doubly sure that the means are available to the customer to do the job. Skimming off the fat in the austerity program should consist at least partly of eliminating some of the overweight requirements when personnel and other resources needed for the jobs are withdrawn. Make sure your own echelon has not put lower units into the squeeze play with a "don't bother me with details" brush-off as to tools needed.

5. Perhaps inspectors might develop a new approach. While checking for compliance with directives, they might ask themselves these questions: To what extent has the issuing headquarters effectively *sold* a project to subordinates? Have necessary resources been provided along with the job? Has enthusiasm been generated? If not, which echelon has failed? Does the total effort required for proper accomplishment justify the end result desired? Is it worth the cost? If it needs rejuvenation or stimulation, what is the most effective method—reply by indorsement, punishment, elimination of the requirement, or just plain good salesmanship from topside?

6. Good public relations come from applying these same principles of salesmanship. How often have you heard a commander blame his PIO for a derogatory editorial when the fault lies in the quality of the product itself? Don't expect your PIO to be merely a whitewash artist. If you have a better mousetrap follow the good advice of the Bible and don't hide it under a bushel basket. Talk it up—put it where people can see it. Create pride among the members of your organization and the taxpayers. Then the cycle starts—pride generates quality; quality generates pride. You're on the way up.

Headquarters, United States European Command

Jet Streams: Fact and Fiction

C. N. TOUART

"JET STREAM" is a pretty loose term at best. Even the meteorologists are still debating its precise usage. What is more, they compound their semantic difficulties by using the term in several different contexts. Since only one of these contexts has aeronautical significance, the nonprofessional should beware lest he be misled. In working its way into the public vocabulary "jet stream" has suffered some distortion. The impression seems to have got around that the term refers to a single and distinct phenomenon—a 300-knot air current channeled through the normal wind field and found with monotonous regularity at 35,000 feet, flowing due eastward. None of these conceptions is true.

In simplest practical terms "jet stream" is merely a handy name given to centers of high wind speed. As such it is analogous to "anticyclone," the name given to centers of high pressure. It no more refers to a single entity that is detachable from the rest of the atmosphere than does "anticyclone." Higher speeds are not inconceivable, but the "official" record now stands well under 300 knots. Jet streams vary widely in geographical location and altitude. They are where you find them. The direction associated

... the high, fast winds

When B-29's over Japan in World War II encountered uncharted high-altitude winds that cut their speed in half, the Air Force had its first rude introduction to jet streams. In the years since, with flight at altitudes above 30,000 feet commonplace, jet stream forecasts are a regular part of the weatherman's data. The suddenness of discovery and the varied and frequently exaggerated reports of jet stream velocities have excited newspaper and magazine interest. Inevitably understanding of this natural phenomenon has become somewhat blurred and distorted by oversimplification. The proprietary interest of the Air Force in jet streams stems from their possible effects on high-altitude air operations. The Air Force is also the Government agency responsible for basic research on the upper atmosphere, the latest in its series of researches being Project Jet Stream. Mr. C. N. Touart, Chief, Atmospheric Analysis Laboratory, Air Force Cambridge Research Center, whose organization conducts Project Jet Stream, corrects some of the popular misconceptions and reports on the state of the weatherman's knowledge of jet streams.

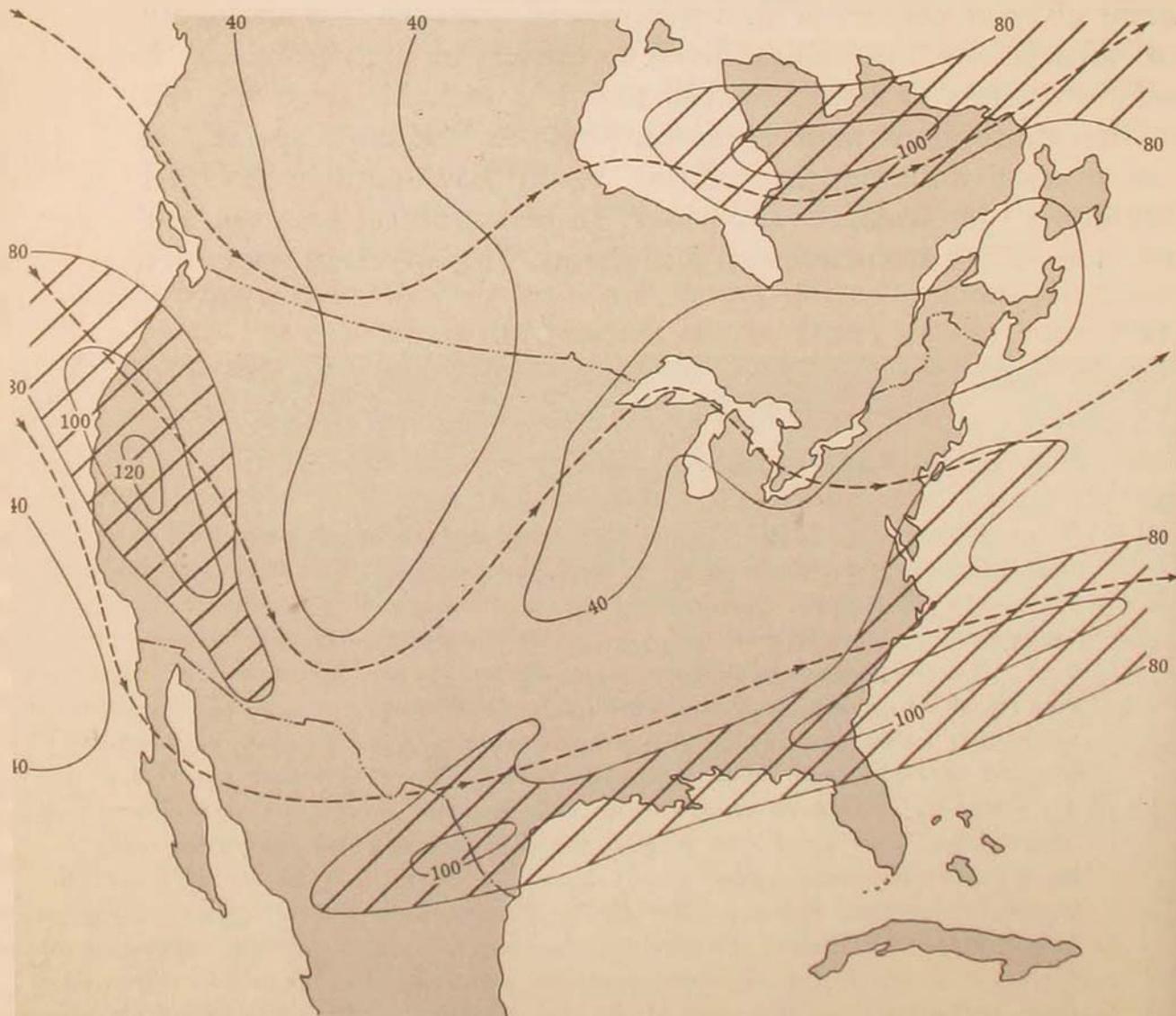
with high wind speeds is also variable. In any particular instance the maximum wind may be blowing from any point of the compass.

No words can serve half so well as a small sample of the raw facts to illustrate just what a jet stream is.

Figure 1 shows the horizontal distribution of wind speed at a high level as it was actually observed one day last winter. (Such so-called isotach analyses are now in widespread use as a supplement to the familiar contour analyses.) By the definition already stated, each of the three cross-hatched regions of high speed is a jet stream. They share two geometrical characteristics: they are distinctly elongated, and the long axis in each case is in the direction of the wind. These are typical characteristics of jet streams.

The choice of the 80-knot isotach to bound the jet streams

Figure 1. The wind field at approximately 40,000 feet pressure-altitude (200 millibars), 0300Z, 19 February 1954. The solid lines are lines of equal wind speed (isotachs) in knots. A few "streamlines" have been dashed in to indicate the wind direction. The areas of speed in excess of 80 knots have been crosshatched.



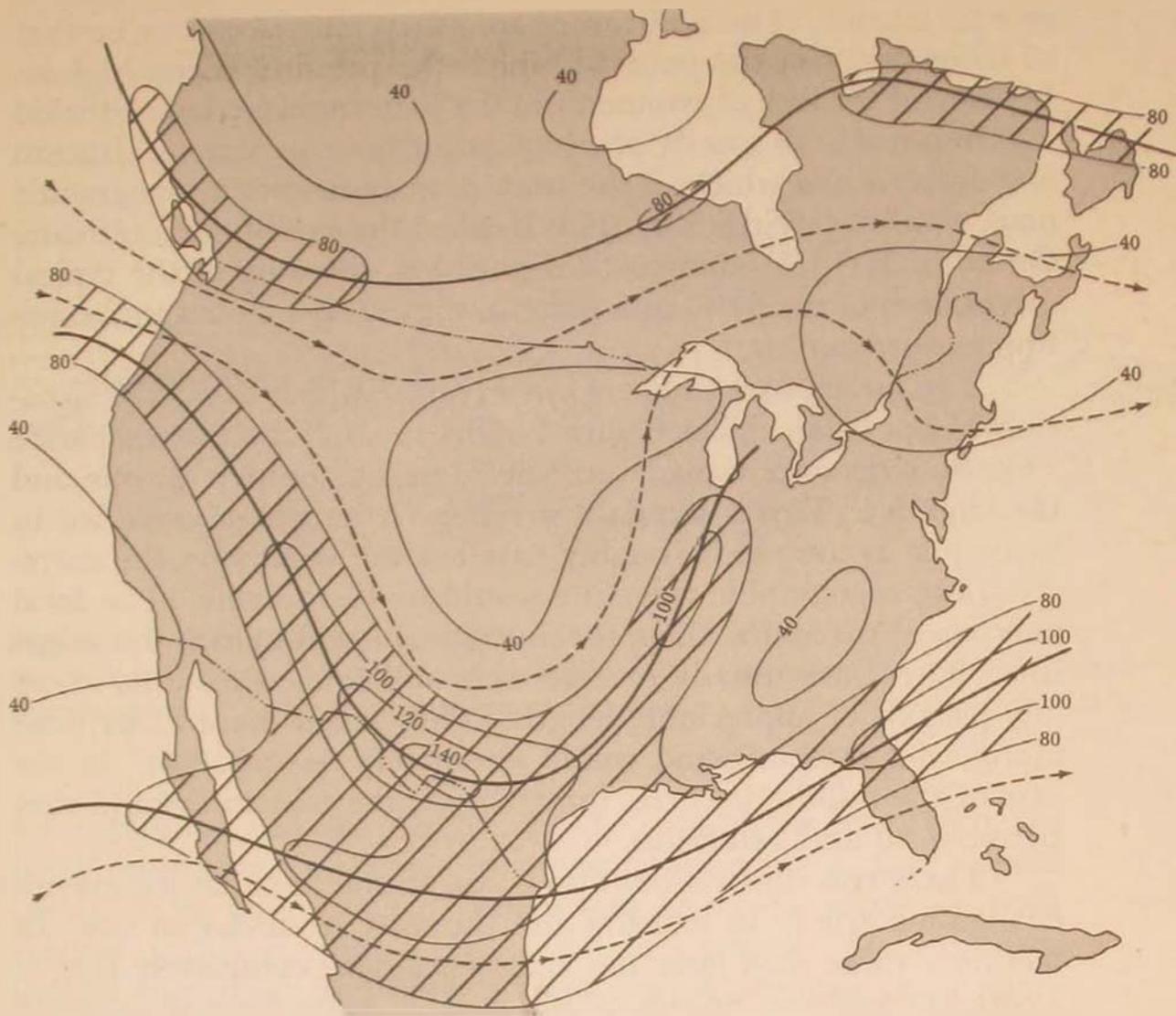


Figure 2. The wind field at approximately 40,000 feet pressure-altitude, 0300Z, 20 February 1954. Again the solid lines are isotachs in knots, and the dashed lines are "streamlines." The heavy lines are jet axes. Note the changes from the previous map. The Canadian jet has weakened in the east. It now extends fully across the continent. The large area of slow speed in the west has split into two lobes, leaving an east-west ridge of relatively high speed. The jet previously coming in over the mid-Pacific coast has moved southeast. It has intensified and turned its nose northeastward toward the Great Lakes. The southernmost jet has changed but little, although its lateral pattern is beginning to merge with that of the middle jet. Such an interaction between jet streams is responsible for the northward protuberance of the 80-knot isotach along the east coast in Figure 1.

was quite arbitrary. This is necessarily true of any means adopted for this purpose. In this respect the atmospheric jet stream is not like the Gulf Stream, because the Gulf Stream is qualitatively different from its environment. In the strictest sense it is meaningless to speak of a jet stream as though it possessed a discernible boundary. Again the comparison with an anticyclone is apt.

On the other hand it is not nonsense to speak of the location

of a jet stream. The position of an anticyclone is said to be that of its center, *i.e.*, the point at which the pressure is the highest. Because of the lack of symmetry in the patterns of high-speed wind it is impossible to specify one such point for a jet stream. Instead one draws a line which, if the isotach analysis were a topographic map, would be a ridgeline. This is called the *axis* of the jet stream. On both sides the wind speed diminishes. Because of the typical orientation of the jet-stream pattern, the axis is a close approximation to a streamline.*

The jet axes are indicated in Figure 2 which shows the situation 24 hours later than Figure 1. Observe that the three separate 80-knot areas over Canada are considered to be part of one and the same jet. This is standard practice. A jet axis is extended in space just as long as it roughly parallels the wind, and the corresponding topographic ridgeline would be identifiable. The local maxima of speed are, then, the analogue of peaks along the ridgeline. There are usually several such well-defined maxima along any jet axis of appreciable length. Thus if one were to fly dead along a jet axis, tailwind would alternately rise and fall. In the case of the middle jet here, for example, the tailwind would vary between 80 and 140 knots.

