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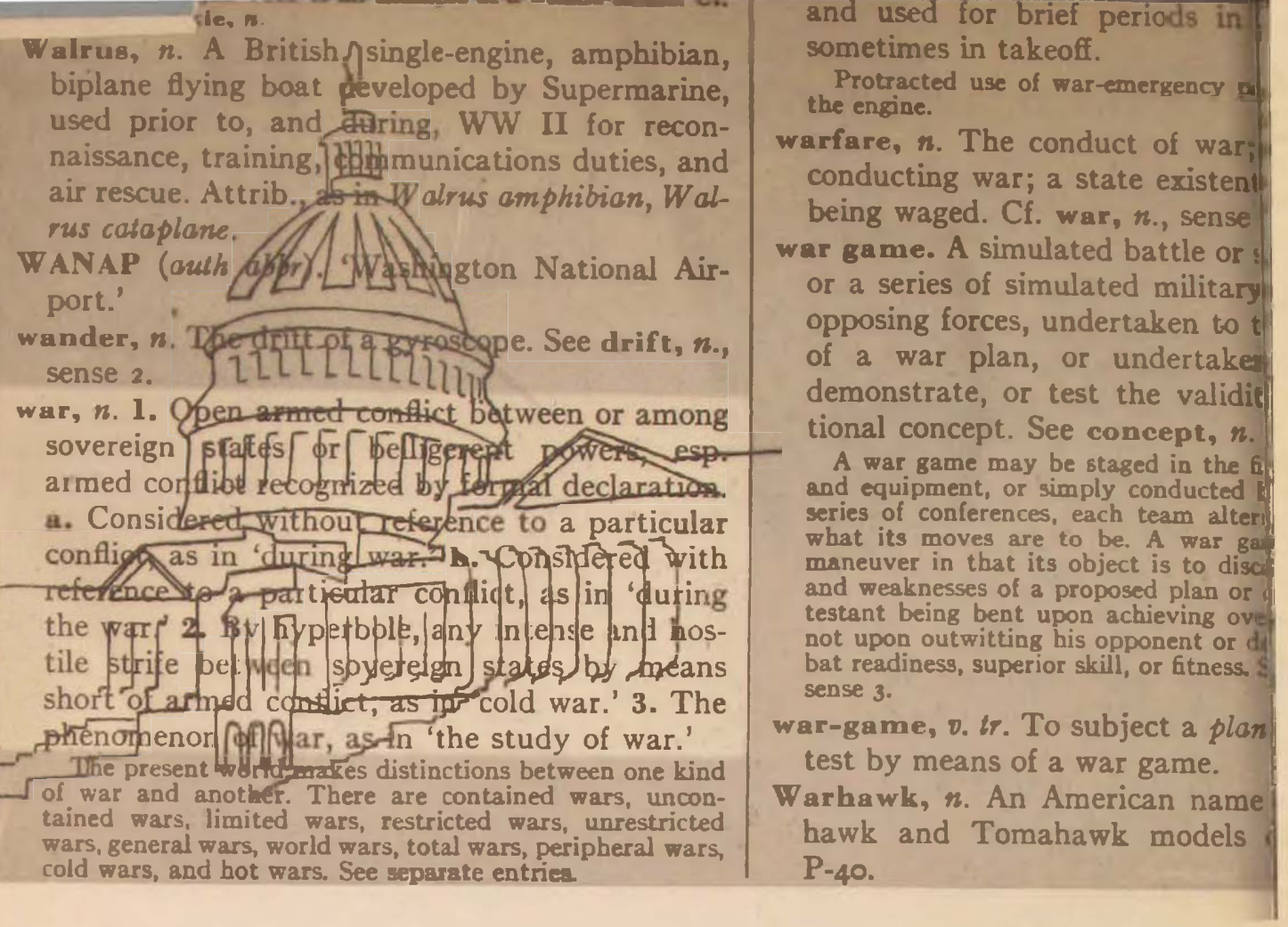


Walrus, *n.* A British single-engine, amphibian, biplane flying boat developed by Supermarine, used prior to, and during, WW II for reconnaissance, training, communications duties, and air rescue. Attrib., as in *Walrus amphibian, Walrus cataplane.*

WANAP (*auth. abbr.*). 'Washington National Airport.'

wander, *n.* The drift of a gyroscope. See **drift,** *n.,* sense 2.

war, *n.* **1.** Open armed conflict between or among sovereign states or belligerent powers, esp. armed conflict recognized by formal declaration. **a.** Considered without reference to a particular conflict, as in 'during war.' **b.** Considered with reference to a particular conflict, as in 'during the war.' **2.** By hyperbole, any intense and hostile strife between sovereign states by means short of armed conflict, as in 'cold war.' **3.** The phenomenon of war, as in 'the study of war.'

The present world makes distinctions between one kind of war and another. There are contained wars, uncontained wars, limited wars, restricted wars, unrestricted wars, general wars, world wars, total wars, peripheral wars, cold wars, and hot wars. See **separate entries.**

and used for brief periods in sometimes in takeoff.

Protracted use of war-emergency p the engine.

warfare, *n.* The conduct of war; conducting war; a state existent being waged. Cf. **war,** *n.,* sense

war game. A simulated battle or s or a series of simulated military opposing forces, undertaken to t of a war plan, or undertaken demonstrate, or test the validit tional concept. See **concept,** *n.*

A war game may be staged in the fi and equipment, or simply conducted b series of conferences, each team alter what its moves are to be. A war ga maneuver in that its object is to disc and weaknesses of a proposed plan or c testant being bent upon achieving ove not upon outwitting his opponent or d bat readiness, superior skill, or fitness. S sense 3.

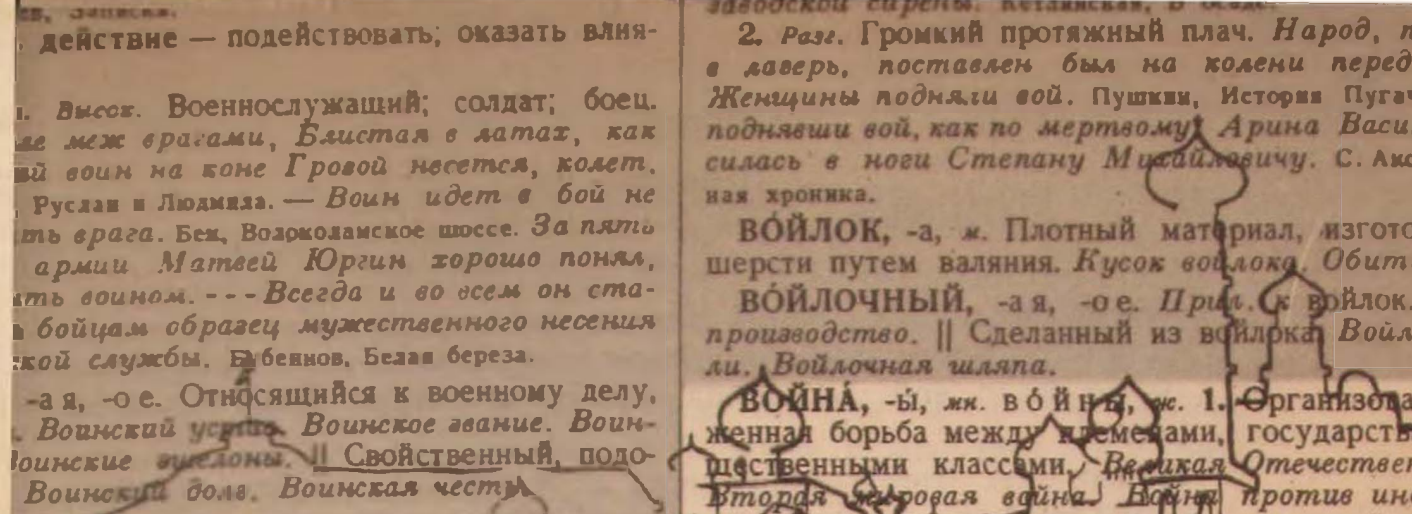
war-game, *v. tr.* To subject a *plan* test by means of a war game.

Warhawk, *n.* An American name hawk and Tomahawk models P-40.

Wordcraft and Warfare

COLONEL PAUL S. DEEMS

DESPITE the fact that semantics plays such an important role in the day-to-day transactions of the Joint Chiefs of Staff, many words in common usage were undefined—in the military sense—until recently. With his usual perception, Secretary of Defense McNamara noted this omission shortly after taking office; and, with customary speed, he directed that a glossary be prepared to define the words the services used among themselves. Obviously, to design the "coherent strategy" that the Chief Executive demanded, it was necessary to establish some coherence in the language used to discuss such a strategy. What was "small war" in one segment of the Pentagon was "limited war" in another. Where one uniform spoke of "total war" another spoke of "general war" or "central war." Even some words commonly used by writers and thinkers outside the services were creeping into usage. "Spasm war" was one such term.



With commendable speed, the services came to some agreement and submitted a glossary, which was promptly declassified by the Secretary. Just as promptly the semanticists began quarreling with the new definitions. The most important of these was the definition of "general war." Some of the anguish which greeted this definition was less semantic than philosophic, for under certain concepts then gaining currency it would be possible to fight a limited war with the Soviet Union, although the glossary definition clearly denied it.

That there is no such thing as "limited" war with the U.S.S.R. is a most difficult idea to accommodate and the one most subject to challenge. There are many *apparent* ways in which war can be limited, and there is so much argument supporting the concept of a war of restraint between the two superpowers that the concept of an integrated strategy for combating Communist aggression deserves wider public exposure.

In short, it can be argued that any deliberate collision between the military forces of the U.S. and the Soviet Union is not a separate prologue to a general war, which might or might not ensue, but instead is the first act of a drama which may not *necessarily* ever reach its tragic climax. The players extemporize their lines around a plot the outline of which is only generally known, and to many in the audience the hero and the villain are of equal character. The two principals have a mutuality of interest in how the play goes, for it is by no means certain that either will triumph or that both will live through

Definitions from
Dictionary of United States Military Terms for Joint Usage (JCS Pub. 1)

general war. Armed conflict between the major powers of the communist and free worlds in which the total resources of the belligerents are employed, and the national survival of a major belligerent is in jeopardy.

limited war. Armed conflict short of general war, exclusive of incidents, involving the overt engagement of the military forces of two or more nations.

Special List of Terms

Not recommended for use	*Use this term instead*
all out war	general war
central war	general war
spasm war	general war
total nuclear war	general war
total war	general war
unlimited war	general war
controlled war	limited war
local war	limited war
peripheral war	limited war

the denouement. And the drama is an entity; if there are intermissions, the integrity of the story is not damaged thereby. The players may default midway, but up to that point their energies, talents, and attention have been centrally and exclusively focused on the same events.

The Spectrum of Conflict

Under the terms of the joint definition, limited war excludes "incidents" and other unpremeditated minor military encounters. It likewise excludes any deliberate—that is, *ordered*—confrontation with uniformed *Soviet* forces, again, as we shall see, by definition. Because there is a substantial body of opinion which holds that "limited" war is possible between the U.S. and the U.S.S.R., it seems necessary to develop further the rationale for the view that such a war is instead general.

It is popular and certainly not erroneous to view the tempo and intensity of our relations with the Soviet Union as a spectrum of conflict. At the violet end, where wavelengths are short and the action sometimes invisible, we find cold war. We pass through blue, green, yellow (the wavelengths are becoming longer; the conflict, like the color, warmer), through orange to hot, red war. Red war is general war. Why is there a discontinuity in the optical scale which requires

us to see any conflict with the U.S.S.R. as red war, rather than, say, orange, or the cooler green?

Let us admit (or advise) that there *is* a discontinuity, and the prism was purposely ground to display at the bottom a single, coherent color. In other words, the prism was shaped to that specification because the untrained eye is predisposed to linger on the various hues of orange, which look less dangerous. There is no such mixture visible in this spectrum as reddish orange, for instance.

Planning for War

The Air Force is the only service that can preplan, in any detail, its operations through the decisive phase of general war. If it can know with reasonable assurance the size of its target list and can approximate attritions en route and later, it can posture itself accordingly. The Navy can plan only so far as its weapon systems can contribute to the initial assaults; after that (except for Polaris) the overriding consideration is survival. The Army campaign, regardless of how the avenues of attack are drawn ahead of time, is entirely dependent on tactical improvisation, logistics, and genius. Force estimates and planning *must* start at the red end, but there is a growing insistence to start planning at the violet end. Even so, there is much uncertainty as to just where ultraviolet ends and violet starts.

In planning for limited war the Air Force is at the same disadvantage as its sister services. Despite the enormous (and costly) effort of the Nation's intelligence organization and resources, it is impossible to predict the place, time, scope, and contestants in the next limited war. While intelligence may assess with some accuracy the order of battle of Communist proxy states (and *knows* force status of allied nations), this information is of little use to the limited-war planner. The only thing the planner knows with certainty is that the *central* enemy is the Soviet Union and that this is the *sole* war resource of those peripheral agents which further the imperialistic designs of the U.S.S.R.

The limited-war planner's concern is the solution of a Churchillian puzzle: a riddle wrapped in an enigma. How much is required (and the resources of the U.S. *are* limited with respect to treasure and manpower) to defeat several possible combinations of Communist states in any of several arenas at any time between tomorrow morning and the unpredictable decline and fall of the Communist empire? Granted a reasonably flexible nuclear policy, the possible range of solutions can be narrowed considerably. With self-imposed weapon restrictions, the answer becomes a problem in hydraulics: the answer *seems* to be reasonably accurate, but the formula is empiric. It is derived from an inexact relationship between the viscosity index of blood flowing over sand and hedgerow, some constant representing the birth

rate, a fraction indicating the number of draftees selected over the number considered, and the over-all effectiveness of concentrated firepower.

One answer is a package force of rather specific dimensions and capabilities, designed primarily for repulsing the "limited" trespass.

The Necessity for an Integrated Strategy

But the U.S.S.R. (as we interpret recent tests and some of Khrushchev's threats) has now accepted as valid the obsolescent U.S. doctrine of a nuclear deterrent built on more and better weapons for massive retaliation. (How else to "balance" the "terror" than with giant rockets, 50-megaton bombs, and policy statements such as "We will utterly destroy any capitalist nation that attacks us"?) And the Soviet deterrent is complemented not only by its own massive armies and those additional forces contributed by its satellites but also by the world's largest tactical air force. Clearly it is to the Soviet advantage if we will *also* differentiate in our security policy between a stable, unusable deterrent strategy and a conventional strategy of known strength to meet aggression on the Soviets' terms.

As we return to the conflict spectrum, two contingencies must be examined: (1) Soviet aggression in a third area and (2) an intensification of military actions in Europe.

the third-area confrontation

The U.S.S.R.'s proximity to the Middle East, for instance, gives it a considerable advantage for surface warfare in that area. The avenue of the United States to its principal allies is by sea and vulnerable to interference if not disruption. The logistic affinity between the United States and its allies is not *apt* to be jeopardized during a "limited" conflict in the Near East, nor at the same time is it much enhanced by the distance over which the logistic lines must operate. In short, the U.S.S.R. enjoys the advantage of interior lines of communication over transportation arteries that are not subject to interruption save as the result of a violation of its territorial sovereignty. The U.S. flag once conveyed the same privilege on shipping, but recent history indicates that the guarantee may be shrinking. If an RB-47 can be destroyed over international waters without reclama, why cannot a U.S. vessel filled with war material?

Assume, however, that an aggression in the Near East is passing from yellow to orange; it has become embarrassingly warm and visible, so to speak. The U.S. has been asked to provide military—organized military—support to an enfeebled government. If the Joint Chiefs recommend intervention, they do so with full knowledge that various

contingencies must be considered. The most important is that formal Soviet military force might present itself as a declaration of the Kremlin's interest.

STRICOM is deployed. And, to the immense surprise of everybody and nobody, the point and cover companies of the advance party come face to face with real Russians: in Russian uniforms, with Russian officers—the advance guard of some undisclosed portion of an army of the U.S.S.R. A Russian fusillade repulses the point.

Allied air sizzles with messages. The curtain is going up, the footlights are dimming, turning red, and the neutral audience is hushed in dread and fascinated silence.

The order goes forward: Engage!

The simple order transfers the conflict from orange to red. The United States and the Soviet Union are in a red war confrontation. Why?

Because the bilateral agreement to join battle is really a decision to commit an undetermined sum of national (military) resources and much prestige on an *issue*. The resource commitment may be initially small; the publicized *prestige* commitment must be large; and, as the issue becomes one of victory or defeat of Free World principles, the political objective becomes unlimited. Thus the military objective, though geographically insignificant, may become virtually unlimited. "Hold that hill at all costs" is just as great a commitment as "On to Berlin."

Granted that Communist operating doctrine permits a fallback in the face of determined opposition. It has also been suggested that Communist leadership considers accumulated prestige as a commodity, to be expended if long-term gain justifies such "sacrifice." No lasting shame attaches to the discomfiture of a proxy like Castro, any more than U.S. good-will benefits from the recent crisis are expected to be everlasting among its allies. And in Cuba, however we assess the result of that provocation, we seem still to lack evidence that it was *meant* to be more than a provocation. At worst, the deployment of Soviet missiles and technicians increased for Khrushchev the risk that Cuba would fall sooner than later. At best, it may have promised (in the Kremlin's assessment) some faster and more permanent solution than doing nothing at all and leaving the initiative with the U.S.

Was the Cuban deployment a miscalculation? It is difficult to believe that Khrushchev concluded that we would *not* react. There is more reason for him to assume that such an intrusion would hasten U.S. action. If it was a test, it was an expensive one. If it was done to make a point, it was a risky method of making it. Regardless of the motivation, President Kennedy seemed to assess it as a deliberate confrontation and so treated it.

But Cuba was perhaps a special case of the third-area confrontation. Let us return to our hypothetical Near Eastern aggression. Neither side can claim "vital interest" in the sense that it is immediately en-

dangered by local action or lack of it. Yet the fact that there has been overt conflict, even at this low level, elevates a new issue as the crucial one: Are the principal powers willing to invoke total force, or is one side willing to endure defeat? And how much of a defeat? How can the decision of the Soviet Union to intervene overtly be interpreted except as a challenge to the West and to the United States in particular? The decision to challenge must be made in full knowledge that in-being nuclear forces are only awaiting authorization to execute their general-war plans. The respective air defense commands would certainly be at war; there can be no margin of numbered "unknowns" in the system when Soviet forces are firing at American forces—even in the third area. Our survival is threatened by the very existence of the Soviet long-range aerospace force, *especially since the decision for attack may have already been made,* predicated upon some contingency beyond our control.

The fact that there has been no formal declaration of war does not alter the rules of national engagement. The Soviets have already made it clear that the war is general by electing a strategy which directly and formally opposes their forces to ours. We cannot chance that their strategy is rigidly limited to local issues or that they put a ceiling on forces committed. Committing organized force *by order* must certainly delimit Soviet strategy; but no Free World intelligence can predict the degree of delimitation, for the Soviets' strategies are their own. Tacit agreements as to weapons and geography notwithstanding, Free World principles are at stake. Only Soviet uncertainty as to a U.S. decision to unleash the winning strategic force can restrain them.

Note the accent on *strategic,* not general, war forces. The decision for general war has already been made by Soviet plans to join in the local conflict. What confuses the issue is the tendency to regard the conflict as something less than red up to the point where the strategic forces receive the "execute" signal. World War II (if we may be permitted a reluctant backward glance) was "general" long before the effects of the strategic forces were really felt in either theater. Nor was it the introduction of two small atomic weapons into the Pacific theater that elevated that war to general.

A glossary definition for general war includes the provision of "total resource employment with the survival of one of the major participants in jeopardy." Because of the persistence of the image of massive retaliation and spasm war, there is a compulsion to regard "employment" as "expenditure." In other words, forces are not employed, according to the prevailing notion, until *all* rifles are firing, missiles are *all* launched, and *all* bombs are falling on target. Such a view cannot accommodate a "controlled" response, the progressive use of attack options, or the incremental escalation of war with pauses for political assessment.

Obviously "employment" begins at an earlier stage than the strategic

assault, even if we must consider employment of the "total resource." For from the moment of deliberate opposition, the total resource is employed—fully—in a coercive role which is *more* than simple deterrence. It is a threatening kind of coercion. The legal equivalent would be an assault threatening an immediate and painful battery if the second party did not desist. Tank parks are emptied, reflex forces are deployed, troops come out of garrison, and a hundred more such actions are taken to demonstrate the jeopardy in which the aggressor has placed his national survival.

Can any nation be at war on one boundary with an enemy and maintain the incredible fiction of peace with the same enemy elsewhere?

The commitment of strategic aerospace power is a climactic stage, rather than the only stage, in general war. The character of "generalness" is conveyed by the U.S. decision to risk, by the declaration of a direct, visible interest, national resources in any conflict with the organized force of the U.S.S.R.—and vice versa. So long as national survival is threatened by either side's secret decision, the war is general.

This is why, usually in the Air Force view, any engagement with identifiable Soviet force requires one strategy and total employment—in all its direct and indirect aspects—of U.S. war resources. If the package force is able to achieve its objective by deployment alone, so much the better. The lower the level of violence at which a favorable decision can be reached, the better. We have no intention of flying to Moscow with a superbomb every time some ragged guerrilla violates a border. On the other hand we would be prepared to use whatever parts and kinds of forces are necessary to avoid the avoidable. And, in a war with the U.S.S.R., this means all parts and all kinds in one grand strategy.

a Soviet confrontation in Europe

The nearness of Europe, the emotional cables that link us, and our long association with NATO make general war easier to define in Europe. Europe is an industrial, if not a natural, treasure chest. What is a market to us is loot to an aggressor. Political, cultural, and economic stakes are at their highest—for both sides. The anticlimax of a Communist victory in Europe would be the death there of democracy and free enterprise.

If the superpowers (and their alliances) elect to meet face to face in Europe, significant actions would take place on the NATO–U.S. front. *All* forces, including the U.S. strategic force segment of allied power, would come to a war-readiness posture. As far as our European allies are concerned, we are determined to lose none. So far as European/NATO integrity is concerned, the die is cast. So far as European integrity can be maintained without resort to nuclear weapons, we seem committed to that method. But the single act of confronting

Soviet Russian forces, and committing the future of the U.S. against an undefined Soviet strategy with declared goals hostile to ours, means a resolution to repulse utterly, or to compromise. If compromise is out of the question in a red war, so there must be no compromise in the U.S. decision to honor its treaty obligations.

Regardless of the size of the force commitments at any particular calendar date, the issues are total (to gain or lose in the ideological struggle), the objectives are total (to gain or lose in the power struggle), and the order of battle of both sides is viewed accordingly. The fact that the *strategic* force is not at once expended is hardly germane. It is on 15-minute readiness, or half of it is. The "generality" of war between more than half a billion of the world's inhabitants does not depend entirely on the *timing* and *lethality* of the weapons involved. If unused weapons serve the achievement of political goals on our side, so much the better. We know that if they *are* used, the victory will be for the Free World. But the decision to "engage" on either side must be predicated on a subjective belief in ultimate strength and in the ultimate will to launch that strength, if necessary, to attain the political objective.

We know that the political objective of international Communism is the death of democracy. How can a "limited war" with Soviet forces be less than general?

Headquarters United States Air Force

The Pro and Con of Military Force

Lieutenant Colonel Donald F. Martin

IF A MILITARY strategist is asked point-blank, "Do you favor the deliberate destruction of cities and people in war?" the answer is usually, "Of course not!" With this response a man puts himself on record as opposing the slaughter of children, mothers, the aged, the crippled and infirm. With this response he becomes a man of virtue. He is foursquare for motherhood and against sin. But the impression is short-lived. With only a pause many continue, ". . . but if the enemy's military force can't be found or if he has used it all up on us, I wouldn't let him off scot-free. No sir, he'd have to pay! At any rate, your question is deliberately slanted—any rational being would rather fight a clean war, but it just isn't feasible any more. You fail to appreciate that nuclear weapons have changed the very nature of war!"

Most people dislike being associated with a credo that countenances human slaughter. They prefer to see themselves as faced with no other alternative. One can more easily become reconciled to slaughter if it can be shown that there was no alternative. Although it is a messy business, it becomes "necessary." But does it—really?

The purpose of military force has been, is now, and will continue to be the destruction of the enemy's military force. Contrary to popular misconception, nuclear weapons did not change this purpose. The advent of nuclear weapons did not change the military objective to destruction of civilians, because one's own people are hostage to the enemy's nuclear weapons.

It would seem, then, that a stalemate must ensue if two contending world powers build city-killing forces, and creation of forces for indiscriminate devastation would be mutually beneficial. Moreover if both opposing forces were reasonably safe from destruction by surprise attack, "stable deterrence" would seemingly obtain. A nation could then turn its attention to small, limited wars, which are much easier to manage because they do not immediately involve national survival.

Unfortunately it just isn't that easy. If the enemy can attack our military force, and he can, with minimal damage to our country and minimal loss of life, we would be foolish to initiate a wanton play of genocide which would inevitably result in the forfeiture of 100,000,000 American lives.

The Arguments Pro and Con

"Military forces cannot be separated from urban areas."

The most vocal argument against attempting to destroy the enemy's military force while avoiding his cities is that the enemy's force cannot be separated from his urban areas. It is said that an attack aimed at Russian military force would do nearly as much damage to Russian cities as one that went after the cities in the first place.

Of course there will be damage to urban areas. Where military forces are located very close to a city, there could be *substantial* collateral damage to the neighboring urban area. In World War II when a military force took refuge in a city, the attempt to dislodge it necessarily involved shelling and bombing until the military force was neutralized or until it withdrew. The responsibility for destruction to the city was on the force which sought refuge there. The attacker only went where the opponent led him. We are fortunate that an enemy attempt to destroy the hardened Minuteman or Polaris need not result in vast urban destruction. (Attempting to destroy the weapon system's supporting structure, such as ports, maintenance depots, etc., is something else again.)

Today we have many military bases near cities. Some of the nearby cities are rather large. The citizens near military bases have every right to be as much concerned for their lives as the residents of New York, Washington, Chicago, Los Angeles, Dallas, or Miami. Yet even those people living near the Strategic Air Command's aircraft bases, missile sites, Polaris bases, aircraft carrier ports, and air defense installations need not abandon hope. Depending upon (a) the distance from the city to the military installation, (b) the accuracy of the enemy's weapon, and (c) the yield of the enemy's warhead, it is *possible* to attack most military targets and do only minor damage to the adjacent urban areas.

On the other hand, if the enemy were to use the largest hydrogen weapons on every military target to increase the probability of destruction, collateral damage to our urban areas would be severe. Yet such an attack has a self-defeating drawback. An indiscriminate attack would give us every reason to use our heaviest nuclear weapons on the enemy's cities. This reasoning is so elementary that the enemy must reckon with it before he launches his attack. With our cities gone and our people decimated we would hardly be deterred from making the devastation mutual and as close to absolute as possible.

The fact remains that the enemy need not use hydrogen bombs or hydrogen missile warheads to destroy our military forces. A one-kiloton weapon develops 1000 psi overpressure to a distance of 150 feet from the center of the explosion in a surface or air burst and can destroy all but the hardest of military targets when placed within 100 feet of

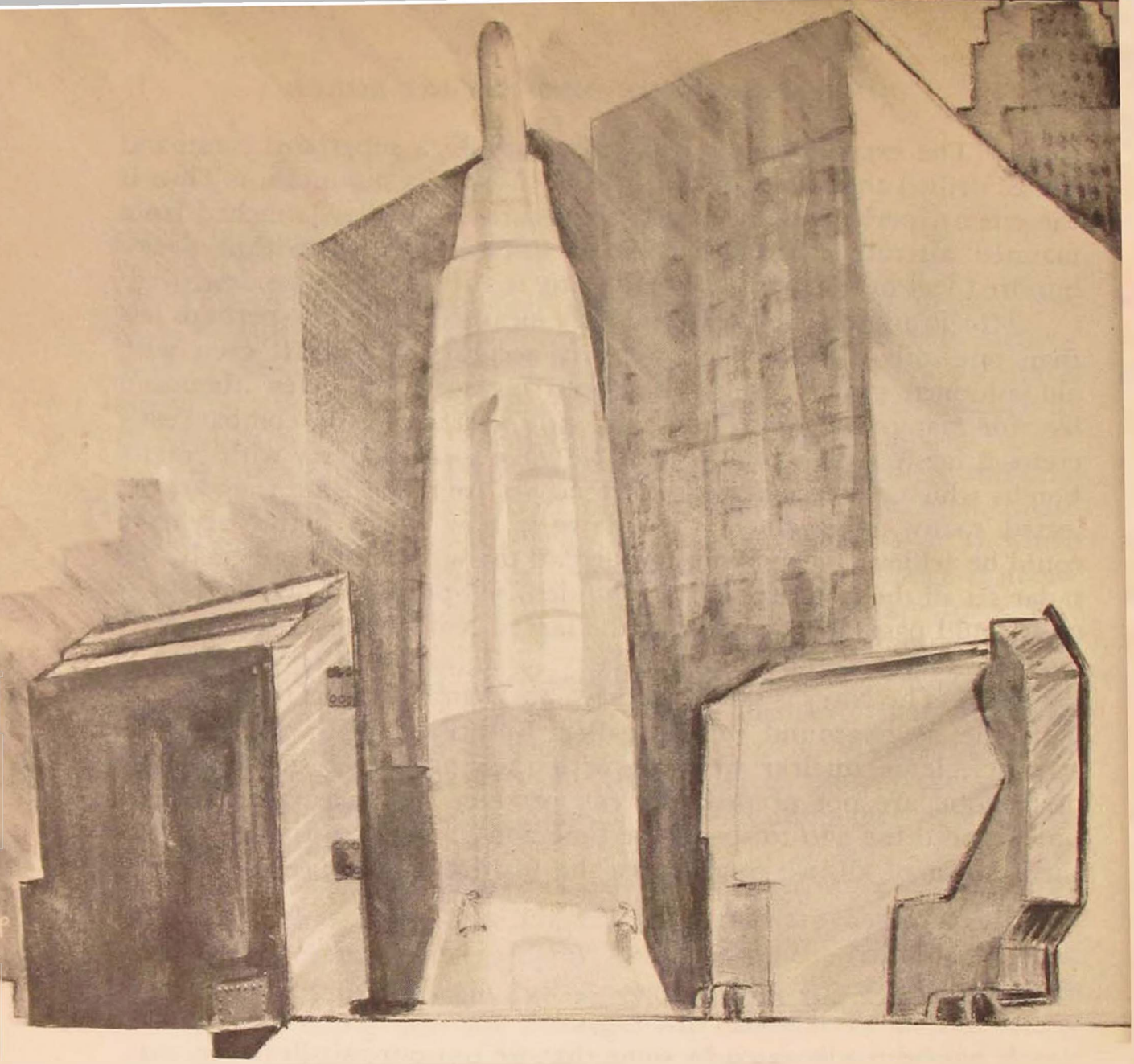
them. (The exceptions are few; one example, a superhard command center drilled thousands of feet into the base of a mountain.) Thus if the enemy, perhaps with guided air-to-surface missiles launched from manned aircraft, can place a small nuclear weapon within a few hundred feet of our hardest missile site, it will probably be destroyed.

Missile accuracy today is generally measured in miles—perhaps less than one mile. The weapon delivery accuracy of aircraft even with old-fashioned gravity bombs has been measured in a few thousand feet for many years. It is said that SAC's average for all combat-ready crews is far less than 2000 feet. If we have such accuracy with gravity bombs which are free-falling, inert masses from the time they are released many miles above their targets, how much better accuracy could be achieved with bombs guided all the way to their targets by the radar set in the bomber? With a guided, self-propelled bomb, the aircraft could pass far to the side of the target. Not having to pass directly over the target would be particularly advantageous if it were heavily defended. The Navy is said to achieve an accuracy of less than 150 feet with the air-to-ground missile called Bull Pup. With this kind of accuracy, large nuclear weapons with their attendant indiscriminate destruction are not needed. We *can* produce superaccurate weapons, but we need the *will* to spend the time and money required to perfect them. Most of all, we need to see the futility of our present concept of war.

"Why not place our missile force in our biggest cities?"

It has been advocated by some that we put our missiles deep within our largest cities to *prevent* an enemy from attacking our military force and sparing our cities and people. The purpose of such a move would be to convince an enemy that if he attacked our military force he would inevitably kill us as a nation. He would have killed his hostages. Hence, he would have removed any reluctance we might have had (as an essentially undamaged nation with most of our people alive) to devastate his country and kill his people in reprisal.

This plan would have us place our nation in hostage to the enemy —apparently confident that he would find the price of attack much too high. Here again we seem to enjoy imagining the enemy as some dull-witted lout. What would our alternative be if he evacuated his own cities and proceeded to attack those of our cities which contained our force? Since only 130 United States cities have a population of 100,000 or more, his target list would be attractively small. If all our military force were *not* in our cities, what would prevent his destroying that portion of our force which could be effectively attacked *without* destroying our cities and leaving us the frightening decision of committing suicide by firing our missiles at his evacuated cities and losing our own in return?



In any event, even those who like the idea of placing our people in hostage to the enemy would find it rather difficult to hide aircraft, aircraft carriers, Polaris submarines, nuclear weapons manufacturing plants, air defense sites, etc., in our cities. Our overseas bases might also prove difficult to hide in U.S. cities!

Even if we did put missiles in our cities, the enemy could choose to ignore the missiles concealed there. He could thereby be reasonably confident that, with our people and urban areas intact, we would not choose to commit them to certain death and destruction by firing our missiles at his cities. What else could we use our city-hidden missiles for? They would obviously be inadequate to destroy the enemy's military force. At best, we might hold them for bargaining purposes.

The fallacy of marrying our missiles to our cities is the same as the fallacy in the concept of minimum deterrence. One is left without an acceptable alternative course of action—surrender not being considered acceptable—if the enemy is careful to attack with discrimination, leaving the country as a whole very much alive.

If a nation is dying, the decision to loose a force of devastation in reprisal is an easy one. If a nation is alive, the decision to loose a force of devastation would be terrifyingly hard, if not impossible, to make.

"The enemy's airfields and launch pads will be empty."

Occasionally during a discussion of the purpose of military force someone makes the admission, "Well, perhaps we *could* separate the enemy's military force from his cities—if we wanted to, that is—but he wouldn't have much force left on site. Most of his missiles and aircraft would have been launched. Even if we had a force left after his attack, there would be very little left for us to go after. His airfields and launch pads would be empty." Such a statement is made in a condescending manner, as if to suggest that only an idiot would fail to see the logic.

Not until devastation and annihilation caught the fancy of the military and the public alike had it ever been seriously proposed to commit *all* of one's force at the outset of war. The exact opposite was true. Never, never, never be caught without a reserve! "Two in the line and one in reserve" was the rule of thumb for ground forces. Wars have always had crucial battles, but never has all of one's military force been expended in a single spasmatic "salvo."

If the Soviet Union were to strike us a surprise blow and consume all its offensive strength in the process, who would inevitably be the victor? Why we would, of course. We would have some strategic force left. We would have some Polaris and Minuteman missiles if nothing else. And we would be militarily dominant.

One doesn't need many nuclear weapons to be militarily dominant if the enemy has none. Remember our nuclear monopoly? The Communists have not forgotten. It is absurd to think that they would ever let themselves be caught with their nuclear forces exhausted. However, there is a question of how much force they would have in reserve. In any event they would have an unknown number of empty, or, more correctly, at that moment empty, launch pads.

Can we ignore launch pads simply because they are at the moment empty? Should we start to destroy Soviet cities instead? Not if the Soviets have a reload capability. It is possible that a nation, even the United States, might remove missiles from some launch pads and secrete them as a reserve. They could then be fired from launch pads that survived the initial attack.

Apparently an attempt must be made to destroy *all* launch pads, whether they are at the moment empty or full, because the empty ones may be only temporarily empty. Who would hesitate to destroy a Soviet Polaris-type submarine merely because it had not been established that the submarine had any missiles left aboard? It is a functioning piece of military hardware that can be reloaded.

The case for destroying empty airfields is somewhat different. First, a modern, long-range aircraft is a highly complex machine requiring elaborate, if not delicate, treatment while on the ground. Such precise treatment is available only at certain airdromes. Long, solid runways must be available. Weapons, fuel, replacement electronic parts, etc., are required to keep an aircraft flying and capable of performing properly. It takes a myriad of electronic components to keep the bombing and navigation systems functioning. (Electronic systems are also the most frequent cause for aircraft repair.)

There are currently only about 100 airfields in the United States that can adequately handle SAC's largest aircraft. Something more than a long, strong runway is needed. SAC aircraft that survived a surprise missile attack, penetrated Soviet defenses to the target, and managed to withdraw to the United States would find a surviving SAC base invaluable. Just one operational SAC base could continue to send bombers into Communist territory again and again until the war was over or all our bombers were lost or until the base was put out of action.

