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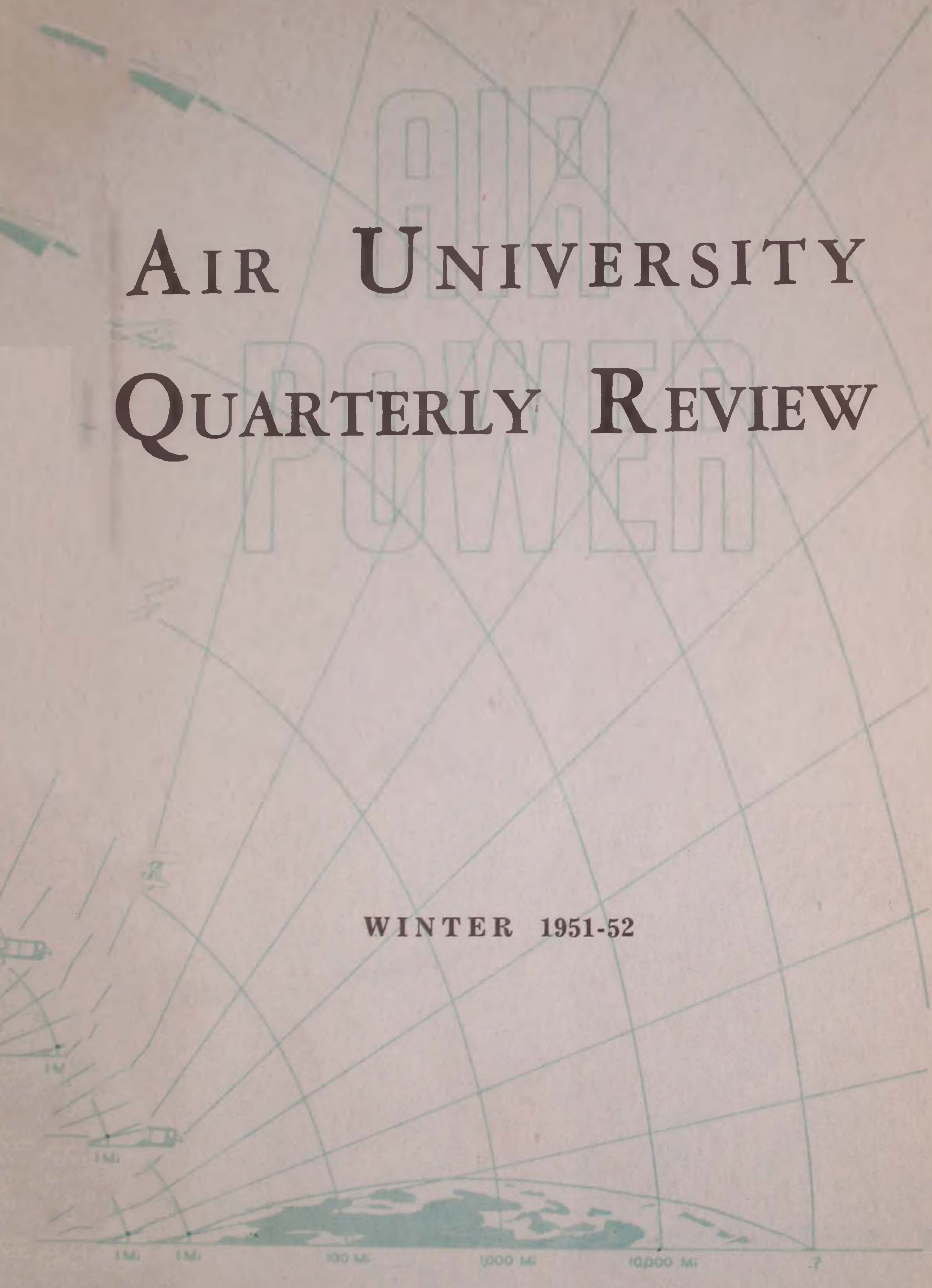

WINTER 1951-52

ATTENTION

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Air Power, the Cold War, and Peace

COLONEL RAYMOND S. SLEEPER

AS long ago as the Napoleonic wars it had become commonplace that "England loses every battle but the last one." And as the United States developed into a world power in the late nineteenth and early twentieth centuries, the same phrase could well be applied to her. It had become a matter of pride among the Western democracies that their ideals, their way of life precluded them from taking sterner measures to preserve the peace than diplomatic suasion and half-hearted economic sanctions. The result has always been the loss of the vital initiative to the enemy. This abdication, combined with the vacuum of military power which accompanied such a concept, meant that in both the First and Second World Wars the Allies suffered a long period of terrible reverses, followed by a longer period of precarious impasse, before the full weight of Western manpower, industry, and technology could be thrown into the scales of battle.

Even under the conditions which obtained during these wars, the losses we suffered as the price of our unreadiness were so heavy as to bring into question not only the practicality but the very morality of continuing such a policy of double jeopardy. But in an age of the atomic bomb, guided missiles, and jet powered aircraft, the margin of safety previously afforded by physical distances and barriers has been reduced to a minimum unpleasant to contemplate. It was midway in the Second World War before the offensive capability of air power was fully recognized and applied on the battlefield. Would a fully prepared enemy, equipped with modern weapons, allow us that much time in a new third World War?

Now we are engaged in a new kind of war—a war of propaganda, of infiltration and subversion. Like a disease which rages within the body, only a few running sores are apparent on the surface, as in Korea, but the disease is no less deadly for that.

ne of the routine tasks of the Air Force in Korea is to keep enemy airfields in North orea non-operational. When reconnaissance revealed that this airfield at Saacham as nearing completion, nine FEAF B-29's peppered the runway with one thousand 00-pound bombs. The strike blanketed 70 per cent of the runway length, leaving undreds of bomb craters which will take immense labor to fill, pack, and resurface.

In this war we are again on the defensive, and a major part of that defense is the Air Force. There is general agreement that our Strategic Air Command, armed with the awesome atomic bomb, has been the chief deterrent to world war. Its potentialities have been widely publicized, so that the enemy will be aware of the destructive force it would pull down on its own head if it pushed us too far.

But while the threat of the atomic bomb may have been sufficient to deter the adversary from all-out war, it also may be the reason that the enemy evolved the system usually known as cold war. Since our democratic heritage has dictated that our strategic air force would be used only as retaliation for attack upon us or our allies, we have lighted the enemy's path. All he had to do was fight his war underground by the use of propaganda and local converts and, in the areas where insurrection or invasion was attempted, to use satellite troops for the actual fighting and thus maintain a fiction of nonaggression, which the code of international law allows him.

The startling successes achieved by this new type of warfare are too fresh in our minds to need recounting. We have finally checked this kind of aggression in Greece and Korea. But even then, because the initiative was largely out of our hands, we had to meet the enemy completely on his terms—in a terrain highly favorable to unmechanized masses of troops with a relatively low degree of fire power, and we have had to match these troops with ground forces, that branch of the service in which the enemy has his greatest strength.

These developments of the last five years now bring up the question: has our strategic air force atom bomb threat been a failure? If it has blunted one horn of the international dilemma, has it not caused another to grow? Is there a way in which it can be employed with other aspects of power to help combat this new turn of events?

One answer to this question rests in the problem of the proper use of power. It is not enough that a country merely possess power. That power must be known to both friends and enemies. It must be constructively employed for the aid and comfort of our friends and the control of the hostile nations. If the mere existence of the air weapon has been enough to prevent world war, is it not reasonable to feel that air power used as a psychological weapon in conjunction with other weapons of cold war might be even more successful than it was in the Berlin Airlift?

In considering this point, let us briefly review the historical use of air power, its effect upon population, and its influence in producing the desired reactions in an enemy. Then we can draw a few tentative generalizations and perhaps imply new ways of employing air power.

Historical Uses of Air Power Against Societies

In World War I, the Germans bombed London with both aircraft and zeppelins.

> In all, approximately 200 enemy airships and 430 German aircraft appeared in the skies over Great Britain during the war years . . . 4,800 casualties, most of them among civilians, and property damage of approximately $14,000,000 provided for Britain a foretaste of what was to come in 1940-45.[1]

There is no clear-cut indication as to exactly what effect the Germans hoped to produce in World War I with their spasmodic raids on England. Since most of the raids were directed against London, it would seem that the chief intent was to strike terror in the civilian population. The raids were not of sufficient size to have materially affected Britain's war-making potential, and, except as the center of government and the rail transportation system, London would not have been of primary importance as a target in any such plan. If creating panic was the object, it seems to have failed. Clamor went up for adequate air defense, roofs were sand-bagged, lights were dimmed, and the early patterns of air raid defenses began to appear. But no panic, no disintegration of the fabric of society, no economic effects, and, in general, no real military effects seem to have resulted.

The intent of the Allies in the Second World War is on record. The ultimate objective of the bomber offensive was stated to be "the progressive destruction and dislocation of the German military, industrial and economic system, and the undermining of the morale of the German people to a point where their capacity for armed resistance is fatally weakened."[2] In the interim years of 1919-1939 many prophets had appeared to argue that air war would quickly "destroy morale," "eliminate the administration," "produce great panic," and "destroy the will to fight." These effects were usually to be achieved by killing people or by destroying morale. With this single-minded mass of theory behind it, it was logical that the military thinking at the outset of the Second World War would follow similar lines. That this thinking continued through the war and beyond is evidenced in the reports of the morale division of the United

States Strategic Bombing Survey (USSBS). These reports focus largely upon the morale effects of bombardment rather than on the psychological effects. Thus the emphasis is upon the "will-to-fight" effect of bombing rather than upon guiding the enemy population's behavior to best suit our own ends.