These two illustrations also point up the fact that jet streams change materially in location and intensity from day to day. In fact only three days later the U.S. was almost completely free of jet-stream activity. Speeds of 80 knots or more were then found nowhere except over the extreme southeast. At the same time it can be seen that these day-to-day changes possess the same general character of continuity as the more familiar weather movements. This is fortunate, for it is no trade secret that continuity underlies the time-honored basic tool of the weather forecaster—extrapolation.

The familiar fact that wind patterns at nearby altitudes tend to be quite similar would suggest that jet streams existed on these days at altitudes other than 40,000 feet. This suspicion is confirmed by Figure 3, which shows for one case that in much the same horizontal position jet axes existed at all levels between roughly 12,000 and 43,000 feet. From 40 knots the axis speed increased slowly with altitude to 100 knots at just under 40,000 feet. Then it dropped off very rapidly above. The point at which

*A streamline is a curve whose tangent at every point coincides with the direction of fluid flow (wind) at that point. It is an instantaneous depiction of the field of motion and should not be confused with a trajectory, which is the path followed by an individual fluid particle in the course of time. Streamlines and trajectories coincide only under conditions that are not generally satisfied in the atmosphere.

1 inch = 100 miles
Vertical scale exaggerated ten times
Isolachs connect points of equal wind speed
Wind is from the south

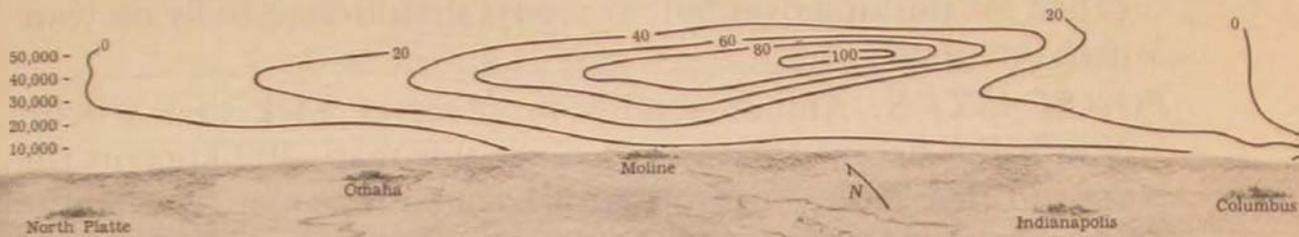
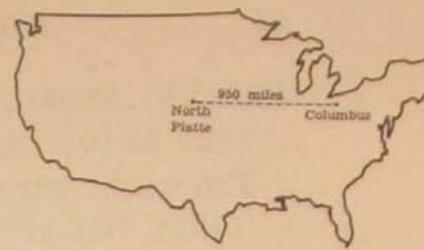


Figure 3. Vertical cross-section of the wind field at 0300Z, 20 February 1954, between North Platte, Nebraska, and Columbus, Ohio. Even with the vertical dimension exaggerated 10 times, it is apparent how shallow a jet stream core is vertically.

the maximum was attained locates the *core* of the jet stream. In three dimensions, of course, the core is not a point, but a space curve. It is important to realize that the core varies in both vertical and horizontal location and in strength. For example, though not illustrated here, a cross section through these same stations on the next day shows the core of this very jet then at 28,000 feet and 140 knots. Simultaneously, upstream over Colorado, its core was still at almost 40,000 feet and only 100 knots. The practical significance of this feature is that if one wishes to "fly a jet stream" to take advantage of the maximum tailwinds, then he must be prepared to vary his altitude. And he will still not have a steady tailwind.

The announced purpose of the preceding illustrations was to tell the truth about jet streams. Have they told the whole truth—even about these particular cases? Probably not. The reason for skepticism is that incidents like the following bit of fiction *do* happen.

The scene is the weather station at Wright-Patterson Air Force Base. The time is early morning, 21 February 1954. A forecaster is studying the chart shown in Figure 2. He looks up to see an old friend, a pilot, stamping into the room. The pilot's face shows that the peeve he is nursing is caused by more than the early hour.

PILOT: When are you pencil-pushing eggheads going to learn how to forecast? Last night I brought a B-47 up from Tinker. I'm right on course, no sweat, until I hit southern Illinois. Then, before I know what's hit me, I'm heading for Canada. My observer got a good fix on a 150-knot wind. The forecast called for nothing over 90! You guys should have to fly on your own forecasts!

FORECASTER: Ahmm—send your observer back to K-school! You had a decent forecast. Look at this map—100 knots is the tops in that area. And you must have passed right by Chanute just about the time of their 0300 wind-run. You guys should have to navigate on your own dead-reckoning!

Or perhaps the pilot is a head taller and 50 pounds heavier than the forecaster, in which case the answer might have been—

FORECASTER: Those jawboners at Chanute—they should have their rawin receiver recalibrated! This is the second time in a week that I've found their winds sour.

Neither explanation is necessarily correct. Even though they were close in space and time and still differed by 50 knots, both rawin and aircraft reports of the wind may have been accurate. Where the core of a jet stream is concerned, "close" is not good enough. The next illustrations show why.

Figure 4a is another vertical cross-section through the core of a jet. This one is based on a dense array of observations made by the B-47 of the Air Force research project Jet Stream. Although some of the finer details may be spurious, the larger features, including the multiple-core structure, are undoubtedly real. Note the complex configuration and the strong gradients of wind speed, even though this jet is of only modest strength. In extreme cases the wind may change by as much as 50 knots in 1000 feet of altitude. Horizontal differences of up to 40 knots in 10 miles have been reported.* There is some evidence of higher values.

On another Jet Stream flight—this time with a sailplane as the probe—a "jetlet" was encountered at 35,000 feet. This was an area only 50 miles across. Inside the wind speed was 115 knots. At the boundary it broke sharply to 70 knots outside. When things like these can happen, small wonder that the Chanute rawin and the peevish B-47 pilot got different values for the wind speed.

Figure 4b shows the same jet as it might have appeared on the basis only of rawin observations from the four stations named.

*Unpublished report of Project Black Sheep.

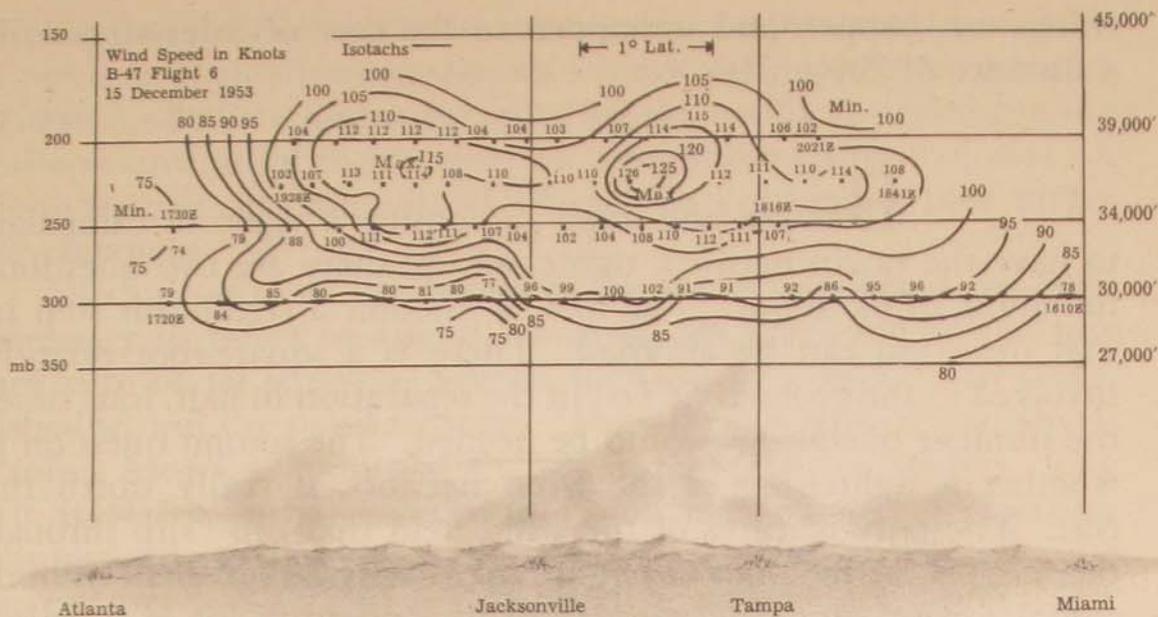
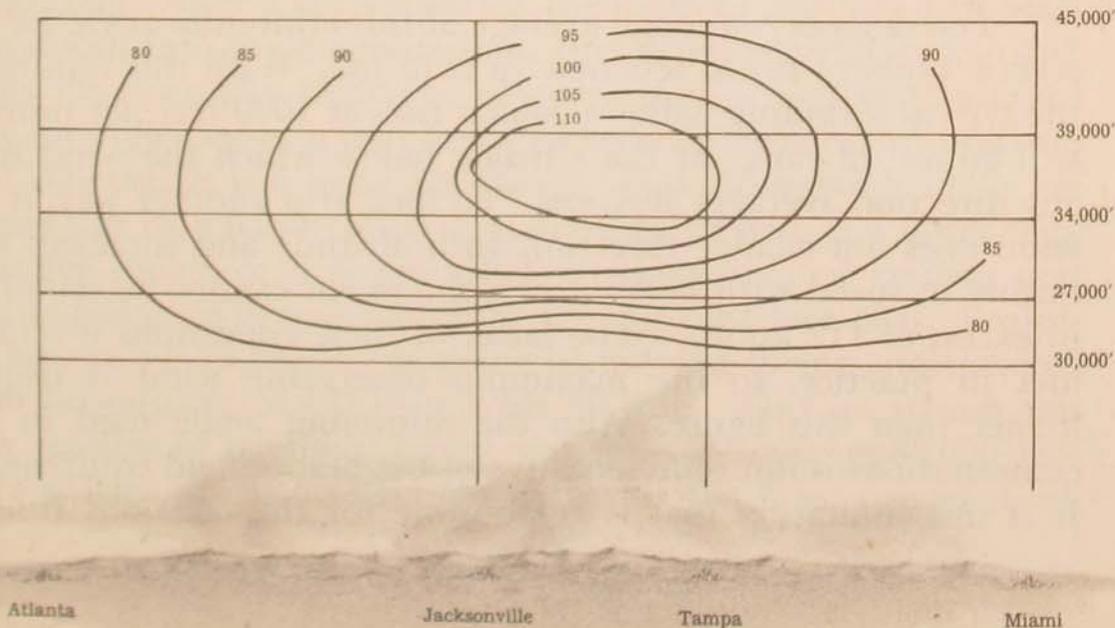


Figure 4a. A jet's cross-section based on aircraft observations. Each numbered dot represents observed wind in knots. Solid lines are isotachs of total wind.

One of the cores is completely undetected; the strength of the other is off by 15 knots. Trying to pick up the "fine structure" of a jet's core with the normal rawin network is like using a steamshovel to sort nails. There are only 60-odd rawin stations in the continental U.S., and this is a far denser network than exists over a comparable area anywhere else in the world. If these 60 stations were uniformly distributed, the distance between adjacent stations would be something over 200 miles. As Figure 4a shows, many

Figure 4b. The same cross-section in Figure 4a as it might have been drawn if the only data available had been those from the four indicated weather stations that had facilities for taking rawin observations along the path of the jet stream.



things can happen and unhappen to the core of a jet stream in a distance of 200 miles.

BEFORE one starts promoting a vigorous campaign to have the rawin network tightened up, there are two questions he might think about. The first is whether a significant step in that direction can be afforded. There is a square-root relation involved in the geometry. To cut the separation in half, four times the number of stations would be needed. The second question is whether a tightening of the wind network is really worth the cost. The only features of the wind field that can "slip through the meshes" of the present net are necessarily rather small in horizontal extent. Such oversights are disconcerting for both pilots and meteorologists, but do they invite dire consequences? Take the case of the B-47 pilot going from Tinker to Wright-Patterson. Suppose he had set his course for a 90-knot crosswind as forecast and blithely followed it without ever noticing the patch of 150-knot wind. Assume further that this higher wind extended over a sizable portion of his track—say, 100 miles. Even under these conditions he would have wound up barely 12 miles off course.

Observation of jet streams is handicapped by another occupational disease of the rawin. The "rawin" data for Figure 4b were actually simulated from the aircraft observations. The reason that actual rawin data were not used is that the Tampa sounding for that hour did not get up to these altitudes. The chances are that the balloon blew out of range at some lower elevation. There is a minimum elevation angle at which the rawin receiver can sight accurately on the balloon-borne transmitter. Below this angle the balloon is out of range insofar as wind-determinations are concerned.

Ten degrees is a rough average of this minimum angle for the several types of rawin sets now in field use. With this minimum the typical sounding balloon, which rises at 1000 feet per minute, will go out of range at the altitude below which the wind from any direction averages 56 knots. To look at it another way, if the wind does not change direction with altitude and increases uniformly in speed with height, then the rawin cannot detect winds in excess of 112 knots. (The latter of these conditions is seldom met in practice, so the maximum observable wind is usually higher than this figure. Also the minimum angle used in the computations is not representative of the best of field equipment.) It is this limitation that is responsible for the facetious rule-of-

thumb that the best way to locate the axis of a jet stream is to draw a curve through all rawin stations from which reports are missing. There are devious means for reducing the handicap—releasing the balloon upwind of the receiver or using faster-rising balloons. A more permanent cure will be effected by equipment now under development.

Because of these limitations of the rawin network it has been necessary to resort to aircraft observations for study of the fine structure of jet streams. Several such projects have been established within the past few years. The oldest is part of the Navy's Project Arowa. The probe aircraft in this case are fighters. The Air Research and Development Command's Project Jet Stream commenced its flight operations in 1953. The principal probe aircraft are a B-47 and a B-29, both especially equipped. The operational-research Project Black Sheep of the Air Weather Service does not make its own flights but pursues related objectives through study of reports from routine flights.