There is yet another aspect to the "empty airfield" argument. Even an outfit as proficient as SAC cannot "empty" its airfields for an attack. Ground aborts due to mechanical malfunction, air aborts, air refueling aborts, and the like add up to a rather significant residual force, even for the country that strikes first. The potential capability of a residual force of aircraft makes it mandatory that it be destroyed on the highest priority.

Finally, missiles are usually lodged one to a hole. (The Polaris locates 16 missiles in a confined area.) Failure to destroy one launch pad merely adds one missile to the enemy's force—perhaps several if the pad has a reload capability. By contrast, a surviving airfield equipped to handle SAC combat aircraft represents 50 to 100 or more missiles because it will continue to produce sorties until it is neutralized.

For these reasons the argument that such an airfield may be temporarily "empty" and thus not worthy of destruction is ridiculous. The fact that an airfield may be empty when we destroy it just doesn't count. To paraphrase General Power, "Pity it wasn't full when it went!"

"A war-fighting capability is provocative."

There are those who believe that a war-fighting capability is provocative. They feel that with a force designed solely for annihilation we, and more important the enemy, could be confident that it would never be used offensively. The thought that general war should become less deadly and thus more probable distresses them. They feel much more comfortable and certainly more secure with the "unthinkable." These people resist efforts to reduce our vulnerability under the mis-

taken notion that actions leading toward a war-fighting and war-winning capability could provoke an aggressive enemy to war before we attained increased strength.

The error in reasoning in this instance is more subtle than those fallacies previously discussed. It might take us several years to re-establish a clear-cut war-fighting, war-winning capability. Our attempt to regain an obvious war-winning military force would unquestionably be resented by the Soviet Union—to say nothing of Communist China. Khrushchev rattles his rockets with a sense of power he never felt before. However, it seems unreasonable to assume that he would be so upset at our effort to establish clear-cut military superiority that he would elect mutual annihilation rather than see the current emphasis on mass slaughter removed from the context of war.

Although developing a capability to wage general nuclear war resulting in fewer than 10 million casualties* would indicate a decision to fight—if pressed too far—it would not appear to offer sufficient provocation for the Soviets to expend 15 times that number of casualties in a senseless act of mutual homicide. It would seem more reasonable for them to recognize the obvious capability for mutual devastation and either amend their military philosophy accordingly or commence bargaining in good faith for over-all disarmament or at least for some form of arms limitation with adequate inspection guarantees. In terms of their own self-interest, they would find an adjustment in military philosophy as profitable for them as for the rest of the world.

"A war-fighting force will weaken deterrence."

The most damning indictment of some advocates of minimum and finite deterrence is their charge that a war-fighting capability will weaken deterrence. That is, they believe that if we admit that deterrence by terror is irrational and that we are probably not irrational enough to make the threat credible, then we shall have abandoned our allies and opened the door to Communist military aggression. Hence deterrence will have been weakened.

If "deterrence" can be "weakened" merely by recognizing that in this imperfect world acts are committed which are not worth self-destruction, then perhaps the deterrence never was very credible. Perhaps the only "weakening" is caused by our introspective view of the paper tiger we have fashioned for ourselves.

"The enemy force cannot be located."

Some say the day is past when one military force can find the

* See Lt. Col. Donald F. Martin, "Counterforce," *Air University Quarterly Review*, XII, 3 and 4 (Winter-Spring 1960-61), 152-58.

other. "The Soviet Union," it is said, "knows the value of submarines, and before long it will have a significant force of ballistic missiles based at sea. It will also have mobile missiles hidden inside Russia. They can be put on trains, trucks, barges; they can even be hidden in forests. Ballistic missiles with intercontinental range will become smaller and smaller. Eventually they may possibly be hidden under a large tree. Even with all the precision and accuracy in the world, you can't destroy the enemy's military force if you can't find it!" So goes the argument that the job of employing military force against military force in order to achieve exploitable military dominance is just too difficult.

Straightway we must admit that finding the enemy's force and then destroying it are tremendously more difficult than finding his cities and then sending rockets over to incinerate them. Nevertheless, the task of fighting a war of force against force is not impossible. Nor does the fact that it is a difficult job make national "suicide" a more attractive or acceptable solution.

World War II was filled with difficult problems solved by hard work, invention, adaption, and inspiration. When the bombers first attempted daylight raids over Germany, the losses were prohibitive. It was said, and correctly, that if such losses persisted daylight bombing would have to be abandoned. It was very simple: we would soon run out of bombers and crews.

An aircraft and crew were a large investment in human lives, material resources, and precious time. It was prohibitive to get only five or ten missions out of each aircraft. In five or ten missions a B-17 could drop only 30 tons or so of high-explosive bombs—not much of a return for an expensive aircraft and crew.

Some people thought that losses in daylight bombing could *never* be brought down to acceptable levels; yet they were. The greatest losses our bombers suffered at the start of the war were at the hands of German fighters. Our own fighter escort aircraft were of little help because they lacked the necessary range to accompany the bombers all the way in to the target and back out again. The Luftwaffe had only to wait until our short-range fighters ran low on fuel and had to turn back to their bases. Then the bombers became highly vulnerable to German fighter attack. The bomber's only defense lay in its .50-caliber machine guns and very mild evasive action, neither of which was sufficient to dramatically lower our bomber losses.

The problem seems simple today, but the answer was a long time coming, for we continued to have high bomber losses. The solution was to extend the range of our fighters. Droppable wing tanks were installed on them, giving greatly increased range. But these tanks were bulky and heavy and reduced combat performance. When our fighters were attacked by German fighters, they had to drop the wing tanks in order to maneuver properly.

The Germans attempted to counter our wing-tank-equipped

fighters by jumping them shortly after they had crossed into enemy territory, forcing them to drop their wing tanks. As soon as the wing tanks were dropped the German fighters would terminate the engagement and return to their bases. With their extra fuel gone, our fighters had to return to base, leaving our bombers unattended. Then, nearer the target, the Luftwaffe would attack the unattended bombers. The Germans thus attempted to nullify our technique for range extension of our fighters through use of droppable wing tanks.

Tactics then became even more important. When German fighters appeared, only a portion of our fighters would drop their tanks and prepare for combat, until it was definitely established that the Germans were serious about pressing the attack and were not merely spoofing our fighters to get them to drop their fuel tanks. Relays of fighters were also used. Each relay would pick up the bombers at a predetermined point, fly with them for a time, and then hand them over to a succeeding relay of fighters further along the bomber's route. Our bombers and fighters concentrated on destruction of German airfields, aircraft factories, and gasoline production and refining facilities in an effort to stifle the German air capability.

These and many other factors combined to reduce our bomber losses and eventually gave us a manageable rate of "aircraft lost to enemy action." At the end of the war we were flying over Germany at will. We had access to every square mile of Germany, although the flights continued to cost us some aircraft and crews. Once we had recognized the essentiality of continuing bomber attacks on Germany, it was only a matter of time until we had perfected the necessary equipment and tactics to accomplish the job. The pessimists were forced to give way to the optimists.

There are other examples of the Air Force philosophy, "The difficult we do immediately, the impossible takes a little longer." German U-boat attacks on our convoys to England (and later to Murmansk) caused some people to say that we couldn't continue to take such losses. They were right—we couldn't, and we didn't. Eventually our losses to enemy submarines became manageable—not by some single action but rather by a concerted attack on submarines as a whole weapon system. Convoy tactics were devised and revised, there were more effective attacks on the submarines at sea and on submarine pens, and their home ports were put under tight surveillance. A great deal of hard work went into subduing the German submarine capability. Little of the hard work and less of the ultimate success were due to those individuals who magnified a very difficult problem until it became, to them, impossible.

When the Washington *Star* asked the USAF Chief of Staff, "Can we, in future years, build a force which can find and destroy the enemy's forces?" General Thomas D. White replied: "The destruction of enemy forces is the age-old military problem. There has never been a time in history when it couldn't be done if one went at it properly,

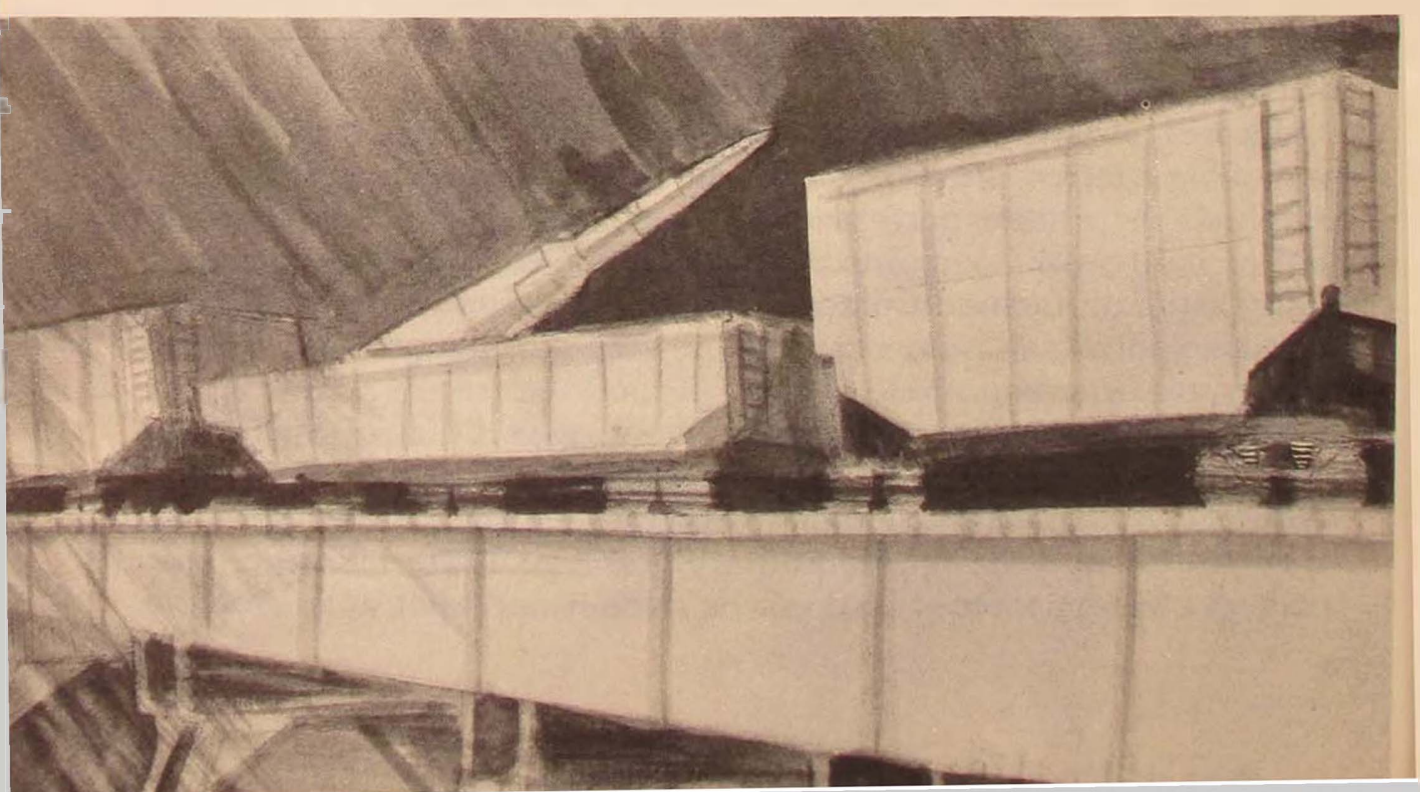
and with adequate forces. Of course we would like to know more about the Soviet forces than we do. But we know a great deal as it is and as time goes on we will learn more. One of the advantages of manned forces is their ability to seek out those targets which are suspected but not located accurately enough to be a suitable target for unmanned weapons such as ballistic missiles."

Creating a Force for Victory

Although rockets have capabilities which the military can very effectively use, they also have some serious drawbacks. The most serious deficiency, and the one which will make it a weapon of secondary or tertiary priority against many targets, is its inability to attack its mobile counterpart. It is possible to destroy mobile missiles by using saturation tactics, but it is infeasible to do so because of (1) the quantity of weapons required for saturation attacks and (2) the widespread collateral damage to adjacent urban areas caused by quantities of multimegaton weapons exploding over large geographical areas.

Assume that an enemy has a mobile missile system mounted on railway trains. If the trains operate over a known trackage X thousands of miles in length, one can compute the number of weapons required to destroy all the trackage (and the train-mounted missiles) over which the missile trains operate. The number of weapons required to destroy a mobile missile system depends upon (a) the reliability of the missiles used to attack the mobile system, (b) the number of miles of track over which the trains operate, (c) the amount of overpressure required to kill the train, and (d) the lethal radius of the warheads of the attacking missiles.

After one computes the number of missiles required to attack the



trackage over which the trains operate, whether or not the attack by saturation is productive is up to the enemy. For example, assume that 1000 missiles are required to achieve the probable destruction of all the missile trains operating over a specific trackage. If the enemy chose to put 100 missiles on that stretch of track, it would cost us 10 of our missiles to kill one of his. He would be foolish to accommodate us by saturating the stretch of track with 1000 missiles, thus allowing us to kill them at the rate of one for one. (A track may be said to be "saturated" when the number of train-borne missiles in a given area equals or exceeds the number of missiles the opponent needs to blanket all trackage and thus kill all missile trains in that area.)

In addition to its quantitative infeasibility, employing the saturation tactic with hydrogen warheads exploding over a large area would certainly result in extensive damage to urban areas and produce exceedingly large amounts of radioactive residue. To reiterate, indiscriminate damage to urban areas is to be avoided if at all possible. So long as the enemy's urban areas are relatively undamaged, powerful incentives exist to confine destruction to military forces.

Of the two objections to destruction of mobile missiles by area destruction, quantitative infeasibility is the more persuasive. It is difficult to believe that the high cost of missiles would ever make it possible for this country to have five, ten, or twenty times more missiles than Russia. Yet quantitative superiority of this order is required to support a concept of destroying mobile missiles by blanketing the entire area in which they move. Even if one were prepared to pay the price of such a tactic, the enemy could quite effectively counter it by producing just enough missiles to keep us short of our quantitative requirements for superiority. For example, if we calculated that we would need a missile force five times larger than the enemy's, he could produce just enough missiles to keep the ratio at three to one. As will be pointed out later, however, even a virtually limitless missile force cannot of itself, ensure victory. It cannot even guarantee a stalemate.

It would appear then that destruction of mobile missiles is a mighty tough problem, and it is. We can expect the problem to become much worse. A fixed missile, soft or even hardened, presents a target at which the enemy may direct his fire, but a mobile missile presents virtually no target—to another missile. A manned aircraft, on the other hand, can search out and kill a mobile missile. This approach would circumvent the two objections to attacking rail-mobile systems by area-destruction or saturation tactics: it would be quantitatively feasible, and it would cause minimum damage to urban areas.

Aircraft might be used to attack *some* land-based mobile missiles, but what of the day when intercontinental rockets can be made so small that they can be manufactured by the thousands and hidden under large trees? To analyze the significance of this possible development, one should proceed from several premises: Ballistic missiles can

destroy fixed targets with high confidence. Because of the time in flight alone, long-range rockets have extreme difficulty destroying *mobile* missiles. Missiles can be made to survive surprise attack by hardening, mobility, deception, and hiding. In recognition of this fact, there should be a limited and lessening number of fixed military forces that can be easily destroyed by missile, at least until an antimissile system is perfected that has a high kill probability against multiple, highly sophisticated missiles carrying their own penetration aids and obtainable at a reasonably low unit cost. And finally, both the United States and the Soviet Union can afford to produce the number of missiles required to destroy the lessening number of targets in the opponent's fixed military forces.

Despite the common belief that missiles are the key to victory, not all of a nation's hidden missiles need be found and destroyed or neutralized in order to ensure victory. Simple calculations will reveal that missiles are very valuable in proper quantity, yet any surplus is almost valueless. Assume that the Soviet Union determines to destroy 50 SAC bases in this country along with 50 civilian airfields that SAC aircraft could use in emergency; 100 Air Defense Command heavy radars, control centers, and airfields; 10 ports serving Polaris submarines and aircraft carriers; and 40 other targets—nuclear weapon production centers, Tactical Air Command bases, Military Air Transport Service bases, etc., for a total of 250 U.S. targets. (These calculations are hypothetical and are used merely for illustration.) No missile is 100 per cent reliable, so that to ensure a reasonably high probability of target destruction, more than one missile must be programed to each target. Remember also that today's missiles do not report back on either their success or failure in destroying the target. Let us say that the reliability, yield of the warhead, and accuracy of

the Soviet missiles require that two missiles be allocated for each target listed for destruction. The missile requirement is thus 500.

Soon we could have 100 or so hardened and dispersed fixed missiles. We could also have additional soft and semihardened missiles clustered rather closely together so that they would present only, say, 25 targets. Again, assuming that two missiles kill one hardened missile or one entire soft site, the Soviets must add 250 more missiles to their previous sum of 500, for a new total of 750 required missiles. They also know that they must have more missiles in reserve so that if, after they attack, we attempt to use our surviving missiles to destroy their cities, they will have enough missiles left to destroy 100 or more American cities in reprisal. They could feel reasonably confident that such a residual force should discourage us from deliberately destroying their cities because we would obviously lose as many *or more* of our own in return. (In this sort of situation, neither side gains from the exchange of cities.) If two missiles attacking one American city give better than a 90 per cent probability of destruction, then the Soviets would add perhaps another 200 missiles to their previous total of 750. Add another 50 for contingencies and get a nice round figure of 1000 missiles.

Missiles are valuable in proper quantity, but the value of missiles in excess of that quantity depreciates grossly. This comes as somewhat of a blow to those who see in an abundance of missiles an absolute or nearly absolute force for peace. To illustrate, let us assume that the Soviet Union has not stopped at our hypothetically calculated requirement for 1000 operational missiles but has actually produced 2000 missiles, most of them mobile. The extra 1000 missiles are "just to be sure." The Soviet Union now attacks and fires 750 rockets at our fixed military targets, retaining 1250 in reserve.

At this point the strength of the U.S. missile force is of interest. If our planning was roughly along the same lines as the Soviets', we would have built a force of at least 1000 missiles—the 750 required to attack Soviet airfields, missile sites (remember we can attack only their fixed missile sites with our missiles), air defense facilities, military ports, nuclear weapon manufacturing plants, etc., plus a small reserve for military purposes (50) and a large reserve (200) to guarantee reprisal if the Soviets elected to attack our cities. That would total 1000 missiles, which would not be enough to equal the Soviets in number of missiles. We did not opt to produce the additional 1000 missiles. Instead we developed the RS-70 and a very long-endurance penetrating aircraft as yet unnamed. The RS-70 and the long-endurance penetrating aircraft (perhaps nuclear-powered) gave us a manned force capable of reconnaissance after the war started and a capability for seeking out and destroying mobile and imprecisely located military targets as well as hardened fixed missiles and other fixed targets.

As a result of the initial Russian attack, we lost most of our fixed military forces, although many of our hardened fixed missiles survived.

Our mobile missiles survived in quantity along with some RS-70's. All airborne long-endurance aircraft escaped initial destruction and needed no further assistance from ground bases to perform their military missions for some weeks into the future. In the case of nuclear-powered aircraft, they could continue flying for up to 1000 hours before requiring the attention of ground crews and technicians. The U.S. fires some missiles in an effort to destroy Russian fixed military forces.

Pause now to evaluate the relative military strengths of the two countries. The Soviet Union has 1250 missiles remaining. Most of these are small and mobile and virtually impossible for us to kill with long-range missiles. In any event, we have only 250 missiles left, plus a number of aircraft. Neither of the remaining missile forces can destroy the other's remaining missiles! Each has the capability to devastate the other's cities, yet the exchange would profit neither. If only missiles were available, a stalemate would necessarily ensue—or a profitless exchange of hostage populations. A third alternative is negotiation, and it would appear preferable to either of the first two alternatives.

With opposing missile forces in stalemate, any military decision must be arrived at with other weapon systems—other weapon systems that possess capabilities not shared by long-range missiles. These will be weapon systems that can break the stalemate by gaining access to the opponent's military force, gathering postattack reconnaissance intelligence, and destroying those enemy forces which they find. A missile cannot do these things.

Missiles then cannot by themselves win a war because (a) they cannot destroy mobile missiles, and (b) they cannot destroy other mobile land, sea, and air forces—such as highly mobile armored units, surface vessels, undersea craft, and aircraft. Thus an overabundance of missiles is of little value, for once the enemy's fixed military forces have been destroyed we need only a rather modest missile force to discourage the enemy from destroying or even seriously threatening to destroy our cities.

THE KEY to military victory today is a combination of manned and unmanned weapon systems capable of swiftly destroying fixed military targets and penetrating the enemy's homeland—albeit with manageable losses—to locate and destroy his mobile forces. While the offensive operation is going on, we must have an active defense to force attrition of the enemy's offensive force. More specifically stated with regard to today's technology, a hunter/killer aircraft that can roam the enemy's homeland is essential to achieve a position of military dominance. The indispensable corollary is a long-range interceptor.

Headquarters United States Air Force

One Viewpoint on Command

Major George C. Cannon, Jr.

THE SCARCITY of command positions available for Air Force officers below the grade of lieutenant colonel, together with the constant aging of the officer corps in relation to grade during the years since World War II, has resulted in little or no command experience for the majority of officers now at or near the mid-point of their careers. Furthermore it does not appear that optimum benefit to the Air Force is being realized from the few command positions which do exist.

The trend toward centralization of authority is denying the full value of command experience to the officers who hold lower and middle echelon command positions. Also the lack of definitive policies as to which officers should receive command assignments and what should be the duration of a command assignment results in an ineffective, inequitable distribution of command experience.

The problem is twofold: Present-day lower and middle echelon commanders may be ill prepared to exercise initiative and imagination in an independent role if the circumstances of war suddenly thrust these responsibilities upon them, and too many of tomorrow's senior commanders may arrive in those positions improperly prepared to assume heavy responsibility.

I believe that the actual experience of command in an environment of decentralized authority is essential to the proper and complete preparation for senior command positions. No amount of professional schooling—no matter how far-reaching, excellently presented, and earnestly pursued and even though combined with staff duty, no matter how high the echelon or how long the duration—can compensate completely for lack of command experience. Command, like any other art, must be practiced, as well as studied and observed, to achieve perfection.

We have recently witnessed increasing emphasis at the highest levels in our Government on the need to develop the necessary balance

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This article is based on a staff study prepared by the author as a part of his academic work while a student at the Air Command and Staff College, Air University.

of forces to wage and win any type of war—general, limited, nuclear, conventional, hot, cold—wherever and whenever it confronts us. This is a definite shift away from our previous national policy, which did not make such full use of the deterrent value of our massive nuclear retaliatory forces.

This shift in policy carries with it a far-reaching implication that does not yet appear to be widely recognized. The fascination with all-out nuclear warfare over the years has generated a gradual shifting of decision-making authority to higher and higher echelons. Lower and middle echelon commanders have become more and more decision-executors and less and less decision-makers. But if the goals of this change in national policy are to be achieved, if we are to have military forces truly capable of coping with the entire spectrum of modern warfare, then the trend of decision-making authority upward must be reversed. The power of decision must return to the lower and middle echelon commander.

The lower echelon commander who has been deprived of the power of decision has also been deprived of learning. He not only will be ill prepared to assume high responsibilities when he reaches those positions, but he also is not as well prepared to assume the greater responsibilities placed on him by the new look in our force structure as he might have been.

We need a philosophy of command which recognizes the changes in strategy and tactics being wrought by modern weapons technology and which accommodates itself to them. At the same time it must be a philosophy which recognizes the ever present need, in the future as in the past, for the commander who can make broad decisions. It must never lose sight of the need to train such commanders continually so that when war comes and the time for training is over they will be available and ready.[1]

Why command experience?

The Air Force does not state a policy either pro or con regarding command experience. Neither does it make precisely clear what the qualifications are for filling senior command positions. Air Force Regulation 36-23 does make this statement:

> The Air Force officer inventory must at all times include both broadly experienced officers who are qualified for senior command and managerial positions, and technically competent specialized officers.[2]

But does "broadly experienced" include command experience? And which "broadly experienced" officers are "qualified"?

By comparison, Department of Army Pamphlet 600-3 states this policy:

> A command assignment is the most important assignment that an officer can obtain during his career. The *proven ability to command* can influence many personnel actions, such as selection to certain high level schools, special assignments, and promotion for those not specialists. Amount of command will vary in each branch and will be dependent on command positions available. It must not be assumed that a potential battalion commander must have actual command experience at the battalion level. His successful completion of a tour of duty as a company commander, coupled with his other duty assignments in time of peace, should make him a potential battalion or even regimental commander in time of emergency. By the same token, *the actual command positions at the battalion and regimental level will be filled by those officers whose records have been so outstanding as to indicate they are potential division, corps, and army commanders.* [Italics supplied.][3]

The first argument usually raised in defense of the Air Force position is that this is a wholly unfair comparison because the Army has many more command positions in its structure than does the Air Force. This is true. The Air Force has no company-grade command position to compare with the Army company or battery commander. But we have squadrons to compare with battalions and so on up the line to the very top of our force structure. On the other side of the ledger, the Army, like the Air Force, has many more officers in the research and development, logistics, and other support areas than it did in World War II. Yet the Army has not seen fit to de-emphasize the importance of command experience on that account.

What about the "proven ability to command" that the Army stresses? And, in the Air Force, are the command positions at the squadron, group, and wing levels actually filled by those officers whose records have been so outstanding as to indicate they are potential commanders of air divisions, numbered air forces, and major air commands?

Through the circumstance of World War II, many of our present senior commanders accumulated considerable command experience at the squadron, group, wing, and even higher levels relatively early in their careers. It is true that there are exceptions to this rule, but the fact remains that, despite the unusual circumstances through which it came about, most of today's senior commanders had *proved their ability to command* at lower echelons.

How did they prove their ability to command? Was it simply that they could hold a command position and keep their nose clean? More likely it involved exhibiting certain attributes, such as these mentioned by General Thomas White:

> . . . the ability to distinguish between the really vital and the less consequential; . . . the attribute of being able to grasp the essentials and to refuse to be cluttered up with the non-essentials. . . .[4]

and these expounded by General Karl von Clausewitz:

> When we must in war entrust the safety of our brothers and children and the honor and safety of our country to some leader, we prefer to find the critical rather than the creative intellect, the broad rather than the narrow mind, the cool rather than the hot head.[5]

and finally this most important one, which General Ira Eaker pinned down so well:

> The brand of courage which the top leaders were required to display in the last war was the courage of decision making. When you get right down to it, there are not many candidates for leadership, and one reason is that most men hate to make fateful decisions. When the military commander has to make a decision which will mean success or failure, which will cost men's lives, most men shirk from the task. The great majority are happier to follow.[6]

We said earlier that professional schooling and staff duty are not sufficient preparation for senior command positions. The reader may grant the former but argue that staff experience offers ample opportunity to demonstrate the cited attributes of a commander. This is true up to a point, and that point is decision-making.

The staff officer may actually make many more decisions than his commander. However, the staff officer's exercise of authority for or in the name of his commander and the responsibility of the staff officer to his commander should not be misconstrued to be the same thing as the ultimate assumption of authority over and responsibility for his unit and mission, *which lie only with the commander.*

The distinction between command duty and staff duty is also widely recognized by the Army. The reorganization of the combat infantry division a few years back eliminated the battalion as such and provoked comments such as the following:

> There is a serious flaw in the current career pattern for Infantry officers. . . . Replacement of the regiment by the battle group, and elimination of the Infantry battalion in the ROCID [Reorganized Combat Infantry Division] division, *limits the Infantry officer to staff duties* throughout his service as a major and lieutenant colonel. In peacetime, this approximates a span of 14 years *without opportunity to receive a command assignment.* [Italics supplied.][7]

One Infantry colonel even relegated the job of deputy commander, a choice alternative for Air Force command aspirants, into the same category with staff duty:

> The absence of a vehicle with which to train commanders between the rank of captain and colonel is an error of such magnitude as to brook no discussion. A 10 to 15-year gap in the training cycle for commanders is a mistake of catastrophic proportions. We will

> pay dearly for it. *Let no man say that duty as a deputy is a substitute for the responsibility of command.* [Italics supplied.][8]

It is interesting to note that the Army has recently seen fit to reorganize its combat infantry division again and reinstitute the infantry battalion.

The Navy is in much the same situation as the Air Force:

> Our Navy is fortunate in having trained over a long period of time, many senior officers to assume responsibility; we will not lack such officers for several years. When these officers retire, however, we will have to depend on the present generation of officers, now in the middle grades, *to assume high responsibility*. There may be doubt in the minds of these officers that they are being trained adequately to meet these responsibilities. Such training must begin early and must become the central theme of the training program for our officer corps. It must offer opportunity for *full assumption of authority at early ages,* and this authority must be exercised without the fetters of administrative regulation which limit it at the present time. [Italics supplied.][9]

the lack of opportunity to command

There are approximately 3000 command slots in the Air Force today. Of this total, about 2300 call for the grades of lieutenant colonel, major, or captain. Futhermore, there are approximately 82,000 officers serving on active duty in these grades.[10] Simple arithmetic shows that the individual who chooses to protest the lack of opportunities for command experience has set himself an uphill course, to say the least.

Comparison of the few available command slots with the large number of officers available to fill them also serves to emphasize the importance of filling those slots to the best possible advantage of the Air Force. In order to provide for the needs of the future while satisfying the needs of the present, the Air Force must fill the actual command positions at the squadron, group, and wing levels with officers whose records have been so outstanding as to indicate that they are potential commanders of air divisions, numbered air forces, and major air commands.

Are these positions so filled? Who in recent years has not known the "career squadron commander"? This individual has failed to advance but instead has gravitated from one squadron command position to another, finally to retire and take with him into retirement many years of valuable command experience, experience that could have been shared with several potential senior commanders. Surely such a system is not making the most effective use for the Air Force of our few existing command slots. Though the "career squadron commander" may have been genuinely effective at the squadron level, his failure to advance indicates that he did not exhibit the necessary

potential to assume higher responsibilities. Thus the Air Force is realizing only partial utilization of the command slots filled by such officers, while there are undoubtedly many others among the 82,000 who could command those squadrons equally well and, most important, who also possess the potential for higher command positions.

No system could guarantee 100 per cent utilization of the lower echelon command positions. It would appear both reasonable and practicable, however, for the Air Force to institute a policy which would prevent an officer who has had one lower echelon command assignment and failed to demonstrate a potential for higher responsibilities from being assigned and reassigned to other lower echelon command positions until his ultimate retirement.

On the other hand, once an officer has proved his ability to command in a lower echelon position and has demonstrated a potential to assume higher responsibilities, it is wasting Air Force resources to reassign that officer to another similar lower echelon command position. Instead he should be assigned to a staff position, where he can further broaden himself, and another officer whose records indicate high command potential should be given the chance to prove himself in that lower echelon command position.

Thus no officer, whether he demonstrates greater potential or not, should receive a second command assignment at the same lower or middle echelon.

A survey of the command experience of line-of-the-Air-Force officers in the 1962 class of the Air Command and Staff College yielded figures that are indicative of the general lack of command experience among today's mid-career Air Force officers.

The results of this survey are not particularly surprising inasmuch as most squadron commander positions, with the exception of headquarters squadrons and a few other isolated ones, call for the grade of lieutenant colonel.

Though not surprising, the results are nevertheless disconcerting when one considers that two out of three Air Force majors with approximately half of a 30-year career behind them have never experienced the responsibilities of command and that more than four out of five captains with one third of a 30-year career behind them likewise have had no command experience.

The table also indicates that another means of attacking the problem of lack of command experience is through the duration of command assignments. It will be noted that, in the nontactical squadron category, almost as many officers had more than two years' command experience as had less than one year. A further breakdown of this experience shows: less than 6 months, 17; 6 to 12 months, 17; 1 to 2 years, 18; 2 to 3 years, 11; and, more than 3 years, 21. Thus there is no clear pattern established in this category. It appears that the amount of experience accumulated by the individuals was a matter of happenstance.

Air Command and Staff College Survey

Total active Federal com'd service (yrs)	No. surveyed	No. w/o comd exp	Per cent w/o comd exp	Tactical squadron				Nontactical squadron			
				Less than 1 yr	1-2 yrs	More than 2 yrs	Total	Less than 1 yr	1-2 yrs	More than 2 yrs	Total
majors											
Over 17	57	33	58	4	3	2	9	6	3	5	14
14-17	114	76	67	8	4	1	13	9	6	9	24
Under 14	110	76	69	5	4	2	11	9	4	10	23
All[a]	281	185	66	17	11	5	33	24	13	24	61
captains											
Over 14	13	7	54	1	0	0	1	0	2	3	5
10-14	105	90	86	2	0	0	2	6	1	5	12
Under 10	42	36	86	0	0	0	0	4	2	0	6
All[b]	160	133	83	3	0	0	3	10	5	8	23
Total—majors and captains											
All	441	318	72	20	11	5	36	34	18	32	84

a. Six majors, four of whom had squadron commander experience, had group commander experience. All but one served for less than a year.

b. Two captains, one of whom also had squadron commander experience, had group commander experience. Both served for less than a year.

It seems reasonable, however, that there would be some optimum point on the learning curve of command experience at one echelon beyond which it would be of greater value to the Air Force to reassign the individual and allow another officer to commence his own opportunity to command. For lack of any authoritative material on the subject, I would place this maximum limit at about two years. At the near extreme, in the interests of both the individual's opportunity to learn and the least disruption of the unit's effectiveness and continuity of effort, I would suggest one year as a minimum limit for the duration of a command assignment. An Air Force policy to the effect that lower and middle echelon command assignments ordinarily should be for a one- to two-year duration, with 18 months as an optimum goal, would provide for a much more equitable distribution of command experience among those who receive command assignments.

The one argument most often raised against treating lower echelon command positions as a "training ground" for higher command positions is that such a policy is disruptive in nature and tends to degrade unit efficiency. The person who raises this argument envisions a constant turnover of commanders, with the unit in a continual state of turmoil and confusion. Such an argument literally disinte-

grates, however, in the face of the figures revealed in the Air Command and Staff College survey. What could possibly cause more turmoil and confusion in units than this present state of affairs, wherein out of 61 nontactical squadron commanders 17 spent less than 6 months on the job and another 17 spent less than 1 year? Thus, on the grounds of duration of command assignment alone, the proposal for an 18-month goal, plus or minus 6 months, as Air Force policy would, if implemented, exert a beneficial rather than detrimental effect on unit efficiency.

Stabilizing the duration of assignment would not be the only benefit to the lower echelon unit. A policy which recognizes the lower echelon command position as a training vehicle for potential senior commanders would gradually raise the over-all quality of talent filling such positions. The "career squadron commander" would become extinct. The officer who has reached the limits of his capabilities in the squadron commander role and fails to demonstrate potential to assume greater responsibilities would not be reassigned to another squadron command position. Instead he would be assigned to a staff position commensurate with his demonstrated ability, and another mid-career officer whose record indicates command potential would get his chance at a squadron command. Such a policy offers far more assurance of the best qualified officers' arriving at the top command positions in tomorrow's Air Force than the indefinable system currently in existence.

Why a decentralized-authority environment?

It is only reasonable that the tremendous destructiveness of modern nuclear weapons should have dictated that the decision for their ultimate employment be reserved to the President of the United States himself. Likewise the speeds and ranges of weapon delivery systems have necessitated consolidation of control of these vehicles at the highest military command levels. Through their very nature, these actions have removed from the middle and lower echelon commander much of the power of decision that he enjoyed in earlier years. By removing a part of his power of decision, these actions have also removed a part of his learning process. They have deducted some unmeasurable portion of his over-all preparation to assume, some day, a senior command position or to be called upon suddenly to act independently in his present role. Yet they were necessary actions.

On the other hand, centralization of authority has come about for a number of other reasons which cannot be justified upon such solid foundations as the destructiveness of nuclear weapons or the advanced state of delivery-systems technology.

One cause for much unjustified centralization is a simple combination of human nature and modern communications. Elaborate and reliable worldwide communications systems make it possible for the

senior commander to be, in effect, constantly present at the lower echelons of his command. He can thereby keep tabs on major problem areas affecting his operations which require his personal consideration and decision. At the same time, however, he becomes aware of lesser problems, problems which ordinarily he would leave to the good judgment of the subordinate commander to resolve, and is tempted to render on-the-spot decisions himself. Likewise the subordinate commander is placed in the position of feeling obligated to ask advice on matters which he should resolve on his own initiative.[11]

Another contributing factor is overstandardization, or command by regulation. Although there is a definite need for standardization in many matters throughout the Air Force, standardization without proper control defeats the purpose. As long ago as 1958 one USAF wing commander wrote: "The average fighter wing commander today has ninety-six volumes of regulations, manuals, and directives to tell him how to run his station."[12] Obviously, much of that commander's authority or power of decision has been withdrawn from him by overstandardization.