The Hamburg raid was an example of the disintegration of social control through air power. Hamburg was brought under severe attack in late July and early August 1943. Probably well over 1,200,000 inhabitants fled from Hamburg as a result of these attacks. While these evacuations were reasonably orderly,[3] only a portion who left were given departure certificates. Communications were destroyed, water power, electricity, and all transport were cut. Even four days after the first raid "feeding was still erratic because there were no facilities."[4]

There is no evidence available to show that Allied forces made any attempt to exploit or influence the disintegration of social control in the Hamburg area precipitated by bombardment.

Over 60,000 casualties resulted, and these included 2000 political leaders in Hamburg. Over 75 per cent of all homes in Hamburg were damaged or destroyed. As a result, 1,200,000 evacuees left Hamburg, carrying tales of death and destruction with them. Thus people spread to outlying areas, and their stories produced rumors of great death and destruction.

Could the social disintegration have been made more complete through psychological preparations? Could the panic have been made more profound by propaganda? On the other hand, was social disintegration the desired reaction? Was the desired reaction of the populace one calculated to assist the Allies more directly, or was the objective of the attack really to kill 30,000 people and wound 37,000 more, and simply to neutralize the industrial facilities of Hamburg? Before analyzing these questions more generally, it may be helpful to examine additional cases.

In Japan 900,000 people were killed, 1,300,000 were injured, and over 8,500,000 evacuees were produced through air bombardment. In the attacks on Japan the Allies concentrated largely on area bombardment, although certain specific systems, such as aircraft factories, airfields, and other specific target categories were attacked.

The atomic attacks on Hiroshima and Nagasaki are cases of social disintegration through air attack. Did panic occur in these attacks? Irving Janis believes that simply because "many survivors felt emotionally upset, it is not safe to assume that they actually displayed panic behavior or that they engaged in reactions which were inappropriate or antisocial."[5] The question as to whether or not panic was produced is of psychological interest, but it is believed that the real question involved in the evaluation of the attacks on Hiroshima and Nagasaki is what was the objective of these attacks in terms of the reactions of the Japanese, and furthermore what were the reactions produced?

Estimates of the casualties have ranged between 100,000 and 180,000 in Hiroshima (only that one instance of atomic bombing will be discussed). The USSBS estimated that from 70,000 to 80,000 persons were killed and an equal number injured.

> . . . . The impact of the atomic bomb shattered the normal fabric of community life and disrupted the organizations for handling the disaster. In the 30 percent of the population killed and the additional 30 percent seriously injured were included corresponding proportions of the civic authorities and rescue groups. A mass flight from the city took place, as persons sought safety from the conflagration and a place for shelter and food.
>
> . . . . Of more than 200 doctors in Hiroshima before the attack, over 90 per cent were casualties and only about 30 physicians were able to do their normal duties a month after the raid.
>
> . . . . All utilities and transportation services were disrupted over varying lengths of time.
>
> . . . . By 1 November only some 137,000 people lived in Hiroshima of an original high of some 350,000.[6]
>
> . . . . The fire storm produced at least one case of overt panic.
>
> . . . . The team fought the fire for more than two hours, and gradually defeated the flames . . . . The frightened people in the park pressed closer and closer to the river, and finally the mob began to force some of the unfortunates, who were on the very bank, into the water.[7]
>
> . . . . Fear reactions persisted among a sizeable proportion of the population for many days and possibly weeks after the atomic bombings
>
> . . . . Anxiety laden rumors circulated among the survivors.
>
> . . . . Among a small percentage of the survivors, there were sustained reactions of apathy and depression during the post disaster period.[8]

The dominant reaction produced thus appeared to be terror and fear. Beyond this the panic and individual disorganization led to community disorganization. According to the USSBS the bomb shattered the fabric of the community. Was the objective of the urban area attacks on Japan to kill and wound 2,200,000 people and drive eight and one-half million more to the hills? Was the objective to destroy the economic war potential of Japan?

What did we tell the Japanese people was the objective of these attacks? There were two leaflets dropped to explain the objective of urban area destruction, one written in MacArthur's headquarters and one in Nimitz' headquarters. The first reads as follows:

> These leaflets are being dropped to notify you that your city has been listed for destruction by our powerful Air Force. The bombing will begin within 72 hours.
>
> This advance notice will give your military authorities ample time to take necessary defensive measures to protect you from our inevitable attack. Watch and see how powerless they are to protect you.
>
> We give the military clique the notification of our plans because we know there is nothing they can do to stop our overwhelming power and our iron determination. We want you to see how powerless the military is to protect you.
>
> Systematic destruction of city after city will continue as long as you blindly follow your military leaders whose blunders have placed you on the very brink of oblivion. It is your responsibility to overthrow the military government now and save what is left of your beautiful country.
>
> In the meanwhile, we urge all civilians to evacuate at once."

The CINCPOA-CINCPAC leaflet reads:

> Read this carefully as it may save your life or the life of a relative or friend. In the next few days, some or all of the cities on the reverse side will be destroyed by American bombs. These cities contain military installations and workshops or factories which produce military goods. We are determined to destroy all of the tools of the military clique which they are using to prolong this useless war. But, unfortunately, bombs have no eyes. So, in accordance with America's humanitarian policies, the American Air Force which does not wish to injure innocent people now gives you warning to evacuate the cities named and save your lives.
>
> America is not fighting the Japanese people, but is fighting the military clique which has enslaved the Japanese people. The peace which America will bring will free the people from the aggression of the military clique and mean the emergence of a new and better Japan.
>
> You can restore peace by demanding new and good leaders who will end the war.
>
> We cannot promise that only these cities will be among those attacked, but some or all of them will be, so heed this warning and evacuate these cities immediately.[10]

The first leaflet undoubtedly aims to produce fear, evacuation, the feeling of helplessness, hatred of the military government and its overthrow.

The second leaflet appears intended to save lives, to explain that the cities must be destroyed because of the military installations in them, to identify the U.S. with the Japanese people, to show that the U.S. policy is humanitarian, to identify the Japanese government as responsible for the war, to demand a new and better government, to produce evacuation, and to hold up a bright picture for peace.

A Japanese reading the second leaflet would be much more likely to consider its intent humanitarian than would a Japanese reading the first.

It appears further that the U.S. object of destroying these cities as noted in the MacArthur leaflet was (1) to destroy military installations, (2) to destroy economic war potential, (3) to produce evacuations, (4) to produce fear, feeling of impotence, hopelessness, and loss of morale, and (5) to produce a new Japanese government.

However the purpose of the CINCPOA-CINCPAC leaflet was specifically stated to be:

> To inspire fear in the Japanese people by informing them of cities we intend to destroy, thereby making it clear by inference that the Japanese Air Force is impotent and that we are master of the skies over Japan.[11]

There is considerable evidence to the effect that these objectives were partially obtained, although some of the reactions produced were not desired.

> The reactions found in the bombed cities appeared in the country as a whole—fear and terror, anger and hatred against the users . . .[12]

Certainly the anger and hatred of Americans were undesirable effects of bombing urban areas. In a very able study of this area of psychological warfare, Rand Corporation reports:

> The most common reaction, especially in the warned towns, was fear. The next most common was a feeling of the great strength of the United States and the impotence of the Japanese. Mortification or resentment over the weakness of Japan and the way it was rubbed in by the warning was expressed. . . . Others interpreted them as humane action and were grateful that Japanese lives had been saved. . . . Relatively few Japanese were primarily impressed with the humanitarian intent of the warnings.
>
> There is evidence that in some cases considerable numbers of the people moved away when they learned their city was listed for bombing. . . . These activities interfered temporarily with the movement of military and other supplies, and absenteeism and other hindrances caused production losses. There was general confusion in the local areas. . . .
>
> Officials spontaneously admitted that the warnings disturbed them more than any other leaflets dropped in Japan because nothing could be done to counteract their effects in frightening people, underlining the impotence of the military, and inducing belief in the truthfulness of the American propaganda.

But both leaflets failed to give any instructions except unfeasible or vague ones. Thus it was unfeasible for the average Japanese to "demand new and good leaders who will end the war" or to "evacuate immediately."

It is evident then that the objectives of bombing urban areas, except for military effects, were not clearly expressed, either to the enemy or in the effects of these attacks. It may well be that the effects desired can be summarized as "unconditional surrender." The difficulties that this unexplained ultimatum produced in both the European and Japanese war have been enumerated repeatedly since the war.[13] Be this as it may, air power can never be most effectively used unless there has been a detailed analysis made of what psychological reactions through air power it is desirable to produce in the "target society" and unless definite plans are made to control these reactions.

Examination of the foregoing examples, to which many similar ones could be added, shows that what undermining of the morale of the people was accomplished through bombardment was left to the force of the bombs themselves in most cases. In Japan, where we made an effort to explain what we were doing, the explanations emanating from different headquarters were contradictory, and in neither case were they fully desirable from a psychological point of view. Even the more obvious psychological accretions to carefully scheduled bombing, such as timing subsequent raids on a city at the periods of maximum rehabilitation from the last raid, were largely ignored. Much of this indifference to the psychological potentialities of air power can be traced to our fundamental thinking on the object of air warfare. We established the objective of the destruction of the enemy's economic war potential, and this required more and more power for more and more destruction. The net result was the beginning of the destruction of the enemy social fabric. Did we lose sight of the political objective of air war: to force our will upon the enemy? To control him?