Still one of the most controversial points in the jet-stream dossier relates to the record high speed. The occasional report of more than 300 knots that comes in from non-research flights is just as hard to verify as it is to discredit. Hence a polite attitude of open-minded doubt toward these is the standard in meteorological circles. According to a University of Chicago group studying Arowa's data: "The measured wind of 244 knots or 275 mph, a mean wind over a distance of 28 miles, is believed to be the highest wind speed reliably measured in the tropopause to date." The Air Weather Service comes to about the same answer from its careful scrutiny and reworking of rawin ascents showing exceptionally high speeds. Among the cases they have investigated is the oft-quoted *Argentia* sounding of 16 October 1952 that created a small sensation with its original report of 320 knots at 45,000 feet. After a correction for the earth's curvature had been introduced into the computations, this value was reduced to 262 knots. Incidentally this kind of correction, which is significant only for high speeds, is now being introduced as standard practice.

Whether it is a puny 100-knotter or a ripsnorting 250, a jet stream can be a handy thing if you are interested in a faster trip, a longer range, or a larger pay-load—assuming, of course, that you do not have to make a return trip into the face of it. Project Jet Stream's B-29 found one going its way last spring and traveled from Edwards to MacDill in 5 hrs 39 min. This jet stream was only modest in strength, but it was long. Winds at 35,000 feet were at least 115 knots over the entire route. A jet stream is sel-

dom obliging enough to lie along the direct route to your destination. Wringing the most out of one usually means employing minimal-flight planning—the old dodge of going out of your way to get there in a hurry. This is what Military Air Transport Service Stratocruisers participating in Air Weather Service Project Tailwind do in accomplishing non-stop flights from Tokyo to Honolulu. During the winter months a phenomenally reliable jet stream lies more or less eastward from the vicinity of Japan. Flying considerably below (*i.e.*, 5000 to 10,000 feet) but along the axis of this jet frequently takes MATS Stratocruisers well north of the direct route to Honolulu, but it is obviously worth it since the flight can be made non-stop.

Minimal-flight planning always requires a wind forecast. Where a jet stream is involved, a forecast is not enough to ensure successful execution—at least not spectacular success. The jet's fine structure requires precise positioning to get top results. The forecaster cannot achieve the necessary precision. He is limited to his normal techniques of forecasting, and therefore to his customary accuracies. As already illustrated, his observations fall far short of the desired precision. Consequently the wind forecast must be supplemented by another ingredient in the ideal prescription for navigating the jet stream. This "something else" is an in-flight technique that will allow the aircraft, guided in the larger sense by the forecast, to seek out the jet's core.

A number of in-flight "observables" have already been nominated for this role. They include flight-level temperature, temperature gradient, and cloud structure. There is some degree of correlation between each of these and the location of the core. Unfortunately none of these nor any combination of them has tested out to be generally applicable. The search for this philosopher's stone is still on. It is one of the objectives of Project Jet Stream.

What causes jet streams is not as mysterious as is sometimes rumored. Like all winds jet winds are driven by pressure differences and are the ultimate consequence of temperature differences. Where cold and warm air are juxtaposed across a vertical boundary, the consistent density difference makes for a hydrostatic pressure difference that increases with altitude. This in turn produces an increasing wind in the direction of the boundary. Although not strictly vertical the Polar Front is a boundary between cold and warm air, and at times it does become approximately vertical. Here, then, it is inevitable that the wind speed should mount with altitude, its ultimate strength depending upon

the depth of the opposed air masses and the degree of their density (thermal) contrast. Likewise it is quite natural that the wind speed should reach a maximum at the tropopause. Above this level the thermal contrast is just the opposite of that below, for the polar stratosphere is typically *warmer* than the tropical stratosphere. At that altitude the same process that operated in the troposphere to strengthen the pressure gradient and wind with altitude is reversed and operates to diminish them.

THUS it is that jet streams, though not predicted by theory, do not flout the meteorologist's pre-existing conception of the laws of the atmosphere. Even so, many questions remain open for study. The most curious of all these questions is actually a very old one: why does the atmosphere "choose" to concentrate its temperature differences and kinetic energy in narrow bands instead of diffusing them broadly between pole and equator? This basic question has been increasingly illuminated in recent years. For instance it is now realized that the atmosphere is not unique in this peculiarity. The beautiful "dishpan" experiments of D. Fultz at the University of Chicago have proved that precisely this habit of forming fronts and jet streams is a fundamental characteristic of a general class of rotating heated fluids. But there are other classes also, and the interplanetary traveler can expect to encounter atmospheres in which there are jet streams and atmospheres in which there are none.

According to the "classical" picture *the* jet stream's core is found directly above where *the* Polar Front intersects the 18,000-foot level (500 millibars). In our part of the world a typical altitude for the jet's core in this picture is 35,000 to 40,000 feet. At the core the tropopause is broken. On the warm side and higher than the core lies the tropical tropopause. On the cold side the polar tropopause is below the level of the core. The altitude difference between the two "halves" of the tropopause is of the order of 10,000 feet.

This configuration oscillates north and south with the Polar Front, and its mean position similarly shifts latitude with season. Generally the farther south it goes, the higher is the elevation of the jet's core. The jet stream is typically stronger in winter than in summer and is strongest on the eastern side of continents where the greatest thermal contrast exists between air masses—between fresh continental arctic air and maritime tropical.

Of course the preceding description is an idealization. Though

useful as a norm it cannot accommodate accurately the full variety of forms in which jet streams occur. Just as there is no Polar Front encircling the hemisphere in clean and unbroken demarcation between polar air and tropical, so there is no single, continuous jet stream. Nor can all jet streams be even remotely associated with polar frontal activity in the generalized sense. East-to-west jets are a common winter occurrence high above the tropical trade winds, and it is suspected that at times these slip as far south as the equator. At the other extreme there is evidence of an intense mid-winter jet in the vicinity of the Arctic Circle. The core of this jet would appear to be well above 65,000 feet.

While high winds are the essence of jet streams, several other phenomena of practical importance are frequently mentioned in connection with them. Foremost of these is clear-air turbulence. A number of composite tabulations have been made in recent years to determine whether clear-air turbulence shows a preference for particular sectors of a jet stream's cross section. The results suggest that when turbulence does occur in a jet stream, it favors the vicinity of the axis or the near left-hand side, looking downwind.

Clear-air turbulence showed no significant preference for jet streams as a whole in the data collected under the U.S. Synoptic High-Altitude Gust Program in the spring of 1953. Military and civilian aircraft joined forces in this unique maximum effort to make simultaneous observations of turbulence at high altitudes. Punch-card machines have just finished the exhaustive cross-examination of these reports. Nothing strictly definitive came out. The best tip—and it is only a tip—is that clear-air turbulence is more likely to occur when the square of the wind speed decreases rapidly with altitude. Such a situation can occur well apart from jet streams, but an obvious place to expect it is just above a jet-core.

It begins to appear that clear-air turbulence has its roots in small-scale features of the wind field. If so, then this would explain why studies to date have produced rather fuzzy and equivocal results. The reason would be that they were based on rawin data. As already discussed at length, such data are capable of depicting only the grosser features of the wind field.

This possible deficiency will be eliminated in a forthcoming phase of Project Jet Stream. Early in 1955 two sailplanes will be teamed with the B-29 and the B-47 in a special study that may shed additional light on the cause and character of clear-air turbulence. The particular virtue of sailplanes in this regard is that

they are able to make observations on even a finer scale than the powered aircraft and that they are exquisitely sensitive to vertical motions.

When all is said and done, the largest, most practical significance of jet streams is simply that of winds in general—the opportunity for reducing flight-time, extending range, increasing pay-load. A final caution—these opportunities do not grow on bushes. The climatological odds vary over a wide range, but for a random selection of time and terminals one has a poor chance of getting any assistance at all from a jet stream.

In return for their occasional spectacular assistance jet streams impose an obligation for sound understanding on the part of all involved in planning and executing flight operations. This is true of weather in general. It is even more true of jet streams because of the forecaster's uncommon handicap.

Postscript

As originally submitted, this article ended with the paragraph above. Among the comments returned by the Editors of the *Quarterly Review* was one that fairly rocked me. In effect, though far more tactfully, they said: "It's all very interesting to depict jet streams as academic curiosities that have little significance for normal air operations. But is this wholly consistent with the fact that the Strategic Air Command, for instance, finds jet streams very much a practical fact of life? Should you not at least acknowledge these 'exceptional' cases?"

It was not at all my intention to disavow or to undersell the practical aspects of jet streams. On the other hand, it was my ulterior purpose to attack the current vogue of attributing "magic powers" to the jet stream. Apparently I more than succeeded.

To set the record straight, I want to list a number of conceivable ways in which jet streams might influence air operations. The first class of examples follows from the fact that in jet streams the wind speed may be a substantial fraction of the aircraft's air-speed. Hence one should expect:

- That cooperative jet streams could lead to spectacular extensions of range.

- Conversely, that an unexpected adverse jet stream might cause a mission to abort for want of range. (In bucking a jet

stream its narrowness could be found a sterling virtue, for head-wind might be considerably lower on a nearby parallel course.)

- That, depending upon the jet stream's orientation, a bombardier might find himself with too much or too little ground speed, or with an impossible amount of drift. Such problems could be even more acute because of the characteristically rapid variation of wind speed with distance near the axis of a jet stream.

The second class of examples depends on the fact that jet-stream winds may change speed by as much as 50 knots in 1000 feet of altitude, or by 40 knots in 10 miles horizontally. Consequently one should expect:

- That precise navigation might require the taking of uncommonly frequent wind-fixes.

- That ballistic-wind determinations based on an assumed simple variation of wind in the vertical might be in error.

- That relatively nearby aircraft could no longer be considered as flying "in the same air." Specifically:

- Formation flying might require large differences in airspeed among the aircraft involved.

- Fighter-interceptor tactics could be affected.

These are only some of the obvious possibilities. The list is not represented as complete, nor the effects as necessarily of significant magnitude.

Air Force Cambridge Research Center

NOTES

For further reading on jet streams the following list is a small sample:

Alaka, Jordan, and Renard, *The Jet Stream*, edited by Riehl. NAVAER 50-IR-249, 1 June 1953.

The most thorough of recent treatments. Spares neither solid detail nor technical language.

Riehl, Alaka, Jordan, and Renard, "The Jet Stream," *Meteorological Monographs*, (August 1954) II, No. 7.

For data and specific details of Project Arowa's jet-stream work see reports produced under Navy contract No. 189s-88360.

B. C. Frost "Flying in Jet Stream Winds," *Shell Aviation News*, (December 1953), No. 186. A highly readable account by a seasoned BOAC captain.

For details of Project Jet Stream see:

Endlich, et al. *Bulletin of the American Meteorological Society*, (April 1954), XXXV, No. 4, 143, and

R. M. Endlich, and H. A. Thur, *Combat Crew (SAC)*, (June 1954), IV, No. 12.

ACKNOWLEDGMENTS. For my acquaintance with jet streams I am largely indebted to my association with the members of Project Jet Stream. Of them R. M. Endlich, P. Harvey, W. D. Mount, H. A. Thur, and W. K. Widger, Jr., have aided me specifically in this writing. H. Lake is my source of the latest word on clear-air turbulence. For the drafting I wish to thank D. W. McLeod and G. M. McLean. To Col. J. J. Jones of the Air Weather Service, my thanks for his views on what the Air Force needs to know about jet streams. Figures 1, 2, and 3 are adapted from analyses by James and Holzworth, *Monthly Weather Review*, LXXXII (1954), No. 2, 64.

Books and Ideas . . .

Lessons from the Luftwaffe

DR. EUGENE M. EMME

BEARDED concepts rooted in the dust of history or romantic notions airborne upon the broom of fantasy have little place in creative thinking of professional military men in the air-atomic age. Yet sound perspective of what has gone before has much utility for reliable forethought about the future. Principally significant is the sense of inevitable change in the present order of things in terms of time and development. This mental appreciation of the certainty of change can be obtained from study of the past. If change and resistance to change did not characterize human affairs, history would indeed offer a drab and meaningless story.

So quickly do modern air vehicles and weapons become obsolete that the ability to place vintage dates on concepts and equipment must be regarded as a requisite for realistic military thinking. A military planner in the present age of globe-circling aircraft with nation-smashing pay loads must possess the capacity to anticipate and to recognize the impact of change in the future.

At the same time the modern air strategist must also realize that human nature does *not* substantially change over a short period of time. Air forces—despite their intimate dependence upon the new products of the laboratory and the workshop—are, above all else, human institutions moderated by doctrine and discipline.

Mushroom-like technical advances in air weapons are highly important to airmen, as indeed they should be to all military planners. Yet an understanding of higher, faster, and more powerful air weapons often beclouds appreciation of those prominent features of military strategy that are essentially products of human thought and action. The mere weaponeer or tactician becomes so engrossed with weapons and tactics that he slights the motivations of men as members of a disciplined military bureaucracy, and their appraisal of and decisions on realities as they see them at a particular moment. Time and progress have outpaced the late high and exclusive importance of the weaponeers and tacticians. Military factors are today of such enormous political and diplomatic importance that it is completely impractical to ignore ideological, psycho-social, and political elements in developing a sound national military strategy. Air power, defined in terms of its entire spectrum of possible effects, must include aviation in all of its aspects as an instrument of national policy. Narrower concepts of air power merely as a weapon of war or as a military arm are not valid in the air-atomic age. Future leaders of air forces must appreciate fully the new realities of air power in addition to the capabilities, limitations, and employment of weapons.