This is not meant to imply that staffs in general are clandestinely plotting to usurp the authority of subordinate commanders. The sheer size of staffs and the volume of business are the main culprits. They grow ever larger, but the number of hours in the commander's day remains constant. Thus matters which once were "major" are relegated to the "minor" category. The staff handles matters of policy. It makes decisions which once would have been made only by the senior commander himself but which he simply no longer has the time to consider and resolve. But in the process of freeing its own commander of bothersome details so that he can devote his attention to matters of major importance, the staff also frees his subordinate commanders of much of their power of decision. Furthermore unnecessarily transferring authority from lower to higher echelons creates an artificially large workload at the higher echelons, which in turn generates a requirement for even larger staffs.

It is rather ironic that so many inroads have been made on the lower commander's authority but that no attempt has been made to lessen his responsibility. One need only observe the rapidity with which many squadron and wing commanders have been relieved of their command because of aircraft accidents or poor showing on operational-readiness inspections in recent years for concrete evidence that the lower and middle echelon commander retains 100 per cent ownership of his responsibility. He not only retains his responsibility, but the magnitude of that responsibility has been constantly increasing while his authority has been decreasing.[13] It is hard to reconcile this state of affairs with the principle that authority must be commensurate with responsibility.

If the problem is recognized already by the Air Force, we are keeping it a well-guarded secret. The few professional publications by or

in the interest of the Air Force are filled with articles on the latest in weapons technology, personnel retention, and management techniques, but extremely close-lipped on the need to combat unnecessary centralization of authority.

In a word, centralization of authority is stagnating. It kills initiative. The junior commander does not have to think for himself. His decisions are made for him. He is told not only what will be done but also how it will be done. Withdrawing the authority from his position also withdraws the challenge from it.[14]

Some readers may feel that the rapid buildup in force structure that thrust great responsibilities upon the pre-World War II junior officer is a relic of another era. The next war will be decided in a matter of days, not years, and the initial phase will be the decisive phase. This may well be true, but a rapid *disintegration* of the force structure, which would be a very real possibility in any World War III, could thrust upon the prewar junior officer far greater responsibilities in far shorter time than occurred from the rapid *buildup* of the force structure in World War II.

Suppose this nation were to be subjected to a surprise all-out nuclear attack without benefit of strategic warning, which is entirely within the realm of possibility. Is it not possible that the high command will not survive that initial attack? If they do survive physically, is it not also possible that vital communications could be so disrupted that the high command's control of the surviving forces would be rendered useless?[15] What greater responsibilities could be thrust suddenly upon the lower and middle echelon commanders of the surviving forces?

In such an eventuality, the final outcome of the war could hinge completely upon the capability of junior commanders to act independently and to make broad decisions. Would squadron and wing commanders who for years had faithfully practiced, according to well-rehearsed, standardized procedures, the ritual of executing decisions made for them by higher authority suddenly produce the brand of initiative and imagination required to regroup shattered forces and devastate the enemy? Could today's lower echelon commander assume authority, reorganize our surviving resources, and—using only broad guidance, the facts at hand, his experience, and his intuitive judgment—make rapid decisions to employ those resources in the most effective manner?

Unless an absolutely unchallengeable need exists for centralization in any given situation, then *authority and control should be delegated down to the lowest operating level.* The senior commander should control through information. He should know what is going on and hold the veto power, but not make people come to him for decisions.[16] The subordinate commander then would know that his superior's silence is tacit approval of the decisions that he, the subordinate, has made and that he need only keep his superior informed of his

actions. The subordinate commander knows the veto will be exercised if he errs.

As for overstandardization, or command by regulation, again the initiative rests with the senior commander. In keeping with the principle of delegating authority to the lowest operating level, regulations, manuals, policy letters, directives, and the like should be reviewed at every echelon of command. All such documents which reserve the power of decision to an echelon where the actual decision will be made by staff officers junior to the subordinate commander in rank and experience should be revised or rescinded.[17]

Finally, authority and responsibility should be brought back into balance at the lower echelons of command. The senior commander must look at the job he has given each subordinate commander to do and then re-examine the freedom of action he has allowed him to do it with. If those two things are out of kilter and the size, or responsibility, of the job cannot be reduced, then he must grant more authority. If it is impractical to increase the subordinate's authority, then it is both unfair and unrealistic to expect him to discharge fully the responsibilities placed upon him.

Is leadership passé?

There is yet another major affliction seriously degrading the value of command experience today. Unfortunately the two primary tools of the commander's trade, leadership and management, appear to have to compete with each other for recognition of their individual importance.

Management was long neglected, not only by the Air Force but also by the other services before there was an Air Force. In retrospect, the reasons are quite simple. Between World Wars I and II the services had so little to manage that the subject would have been almost academic. Because they had so little, they probably practiced a great deal of good management, but the process itself was largely unrecognized and unacclaimed. During World War II, the guidelines were "victory at any cost." Mismanagement had to reach the magnitude of scandalous waste before it received any attention to speak of. But who is to say that that was not the best philosophy for the time? The primary emphasis had to be on building, training, equipping, and supporting the forces required to gain victory. Perhaps it was better to mismanage than to risk overmanaging to the detriment of the prime mission.

Management continued in neglect after World War II. Only when the Soviet Union demonstrated a nuclear capability, and we belatedly set about developing the intercontinental ballistic missile, did the importance of management begin to be recognized. Through the Fifties, as the technological race between our nation and the Soviet Union continually increased in intensity, the emphasis on management increased in the same proportion. We recognized that Soviet technology

had progressed to the point that we could not afford to lose time through poor management. Unity of effort and shortening of the development cycle through the concurrency concept were required, and they were achieved through the application of good management. Further, the cost of new weapons grew to tremendous proportions. If the importance of good management had not been recognized by the services, we not only could have hopelessly lost the technological race but also could have bankrupted the Nation in the process. Thus, when the pressure was on, management was retrieved from its long years of neglect, dusted off, and put to work.

The fact that pressure was put on management is good, but today management is being overemphasized. The perspective has been lost. Even official guidance, such as AFR 36-23, *Officer Career Management,* has been rewritten to focus attention on the *overwhelming* importance of management.

> Managerial responsibility is inherent within each officer position. Normally, it increases in proportion to the officer's progression to higher and more responsible positions. In senior field grade positions, managerial responsibility generally outweighs the requirement for specific technical job knowledge, except in a few of the most highly complex areas.

This same regulation has no such kind words for leadership. It does not point out that leadership is also "inherent within each officer position." Is leadership passé? Now that we have rediscovered one lost art, must we drop the other one in its favor?

Management is essential to command, but management is not command, nor is management a substitute for leadership. Management is nothing more than a process of employing men, money, and materials in a judicious manner.

The Air Force is big business, but it is not a corporation. The commander may be a manager, but he is not running a department store. *The image of the commander as a leader must be recreated.*

IT IS TIME for a good hard look at command. Who will command the Air Force tomorrow? Would our lower echelon commanders be ready if heavy responsibility fell on their shoulders today?

We have many capable, mid-career officers with little opportunity to prove their ability to command and to demonstrate their potential for higher command. We should manage the few command slots we have to the hilt in order to derive the greatest possible benefit to the Air Force from them. But only that commander who can exercise his initiative and imagination and make his own decisions, then stand by them win or lose, is building toward assumption of greater responsibility in the future.

Headquarters Air Defense Command

Notes

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12. Colonel Robert C. Richardson III, "In the Looking Glass," *Air University Quarterly Review*, IX, 4 (Winter 1957-1958), 48.
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THE ROYAL AIR FORCE AND SEA MINING IN WORLD WAR II

Dr. L. R. N. Ashley

THE sea-mining campaign carried out by Bomber Command of the Royal Air Force in World War II created an impressive record. Beginning in earnest in the spring of 1942, the operations yielded a harvest of 900 known ships sunk or damaged. They disrupted enemy sea communications, and they tied down a huge force of German minesweepers. It seems incredible but it is true that during the last year of the war 40 per cent of the entire German navy was engaged in minesweeping operations!

Many a capital ship of the German navy, try as it might to escape damage from the sky, fell prey to aircraft of RAF Bomber Command. In fact, the list of heavy ships sunk by Bomber Command is just about equal to that sunk by all other methods employed during the war.* Consider, then, that important as minelaying was in naval warfare it represented only a sideline of RAF Bomber Command, whose principal efforts were expended on standard bombing missions, raining destruction on land targets, blasting industrial centers (especially oil targets, which took 96,000 tons of British bombs from D-Day to the end of the war), softening up the Continent for the Allied invasion, and supporting armies smashing Hitler's vaunted *Festung Europa*.

From February 1942 until the end of the war RAF Bomber Command was under Air Chief Marshal Sir Arthur T. Harris, G.C.B., O.B.E., A.F.C., Air Officer Commanding-in-Chief. Harris moved up from command of Number 5 Group RAF, the organization within the Royal Air Force which from the start of hostilities had exclusive interest in minelaying. It was natural, then, that "Bomber" Harris should immediately suggest that minelaying at sea become a concern of all groups within Bomber Command. He proposed that 1000 mines a month be laid by Bomber Command, in addition to its other missions.

The Lords of the Admiralty enthusiastically welcomed the idea. In the previous year (1941) only 1005 sea mines had been laid. With the adoption of Harris' suggestion the tempo was stepped up considerably, and by the end of 1942 the annual total reached 9574 mines, accounting for very nearly 15 per cent of Bomber Command's sorties. Medium and heavy bombers were equipped with minelaying apparatus and operated against German naval and mercantile shipping whenever they were not on regular bombing missions. From February 1942 until German capitulation in May 1945, Bomber Command laid an average of 1113 sea mines a month. A naval staff officer was attached to each group in Bomber Command, and the Royal Navy cooperated closely with the RAF in the work.

The effectiveness of the program is proved by the statistics. From 1 February 1942 to 8 May 1945 a total of 45,428 mines was laid. That represented 16,240 missions, or an average of only 416 sorties a month, only 4.8 per cent of Bomber Command's total effort. The score was 491 ships sunk, 410 damaged. One mine out of every fifty sank or damaged a ship!

U-boats in the Bay of Biscay were important and frequent targets. A

*RAF Bomber Command sank *Tirpitz*, *Scheer*, and *Lützow*, attacked *Köln* at Oslo Fjord (later sunk by the USAF at Wilhelmshaven), and bottled up *Scharnhorst* at Brest for 11 months and later mined her (the Royal Navy eventually sent her to the bottom). It put the *Gneisenau* out of operations, knocked *Admiral Hipper* out of the war while in drydock at Kiel, put *Prinz Eugen* out of service for a year, and bombed *Emden* until she was beached and burned out. These victories were generally achieved with bombs rather than mines.

special minelaying effort there in November 1942 protected the great convoys moving from the United Kingdom to Gibraltar to support the North African landings. Sea mines bottled up many U-boats along the west coast of France. Right after D-Day minelaying played a large part in checking the German navy's attempt to disrupt vital cross-Channel lines of Allied communication and impeded the evacuation of the remaining U-boats from the French coast to Norway. Minelaying operations also hindered the prefabricated U-boats which the Germans attempted to try out in the Baltic.

The German merchant navy was greatly disorganized by RAF-laid sea mines. From 1942 onwards traffic in iron ore from Scandinavia to the vast industrial complexes of the Ruhr via Rotterdam and from Bilbao, Spain, to Bayonne, France, was frequently disrupted. The attacks on the sea lines of supply beautifully supplemented the heavy bomber raids on industry in the Ruhr Valley itself. Neutral ship owners, who had rented Germany a large percentage of the merchant vessels being used, were frightened into pulling their ships out of service at a crucial time.

The effects of sea minelaying were also felt sharply on the Eastern Front. The movement of essential supplies from western to eastern ports on the Baltic meant that German ships had to navigate mineable waters all the way from Kiel to Königsberg—and the RAF planted mines there continually. Train ferry routes between Sweden, Denmark, and Germany also came in for their share of mining.

As the invasion of Europe grew imminent, mines were laid in the Channel and nearby waters. This reduced the movement of enemy light surface craft in the Channel, protected invasion convoys on D-Day, and hampered the movement of German troops from Norway at the moment when they were most needed to reinforce the coastal defense against the invasion. Also just before D-Day the minelayers hit the Kiel Canal, Kiel Bay, and Heligoland Bight, a series of operations that is estimated to have cost the Germans 2,750,000 tons of import just when the loss hurt most.

Nor were the capital ships of the German fleet neglected. RAF Hampdens, twin-engined monoplane bombers that could carry up to 4000 pounds of mines, laid their deadly loads ahead of the *Scharnhorst* and the *Gneisenau,* turning the Straits of Dover into dire straits indeed for German battlewagons.*

All the while a scientific war was being waged. The Germans continually strengthened their minesweeping defenses, and the British strove to produce better and better mines. In September 1942 the British laid the first 346 of the new magnetic mines from Bordeaux to Danzig.** That was a mile-

*In March 1941 the battle cruisers *Scharnhorst* and *Gneisenau* put into Brest for refueling after having sunk 22 Allied ships in the Atlantic. They stayed there in drydock (where they were heavily attacked) until 12 February 1942, when they made a dash through the Channel under cover of low cloud. Bomber Command at this time made what use they could of daylight hours and laid mines ahead of the ships. Both cruisers were damaged by these mines and limped into Kiel. Another air attack there damaged the *Gneisenau* to such an extent that she had to be towed to Gdynia and dismantled. It took about a year to repair the *Scharnhorst.*

**The magnetic mine was the Nazis' first "secret weapon" in World War II. It was introduced in November 1939 and, laid close inshore by aircraft and U-boats, sank over a quarter of a million tons of shipping in the first three months.

stone. So was the development of a tougher mine casing that enabled the RAF bombers to lay mines from greater altitudes and thus with greater safety. In early minelaying sorties the Bomber Command had been compelled to drop their mines from 600–800 feet, thus leaving the bombers open to enemy flak. By March 1943 the casings had been improved so that the mines could withstand a 3000-foot drop. Soon afterward parachutes were fitted to the mines to slow their fall, and they could be dropped from 15,000 feet.

As the scientists increased the altitude of the drops, they also improved the accuracy, and by the end of 1943 complex navigation and aiming devices were available. One code-named H_2S came into service in 1943, and a new pathfinding technique was worked out and put into service at the same time. Halifax II and Halifax V bombers, equipped with H_2S and the new all-airborne navigation devices, led the rest—generally Halifax and Stirling bombers—on the sea-mining forays. Gradually all aircraft were fitted with H_2S, and operations were generally conducted at from 12,000 to 15,000 feet. Increased altitude opened up all sorts of new possibilities: for one, minelaying over heavily defended areas—even inshore waters—became feasible.

Having perfected the methods of delivery, British scientists turned their attention once again to the weapons themselves. The defects of the early magnetic mines were soon overcome. In 1942 the double-contact magnetic mine was followed by the first British airborne acoustic mines. Period delay mechanisms and arming clocks were built into these deadly devices. Special antisweeper mines were worked up to make it even harder for the Germans to weed out the "gardens" the RAF had planted. In 1943 a special program of 200 "headache" mines a month was instituted, and the minesweepers were in for even more trouble, constantly faced with new problems. As soon as a minesweeper learned to cope with one new device all his novel techniques would have to be scrapped, canceled out by some still newer gimmick introduced into these 200 special productions.

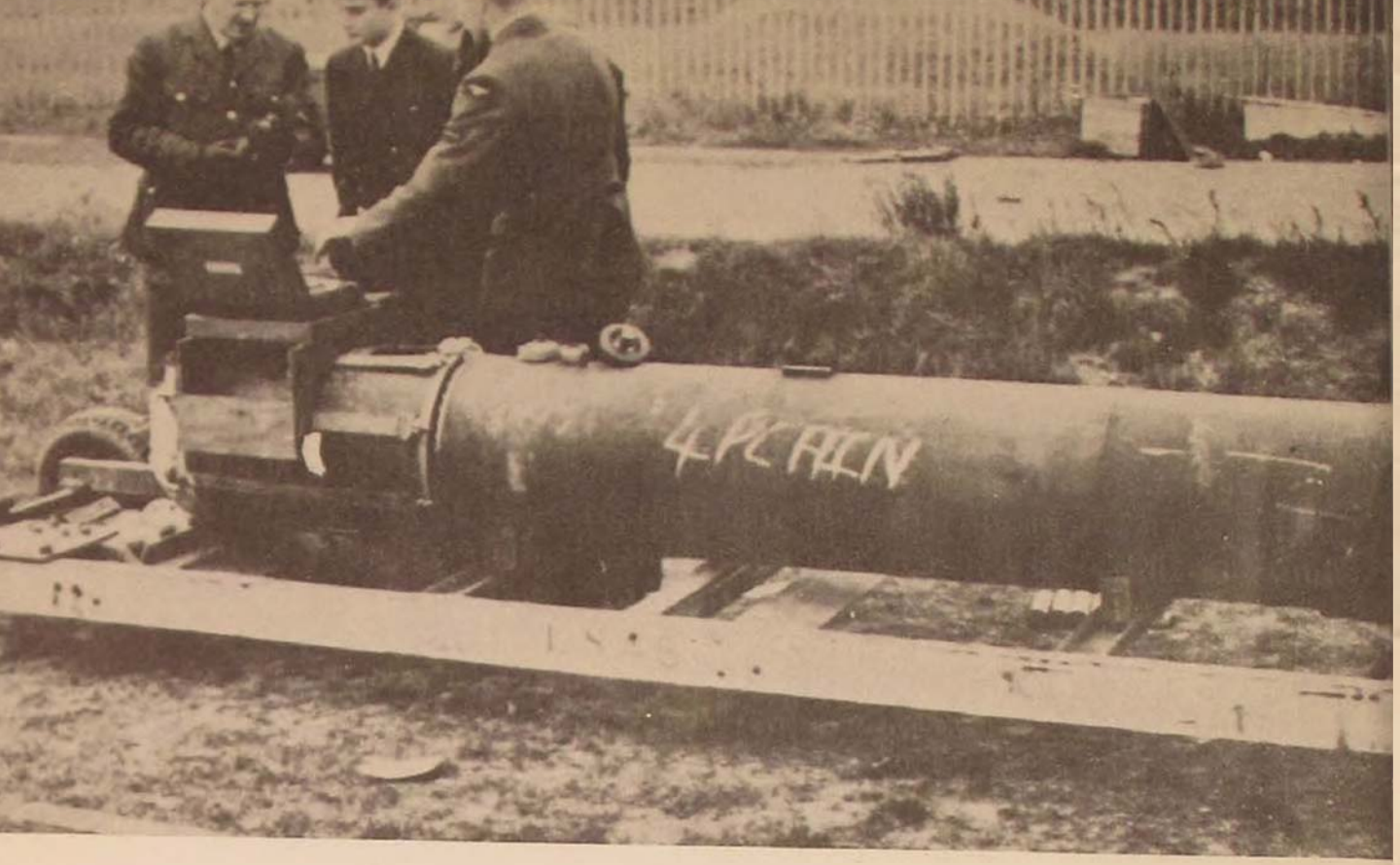
As many as 35 or 40 different types of mines were in general use, but between 1942 and 1945 the commonest were the A. Mark I (1500 pounds), A. Mark VI (1850 pounds), and a few Mark V's and Mark VII's (1000 pounds). The special 200-a-month were variations on these themes. Casings, parachutes, fusing, fitting mines to aircraft, and all the other problems involved were handled with admirable ingenuity and dispatch as a result of the close teamwork of RAF armament officers, Royal Navy specialists, and civilian scientific experts.

Indeed the whole story is one of teamwork. It amply illustrates how cooperation between naval forces and Bomber Command succeeded in turning a "sideline" into a "very profitable business," contributing significantly to the over-all war picture. Since World War II a great many concepts about the nature and function of air forces have changed radically, but it is always best to keep in mind their historic and continued versatility.

Royal Air Force and Royal Navy officers plan a sea-mining sortie.

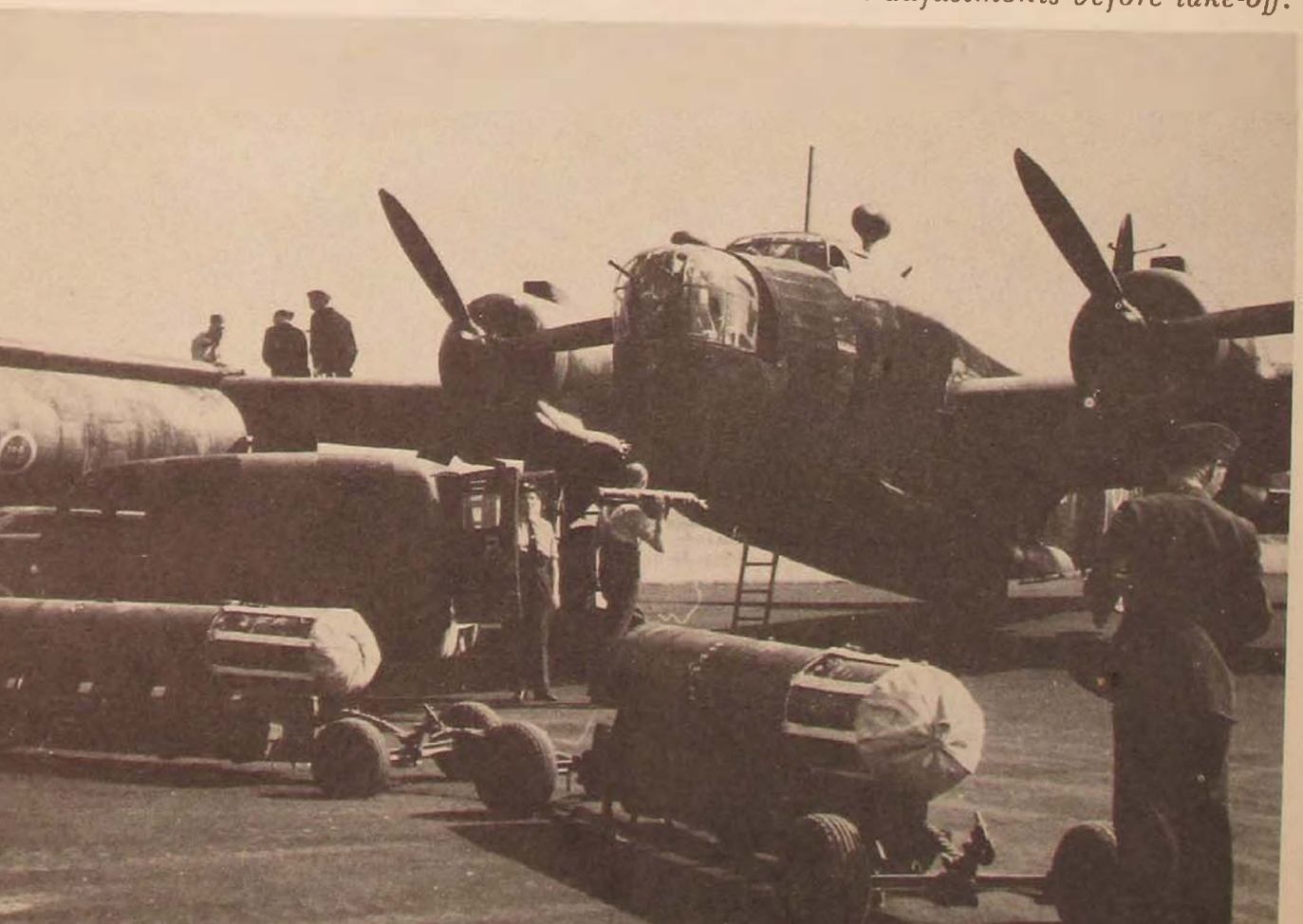
Sea-mining crews are briefed at Lakenheath, March 1944.

A navigator works out his flight course.



Specialists test each mine before it is loaded in a minelaying bomber.

Wellington bomber is fueled as mechanics make last adjustments before take-off.



A Stirling long-range heavy bomber mines up for early delivery.

Hampden bombers head toward Nazi shipping lanes in the North Sea.

A large supply ship sinks in the Kattegat, a victim of RAF mines dropped along the main Nazi supply route to the Norwegian front. Rescue vessels have come alongside.

An enemy merchant ship is discovered foundered the morning after mines were sown in her course.

Bomber Command took its mines far east in the Baltic. This valuable transport loaded for the German Eastern Front sits on the bottom in shoaling waters.

As far south as the Gironde, the enemy's meager but essential seaborne traffic is dislocated. A large merchant ship has been mined and sunk off a spit of sand.

Debriefing. A crew is interrogated after a minelaying sortie.

Sea-mining crew examines wing damaged by enemy fighters.

Incremental Phasing of Mobile Air Strike Forces for Limited War

Colonel Robert A. Shane

LIMITED war has taken on increased significance in the last five years and has sparked an intense interest in the methods used by military planners to alleviate the problems inherent in this type of operation. The tactical planner must devise methods to solve "real life" practical problems now facing U.S. military forces. Much of the current planning for limited war is a by-product of or secondary consideration to the planning required for long-range, widely dispersed operations. More intensive development of stopgap methods is urgently needed to increase the substantial mobile striking capability the United States now has.

Of the many factors involved in planning for limited war, our discussion will deal with the development and implementation of methods to determine and best satisfy requirements for logistical support of a mobile air strike force. First it is necessary to define logistics in terms of its application to limited-war operations. This involves understanding the basic philosophy of logistics, the use of computers, the requirements imposed on logistics and operations planners by the circumstances of limited war, as well as the current logistics theories and practices upon which any changes must be superimposed. On a basis of such understanding the problems facing logistics and operations planners can be formulated in more detail and methods to alleviate the problems can be developed. The methods proposed here represent only a "first look" at solutions—they are not terminal—but they show that the problems, considering available time and equipment, are not insurmountable.

The Problem and a Solution

Incremental phasing tells which items of support to provide, in what quantities, and when. It is intimately associated with such factors as the preferred rate of buildup of the combat forces, constraints imposed by airlift restrictions, requirements for sorties before the arrival

of sea-lift support, etc. Incremental phasing is monitored in the field by the war planner and is one of many key problems he must resolve in preparing a sound war plan.

The war planner makes a classic two-way approach to the problem of incremental phasing. First, on a capability basis, constrained by airlift restrictions, his problem is to compute the optimum size and order of combat and support increments and determine the spacing between arrivals which will produce the maximum number of sorties for a force before the arrival of sea-lift support. Second, on a requirement basis, in the hope of getting more airlift and constrained by a specified sortie objective prior to sea-lift support, the problem again is to compute optimum size and order of combat and support increments and then determine the spacing between arrivals for minimum airlift (normally greater than that available). Finally, prior to the refinement of any mobility plan for the deployment and employment of forces in a contingency area, further work must determine the composition and priority of increments. These in turn must be correlated to airlift limitations and measured against specific political/tactical situations. Work thus far has been most elementary and has failed to measure possible results at the extremes of optional courses of action, much less to consider intermediate choices. Because of the intricacy and ill-defined nature of the calculations, guesswork has been resorted to all too often in determining these courses of action.

During the past five years there have been several limited-war exercises, but the efforts of analysts have generally been focused on the specifics of each exercise (e.g., tactical doctrine, command and control, communications) rather than on limited-war planning as such. After each exercise, analytical effort necessarily returned to general-war problems. That portion of the analysts' time devoted to limited war was spent in the over-all improvement of numerous contingency war plans. Gradually more sophisticated exercises, especially those in Southeast Asia, have brought to light the need for developing a method by which the sortie rates desired by operations could be met or adjusted to coincide with available airlift and logistics resources. To meet this need a close working relationship was ultimately established between combat and logistics operations analysts.

Note, for example, the limited-war situation in Thailand, where no U.S. forces were permanently deployed. Moving the combat echelon from its home base to the contingency area affected the logistics requirements greatly. The logistics required at the home base or other support location perhaps did not meet the immediate requirements imposed by the transfer. Also those resources already existing in the limited-war area changed the logistics requirements. To those uninitiated in combat field operations in an area such as Thailand, simple items such as potable water and adequate tentage can constitute a major problem. In addition a significant problem was the providing of certain critical support items necessary before combat echelons could

begin operations. An inherent weakness was noted in logistics operations analysis. It overemphasized such subjects as inventory control, production/procurement schemes, manufacturer/Air Force Logistics Command operations, and depot repair analyses and failed to give proper emphasis to the logistics requirements of combat elements of the Air Force.

Another requirement which takes on added significance in limited war is the gathering of data from widely dispersed areas and the increased number of points between which data must flow. Since combat echelons operate at many locations, a more sophisticated cross-telling system is needed to meet the requirements imposed by limited warfare.

Requirements that must be satisfied are imposed by various conditions—the geography of both the air base and the area where the combat unit deploys, different weapon systems, peace data versus war data (some air munitions being for peacetime training and others for war use), and limited-war versus general-war data.

Finally, the analyst dealing in limited war must consider the accurate collation and updating of information about the assets of friendly forces (allied units).

Electronic computers have brought the problem within the practical range of analysts and logisticians in the field. A fully analytic solution, however, has not yet been developed, and data supplies and computational facilities in the field would be inadequate to support such calculation even if the model were at hand. What is needed at this point is a compromise solution in which middle-sized computers are used, permitting interim solutions of planning problems to be made from the fragmentary information available early in the game. Such "guesses" may appropriately be dignified by the term "professional estimates," since they may flow from reservoirs of experience. If rough data are initially acceptable, it is possible for a working group of one intelligence officer, one operations analyst, two logisticians, one airlift specialist, and one operations plans specialist to compute manually three basic options within a three- or four-week period. Such a possibility should be broached to planners if the decision is made to develop incremental deployments within a military staff's capability—a decision which the very times seem to call for.

The special problems created by recurrent limited-war situations could usually be effectively solved by an incremental phasing model, a compromise between "crystal ball" guesswork and the use of ultra-sophisticated computer equipment in the field.

We shall use the term "combat logistics" to describe a concept fundamental to the implementation of our incremental phasing model, as distinguished from "business logistics." Business logistics tends to evaluate an item primarily by its dollar worth whereas combat logistics is more concerned with the combat effectiveness of an item. In combat logistics, for example, a piece of safety wire is probably of

greater worth than solid gold mess gear, which would be the more highly valued in business logistics.

A similar distinction exists in the personnel area of logistics. In the "business" sense, it may appear that the ratio of available personnel to authorized manning is quite satisfactory, but if the impact of career field and skills on combat effectiveness is considered, as it must be in combat logistics, the picture may change considerably. For example, combat personnel such as fire control supervisors have a much greater impact on combat performance than clerical personnel, though the latter far outnumber the former.

This is not to say that clerks or mess equipment are unimportant. The massiveness of a total logistics effort in a "business" sense, however, is too unwieldy to merge with the rapid-response computer applications the Air Force is developing today. Thus it is necessary to cull out unneeded business logistics items and arrange combat-related items according to a priority determined by their operational impact.

Incremental Phasing Model

The incremental phasing model, which effects a compromise between the extremes of "guesswork" and "automated" war plans, is composed of six steps: establishment of a system for processing data, establishment of categories of combat-related items, initial establishment of priorities, initial selection of a course of action and the resultant time spacing between increments, refinement of course-of-action selection, and use of computers for sortie optimization. These steps are not necessarily sequential, and there is an interplay between them required by a number of factors involved.

step 1—establishing a data flow system

Throughout the process of selecting the optimum course of action, it is necessary to keep all command levels informed of the status of combat logistics requirements and keep the various levels acting on this information. How this can be done is shown in Figure 1. Combat logistics data are separated from business logistics data at various levels of command. The business logistics data are analyzed by computers, as has been done routinely for some time, and the results remain separated from combat logistics. At each level, business logistics items are eliminated, combat items are rearranged, and other items are added as necessary. The results are siphoned off to the operations center at each command level and then integrated with data from operations dealing with the conflicts over targets, mission profiles, crew and vehicle performance and readiness, etc. Computers (typical electronic data-processing equipment) are used to analyze these data, and the results are translated into language meaningful for operations

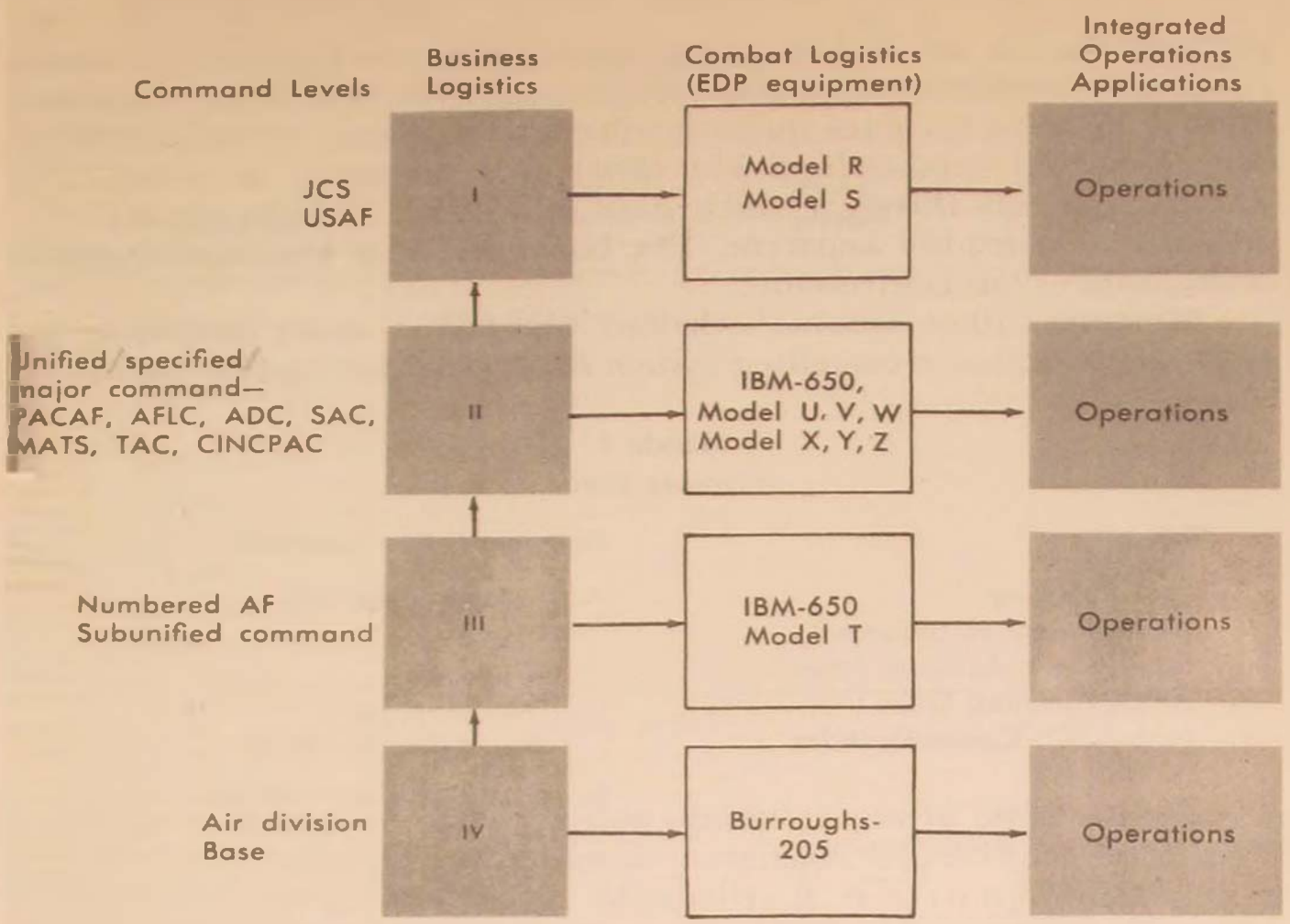


Figure 1. Sample combat logistics siphon

decisions. These results are in the form of computer printouts and include: differentiation by geographical base versus numerical combat units; differentiation caused by various weapon systems; differentiation of quantities of items, activity rates, and types of missions caused by various modes of operation (peace versus war; general versus limited war) ; consideration of the assets of friendly forces.

step 2—establishing categories of combat items

A list of combat-related items varies with weapon systems and with theaters of operation. For a tactical air force whose activities include preparation for limited war, such a list can be covered in 10 to 15 categories, 50 to 100 subcategories, and 200 to 300 items. A list of categories pertaining to aircraft units is presented in Table I, along with a breakout of one category. The 300 items (partially depicted here) represent the heart of combat logistics, perhaps 98 per cent of the logistics impact on combat sorties.

The flow of data is somewhat more complex in the combat logis-

tics area than in the business area. Business data are gathered for each geographic location, e.g., a base such as Kadena, Okinawa, whereas combat logistics becomes quite involved with many diverse cases of data flow and cross-telling. No effort will be made to trace the various channels through which data must flow, but the variety of possibilities is readily apparent. The bookkeeping of business logistics is voluminous but controllable.