Control Through Air Power

Let us turn now to an example of a different concept in the use of air power, an example which is extremely fruitful in these twilight days of half-peace-half-war. This example was furnished by Air Chief Marshal Lord Portal, who commanded the RAF at Aden, in Saudi Arabia, in 1935. In his article[14] Portal analyzes the means of controlling rebellious tribes in Aden. He states:

> We do not simply tell the tribe that they are going to be bombed and to clear out of their villages, and then give them a good bombing and a warning that if they misbehave again they will get a further dose of the same medicine . . . that may sound like the common-sense thing to do . . . but it would be utterly useless against a tribe of any spirit.
>
> This method of "bombing and scuttle" fails because its use has given too little thought to the final question of "what is the *object* of the operations?" Surely, the object of all coercive police action is to bring about a change in the temper of the person or body of persons who are disturbing the peace. In other words, we want a change of heart, and we want to get it by the use of the minimum amount of force. But to do what I have just described, we use the maximum of force and do not get a change of heart.

Portal goes on to explain the method of controlling rebellious tribes through air power:

> 1. You must be absolutely sure of the guilt of the people against whom you propose to take action . . . Bombing the wrong people, even once, would ruin the government's reputation and would take years to live down.
>
> 2. The law breaking tribe must be given an alternative to being bombed and . . . be told in the clearest possible terms what that alternative is, that is to say, the government's full, final and irrevocable demands.
>
> 3. These demands must be adhered to throughout the operation, never increased or decreased by one jot 'til they are accepted.
>
> 4. The government must "never include in its terms anything which can be represented as being impossible or even unreasonable.

In the case Portal describes, a tribe raided a caravan in the mountainous country some sixty miles north of the Port of Aden. The tribe was given a ultimatum to pay a $500 fine and hand over the guilty raiders. The tribe was given ten days to comply, at the end of which time its villages would be bombed. The ultimatum warned the villagers to leave their homes and to take their property with them. The ultimatum was not met. The villages were bombed, though lightly, and a rather complete air blockade was established. After two months of this the tribes became bored and even worried about getting their crops planted. Then they began to make an effort to arrive at a solution. At this stage the government tried to make it easy for the tribe to accept the demands of the government by arranging a meeting with the political officer and by emphasizing that the goal was to have the tribe rejoin the family of law-abiding, peaceful tribes.

Portal states that:

> The most remarkable thing and the most satisfactory from the political point of view is the way the tribe came back into the fold

> after the "police action" with practically no ill will. . . . It would be the greatest mistake to believe that a victory which spares the lives and feelings of the losers need be any less permanent or salutary than one which inflicts heavy losses on the fighting men and results in a "peace" dictated on a stricken field."[14]

It should be noted in passing that the RAF had complete air domination. It should also be noted that the "crime" of the tribe and the civilization of the tribe were simple. In the social science sense this was a quite distinct laboratory situation. Lord Portal further implies that the tribe was heavily "persuaded," through propaganda, that the government had informers in the area and that knowledge of the tribe was complete. Finally the loss of life and destruction of property was almost negligible.

Does not Lord Portal's statement that, "Surely, the object of all coercive police action is to bring about a change in the temper of the person or body of persons who are disturbing the peace" apply precisely to the present international situation—at least as far as the Western democracies are concerned? With our hatred of war, we have had to be driven to the final extremity of danger before we would take up arms in self-defense. When we did so, surely it was essentially for the purpose of forcing a change of temper on a malefactor nation which could not be persuaded by gentler means. Ever since the last war we have been trying to convince the German and Japanese peoples that we had harbored no ill will against the populace of those countries but only against their criminal governments. The success of our effort is still in doubt. Now we are doing the same thing in our propaganda directed at the peoples of the U.S.S.R. The themes for psychological warfare against the U.S.S.R. hold that we have no brief against the Russian people; it is the behavior of the Soviet government that must be altered. It should be remembered in this light "that nearly one-fifth of the survivors (of Nagasaki-Hiroshima) hated the Americans for using the bomb."[15] It should be further noted that this expression of hate appeared spontaneously since the interviews did not investigate hate specifically. It is therefore highly probable that the reaction of hate was much more common than indicated in the interviews of the USSBS.

Is there a suggestion in Lord Portal's model which we might use? He said the objective of police action is to bring about a "change in temper." Is this what air power is trying to do in Korea or are we still operating on World War II concepts of destroying economic war potential and morale? Are we trying to understand the problem of bringing about a "change in temper" through air power? While it appears we must better understand this problem in terms of an all-out war, is it not even more urgent to review our present situation in terms of an integrated program in which air power could play its maximum part in the task of strengthening the resolution of the Allies and of persuading the Russians to mend their ways?

Accentuating the Positive

What will be the objective of our air power if the Soviet Union should force us into an all-out war? To implement our World War II objective looks almost easy with atomic power. However, with some 80 per cent of Soviet population living in rural areas, and over 15 per cent living in cities smaller than 100,000, it appears quite clear that any capability of "killing the enemy" would not be adequate to the task. In addition, would all Russians be enemies? Or would it be largely the policy-making level we should aim at? Seversky rejects the killing of people as an objective of air warfare, and prescribes precision bombardment against war-making capacity:

> The regime has to be disarmed through the elimination first of its air power, then of its decisive industrial means. Only then will the people, soldiers, and civilians, perhaps turn on their government, which will have shed its aura of invincibility.[16]

Sir Arthur Harris, on the other hand, prescribed a policy of area bombardment to cut across the board in economic war potential and morale. Of the Second World War decision to concentrate upon precision attacks against the specific target, oil, Harris says: "At the time I was opposed to this further diversion" [from air attacks]; "what the allied strategists did was to bet on an outsider, and it happened to win."[17] Harris holds that the USAF finally reverted to area attacks in the raids upon Japan. Apart from the operational problems of hitting targets, area bombardment appears less desirable, as a general principle. Possony points this up succinctly when he states:

> In a modern industrial war in which the demands for armament production always exceed the capacity to produce, the principle of economy of force can no longer be discarded . . . . The ruins of Europe's cities . . . are a monument to poor aerial planning and strategy.[18]

Possony carefully analyzes morale and its structure and states that morale is important only as it affects behavior, that "the chief objective of morale bombing ought to be to change the behavior of the enemy nation,"[19] so as to be favorable to the attacking power.

In World War II the ultimate objective for the bomber offensive, as previously stated, was to destroy the enemy's capacity and will to wage war. Was this objective an absolute? Was this what we really wanted through air power? Would we have settled for a more practical objective—for example, German acceptance of specific conditions for peace? Have we learned that lesson—are we planning a more realistic objective, using air pressure and air persuasion to convince the Soviets that aggression, slavery, and attempt at world domination by any one power must fail?

The first problem that confronts us in stepping down from such an absolute objective for air power as the destruction of the enemy capacity and will to wage war to some more concrete objective is to specify the concrete objective or objectives. This task is political in nature, and it especially behooves the air strategist to attempt to answer it. For if the air strategist does not comprehend this more clearly than all other strategists, then surely no one else can be expected to. This point needs further discussion, but let us now tentatively agree that the objective of air power is not to destroy the enemy people, not to destroy the enemy cities if it can be avoided, not to produce panic, not to destroy morale, but to "change the temper" of the enemy, or, specifically, to produce behavior in the opposing government that is acceptable to us.

Recognize that this line of thought requires the extension of the use of air power from the purely destructive military use to the positive, active psychological and political use. How can this be translated into use in our present situation?

We see at once that Western Europe, the perennial battleground, fears that in an all-out struggle between Communism and the democracies it would become the target for atomic bombs. That means that our air power must be identified with Western Europe, with the political aims of the West, and as the main bulwark of peace that it now is. To accomplish this, we must begin to wage in Western Europe a positive program for peace through air power. There are false prophets who say that we are not strong enough yet; there are the negative voiced who tell us that we can only risk containment; there are those advocates of decadent doctrines who say we must get "strong" before we can risk a positive stand. In contrast there are some voices saying, "We are now strong enough; let us act positively to resolve this conflict while we are strong."

On March 31, 1949 Mr. Churchill said:

> I must not conceal from you the truth as I see it. It is certain that Europe would have been communized and London under bombardment some time ago but for the deterrent of the atomic bomb in the hands of the United States.

Churchill was saying that the atomic potential of the U.S. Strategic Air Command was holding the Red forces from Western Europe. This was in 1949. We had and still do have dominant strategic air power and our strategy has been based on this air power, although too few people realize either point.

The recent emphasis upon building surface forces to hold Western Europe, the commitment of surface forces to hold Korea, and in general the continuation of the containment policy, albeit a somewhat more dynamic containment, reflect general failure to understand Churchill's estimate of 1949. Has Churchill's view changed substantially? Only a year ago Mr. Churchill stated in the House of Commons:

> I am in favor of efforts to reach a settlement with Soviet Russia . . . while the immense and measureless superiority of the United States atomic bomb organization offsets the Soviet predominance in every other miltary respect. . . .

If the U.S. strategic air potential is in fact standing down the Soviet military forces, then let us mobilize our political-psychological forces and build on this power foundation.

We made a magnificent start with the Berlin Airlift which unquestionably was a decisive point in the cold war. Did we predict the possible political-psychological effects of this operation before we executed it? Have we analyzed the political-psychological results of the operation? If we had dropped ten tons of bombs on targets to break the blockade, the Air Force would have taken pre-strike and post-strike reconnaissance pictures. A team of target experts would have chosen the target and predicted the effects of its destruction. Physical damage experts would have calculated the success of the attack. Did the Air Force send over a team of experts to assess the political-psychological effects of this operation?