In either peace or all-out war, weapons and machines remain the tools of men and their ideas. The features of air power as a force in the life of nations include the selection of targets in both general and limited warfare, the establishment and workings of command arrangements, the influence of resistance to change in doctrine and technical development, plus the politico-military, economic, and psycho-social effects of air power during times of relative peace. All these features of air power can be documented in the realities of the recent past.

Historians have few pages to record what might have happened in the last great TNT war called World War II. To the German airmen who fought well with what they had, defeat in the air over Germany itself in early 1944 was a bitter pill to swallow. The glimmer of doom ahead for the *Luftwaffe* in the air, fleetingly apparent over Dunkirk and Britain in 1940, was ignored at the highest level of the German war effort as well as by the *Luftwaffe* leadership itself. The demanding land campaign in Russia and the side show in North Africa became a preoccupation of Hitler and his army generals. Goering, wearing two hats as Commander-in-Chief of the *Luftwaffe* and as Air Minister, was no help.¹ The jointly-won laurels of the *Luftwaffe* and the German Army in the *Blitzkrieg* in Poland, Norway, the Low Countries, and France were reaped quickly. Yet they soon became symbols of bygone days.

The debacle at Stalingrad in 1942 and the fire storm at Hamburg in 1943 were but a beginning of a story of too little and too late. Thus by March 1944 German industries and cities were exposed to an unrelenting rain of TNT by day and night. After Normandy the German Army in the West, like the whole of Germany, could not escape the "air terror." To all Germans mid-1944 was anything but the "finest hour" of German airmen. Ironically the technically superior German jet interceptors and the ersatz bomber force of V-weapons failed to resurrect "air superiority" for the dying Third Reich.² What had first been apparent as a stark reality to a few German airmen became a catastrophe for all of Germany. Beyond the curse of Nazism the tragedy of Germany in World War II has as one of its main themes the rise and fall of the *Luftwaffe*.

What happened to the German Air Force and what happened to thinking German airmen before time ran out? This question has neither been answered fully by historians nor explained satisfactorily by those most intimate with the story. The apologia, money-maker memoirs, or politically inspired books of German army generals have been available in a tiresome flood of ink. Battle victories must appear more brilliant, defeats pardonable, Nazism inescapable. Catastrophe was the fault of Hitler, Goering, or the *Luftwaffe*. But if victory in the last major war offers no guarantee of any degree of success in the next war, perhaps the defeated German airmen

¹[On Goering, see E. M. Emme, "The Reichsminister and the *Luftwaffe*," *Air University Quarterly Review*, V, 1 (Winter 1951-52), 113-17.—Ed.]

²On the air war as it was diversely viewed by air leaders and the German High Command, see E. M. Emme, *Hitler's Blitzbomber: Historical Notes on High Command Decision Influencing the Tardy Operational Use of the Me-262 in German Air Defense* (Air University Documentary Research Study, 1951).

themselves are worth listening to. Airmen in all nations, except perhaps the air marshals of Britain, have been rather mute on serious matters—including the past, the future, and the conduct of the late World War II. This is decidedly in contrast to their opposite numbers in armies.

Two volumes written by German airmen are now widely available and worthy of consideration. While they do not fully explain the German defeat in the air during the late war, they help. One of these is the explanation of Field Marshal Albert Kesselring, a high-ranking product of the peacetime *Reichswehr*. He was the single theater commander of both ground and air forces in World War II who wore an airman's uniform.³ The other is the personal story of a German airman of the younger and war-promoted generation, General Adolf Galland.⁴ Both provide perspective on change and resistance to change in the recent past.

ALBERT Kesselring's professional military career began in the Royal Bavarian Army in 1904. He was transferred in 1933 from the *Reichswehr* to the Air Ministry, the civilian cloak for the clandestine air rearmament sponsored by the young Hitler government until March 1935. As head of the Administrative Section, Kesselring was a key figure in implementing Goering's intent to make Germany "a nation of fliers" and to create an "air weapon" second to none. He learned to fly at the age of forty-eight. During 1935-37, he was Chief of Staff of the *Luftwaffe*. And throughout the war itself, Kesselring held a succession of high command positions: Commander of Air Fleet Two in the campaign in France, in the Battle of Britain, and in Russia until November 1941; theater commander in Italy, 1943-44; and Commander-in-Chief West, replacing Rundstedt after the failure of the Ardennes offensive. In defeat, he was convicted of "war crimes" which took place in fighting partisan irregulars during the German withdrawal from Italy.⁵ In Kesselring's book the thoughtful reader can find an important thread of World War II as viewed in hindsight by a prominent German military leader.

Among the more significant of Kesselring's explanations appear to be the following: (1) the political neutralism of the German military elite to the Nazi leadership of the Third Reich; (2) the inability in 1940 to recognize the defeat of the *Luftwaffe* over Britain for what it was—and what could have then been done to counteract shortcomings; (3) the contrast between actual conditions on the far-flung German battle lines and the apparently unrealistic appreciation of the over-all war situation of the German High Command in Berlin; and (4) the impossibility of employing ground and air forces decisively in the Mediterranean and in France when the enemy possessed commanding

³A Soldier's Record, by Field Marshal Albert Kesselring (New York: W. Morrow, 1954, \$5.00), 381 pp.

⁴The First and the Last: The Rise and Fall of the German Fighter Forces, 1938-1945, by Adolf Galland (New York: H. Holt, 1954, \$4.75), 368 pp.

⁵This was a controversial judgment, for Kesselring yet maintains that he prevented a scorched-earth withdrawal from Italy.

"air superiority." While the personalities of Hitler and Goering as well as the context of World War II weapons and geography must be discounted as historically unique, Field Marshal Kesselring's memoirs provide valuable perspective on the problems of command and employment of military forces in TNT warfare.

The doctrine of political neutralism long held trenchantly by the German General Staff appears extremely interesting to the American reader.⁶ Quite acceptable is the view, on the one hand, of clear-cut organizational distinctions in the matter of respective civil and military responsibilities for determining policy and strategy (civil supremacy in a democratic state). On the other hand, Kesselring clearly documents how the German military elite by merely performing their assigned duties became political vassals of the leaders of Nazi Germany. This was particularly true before the war when by forceful persuasion within Germany, and bluff and initiative in international affairs, Hitler conducted a bloodless aggrandizement of the Third Reich. Kesselring says:

Whether our indifference to political events was right or wrong, we had no need to, nor could we, bother our heads about them. Goering had reserved to himself the exclusive right to influence them and to represent us. This was beneficial for our work. Even if in retrospect I am obliged to admit our indifference to political questions was a mistake—and in my activity as Chief of the *Luftwaffe* Administration I must plead guilty to the charge—even so in practice another attitude would scarcely have made any difference.

This nihilistic attitude, it seems, meant that resignation from military service, instead of carrying out distasteful policies blindly, did not seem the way out from under the Nazis for the German generals. During the war suicide or "treason" became the only paths out for many conscientious and patriotic German officers of all services. Prominent suicides in the *Luftwaffe* included Ernst Udet (1941) and Chief of Staff Jeschonnek (1943), both cases noteworthy here because they were ignored completely by Kesselring in this volume. That fateful combination of politically-gifted but unscrupulous Hitler with the highly capable military specialists, the world will long remember. The bloodless triumph of Munich in 1938 and the devastation of Germany by 1945 must be considered root and branch of the same historical growth.

With regard to the first strategic air battle in history, the Battle of Britain in 1940, Kesselring's account is important for his chronological review. This includes the German failure to plan the campaign on Britain in detail and in advance, "muddleheadedness" in high places, the parceling out of the bombing effort during each of the phases of the battle, and his testimony that the *Luftwaffe* was not "defeated" in 1940 by the Royal Air Force. With regard to the last point, he wrote:

I cannot accept the statement that the first attempt [against England] ended with a decisive defeat for the *Luftwaffe* in the months of July, August, and September [1940]. To break off a battle that in itself is going well is not by any means the same thing as being decisively defeated.

The historical fact that the Germans came very close to achieving daylight air superiority and thus the ability to bomb Britain at will in 1940

⁶[On this point see E. M. Emme, "Generals in the Rise and Fall of Germany," *Air University Quarterly Review*, VI, 2 (Fall 1953), 91-95.—Ed.]

(as Churchill has reluctantly recorded from the British side) seems to be still unacceptable to Kesselring fourteen years after the event. He even remains convinced that actual occupation of England by German forces would have been necessary to achieve a decision. What did not happen in history, Kesselring considers an open question.

While over-all air superiority during strategic air operations in general warfare can never be regarded as an absolute or permanent condition, Kesselring's review of the role of *Luftwaffe* forces in the Russian and Mediterranean campaigns likewise helps to explain in part how the Germans failed to win a favorable decision. The reader cannot help but detect a feeling that a German theater commander's view of the condition of "air superiority" over the battlefield, even when he was an airman, was most attuned to realities when his ground and air forces did not enjoy such a situation. The surprise and concentration of the air assault effective during the *Blitzkrieg* in Poland, France, and in the early campaign in Russia could not be duplicated in the long-term campaign of attrition against more equal forces. The breakdown of sea, then air, supply to Rommel's *Africa Korps*, the rather brilliant holding operation in Italy, and the hopeless battlefield in France after Normandy—these Kesselring recalls in interesting detail without malice toward his superiors and nothing but praise for his subordinates. That he was asked to replace Rundstedt after the Ardennes offensive seems to indicate clearly that Kesselring continued to enjoy, during adversity, the confidence of Hitler and company, who by late 1944 had nothing but contempt for the inabilities of the *Luftwaffe* to stem the "air terror" of the Allied air forces over Germany itself. While Kesselring goes to understandable lengths to explain the difficult problem of fighting partisan forces in Italy, he omits discussion of several things important for airmen, such as V-weapons or the jet interceptors and, indeed, the crucial phases of the air battle lost by Germany early in 1944. Thus in spite of its explanation with regard to certain of his responsibilities, Field Marshal Kesselring's book seems to emphasize views that prevailed in his thinking during the crucial moments of decision during World War II.

As an airman, Adolf Galland presents as severe a contrast with Albert Kesselring as their respective books reflect contrasting views of World War II. Galland's personalized account, *The First and the Last*, though no less interpretative in his discussion of the past, is more cognizant of the future than Kesselring. It is rumored now, of course, that Galland may become head of the new West German Air Force. He has already returned to Germany from his six-year tour in Argentina. He is today 43 years of age.⁷

Galland began his flying career as a teen-age glider pilot, and his military career in a *Lufthansa* airline pilot training school in 1932. Joining the secret *Luftwaffe*, Galland first saw combat in the limited war in Spain as a member of the Kondor Legion. A *Stuka* pilot over Poland, he rose rapidly in rank as a fighter pilot in France. By 1942, at 30 years of age, Galland had

⁷See *Time*, 24 January 1955, p. 25.

94 kills to his credit, was a major general in rank, and *Luftwaffe* Inspector General of Fighters.

His volume begins with the Battle of Britain where he became commander of a fighter wing.⁸ His view of World War II is essentially that of the new generation of German airmen, which he explains as follows:

The old fighter pilots from World War I, who were now [1940] sitting "at the joy stick" of the supreme command of the *Luftwaffe*, with Goering at their head, had a compulsory pause of 15 years behind them, during which they had probably lost contact with the rapid development of aviation. . . .

From the "indescribable misery" of defeated Germany Galland develops his airman's thesis of World War II:

The *Luftwaffe* had revealed her limitations and weakness to the whole world during the Battle of Britain. The myth of her invincibility had been exploded. But something else had occurred which nobody could have anticipated: The first step [in air warfare] Germany had undertaken with the opening of the Battle of Britain led into uncharted fields of air strategy, and became a hypothesis for the second, the finally successful, step. This was taken by the Allies, following German footsteps. The first step was full of risks and dangers. Germany stumbled but did not fall. Only the second step brought the success to the others—and destruction to Germany.

General Galland's latter-day review of statements he made on record during the war do not seem to stand out as clearly in his book as they did at the time they were made.⁹ It was Galland who bluntly told Goering during the Battle of Britain, "I should like a squadron of Spitfires for my squadron." It was Galland in April 1944 who went on record as saying, "At this moment I would rather have one Me-262 than five Me-109's." He fought passionately for jet interceptor aircraft against red tape. Hitler in rage issued his amazing order that jet interceptor aircraft were arbitrarily "bombers." The German Supreme Commander viewed the Me-262 only as a *Blitzbomber* to chop up the Allied invasion of the continent which was to come in Normandy. When Galland, then Inspector General of Fighters, again appealed to Hitler in person for a reconsideration of the *Blitzbomber* question, he was demoted and removed from command and flying status. Galland could not, he says, "call a horse a cow." Eventually, when it was too late, even Hitler changed his mind. Subsequently Galland was recalled to command of an Oberst-manned Me-262 squadron based near Munich. With small numbers Galland's group flew with considerable effect against American bomber formations until the last days of the war in Europe. The reader will find General Galland's book enjoyable reading, for it reflects the experiences of an active pilot and a brilliant young man.

A sound philosophy for the organization and employment of air weapons in general war, ever subjected to the dynamic influence of technical progress, remains a prerequisite for national survival in the future. The testaments of Kesselring and Galland are part of that which must go into such a coherent framework of reliable concepts. While specific lessons from the *Luftwaffe* can be safely drawn in some detail, as also from the record of success and

⁸General Galland's over-all views on World War II were presented in "The Defeat of the *Luftwaffe*: Fundamental Causes," *Air University Quarterly Review*, VI, 1 (Spring 1953), 18-36.