However, since combat echelons operate at many locations, a more sophisticated cross-telling system is required for combat logistics.

Table I
Aircraft Units

Category	*Category II Item Breakout*
I. Fuel, Refueling	*A. Oxygen Equipment*
II. Aircraft Ground Equipment	Liquid
III. Base Power, Auxiliary Power	Gaseous
IV. AACS Facilities, GCA	Transport Tanks
V. Non-AACS Communications Facilities	Liquid Oxygen Plants
VI. Transportation	*B. Aircraft Servicing Ground Equipment*
VII. Ammunition, Bomb Handling, Armament	Starting Capability
VIII. Crash, Fire, Barrier	Compressed Air
IX. Runway Construction and Repair, Parking Facilities	Ground Check Power
X. Aircraft Recovery Vehicles and Ground Equipment	Hydraulic Testing
XI. Air Vehicle Systems	Towing Capability
XII. Air Vehicle and Engine System Spares	*C. Non-Powered Support*
XIII. Shops Sustained Performance	Jacks
	Maintenance Stands
	Tow Bars

step 3—initial establishment of priorities

Increments of combat and combat support forces must be listed according to a priority determined by operations without regard to logistics limitations, as shown in Table II. A specific sample contingency war plan wherein empirical data of some accuracy are available to some extent should be utilized during this initial study phase. The listing should not show the time (t) between increments in this early stage; that is computed later. Increments should be either the size of task forces or flights for combat units and the size of work sections or some similar section for combat support units. In laying out the incremental priorities, it is better to list too many increments than too few. As greater sophistication is developed, it will be possible to combine small increments into larger ones for specific situations. The initial study should, therefore, work with the small increments which

Table II
Incremental Force Structure

# Unit Type	Designated Squadron	Home Location	Deployment Location
Increment 1	87th TAC Ftr	Coco AFB	Irrawaddy
t =	Sq Flt A		Mun. Airport
Increment 2			
t =			
Increment 3			
t =			
Increment 4			
t =			
etc. through			
Increment N			

can be used as parts of the various options. Later in programing a computer, one can compare numerous patterns of incremental priorities to determine optimum spacing. Manually, it is a considerable task to measure against a broad spectrum of patterns; however, as trends become apparent, it would be worthwhile even though only limited use could be made of the results.

step 4—initial selection of course of action and resultant time spacing

After increments are first listed in order of priority, the next problem is to determine the time spacing between them. This spacing would be based on given quantities, such as airlift availability and logistics resources in tons and cubic units, and on variable options in the effectiveness. This is illustrated in Figure 2. The objective of the entire process is to arrive at the choice of options which will produce a measure such as the greatest number of sorties for the selected period. Before describing the flow of data and the interaction of the various elements depicted in Figure 2, it is necessary to define the elements shown in Blocks I and II in some detail.

Effectiveness Probability. Effectiveness probability, i.e., effectiveness in number of sorties produced per aircraft (Block II), ranges from something more than 0 to something less than 1. Theoretically, when all resources listed in Block I are moved into place, an effectiveness probability close to 1.0 should be attained for each deployed aircraft in the entire force. Therefore, when all required logistics resources eventually move to a usable location, an effective-

ness approaching 1.0 will be attained under Option A, B, or C (defined in the next three paragraphs). However, between D-day and this point in time, variations in effectiveness probability will give different results as between options. Also it has been assumed that providing the logistics resources in Block I will in fact produce a 1.0 effectiveness if all are delivered, though past experience shows that this is seldom true: austerity in authorization has often caused an understatement (sometimes by as much as 100 per cent) of the resources required. For initial computing purposes, however, and with "tongue in cheek," it will be assumed that delivery of all given logistics resources in Block I will produce a 1.0 effectiveness probability. (Lest those unacquainted with "logistics" in contingency areas fail to recognize what is included in this term, note that people, armament, maintenance, communications, facilities, supplies, equipment, and transportation are all involved, not merely "materiel.")

Courses of action.

Option A—high effectiveness per aircraft—small force in place. This course of action establishes and maintains probability approximating 0.8 to 1.0 effectiveness by deploying increments of the

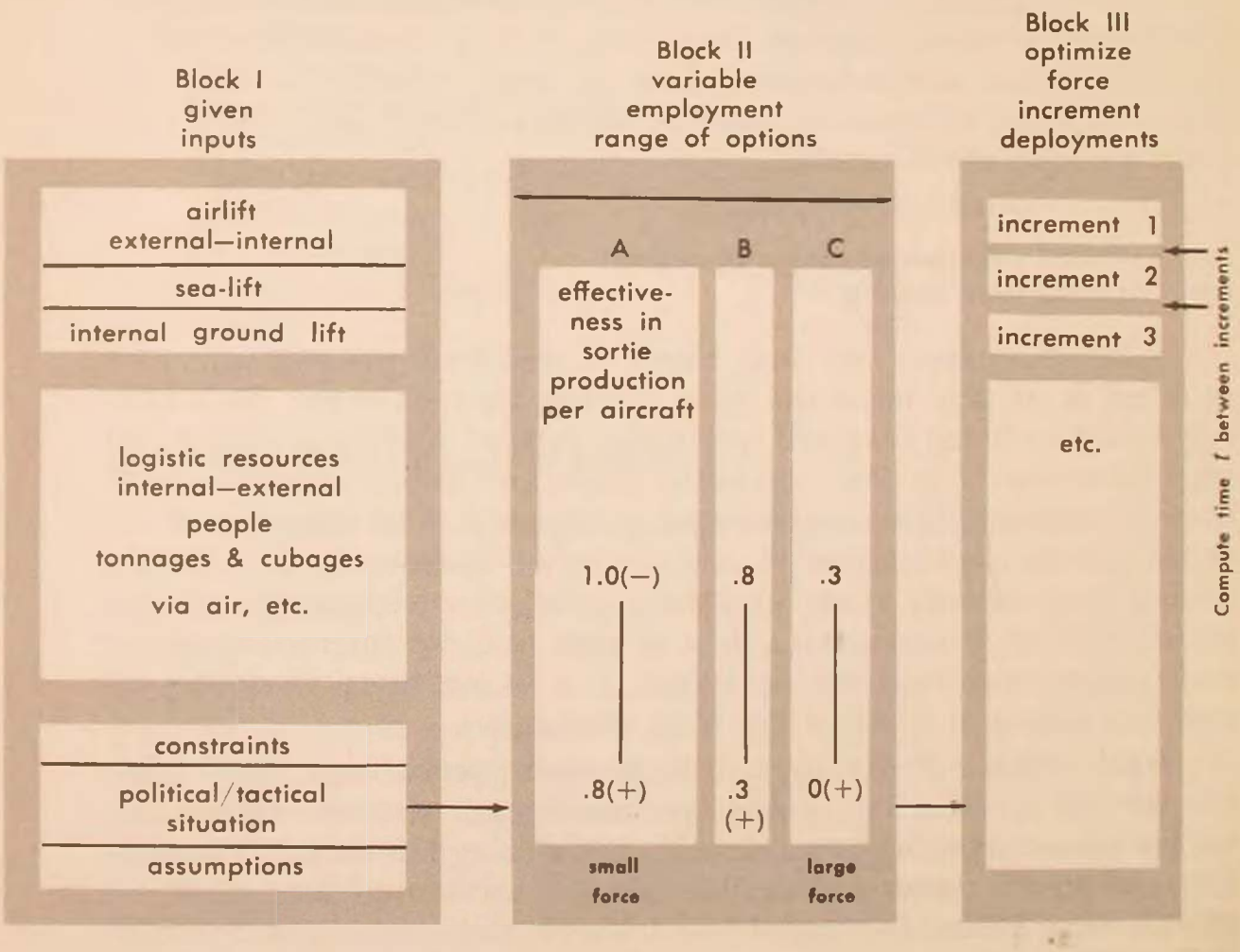


Figure 2. Computer application for incremental phasing of mobility forces

combat force commensurate with the reduced lift of logistics resources caused by limited airlift. New increments are deployed forward only as airlift is available to move related logistics resources to maintain a 0.8 to 1.0 effectiveness. This will result in a pattern of large time intervals between incremental phasing. In Option A, the order of loads would give high performance support to a specific small increment and repeat the same procedure for additional small increments until the entire force is in place on a high effectiveness basis.

Option B—medium effectiveness per aircraft—larger force in place. This course of action establishes and maintains probability approximating 0.3 to 0.8 effectiveness by deploying increments more rapidly than Option A but slower than Option C. New increments are moved forward only as airlift is available to move related logistics resources to maintain a 0.3 to 0.8 effectiveness probability. Pattern of time intervals will be between the two extremes of A and C.

Option C—low effectiveness per aircraft—largest force in place. This course of action establishes and maintains probability approximating 0 (mere show of force) to 0.3 effectiveness by deploying increments in rapid succession with minor attention paid to lift of logistics caused by limited aircraft. Time intervals between increments would be insignificant in this extreme of the probability range. This will result in a pattern of small or no time intervals between incremental phasing. In Option C, the order of loads would be fashioned on a "shotgun" basis to give initial partial and very limited support to the entire force brought in at an early date. The philosophy of Option C is geared to the importance of a rapid show of force. In this case the effectiveness per aircraft probability would build up slowly, approaching 1.0 in the vicinity of the utilization point of sea-lifted resources. This is not to be construed to mean that Option C will not produce more total force sorties than Option A. It well may!

Selection of Course of Action. To determine manually the factors involved in the selection of a course of action, procedures similar to the computer application process would be followed, although on a more limited scale of analysis. Manually, the use of a single situation is the most likely and feasible, with data restricted to (1) given external airlift, (2) given sea-lift arrival date including petroleum vessels, (3) given external logistics resources to be moved only by air, and (4) the most likely of many possible political/tactical situations. How this is done is described below.

Beginning with Block I in Figure 2, data progress through the posting of the given inputs. This first group of inputs includes airlift (both to the area and within the area), sea-lift, and internal ground lift (port, railroad, and highway statistics). Initial computations for manual determinations can be restricted to the most rational airlift to the area (external) even though numerous patterns of lift are possible. Later, using a computer, other lifts such as sea-lift and transportation

within a country can be included for accurate plotting of an entire campaign. If the problem can be limited initially to the period from any D-day to the arrival of forces at sea-lift day (S-day) and an assumption can be made that logistics resources are delivered to usable locations in some efficient manner after being brought to an area, manual determinations may proceed on a limited scale.

The second group of given inputs is the pile of logistics resources available externally and internally, all earmarked for the entire force in question. Without posting Military Aid Program and other friendly force assets (internal) on the computer (a step not yet solved in the combat logistics area), initially it would be necessary to assume that all logistics assets will come from external to internal, from a point outside the contingency area of operations to a point within the area of operations. Logistics assets would also be grouped as to how they must be transported—by air, sea, land, or combinations of methods. Initially items should again be restricted to those involved with movement by air only, thereby reducing the number of factors to be considered during manual determination.

The third given input is that group of constraints imposed by political or tactical assumptions. An example is the assumption that show of force is of greater value than a small, perfectly supported force. Another is the assumption that the first three days are five times as important as the remainder of the period before the arrival of sea-lift forces. Another example might be that every day is of equal value from the aspect of producing sorties between D-day and S-day. These constraints would be provided in the form of Joint Intelligence/Operations assumptions.

The three given inputs would now be utilized to compute the most favorable option in Block II which, combined with t (time between increments) in Block III, would produce the greatest number of sorties during the airlift period from D-day to S-day. Block II portrays three options of effectiveness. With computers available, an almost infinite number of Category B options could be run out. Manually, three options could initially bracket a solution to the problem of spacing of increments. Therefore, only one B-type option would be considered for manual determination.

The mathematical relationship of Block II and Block III can be considered somewhat in the form of a yo-yo or trade-off arrangement. Thus, t in Block III varies inversely with force size, going from Option A to Option C in Block II. This means that high effectiveness in producing desired sorties per each deployed aircraft (Option A, Block II) is constrained by given input limits (airlift), forcing a large t (spacing between increment deployments) for a small force. Since high effectiveness in sortie production can be traded off, Option B is passed through. At its extreme, Option C represents an infinitesimally small t, or essentially the whole force deployed in one day with low effectiveness probability per aircraft. In all likelihood some point

between A and C will produce the probability of greatest effectiveness in sorties for a deployed force. Therefore, at least one mid-position within this option should be manually computed.

step 5—refinement of course of action selection

It must be pointed out that order and content of loads for forward movements of logistics resources to support Option A differ from those under Option C. Thus, if 10,000 types of items (Table III) are required to support Option A, no increment will be deployed without the 10,000 types of items and in the quantity required to attain 0.8 to 1.0 effectiveness per each deployed aircraft. On the other hand, to support Option C only 2000 types of items might be delivered early and with shortages in the quantity of each type as shown in Table III.

Table III
A Real Life Pattern

	Option A (Small Force Increment)	*Option C (Large Force Increment)*
Combat Units	2	50
Differing Type Items	10,000	2,000
Over-all Quantity Fill Percentage for all Items	98%	10%
Total Tonnage	Same as C	Same as A
Effectiveness	1.0—0.8	0—0.3

The resource categories actually moved for a typical mobile air strike force include:

Direct	*Supporting*
Basic Aircraft	Support Personnel
Crews	Personal Equipment
Unit Mission Equipment	Air Base Equipment—e.g., Civil Engineering
Unit Support Equipment	Station Set Equipment—e.g., Vehicles
Personal Equipment	Housekeeping—e.g., Cots
Enroute Kits	All Classes of Supply: (follow-on) I, II, IIA, III, IIIA, IV, IVA, V, VA

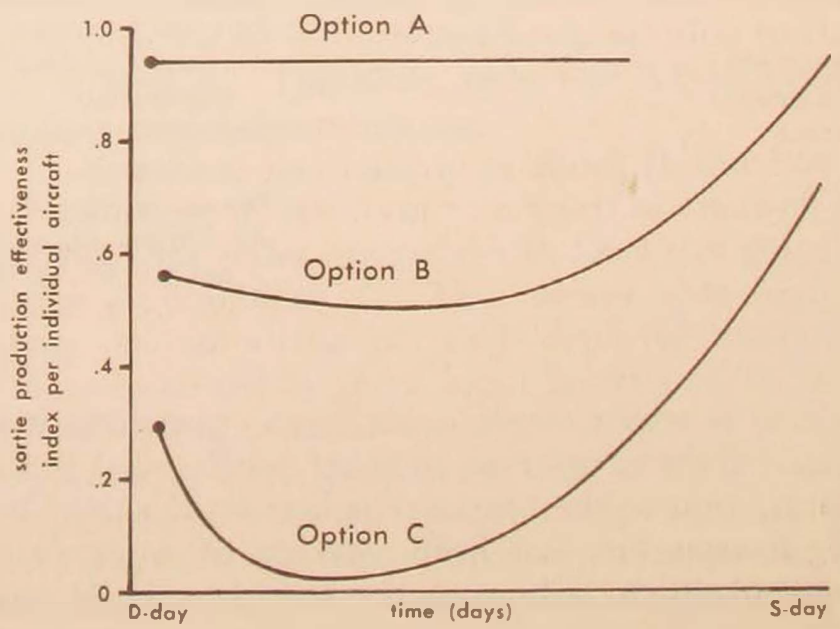
Manually, it is very difficult, aside from "guesstimating," to put items in order-of-delivery priority. In other words, what is the value of the third starting unit to the fourth refueling unit? RAND Corporation, in developing flyaway kits, has been working on interrelationship of items, a problem which is beyond the human mind's capability to

compute mathematically. Initially, however, without a computer model, the judgment of a group of skilled logisticians would be used to decide the type of items, their quantity, and order of delivery for each option. After the D-day deployment each successive day will require a resupply for prior increments as well as the deployment of new increments. This is an important fact to keep in mind, as the resupply problem is often placed in a minor role or completely neglected.

The over-all situation is presented rather simply in Figures 3 and 4. Figure 3 presents the effectiveness probability of producing sorties per each deployed aircraft as a function of time from D-day to S-day. Figure 4 shows total potential effective sorties for the entire deployed force based on the probabilities presented in Figure 3.

The areas under the curves for each option, or simply the totaling up of each day's sorties as shown in Figure 4, will show which option produces the greatest number of sorties. It is apparent that the different options have higher total sorties during different time periods, as well as a different grand total between D-day and S-day. Under all courses of action, the entire force is eventually deployed (enemy action permitting), and all resources are in place. At that point the total sorties for a day are the same for all courses of action. This point of stability (*h* in Figure 4) will be reached at a different time for each course of action. In Option C the last percentage of logistics resources will have less impact on sortie production than in Option A. Thus point *h* will be reached by Option C a short time in advance of Option A, say, S − 2 versus S-day. Under Option B, *h* will be reached sometime between the times calculated for A and C. At roughly S-day, when sea-lift resources are put to use, all necessary resources will be in place and the total force deployed under any option chosen. From

Figure 3. Schematic performance curve per individual aircraft possessed



that point on, airlift options may be considered to have merged into equal performance conditions producing *h* sorties daily, all other conditions being equal.

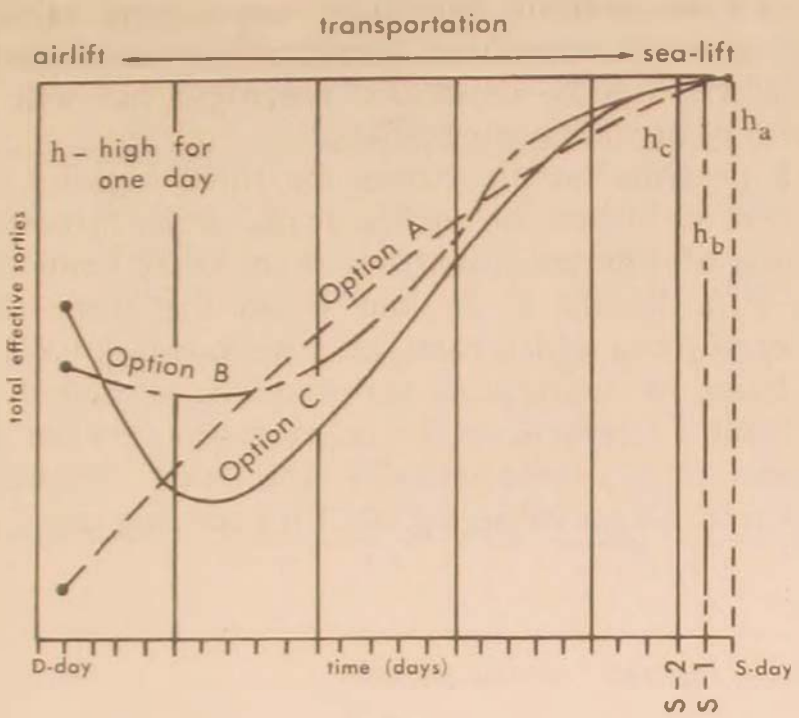


Figure 4. Total performance curves for entire force as deployed. Area under each curve represents total sorties for the period for each option.

step 6—use of computers for sortie optimization

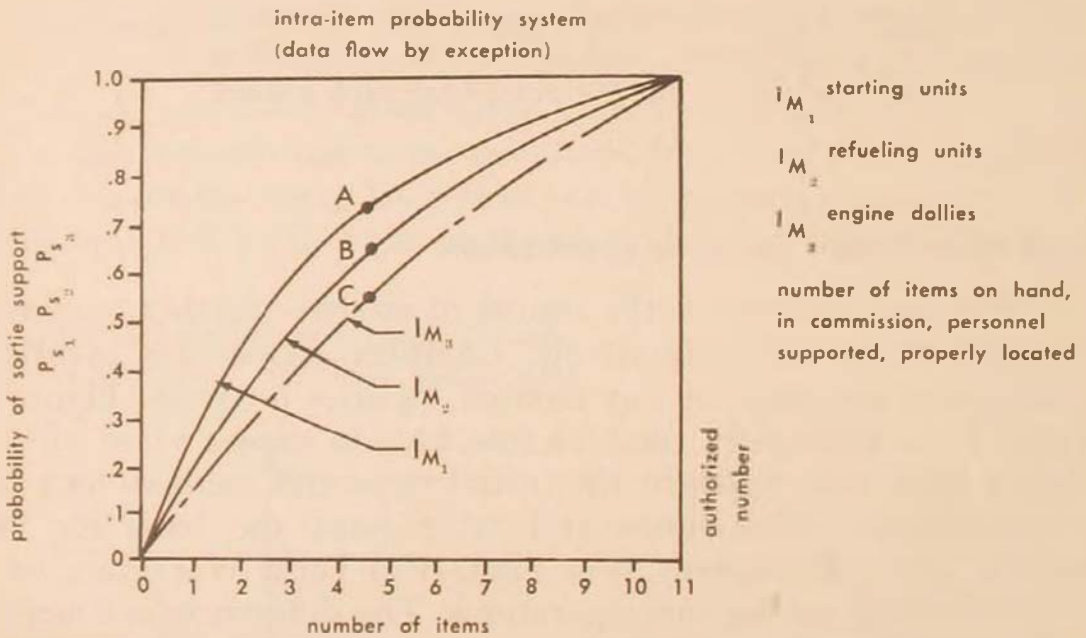
To refine the accuracy of the results of analyses further, computers will have to be used extensively. Complex factors are involved when computers are used for any combat logistics program. Figure 5 and Table IV oversimplify these factors but do depict some of the preliminary logic and represent the initial steps and methodology for sortie optimization. This figure and table form the basis for the development of an Emergency War Plan, Mid-Term War Plan, or a specialized study of contingency operations. The differences are merely in the desired product (capability or requirements), the nature of the operation (general-war or limited-war performance), and the arrangement of data (by unit or by base).

THE SYSTEM developed here is designed to reflect an over-all integrated effectiveness probability. It is also designed to red-flag each critical item so that the fact that a unit is 98 per cent prepared for a war plan will in no way prohibit the reporting of the weak 2 per

cent. The system is presented to highlight a few salient facts on the complexity of limited-war force planning: (1) the use of computers is as essential in limited-war operations as in general war; although forces may be smaller, the volume and frequency of transactions can easily become astronomical in both the operational and support areas. (2) Air Force in-house capability may require augmentation by research agencies and consulting graduate-level mathematicians. (3) The program will not be developed overnight but will profit from early initiation of manual computations.

Figure 5 presents sample curves for three logistics items (I_{M_1}—I_{M_3}) which have an impact on sorties. It shows the intra-item effectiveness probability of different quantities of the three items in producing sorties (P_{S_1}—P_{S_3}). Points A, B, and C on the three curves represent a number of items which meet, on a weakest-link basis, the criteria of being on hand, in commission, supported by personnel, and properly located. Table IV represents the relationship between items (inter-item) in terms of a mathematically developed "Impact Value on Sortie Production." This value, e.g., 0.04 for starting units, is computed

Figure 5. Combat logistics "oversimplified"



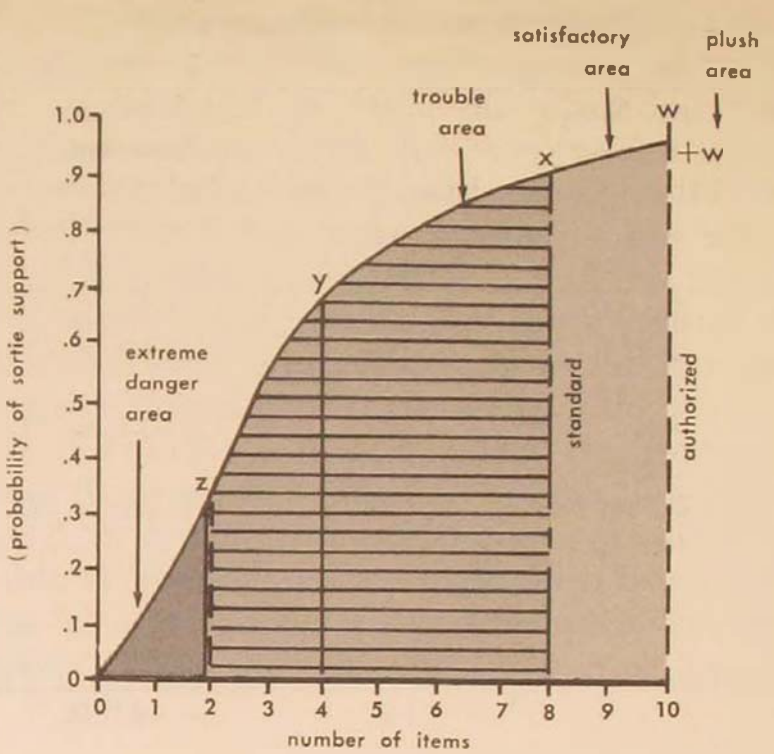
considering data for maintenance, personnel, and location as well as the basic resource or equipment on-hand status. As shown in column 4 of Table IV, predicted performance for starting units is obtained by the product of 0.7 (read off the curve I_{M_1} in Figure 5) and the aforementioned 0.04. This results in a predicted performance value of 0.028, i.e., the weighting of P_{S_1} by an impact value. The total possible

Table IV
Oversimplified Interitem Value System
(Daily Run-out by Mission Unit)

(1)	(2)	(3)	(4)	(5)
Category	Item	Impact Value on Sortie Production	Predicted Performance A Weighted by B Col. (3)	Final Step
Material	Starting		A × B	
I_{M1}	Units (I_{M1})	.04	a. (.7) (.04) = .028	
I_{M2}	Refuelers (I_{M2})	.02	b. (.6) (.02) = .012	interplay of items
I_{M3}	Engine Dollies (I_{M3})	.01	c. (.5) (.01) = .005	
I_{Mx}	etc. (I_{Mx})			
Installations, Communications, etc.				
Total =		1.0	= (x) (1.0)	= (x) (1.0) (adjustment)

impact value (column 3, Table IV) is 1.0, although a computer may never be available for an effort large enough to list all the items with infinitesimally small impact on sorties. Thus, in reality, those items actually listed would total somewhere between a 0.95 and 0.98 impact value, but for purposes of demonstration, let us call this total 1.0. If all the individual items listed in Figure 5 were on record, in commission, properly located, supported by personnel, and available in fully authorized quantities, each of the P_{S_x} values would equal 1.0. It then follows that column 4 of Table IV would total 1.0, equaling the total for column 3. Logistically this is a perfectly supported unit, capable of meeting its sortie levy. Where P_{S_x} values in Figure 5 are less than 1.0, a final step is required as shown in column 5 of Table IV. This is the measure of the interplay between items, e.g., when there are zero starting units, the impact of starting units is greater than 0.04 compared to other items! This is reflected on the bottom line of Table IV. Note that column 3 shows "1.0." Column 4 shows "= (x)(1.0)," where (x) is normally some fraction of 1.0. Column 5 shows "= (x)(1.0) (adjustment)," where adjustment is normally some fraction of 1.0 and could be zero. Thus a situation of no starting units on hand could temporarily produce a zero result for the organization pending corrective action regardless of top performance in all other logistics items. Interplay of items is a hoped-for later step, especially as related to the value or effect of a change in one item on another, e.g., an increase in starting units versus a decrease in refueling units.

Figure 6. Intra-item system blowup of further detail of item I_{M_1} *—starter units*



Slightly more detailed is a blowup (Figure 6) of Item I_{M_1}, starting units, extracted from Figure 5. Four points must be computed on the curve—$w, x, y,$ and z, defined as follows:

$w =$ Authorized number of items. If point w is below $P_{S_1} = 1.0$, additional requirements may be necessary. On the other hand if data on effective items show $+w$, the possibility of redistribution must be examined.

$x =$ Quality control—high standard. This is the point at which the second degree curve flattens, usually between where $P_{S_1} =$ 0.9 and 0.95.

$y =$ Actual number on record, personnel supported, located properly, in commission (on weakest-link basis).

$z =$ Quality control—lower standard. Whenever y falls below z, special computer action will earmark this situation, and in addition interitem interplay will be specially calculated. An example of this situation would be when zero starter units are in commission.

Actually w is the authorized quantity of an item, but x is "accepted" as a standard to reduce load on the computer in reporting cases between w and x. The weakest link is represented by y. Thus, with 10 starting units on record, 9 in commission, 9 personnel supported, and

8 properly located (1 on loan), y would be posted as 8. Where performance dropped below z, a special-action red flag would be designated by the computer on an "Operations Immediate" basis. Where quantities exceed w, the situation would be examined for possible redistribution or additional mission assignment. Data would flow into the computer system on an exception basis only in situations where performance dropped below x or was corrected to a position above x in the profile shown in Figure 6. Some items can be made available in additional quantities as a function of warning time, thus raising the probability of sorties if such time is available. Starting units can be placed in this category. Other items such as petroleum storage and fueling capability may be impervious to short warning times and gain little from such a situation with respect to improving the over-all fuel problem. The computers can handle such factors as part of their programed tasks.

Implementation of the Model

Several steps are necessary to initially implement the daily application of the model to combat logistics:

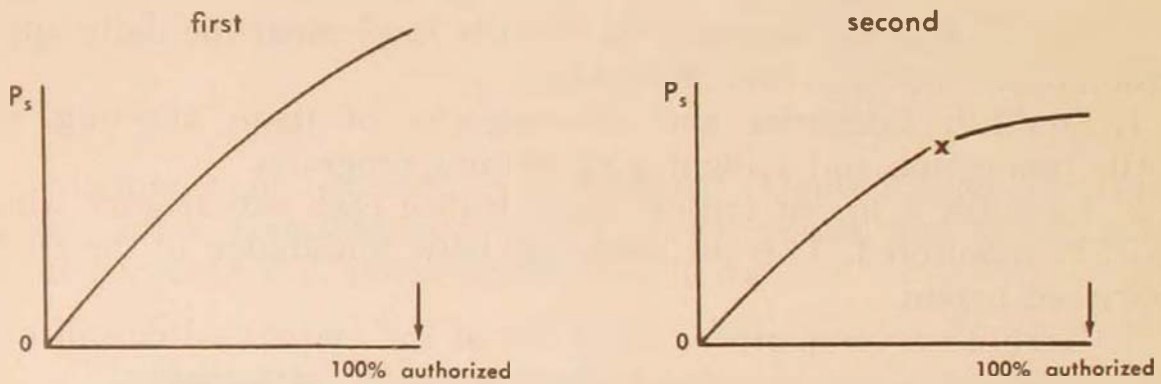
1. Establish categories and subcategories of items affecting war sortie production and flying during training programs.
2. Establish a list of critical items within each subcategory which shall be monitored. This list forms the basic foundation of the model described herein.
3. Establish a component coding list of the major subitems of each item which are most commonly short or out of commission.
4. At the item level, consider on-record supply status, location, commission status, and personnel support. Subitem data should be posted only when an item falls below standard on an exception basis. A typical breakout would be

Category – ground support system
Subcategory – aircraft servicing ground equipment
Item – starting units
Subitem – key parts of starting unit (exception basis only)

5. Establish a list of weights representing impact value on sortie production covering each item. This requires research-agency assistance but can initially be estimated by concerted effort of field logisticians. Such a list of weights would parallel and further develop the efforts put forth by RAND Corporation logisticians in facing similar problems related to optimum flyaway kit composition. Field logisticians also in a qualitative sense can be polled, and based on their ex-

perience will be capable of furnishing a fairly credible ranking for each item including a percentage impact as against the whole. This will not initially include the interaction of items in anything but the broadest sense.

6. Establish an initial series of two curve patterns to cover a range of intra-item probabilities of sortie production. Items will be placed in one of the two curve categories pending a more sophisticated development of individual curves. Basically, one curve approaches a straight line portraying a situation where each successive unit has almost the same value as the prior unit up to the 100 per cent authorized point. The second curve reflects the situation where initial items have a greater effect than additional units (diminishing returns effect). In this case at point *x*, probability increases by only a slight increment up to the 100 per cent authorized point. Curves should appear as in the accompanying graphs.



In the early phase of the EDP system development, curves would not be indivdually prepared for each and every item. Instead one of the two types of generalized curves as shown above would be utilized as apropos for each item. Some items are equally vital at all points of the curve prior to 100 per cent authorized. This is shown in the pattern of the first curve. Some items are not nearly so important after, let us say, the first 50 per cent of authorized are available. This is shown in the pattern of the second curve.

7. Establish a method to reflect personnel effect on probability of sortie effectiveness as reflected on intra-item blowup (Figure 6). One rough initial solution would be a reduction in quantity of items credited based on a skill level on-hand versus authorization by career field formula. This would be applied to various categories of resources involving these career fields. Such a methodology has been applied in Air Defense Command war gaming models. It is not ideal,

but a start in the right direction. A sample formula is shown below.

$$\frac{\text{Credits}}{\text{Requirements}} = \frac{1 + 2 + 3 + 4 + 5}{\text{Authorized number}} = \_\_\_\_\_\%$$

where

1 = 3 levels filling 7 levels in authorized career field *credit* 0.333
+2 = 3 levels filling 5 levels in authorized career field *credit* 0.5
+3 = 5 levels filling 7 levels in authorized career field *credit* 0.5
+4 = Any levels filling vacancies with unauthorized career field *credit* 0.2
+5 = All properly filled authorizations *credit* 1
= Total Credits

Equipment or resource credits would be reduced on a personnel effectiveness basis when the formula results in less than 75 per cent. Thus 65 per cent for starting equipment would reduce effective quantity of starters by 10 per cent. Fractional reductions would be adjusted to the nearest whole number.

8. Items should be differentiated as to whether they are front-line type (unit assigned or producing for specific combat units of one type, model, series) or backup type (base assigned or producing for numerous combat units of various types, models, series). Front-line logistics items will be more easily computed than backup items, which involve a distribution to the various missions supported. A front-line type could be the fire control system of an all-weather interceptor, a backup type a piece of vital field maintenance shop equipment which supports several different aircraft.

THERE IS unquestionably much in the way of a theoretical advantage to the electronic data-processing system outlined. From the aspect of the wing and air base commanders, their staffs, and base activities, a number of practical advantages of the system are readily apparent.

• *It points up danger areas before they materialize and consequently results in improved use of manpower.* In the utilization of basic data, current practice is mainly a corrective process. The large quantity of small critical items which cause the combat system to break down involves such a tremendous volume of data that, with the current guesswork method, the situation can only be corrected following a system breakdown, and base level must continually "fight fires" after they have broken out. With EDP, controls can be set up for every vital item and point up danger areas before they materialize. Another benefit will be improved use of personnel, many of whom were formerly employed tracing and correcting some segment of the wing or base logistics system on a crash basis.

• *It uses data on past trends for forecasting, and the computer serves as storehouse for these data.* Voluminous archives of past data are available. The mass of material covering only a year under our present system is overwhelming. Even with punch-card accounting, to reassemble past data for trend analysis and eventual forecasting requires slow, costly, and often inaccurate effort. The memory of the computer, on the other hand, plus its ability to rapidly process a program, can convert past trends to accurate forecasting. As maintenance data and histories of certain key supplies and equipments can be memorized by a computer, these records need not be bundled up for permanent storage, never to be used again or, at best, used infrequently.

• *It provides cross-tell data.* From the combat commander's outlook, the computer will be extremely valuable, for it will feed back to him in operational language data pertaining to his units which deploy to other locations. This cross-telling procedure will be applied to data pertaining to other major combat commands and Air Force Logistics Command as well, and it is expected that this will be accomplished on a reciprocating basis. For example, the Clark AFB computer in the P.I. would feed to the Fifth Air Force covering north Asia certain information which would be of great interest to all units engaged in operations in the Thirteenth Air Force's geographical area, south Asia. Only through cross-telling can each commander know the complete story on his unit. At the present time, under the manual system, logistics cross-telling is handled in a rather makeshift fashion that leaves much to be desired.

• *It provides many options for one decision and stores them for future use.* The computer will free the planning analyst's time for review of numerous options covering a situation. This will be accomplished in the same time now used by an analyst to analyze a single course of action manually. The result will be a more comprehensive coverage of planning problems and improved decision-making by the commander. Various options can also be stored in the computer memory to be used later as they fit a current operating situation. This will substitute for the usual practice of radically and hastily changing prepared plans because of some "seat-of-the-pants" exigency.

• *It enables the analyst to analyze rather than function as a clerk.* Without the computer, the planning analyst becomes a slave to reams of yellow pads full of figures. In essence, he becomes a tabulating and computing clerk during the bulk of his man-hours, an analyst only for short intermittent periods. This costly, slow process will be greatly alleviated with EDP systems.

• *It provides quick response for the commander.* Combat logistics data are being systematized to provide answers to the commander rapidly and in a form he can use without having a Ph.D. in mathematics constantly at his side. Program applications work will not be

accomplished in a vacuum. Programs will be carefully discussed with unit commanders and operations personnel. The result will be a system of combat logistics geared to operations' need for information concerning the logistics plan. If the combat logistics system is tied in with the operations centers, logisticians are in a position to know what the commander needs, when he needs it, and how to get it to him rapidly.