For months we supplied a beseiged city almost entirely by air, making what was, in terms of our air resources at that time, a supreme effort to carry out the promise we had made to the people of Berlin. It was a dramatic countermove and received the widest publicity throughout the world. Most analysts are agreed that the success of the Berlin Airlift was the turning point in the battle for the allegiance of the West

Germans. It was visible, tangible proof to them that we stood behind our word, that we could keep our word without precipitating the war which is the constant nightmare of people on the Continent. Are we in the Air Force aware of the magnitude of the psychological victory we won? How much concerted effort has there been to exploit this victory—to keep it in the minds of Europeans on both sides of the Iron Curtain, to fully realize the propaganda value from this overwhelming evidence of our good faith and our ability to deliver the goods?

Did we make political-psychological errors in this operation which we could avoid in the future? Did we realize political-psychological results from this operation of great enough magnitude to plan and execute similar operations?

Operations such as the Hay Lift and the Berlin Airlift are ideal expressions of the claim that air power is peace power. We must plan and execute such operations, not only in cases like Berlin where our military position is threatened, but in a wider sphere of emergencies where peoples need help.

Airlifting wheat to the hungry Indian nation could have done more to focus attention upon this theme than any other single recent item. This maneuver would have been a natural outgrowth of Operation Haylift and Operation Vittles and would have identified air power as peace power, friendly to our Allies. All the needed wheat would not have been airlifted to India—simply enough to tide over the starving peoples; to recapture the psychological initiative lost through our long indecision; to show that although the democratic process of decision may take longer than a totalitarian process, we do have the operational know-how once decisions are reached; and finally to establish still more firmly the fact—not just the idea—that Western air power is peace power for the hungry and oppressed everywhere.

On the 5th of July 1951 there appeared a small item in a Tampa, Florida, newspaper that a flight of B-36's had departed from the U.S., overflown Western Europe on July the 4th, and returned on the 5th of July. Did we identify this forceful gesture with Western Europe? On July 14th, the 162nd anniversary of the founding of the first French Republic, 500,000 Frenchmen turned out to see a parade of 7000 men, French aircraft, U.S. F-84's, Helldivers, Hellcats, and British Vampires.[20] President Truman sent his congratulations to the French people. Would those 500,000 Frenchmen have enjoyed receiving a copy of the President's salutation dropped by B-36's non-stop from Washington, not on America's 4th of July but on France's Bastille Day, July 14th? How much more conscious the average Frenchman would be that the air power is his air power rather than it might be air power against him! How much more secure would he feel with the great strategic air power there ready to go on and strike down any aggressor in his defense?

The psychological victories that lie in the offing from such operations cannot be fully anticipated any more than the significant political-psychological victory of the Berlin Airlift was expected, but we must plan, predict, and observe the full results of such operations so that we may be able to forecast effects. Each of these operations requires precise timing and full analysis of the situation, or it may result in dangerous backfire. Operations of this nature obviously require broad interagency and intergovernmental coordination.

There are other ways air power can assist the political-psychological forces. We have already begun to establish air power in the minds of our Allies. Eighty B-29's have been reconditioned and transferred to the RAF, giving the British a substantial cadre for a long range air force, yet this transfer was done with almost no fanfare. Could we build on our own air power and join with other Western air forces to conduct the first world air parade? It could be announced in general information programs, designed to renew interest in air power, and planned to create confidence in the great strategic air power we now possess. The old cliche that air power is peace power could provide the theme that air power is the prime force supporting world peace and that it "belongs" to the powers that are creating a better world everywhere.

Could we even go so far as to propose a grain lift to the Albanians, who are reputedly suffering a great food shortage? Could we in similar ways begin to identify our air power with the peoples behind the Iron Curtain?

By emphasizing that the objective of air power is the destruction of economic war potential and morale, we have almost ignored the significant political-psychological aspects of air power. But if we define that objective as compelling behavior on the part of the opponent government that is acceptable to the Western world, we find this modified concept of air power reasonably compatible with our own national goals. This concept involves on the one hand the real air power to retaliate and on the other hand the use of air power in the cold war to enhance our political-psychological power. This results in utilizing current air power as peace power. But for air power to be peace power, we must politically and psychologically wage peace through air persuasion. To wage peace through air persuasion requires a much better understanding of the political-psychological aspects of air power with emphasis not only on the possible emergency military objective but also on the immediate and long range political objectives. We have great strategic air power today, and in Churchill's words, it must be used while it is still superior to Soviet strategic air power. It must be used, not to deliver a "preventive war," not to "clobber the enemy," not to destroy the social fabric of an enemy, not to "panic" our friends in the enemy country, as well as our allies in other parts of the world, but as a power foundation for air persuasion to encourage international behavior that will build toward a solid world peace.

Air War College

NOTES

[1]H. P. Goss, **Civilian Morale Under Aerial Bombardment 1914-1939** (Maxwell AFB, 1948), p. 13.

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[4]**Ibid.**, p. 7.

[5]Irving L. Janis, **The Psychological Effects of the Atomic Attack on Japan** (Santa Monica, California, 1950), Rand, No. 439, p. 30.

[6]USSBS, **The Effects of Atomic Bombs on Hiroshima and Nagasaki** (Washington, 1946), pp. 20-22.

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[8]Janis, **op. cit., passim.**

[9]**Report on Psychological Warfare in Southwest Pacific Area 1944-1945**, Annex 16.

[10]**CINCPAC-CINCPOA**, Bulletin No. 164-45, **Psychological Warfare**, Supplement No. 2, Serial No. 2106.

[11]**Ibid.**

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[17]Sir Arthur Harris, **Bomber Offensive** (London, 1947), p. 220.

[18]Stephen Possony, **Strategic Air Power** (Washington, 1949), p. 62.

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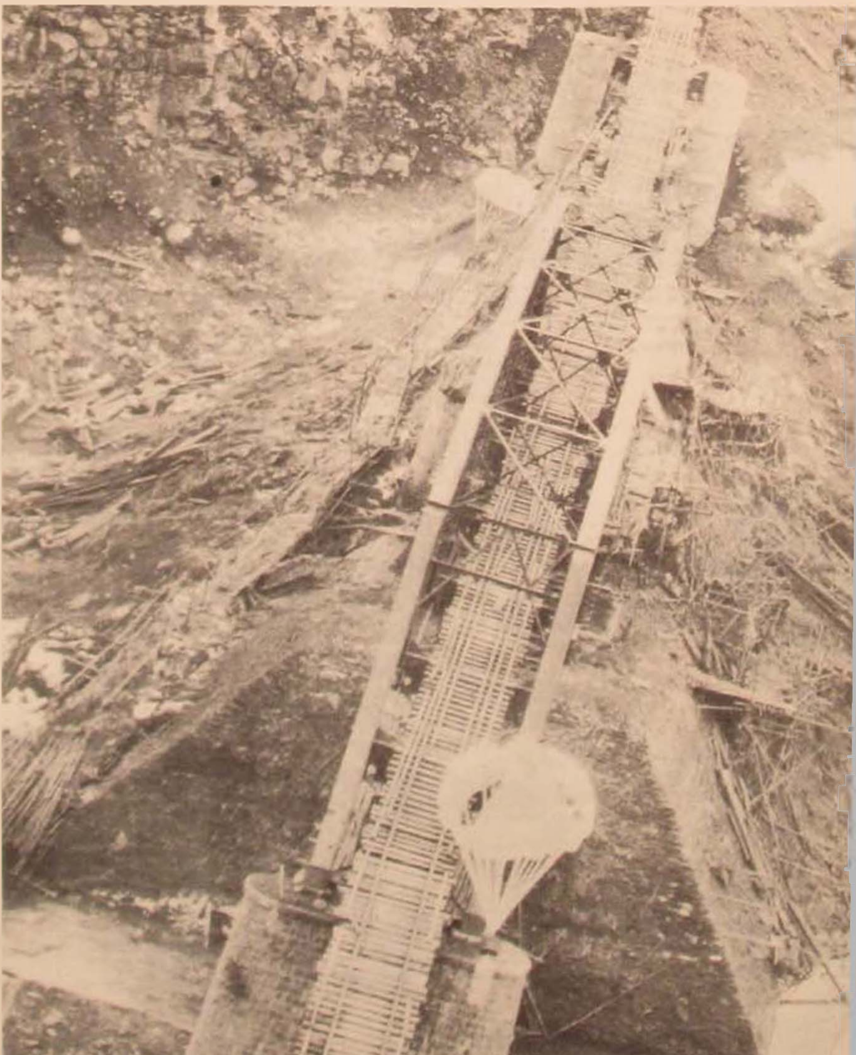
Paramunitions in the Korean War

Use of tactical air power in the Korean campaign has presented new problems of strategy and tactics not encountered during World War II aerial operations. The limited scope of the war has precluded massing of aircraft for saturation bombing of strategic targets in the manner that was common in the Second World War. There were only a few industrial targets requiring saturation bombing, as compared to the great number of targets of opportunity in the war of interdiction and close support of ground troops. Even in the interdiction campaign the sparse Korean communications system has offered few targets worthy of large packs of bombers or fighter-bombers. The combination of these factors has affected the techniques of aerial warfare used on the beseiged peninsula. One trend was toward the employment of relatively small numbers of airplanes to seek out and destroy such Communist targets as bridges, trains, trucks, barracks, and supply centers.

An effective and destructive method against these targets was a low-level attack at altitudes from 50 to 300 feet with 500-pound general-purpose (GP) bombs equipped with a device that snapped open in parachute fashion when the bomb left the bay. The technique was successful because minimum air and ground opposition enabled small numbers of light bombers to come in for a strike at low level, deliver their bombs with maximum accuracy, and inflict great damage upon the enemy in proportion to the quantities of munitions and aircraft used.