⁹Galland's wartime views have been available for some time in fourteen monographs compiled immediately after the war from official data and personal experiences by former general officers of the *Luftwaffe*. See Herhudt von Rohden (ed.), *European Contributions to the History of World War II, 1939-46, Air War* (translated title), available in manuscript or microfilm at the Air University Library or the Library of Congress. Five of these volumes have been translated.

failure in our own Air Force, space here does not permit this. But if there be one lesson worth taking as an isolated text for clear thinking today, the testimony of the late Karl Koller, former Chief of Staff of the *Luftwaffe* (November 1944 to March 1945) appears especially recommended:

Everything depends on air supremacy, everything else must take second place. The country that has air supremacy and vigorously strengthens its air power will rule the world. The Air Force must be allowed to move its wings freely, unhampered by ground or naval forces. Future Supreme Commands must have Air Force officers in the decisive position, men who can think in terms of the world and have a wide horizon. We [in the *Luftwaffe*] have been beaten and eliminated, we have nothing more to say. But it will be interesting to watch the development of Great Powers and the battle of wits. Will it be as it has always been that they all, every one of them, will not learn from the past and will continue to make the old mistakes again and again?¹⁰

¹⁰As quoted in *Hitler's Blitzbomber*, p. 41.

Air War College

The Greenland Icecap



Legend

- air bases 
- sea ports 
- exploration routes 
- land area 
- "rough ice" area 
- Ice Cap 

Project Mint Julep

Runways Beyond Greenland's Icy Mountains

SINCE the global impact of air power was conceived in the '40's, the great powers of the world have scrutinized the vast ice-laden land masses north of the Arctic Circle. As the Soviet air threat from across the North Pole has become more apparent, the United States, with the aid of Canada and Denmark, has established air bases in Newfoundland and Greenland in an effort to protect North America from air attack over the North Pole. Present air bases in Greenland are along the western coast. These bases, necessary and valuable as they are, are few, costly to construct, and vulnerable to atomic air attack.

Greenland, the largest island in the world, divides into three distinct areas. The entire central region is perennially covered by the inland ice, the icecap, an enormous sheet of glacial ice burying all valleys and mountains far below its surface. The icecap, approximately 637,000 square miles in area, is by far the greatest glacier of the northern hemisphere. It is

Ever since the gospel of the Renaissance swept through the minds of Western European scholars, research has been a primary mission of great universities. Today the emphasis on scientific inquiry is so great that during the fiscal year of 1947 American universities spent \$45,000,000 on research projects alone. The men who planned and established Air University in 1946 recognized the need for research in air science. Accordingly research missions were assigned several of its divisions, such as the USAF Institute of Technology, School of Aviation Medicine, Air War College, and Research Studies Institute.

In 1953 Air University designated the Arctic, Desert, Tropic Information Center of Research Studies Institute, to direct a research expedition to the immense and relatively unexplored icecap of Greenland, with Lieutenant Colonel Donald Shaw, executive officer of ADTIC, as project officer. Many scientific expeditions are without direct application to current problems. This on-the-spot investigation was intended to answer a major question in air strategy: does the icy interior of Greenland offer the USAF stable, easily constructed landing areas so aircraft can defend and supply the defenders of the northern perimeter of America's defense? Knowing that the Danes had long manifested a deep interest in glaciological research and had done important work of their own in this field, the USAF proposed a scientific expedition to Denmark's sovereign territory of Greenland to examine the landing-strip characteristics of the smooth ice. The Danes approved, and the Air Force's "Project Mint Julep" found such landing areas to be feasible. Its findings may be the beginning of an increase in strength and flexibility in USAF defenses on the Arctic frontier. In collaboration with Colonel Shaw, the Editors of the Quarterly Review summarize the findings of "Mint Julep."



several thousand feet thick throughout most of its extent. The topography of this entire central shield of ice consists of rolling terrain or ice foothills which at its perimeter slopes gradually to a second distinct topographical area known as the "Rough Ice," or marginal area, a 30-to-40-mile belt of rugged ice and glacial fissures that almost prohibits the passage of man or machine. The coastal land comprises the third topographical region, lying along most of the coast and totaling about 114,000 square miles. The coast line itself is frequently indented with deep, long fiords, some shadowed by steep walls 4000 feet high. Most of the coastal land is rugged and offers few level locations for air bases.

The enormous island of Greenland comprises three distinct topographical areas: the ice-free land areas on the coasts, the intermediate "Rough Ice" zone, and the Greenland icecap which covers the whole interior. The coasts are for the most part deeply indented by fiords. The picture at left shows a land area near the coast of Greenland. The numerous glacial marks evident in the picture prove that the whole of Greenland once was covered by the ice-sheet. Near the margin where the icecap meets the coastal land areas, the icecap is broken up by numerous crevasses. This area is called the "Rough Ice," pictured below at the point where it meets the land area. Extremely broken and full of fissures, the rough ice is almost impassable for men and machines moving on the ground. The problem of getting across this area to the interior was unsolved until the Air University expedition to Greenland in 1953 found it possible to land aircraft on various smooth areas of the icecap.



The surface of the Greenland icecap cannot be used as a "highway of the Arctic," as are extensive ice areas elsewhere in the far north. Its high elevation and rough margins are obstacles to any type of movement. Until 1943 only the dog team and sled were employed with any success on the icecap. During World War II an oversnow motor vehicle, the T-15 snow tractor, proved very successful in carrying delicate equipment and technicians over its surface. Thus modern military and scientific operations became possible on the interior zone if ground parties would be supported by air drop and if the rough ice belt bordering the icecap could be crossed.

Air support of ground parties is feasible, but the surface transportation of men and materials across the rough ice margin to the interior has remained unsolved. In only a very few places can vehicles cross the rough marginal zone, and these are either too far from a base or a harbor for practical use or are inaccessible because of the rugged, mountainous terrain of the adjoining ice-free coastal land.

In 1947 Lt. Colonel Donald Shaw, USAF, discovered an area of hard, smooth ice in the southwest portion of the icecap. Here was a possible site for inland landing strips. If strips could be constructed there, it would then be possible for aircraft to fly over the "Rough Ice" area and discharge cargoes of men and materials on the icecap. In the spring of 1953, after the Danish government had approved the expedition, the Air University designated the Arctic, Desert, Tropic Information Center to send a research expedition (christened "Mint Julep") to the icecap to determine if the origin, extent, and permanence of the smooth ice area was potentially a natural landing strip for conventional aircraft. If it was, it might afford the Air Force an inexpensive means of establishing temporary or auxiliary airfields to supplement permanent bases in the Arctic. Since the Arctic may well be tomorrow's battlefield, an important practical contribution might be made to U.S. national defense by such a research mission.

The expedition left Maxwell Air Force Base, Alabama, on 7 May 1953 and was reinforced at Westover AFB by three members from the American Geographic Society and three from the Arctic Construction and Frost Effects Laboratory, Corps of Engineers, U.S. Army. It was an unfortunate loss that the two experienced Danish scientists who were to have accompanied the expedition were unable to make the trip. The other members arrived at Sondrestrom Air Base, Greenland, 11 May, where the Northeast Air Command support units joined the expedition to provide transportation, messing, and maintenance units for the group. The members of the expedition were flown in a ski-equipped C-47 aircraft over the "Rough Ice" area and were landed on the icecap at the point where the smooth ice zone had been found several years earlier. Not even an igloo "hotel" was available when the explorers arrived at the camp site, some ninety miles southeast of Sondrestrom Air Base. Research and exploration were to cover the regions within approximately a 100-mile radius of the camp.

Although high winds, low temperatures, and heavy snowdrifts were expected, the expedition was pleasantly surprised to find very good weather for summer field operations. From 14 May to 21 August there were only a few days during which the weather actually prevented field work. One three-week period in late June and early July was marked by virtually uninterrupted clear weather. Temperatures were normally above freezing in the



A C-47 ski-lands near "Mint Julep" camp site. Because the Greenland icecap is completely surrounded by a 30-to-40-mile area of rough ice and deep crevasses, the problem of getting men and materials to the interior of the icecap had seemed practically insurmountable. Since 1947, when an area of hard, smooth ice was found in the southwest portion of the icecap, the possibility of skipping over the rough ice by air and landing on natural smooth-ice landing sites has been studied. "Project Mint Julep" was set up to explore the possibilities. On 11 May 1953 the Air University research mission landed on the icecap and set up camp near the smooth-ice area.

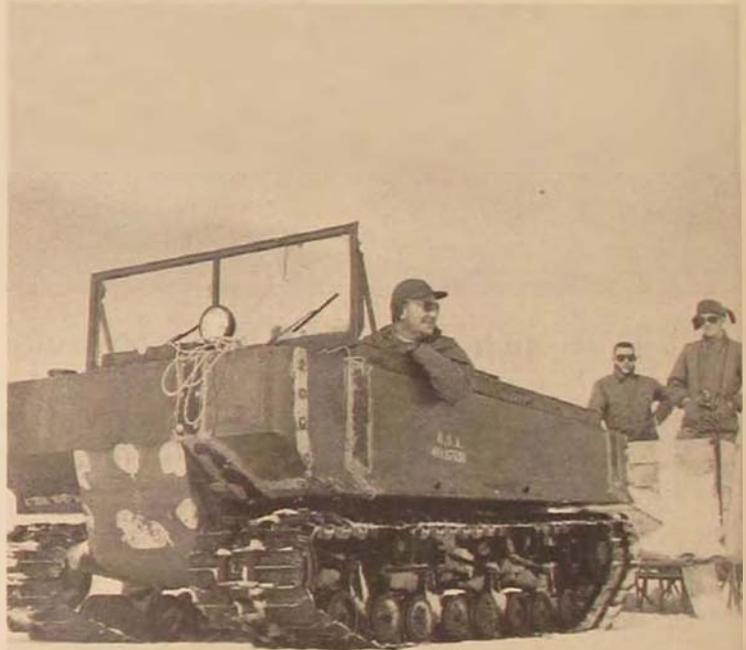
afternoons throughout June and July and rarely dropped below 10 degrees at night. The week of 28 June to 4 July 1953 was referred to as the "good weather" period and a near-record high temperature of 43 degrees was experienced during this time. Rain fell on two occasions. Winds were generally moderate or light.

Since the mission of the expedition was to discover if all or part of the icecap would permit airfields, the members of the expedition set out to study in detail such factors pertinent to airfield construction and maintenance as weather, topography, snow compaction, permeability of the ice-and-snow surface, trafficability, foundations, drainage, and construction problems.

Much work had to be done in meteorology. Weather forecasting was difficult because of limited knowledge of local conditions and the scarcity of adjacent weather stations. But the weather personnel believe that the summer's records will provide a basis for reasonably useful forecasts in the future, partly because the weather patterns and indications of weather changes were found relatively simple and easy to recognize.

Research on Ice Landing Strips

The idea of setting up "temporary" landing strips in the interior of Greenland to supplement the expensive, vulnerable permanent Arctic bases is an attractive one to the planners of North American air defense. But the smooth-ice sector of the Greenland Icecap is so isolated that many scientific questions had to be answered before it could be determined whether such strips were operationally feasible. What kind of a landing surface would the glacial ice offer? Was the crust strong enough to sustain the weight of today's air transport aircraft? How much snow would be likely to accumulate? What kind of weather conditions would aircraft confront if they operated in and out of this area? What range of temperatures would men and machines have to function in? How stable would the features of the surrounding landscape be? What, if any, special equipment would aircraft need in using the icy landing strips? These were the questions Project Mint Julep set out to investigate and answer.



The "weasel" (above) was the main vehicle for overland transportation during "Mint Julep" research. An outgrowth of the World War II T-15 oversnow tractor, the weasel replaces the traditional dog team and sled. The penetrometer (left) is a special instrument to test the physical characteristics of the ice and snow near the camp site. Natural landing fields exist where basal glacial ice is exposed or is covered by a thin film of refrozen melt-water ice.



A power drill that bored deep brought samples of various strata of ice to the surface for study. In certain areas drilling below a shallow surface layer of weak ice revealed basal ice strong enough to support any USAF aircraft.



Snow studies in a "cold chamber" below the surface. Findings are that approximately 30 inches of snow accumulate per year in the Mint Julep area of the icecap.

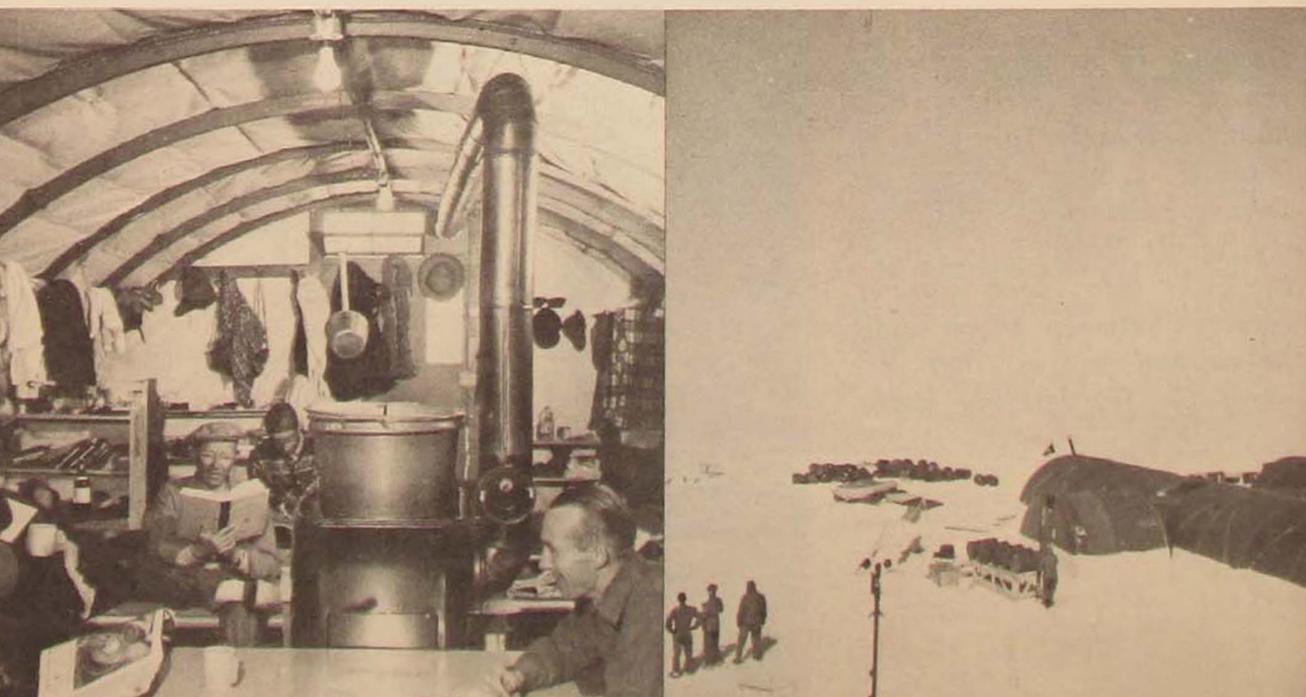
Gauging to measure the discharge of the streams that flow from early July to mid-August. Larger streams are serious barriers to cross-country travel. Rivers have carved the ice into deep valleys, leaving between them wide, flat-topped ridges that are ideal for icy landing strips.