• *It more closely relates the logistics/operations team.* Combat logistics by its very nature will forge a closer team of operations and logistics personnel. The area of data covered represents a gray area between basic operations and "business" logistics. The combat logistician in most cases has served one or two tours of duty in operations as a primary duty. It is anticipated—and early work seems to bear this out—that closer teamwork will result between these two major staff activities.

• *It holds beyond aircraft and crews.* Basically, as one progresses beyond the aircraft and crew, logistics data break up into a myriad of small items. Each item has a minor impact on the unit effectiveness of a combat organization. This minor impact is almost impossible to measure without the utilization of a computer, or, its importance having been measured, the volume of data covering the many hundreds of such items exceeds the capacity for manual determination. Even though the effect of each item may be minor, the total effect of the items governs the real effectiveness of combat operations. The computer thus enables a look beyond mere aircraft and crew.

• *It recognizes and handles combat logistics.* The proposed combat logistics EDP system recognizes the fact that a combat computer system which proceeds down two individual channels, materiel and operations, will be at best only partially successful. This fact is not always easily recognized. The operations applications may be prepared unilaterally and without consideration of logistics, and logistics applications may be prepared from a business aspect without regard to operations. The closing of this gap is embodied in a recognition and special high-priority treatment of combat logistics.

• *It will fit in with the worldwide data net.* Many of the features being developed in the combat logistics EDP system will eventually fit in with the over-all USAF EDP pattern. Every application would be developed with this thought in mind. In no case is an application planned in such a shortsighted fashion that it fits only the Asian example used in this paper. The extra work involved to make this possible will, in the long run, be advantageous as each combat air force takes its place within an over-all system where all subsidiary air elements are compatible if not perfectly similar.

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Enigma of the International Military Staff Officer

LIEUTENANT COLONEL JACK E. CARTER

WHY IS IT that two officers having just completed similar assignments to key positions on international military staffs give such divergent views about their tour? One may consider the experience to have been the richest and most rewarding of his career. The other comes away shaking his head and attests it was the most frustrating and bewildering experience he ever encountered. Could it be that the first faced up to the facts of life about the duty and was able to deal with the situation, while the second never did actually appreciate and effectively grapple with the many varied and strange problems? Only by being aware of these problems can one adjust properly and determine means of performing more effective international staff duty. An officer who gets this type of assignment can rest assured that changes are in store for him, and the greater the responsibility the more essential it is that he be aware of these changes.

Most officers assigned to an international headquarters are thoroughly versed in uniservice national staff procedures and quite frequently are familiar with joint national headquarters. The differences between the systems with which they are familiar and the international system come as quite a shock—a shock that can be cushioned somewhat if these differences are known in advance.

command by persuasion

The job of the international staff officer, as well as that of a national staff officer, is to assist the commander in performing his command functions. Command functions of an allied commander are seldom, if ever, as neatly defined or clear-cut as they are in national commands. Their terms of reference are subject to agreements by the sovereign nations having forces in the particular command. The members of international organizations are not going to surrender any more sovereignty than absolutely necessary. Thus they are careful to limit the allied commander's authority in peacetime. His wartime powers will normally be those necessary for any supreme commander, but quite often they are carefully left undefined. Yet in peacetime he is given broad responsibility for organization, training, and coordination of logistics even though the authority for carrying out this responsibility is frequently limited to making recommendations. By necessity, the supreme commander retains certain authority which further limits and complicates the work of subordinate commanders. The further down the chain of allied command one goes, the more clouded command authority and responsibility become. Throughout all echelons the work is more advisory than executive in nature.

It is frequently said that the allied commander "commands by persuasion." This can be most perplexing to the officer who has had experience on a national staff where the commander's authority and responsibility are clear-cut and he goes about the business of commanding. This was effectively pointed up in a memorandum by Admiral Robert B. Carney to his staff just after he took over command of Allied Forces Southern Europe in August 1951:

> Politics are politics the world over and many times we encounter difficulties and objections which are illogical from the military standpoint but which stem from political factors that are very real to the officeholders, the voters, and the taxpayers of the countries concerned. It is to be expected that we will frequently encounter problems of obscure and puzzling origin, and an awareness of the probability should help to foster the patience and flexibility necessary.[1]

formal and informal system

What type of organization will an officer encounter if he is assigned to an international staff? United States concepts of command authority, responsibility, headquarters organization, and staff functions have been generally accepted for most allied commands, except as to the limits of authority placed on allied commanders. Beyond this, allied commands are integrated though international in character. Thus the problems of an international headquarters are considerably greater and more complex than those of national commands. The interna-

tional aspect and the lack of approved policy and doctrine present a multitude of unique problems.

The official staff organization is quickly recognized as being similar to U.S. staffs and is therefore easily understood. As with most staff organizations, however, there is a very definite informal organization, a select group of people spread throughout the headquarters who are the contact points for "getting the job done." These unofficial channels seem to be even more pronounced in allied than in national staffs. The causes are many. First, there is a tendency for nationals to work through fellow nationals; for example, a U.S. officer in operations is likely to go to an American in communications for information or action. Then there is also a tendency to work with people that have the same native tongue. Although there seems to have been some success in eliminating this informal method of operation in many allied headquarters, no doubt it will continue to be a problem for a long time.

national manning of staffs

It has been policy in many international headquarters for staff manning to approximate the proportion of national forces in the command. Thus staffs were composed of personnel from many nations diverse in language, culture, custom, and economic and political structure. It was not always possible, however, to adhere strictly to this idea when the international staffs were initially established. There were various reasons why some European countries could not provide their proportionate share of sufficiently trained staff officers. Many were lost during the war, and their staff schools were not geared to the increased demand. Also some countries urgently needed their best officers at home to rebuild their forces. Thus, in order to get the headquarters functioning, it was necessary for Americans and British to man a major part of the initial staff organizations. It was anticipated that as additional forces were committed by other countries and as additional officers were trained in concepts, planning techniques, and languages there would be an adjustment in the national proportions.

It is generally recognized that international staffs are purposely overmanned. There are two reasons for this overmanning. First, it is desirable to have a good spread of national representation throughout a headquarters, and each nation wants maximum representation for prestige purposes. Second, and probably most important, it is necessary to allow for the training of other nationals in staff work. With the United States assuming the major role of leadership, the job of training falls to U.S. officers, a job which is not always appreciated. It is for these reasons and because of the large number of U.S. forces committed that so many U.S. officers are found in most international staffs. The number has been reduced in several headquarters, but the preponderance of officers in most headquarters is still American.

fixity of organization

When a headquarters is initially established, the manning document is agreed upon by all nations represented on the staff. This agreement fixes the organization, grade structure, and nationality of the officers to be assigned. It seems a wonder that agreement is ever reached, considering each nation's interest in having its personnel in key positions.

A staff organization is of a dynamic nature, and changes should be made to meet changing requirements. However, a major change normally has an indirect effect on the entire staff structure, and this requires agreement in an international headquarters. The Chief of Staff of a principal subordinate command once set about to improve the effectiveness of his staff by combining the Plans Division with the Requirements Division. In addition to improvement in effectiveness of the organization, this meant that the Chief of Requirements position would be eliminated and the new Chief of Plans would have more authority. To pacify the nation of the Chief of Requirements, considerable reshuffling of many other spaces in the headquarters was necessary.

After many months of planning and detailed coordination, it looked as if the change would be beneficial and everyone would approve. The elaborate and apparently satisfactory proposed changes met with initial agreement by all senior nationals in the headquarters. When the time came for the change, however, it could not be effected because the national governments would not concur. The process was repeated three times, but even after three years of effort, final approval could not be obtained. When the project officer left the command, his only legacy for his replacement was the advice, "Never, but never, attempt to reorganize." Actually, changes are made in international staff organizations, but it takes considerable time and coordination and an abundance of patience.

This fixity of organization—the inability to make periodic changes easily—contributes to the functioning of the informal or unofficial system previously mentioned. Further, the lack of an appropriate organization to meet special needs or changing requirements results in many other bad effects, from slowing down staff functions to violating channels of command. However, if the staff recognizes conditions and makes the best of an undesirable situation, it can continue to operate effectively. It is the quality of people and the manner in which they are used that develop effectiveness. A good organization with poor people is no good, but a poor organization with good people well integrated can make an effective international staff.

combined vs. integrated staff

The basic philosophy of an international headquarters should be

integration, and it *is* in the most effective organizations. General Eisenhower repeatedly stated that, unless there was integration of forces and command organizations, there could be no effective international force. The term "combined staff" is frequently used when referring to allied staffs. "Combined" does not carry the same connotation as "integrated." The difference stems from the basic concept of the organization and is dramatically illustrated by the current discussion within NATO concerning implementation of the Nassau agreement. The profound disagreement is over basic concepts of how the allied organization and Western global strategy planning as a whole should operate. The most important issue pertains to the philosophy of the North Atlantic Treaty Organization. President de Gaulle feels that the present concept must be changed from integrated defense to combined defense. He says the defense of a country "must have a national character" instead of having its defense forces "swallowed up" (integrated) so that an American or Italian or Briton might be commanding French forces, or vice versa, or so that forces might be a mixture of nationalities. Nevertheless the basic philosophy of the international forces remains integration.

It is not intended to debate the concepts of a particular organization. The issue is brought up for two purposes: first, to provide the necessary understanding of the philosophy of integration of forces and of organization; second, to explain the differences between the "integrated" and "combined" concepts and point out some of the pitfalls of thinking solely in terms of "combined" staffs.

The accepted U.S. Joint definition of "combined" does not sufficiently describe the composition of an integrated headquarters.

> **combined.** Between two or more forces or agencies of two or more allies. (When all allies or Services are not involved, the participating nations and Services shall be identified, e.g., Combined NATO Navies.) [2]

The concept is not merely to combine or bring together efforts, forces, and staff personnel but to integrate them into a cohesive and effective defense force. International headquarters should be organized and manned as integrated staffs and should so function. A staff officer of one nationality would, in all probability, find himself working for a boss of another nationality, e.g., a Turkish officer working for a Greek officer or a Frenchman working for a German. Americans are working for officers of all nations participating in the various headquarters.

It might be asked, Why all the discussion about what the staff should be called? It is essential that staff officers appreciate the spirit of unity and integration within the international headquarters. Further, an integrated staff means integration of all nationals, U.S. nationals included. The idea of integrating all others except U.S. nationals is not in keeping with the spirit of unity and could be detrimental

to staff work. In an effort to improve staff effectiveness the attempt was made to integrate the "other nationals" (i.e., other than U.S.). Staff integration was needed, but complete staff integration, not just the "fitting in" of other nationals. The implication was that they were being integrated into a U.S. system, and the effort failed because of the resentment generated by the approach.

U.S. influence

The staff system of an international headquarters is normally that of the nation contributing the most forces to the command. More often than not it is the system of the commander. It is normal to expect the commander and his chief of staff, who is frequently of the same nationality as the commander, to work through the system to which they have become accustomed in their many years of service.

Since the U.S. was the only nation with sufficient economic, industrial, military, and geographic strength to meet the requirement, it assumed leadership of the free world. Consequently it was agreed that certain key command positions would be U.S. Further, because of the historical and political differences of countries contributing forces in the many commands, a commander from an outside and unbiased nation is often desired, frequently a U.S. commander. Thus the statement frequently made is true that the U.S. provides more commanders than other nations, and it is true that their staff organizations have the characteristics of U.S. staffs. Regardless of the international headquarters to which a U.S. officer is assigned, its official organization will be familiar to him, though the unique aspects of the integrated system may well present some problems.

the gray area

In a speech on 16 December 1957 General Lauris Norstad, former Supreme Allied Commander, Europe, stated: "It would not be possible here to describe in detail the problems—political, military, economic, and psychological—that have had to be overcome to make NATO the strong bulwark against aggression that it is today." Service with a NATO headquarters can be more exacting than any uninational service. The exaction may not be in the form of higher output, but it will probably place heavier requirements on the individual's patience, tolerance, and ability to adjust to the new working environment and procedures.

The requirement for the attributes of patience, tolerance, and adaptability is always stressed in discussion of international staff duty. However, the discussion becomes vague and cloudy when consideration gets down to the practical aspects of developing loyalty to an international headquarters.

"sink or swim together"

Officials of any international organization must develop a loyalty and attachment to the organization served. They must strive to understand different views, cultural patterns, and work habits. They must be able to work objectively with people of other nationalities, religions, and cultures. Most international organizations employ permanent civil servants, and a reservoir of qualified international civil servants is gradually being built up. This is also true of the secretariats and certain civilian administrative employees in the international military headquarters. It is not necessarily true of the military staff personnel.

It is a very difficult job to promote the desired loyalty among the permanent personnel who are employed, paid, promoted, and released by the international organization. The problem is magnified many times as it relates to international military staff officers employed, paid, promoted, and released by their national governments and not by the international organization. Yet it is essential that staff officers be loyal to the international command.

When General Eisenhower was establishing Supreme Headquarters Allied Powers, Europe, he recognized that his first problem was to build "loyalty to an international team." He stated the case plainly in a personal letter to each of his staff members, which was quoted in *The Joint and Combined Staff Officers Manual.* It read in part:

> As a member of SHAPE you are given the opportunity of contributing heavily to the preservation of a peaceful world and to those values cherished by free men. The worth of your contribution will depend in large measure upon your recognition of the fact that the purpose to which your country has subscribed will be best served by your unswerving loyalty to our allied team.[3]

The same source quoted Field Marshal the Viscount Montgomery of Alamein, former Deputy Supreme Allied Commander, Europe, as expressing it this way:

> The really necessary thing is for every officer to understand that he is an international and not a national person. Although by accident of birth he happens to be British, for instance, he must be concerned just as much for the defense of France, Belgium, and Holland as for the defense of England. I am an international soldier; so must they be. It is not always easy to make people understand that. If I allowed national feeling to rule, I would never get anything done at all. We are all one team and we sink or swim together.[4]

These are noble words, but how are they to be implemented? How is an individual with many years of training and experience in developing loyalty for his service and country to develop this new loyalty—international loyalty? How can a person *subordinate* loyalty to his country to fidelity to an international cause? First, he must realize that

it is not necessary! Developing loyalty to an allied cause should not detract from loyalty to one's own country. The key to this lies in General Eisenhower's statement that loyalty to the allied team best serves one's country. Neither is there normally conflict between loyalty to the allied organization and proper United States representation.

Loyalty goes much deeper than merely talking about changing a philosophical outlook. Many factors work against this deeper loyalty, not the least of which is the attitude of officers who submit effectiveness reports—a matter for later discussion. An appreciation for the international outlook must be developed at the top and reflected down through all echelons if the staff is to function as an effective and integrated unit.

legal organizational channels

It is an accepted principle that organizational channels should be followed. Bypassing channels is undesirable in any organization. But it takes place. A national staff can tolerate an occasional bypassing of channels without too much ill effect. To an international staff, bypassing channels can be more detrimental than any other one thing. It can negate all other efforts to develop a truly integrated staff. Yet there is a natural tendency to develop national short cuts and bypass individuals of other nations in an international staff. This fault normally starts at the top rather than at a lower level. Once started, it becomes routine, and many woes beset the staff.

Admiral Henry E. Eccles, who served on an international staff, has stated:

> The Deputies are sometimes by-passed by the Chief of Staff or Division Chiefs because of the need for speed or because of language problems. For the same reason the non-English speaking officers within the divisions are sometimes by-passed. The Chief of Staff may by-pass the Division Chiefs and use his special assistants. . . . Again the need for speed may cause this. . . .[5]

When an individual is pressed for time and especially where he encounters language problems, it is very tempting to disregard established legal channels. Yet this bypassing should be avoided. The practice encourages the formation of national groups and general acceptance of informal or unofficial functioning within the international organization. Developing confidence among the various nationals is very difficult, and once established it cannot stand many jolts. The sensitivity of international staffs must always be kept in mind. Bypassing channels may accomplish a particular task quickly, but it normally has a severe effect in the long run because so many people are not contributing. Successful accomplishment of one task is not worth wrecking the over-all operations of the staff.

dual security systems

Smooth operation of the staff is also affected by the required dual security system for each nation—international headquarters security and national security. The need for security of national matters can be misinterpreted and consequently affects loyalty to the integrated staff. It is easy for newly assigned staff officers to overclassify national matters, which keeps them out of international channels. Admiral Eccles also recognized this problem:

> While each nation has a perfectly legitimate reason for dealing with purely national matters among its own native groups within a NATO staff, there seems to be no way of publicly admitting this and setting it up on a sensible basis.[6]

It is evident that this necessary evil is one that must be reckoned with.

pushing the panic button

Although it appears that the international staff will have to live with the national security problem, certain undesirable national traits must be eliminated. High on the list for Americans is the national tendency to do things in great haste, which often results in "pushing the panic button." Panic operations have no place in an international headquarters. If a United States chief wants a problem to be handled strictly by U.S. officers on an international staff, he needs only to say the word. If a Norwegian or Frenchman or Italian is working on a project at a normal pace and an unreasonable suspense is placed on it, one of two things may happen. Either he will ask a U.S. cohort to take it over or someone up the line will insist that a U.S. officer pick it up and race it through to completion.

But when staff work is forced from the hands of another national to a U.S. staff officer, it crushes the loyalty of both to their common headquarters. The other national who was originally responsible takes the attitude that there is actually no need for him on the staff, and in the future he will not put forth much effort. The U.S. staff officer is forced to the position of retaining or taking over the work and developing it so he will not be caught short. If he has it in the first place and the suspense date is moved up, he will be in a better position to bring it to a rapid and successful conclusion. The end result of such a situation is that the staff officers undergoing pressure end up with most of the work, and only insignificant matters are given to the other nationals. Thus a dominated headquarters rather than an integrated staff develops, and loyalty to the international headquarters is only lukewarm.

Anything that contributes to developing national cliques also encourages staff activity through the informal channels. The certain few that are called on to produce rapidly become known by the other staff members of the same nationality. Then when they have staff

activity in another staff agency, they go to their respective nationals. Once this informal setup becomes firmly established, international staff loyalty has almost gone by the board. A vigorous effort to reintegrate the staff will then be required if it is to be returned to a real integrated and international status.

the project system

Another natural tendency in an international staff is to fall into the trap of the "project system." This gimmick, requiring that all staff actions be grouped into projects under the guise of simplified staff management, is harmful to command loyalty. The assignment of projects has some merit, especially in a national staff, but the tendency to put *all* staff work in the form of projects and assign these projects to a particular officer can be very harmful in an integrated staff. An example of this was related by an officer who "had a friend that devoted his entire tour to one project, development of an air rescue plan." This officer contributed very little to the staff. First, there was little to be done on the project, and second, he was never given anything else to do. Since this project made up his one job, he did very little other constructive and creative thinking.

An integrated staff is designed around homogeneous functional areas, as are U.S. military staffs. A staff officer is responsible for a particular functional area of staff work. He is there to assist the commander by doing creative as well as routine staff work. A system in which a narrow package of work is assigned an individual makes it difficult if not impossible for him to contribute his best.

who rates whom

A staff officer will not be fully loyal to an integrated headquarters as long as the quality of his performance is rated strictly on uniservice or uninational basis. Full consideration will not be given to the individual's loyalty to the international staff. In short, if the rating officer does not thoroughly understand and appreciate loyalty to the allied command, the staff officers for whom he prepares the national effectiveness report will not be motivated to do effective international staff work.

Reporting officer effectiveness becomes a problem in the allied staffs. Since an officer frequently works for a boss of another nationality and/or service, the normal uniservice procedures do not apply. One method requires the immediate superior, regardless of service or nationality, to submit a letter report on the individual being rated. This letter replaces the normal report and is included in the record. The proponents of this method say that the letter report reflects the actual effectiveness on the job, that while the rater may be of another nationality or service he is the one most familiar with the rated offi-

cer's work. On the other hand, many question the actual weight that a letter of this type carries with a promotion or selection board. A similar method asks the immediate superior to submit a letter which the next senior officer of the same nationality and service in the chain of command uses to make out a regular service effectiveness report. These two methods seem to be in line with the international aspects of the job and should reduce some of the loyalty problems previously discussed. However, if the letter report does not carry the same weight as a regular service report, the individual being rated is at a disadvantage.

A third method is aimed at preventing this disadvantage. The next senior officer of the same service in the chain of command makes out a regular report as if the officer being rated worked directly for him. This method does not depend on a letter or report submitted by the immediate superior. Without an acceptable report from the immediate superior, the officer being rated is inclined to look to the next senior officer of his service as a boss. This could have a direct bearing on the rated officer's loyalty to the international organization. Regardless of which method is used, the rated officer could well question the effect it would have on his career progress.

The matter of loyalty to an international organization cuts across all aspects of staff functions, including pace of activity, language, and human relations.

pace of activity

In general, the American considers himself a man with energy, drive, and ability to accomplish things. These traits are considered especially desirable in an officer. However, an extensive survey by a group from the Maxwell Graduate School of Citizenship and Public Affairs of Syracuse University to determine the qualities for successful "overseasmanship" revealed that other nationals consider these traits as anything but good. "Yet the composite American described by peoples of other cultures is awkward, well-meaning, embarrassingly friendly, and, most irritating of all to them, perpetually impatient and possessed of an annoying sense of superiority."[7] This lack of appreciation for what the American considers an asset in his make-up comes as a disappointment and a shock to many, a shock which, if not quickly adjusted to, can make a sick person of the American by the time he completes his tour.

If they do not like what we consider our best, what do they want? By means of interviews, the survey attempted to determine the type of technicians desired by certain countries, and frequently the answers indicated: "Please do not send us technicians who are too pushy, who are too aggressive, who need to succeed at their own pace and time at the expense of our operation." Or, as some said, "Send us men who can understand our pace and adapt themselves to it." (The paradox of

this situation was illustrated by a contrasting remark penciled in the margin: "Often there isn't time to go at their pace. The Reds are too close.")

The foreign national's history, culture, and way of doing business are not the same as ours, and we can expect him to change only so much. General H. R. Bull, in an address to the Armed Forces Staff College in 1949, pointed out that we should not attempt to change the people and that integration should be carried only so far. Speaking of the British and American Allied headquarters in World War II, he stated:

> It is noteworthy, however, that integration was never carried so far as to include personal habits. You will find that the British during the war continued to drink their tea and the Americans always guzzled their coffee down to the last drop. That was important. Don't venture into that field if you want unity of effort.[8]

Things just do not happen as fast in the various international headquarters as in Continental Army Command, Strategic Air Command, or Navy Bureau of Operations. This condition must be recognized. It is true that time is pressing on many of the matters, but the pace can be pushed beyond the breaking point. There is only a certain amount of pushing or speeding-up that can be accomplished. While considerable progress has been made in stepping up the pace of activity in most staffs, there are many obstacles that will continue to interfere. The chief one is that the required assets to do the job are not readily available as they are in U.S. commands. The capability depends on financial and personnel resources. Then, too, there will always be the need to obtain agreements from the sovereign nations on certain matters, plus the ever present language problem that compounds the many other problems.

language problem—no barrier

As noted several times previously, most complications in the integrated staff are aggravated by the lack of ability to communicate fluently in a language other than one's own. Not only is this true within the staff, but the problem is compounded as the staff officer contacts subordinate commands, units, and national headquarters. Much has been written on this problem, and many solutions have been proposed, from developing an international military language to requiring everyone to become fluent in a common language. Many writers refer to the language problem as a "barrier," as if it would bar or stop progress. An early Chief of Staff, Supreme Headquarters Allied Expeditionary Forces, indicated that it was impossible to establish an integrated headquarters where the staff members were not all fluent in a common language. Six years later General Eisenhower set up an integrated headquarters, Supreme Headquarters Allied Powers, Europe,

which was eventually to be composed of officers from 14 nations. It was not impossible then and it is not impossible now. One only need look at the tremendous accomplishments of the various integrated headquarters to see that the language problem does not stop progress. Yet it remains a great problem in an international organization.

Translation is only a partial solution. Even under the most ideal conditions translation takes a long time. It took the Turks about a year to translate the basic documents when they joined NATO. Enough good translators with the required understanding of military matters are difficult to obtain, and there is always the possibility of incorrect interpretation.

One of the most serious aspects of the language problem is the psychological effect of both written and oral communications. For example, if a highly experienced staff officer had a good idea but had not properly expressed himself in the working language of the headquarters, what should his supervisor do if he saw a definite need for correction in the language of the paper? Should he rewrite it or send it back to the originator? Of course, the proper way to handle this would depend on other circumstances surrounding the particular instance; but with the appropriate psychological approach the idea could be salvaged and expressed in suitable language without offending the originator.

Psychological effects of language often create a sensitive environment in conferences. While a staff officer may be loyal to the headquarters, he still feels obligated to consider the interests of his nation. Also quite often officers in international headquarters have enough conscious or subconscious prejudice to be suspicious at times of what is going on, and the way words are interpreted may cause someone to suspect something, or it may cause an unfavorable emotional reaction.

Language difficulties must be of primary concern in conducting conferences. It is essential that a detailed written agenda be prepared and distributed beforehand. Also important are adequate facilities, such as a quiet room, visual aids, and a means of translation if required. Patience and knowledge of conferees are essential. Speech must be slow, and only basic words that can be easily translated into other languages should be used. Above all, adequate time should be allowed to complete the conference.

U.S. staff officers in those headquarters where English is the working language are depended upon by many other national staff officers to help with written and oral English. Thus most U.S. officers can expect this additional training responsibility to be inherent in their work. Although it is time consuming, there is great reward in appreciation and increased staff effectiveness. This responsibility should be wholeheartedly carried out rather than shunned, since the other nationals are working in a foreign language which they are required to be able to speak before getting the assignment. This is not true with

most Americans. A very small percentage of the U.S. officers speak the local language fluently when they go to these assignments.

It is becoming increasingly evident that U.S. officers must have more language capability. As Army Chief of Staff, General Maxwell D. Taylor recognized this need. In 1957 he authorized a phased language program to develop an officer corps with multilanguage skills similar to the language abilities that have characterized the European officer corps. President Eisenhower emphasized the same need when he advised the Naval Academy graduates of 1958 to develop a foreign-language proficiency. The current Air Force program has received so much stimulus that in a few years practically every officer will be able to speak at least one foreign language. Also courses in the language of the country in which the headquarters is located are frequently offered by the U.S. element of the headquarters. With all the emphasis on the U.S. officer to develop a foreign-language proficiency, this problem should be eased in years to come, but it will continue to be one of the major problems for the near future.

human relations

The language problem with all its ramifications and the many other complications in integrated staff functions can be eased, and circumvented to a certain extent, by good human relations. The art of getting along is recognized as important in any endeavor where more than one person is involved. It is a virtue for which most officers in staff work strive, and lack of good human relations becomes of prime concern on any national staff. Add poor human relations to the other problems of language, differences in religion, culture, national habits and heritage, as well as conflicting service doctrines, and the possibility of friction and misunderstanding is greatly increased in an international staff.

For an officer to contribute effectively to an integrated allied staff he must be able to put himself in the position of his fellow staff officer. This is necessary to determine how a certain action will be received and how the other national will react. The U.S. officer will be well rewarded if he diligently seeks to learn the background of his fellow officer. In turn, this will help him to know the other national as an individual, which is essential to understanding his thinking and anticipating his reactions. Furthermore an integrated staff officer can often gain the confidence of other national staff members simply by respecting their religion, culture, heritage, and habits.

THE OFFICER who is fortunate enough to be considered for an assignment to an international staff should, in addition to the normal technical qualifications, develop certain other qualities. He must have the proper temperament and attitude, and, most important of all, he must

be able to adapt quickly to new and strange situations. He must effectively deal with a different system involving nationals of other sovereign nation-states, language problems, a slower pace of activity, and loyalty to an international organization.

He will actually have a threefold job: first, the normal staff responsibility; second, assisting in training other nationals in staff work; and third, creating a favorable impression of the United States. Failure to recognize any of these responsibilities will jeopardize his effectiveness. He will find himself intimately involved in three cultural and institutional patterns—the pattern of the United States, the pattern of the international organization, and the pattern of the country in which the organization is located. In short, he will be a new breed meeting new and strange requirements and situations which, if faced up to and properly prepared for, could prove to be one of the richest and most interesting tours of his career.

Headquarters 32nd Air Division (SAGE)

Notes

1. As quoted by Col. Jack D. Nicholas, USAF, Col. George B. Pickett, USA, Capt. William O. Spears, Jr., USN, *The Joint and Combined Staff Officer's Manual* (Harrisburg: The Stackpole Company, 1959), p. 187. This book is highly recommended to staff officers.
2. *Dictionary of United States Military Terms for Joint Usage* (Washington: Joint Chiefs of Staff Publication No. 1, 1 February 1962), p. 50.
3. Nicholas *et al.*, p. 200.
4. *Ibid.*, p. 201.
5. "Allied Staffs," *United States Naval Institute Proceedings*, 79, 8 (August 1953), 865-66.
6. *Ibid.*, p. 865.
7. Harlan Cleveland, Gerard J. Mangone, and John Clarke Adams, *The Overseas Americans* (New York: McGraw-Hill, 1960), p. *vi*. Highly recommended reading.
8. Gen. H. R. Bull, "Combined Operations Planning," lecture, Armed Forces Staff College, Norfolk, Virginia, 25 April 1949 (AFSC 5th D-20 2.2). An excellent presentation on allied staff planning.

IDENTIFICATION AND USE OF EDUCATIONAL QUALIFICATIONS IN THE NEW PERSONNEL MANAGEMENT SYSTEM

COLONEL JOHN P. LISACK

THE Air Force recognizes the increasing tempo of technological advances, the significant economic, political, and social developments having international implications, and the expanding mission of the military. The related urgent requirement for every officer to continue his education throughout his career is increasingly evident. Two important elements are essential to meeting this requirement: (1) the personnel management structure must be designed to include educational requirements as a criterion in the selection, assignment, and career progression of officers, and (2) these educational requirements must be objectively derived and defined for both current and future needs.

A vivid illustration of advances in military technology can be seen in a quick examination of weapon systems which the present generation of field-grade officers has been called upon to help acquire, operate, and maintain in the span of their careers. Compare, for instance, the subsonic P-47 Thunderbolt airplane with the all-weather, supersonic F-105 Thunderchief. Consider that we have advanced from dropping iron bombs from the B-17 Flying Fortress, flying at about 170 knots and 20,000 feet altitude with a range of less than 2000 miles, to the B-52, flying at 500 knots and 45,000 feet with a range of over 7000 miles. Further, the B-52 is capable of refueling and dropping iron or nuclear bombs and launching air-to-ground missiles anywhere in the world. Even more startling, within the last five years we have gone from no ICBM's to replacement generations having inertial guidance systems and storable fuel or solid propellants. Command and control systems utilizing complex electronic data-processing and display equipments are in use. X-20 Dyna-Soar and the XB-70 are in the making, satellites and men have been rocketed into orbit around the earth, a moon base is almost within reach, and more sophisticated space systems are on the threshold. In fact, every area vital to the military reflects important technological advances: communications, construction, management, manufacturing, research and development, transportation, and power generation and transmission, to name some key ones. Air Force officers must never fail to grasp the significance of these developments.

Some of the far-reaching political, economic, and social developments that these men have seen have important military significance also. The pivot

point and the *modus operandi* for world domination have shifted from the Nazi-Fascist to the Sino-Soviet powers. We live in a state of so-called peaceful coexistence that belies the very real struggle actually taking place. The spectrum of war includes on one end the innuendoes of cold war, which is being waged largely with ideas and propaganda, and on the other the holocaust of an all-out nuclear war. The political scene has widened with the emergence of more than thirty-five new nations since World War II. These officers, as they move upward to national and international levels in such fields as communications, air traffic coordination, and economic and scientific cooperation, are witnessing and participating in significant planning responsibilities. They are seeing more military planning move to the Joint Chiefs of Staff and Department of Defense levels, more commands and operations become joint or combined service responsibilities. They have seen NATO, SEATO, and the European Common Market develop.

All these changes and more have occurred during the careers of our present field-grade officers, and the tempo of change continues to accelerate. The changes within the career span of our younger officers will undoubtedly be even greater. This time compression for major changes within the span of a single career dictates the need for proper initial educational preparation and compels the continuance of that education. Not to fulfill this need will leave the officer corps unequal to its tasks; to recognize the need but move too slowly will result in regression.

The Air Force Educational Requirements Board

Describing and identifying the current and future educational requirements for full qualification in each of the more than 250 Air Force specialties are the responsibility of the Air Force Educational Requirements Board (AFERB). The chairman of this permanent board is Major General C. H. Pottenger. He and members representing key Air Force staff elements and major air commands are appointed by the Chief of Staff of the U.S. Air Force. A small secretariat located at Headquarters Air University conducts or arranges for the necessary research, budget, and administrative support. Meetings of the Educational Requirements Board may take place anywhere in the United States, dependent upon the nature of the problem or the particular career area under study.

The board has capitalized on the officer classification and career management structure in organizing its own operations. A panel of well-qualified senior officers, assisted by civilian consultants, has been formed for each line career area (that is, all areas except legal, chaplain, and medical). The selected panel members currently work in the particular career area, and their panel assignment is an additional duty. Each panel develops and recommends to the board the kinds and levels of academic study and subject matter that are needed for an officer to acquire the knowledge and understanding to perform the duties and responsibilities for each specialty.

In addition to the panels, a separate task group has been formed to assist

the board in determining the objectives, areas of study, and other details concerning professional military education (for example, the instruction given in the Air War College, the Air Command and Staff College, and the Squadron Officer School, which officers attend regardless of their specialty).

panel and board operation

The various career-area panels generally follow a series of steps in determining their recommendations. First, data sources are studied, and literature is researched; job, duty, and qualification descriptions are reviewed for every specialty; officer population studies and job and job-function surveys are conducted; trend studies are made; and expert opinion is obtained. In effect, data concerning past, present, and future needs are assembled and analyzed. One of the techniques used frequently is to list the various positions in each specialty, list the duties and tasks appropriate to each position, and then determine the knowledge and understanding necessary to acquire the skills or to be able to perform. Thus the groundwork is laid to identify the appropriate course objectives or subjects for study that are directly related to the duties to be performed.

After all necessary data are acquired and analyzed, conclusions are developed and recommendations made. The panel then prepares a draft report which includes current, near-future (up to four years), and long-range (five years or more) educational requirements needed for full qualification in each Air Force specialty. The methodology and data used, explanation or justification, and collateral issues are included in the report.

After the panel has prepared the draft report, it may be reviewed by selected personnel in universities, professional associations, institutes, industries, or major Air Force activities. A report incorporating recommendations of these reviews is then presented by the panel to the board for an appraisal. When the board approves the report, it is sent to Hq USAF for full staffing. If the report is satisfactory, the Air Staff directs that its recommendations be put into effect, and it is distributed to all major air commands, officer precommissioning schools and the Air Force Academy, all base educational services offices, and the Air Force Institute of Technology. The reports are also used by occupation analysts, career management planners, educational programmers, and other personnel staff officers.

A summary of the current educational needs by academic areas of study and levels of education as determined by these panels is shown in the accompanying table. It can be seen that the educational requirements of the officer corps are almost equally divided between the science and engineering areas of study on the one hand and business administration/management on the other. Note that over 13 per cent of the officer corps require the knowledge represented by graduate-level degrees to perform their duties, yet at the present time only 6.2 per cent of Air Force officers hold advanced degrees. (In a recent study* of officers assigned to the scientific and engineering area,

*Chester J. Judy, *Contribution of Education to the Rated Effectiveness of Officers in Scientific and Engineering Assignments* (Lackland AFB, Texas: 6570th Personnel Research Laboratory (AMD), September 1962 (PRL-TDR-62-20)).

it was found that the higher the educational level of an officer, the higher his Officer Effectiveness Report.)

AFERB Recommended Kinds and Levels of Education Required by Air Force Line Officers

(1% = 1300 officers)

Major Subject Area	Some College	Bachelor's Degree	Master's Degree	Doctor's Degree	Total
Science and engineering					
physical and bio sciences	11.8%	18.7%	1.8%	.2%	32.5%
engineering	.1	11.4	3.5	.2	15.2
mathematics	*	.2	.1	*	.3
(subtotal)	(11.9)	(30.3)	(5.4)	(.4)	(48.0)
Business admin & management	7.1	32.1	5.8	.1	45.1
Social sciences	*	3.0	.7	.1	3.8
Humanities, arts & education	*	2.3	.7	.1	3.1
Totals	19.0%	67.7%	12.6%	0.7%	100.0%

*Less than 0.1%.