Parademolition bombs are one of the principal types of ordinance used by low-flying light bombers on interdiction missions. After previously being knocked out of commission by Far East Air Force bombardiers, this bridge at Sin'gosan, North Korea, was frantically repaired by the Communists. As it neared completion, it became the target of B-26 parademolition bomb attack. In the upper left one delayed-action parademolition bomb is hung on the side of the bridge, while another in the foreground is shown heading toward the near embankment. One of the parabombs dropped by the attacking B-26's after this photograph was taken descended directly through the interlacing braces of the bridge. The subsequent explosions completed a successful interdiction mission that negated the thousands of man hours spent in repairing the original damage. Parabomb interdiction has accounted for an appreciable part of the U.N. successes in Korea.



Because they are primarily "special purpose" bombs, the parademolition and parafragmentation bombs are limited in use. They are of particular value during daylight hours, when extreme accuracy can be obtained. For night operations either bright moonlight or powerful artificial illumination is necessary to eliminate the hazards of mountainous terrain and to achieve any degree of accuracy.

Parafragmentation bombs weighing twenty-three pounds have been used effectively on enemy troop concentrations, light motor vehicles, parked aircraft, and, when dropped in sizable quantities from one attacking aircraft, upon several types of flimsy buildings. The compactness of this bomb allows an aircraft such as the B-26 light bomber to carry considerable numbers of it. One bomb detonated at ground level can inflict heavy casualties in a normal troop concentration area, as well as severely damage any aircraft in its vicinity.

There are three main size and weight groupings of parademolition bombs: the 500-pound, 250-pound, and 100-pound general purpose parabombs. The heavier 500-pound parademolition bomb is most effective in destroying bridges, railway cuts, trucks, tanks, trains, tunnels, barracks, and similar targets. The smaller parademos are used to great advantage against troops, vehicles, aircraft, and light structures and in post-holing rail lines. A 500-pound GP bomb, whether it is free falling or slowed by parachutes, is capable of a known degree of destruction, which is essentially the same for either type of delivery. The accuracy of bomb placement under prevailing target conditions is the basis of relative superiority of one type of bomb over another. Under some conditions the parademolition bomb used on low-level missions can be more accurately placed than the standard free-falling general-purpose bomb. Its greatest advantage is the delayed fall, which permits the pilot to drop down to his target—troops, aircraft, vehicles, warehouse, bridge—drop his bombs accurately and climb up and

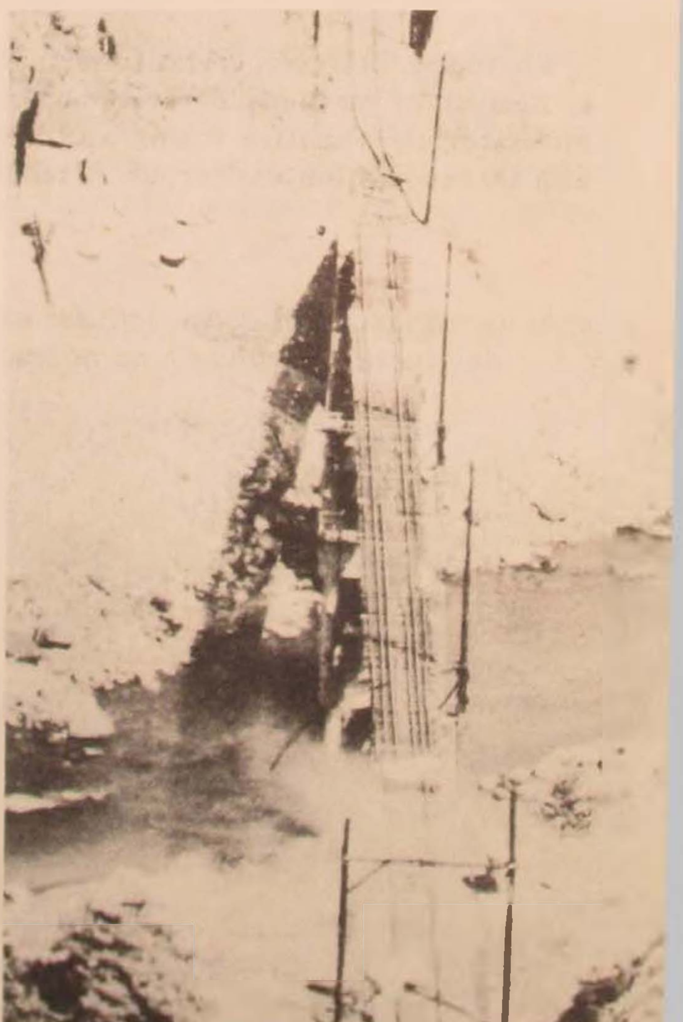
The deadly accuracy of the parachute technique of bombing is shown in this photograph taken from the tail of a B-26 after the aircraft had cleared the target area. Nineteen parafragmentation bombs are descending directly on the target concentration center, a cluster of enemy barracks in the Wonsan area of North Korea. The target was totally destroyed after a succession of parafragmentation bombing passes. Low-level attact, possible when the bomb descent rate is slow, can increase bombing efficiency.

away from the danger area before its detonation. Standard GP bombs equipped with the same short-second delay fuses as the parabombs, rebound great distances after ground contact when released at minimum altitude, often overshooting the selected target and endangering the crew and the aircraft. Instances have been recorded of these bombs detonating directly below the aircraft.

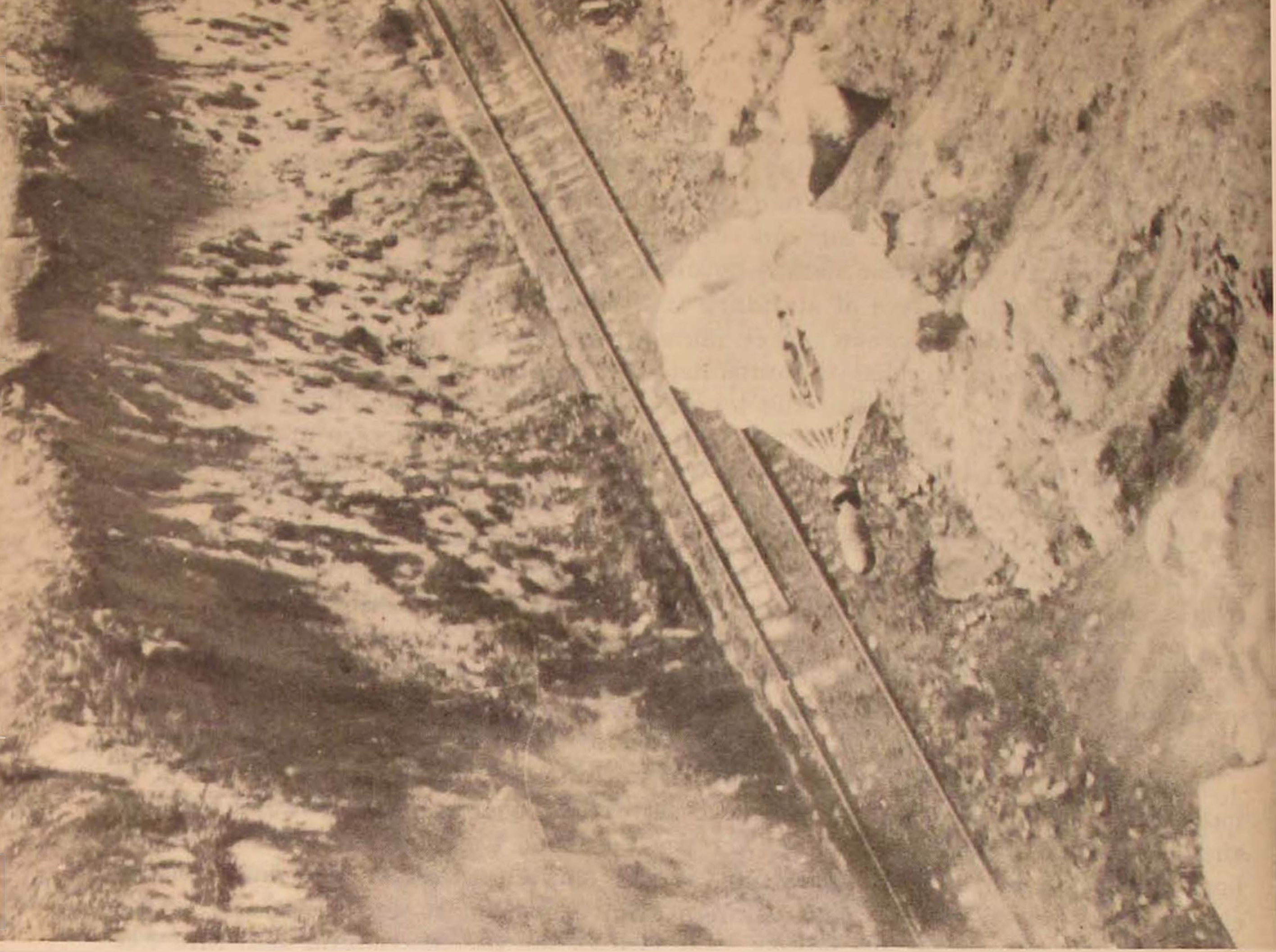
The greater "skip" effect of standard free-falling demolition bombs frequently makes the difference between merely damaging a target or totally destroying it. But 500-pound parademolition bombs dropped against a target such as a bridge will not rebound so much that the target is missed. The major portion of these bombs will detonate on or under the bridge. In the rugged terrain of the Korean countryside, low-flying aircraft must work in confined areas. Para-type munitions allow split-second release with reasonable certainty of accuracy.