It was imperative that as much as possible be learned about the snow and ice in the area. Daily snow temperatures were measured at selected depths near the camp. Studies indicated that there is relatively little annual precipitation in the "Mint Julep" zone. Of special significance in airfield building is the fact that the snow rests on a fairly smooth ice base composed of old basal glacial ice and new melt-water ice formed from slush at the base of the snow pack. Observations of snowdrifts indicate that the shape and size of drifts depend regularly on wind velocity and amount of snow fall.

A large amount of special equipment aided the scientists from the Arctic Construction and Frost Effects Laboratory in studying the strength and potential utilization of ice and compacted snow. A California Bearing Ratio apparatus was used for measuring the capability of the ice-snow surface to resist the stresses caused by aircraft coming in for landings and to support their weight. A power drill bored out cores of ice, which were tested to determine the consistency of subsurface ice. An ice mechanic's test kit containing various instruments was used for snow and ice observations. Tests with these instruments indicated that smooth ice is extensive in the "Mint Julep" area, underlying not only the basin in which it was first discovered but extending westward approximately ten miles, where it passes beneath a permanent snow pack. Smooth ice also extends at least five miles south of the original discovery area and at least nine miles northward. The usable portion of the smooth ice area fortunately lies within a band about twenty miles wide. Scientists believe that it is likely that this zone extends hundreds of miles north and south. There are many areas within this band that cannot be used for airfields—because of lakes, streams, or slush fields that, although hard and strong during the cold season, are moderately to extremely rough in winter and wet during the summer. Various tests indicated that elsewhere below a shallow layer of weak ice there is basal ice sufficiently strong to support any aircraft the Air Force now operates.

The "Mint Julep" camp site reflects the fine cooperation of the supporting units, which contributed immeasurably to the success of the project. Northeast Air Command personnel from Sondrestrom Air Force Base constructed Jamesway huts to house the sleeping and messing facilities, offices, radio equipment, and storage space. Transportation, messing, and complete maintenance service were also provided.



Although most people think of the Greenland icecap as a land of perennial ice without any thaws, enough thawing occurs during the summer so that streams flow from early July to mid-August. Their channels are constant topographic features, with little or no changes in position each year. In fact large streams exist as serious barriers to cross-country travel. In some places the rivers have carved the ice into valleys as deep as 180 feet, leaving between them wide, flat-topped ridges which are ideal for landing strips. Lakes and slush fields are poor landing sites for wheel aircraft at all times, except perhaps in early fall. Many lakes are not completely open in mid-summer, and ice blocks and heavy snows in the basins prevent their use for landing strips in winter.

Project scientists drew up a topographic map of great usefulness to future studies and in planning airfields. It was found that in the firnline area (above which no thawing occurs) ice-covered lakes, rivers, slush fields, ridges, and broad benches were representative of a variety of distinct topographic forms. Comparison of air photos taken over a period of time shows that minute details of lakes and stream patterns have persisted year after year.

While there are numerous uses for the data collected, the airfield studies were of primary importance. Data taken from snow, ice, hydrological, and topographic studies were combined in an appraisal of the area in terms of wheel-landing sites. Ten possible landing sites were designated, and data were collected for weekly or fortnightly periods throughout the field season. The sites were located on flat ridges, wide benches, lake shores, basins, and lake surfaces. Sites on the flat ridges were found to be superior to others, including the original smooth-ice area.

One of the most gratifying observations of the expedition was that some airfield sites can possibly be used throughout the year if maintenance equipment is available. Other sites can be used at certain times of the year without using snow removal equipment.

PROJECT MINT JULEP was successfully completed nearly a month ahead of schedule, with its major objectives accomplished. The best landing fields were found to be interstream divides and the slopes of headwater basins. The area in which natural landing fields occur is limited on the east by permanent snow cover and on the west by closely spaced rills and crevasses. Its natural ice strips are long and level enough for use by conventional aircraft. Its smooth ice is presumably as permanent as the icecap, although climatic changes, glacial movement, and local wasting away of the glacial surface may demand reallocation of the usable portions after extended time. Airstrip sites and installations are probably "permanent" for five to ten years.

The results of the Mint Julep studies definitely indicate that it is feasible to fly over the marginal "Rough Ice" area and land on selected parts of the icecap in order to unload equipment and supplies for unhampered transportation to any place in the interior. The transport aircraft will not require skis because there are places where the basal ice is smooth enough for wheel landings and take-offs by the heaviest USAF transport aircraft. Indications are that similar natural landing areas exist north and south for unknown distances along the entire western slope of the icecap.

Project Mint Julep has produced a wealth of significant information both on the immediate problem of how, where, and with what equipment the defenses of the Arctic can be expanded and on air science in the Arctic.

COMMUNISM AND AIR POWER

continued from page 54

course, the moral backbone of the free world and especially of the United States had been broken in advance and unless the United States entrusts its security more to its "war potential" than to its forces-at-instant-readiness.

But is the accomplishment of Soviet superiority not an unrealizable hope? Are not some Western observers overly impressed by the rapid industrial and military growth of the Soviet Union since the end of the second World War, forgetting its near-defeat in 1941 at the hands of a considerably weaker nation (which for that matter was fighting against other major powers)? It is a fact that Soviet Russia, and even more so the Soviet orbit, is still a primitive area which must overcome numerous crucial deficiencies. Unfortunately the idea that the Soviet Union with its vacillating and underdeveloped allies could take on the intensively developed and, for a long time to come, far more powerful United States, together with other highly industrialized nations, and finish it off in one series of well-prepared intercontinental blows, no longer is so fantastic as it would have been ten years ago. And Soviet strength continues to grow.

The task remains forbidding. The Soviet strategist is confronted by the most difficult military problem of all times. The probability is very high that something will go wrong with Soviet planning, that the demoralization of the free world will not proceed according to plan, and that the Communists will make some blunder which would lead to their destruction, regardless of what happened to the United States. It is true that when an American looks at the growing strength of the Soviet conflict machine, he may not see the carefully hidden material and moral difficulties with which the Soviet government must cope. By contrast the Soviet leaders, who traditionally have been awed by the might of the United States, cannot help contemplating their own difficulties and applying all safeguards to minimize the risks inherent in their conflict with the United States.

Soviet Strength Factors

The difficulty of preparing reliably effective surprise attacks is compounded by the inevitable requirement that the operation must be launched across the world oceans and against numerous targets dispersed all over Europe, Asia, Africa, and North America. No precedent exists for such an operation. Therefore reliance on *truly effective surprise* to preclude substantial retaliation would

be both hazardous and a violation of a strongly emphasized point in Soviet military doctrine: *to prepare and exploit windfalls but never to entrust one's fate to transient and fleeting elements of strength, such as surprise postures, however attractive they may be at a given moment.* The penalty for failure would be the extermination of the Soviet system and the end of Marxian socialism, except as a subject for historical research. Being better students of history than some American abstractionists, Soviet leaders hardly entertain doubts on this score.

At this point, however, the Soviet strategist might be in a position to make use of one of the "permanent" strength factors in his armory:

1. **Political and Subversive Warfare.** The Communists have capabilities for political and subversive warfare, for infiltration in critical economic activities, and for the running of many well orchestrated propaganda machines. They exercise full control over Communist and crypto-Communist parties in all of the countries allied with the United States. They possess or influence paramilitary forces in many lands of the free world and, last but not least, they hold out the lure of "peaceful co-existence." All these could be factors in getting the Western alliance to disarm or at least to keep armaments at dangerously low levels, to maintain poor standards of readiness, and to provide for retaliatory forces of less strength, less strategic and tactical security, and less penetration capability than would be required. American disarmament may be a wish dream of the Soviet strategist; but the *degradation* of American armaments and the fostering of *decrepitude in free world strength* is a real capability. Who can say at this moment that this Soviet capability is not now being exerted with some effect or that, regardless of Soviet efforts, free world armaments never will fall below a level commensurate with the growing threat? The American nuclear strength is the main obstacle to the Communist strategist's freedom of action. But the Western strategist's performance is greatly handicapped by budgetary and political limitations. To be sure, this Soviet capability to degrade Western armaments is a derivative of free world vacillations, lack of resolution, and unwillingness to shoulder economic sacrifices. Even so, it is a potent factor in Soviet operations.

2. **Iron Curtain Security.** A second Soviet "permanent" strength factor stems from the Soviet security system, which combines far-reaching intelligence coverage of foreign countries with a very effective blackout on information from within the Soviet's

own borders. It may be arguable whether the iron curtain is really a curtain, and if so, whether it is made of iron. It is even more arguable whether the Western alliance is unable to pierce this curtain. The fashionable opinion that the Soviets know all about us, while we know nothing about them, with the result that there is a unilateral flow of intelligence, is certainly unwarranted. The fact remains that the Soviet capability to achieve technical and tactical surprises is enhanced by the iron curtain. Further, Western weakness in intelligence, however relative it may be, is compounded by democratic acquiescent willingness to allow the Soviet Union, if it is so inclined, to strike the first blow. Thus, with the initiative safely in their hands, the Soviets can decide to go to war when and if, in the course of the everlasting technological and industrial race, their military posture has reached a peak. Since such an advantageous posture must be expected to be temporary, the inclination of the Soviet strategist to exploit the opportunity was described by Oscar Wilde when he said: "I can resist everything but temptation."

And yet technological progress everywhere follows its own laws. It is not necessarily dependent on up-to-date intelligence, although lack of reliable information must be paid for by more extensive and costly technological and industrial programs. While one side may gain an advantage, it does not necessarily deprive the other side of its capabilities, nor does technological progress become a monopoly possession of the contestant with the better intelligence system. Soviet political warfare and intelligence capabilities are great, but these capabilities may have been declining for many years in most of the leading Western nations. Still, a strategy of intercontinental surprise remains a most hazardous and dangerous business, the risks of which can be reduced *but not eliminated* by political warfare and superior intelligence. Unless, therefore, the Communists succeed in reliably rigging the game in their favor, or unless the "muscle" of the American military budget is cut as a result of our homegrown follies, the Soviet Union would be truly foolhardy to initiate a global nuclear war that could not fail to become a war of co-extirmination.

Nuclear War of Attrition

Has war therefore become impossible? We have no reason to assume that the Soviet government has abandoned its objective. So we must look for other means with which it may want to

beat the free world at the nuclear game. Let us go back to Communist doctrine. We know that the Soviets must aim, first, at acquiring freedom of action, second, at utilizing this freedom to create additional strength, and third, at disintegrating their opponent while becoming stronger themselves. The Kremlin has not told me what it wants to do, and therefore I can only speculate about the way the Soviets might apply their doctrine to the atomic problem. But it seems to me that the atomic bomb need not be used exclusively as a weapon of physical destruction. It also can be used as a psychological weapon, not necessarily for the purpose of defeating the United States but rather to acquire the much-coveted freedom of nuclear action.

Atomic Blackmail

If exploited for brazen, uninhibited blackmail, the atomic bomb may prove to be a psychological weapon of extraordinary potency. The mere thought of nuclear destruction could force many nations into submission. More important still, it could obviate the danger of American intervention, at least so long as vital American interests are not at stake. This atomic *chantage* could be played in such a manner that the free nations might become paralyzed by fear and give in to Soviet demands in order to forestall Communist ruthlessness. The continuous threat of atomic warfare would engender fear, hysteria, and terror, thereby dislocating moral determination and mental clarity and opening to the Soviets many opportunities for political warfare. To sap the will to resist surely would be the cheapest employment of nuclear weapons. The history of revolution indicates that mental terror often is a far more effective weapon than physical violence. The military use of the nuclear capability would bring the greatest result, but it would do so at the greatest risk. By contrast the psychological use of the nuclear capability may be expected to yield relatively good results at minor risks. While atomic blackmail hardly would work against the United States, and so *in itself* would not be a weapons system capable of giving the Soviets world rule, it still would be a strong enough weapons system to allow a gradual extension of the Soviet orbit, effective interference in many countries, and the gradual erosion of the American alliance system.

Localized Conflicts

The creation of additional relative Soviet strength would be an ominous development. It will not do to argue that further

Soviet expansion will be permitted only in "unimportant" areas. In the first place the mere fact that Soviet expansion had not been stopped would be a highly dislocating factor. In the second place the true significance of the process would be less in the continued accumulation of Soviet strength—for example, through the emergence of "peace-loving" governments in some of the smaller nations—than in the disintegration of the major strengths of the free world. Assume, however, that the predatory advance was directed neither against an "unimportant" nor against an "important" area but against one of intermediary strategic value and that the free world decided to resist but to avoid full-fledged intercontinental war. Or assume that there will be limited interventions in local civil wars; or that a series of international wars will be fought with limited objectives in narrowly circumscribed areas, with both sides emphatically refraining from adopting a strategy of mutual extermination. In other words assume that for some reason or other localized wars will be occurring again. If so, a crucial question will arise: will the main belligerents fight those wars with weapons presently called "conventional," or will they employ nuclear weapons?