The comparative figures for presently existing educational levels of Air Force line officers are:

Some College	Bachelor's Degree	Master's Degree	Doctor's Degree	Total
47.4%	46.4%	5.8%	0.4%	100.0%

educational data elements

It is extremely important that educational requirements for specialties and the educational qualifications of officers be expressed in the same terms and categories. It is also important that these terms and categories be designed for both manual and mechanized use. Planned electronic data processing will facilitate personnel data and information transfer, program exercising, trends analysis, policies and criteria analysis, and gaming. To accomplish the task of categorizing and defining all important educational terms, the secretariat of the board, assisted by the Air Force Institute of Technology, is now preparing a set of handbooks, which are being reviewed by leading national professional societies and associations. (For example, the American Society of Engineering Education has been extremely helpful in validating terms and definitions in the engineering area.) A separate handbook is being prepared for each of nine general areas of study:

administration, management, & military science
arts, humanities, & education
biological & agricultural sciences

engineering
law
mathematics
medical sciences
physical sciences
social sciences.

Each of these general areas is divided into major academic fields. In engineering, for example, the major academic fields include aeronautical, architectural, chemical, civil, industrial, mechanical engineering, etc. The specialization or subspecialization (option of study) within each major academic field is also listed, and each term used is carefully defined. A code is being designed on the basis of aggregation. This code, in a four-letter sequence, can accurately identify the formal education of an officer. A single digit is used to identify each level of education from a high-school graduate through the various college levels to the doctor of philosophy. A series of these alphabetical and digital code listings will accurately present the level and type of education in any orderly sequence desired. For example, an officer may have a bachelor's degree in mechanical engineering with a certain specialization and then acquire a master's degree in business administration, perhaps specializing in engineering or R&D management; the code will effectively reflect the nature, level, and sequence of such an educational record. A like categorization and coding for all *military*-type education is also being prepared.

The Air Force is now adapting its personnel system to electronic data processing. Present and future educational requirements can soon be readily compared with the present and projected inventory of military personnel. More accurate planning for officer procurement, educational programs, assignments, and other personnel actions will then be possible.

IT IS extremely important that the U.S. Air Force personnel system provide a basis for molding the officer structure for present and future needs. Educational requirements must be identified and necessary actions taken to meet them in time. These requirements must be valid and expressed in precise terms readily comprehendible within personnel classification and management systems. The current officer inventory, projected with expected gains and losses and expressed in types and levels of education, will be compared with current and future manpower requirements similarly expressed. An automated personnel system will facilitate this process. Through such a comparison, deficiencies and surpluses will be made evident. Proper assignment of personnel will be easily ascertainable, as educational requirements which do not match related job requirements will be immediately apparent. Thus better policy making and planning for the officer corps should be possible, career management should be facilitated, and the assignment and utilization of officers should be improved.

Air Force Educational Requirements Board Secretariat

In My Opinion...

OFF WE GO . . . WHERE?

COLONEL GARLAND O. ASHLEY

ONCE upon a time, but not too awfully long ago, the "wild blue yonder" airman was one of our important national heroes. He was by image a "knight," but a knight transformed into the glistening mechanical armor of the twentieth century.

When heroic airmen went to their home towns, the young ladies squealed in admiring delight. The young men trembled a bit, respectfully, as they moved up to shake hands. Many of those young men vowed to make a career in the air. Some of them started that career and stayed with us. Many others started that career and then left us.

In those same home towns, once upon a time, there were also older men. Some of these older men pondered as they watched. They remembered Verdun.

These older men pondered and came to know intuitively that this new warrior and his new, shiny, powerful craft had somehow greatly changed the shape and ultimate mold of man's forming destiny in war on or near this earth. Some few of them formed a brooding question which persists, to an extent unanswered, today. "Off we go, all right, but where? Toward what?" Being older, though, and possibly wiser about the paths of headstrong youth, they did not speak out loudly if they spoke at all.

The airmen's song was "Off We Go . . . " We also used to sing "The Whiffenpoof Song." Do you remember?

Of course. But all that was once. It was upon a time.

Now there is *another* time!

Sometimes even now we make out as if we were the same. But, as we should admit, we are not. So what if we were to pause now? Would it help us? What if we were to reflect a little about what it was that we were, what we seem to be now, and what we may be rather far along toward becoming?

It would seem to be prudent to do so, for if we were to look carefully at some of ourselves we would see in some of our faces an angry blue funk of bitterness, frustration, and peevishness. A number of us certainly do not look "knightly" anymore. Thus, before we get further along toward what we may be becoming, we might do well to ask what has caused this blue funk. Is it just a reaction to the people and poli-

cies which are in authority over us? Is it coming out now that we just can't stand taking orders? Or are there deeper causes?

Let's start with us.

If we will be fully honest about it, we have become rather steamed up and touchy about some of our so-called "doctrines" which have not stood the test. A few of us have become so touchy that it could be said with good accuracy that we are not even good company any longer for ourselves. Much of our professional talk, much of our club talk, and much of our conference room talk is no longer the fine, dedicated talk that it used to be, is it? So what is it that has happened to us?

It would be a tremendous relief to be able to say and prove that it has all been someone else's fault. We could, then, in great relief from our present frustrations, cite the culprit and tack his hide to the hangar door. But saying so would not alter facts, for it would not be true. Some of us have been our own worst enemy.

A part of our trouble is a function of just being mortal. We can laugh off that part and know that we are in good company. The other part we cannot laugh off, for much of the angry blue funk is of our own creation. We have drifted into some habits which it might be wise to modify. One such habit is the notion that because we were once revered we should still be. Let's talk straight about that.

We are feared now, not admired.

Though we might wish honorably or nostalgically for a return to the good old days, we ought to notice that they are gone! Nor will it be useful to stir up any corrective "package" information program to set things right. No matter how brilliantly such a "package" might be contrived to try to re-create those fine days, the old days are gone. And gone with them is the psychic place of honor and unquestioned adulation in which we used to stand, in men's minds.

Please remember that. Today we are feared. We are feared mortally and gnawingly and possibly illogically, yes, but nevertheless we are feared. In some diplomatic minds we are counted as being a "greater threat to the stability and safety of civilization than a Communist conspiracy."

As incredible as that may sound to you, this is a discernible and documentable view. I urge you earnestly to become fully aware of it. On this score some of our habits of talk have harmed us more than any other examples of foot-in-mouth disease that can be cited.

We are a dreaded force. We are feared. And we have got to recognize honestly that in some of the things that we do or say we do not show that we are aware of that hard-to-face emotional fact.

We are feared. Please remember that!

We have been deprofessionalized, by "management."

To trace all of the history and each of the root causes of our deprofessionalization would take more space than we have here. Let it suffice to say that we have sloganized ourselves out of *our* heritage by bringing in a *different* heritage called "management." Management is a heritage antithetical to our professional military way of life.

There may be bitter arguments about this. But such arguments will in the end be pointless unless they touch at the one key, core principle: that *command* and the allegiance due it in honor by all trained ranks *cannot* be replaced by any substitute. The principle of command is the fundamental principle for all military men throughout history. If from other preference or from habit we urge ourselves to say that we can alter this principle, then we are at liberty to introduce as substitute something called "management" or anything else our fancy may decide upon. If we substitute management, for instance, in addition we substitute another heritage, marked by terms such as "cooperation," "accommodation," "adjustment," and "group processes."

Now, if you have an honorable, fit, professional corps of officers and men, you do not need "industrial management practices." On the other hand, if you have industrial management, the subtly operating human motivations shift causes and emphasis toward other goals that matter more than achieving a fit professional corps. It is at present inexorably in the nature of things which mold the character of man that we cannot, repeat *cannot*, get the two so-called "good sides of both," no matter what words upon words upon words we may pile up to assert that we have. Let us not be diverted by great verbal wind about "blacks and whites and shades of grey."

Today man can find a "home" in the house of management in a pocketbook bought from a corner drugstore. But, today, we are dangerously far on the way toward offering man no "home" to belong to in the USAF. When we are no longer able to offer that to men, then we will be inhabited by "renters" and "transients."

We are deprofessionalized. Please remember that!

And if some ultrasophisticate says that what I mean here is a return to close-order drill, please tell him for me to take off his uniform and go.

We are no longer personal warriors.

On that day and hour when we put out that first word of copy on that first self-sponsored program to adulate a "technician" or a "specialist," we began to chip away at the foundation of our professional "home." I say this earnestly, no matter how pressing the other considerations that persuaded us to do so.

In addition we ought to note by now that we have been grossly misinformed for a decade by self-styled psychologists, educational pundits, and group dynamicists about the true nature of man. Contrary to the placid, placating, submissive counsel that we have received from that kind, man is only alive and functioning and possessed of a feeling of intrinsic worth when he is fighting for some good thing. That he may be fighting in some obscure mail room is largely irrelevant. Even there, if he is properly trained and motivated, he is doing *his* share toward that greater effort which has been set off to win a new lease on life for that quixotically beautiful idea about man which we are sworn to stand for.

In the remainder of his time when a man is not personally so committed, then what is a man? Is he some flaccid consumer of goods? Is he a cipher? Is he a technician or a specialist? Is he a warrior? What is he, this man?

Today, when many of our men go home, their youngsters may ask, "Daddy, what did you do today to make the world safer?"

What would you have these fathers say? How would a man feel, deep down, who had been habituated to answer, "Look here, I'm not in *that* work. I'm a technician."

The child may look away. There may be no more said. But, said or not, there was an "exchange" there. In that exchange something rather important, it seems to me, got lost. What got lost may never be retrieved again.

"So what's lost?" our ultrasophisticate might ask. "This is home and mother and fireside stuff!"

But what would he say about the blue funk? Has he an equally ready answer for that? You may rest assured in advance that it will be equally specious.

We are no longer personal warriors.

General Fairchild died too soon.

General Muir S. Fairchild created a unique school system to educate officers and through them their men. He really only set out one goal. The goal was to show the folly of thinking that "all there is to war is the bang."

"It would not be at all sufficient," he said once, "if our officers knew all the technology of all the world to date. It would not be at all sufficient if they could forecast all the new technology that would come for the next twenty years. It would still not be enough wisdom for them, for they might not still have got taught why or when or where or how they and their weapons ought best be applied."

The magnificent and instructive Air University system has done a major part toward producing such education, well toward that goal. It must be noted, however, that we have not yet been so effective as

we need to be. A specially important place where we have not been fully effective has been in telling all those in properly constituted authority over us what we stand for and how we might best be used—selectively—over some of the years past. Or, potentially more important, how we might best be used over the next years to come. In some places, it may be observed that there are appearances that some of us don't know. Most tragically, some few officers have been heard to say that they don't care! Had we all put in half as much talk-time on developing new answers as we have put in on developing the self-defeating blue funk talk, I suspect that we'd have had some good answers by now.

Altogether too many of us got verbally stuck on the repetition of a tired set of slogans, patterned about a rigid all-or-nothing mind fix. Some of us have repeated these slogans so much that even we have got sick of hearing them. That's why we are not even good company for ourselves, sometimes.

When we got to that sloganeering which held that "the new war would be so horrible that we would sit it out," by the sheerest accident our sloganeering became prophetic. For that's where we find ourselves in some measure today—sitting OUT!

Whether we are sitting in a headquarters or before black boxes or in a cockpit, altogether too many of us are sitting it out, away from today's issues and realities.

General Fairchild died too soon. He had more to say to us about persuasion, about really effective oral and written communication, and about not sounding off with slogans before we had done some thinking about how they would sound to the other fellow. We forget too soon and too frequently that a slogan which sounds to us as if it is veritable scripture may sound like claptrap to other people. And we tend to forget too that historically it has been just before some of our noisiest times when we have finally seen that we were most wrong about what we had been shouting about with such vigor.

Certain great national and international shifts of power and emphasis have occurred since that older once-upon-a-time. Are we up to each of them? Or, better, are we ahead of them, as in this opportunity for reflection? It is useful to admit to ourselves forthrightly that we have not been infallible.

General Fairchild died too soon.

More?

There are a few more places where we are our own worst enemy. These include our near-slavish preoccupation with "packages" that are not packages, "entity systems" that are not entities, "procedures" seemingly sacred that are self-serving farces, and "inviolable policies" which, on second thought, may be seen to be abundant nonsense. I

shall not cover these, however. It ought to be sufficient to set up a main trend of thought.

That main trend is that we have had many, many things happen to us and around us over which we have had only varying degrees of control. These events have indeed caused great problems and great adjustments and great re-emphasis. But that's life, and moreover that is what we are professional officers for. Where we hold to the professional ideal, it is exactly to come to grips with such changes that we exist at all.

Accordingly, a large part of our blue funk problem is of our own making. It would seem to be especially bright of us if we were to clean up these things ourselves, in our own way, prior to some future time when someone else may undertake to do it instead for us and to us. If we cannot gird up to do this, away from our raging blue funk, then it ought to be said for the record that we well deserve whatever we may get. For the cold facts *then* will be that we may not have been sufficiently fit to hold up our individual share of the heritage of the USAF. If that becomes so, then it will be said that we passed nothing on to our young officers and men because we didn't have anything to pass on to them.

Shall it be our epitaph—for General Mitchell to come back spiritually to look at—"Here lie the remains of an air corps—an air force—an aerospace force—interred by some actions of its own members through some lack of vision, their sight partly obscured by a raging blue funk"?

Off we go . . .

Where? From here, where?

Weapons Systems Evaluation Group, OSD

The Research Frontier...

LASERS

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THE laser is the most important technological development since the transistor. It is a product of man's education rather than his ingenuity and inventiveness, since it evolved from such basic technical fields as quantum mechanics, microwave spectroscopy, and electromagnetic theory. Educational requirements such as these would reduce to almost zero the chances of an Edison inventing such a device.

The term laser is an acronym for Light Amplification by Stimulated Emission of Radiation. Although true amplification of light has been achieved with a laser, its greatest use by far has been as an optical oscillator, that is, as a source of coherent radiation in the visible portion of the electromagnetic spectrum. The concept of the laser, which is a further extension of the principles of the maser (Microwave Amplification by Stimulated Emission of Radiation), was first discussed in 1958 by Charles H. Townes and Arthur L. Schawlow, then of Columbia University and Bell Telephone Laboratories, respectively. The first operating laser used ruby as the active material and was developed in mid-1960 by Theodore H. Maiman of Hughes Aircraft Company. Since that time many other types of lasers using other crystals, glasses, gases, and semiconductors have been developed.

The most striking properties of the laser are:

(1) Focused power densities in the order of hundreds of millions of watts per square centimeter can be obtained. This is then a new tool for investigating the interaction of light and matter, and many applications are envisioned which make use of this property, such as welding, cutting through diamond, in medicine, and in communication systems.

(2) The radiation that the laser produces at optical frequencies is coherent. The quality of coherence in light can be described by the following experiment. Two light beams are allowed to fall on a single piece of film at different times, and the intensity, as recorded by the film, will be the sum of the two individual intensities. If, however, they are allowed to fall on a piece of film simultaneously and an intensity pattern is observed that differs from the one obtained when they exposed the film at different times, then the two light beams are said to be partially coherent. If an absolutely dark spot is found in the second pattern, then the two beams are fully coherent. There are advantages in using coherent radiation in a communication system in that there are more refined ways of modulating it (putting information on it that

is to be transmitted) and detecting it. The amount of information that can be carried is directly proportional to the frequency. Since the frequency of optical radiation is approximately 10^{14} cycles per second as compared to 10^{9} cycles per second for the microwave link that is used for coast-to-coast TV transmission, the increase in its capacity for carrying information is enormous. It is in fact so large that it may never be fully used.

(3) The output radiation from the laser is extremely directional in nature. If the laser were to be used in conjunction with a properly designed optical system, the beam spread could be as small as 10^{-6} radians. For every one million feet (about 190 miles) the beam traveled, its width would increase only one foot! This would make possible a spot size on the moon of one quarter of a mile.

These properties, their applications, and the underlying physical phenomena will be discussed in greater detail later.

construction of a laser

It is certain that many intriguing uses will be found for the laser, since it is so simple to build. Unlike masers, or electron beam machines or other devices, the laser can operate at room temperature and room pressure—no low-temperature or high-vacuum apparatus is required. The construction of the laser used in most research laboratories is the same as that of the one originally developed by Maiman.

Solid Lasers. The critical element in a laser system is the laser material. Several materials have demonstrated laser action, but the best known is the ruby. For convenience in the following discussion, the laser material will be referred to as ruby. Aside from the ruby, the primary element in the laser system is the light source that supplies energy to the ruby rod. This light source is a high-power helical photoflash lamp of the type used in studio photography and is capable of handling megawatts of electrical power on a pulse operation basis.

The ruby rod is coupled to the flash lamp by attaching one end of it to the end of a brass tube. This tube serves as a holder and a light pipe for the laser radiation. The unshielded portion of the ruby rod is inserted in the center of the helical flash lamp so that it will absorb the maximum amount of light.

The last step is to provide the large amount of energy to the flash lamp that is required to induce laser action. Approximately 1800 joules of energy are required for about one thousandth of a second. This is a power flow of 1,800,000 watts, which obviously cannot be obtained directly from an a.c. line! It is necessary to store up this amount of electrical energy in a large capacitor bank and then allow the capacitor to discharge its energy into the lamp.

The elements outlined are the rudiments of most laser systems in which solids such as ruby are used for the active material. A possible variation in this system is in the configuration of the pumping lamp. A helical configura-

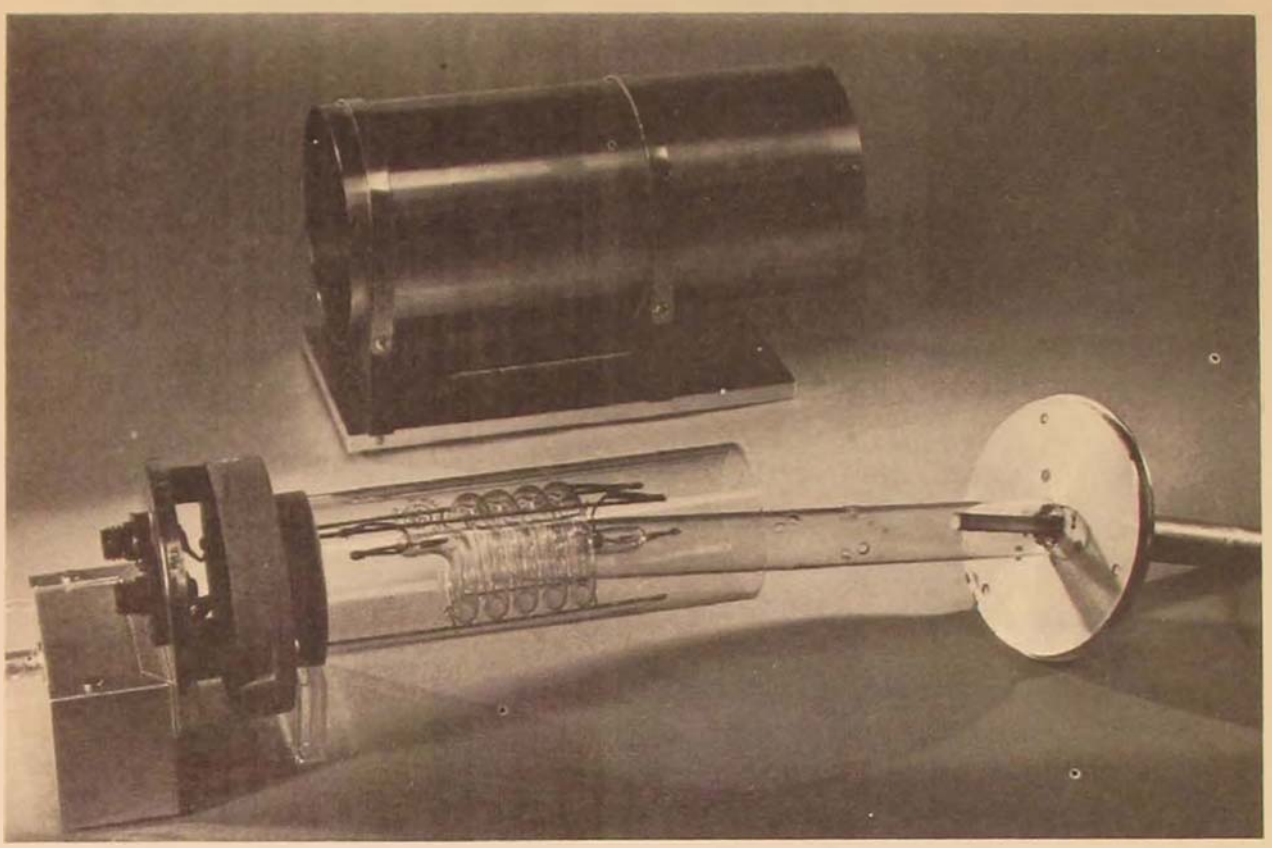


Figure 1. Exploded view of an optically pumped solid laser. A laser assembly constructed like this one can be used to pump any solid laser optically. Its primary element is the helical flashtube or lamp, which is inside the large glass envelope. The three small-diameter metal rods support the helical lamp and carry the current from the connectors on the rear plate (left) to the lamp. The small aluminum box (far left) houses a high-voltage pulse transformer, whose output is carried by the third metal rod to the lamp, where it initially ionizes the xenon gas in the helical lamp. This permits a large capacitor bank (not shown), which is coupled to the laser through the small connectors, to discharge through the lamp and make the intense white light required to produce laser action. The smaller-diameter glass tube slides in through the center of the helix and prevents the high voltages on the lamp electrodes from arcing over to the laser rod (seen protruding into the smaller glass tube). One end of the laser rod (usually ruby) attaches to the end of the brass tube (far right), which serves as a holder for the rod and a light pipe for the laser beam. The stainless-steel can (top) fits around the laser assembly to shield personnel from the intense light of the flashtube.

tion is very inefficient. A much better design from the viewpoint of increasing over-all efficiency is a straight lamp. If this linear lamp is placed in direct contact with the laser rod and the two are wrapped with silver foil, which acts as a reflector, the best over-all efficiency is obtained in conversion of stored electrical energy in the capacitor bank to emitted energy from the laser. This efficiency is of the order of one per cent.

The simplest laser system ever constructed consisted of a neodymium-

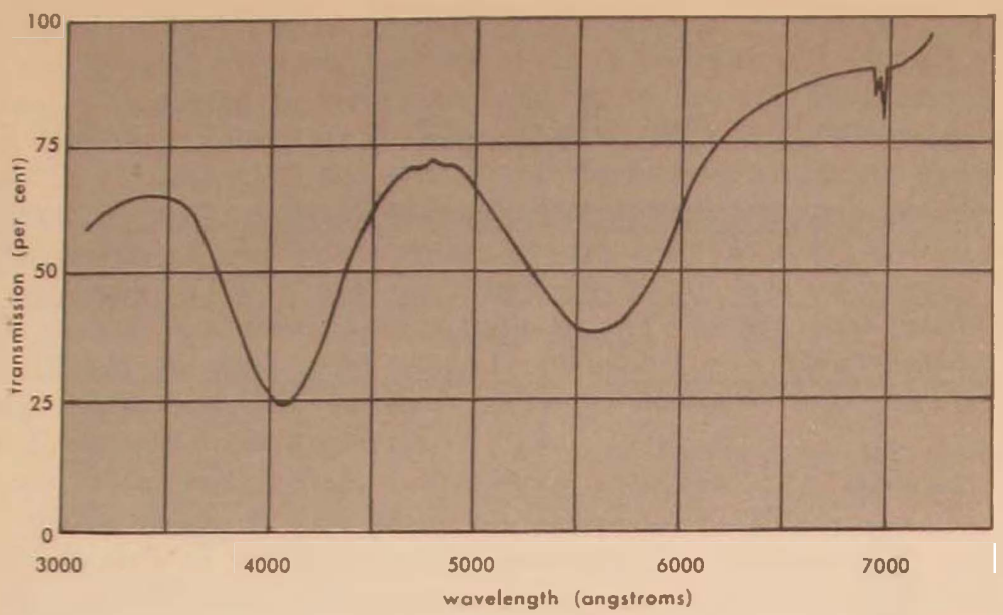


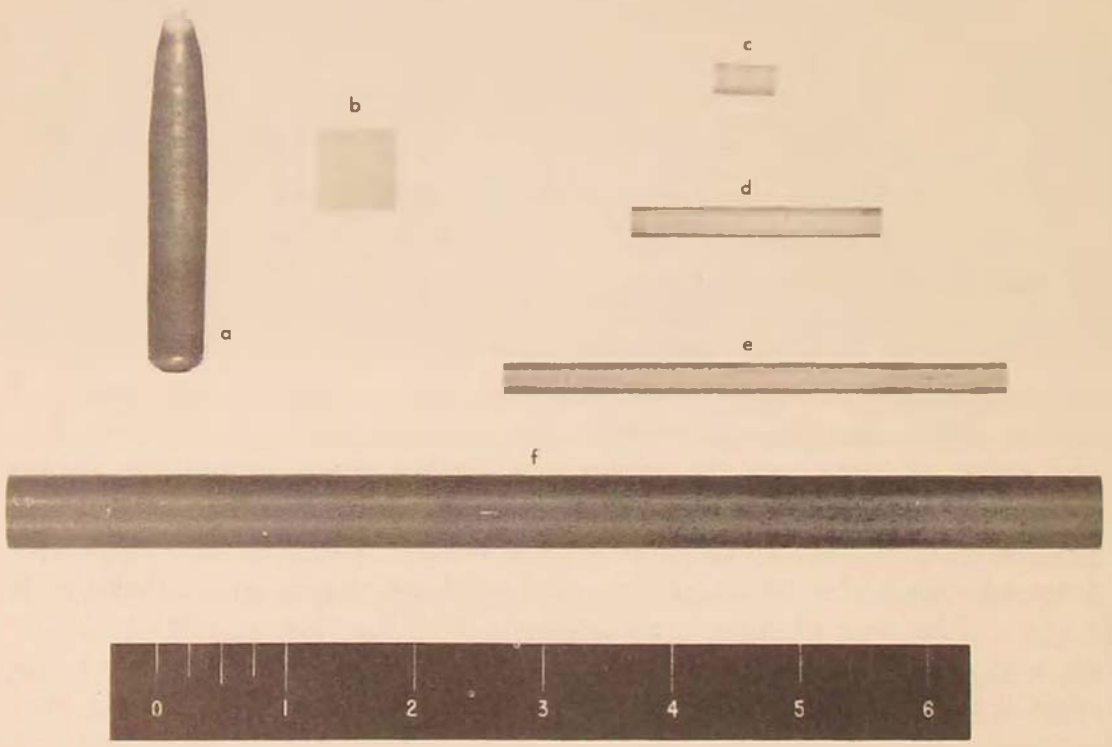
Figure 2. Light absorption by ruby. The plotted curve shows the percentage of the incident light that is transmitted through a thin sample of ruby as a function of the wavelength of the light. The shape of the curve is therefore due entirely to absorption of light in the ruby. The wavelengths of maximum absorption are 4100 angstroms and 5600 angstroms, which in color are violet and yellow-green, respectively. Since only those colors are absorbed, the resultant light that passes through the crystal looks red to the eye—hence the color of ruby. As the violet and yellow-green bands are rather broad, they will absorb approximately 50 per cent of white light, and thus white light is a reasonably efficient pumping source. The two sharp spectroscopic lines observed at 6929 angstroms and 6943 angstroms are called the R *lines of ruby. The one of longer wavelength (the* R_1 *line at 6943A) is the one from which laser action occurs and is therefore designated as the metastable state. Photons absorbed in the violet or yellow-green bands lose part of their energy in "falling down" to the* R_1 *line. The other photons are then given up to the growing laser beam as it propagates through the ruby rod.*

in-glass laser rod placed in direct contact with a type AG-1 flashbulb. It was then fired in the same manner that a flashbulb is fired in a camera. This simple system worked because the type of laser material that was used has a very low threshold energy* at which laser action starts. Of course the difficulty with this system is that a new AG-1 bulb is needed for every flash, but it demonstrates the basic simplicity of a laser.

The large photoflash lamps can be used for many flashes. They are essentially no more than a long tube with electrodes at each end filled with a gas such as xenon. When the capacitors are discharged through the gas, the gas molecules become ionized. When they fall back to their initial and lower

*This is so because it is a four-level laser, which will be explained in more detail later.

Figure 3. Samples of ruby crystals and laser rods. High-quality ruby is an exceedingly difficult material to produce because of its very high melting temperature—about 3700°F. The ruby boule (a) is as it appears after being grown and before any optical work is done on it. The clear part at its top is a seed crystal of sapphire from which the ruby started to grow. This boule, about 2¾" long and 7/16" in diameter, would be suitable for a laser rod 2¼" long by ¼" in diameter. The square piece of ruby (b), ¼" thick, can be silvered on any two parallel faces, and if it is pumped hard enough, laser action can be obtained. Of the cylindrical ruby rods, the largest (f), 8⅝" long and 0.55" in diameter, is used in a high-power laser system. The smallest (c), ½" long and ¼" in diameter is for generating only one frequency. Longer rods, such as the 2"-long (d), typically generate five frequencies when fired at the laser-action threshold.



energy level, they emit light. Although each molecule emits light at one frequency only (at a given instant of time), there are so many of them radiating at so many different frequencies that the resultant light looks white to the eye.

The process for getting energy into a laser rod in order to induce laser action is one of absorption by the laser material. Ruby absorbs yellow-green and violet light but does not absorb red light. Since the red light is not absorbed, it is transmitted through the ruby rod, which accounts for the red appearance of ruby. Other solid laser materials absorb other wavelengths, and consequently the xenon-filled photoflash lamp is a good one for general purpose laser pumping since it does emit at all wavelengths.

The typical configuration of a laser rod is that of a right circular cylinder with a length ranging from one to twelve inches and a diameter ranging from

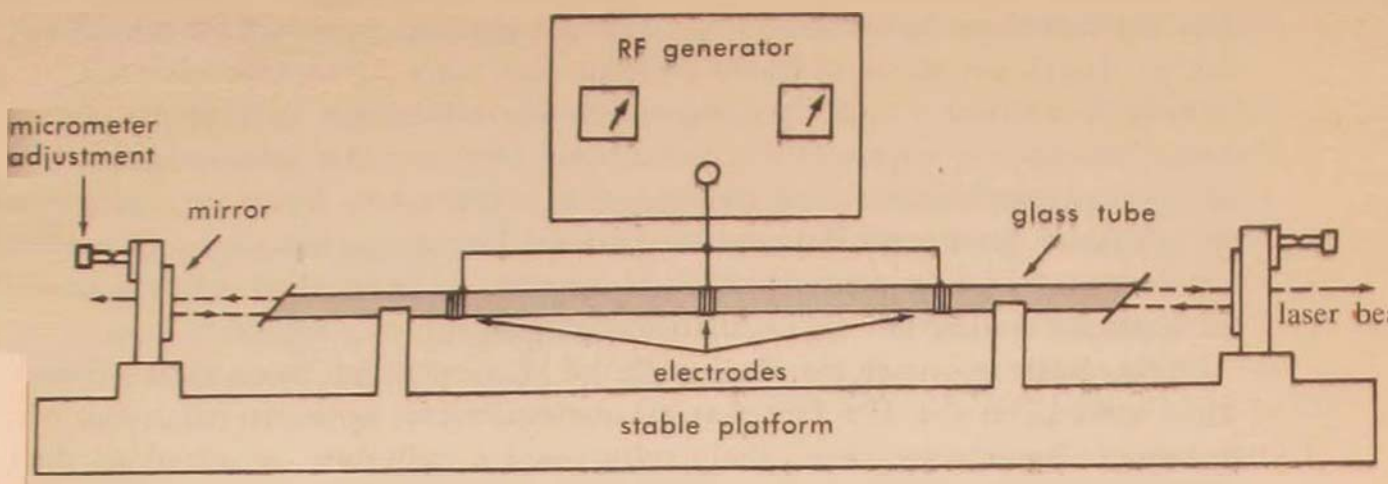


Figure 4. Construction of a gas laser. The laser medium for the visible system is a mixture of helium and neon. Other gases can be used, but their laser frequency is in the infrared. The gas is contained in the glass tube, and energy is supplied to it from a radio frequency generator by electrostatic coupling. The typical power requirement is 40 watts at 27 megacycles per second. At each end of the glass tube a glass plate is mounted at Brewster's angle, which prevents a reflection at this surface for a certain polarization of the laser beam. The mirrors are generally mounted externally to the gas laser medium, and they must have a reflectivity of 99 per cent, which requires the use of multiple-layer dielectric films instead of silver. As the mirrors must be aligned to within several seconds of arc parallelism, micrometer adjustment is necessary. The beam builds up by first passing through the gas medium. The mirror then reflects 99 per cent of the laser beam back into the gas, where it is amplified further. The one per cent of the beam that the mirror transmits constitutes the actual output of the laser.

one tenth to three quarters of an inch. For best operation the ends of the rod should be optically polished so that the variations in flatness are no greater than one tenth of a wavelength (0.000003 inch), and they should be parallel to within four seconds of arc. Other configurations of the ends can be used (such as hemispherical surfaces), but the flat ends are the most common. One end of the rod is then heavily coated with silver so that no light can pass through it, and the other end is coated to allow only a few per cent of the light to be transmitted. This few per cent constitutes the output of the laser.

At the time of the writing of this article, ruby is the only optically pumped solid laser material that oscillates at a visible wavelength. All the other solids that are pumped in this manner oscillate in the infrared. Since new laser frequencies are being announced at the rate of two per month, it should not be long before there are other lasers of this type that emit coherent radiation at visible wavelengths.

Gas Lasers. The second type of laser uses gases as the active medium instead of a solid. The first one of this type was set in operation late in 1960 by Javan, Bennett, and Herriott of the Bell Telephone Laboratories. The basic theory of operation of a gas laser is roughly the same as that of a solid laser,

but the actual performances of the two are considerably different. First of all, gas lasers can all be operated continuously, since the power requirement is only 40 watts at a radio frequency. The few solid lasers that can be operated continuously require 1000 watts input; they are therefore elaborate in design in order to remove all the heat that is generated. The power outputs of gas lasers (and even the continuous solid lasers) are less than one watt, whereas the output power of pulsed solid lasers can be hundreds of thousands of watts for a duration of less than one thousandth of a second.

Gas lasers approach the ideal model of laser operation much more closely than solid lasers do. The fact that gas molecules can move around is not of too great importance, since their velocities are still slow compared to the velocity of light, which is 3×10^{10} cm/sec. Gas molecules are much more widely separated than the ions are in a crystal, and consequently interaction effects are of secondary importance. The gas laser generates frequencies that are more nearly monochromatic than those emitted from ruby lasers. In fact, the spectral purity (or monochromaticity) of the radiation from a gas laser is several orders of magnitude better than that of the best electronic oscillator. The gas laser oscillates at a frequency of about 3×10^{14} cycles per second, and the frequency width of this radiation is about 100 cycles per second. This gives an impurity of 3 parts in 10^{13}. A similar figure for the ruby laser is 2.5 parts in 10^{8}. Although this is not as pure as the gas laser, it is still an order

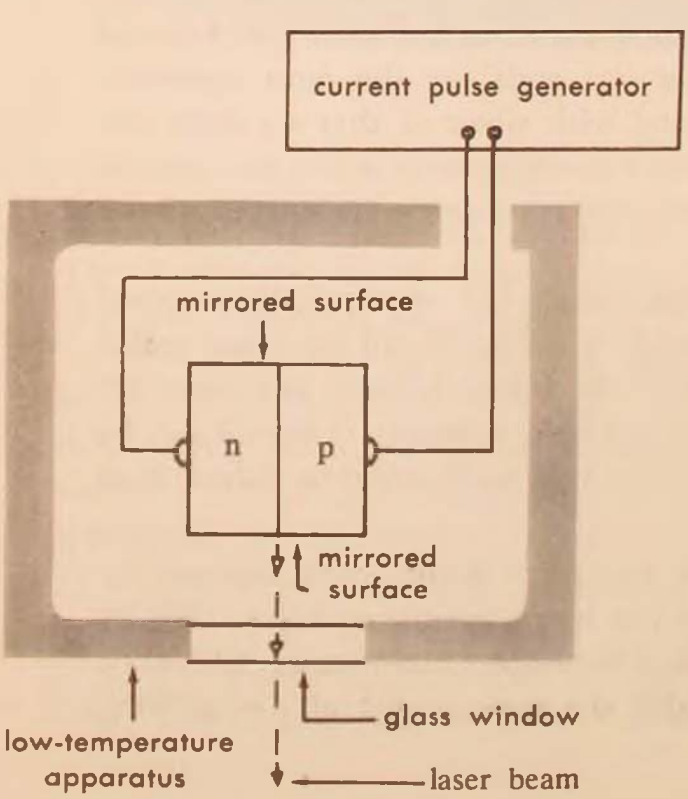


Figure 5. Construction of a semiconductor diode laser. The semiconductor diode laser is much more efficient than other lasers in converting electrical energy to coherent energy at optical frequencies. Its present efficiency of 40 per cent compares to 1 per cent for optically pumped solid lasers and 0.1 per cent for gas lasers. The techniques used to make semiconductor p-n *junction diodes are used in making this type of laser. A cube of gallium arsenide, with an edge dimension of about 0.04 inch, is the basic part. Electrical contacts are made to the cube on the two sides parallel to the narrow (0.0002-inch) junction. Two other surfaces, perpendicular to the junction and parallel to each other, are polished to a high-quality optical finish. The gallium arsenide cube is then immersed in a liquid-nitrogen bath at −321°F and oriented so that the beam, traveling in the plane of the* p-n *junction, passes through a glass window in the low-temperature container. In principle, only a d.c. battery is needed for the pumping source, but to avoid overheating it is still necessary to apply power in short pulses.*

of magnitude narrower than the best conventional light source before lasers were invented.