While the primary objective of combat is to destroy the enemy's war potential and will to fight, this objective cannot be attained if the attacking force suffers excessive losses in personnel and equipment. One of the most singular advantages of the parademolition and parafragmentation bombs is the high morale and confidence it lends to the air crew. Since low-level bombing attacks are widely employed in Korea, para-type munitions have been immensely valuable for the safety they offer crews by allowing the aircraft time to clear the area.

Necessity was the mother of a field invention that made possible the use of parabombs in Korea when the regular cannistered parachute adapters were in short supply. A flat metal-plate device was fastened over the rear section of the bomb. To the plate were attached various combinations of the small parachutes used for 23-pound parafragmentation clusters. It took two chutes for the 100- and 250-pound GP bombs, four chutes for the 500-pound GP, and five to slow the 1000-pound GP bomb.



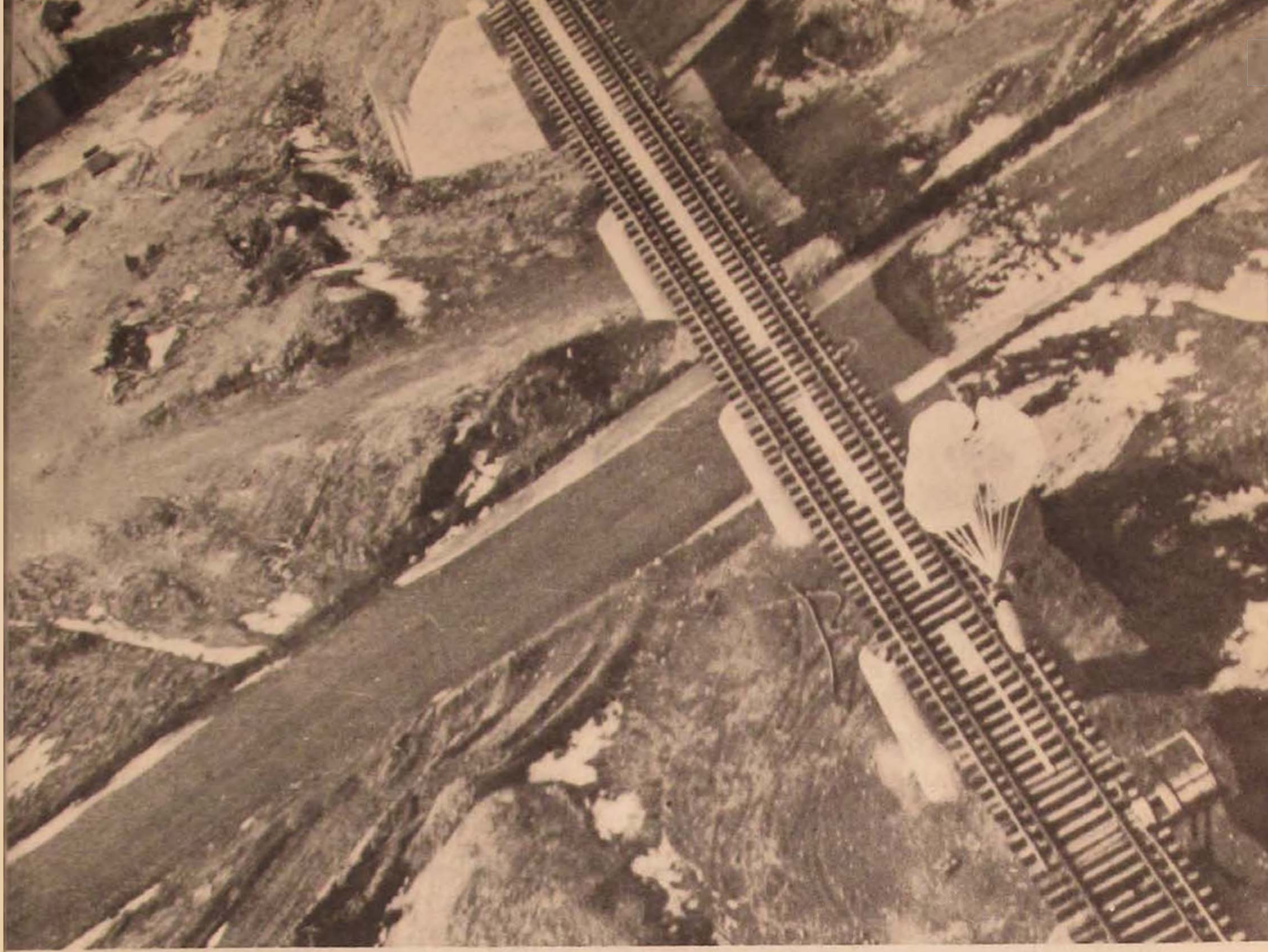
Descending at a slower rate than conventional bombs, parabombs are less apt to skip or rebound away from the target. On this narrow one-track railroad trestle south of Wonsan, an accurately placed diagonal strike has put three parabombs athwart the rail line. One lies on the left side of the track just under the crossbar telephone pole, the second lies to the right of the track just short of the first support column of the trestle, and the third bomb is hanging under the center section of the bridge, held there by its parachute which has caught on the crossties. Shortly after the picture was taken, the delayed action fuses exploded, cutting the rail line in three places and putting the trestle out of use.



Successful parabomb interdiction has seriously curtailed movements of enemy supplies and troops. In addition to ripping up trackage, the bomb pictured here can easily start a landslide in this deep rail-cut and hold up enemy railroad traffic for days.

There are, however, certain shortcomings in the para-type bombs, and research is needed in methods of overcoming them. The parafragmentation bomb has an extremely sensitive fusing and arming mechanism, which makes its loading and transportation dangerous. A tendency still exists for the heavy (500-pound)

Supply warehouses and dock facilities at the North Korean east coast port of Wonsan felt the destructive weight of parademolition bombs from FEAF light bombers. The miniature atomic blast effect shown here resulted from a direct parademolition bomb hit on a building believed to contain high explosives. Pieces of the building are seen flying high into the air at the instant of the recurring explosions. Delayed action parademolition bombs permit the attacking aircraft to deliver its explosives from rooftop height without being caught in the bomb blast.



This parabomb, armed with a delayed-action fuse, is shown heading directly for a sturdy enemy rail bridge. Released from altitudes of 100 feet or less, the bombs dropped by B-26's in Korea have demonstrated the accuracy possible in low-level parabombing.

parademolition bomb to skip three or four feet into the air upon impact and travel approximately fifty to one hundred feet after impact.

Yet parabombs have been particularly effective against a variety of targets. Their future employment may bring about even greater destructive results against selected, suitable targets where parabombing accuracy is most useful.

Twisted spans and scattered debris attest to the destructive energy released by a parafragmentation bomb on an enemy railroad bridge at Sunan, North Korea. Another parachute bomb is shown headed for the remaining serviceable portion of the bridge. By slowing the rate of descent the parachute minimizes bomb skipping or rebounding from the target and prevents the bomb from burying itself in the earth, so that the full effect of the blast is expended on the surrounding objects. The low release altitude minimizes parachute drift from wind.

Super-Altitude Weather

Dr. Marcus O'Day

As our favorite topic of general conversation, weather implies only a few meteorological commonplaces: the vagaries of temperature and pressure, relative humidity, winds, and amount of sunshine. Occasionally the ordinary person is interested as well in the electrical state of the atmosphere—in a lightning storm which is brewing, or what makes radio reception poor on a certain night. Attuned to weather symptoms at the ground level on which he lives, he immediately detects changes in these weather conditions, and, to some extent, he can use his own senses to take rough estimates of the usual weather bureau readings. When, however, he rides in a high-altitude airplane, the state of the atmosphere is such that man's senses no longer respond as they do near the ground. In some instances even the ordinary types of instruments are no longer usable, and quite different measuring techniques must be employed. When he goes twenty miles or higher, these facts become increasingly evident. In addition, many more weather considerations, many of them unfamiliar or non-existent at tropospheric levels, will assume importance.* Years hence, super-altitude weather forecasts may contain such items as the electron density of the ionosphere layers, the solar flux in the x-ray region, and the direction and velocity of clouds of ions. Predictions may even include the imminence of a meteor shower and the density of meteoric dust.

To the U.S. Air Force, super-altitude weather has a vital role to play in the design and performance of radically new planes to meet every operational need, pilotless aircraft of long range and great precision, completely dependable radio communication unaffected by atmospheric conditions, and top-secret super-altitude weapons for military countermeasures. These are among the obvious technological needs of an Air Force determined to maintain supremacy. Not so obvious, perhaps, is the dependence of such achievements upon the success of little

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*For example, at very high altitudes the concept of air temperature loses its usual significance. Because the atmosphere at that level is very thin, so few air molecules will actually come into contact with an object exposed to such a low-density medium that the resulting temperature of the object will depend much more upon the radiation to which it is subjected than upon the temperature of the air itself. Thus a rocket flying through upper atmosphere would be little affected by the physical temperature. On the contrary the skin would get extremely hot as a result of friction and radiation.

publicized, relatively small groups of physicists who are using every possible scientific tool to determine the properties of the earth's upper atmosphere.

Such knowledge is no longer merely a matter of scientific curiosity. The air vehicles and missiles of the future will actually travel in these regions. To design them properly, one must know the physical conditions in which they will operate—the atmospheric pressure, temperature, and density and how these quantities vary with the altitude, latitude and longitude, time of day, and season of the year.