The answer depends on the time of the conflict. The sooner such a war should occur, the greater would be the reliance on "conventional" weapons. With respect to the Soviet leaders, however, we never should forget that they would employ their military forces *together* with their paramilitary, subversive, economic, and psycho-political forces and also make major efforts in the field of policy sabotage.

Nuclear Substitution

As time passes and nuclear technology develops, however, the odds will become increasingly greater that nuclear weapons will have been integrated into, or actually have replaced, "conventional" weapons systems. This process of nuclear substitution seems irresistible if only for reasons of budgetary tightness. It really is a simple and unavoidable calculation: if a target can be destroyed by one nuclear weapon carried by one aircraft, such an operation is considerably cheaper than the destruction of this same target by 500 planes carrying some 4000 tons of high explosives. A similar calculation can be made for ground and naval weapons.

But there is a still more stringent reason for nuclear substitution that exceeds the purview of simple economy. Since

nuclear weapons have become available to major powers, there is no certainty whatever that such weapons will not be used. And if only to ensure its own security, every major nation must possess such weapons and the required delivery systems. Suppose the decision were made not to use these weapons. Nations would still find it necessary to maintain a conventional combat capability *in addition to the nuclear capability*. Thus, you would create a *double* military establishment, with the second system being the more costly and the less effective. The odds are that no such development will take place and that nations will restrict their military budgets to the acquisition of just *one* military establishment which by necessity must be based on the atom.

Theoretically, of course, there exists a possibility that nuclear weapons will be kept from armaments. Disregarding the pressures from technology, nations might agree to forego nuclear preparations and devise a system of mutual control. But this is exactly where the concept breaks down. It is entirely unlikely that a system can be devised which will *guarantee* that there can be no clandestine nuclear armaments. Thus nations would feel compelled, as a backstop to their agreement, to maintain "insurance nuclear forces," and we would be back at the point of a dual military establishment. Assuming that the technical difficulties of mutual control can be overcome (which I doubt), it would then appear that controls will function reliably *only* in democratic countries which have a fully developed free press, free speech, *habeas corpus* provisions, no secret police, a judiciary which administers the law fairly, and a constitution which recognizes the legal relevance, if not the primacy, of international agreements. This means that a safe control agreement could be concluded with Russia only *after* that country had adopted a truly democratic form of government, in which case the threat of war would have evaporated anyhow.

There is the other possibility that to minimize the risk in a localized war the Soviets simply will not use nuclear weapons, preferring to take their chances with a sort of ramshackle secondary weapons system. Or they may rely on some kind of a creeping war—for example, a war of guerrilla operations. This type of operation might help their expansionist schemes somewhat, but it would not give them strong leverage against the United States. The whole argument boils down to this: the Soviets can adopt a strategy-short-of-nuclear-weapons *only* if they previously abandon the goal of world dominion and make the concurrent decision *not* to eliminate the United States as the leading nation by military

methods, contenting themselves with regional power in Eurasia. The Soviet leaders might very well make such a decision *if* they were to conclude that there is no satisfactory and safe solution to the atomic problem. Unfortunately there is no evidence that they have given up playing with fire. Hence if war comes again, be it ever so much restricted in geographical scope, ultimately it will see the employment of nuclear weapons. The simple but overwhelmingly important fact is that fissionable materials cannot fail to become the "conventional" explosives of the future.

Contest of Attrition

At this point a very interesting development could take place: in a contest in which nuclear weapons are employed, the side which controls the air is the potential or actual victor. In a limited war, as in a global war, the battle for air control must be the decisive battle. But a local air control battle will be fed from resources *outside* the combat zone. Since it would be fought with atomic weapons, the attrition on the contesting air forces must be exceptionally high. Whichever side stops supplying the battle from the home base loses the local war, but if neither side desists voluntarily one belligerent necessarily must be attrited before the other. Who will succumb to attrition first? Obviously the side which has the smaller forces-in-being and a slower personnel replacement rate and which has failed in time to order all-out industrial mobilization. Unexpectedly factors like mobilization, which were believed obsolescent, may make their reappearance. Their revival would be due to the re-emergence of "sanctuary war," an interesting variant of atomic conflict which can be fought without "total risk," because the main industrial bases of the belligerents are left intact by mutual tolerance.

Now with its customary economy budgets and its frequent shortages of forces-in-being and usable reserves, American air power might come out second best in this contest of attrition. Even if deficiencies are repaired speedily after the outbreak of local war, attrition still may come about as a consequence of just a small dose of "too little and too late," and of a somewhat hesitant determination to win the particular conflict. Political warfare then could really prove decisively effective.

If American air power were put through the "meat grinder" of a local atomic conflict, it might be attrited to the extent of losing its global posture. This could be the result of repeated attempts to regain air control after it had been lost in the wake of

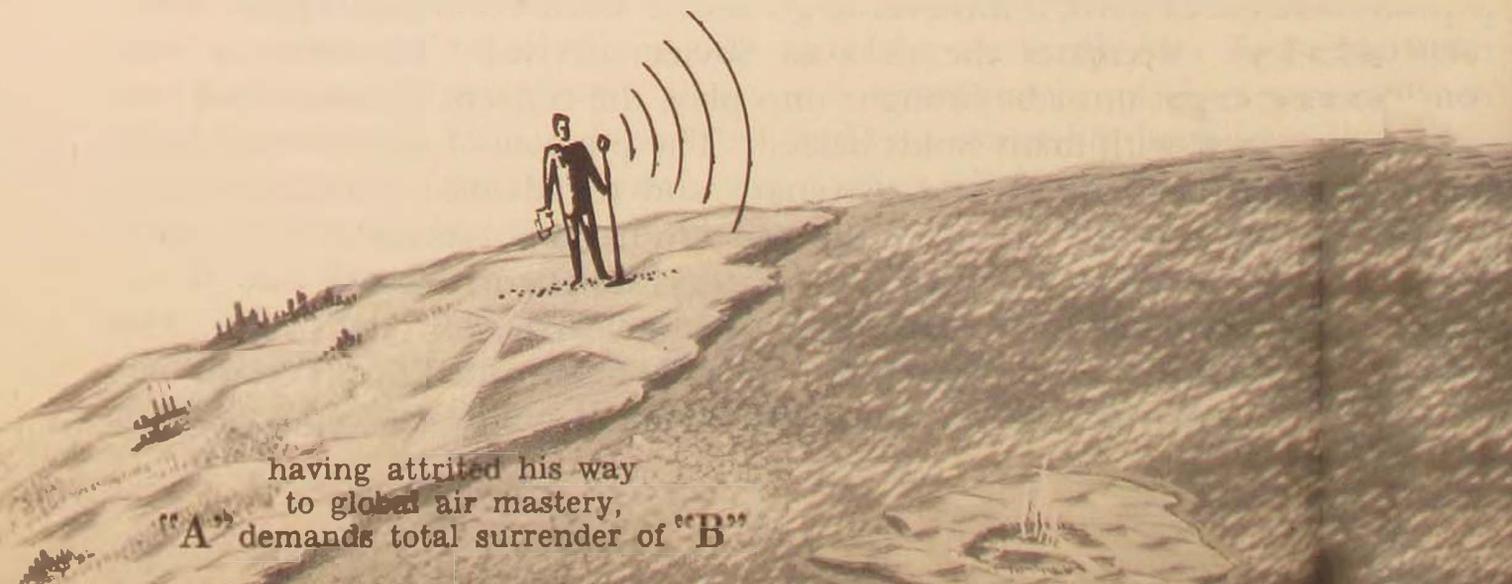
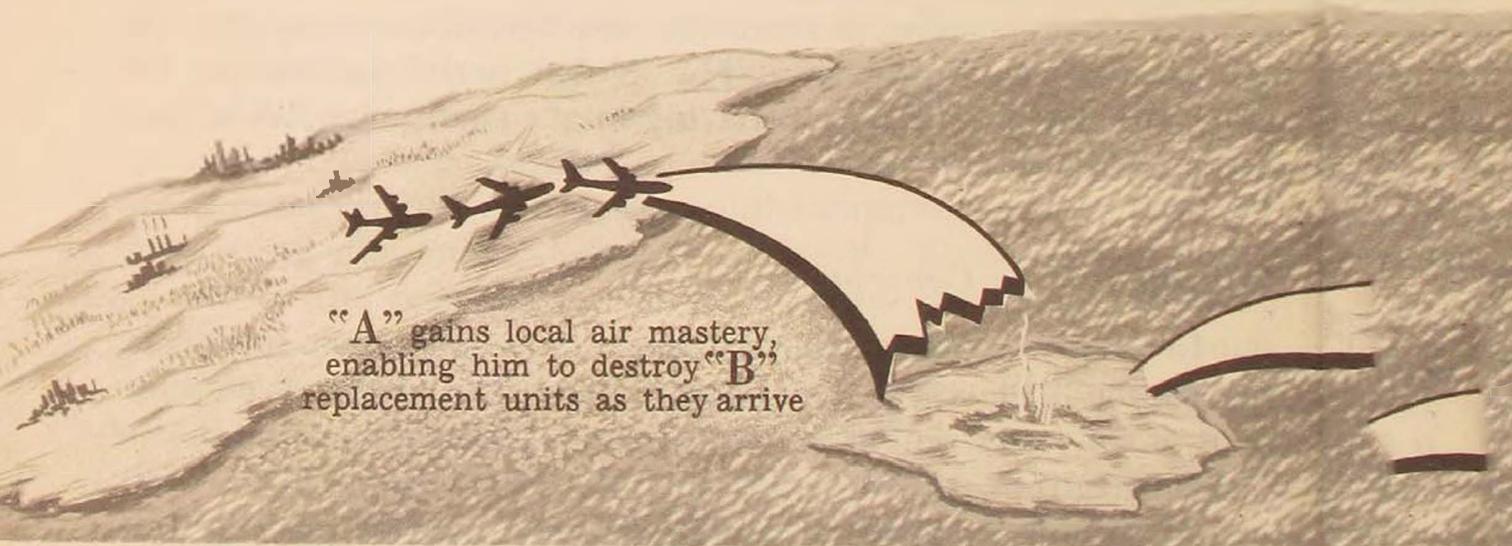
surprise nuclear attack. Attrition to this futile cause could be avoided only if the battle were stopped in time (and in this fashion another country be abandoned to the Soviets) or the conflict carried into other theaters. Naturally the enemy may be attrited himself. In an atomic slugging match he may lose his effective intercontinental striking power. But remember that the side which initiates nuclear attack in a local theater should reap all the habitual advantages from such a surprise blow. In this context we assumed that the nuclear duel would be started by the Communists.

Regardless of whether the ultimate would be reached in a particular local attrition campaign or in a series of such campaigns, the point is that *limited nuclear war offers a suitable method of creating the conditions of unilateral nuclear global war*. If a local war can be engaged under conditions favorable to the Soviets, if local American air forces can be destroyed through surprise nuclear attacks and the United States forced to replenish, perhaps several times, its local air strength, they could rapidly "work through" American air power without necessarily suffering heavy losses themselves. The global strategic significance of such defeats would be dependent on U.S. strengths-in-being: if American air forces were closely tailored to fit just the over-all mission of defense and retaliation, their strength could be whittled down through such "unplanned" commitments. The global aerial imbalance for which the Soviet leaders are striving might emerge in this round-about way.