It is more difficult to construct a gas laser than a solid laser system for several reasons. First, the gain per unit length of a wave propagating through the activated gas medium is much less than it is for a solid laser. In order for a wave to grow in amplitude by a sufficient amount to make up for the amount that is lost when it strikes the partial reflector, the path length must be comparatively long. A typical length is one half to one meter, whereas for ruby a one-inch piece is sufficient. This long path length puts very tight tolerances on the alignment of the two mirrors. The second difficulty is that one is working with a gas or mixture of gases that must be enclosed in a sealed glass tube. Although more difficult to set up initially, a gas laser does avoid the problems arising from the great variations in operation between similar types of crystals used in solid laser systems.

The systems that are used for pumping a gas laser differ considerably from the optical pumping used for most solids in that the step of converting electrical energy to optical radiation is eliminated. The system that will be discussed here is the one used by Ali Javan to pump the helium-neon laser. This gas laser consists of a mixture of helium and a smaller amount of neon. An electrical discharge excites the helium atoms to a higher energy state. These excited helium atoms can then transfer all their energy to the neon atoms via a collision. It is from the excited neon atom that laser action occurs, and the mechanism is the same as it is in solids (this mechanism will be discussed in greater detail later).

Most gas lasers oscillate in the infrared, but there is one atomic transition in the helium-neon gas laser that permits it to oscillate in the visible wavelength region at 6328A (red). This is the highest-frequency laser definitely known of at the writing of this article.

Semiconductor Diode Lasers. A third type of laser was announced in November 1962 by R. N. Hall and his colleagues at the General Electric Company. This is a semiconductor device, and many of the techniques that have been developed by the semiconductor industry for making transistors and diodes were used in its development. This laser is basically a *p-n* junction diode with mirrors on each end. A "*p-n* junction" is a junction of two slightly dissimilar semiconductor materials. The actual junction occurs in a very narrow and well-defined region. When a voltage with the correct polarity is applied to the diode, large currents can flow, and in the immediate vicinity of the junction one can have more electrons in the conduction band (the upper energy level) than are in the valence band (the lower energy level). This is one of the criteria for laser action. The electron then drops down (in energy) to the valence band and gives up this energy difference as a wave or photon. The semiconductor material that is used consists of a mixture of gallium arsenide and gallium phosphide. By properly adjusting the mixture, the wavelength at which laser action occurs can be controlled over a range from 8420A to 6300A. If no gallium phosphide is used, the emitted wavelength is 8420A; if 40 per cent gallium phosphide is used, the wavelength is 6300A.

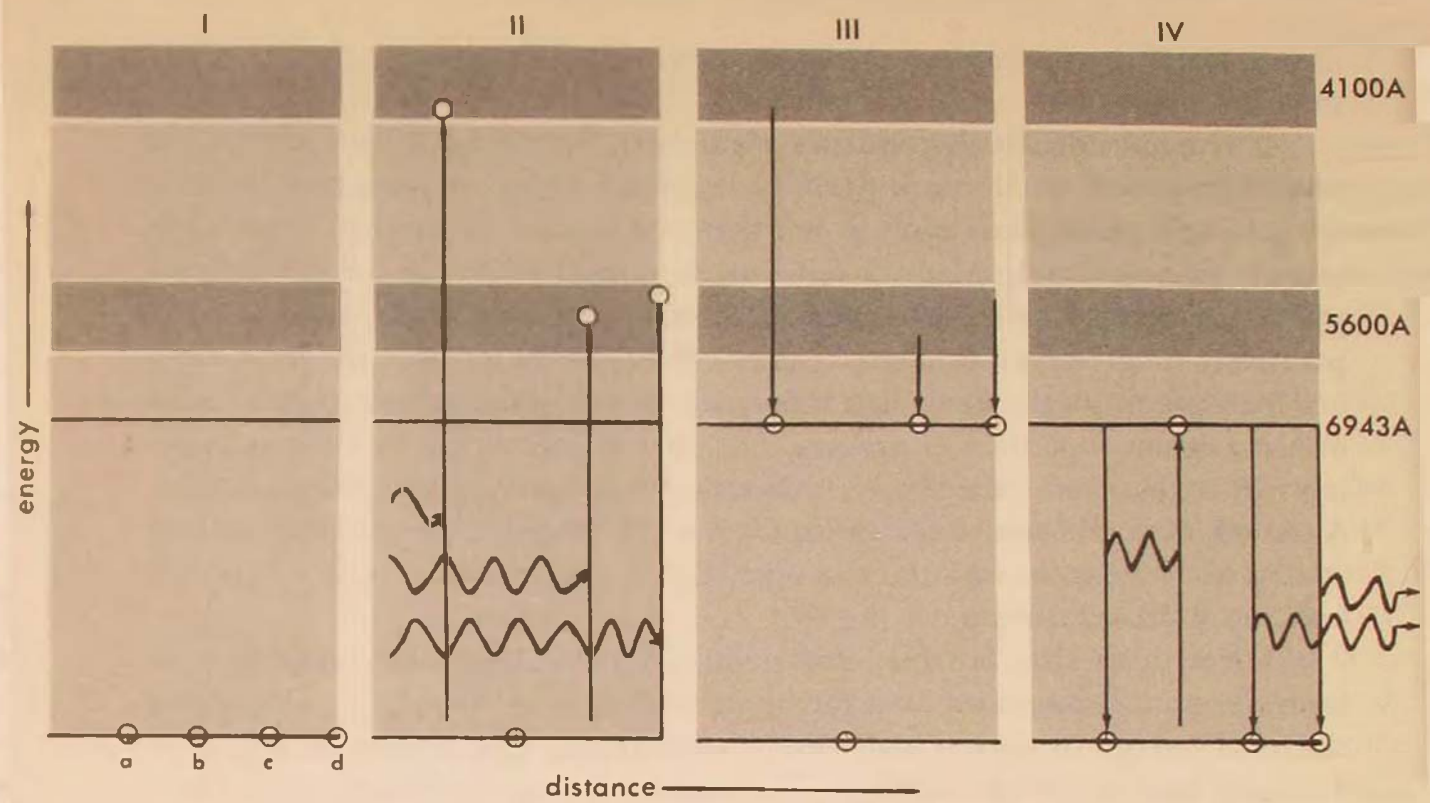


Figure 6. The laser mechanism. The different aspects of the laser mechanism in ruby may be visualized graphically. In I, atoms a, b, c, *and* d *are in the ground state (lowest energy level) before the pumping light is turned on. The darker areas represent the two absorption bands, and the middle horizontal line represents the metastable state at 6943 angstroms, from which laser action occurs. In II, the flash lamp has been turned on, and three photons from it are being absorbed by atoms* a, c, *and* d. *In III, these atoms have collided with the crystal lattice and have lost a portion of their energy. The lost energy is not radiated in the form of a photon but instead heats up the crystal. When the three atoms lose this energy, they drop down to the* R_1 *line at 6943A. In IV, the first thing that occurs is that atoms* a *and* c *fall back down to the ground state spontaneously. The photon generated by atom* a *is absorbed though by atom* b *and does not contribute to laser action. The photon released by atom* c, *however, stimulates atom* d *to radiate (the inverse of absorption). Photons from atoms* c *and* d *are then in phase and continue to propagate through the crystal. They stimulate other atoms to emit photons, and through this process the laser beam builds up in intensity.*

This is the shortest wavelength of emission of any solid laser whether it is optically or electrically pumped. The outstanding feature of the semiconductor laser is that it has an efficiency of 40 per cent or greater in the *direct* conversion of electrical energy to coherent optical energy. This conversion efficiency is about 40 times greater than that of optically pumped solid lasers. A pure gallium arsenide laser has been operated at room temperature, but this is the exception rather than the rule, for most of them must be cooled to temperatures in the order of —300°F or less.

the laser mechanism

In this section I shall be referring to ruby and its characteristics although

it is, in most respects, typical of all optically pumped solid lasers. The part of the following discussion that is about stimulated emission is characteristic of all types of lasers, whether they be gases or solids and whether optically or electrically pumped.

The ruby that is used in conventional lasers consists of a dilute mixture of chromium and aluminum oxides. Pure aluminum oxide, otherwise known as sapphire, is colorless; that is, radiations in all parts of the visible spectrum pass through it unabsorbed. As was mentioned above, ruby gets its red color because the chromium atom in the aluminum oxide absorbs radiation in the yellow-green and violet regions and allows the red and some of the blue to pass through. The chromium atom, because it absorbs a light ray (or photon, which is a quantum of light), gains the energy of this photon and is "raised" to a higher energy state. The chromium atom then returns to its lowest energy (or original) state in two steps. In the first step, the chromium atom collides with the basic crystal lattice structure and in this process loses about 20 per cent of the energy that the absorbed photon imparted to it (if that photon was absorbed in the yellow-green band). It has then arrived at a relatively stable (or metastable) energy state at which it can reside for some three one-thousandths of a second. This is long compared to the elapsed time since the photon was first absorbed. In fact, the time between absorption of the photon and arrival at the metastable energy state is less than one millionth of a second. Final transition of the chromium atom back to its original energy state can occur spontaneously, or it can be forced down. "Spontaneously" implies that it remains in this metastable state some three one-thousandths of a second on the average and then suddenly, of its own accord, drops down to its original energy state. The energy it loses in making this transition is given up as a wave (or photon) whose frequency f is equal to $\Delta E/h$ where ΔE is the energy difference between the two states and h is Planck's constant.

Now the fact that the chromium atom can also be forced to lose this last amount of energy ΔE is the whole heart of laser action. The process of being forced down is called stimulated emission, the reverse of the process in which a photon is absorbed between the same two energy levels. During the time when the chromium atom is at the metastable energy level, it can be stimulated to emit a photon if it is struck by an outside photon having precisely the same energy as the one that it would have emitted spontaneously. As a result of stimulated emission there are now two photons of the same energy, or, from the wave viewpoint, the wave amplitude has been doubled, and the chromium atom is now back at its lowest energy level again. The most remarkable feature of this process is that the additional wave that was created is exactly in phase with the wave that stimulated it downward. This in-phase relationship between the stimulating and stimulated waves is responsible for the coherence of the light that is generated. As this wave continues to propagate in the ruby crystal, it stimulates other chromium atoms in the metastable state to lose their energy. This energy then is all added in phase to the stimulating wave, thus producing a wave that is growing in amplitude.

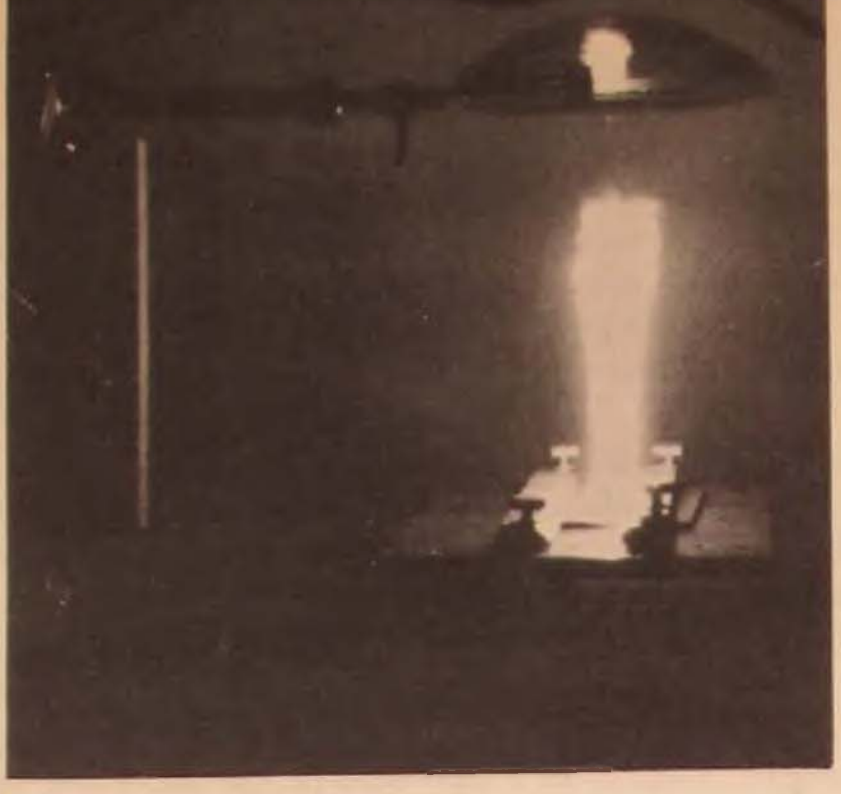
Since this process can start out in any direction, one must find a way to

create a favored direction if it is to be controlled and if use is to be made of it. Schawlow and Townes, in their now historic paper on the theory of lasers, suggested that this "active medium" (e.g., ruby) be placed between two highly reflecting, plane, parallel mirrors. Then a wave that starts out in a direction that is perpendicular to the plane of these mirrors will be reflected back into the active medium every time it strikes the mirror. Since some energy of the wave will be lost when it strikes the mirror that is only partially reflecting (this energy that is "lost" in the output of the laser), the wave will be slightly reduced in amplitude when it starts back through the active medium again. If a wave which has started from any point in the crystal and has undergone reflection at both mirrors arrives back at this point with a greater amplitude than when it first started out, it will continue to build up in amplitude, and oscillation will develop. This is another condition for laser action, that is, that the gain of the wave in the active medium must be greater than the losses it suffers upon reflection at the ends (plus other losses due to imperfections in the crystal and diffraction).

The laser described is a "three-level" laser; one level is the lowest energy state of the chromium atom, the second level is the energy state to which the atom is raised when it absorbs a "yellow-green" or "violet" photon, and the third level is the metastable state from which it is stimulated downward. Now consider a photon that is just starting to propagate through the crystal. The probability of its stimulating others downward and starting laser action requires that there be more chromium atoms in the metastable state than there are in the lowest energy state (often called the ground state). So, in order to achieve laser action in the three-level system, more than half the chromium atoms must be in the metastable level. The number that are in the absorption level or highest energy level are few, since they spend so little time there. Therefore they are neglected.

Now a considerable amount of power is required to keep at least half of these chromium atoms in the upper energy level, and if a way could be found to avoid the necessity, it would be exceedingly worthwhile. Since the important thing here is that the metastable state must have more atoms in it than the state to which they are falling (in energy), then why not insert a normally empty fourth level into the system, to which they can fall from the metastable level? Then only a small part of the total number of excitable atoms rather than half of them must be in the metastable level to get laser action. A considerable savings in pump power results, and it becomes possible to operate a four-level laser continuously. Once the excited atom has dropped down to the fourth level from the metastable state, it then must fall down (in energy) very quickly to the ground state to prevent the fourth level from filling up. If it did fill up, laser action would cease very quickly after it started. A fast decay rate between the fourth level and the ground state is therefore an additional requirement for this type of laser.

Four-level lasers have indeed been built. In fact, there are more solid lasers that operate in this manner than there are three-level lasers. It is not possible to convert ruby to this type of operation; new materials have to be



Figures 7 and 8. Effects of laser action. When a high-intensity laser beam strikes steel (above), a luminous glow or flashback occurs. This "laser plume" is presumably composed of hot, vaporized gases expelled from the metal. The short, concentrated pulse makes a crater in the steel, in this instance about 1/16 inch in diameter and 1/16 inch deep. Repeated firing widens and deepens the hole. The depth of narrow drills can be limited, however, by bubble formation in the hole. (Pictures with less contrast are difficult to obtain because of the intensity of the plume, here about 4 inches long.) When the same laser beam impinges on an anesthetized hamster, the plume and the interaction are substantially less. The gross effects resemble a minor burn, not unlike that of a cigarette. Studies are continuing, but thus far the reduced effects seem to be due to transparency of the tissue to the radiation. As a consequence the radiation is absorbed in larger volume and results in a smaller temperature rise in that volume and a faster dissipation of the laser pulse energy. The 45-degree angle of the 1½-inch plume here is due to the angle of the laser beam against the tissue surface. [Photograph courtesy of Dr. Richard Seed, of Northeastern University, and the American Optical Company, where the experiments were performed with a neodymium-in-glass laser.]

found that naturally exhibit this type of energy-level structure. Although ruby has been made to operate continuously rather than pulsed, all other continuous lasers are four-level systems, which require much less power. Lasers of this type will probably become predominant in the future.

major properties and their applications

As mentioned above, the major features of the laser are the extreme intensity of its beam, its almost complete coherence, its very sharp frequency, and its very directional nature. Each of these features merits further discussion in order to indicate its usefulness.

Intensity. This property of the laser beam is probably the best known and the most widely used one at this time. To emphasize the beam's extreme intensity, let us compare it with the radiation of a conventional light source, such as the tungsten filament of a light bulb or the sun. These light sources emit almost "white" light; that is, they emit at all the visible wavelengths so that the superposition of all the radiation looks white to the eye. It can easily be shown that a light bulb does emit red light by looking at it through a red filter, which allows red light to pass through it but absorbs the other colors or wavelengths. Since it emits red light, the light bulb looks red; if it did not emit red light, one would not be able to see through the filter.

These types of light sources are called blackbody radiators, and their radiation can be characterized quantitatively by the blackbody radiation law that was first derived by Max Planck in 1900. This law is essentially a formula for the amount of radiation (power) from a square centimeter of surface area in a wavelength interval of one angstrom.* The sun, in the red wavelength region, emits about 0.7 watt/cm^2/A. Now the ruby laser can emit a thousand watts from a square centimeter (for a very brief period of time) within a wavelength interval of 0.0001 angstrom (this is equivalent to a frequency width of 10 million cycles per second). On a per angstrom basis, it emits 10,000,000 watts/cm^2/A. The laser is therefore some 10^7 times as intense as the sun.

One can argue that this is not a fair comparison, since the sun emits over a much wider wavelength range than a laser and also emits in all directions rather than in a well-confined beam. This is a good argument. The biggest difference, though, is the fact that the laser's radiation is coherent whereas sunlight is not. So from this point of view the laser ought to be compared with conventional man-made electronic transmitters which generate coherent radiation. These transmitters can easily produce thousands of watts in a well-directed beam and in a frequency interval smaller than 10 megacycles per second. Why, then, is the laser so good? Its big advantage is that it emits at optical wavelengths, which are some 100,000 times shorter than radio frequency wavelengths, and the area down to which radiation can be focused is proportional

*The visible spectrum extends from a wavelength of 7000 angstroms, which is red light, to 4000 angstroms, which is blue light. One centimeter equals 10,000 microns, and one micron equals 10,000 angstroms.

to *the square of the wavelength.* Hence a laser beam with a peak power of one million watts and a beam width of 0.5° (one hundredth of a radian) can be focused to a spot size of 0.0001 square centimeter if a one-centimeter-focal-length lens is used. This corresponds to a power density of 10^{10} watts per square centimeter—a power density not achievable with *any* other type of power source. Thus it becomes a relatively easy matter to drill holes in diamonds and puncture sheet steel.

This, then, will probably be the area where the laser will find its greatest practical application in industry. The laser has the potential of being able to drill holes with diameters not much larger than one ten-thousandth of an inch. This is not possible by conventional means. Holes of this size can be drilled using electron beams, but this equipment is much more complex than the laser. The laser is also useful as a power source for vacuum evaporation and deposition of a wide range of materials because it can be external to the vacuum system and therefore will not contaminate it as conventional heating sources that have to be inside it are prone to do.

The electric field strengths that are produced in the focused spot are in the order of millions of volts per centimeter. These high electric fields will make possible the production of new nonlinear effects in materials. Some of these have been investigated already, and frequency doubling and tripling have been observed. It has been reported that a 20 per cent conversion efficiency of red light (6943A) to blue light (3472A) has been attained. In the area of medicine, the laser's intensity has been used to reattach a detached retina to the back of the eye. It can also destroy cells in human tissue, and there is hope that it will kill malignant cells in body tumors.

Coherence. The natural coherence of the laser beam is what truly distinguishes it from other optical sources. Coherence is a property of radiation that has always been obtainable at microwave and lower frequencies but never completely obtainable at optical frequencies. One can generate very low-intensity light that has a small degree of coherence, but the system for doing it is complex and inefficient. Consequently it has never been considered practical for use in, say, a communication system.

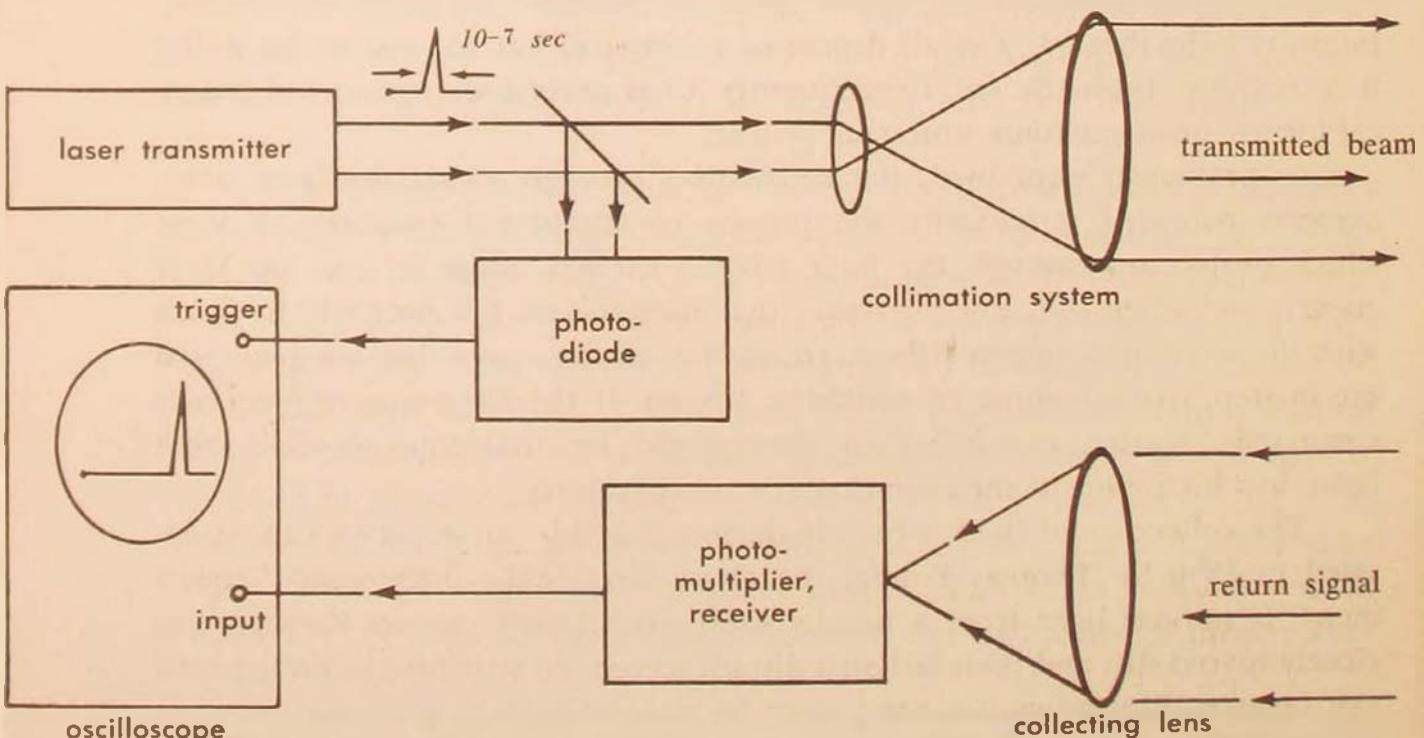
As previously explained, the mechanism through which the laser beam becomes coherent is basically the process of stimulated emission. A wave which propagates through the laser triggers excited atoms to give up their energy, and when they do, the waves that they release fall precisely in phase with the wave that triggered them. In a sense, all the waves that are generated are in step, like a column of marching airmen. If the airmen were given the command "Scatter, march!" then they would be analogous to incoherent light, in which none of the radiating atoms are in step.

The coherence of light is readily demonstrated by an experiment first devised in 1806 by Thomas Young, the classic double-slit interference experiment. If normal light from a nearby source is allowed to pass through two closely spaced slits and then fall on a distant screen, no structure in the pattern can be seen. But if two slits are placed in front of a laser, a pattern of alternating light and dark bands is observed. At the position of a light band, waves

which pass through the different slits arrive in phase and reinforce each other, whereas at the position of the dark band half of the waves have traveled an extra half wavelength and arrive out of phase. Consequently a dark spot is produced. Since normal light is not coherent, the relationship between the different waves that strike the two slits is not fixed as a function of time. If one could make an instantaneous measurement of the light intensity on the screen, an interference pattern could be detected. But the observation is always made over a longer period of time, during which the patterns produced by the incoherent source have shifted around, and one measures only a smear in intensity, indicating incoherent light.

The primary application of the coherence property of the laser beam is in communications, and this feature is the strongest interest to the Air Force. Since application to communication systems also makes use of the other three properties of the laser, it will be discussed at the end of this article.

Figure 9. A simplified laser radar. In the simple laser radar system sketched, the laser transmitter can generate a pulse with a duration of one ten-millionth of a second and a peak power of one million watts. With a pulse this short, the radar could have a minimum range of 15 meters. When the pulse is generated, a small portion of it is picked off by a beam splitter and directed to a photodiode. The output of the photodiode starts the sweep of an oscilloscope. The beam is first collimated before it is transmitted in order to get as narrow an angle as is desired. The return signal comes in through a second optical system and is detected by a highly sensitive photomultiplier receiver, the output of which is fed to the main amplifier of the same oscilloscope. Knowledge of the time delay between initiation of the sweep and reception of the return signal permits computation of the range of the target. Optical radars are extremely valuable because they can work at very close ranges and with resolutions of one foot or better at 50,000 feet.



Frequency Sharpness. In order for radiation to be absolutely coherent, it must be absolutely pure in frequency or perfectly monochromatic. One cannot entirely separate these two features of the laser radiation, since in the limit of either perfect coherence or purest frequency one of these implies the other. But since there are some applications of the laser that require only a narrow frequency, they are separated in this discussion.

Although several discrete or well-defined frequencies are usually generated in the firing of a laser, individually they are extremely narrow. This narrowness arises because the internal gain of the laser medium is a function of frequency. Since it has this property, the wave that is propagating through the material with one of these preferred frequencies will grow faster than waves at other frequencies, and as time progresses, it completely swamps out the waves with a nonpreferred frequency. This procedure of the wave becoming sharper and sharper in frequency as it grows is an extremely regenerative process. As was mentioned at the outset, the frequency impurity of the gas laser is only 3 parts in 10^{13}.

The frequency purity of an electronic oscillator is also obtained by a highly regenerative process. In this case a quartz crystal that is cut to a prescribed shape determines the oscillator frequency, and the vacuum tube provides the gain. For the laser, the shape of the rod also determines the frequency of oscillation, but the system that provides the gain is built right into the rod rather than being an external element. The best specification for frequency impurity of an electronic oscillator is about 1 part in 10^{10}. Hence the gas laser is superior by several orders of magnitude.

In some experiments performed at Massachusetts Institute of Technology by Javan, the inventor of the gas laser, it was found that the resetability of the gas laser output frequency varied by less than 1 part in 10^{9} when compared with other tries. Since this is better by a factor of 10 than the present standard of length, it is certain that a gas laser will replace this standard of length in the future. Another astonishing feature of this laser is that it will permit detection of a change in length of less than 2 parts in 10^{13}. This corresponds to being able to detect a change of 1.2×10^{-11} cm (the radius of the nucleus of an atom) in a length of 60 centimeters.

Directivity. The directional nature of the laser radiation is due to both the laser mechanism and to the parallelism of the flat surfaces on each end of the laser rod. The wave that is propagating in the crystal tends to grow fastest in the direction that has the least loss, and this is the direction that is exactly perpendicular to the two end mirrors. Waves that propagate at some other angle soon "walk off" the plates and are lost. As a consequence, the output beam is extremely well defined in direction. For the case of the gas laser, the spread of the beam is primarily limited by diffraction effects. Hence, if the diameter d of the end mirror is one centimeter and the wavelength λ is 10,000 angstroms (10^{-4} cm), then λ/d (the diffraction-limited beamwidth) is equal to 10^{-4} radians. This is also equal to approximately 0.006° since one radian equals 57°. Observed beam spreads for a ruby laser are about an order of magnitude less than this, but because the output radiation is coherent the beam

spread can be reduced by an external optical system to a point where it too is limited by diffraction.

If the 200-inch telescope at Mt. Palomar Observatory could be used as a collimating lens for laser radiation at 10,000 angstroms, a beam spread of 10^{-7} radians (or one half second of arc) would result. It would be of little value to do this, however, since fluctuations in the atmosphere will deflect the beam by one second of arc. Even more important is the fact that engineers cannot design systems that could point the beam that accurately. This will be the determining factor in what beam width shall be used in a system, rather than the laser itself.

An obvious use for the directional properties of the laser beam, in conjunction with its intensity and coherence, is in communication systems, and, as mentioned before, the Air Force has a great interest in this area. An immediate objection from many people is that communication will be limited to times when there is little water vapor between the transmitter and receiver. This is certainly true when one wants to communicate from point to point within the atmosphere, but it does not hold in outer space where there is nothing to absorb, scatter, or deflect the beam.

Several optical tracking systems are well into the development stage at this time. One of these is PIRT (Precision Infrared Tracking System). The PIRT is to be installed at Cape Canaveral for precision missile tracking in the range of zero to 50,000 feet, which is too close for normal radar systems. Another system is being assembled by NASA's Goddard Space Flight Center for optical tracking of a satellite. It will use a high-power ruby laser as the transmitter and a highly sensitive photomultiplier as a detector. The laser will be capable of being fired once per second.

The laser will be used best though as a communications device in outer space, where there is no atmosphere to disturb the beam. Because of the extreme directionality of the radiation it can be a highly secure system, for the input acceptance angle for laser radiation at a receiver can be made very narrow. Also, an optical communication system is ideal, since antenna sizes can be made much smaller if necessary than the satellite and, once again, because of the low beam spread, very little power is wasted. The transmitter can be made extremely efficient also, since semiconductor diode lasers have been developed with power conversion efficiencies of greater than 40 per cent. Background noise will probably put a limit on the range of these systems, however, and this range is liable to be the diameter of our solar system or some 7×10^9 miles. For this range a laser pulse energy of 0.1 joule could be detected, but if one wanted to communicate with our nearest star, Alpha-Centauri, he would need 10^6 joules in a pulse, which would be exceedingly difficult to obtain.

ALTHOUGH the over-all features of a laser system for communicating in outer space seem good, there are many basic problems yet to be solved that apply to this area as well as others. New frequencies are needed (and this implies new materials), increases in efficiency must be obtained, more efficient modu-

lators must be designed, superheterodyne receivers must be developed, transmitters and receivers must be made tunable, and power outputs must be increased. All these will appear in the immediate future if continued emphasis is placed on basic research. The Air Force realizes the importance of these varied fields of research to the development of laser systems. This is as it should be, for only through basic and applied research will the ultimate potentialities of the laser be realized.

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Military Opinion Abroad...

SOME SOVIET VIEWS OF AMERICAN STRATEGY

Dr. Kenneth R. Whiting

IN THE last three or four years there has been more discussion in the Soviet Union about military strategy than at any time since the early 1920's. This may be partly because of the gap that seems to exist between Soviet global strategy and the structure of its armed forces and partly a reaction to shifts in American strategy. The Soviets brag constantly about their pre-eminent position in the latest weapon technology, but they simultaneously chant the old litany calling for enormous ground forces and huge amounts of conventional weapons. Therefore their problem seems twofold: What should be the ratio between expenditures for nuclear weapons and missiles on the one hand and conventional forces on the other? And have recent changes in American strategical concepts made it necessary to change their own global strategy?

Khrushchev, in a speech to the Supreme Soviet on 14 January 1960, openly ridiculed the efficacy of conventional armaments, especially manned bombers, in modern warfare. He stressed the decisive role of missiles and nuclear weapons in any future world war. Khrushchev was setting the background for a severe manpower cut in the Soviet Armed Forces, a cut from 3,623,000 to 2,243,000 men according to his own figures. There is little doubt that Soviet industry needed this manpower, and where better to get it than from an army whose huge numbers were no longer consonant with a global strategy based primarily on ICBM's and nuclear warheads?

Although the military leaders paid lip service to the desirability of Khrushchev's slashes into their manpower, they were doubtless unhappy about the whole idea. They rather obviously dragged their feet in carrying out the cuts, and the U-2 incident, the heightening tensions over Berlin, and the Kennedy call-up of the reserves saved them. Not only were the reductions called off, but even men scheduled for discharge after their normal tour of duty were retained. One apparently reliable estimate puts the total manpower in the Soviet Armed Forces in mid-1962 at 3,884,000, or 261,000 more than when Khrushchev announced his plan to reduce the size of the army.[1]

1. N. Galay, "The Numerical Strength of the Soviet Armed Forces," *Bulletin*: Institute for the Study of the USSR, IX (May 1962), 41-43. Galay, using figures based on the number of military delegates to the 22nd Party Congress in October 1961 and the 14th Komsomol Congress in early 1962, arrived at the figure of 3,884,000 men. Inasmuch as each delegate represented a fixed number of Communist Party or Komsomol members and as Marshal Malinovsky stated at the 22nd Congress that 82 per cent of all members of the armed forces belonged to one group or the other, Galay's figures would seem to be reasonably accurate.

Marshal Rodion Ya. Malinovsky, the Minister of Defense, in a speech at the 22nd Party Congress in October 1961, brought Soviet doctrine and strategy nearer to their traditional position. He pointed out that, in spite of the important role of nuclear weapons and missiles, final victory over the imperialists could only be obtained through the use of all arms and services in combined actions. He further stated that even under modern conditions the next world war, if unleashed by the imperialists, will be waged by massive, multi-million-man armies. Having gotten this sacred tenet of Soviet military doctrine re-established, Malinovsky then graciously pointed out that Khrushchev had made a profound analysis of the character of modern war and laid the basis for Soviet military doctrine in his speech on the 14th of January, 1960. Malinovsky summarized the Khrushchevian contribution as follows:

> One of the most important theses of this doctrine is that a world war, if it is ever unleashed by the imperialist aggressors, will inevitably take the character of a missile-nuclear war, that is, a war where the chief means of destruction will be nuclear weapons, and the basic means of putting them on target will be missiles. In this respect, the war will both begin differently than formerly and will be waged differently.
>
> The use of atomic and nuclear weapons with unlimited possibilities of delivery to any point in a matter of minutes with the help of missiles will permit in a very short time the attainment of decisive military results at any distance and over enormous areas. Along with groups of the armed forces of the enemy, there will be shattered such objectives as industrial and population centers, communication junctions—everything that feeds a war. The next world war, if it is not prevented, will have an unprecedented destructive character. It will lead to the destruction of hundreds of millions of people and whole countries will be transformed into lifeless deserts covered with ashes.

The new Soviet line of "destruction of hundreds of millions of people" and countries as "lifeless deserts covered with ashes" is a far cry from Stalin's doctrine of the relative unimportance of nuclear weapons and Mao's derisive designation of them as "paper tigers."

In May 1962 one Colonel I. Sidel'nikov summarized Soviet military doctrine very succinctly in *Red Star*.[2] According to Sidel'nikov, another world war, if it comes, will inevitably be a nuclear war. Industrial and population centers will be destroyed along with military targets. The enormous area of the U.S.S.R., however, makes it less vulnerable than other nations in this type of warfare. Although the new weapons will be very important, final and decisive victory will still be dependent upon the combined action of all services and arms. On the other hand, the first nuclear strikes may determine to a large degree the consequent course of the war, and it thus behooves the Soviet Armed Forces to make it their main task to be in constant readiness to repulse a surprise attack and to frustrate the enemy's aggressive plans.

2. Colonel I. Sidel'nikov, "O Sovetskoy Voennoy Doktrine," (Concerning Soviet Military Doctrine), *Krasnaya Zvezda*, 11 May 1962, pp. 2-3. See the English translation of this article in the *Air University Quarterly Review*, XIII, 4 (Summer 1962), pp. 142-150.