Are there winds beyond the troposphere? What background light must be taken into account in designing optical devices? Which gases, in what proportions, make up the rarified atmosphere? Do upper-atmospheric gases act as selective filters for radio waves, as we know they do at certain heights for ultraviolet light waves? If so, which frequencies will be absorbed and so be useless for devices such as radar? (Lack of such knowledge in World War II permitted development of a radar operating on a frequency now known to be one naturally absorbed by water vapor.) What types of atomic particles and solar radiation will be encountered above, say, twenty miles? These are some of the questions which forward-looking aeronautical engineers, communications experts, and military strategists are waiting to have answered.

Isolated fragments of data, even the answers to each specific question now being asked, will not be enough. The upper-air scientist hopes to gain enough knowledge to construct, as it were, a working model of the upper atmosphere, based upon reliable theory well authenticated by experimental facts. From such a model he expects to extract the answers to almost all questions that might be asked and, equally important, confidently to predict abnormal conditions that cannot be directly measured. To construct such a model, he must gain a complete understanding of the physical processes and interactions that cause formation of the various strata, such as the ozone layer and the ionosphere. He must search out the basic causes of ionospheric storms, bursts of radio noise, auroral displays, and associated geomagnetic disturbances—any condition that might have direct terrestrial consequences and therefore military significance.

Moreover, since the only fixed boundaries in a gaseous atmosphere are those marking the limitations of human knowledge, conditions nearest earth, where the "weather" of present day flight is met, are certainly influenced by conditions in the up-

Figure 1. Characteristics of the Upper Atmosphere

Outer Limit of Earth's Atmosphere. It is estimated the air ocean extends upward to between 6000 and 60,000 miles although half of its content lies within 3.5 to 4 miles of the earth's surface. Assuming that the outer limit is in thermal equilibrium with the gas of interstellar space, its kinetic temperature would be 10,000° to 15,000°C.

Meteors. Meteors are the result of meteoroids (solid fragments or other cold bodies generally composed of stone or iron) of two types, *i.e.*, those passing through the solar system at speeds too great to be captured by the sun's gravitational attraction, and those traveling around the sun in orbits similar to the earth's orbit. Most meteoroids are believed to be tiny fragments, generally no larger than a grain of sand, which are eroded by impact with molecules of the atmosphere and activate ions and molecules in the E layer of the ionosphere. Passage of meteoroids through this region makes them visible from the earth. This action heats the particle white hot, in which state it is known as a meteor and leaves behind it an incandescent vapor trail. Meteors which survive passage through the atmosphere and strike the earth are called meteorites.

Cosmic Rays. Originating from undetermined sources (interstellar space), cosmic rays are ultra-high-speed particles possessing energy in excess of billions of electron volts. Some of these particles are capable of producing fission. After entering the atmosphere the primary cosmic rays produce secondary rays, tertiary rays, *etc.*, and some mesons, which are particles approximately 200 times the mass of the electron—all these being atom replacement combinations of varying complexity. Sometimes the production of secondaries, tertiaries, *etc.*, results in cosmic ray showers, generally centered in the area between 80 and 20 miles altitude. Activity decreases at lower altitudes until at sea level it is only one three-hundredths that of the ozone layer. Cosmic rays reaching the earth may penetrate several hundred feet into the ground.

F_2 Layer. The lower edge of the F_2 layer varies from about 150 to 250 miles altitude. The principal reflecting region for short wave radio waves, the height and ionization density of the F_2 layer varies diurnally, seasonally, and with the sun spot cycle. The F_2 layer reflects high frequency (approx. 4-45 megacycles) during daytime and low medium frequency (approx. 1-10 megacycles) during night. The F_2 and F_1 layers merge at 180 miles altitude during absence of sunlight, at which time field intensities and noise are generally higher because of reduced absorption by E and F_1 layers.

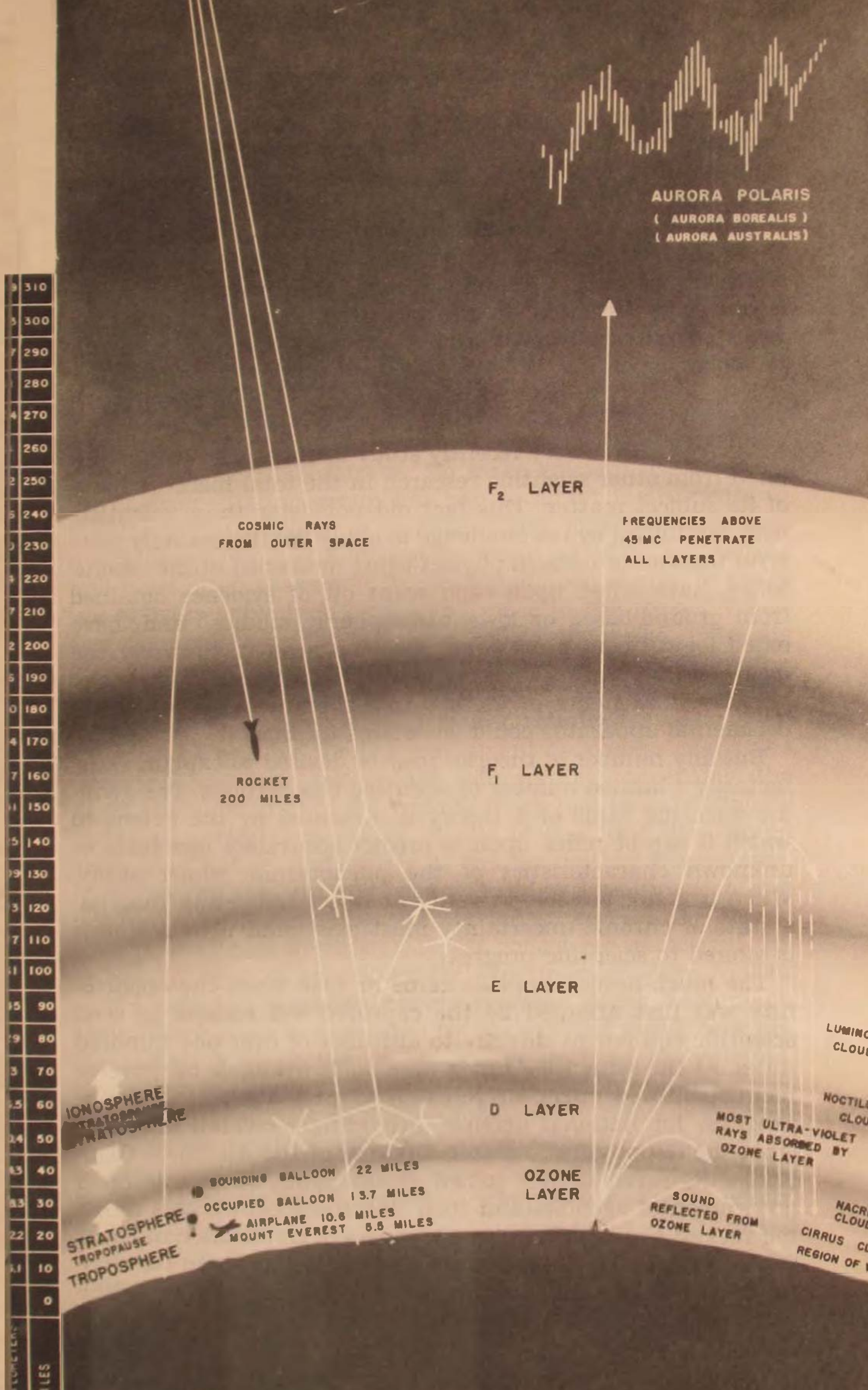
F_1 Layer. The lower edge of the F_1 layer varies from about 100 to 150 miles altitude. The F_1 layer exists only during daylight. It normally reflects short wave radiation. Other waves penetrating this layer are somewhat absorbed by it.

E Layer. The lower edge of the E layer varies from about 50 to 80 miles altitude. The E layer reflects medium frequency (approx. 1-20 megacycles) daytime radiation and medium frequency (approx. 200-1400 kilocycles) night-time radiation. Its ionization density is closely related to the altitude of the sun. Irregular cloud-like areas of unusually high ionization, called "SPORADIC E," occur in the E layer on certain days or nights, occasionally reflecting radiation which normally penetrates it.

D Layer. Estimates of the altitude of the D layer vary from 20 to 60 miles. The D layer exists during daylight only. Its ionization density corresponds with the altitude of the sun. It reflects very low (0-70 kilocycles) radiation, and its high molecular collision causes absorption of 70-4000 kilocycles. This layer is of slight importance to normal communications.

Ozone Layer. Estimates of the altitude of the ozone layer are vague. The main part of the layer is estimated to be between 10 and 40 miles. The ozone layer does not reflect presently used radio waves. Its chief importance is that it screens out a large proportion of the ultra-violet rays arriving in the earth's atmosphere from outer space.

Troposphere. The height of the troposphere varies from about five miles at the poles to about ten miles at the equator. Within this first blanket is concentrated about eight-tenths of the weight of the earth's atmosphere. The air in the troposphere is composed almost entirely of a mixture of oxygen and nitrogen.