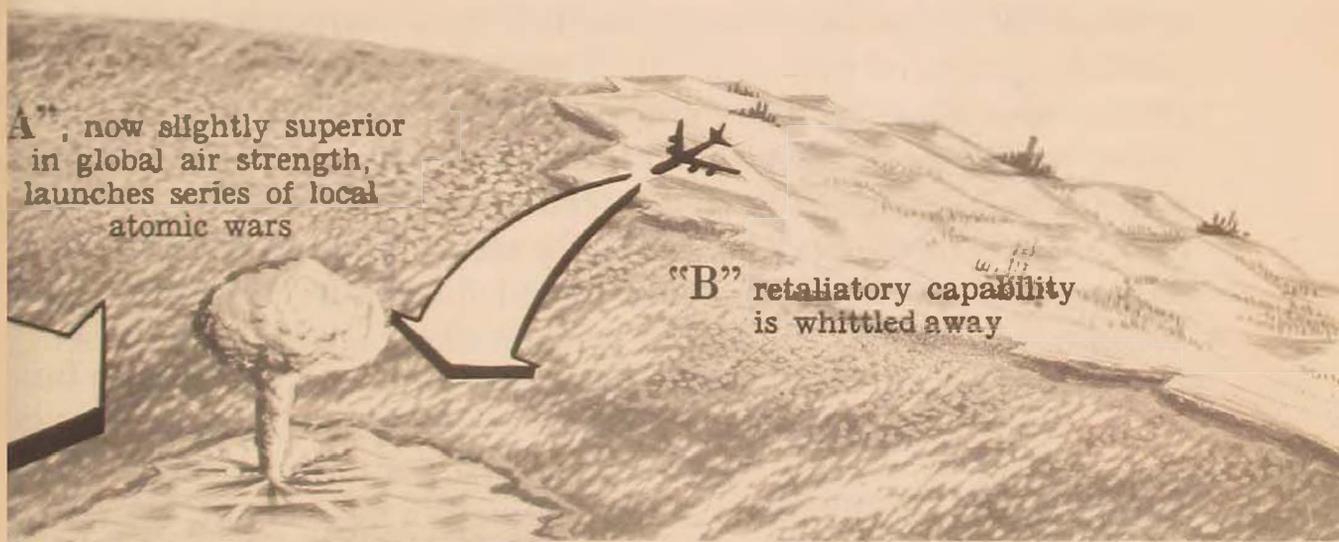
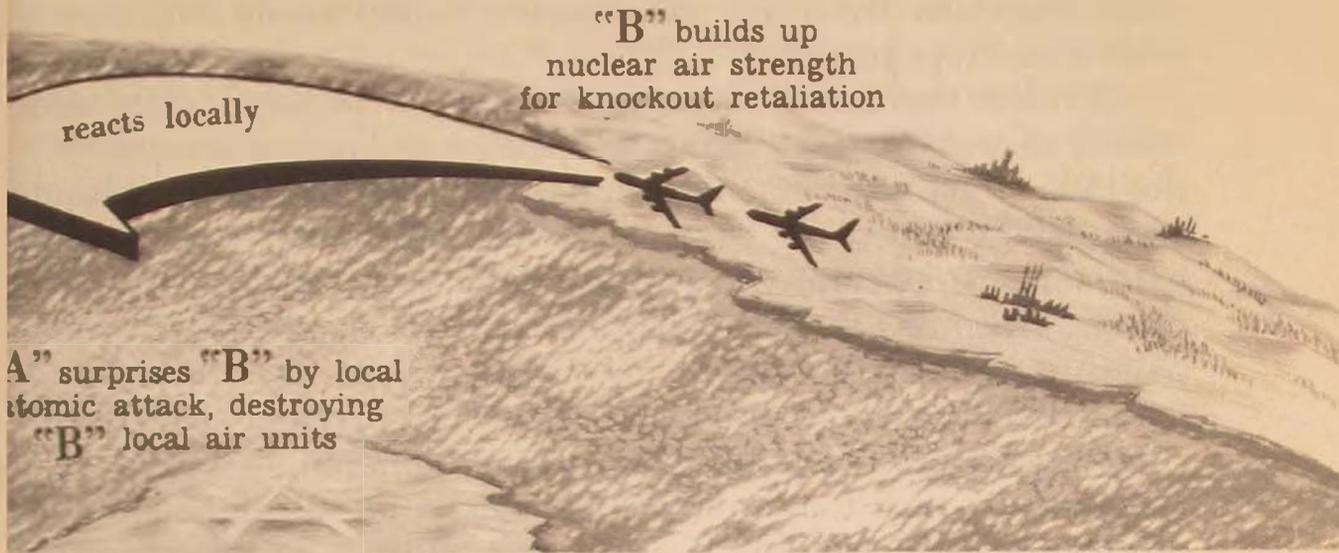
Controlled War Concept

In such a situation the United States may be tempted to stop acting as the U.S.S.R. wishes and resort to offensive employment of nuclear strength at the time and place of its own choice in order to eliminate the Soviet capability of attrition. The Soviets realize, of course, that the United States must be pushed, and pushed hard, if it is ever to go under. Each Communist push inevitably recreates the risks to Soviet survival. Therefore a new concept must be brought into play, the concept of *controlled war*—war with many holds barred. The purpose of such a war would be to attrite Western strength and to advance the Communist position but to prevent the Western nations, especially the United States, from adopting any strategy designed to break out of the trap, much the less to employ its nuclear power offensively. The capability of the Soviets in this field of controlled war is enormous. It again is a derivative of their over-all political weapons system

Nuclear Air War:



Pattern III, Attrition



and their atomic blackmail capability. Precisely because nuclear weapons might have been used in local theaters, the fear of full-fledged atomic war could get out of hand, to the point that no suitable counter-strategies would be authorized. In this case the local defeat would have to be accepted, in order to preserve the main American aerial strength; but the Soviets would have made some vital steps forward.

Even if the United States refused to accept local defeat, the Soviets may reason that, before adopting a strong counter-strategy, the American government would issue suitable warnings and attempt to compose the conflict. Hence the Soviet leaders would have ample opportunity to cut losses and withdraw. If so, a continuing advance through the application of controlled war would pose only small risks for the U.S.S.R. Future attempts in this field may or may not be modeled after the pattern of the Korean and Indo-Chinese wars, one of which the Communists did not lose and one of which they won. From their point of view the main shortcoming of both wars was that they did not produce enough political dissension within the United States and that the American armed forces escaped demoralization and material attrition. But both wars proved that the American nuclear capability can be neutralized by *political means* and that expansionist progress is possible, provided that immediate goals are modest. The greatest "risk," therefore, in using controlled war recurrently may seem to lie in the possibility that an offensive operation would have to be called off and the Soviets forced to fall back to their positions *quo ante*. They would be unable to secure additional gains, but while trying to advance they would be insured against loss. Wouldn't we all like to play the stock market on such a convenient basis?

Gaining Air Dominion

A controlled war need not remain a localized conflict fought by "proxies." It could expand into a full-fledged Russo-American war fought with nuclear weapons but without adoption of a strategy of co-extermination. The battle for air control would be of key importance, with one of the belligerents eventually winning it. This victory may come in degrees, ranging from air control via air mastery to air dominion. The military force which in a nuclear war has gained an initial advantage should be in a position to drive forward to conclusive results. Hence the air force which initially establishes ascendancy may end up with air

mastery, or even complete air dominion. Air dominion can be described as the posture of a belligerent wherein he can execute all the aerial operations he wants, while denying his opponent the ability to fly.

But can a global air dominion be established at all? Such a vital and definitive military success should be obtainable as a result of full attrition in a theater campaign, or of a global campaign waged for air control, or as a result of a combination of both strategies. The point of this discussion is to suggest the possibility that attrition in a local war could set up the attrited air force as a "sitting duck" target for a follow-up intercontinental offensive launched, at a moment of favorable strength relationships, with full application of all surprise techniques. The initial and local attrition of a hostile air force followed by its intercontinental annihilation may be the high road to air dominion. In turn air dominion would place the air dominator in a position of waging unilateral, *strategic* nuclear war. Thus, while most Western thinking revolves around a war whose *first* battles would be fought intercontinentally with nuclear weapons strategically employed, the chances are that the Soviet leaders contemplate the utilization of their long-range nuclear air power against American urban and industrial targets during the concluding battles, *after* their definitive conquest of the air.

Let us assume that such a situation has come into existence and that American air power has been crippled. To be sure, the outcome could be entirely different, and the United States might wind up as the master of the air. But we want to know how the Soviet leaders would wish to employ their atomic weapons in order to accomplish their hypothetical air victory. With the USAF down and out, the conflict could be decided merely by the psychological exploitation of the presumed Soviet unilateral capability. The U.S.S.R. could summon the United States either to desist or to suffer systematic atomic bombardment. If the U.S. should prove hard of hearing, the Soviets might attack one or two cities and announce that, if their ultimatum is not accepted within 24 hours, they will destroy additional cities—and name them. This could go on to the bitter end.

But it might not happen that way. In the first place the impotence of the American forces need not be complete or the Soviet leaders might fear that there is some, or in any event too much, of the American retaliatory capability left. Hence they might see themselves compelled to attack a large number of key industrial targets in North America. But, secondly, they may

without further ado proceed to exploit their air dominion and blast the living daylights out of American targets.

What would be the purpose of such bombardment if the U.S. already were prostrate or willing to surrender? The Communists are unresponsive to humanitarian reasoning. In this particular case they may be anxious to disintegrate the free society as a means of preparing for their post-war activities. They probably would feel that they must cripple, preventively, any American resistance and revival capability, eliminate the U.S. even as a potential "base" of significant power, destroy American living standards, reduce the American population, liquidate the various "kulak" classes, and create misery and chaos as a prerequisite for the imposition of Communist world rule. The job of smashing the bourgeois society and state, not only in the United States but in other free nations as well, may be entrusted to the nuclear air force substituting for less-potent conventional weapons of class warfare.

Or the Soviets may want to end the war in the classical style, with a revolution. For this purpose they may desire to use nuclear bombardment to create revolutionary situations, produce "mass movements"—not necessarily clamoring for Communism but vocally representing the cause of "peace" (*i.e.* surrender)—and to prepare for the exploitation of this revolutionary situation through the political, insurrectional, or military seizure of the government by local forces. In short, nuclear bombardment after victory would appear to be a possible novel technique both of revolution and of Assyrian destruction.

What Will the United States Do?

My discussion was not intended to forecast future events. My purpose was merely to elucidate the manner in which the Communists *may* be looking at the nuclear air problem. Their atomic air strategy is still unfolding. Its ultimate form will be dependent, in part at least, on what the United States will be doing or failing to do. My main—and unproved—assumption was that at all costs the Soviets want to avoid being pounded by American nuclear air power. They will launch an initial surprise attack against the United States only if and when we expose ourselves through erroneous military and political policies, including, above all, a fatal underrating of the Soviet threat. But if proper American policies (which, in my opinion, we have not yet

quite adopted) were to forestall a Soviet strategy of direct approach, they would experiment with a strategy of indirect approach based on three fundamental concepts:

1. **Freedom of Action.** Gain freedom of action by means of political warfare, including atomic blackmail, by the integration of the Soviet orbit, and by the incessant expansion of Soviet military production and territorial holdings.

2. **Surprise Element.** Maximize the element of surprise through emphasis on technological progress, intelligence, and deception and through political warfare especially designed to slow down American technological advances, reduce levels of preparedness, paralyze free world decision-making, and disintegrate the social fabric and the morale of the free nations.

3. **Global Air Mastery.** Whittle down and weaken fatally American and Western military power by committing it to massive deployment and attritive combat overseas and attempt to gain *global* air mastery first through *localized* and then through *limited* warfare. After gaining air dominion, strategic nuclear attacks may be launched unless they are deemed unnecessary.

While there are numerous weak spots in such a strategy, the effectiveness of the scheme should not be underrated. The best foundation for successful American action would be the realization that, essentially, a Soviet strategy of *indirect* world conquest would be leading from weakness rather than strength. Since the Soviets cannot take too great a risk, an American strategy of daring based upon a firm decision not to allow the U.S.S.R. to push us around further, really should pay off. Morale is the key factor which in the long run will decide the outcome of the free world's struggle with Communism. If the American nation and its allies should succumb to fear, and if they should lose the will to win, then indeed there will be no place to hide.

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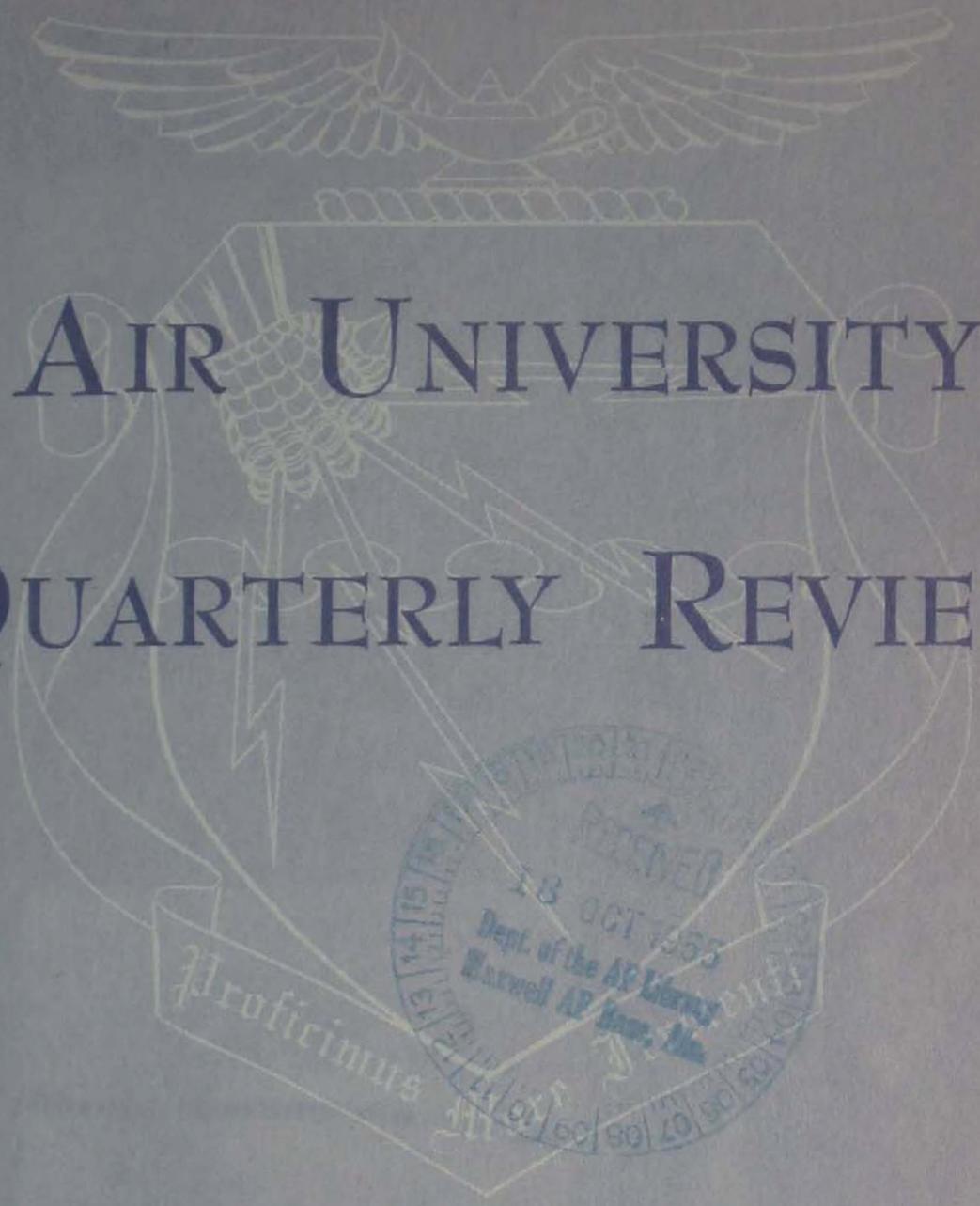
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