Later in 1962 the Ministry of Defense published a book entitled *Military Strategy*,[3] a collective work under the editorship of Marshal V. D. Sokolovsky, former Chief of Staff. This is the first full-dress Soviet discussion of strategy since A. A. Svechin's *Strategy*, published in 1926. The book consists of eight chapters and takes up many of the most important aspects of global strategy. The authors make the usual assumptions about the aggressive character of the imperialists and emphasize the necessity of countering the threat by striving mightily to maintain Soviet superiority in missiles and nuclear weapons. They even point out the American schemes to use space for military purposes and draw the logical conclusion that Soviet military strategists must study ways to foil such aggressive plots.

Although the authors pay the usual lip service to the necessity of maintaining large ground forces, their main pitch is on missiles and nuclear weapons. General of the Army P. Kurochkin, who reviewed the book, complained that the authors give altogether too light a treatment to the roles and missions of the other services in their fascination with the Rocket Forces.[4]

It would seem that the latest literature on Soviet strategy has dropped most of the Stalinist contempt for surprise attack and the decisiveness of nuclear weapons as well as his overemphasis on the roles of the ground forces and tactical air. There seems to be a frank acknowledgment of the extremely important place of missiles and nuclear weapons in modern warfare. One of the more interesting aspects of these changes in Soviet strategical thought is the degree to which they have been brought about by the changes in American global strategy. In other words, to what extent are these changes a response to American initiative in weapon development and strategical concepts? We have heard for years the constant plaint in the press that we merely respond to Soviet moves; but the Soviets seem to give evidence in their writings that at least in one field they are doing the responding.

If the political and military leaders are now convinced that the opening nuclear exchange can have a decisive effect on the consequent course of the next world war—and Soviet literature on the subject makes this assumption —then the problem of superiority in nuclear weapons and long-range missiles is of overwhelming importance today. This has led some American commentators to see in the Cuban gamble a rather desperate Soviet attempt to gain such a superiority on the cheap.

It would therefore seem that the Soviets' view of American strategy has an enormous bearing on how the Soviets formulate their own strategical concepts. The rather rapid changes in American strategy in the last two years have had their repercussions in the Soviet press and would seem to indicate a minor uproar going on in Soviet strategic thought. The following articles by Major General M. Milstein and Major General I. Baryshev are illustrative of the type of analysis now being published in the Soviet Union.

3. V. D. Sokolovsky (editor), *Voennaya strategiya* (Military Strategy), Moscow: Voenizdat, 1962.

4. *Krasnaya Zvezda*, 22 September 1962, p. 2.

I.

ON CERTAIN STRATEGIC CONCEPTS OF AMERICAN IMPERIALISM

BY MAJOR GENERAL M. MILSTEIN*

The Methods Are Changed, the Aims Remain the Same

The fact must be recognized that no American government in the post-war years has put into practice such broad programs of military buildup and preparation of the country for war as has been done by the Kennedy government. Not one American government—in any period of history—has expended in peacetime on military needs such colossal resources as are now being allocated by the present government. Finally, not one American government has called into the military service on such a mass scale those who were discharged or in the reserves. To this it is necessary to add that never so intensively as now has the elaboration of new military-strategic concepts been carried on by both the Pentagon and a multitude of civilian research centers.

What's it all about? Has the danger of attack by someone outside the United States of America increased? No. No rational considerations of national danger constitute the real motives of the dangerous, unchecked flywheel of the military machine which can now, unhappily, be observed in the United States of America.

The approach of the third stage of the general crisis of capitalism signifies a radical change in the relationship of strengths in the world arena, which will be accompanied by a sharp weakening of the economic and political position of American imperialism. The former military-strategic concepts of the U.S.A. have suffered damage, and American military policy as a whole has entered a crisis. In these circumstances, not wishing to reconcile themselves with objective historical developments, the ruling circles in the U.S.A. are making a determined gamble on further increasing the arms race, and their new military-strategic concepts in attempting "to modernize" are nothing more than a way of implementing that same oft-bankrupted policy of "from positions of strength."

The leaders of the Democratic Party in their pre-election platform came forth with criticism of the Republican legacy in the military-strategic field.

In putting complete responsibility on the Republican Administration for the loss of the former might of the United States, the program document of the Democratic Party recognized with heat:

> . . . Our military position is characterized by a whole series of important shortcomings: a lag in the field of rocket building, a lag in the field of space research and a lag in preparation for limited war.[1]

*Mirovoya Ekonomika i Mezhdynarodnie Otnosheniya (World Economy and International Relations), August 1962, pp. 85-95.

1. *Air Force and Space Digest*, September 1960, p. 6.

The aim of the United States is proclaimed to be the creation of "such a deterrent strength that the Soviet and Chinese leaders will distinctly realize that an attack upon the United States will undoubtedly lead to the destruction of their countries."

The hypocritical reference to the threat of an attack by the socialist camp needs no commentary. The rest is important: the quotation abstracted by us from the program document of the Democratic Party proves that the new rulers of America came to power with the aim, decided upon beforehand, aggressive in its direction and reactionary in its essence, of turning back the irreversible historical process. This aim has determined the character and all their efforts to re-examine the old and nurture the new military-strategic doctrines.

"Nuclear Survival" —Sermon of Madness

The first building stone in the new structure of the U.S. military-strategic thought was the theory of the so-called "nuclear survival."

The loss of the atomic monopoly by the United States and then its superiority in the latest weapons had at that time a most sobering effect on many political and military leaders in the West. In place of the thunderous speeches of the American atomic-war-makers there was the realization that the United States could not count on victory in a global atomic war. Thus, on the lips of those who only yesterday were brandishing atomic torches, this acknowledgment was expressed in the formula "In a modern atomic war it is impossible to be the victor."

Such eminent representatives of the American warmongers as the Minister of Defense in the Eisenhower government, Wilson, and the Commander-in-Chief of the NATO forces in Europe, General Norstad, came forth with statements of a similar nature. American military commentators often cited an analogous utterance of the Prime Minister of Great Britain, Macmillan. The newspapers and journals published extensive footnotes of specialists about the effect on the population and economy of the U.S.A. if they undergo an atomic attack. Thus according to the data submitted to the Senate by American specialists, the losses which could be expected in the U.S.A. after a 24-hour atomic war came to 50 to 75 million people. Kissinger, in his book *The Nuclear Weapon and Foreign Policy*, wrote that "an attack on the 50 largest cities in the U.S.A. will knock out 40% of the population, 50% of the basic buildings and 60% of the industry."

From the sharp criticism of this type of admission and evaluation there began a revision of former views and a working-out of new military-strategic concepts. The militaristic propaganda in the U.S.A., in heaving overboard the elements of a sensible understanding of the situation, took on an unbridled, frantic character. The idea of "nuclear survival" occupied the chief position in it.

A graphic specimen of this propaganda is the report of the Washington Center for the study of foreign policy of Johns Hopkins University on the

subject, "The Development of Military Technology and Its Influence on the Strategy and Foreign Policy of the U.S.A.," which was written in 1960 for the Senate Committee on Foreign Affairs. In this report, in particular, it is stated: "To assume that the degree of possible mutual destruction as the result of a total nuclear war or the degree of intensity of radioactive fallout connected with it will be so high as to make nuclear war 'suicidal' (and therefore 'impossible') means actually to evade the most serious military problem facing the U.S.A." "The United States must have a rational possibility of waging such a war"—this is the conclusion which the authors of the report came to.

"With suitable preparation and a warning system . . . the majority of the population can survive . . ." stated the compilers of another report, in agreement with them, a report prepared by the Stanford Research Institute. "Furthermore, the economic consequences will not be so catastrophic as earlier supposed."[2]

In the many-voiced chorus of advocates of war, one of the loudest voices belongs to the military commentator of the *New York Times,* Hanson Baldwin. Having zealously embraced in his propaganda the idea of "nuclear survival," Baldwin wrote with enthusiasm about the studies "which have as their aim to show that if the country will be prepared to wage an active defense, will have a broad system of shelters and many other necessary precautions, then it not only will not be destroyed and will not have millions of dead from a nuclear attack, but will even be in a condition in approximately a decade to produce about the same amount as was produced immediately before the nuclear war."[3]

Edward Teller, "the father of the hydrogen bomb," came forth with a similar statement early in 1962 in the pages of the American journal, *The Saturday Evening Post.*

The theory of "nuclear survival" served as a starting point and as a prelude of the aim of a number of military-strategic conceptions, the regrettable climax of which was the well-known statement of Kennedy about "the initiative of the U.S.A. in a nuclear conflict with the Soviet Union." In this [statement] the government of the United States of America openly stated that it will not stop short of unleashing an atomic war against the socialist camp. Aggressive in all their essence, the military-strategic conceptions of the U.S.A. are now acquiring an especially adventurous character.

"Flexible Strategy — The Key to Victory?"

General Maxwell Taylor, former chief-of-staff of the Army and now chief military adviser to Kennedy, is rightly considered the father of the so-called "flexible strategy." Its basic principles, which have been officially accepted, were enunciated by Taylor in his book, *An Unreliable Strategy,* published

2. *U.S. News & World Report,* 21 December 1959, pp. 54-55.
3. *The New York Times,* 12 January 1961.

in 1960.[4] The ruling military-political circles of the U.S.A. at that time had taken the position of the notorious Dulles doctrine of "massive retaliation," which Taylor subjected to criticism in his book. The purpose of this doctrine was the preparation for a sudden massive application of nuclear weapons against the Soviet Union and the other socialist countries.

In their prognoses of the character of a future war, the military leaders of the U.S.A. proceeded from the unfounded premises of an imaginary superiority of the U.S.A. in nuclear weapons and in strategic aviation, which, according to their calculations, must over a long period remain the basic means of putting nuclear weapons on target. This badly conceived premise proceeded on the basis of the territory of a U.S.A. invulnerable to nuclear attack. Furthermore the strategy of "massive retaliation" had still another peculiarity: it "could leave our leaders," as Taylor wrote, "with only choices: either to unleash all-out nuclear war, or to compromise and retreat."[5]

The great scientific achievements of the U.S.S.R. frustrated the calculations—the basic concepts of the military plans of the U.S.A. in general and the doctrine of "massive retaliation" in particular. In the military-strategic plans there appeared a breach which General Taylor hastened to fill. This is how he formulated the essence of his new strategy. "The strategic doctrine," he writes, "which I would propose in place of massive retaliation, is called a strategy of 'flexible reaction.' This designation demonstrates that we must be prepared to react to any challenge and successfully act in any situation."[6]

In implementation this strategy of Taylor's was distinguished by a whole series of measures, part of which have been actually realized at the present time. His proposal contemplated in particular to increase the race in rocket weapons, to put a good deal more emphasis on antirocket defense, and to raise the status of the infantry in the armed forces. A number of them were directed at enlarging and strengthening the forces for waging "limited" wars, in which he saw one of the chief elements of the strategy of "flexible reaction." Finally, Taylor suggested the idea of reorganizing the armed forces and the creation of a central operative-strategic organ in the form of a general staff.

It goes without saying that as a basis for this program Taylor counted on a significant increase in the budget assigned to military needs, brazenly proposing a yearly budget on the order of 50 to 55 billion dollars in the next five years.[7]

In undergoing the well-known evolution and widening of new proposals, Taylor's doctrine received official approval by the present government of the U.S.A.,[8] and became an important part of the military foundation of the

4. Maxwell D. Taylor, *The Uncertain Trumpet*. New York: 1960. Russian translation: *Nenadezhnoya Strategiya*. Moscow: Voenizdat, 1961.

5. M. Taylor, *Nenadezhnoya Strategiya*, p. 35.

6. *Ibid.*, p. 36.

7. *Ibid.*, p. 176.

8. As a demonstration of this it is sufficient to allude to, for example, the statement of the Minister of Defense of the U.S.A., McNamara: "Our new policy gives us the necessary flexibility to choose between several operational plans and along with this does not demand that we beforehand tie ourselves to the obligation to use this or that doctrine or deliver an attack on this or that objective."

"grand strategy" of Kennedy, that same "grand strategy" which was designed as the spearhead in the preparation for a preventive war against the U.S.S.R.

The first practical step in the realization of the new "theory" was the sharp increase in military spending.[9] The budget for the 1962-63 fiscal year, presented for the approval of Congress by President Kennedy, called for an appropriation of 58 billion dollars, which is almost 4 billion dollars more than in the current year and 10 billion more than the military budget for the 1960–61 fiscal year.

The first, the fundamental, demand of Taylor thus seemed to have been fulfilled. But it was not only the significant increase in military expenditures that pointed to the aggressive tendency of the new military budget. For the first time in U.S. history the appropriations of the military budget were distributed not by the branches of service, as had been done formerly, but compositely by special forces and systems. The deputy minister of defense of the U.S.A., Gilpatric, speaking in March 1962 before the members of the Association of Electronic Industries, described this new order in the following manner.

"Any military program," he stated, "must consider the quality of the means for achieving political aims. . . . Force is used to back policy." In practice this emerges as follows: "One composite program," he said, "has united all the military systems which make up our strategic retaliation forces; a second program united all the factors which constitute our antiaircraft and antirocket defense from a nuclear blow; a third, all our forces for conducting limited war; the fourth composite program embraces our forces for air and sea transport which guarantees the opportunity to use them in limited war; the fifth program united all the scientific-research work, etc."

The distribution of the budget allocations by composite military programs reflects, as in a mirror, the measures for the reorganization of the ministry of defense and the organs of higher military command, as well as the kinds of armed forces which are being carried out at an intensive tempo at the present time by the Kennedy government and aimed at speeding up the readiness of the country for war.

Along with this, the creating of new commands is being discussed.

The idea for such a reconstruction of the armed forces, which assumes a radical reorganization, flows above all from the aspiration of the ruling circles of the U.S.A. to create special forces which would possess a high degree of readiness "for certain circumstances," that is, at that time when the U.S.A. could regard it as fruitful to begin a thermonuclear war.

These forces are named in various ways in the U.S.A. In order to conceal the aggressive destination of these forces, they are consolidated under the designation "nuclear striking power"; in official speeches they are often called "nuclear deterrent system," or "forces of counter attack." In the official military circles in the U.S.A. a new concept has gradually won support. This concept is called "counterforce" or "second-strike force."

9. *Army, Navy, Air Force Journal*, 20 January 1962.

About the Concepts of "Counterforce" and "Second-Strike Force"

H. Baldwin, who has been cited by us, defines the essence of this theory succinctly as follows: "The Air Force figures," he writes, "that we (i.e., the U.S.A.—M.M.) must have forces enough to guarantee our superiority in any nuclear clash. This constitutes the heart of the doctrine of *counterforce.*"[10] It is reputed that the representatives of the U.S. Air Force, who have already gained for themselves an unfortunate reputation as adherents of very aggressive and adventurous military theories, are the authors of this concept. It would be incorrect, however, to ascribe it only to the American aviators.

According to the journalist Alsop, in January 1962 there took place at the White House a meeting of the National Security Council at which Kennedy explained his "political-strategic plan." The first principle of this plan is the continuous maintenance of a nuclear deterrent much mightier than the nuclear striking force of the Soviet Union. The Minister of Defense, McNamara, speaking at a banquet of the American Association of Jurists in Chicago about the main requirement of the new American military policy, put as its main task the preservation and augmentation of the nuclear might of the U.S.A. as "an effective, real deterrent system."

Consequently, the theory of "counterforce" is aimed at a furtherance of the arms race and a still greater accumulation of nuclear weapons as well as the means of delivering them on target.

"The accumulation of these types of weapons," warned N. S. Khrushchev from the rostrum of the 22nd Party Congress of the CPSU, "which is taking place in the setting of the cold war and military psychosis is fraught with horrible consequences. It is enough to give a case of nerves to any military type on duty somewhere in the West at a 'push button,' and could provide events which would bring great harm to the peoples of the whole world."[11]

However, from the point of view of the strategists in the Pentagon, the presence of powerful "counterforces" is still not enough for victory. Here there has appeared on the scene more than once the no-less-fashionable (at the present time) theory of "the second-strike force."

"We are no longer able to hope to guarantee such a deterrent factor if we only have a bigger arsenal of nuclear weapons," the Minister of Defense of the U.S.A., McNamara, stated bluntly. "Our weapon must be still more invulnerable, more widely dispersed."

His deputy, Gilpatric, added to this: "It is completely clear that neither the survival of our nuclear forces nor our capability to respond to a massive first strike of the opponent can be guaranteed only by a further broadening of our stock of nuclear weapons, very important though that is." What then is still needed? "It is completely evident that our weapon will be useful as an answering volley only in that case where it is protected in special shelters, dispersed over wide areas, or made mobile."

In support of the fact that this doctrine has received a really official

10. *The New York Times,* 12 January 1961.

11. *Twenty-second Congress of the Communist Party of the Soviet Union. Stenographic report.* Vol. I, Moscow, 1962, p. 42.

character it would be possible to quote many Kennedy speeches. He, for example, said: "Our hopes for a deterrent system close to absolute must be based on weapons in concealed, mobile, or invulnerable bases which cannot be destroyed by an enemy in a surprise attack."[12]

Kennedy and his ministers are concerned with forces and systems which can "survive" after the exchange of the first nuclear strikes. As appeared in Kennedy's message "On the State of the Nation," to the forces and systems of the "second strike" in the first order belong nuclear rocket-launching submarines armed with Polaris-type missiles; intercontinental ballistic missiles, especially the Minuteman type; part of the aircraft of strategic aviation and aviation based on aircraft carriers.

"We have more than doubled the tempo of delivery of submarines with Polaris rockets, doubled the tempo of production of the Minuteman rocket and increased by 50% the quantity of piloted bombers ready for action within 15 minutes after warning," it was stated in this message.

If one throws out the fallacious phrases about "the enemy attack," about "the retaliatory strike," etc., with which the forced formation of the "second-strike forces" is justified, then it is possible to make two major deductions.

First, the American military command under the pretext of creating "counterforces" and "second-strike forces" is in fact creating at an accelerated tempo and maintaining at a high degree of combat readiness the necessary means for an attack not second but in reality a first strike.

Less diplomatically than his highly placed associates, Baldwin, in essence, cynically acknowledges this. "We must," he points out, "have a composite system for delivering nuclear weapons on target which would be sufficiently diversified and sufficiently dispersed 'to survive' the first strike of the enemy, 'to blunt' or weaken the force of this strike and to mount a retaliatory blow. . . . The word which settles all these problems is 'counterforce'. . . . With this theory is associated the doctrine or concept of the forestalling strike."[13]

The second conclusion: the American strategists admit that as a result of the retaliatory strike by the Soviet Union many of the U.S. nuclear attack systems, especially those which require stationary installations, would be either fully destroyed or so damaged that they could be no longer utilized. Therefore they hope to save the mobile systems such as the rocket-carrying nuclear submarines, the Minuteman rocket in mobile installations, part of the strategic aviation, etc., with which to gain in the course of the war nuclear superiority over the Soviet Union. Such are their hopes.

It is necessary to note, however, that the military command of the U.S.A. is not limited to a theoretical elaboration of the problem of "second-strike forces." From Kennedy's budget message and the U.S. press it is known, in particular, that 50% of strategic aviation (that is, around 800 to 900 bombers) are on 15-minute alert to take off on the combat task of delivering

12. *New York Herald Tribune*, 29 March 1961.

13. *The New York Times*, 12 January 1961.

nuclear weapons. Furthermore, there are 70 to 75 heavy bombers with nuclear bombs aboard circling on patrol. Five nuclear submarines with missiles are constantly ploughing the Atlantic. To this must be added the powerful Minuteman rocket, the number of which, according to McNamara, will come to 800 units by 1965. The conclusion invites itself: this is no second-strike force but a first-echelon force designated for a surprise attack. Thus the actual activities of the U.S. military command reveal the real character of falsely concealed theory.

However, even the theoretical researches of the strategists of "counterforce" and "second-strike force" are turned into self-exposure of them. At the present time within the Pentagon there is an argument about the enemy objectives that must be selected as the basis for the first strike. The adherents of one point of view, chiefly representatives of the Navy and the Army, feel that basic objectives must be the "key centers," or the large cities.

The adherents of the "counterforce" concept, on the other hand, feel that they must be basically military objectives, or, more exactly, the nuclear systems of the enemy: rocket bases, launching areas, airfields, stocks of nuclear weapons, etc. Commenting on this point of view, the French commentator Raymond Aron wrote in *Figaro* on the 12th and 13th of May 1962 that the flexible strategy "envisages many forms of intermediate reactions between passivity and the apocalypse—retaliatory strikes utilizing conventional, tactical nuclear weapons, or thermonuclear weapons, but not against cities."

The adherents of the point of view are only disturbed by one circumstance: for a successful first strike it is necessary to carefully reconnoiter regions in which the enemy's nuclear systems are located. In this connection it is fitting to reveal the "secret" of that enviable persistence with which the proponents of the theory of "counterforce" stick to the question of the inspection of armaments.

The quarrel of the American *mal'bruki** about the selection of objectives for nuclear attack most persuasively demonstrates to all the evilness of the aggressive design which lies in their new military-strategic researches. There is present in this quarrel at the same time still another characteristic feature: in actuality it is an attempt to find an escape from the inevitable retaliation which would befall the executors of these doctrines.

However, the alignment of forces in the world arena and the character of contemporary armaments make such calculations completely hopeless. Warning voices of reason are ever more loudly now being heard from the midst of American society. Eight well-known scholars in the U.S.A., answering the malevolent articles of E. Teller, wrote in *The Saturday Evening Post* of the 14th of April of this year [1962]: "Only knuckleheads and fanatics can beguile themselves with the hope of the nuclear strategy of "counterforce" . . . The inexorable fact is that any surprise attack . . . will immediately evoke a lightning devastating counter-attack directly against the populated and industrial centers of the attacking side."

This and other warnings must be well known to the American strategists.

*["Malbrook" used in the French song "Malbrough s'en va-t-en guerre" referring to the famous general, the Duke of Marlborough.—K.R.W.]

Already, at the beginning of this year, in answering several excessively warlike speeches, the Minister of Defense of the Soviet Union, Marshal Malinovsky, said: "On our side I could state that we are in a state to sweep out of existence with one rocket-nuclear strike any objectives, all the industrial and administrative-political centers of the U.S.A. and to destroy whole countries which permit American military bases on their territories, bases located around the Soviet Union and other socialist countries."[14]

It would be in truth senseless to try to ignore these warnings.

"Limited War" and Conventional Weapons—Important Links of the "Flexible Strategy"

An essential element of "flexible strategy," which was evoked to patch up the breach in the bankrupt doctrine of "massive retaliation," is the theory of "limited war." This theory is an old guest in the pages of the American press and in numerous words of the military theorists. The new aspect—and dangerously new—that "flexible strategy" introduces into it concerns above all an understanding of the term "limited war." Until recently the American political and military leaders regarded as "limited" those wars which were waged on the "periphery," in "limited" (according to this terminology) regions, that is, chiefly in the regions of Africa, the Near and Middle East, and Southeast Asia. But here is how Taylor, the chief military adviser to the president of the U.S.A., defines this term.

"Under the conditions of mutual deterrence," says Taylor, "it is necessary to give a new definition to limited war as armed conflict in which the existence of the United States as a nation is not directly threatened." And further: "This new definition would admit the possibility of armed conflicts in such places as the zone of NATO which was formerly excluded from the definition."[15]

The Taylor interpretation of "limited war" has now received official approval. What accounts for such an evolution?

It is indicative of the fact that the American strategists are trying to limit war so that it will not affect the American continent. They prefer to wage war on the territories of other states where use of all the modern means of destruction is recommended. In other words, "limited" war from the point of view of the U.S.A. is destructive "total" war for other countries.

The danger with which the propaganda of "limited war" in its newest wording is fraught (in this connection the reference to waging it in the NATO zone is very important) has an even more threatening character since the United States has recently sharply increased its preparations in troops and weapons for waging "limited wars."

This is particularly manifested in the increase in the personnel of regular armed forces, in the increase in the number of infantry divisions, in the increased expenditures on the production of conventional weapons, which in the 1962–63 fiscal year increased by 4.5 billion dollars.

14. *Pravda*, 24 January 1962.
15. *Army, Navy, Air Force Journal*, 10 January 1962.

In addition, a special strike command designated for waging local wars has been formed. It is made up of three divisions (two of them airborne), tactical aviation and transport for the airlift of troops. The armament of this command will consist of around 1800 aircraft, tactical nuclear weapons, as well as marine detachments and navy for the transport of troops by sea and to ensure beachheads. The command comes to around 165 thousand men.

The aim in the waging of "limited wars," which counts on the "strengthened buildup of conventional weapons," serves as a very important supplement to the nuclear strategy of the Pentagon. The drive for conventional arms has been animated, in turn, by a desire to guarantee concrete means for the accomplishment of one of the basic principles of the "new," or "grand," strategy of Kennedy. As expressed by Kennedy, this principle consists in "raising the threshold" of waging war with the conventional means of destruction.

What do the American strategists need this complicated novelty for? "Raising the threshold" proposes actually nothing other than a maximum widening of the spheres and opportunities for waging wars in which the United States could avoid using nuclear weapons. This widened sphere of potential military conflict, in answering the interventionist intentions of American imperialism, could have still another implication, which President Kennedy has rather openly discussed. It is the fact that in this case the U.S.A. figures on avoiding a retaliatory strike from the peace-loving countries, as Kennedy explains: "The Soviet Union understands that this kind of broad collision would inevitably lead to the use of nuclear weapons."

In other words, by the blackmailing threat of nuclear devastation, the militaristic circles of Washington would like to untie their hands for an unpunished accomplishment of aggression with the help of "limited" wars and conventional weapons. But these circles forget that the forces of socialism and peace have grown immeasurably along with the capability to frustrate any imperialistic plans.

"The New Weapon" of the Pentagon

An enumeration of the new military-strategic concepts of American imperialism would undoubtedly be incomplete without mention of still another of its inventions. We are speaking about "special war," under which is understood "partisan" or "counterpartisan" military operations which have been prepared and carried out under the guidance of American instructors.

Under the pretext of the struggle with an imaginary Communist aggression, the ruling circles of the United States of America are forming and training "special forces" at an increased tempo. They are mainly intended for the carrying out of subversion, arson, assassination, and sabotage in the rear areas of the socialist countries and countries which are struggling for national liberation. These forces, "the new weapon" of the Pentagon, play the role of instructors and teachers at the time combat activities are being waged by the indigenous armed forces.

The number of special forces and their budget allocations are being constantly increased. Several training centers have been established in the U.S.A. where, mainly from déclassé elements, are trained selected cadres of subversionists and saboteurs. The main one in the United States is at Fort Bragg in the state of North Carolina. Other subversion centers are located in Okinawa, in the Zone of the Panama Canal, and in West Germany. The geography of these centers speaks for itself. The cadres, which each of them trains, are intended for activites in definite regions.

Consequently, the purpose of the "new weapon" of the Pentagon is the export of counterrevolution in its most active, mobile, provocative form.

The United States already has experience in such wars. It is impossible to overestimate the deep danger, fraught with the most pernicious consequences, of this newest form of armed aggression of American imperialism. It is impossible at the same time not to see that the most refined tricks of military doctrinairism will not bring success for warriors from the Pentagon who are trying to turn backward the course of historical events.

The theory of "nuclear survival" and "flexible strategy," the doctrines of "counterforce" and "second-strike force," the gamble on "limited" wars and the massive use of conventional weapons, and finally, the subversive venture of "partisan" and "counterpartisan" wars—these are the basic novelties in the military-strategic programs of American imperialism.

What has changed? American imperialism retains its former nature, it retains its former aims, to which its military-strategic planning conforms: the preparation and carrying out of aggression in all parts of the globe—accompanied by the inherent fear of any aggressor about retaliation, and an aspiration to avoid it. The new which appears in the military-strategic concepts of Washington reflects a further deepening of both these tendencies, reflects the new methods which seek the achievement of these aims. In modern conditions, any attempt at aggression will inevitably involve its planners in the net of adventurism. In the new developments of U.S. military-strategic thought, that feature is its most prominent trait.

II.

ANTICOSMIC DEFENSE

BY MAJOR GENERAL OF ARTILLERY I. BARYSHEV*

Dear editor: In the press one has come to meet the term "anticosmic defense." I request that you explain how this concept arose and what means of attack and defense are cosmic.

Major A. Babkov

*Krasnaya Zvezda (Red Star), 2 September 1962, p. 3.

In order to understand the origin of the term "anticosmic defense" it is necessary first of all to speak of the emergence of the means of combat in the cosmos. The rapid mastery of space beyond the atmosphere in the last few years has shown that there are no limits to the penetration by man into the space of the Universe. However, successes in the mastery of the cosmos, as in other scientific achievements, abroad and especially in the U.S.A. reactionary circles, are intended for use above all in military matters.

The American journal *Parade,* for example, says that the air force of the U.S.A. is planning to put into cosmic space not only command posts but also a series of military weapons. According to their plans, there must be located complicated communications networks, cunning systems for observation, repair stations, filling stations, and everything necessary for the preparation and rearming of cosmic ships. The cosmic fleet, the journal further states, "will be scattered like tiny points among the stars in full readiness to wage war in the silent, icy, mysterious infinity."

Military circles in the U.S.A. are devoting a good deal of attention to the creation of cosmic means of attack. One of the most zealous champions of preparing for cosmic war, the former Hitlerite rocket specialist and now working in the U.S.A., Dornberger, in the pages of the journal *Aviation Week,* openly says: "We must have in the cosmos offensive weapons systems . . . Most of all we must have bombardment systems, made up of hundreds of nuclear bombs, which are revolving in orbit around the earth in all directions."

And this is not simply the cannibalistic ravings of the maniac out of his head. In his writings are reflected the real intentions of the American militarists who have worked out, over many years, a program to utilize the cosmos for military aims. Even now, in accordance with this program, there have been created reconnaissance sputniks, sputniks for the discovery of the launch pads of ballistic rockets, cosmic systems for the navigation of rocket-carrying submarines and strategic bombers, meteorological and communication satellites, and a whole series of others. And in the future it is contemplated to introduce maneuverable rocket planes, orbital sputniks carrying nuclear missiles, a system for carrying out attacks on designated targets.

As always, the appearance of a new offensive weapon calls forth intensive research for the antidote—the means of defense against it. It is not by chance that lately a number of countries have been actively occupied with the problem of anticosmic defense. The defense is considered a logical continuation of antiaircraft defense, which is undergoing rapid development.

Now, in speaking about antiaircraft defense, they have in view a struggle not only with aircraft but also with ballistic rockets, as well as guided and unguided missiles. Without this "addition" no one has any hope under modern conditions of defending either the population or the military forces from the nuclear attacks of the opponent.

In the most recent period the boundaries of antiaircraft defense have been still further extended and have reached beyond the limits of the atmosphere. Defense has grown from antiaircraft to anti-aircraft-cosmic.

The anticosmic defense, as the foreign press affirms, has been called upon to defend the state from the cosmic attacks of the opponent, piloted and unpiloted, by destroying them in orbit. Ballistic missiles are not usually included in the task of anticosmic defense because, although these rockets fly through nonatmospheric space, they are not cosmic means of attack. For defense against global rockets, in the opinion of foreign specialists, there is a need for the creation of special cosmic means because antirocket defense is simply helpless.

For the discovery, identification, and interception of foreign cosmic objects, it is considered important to guarantee observation of the whole air-cosmic space from the earth's surface to the orbits of the artificial satellites. The presence in the cosmos of a large number of objects requires the preparation of special maps of the air-cosmic space, analogous to the maps of the stars in the heavens. These call for systematic correction, otherwise it will be impossible to detect in time the appearance of new mechanisms in space.

These maps must be put in special electronic computing machines, where they will receive information from all sources of observation. These machines in a very short time would determine to whom the cosmic mechanism belongs and calculate the elements of its trajectory. The period of time from the moment of its detection to the putting into action the necessary means of anticosmic defense is extraordinarily short, thus recognition and preparations for destruction must be carried out at a fantastically rapid tempo.

The destruction of artificial earth satellites is already regarded abroad as a real task. An attempt has even been made on them with "fired" projectiles. Thus in October 1959, from a B-47 bomber at an altitude of 20 kilometers, there was launched a ballistic projectile in the direction of an artificial earth satellite. The satellite was at that time 232 kilometers from the earth. According to the foreign press, the projectile came within 6 kilometers of the satellite.

Furthermore, according to information in the foreign press, the possibilities are being investigated in the U.S.A. of destroying artificial satellites by putting into their orbits clouds of sand, small shot, and other solid particles. They can be formed by exploding special rockets in space. The military specialists count on using nuclear explosions at great heights in order to hinder the operation of the radio equipment of space ships. This, in their opinion, could cause difficulties or even real trouble in the guidance of the space systems.

Furthermore, the military circles in the Western countries are counting heavily on the creation of antisatellite or pursuit satellites, i.e., special space ships and space equipment, guided by crews and capable of maneuver. According to the press, the leaders of the U.S. Air Force are firmly convinced that the struggle in space will not be a war of pilotless craft or robots: "As long as people are produced in mass quantities, man is our cheapest automatic machine." In addition to this very cynical argument, the militarists of the U.S.A. are evidently taking into account the fact that on more than one

occasion American rocket technology and automation have failed in the launching of satellites and in the flights of space ships.

Cosmonaut John Glenn, for example, had a great deal of trouble of this kind when he was making three circuits around the earth. If he had not kept the guidance levers in his hands, then his capsule, according to the press, would have made a premature landing. Therefore it is calculated that piloted and maneuverable space vehicles with a payload of several tons will constitute the combat nucleus of the anticosmic and even the antirocket defense and will become the main strength in combat activities in outer space.

How the military specialists of the U.S.A. see their future air-space defense is demonstrated by an article entitled "Air-space Defense in 1970—1975," published in one of the American journals. In it, specifically, it is stated that air-space defense after 1970 will include a system of detection which will embrace the globe from its surface up to a 24-hour orbit (a height of 36,000 kilometers). This system will detect objects, identify them, and track them. Various sensing data-machines located on the earth and in orbit will feed into it. The data from these, along fast-acting channels of communication, will be received in the guidance center for appropriate processing and display on a screen.

With this system, in the words of the journal, there will be closely connected a means of defense capable of intercepting and destroying objects anyplace in the space covered by the detection system. The arsenal of combat tools will include rockets and piloted and unpiloted orbital apparatus. The guidance of the entire broad system of detection and interception will be centralized. The guidance center of the air-space defense may be located on earth, but a reserve system can be on one of the ships of the space system.

The American military specialists are talking a great deal at the present time about antispace defense. In preparing for aggression against the freedom-loving peoples, the imperialists of the U.S.A. are horribly afraid of a shattering retaliatory blow. But nuclear explosions in space, the launching of satellite-spies, or numerous antirocket projects will not enable them to evade retribution in the case of the unleashing of a nuclear-rocket war. As N. S. Khrushchev stated in an interview with an American journalist, "The high-altitude explosion which the U.S.A. carried out will not to any degree hamper our global rockets," nor will they be subject to destruction by an antirocket system. As regards our means of defense, it would be advisable to know that "our rocket, it may be said, will hit a fly in space."

The Soviet Union, in consistently carrying out a policy of peaceful coexistence and general disarmament, is not dreaming about the preparation for aggression in space. The remarkable flights of Yu. A. Gagarin and G. S. Titov and of the first-in-the-world joint space pilots A. G. Nikolaev and P. R. Popovich have made a remarkable contribution to the treasury of world science. In addition, these flights demonstrate what kind of technology, what kind of people our Soviet regime has available and that our people have everything necessary for the suppression of any aggression.

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ANNOUNCEMENT

The Air University Review

In response to the wish of the Chief of Staff for a greater flow of professional literature on the development and employment of aerospace forces, Air University announces an increase in publication of AIR UNIVERSITY QUARTERLY REVIEW to six issues a year. The quarterly series that began in 1947 with the founding of the journal by General Fairchild, first commander of Air University, therefore comes to an end at this issue, "Summer 1963." The new bimonthly series will be published under the name AIR UNIVERSITY REVIEW, and the first issue will be designated "September-October 1963 (Vol. XIV, No. 4)." The volume and number codes will continue the old sequence.

A new, and we think attractive, format of larger page size will permit freer layout and the two-column text page that many of our readers have suggested for easier reading. The content of the journal will continue to be addressed to the mature Air Force professional, and the Editors intend to present articles of advanced information and professional opinion by writers who speak with authority in their field. Contributions bearing on the creation, maintenance, and operations of aerospace power are welcomed from all informed sources. The fundamental principles governing our selections are competitive excellence and timeliness with respect to the professional interests of our readers. New contributors are invited to write the Editor for guidance in our requirements.

ATTENTION

Air University Quarterly Review is published to stimulate professional thought concerning aerospace doctrines, strategy, tactics, and related techniques. *Its contents reflect the opinions of its authors or the investigations and conclusions of its Editors and are not to be construed as carrying any official sanction of the Department of the Air Force or of Air University.* Informed contributions are welcomed.