AURORA POLARIS
(AURORA BOREALIS)
(AURORA AUSTRALIS)
F2 LAYER
COSMIC RAYS
FROM OUTER SPACE
FREQUENCIES ABOVE
45 MC PENETRATE
ALL LAYERS
ROCKET
200 MILES
F1 LAYER
E LAYER
D LAYER
OZONE
LAYER
IONOSPHERE
STRATOSPHERE
TROPOPAUSE
TROPOSPHERE
SOUNDING BALLOON 22 MILES
OCCUPIED BALLOON 13.7 MILES
AIRPLANE 10.6 MILES
MOUNT EVEREST 5.5 MILES
MOST ULTRA-VIOLET
RAYS ABSORBED BY
OZONE LAYER
SOUND
REFLECTED FROM
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per atmosphere. Eventually upper-air research should aid materially in developing accurate long-range weather forecasting—that long-sought-for panacea to innumerable problems in our civilization.

In the long run the most important result of all should be these entirely new military devices, the form and substance of which, at present, we cannot foresee. The history of science is one long testimony to the fact that increased knowledge reaps not only its own reward but also the truly great advances in technology.

UNTIL very recently study of the upper air has differed from other scientific research in the total inaccessability of its subject matter. This fact did not deter those scientists who, fascinated by the challenge to apply the increasingly powerful theories of modern physics being developed in the laboratories, have seized upon each scant bit of evidence obtained from ground-based or lower-atmospheric studies, and have based logical conjectures and predictions on it. Probably the most spectacularly successful of such efforts was the prediction of the existence of the ionosphere many years before experimental apparatus could be devised to prove it.

But any number of theories may be devised to explain satisfactorily a limited number of scientific observations. The genuine scientific value of a theory is measured by the extent to which it can be relied upon to predict accurately new facts or unknown characteristics of the phenomenon under study. When it is not possible to verify or reject competing theories, a state of chronic uncertainty must exist, and little stimulus is offered to scientific progress.

The much-needed impetus came in 1946 when the opportunity was first afforded by the captured V-2 rockets to send scientific equipment directly to altitudes of over one hundred miles. At the same time funds were made available for government-sponsored upper-air research as part of our long-range program for national defense. Accordingly civilian scientists from the Geophysics Research Division of the Air Force Cambridge Research Center joined groups from other interested governmental agencies and their university contractors in using rockets as tools for upper-air research. Duplication of effort is avoided by coordination through the Research and Development Board. There is so much to learn and needs for scientific knowledge are so diversified that each group has a wide field of activity within the interests of the agency it represents.

Our knowledge of the upper air is not limited by data obtained from rockets alone. Observations from ground-based stations, as well as theoretical calculations, add materially to our understanding. However rockets are the only means by which direct measurements can be made at high altitudes. Their use has introduced new and difficult instrumentation problems involving a whole program of preliminary laboratory investigations, among which is the determination of those experiments which are most pressing and feasible.

For rockets that move a mile a second and disturb the very conditions one is trying to measure are, to say the least, mighty peculiar physical laboratories. To make efficient use of them, the instrumentation group has had to adapt instruments to the conditions peculiar to rocketry. They must redesign normally heavy, bulky equipment to weigh as little as possible and must often package it in exceedingly odd shapes to make use of every cubic inch of payload space in the rocket. When this program began, so little was known about the upper air that in most cases no reliable guide existed for determining the sensitivity of a measuring instrument. "Educated guesses" covered a bewildering range of values, usually far wider than it would be possible for the instrument to possess. Even the Germans had very inadequate information concerning the flight characteristics of the rockets. They had been frantically trying to perfect a workable missile of war, one that would cross the Channel and terrify as well as destroy Englishmen. If the rocket went up and over and did not malfunction and fall back on its launching site (as indeed several did, killing some of their best scientists), it was considered successful. Information vital to the upper-air experimenter—how violent is the expected vibration during powered flight, how much radio interference is generated by the exhaust gases, how are the radiating properties of the rocket itself as an antenna, how much the rocket rolls and pitches—simply did not exist. Upper-air researchers have been incidentally compiling a vast store of information otherwise unavailable to designers of rockets and their accessory devices: performance characteristics of electronic and mechanical components—tubes, relays, batteries, etc.—during rocket flight; the complex effects of the rocket upon the efficiency and radiating patterns of rocket-mounted antennas; and the gremlin-like electrical interferences among various instruments that become evident only after the rocket is well on its way.

The most immediate problem was, of course, recovery of the data obtained during a rocket flight. At first the only practical method was the use of telemetry—a rocket-borne automatic radio system in which the reading of each scientific instrument is sampled many times per second and, together with an accurate indication of time, is transmitted to a ground station. Such a method is extremely valuable, but since all the readings must be taken electrically, a rather severe limitation is placed upon the experiments which can be performed. Many times it is necessary to recover the actual record—an exposed film or a sample of gas, for example, and in the interest of economy it is most desirable to recover the apparatus and use it as many times as possible. Recovery experiments got underway early in the program. The present method is, briefly, automatically to detonate a charge that separates the rocket instrument section from the motor section at a desired point in its trajectory. The instrument section is then brought down by a special parachute.

BECAUSE of its very great influence upon the transmission of radio waves, the ionosphere has been one of the most emphasized subjects of upper-air research. This region consists of electrically charged—*i.e.*, ionized—particles in several layers, successively termed "D," "E," and "F," located within an approximate height range of 50 to 200 miles. From ground-based probing measurements (experiments operating on the same reflection principle used for sounding the ocean's depths) it was learned that, according to its frequency and angle of incidence, an upward-directed radio wave either passes through the ionosphere to outer space, or is reflected back toward earth. It is the latter property that makes long-range radio communication possible. But the usable frequency limits for each layer and the direction and strength of the reflected wave are critically dependent upon the height, electron density, and state of turbulence of the ionosphere at the time of transmission. Thus accurate prediction of the exact state of the "weather" in the ionosphere is the key to reliable radio communication. As in the case of tropospheric weather, accurate forecasting must be based upon an understanding of the physical processes involved. In the so-called probing experiments carefully controlled radio signals are transmitted and, after their reflection from the ionosphere, are received in such a way that the reception data determine statistical averages of the electron and ion densities, the height of maximum concentration of charged particles, and so on. Direct measurements taken from rockets extend such data by providing information concerning the actual internal structure of the ionosphere. One of the most important rocket experiments measures the way in which the density of the charged particles varies with height. These data yield an average ion density for the "E" layer near that indicated by the ground-based experiments. They also show, however, that it is patchy, or "cloudy," in composition.

The widely-acknowledged contributions of amateur observers to astronomy are being duplicated in upper-air research by the splendid work in ionospheric measurements by the radio "hams." In particular they are gathering data otherwise unobtainable on a peculiar effect known as "sporadic E" ionization, which has marked practical influence upon radio communication, as well as important theoretical implications. "Sporadic E" may cause certain radio frequencies to be obliterated entirely, while others may undergo a tremendous increase in range and signal. By reporting information on their radio contacts with other amateurs located over extensive areas, the radio hams make possible a fairly good record of the growth, movement, and dissipation of the sporadic "E" clouds. Analyses thus far completed indicate ionospheric "winds" or movement at the 60-mile level having speeds of 50 to 250 miles per hour, generally from the southeast to east.

Temperatures, pressures, wind velocities, and atmospheric density and composition are among the quantities that can be determined from rocket-borne experiments. Pressures are read by various types of gauges mounted upon a rocket. Upper-air temperatures, however, are usually calculated from other directly-related quantities which are more readily measurable during rocket flight. The velocity of sound in any gas, for example, is directly related to the temperature of the gas through which the sound is passing. In practice, rocket-borne experiments are yielding temperature information from measurement of aerodynamic characteristics of the rocket itself that are also theoretically related to the velocity of sound and thereby to temperature. In one method air-pressure probes that can move forward or backward in the tip of the rocket nose cone locate the pressure discontinuity that marks the shock-wave angle. An aerodynamic equation permits calculation of Mach number from the shock-wave angle. Since Mach number is the ratio of rocket speed to speed of sound and since the rocket speed at each point on its path is known, the corresponding values of the speed of sound—and hence, temperature—can be computed.

Below 300,000 feet a probing method similar to that used in oil-prospecting yields temperature and wind data. Bombs dropped from airplanes produce explosions near the earth's surface. The resulting sound waves travel upward, are bent back toward the earth from the two so-called "temperature-inversion" layers near 100,000 feet and 300,000 feet respectively, and are recorded by special microphones. By careful arrangement of the microphones, the direction of arrival of the sound ray and its total travel time are determined. Several sets of recording equipment located in different directions from the explosion show the variation of velocity with height and this information can be converted into winds and temperatures in the levels through which the sound has passed. Variations of the winds and temperatures near 150,000 feet have been studied for various latitudes from the Canal Zone to Alaska and for various seasons and times of day. Figure 2 shows the most recently compiled measurements of upper-air temperatures. The data were obtained from sixteen rocket flights and numerous ground observations of meteors. Tentatively it has been shown that no large diurnal temperature variations are found in the ionosphere, although seasonal variations do occur.

Air density is usually calculated directly from the law of physics relating it to pressure and temperature. An independent measure of air density is obtained by making use of a less obvious formula by which gas density can be computed from the amount of electrical energy required to discharge a sparkover between metal electrodes spaced a known distance apart. The electrodes are mounted on the skin of a rocket and the change in sparkover potential is measured as the rocket rises. The corresponding air densities are then calculated from these voltage readings.

Preparations are underway for the measurement of wind velocities in the upper atmosphere by means of an air-speed indicator that records motion of the air relative to the axis of the rocket. From the independent measurements of the rocket-to-ground velocity and a knowledge of the orientation of the rocket during flight, the air-mass velocity relative to the ground—that is, the wind velocity—can be computed. Such information will contribute much to our understanding of "mixing" of the gases present and hence add to our knowledge of atmospheric composition.

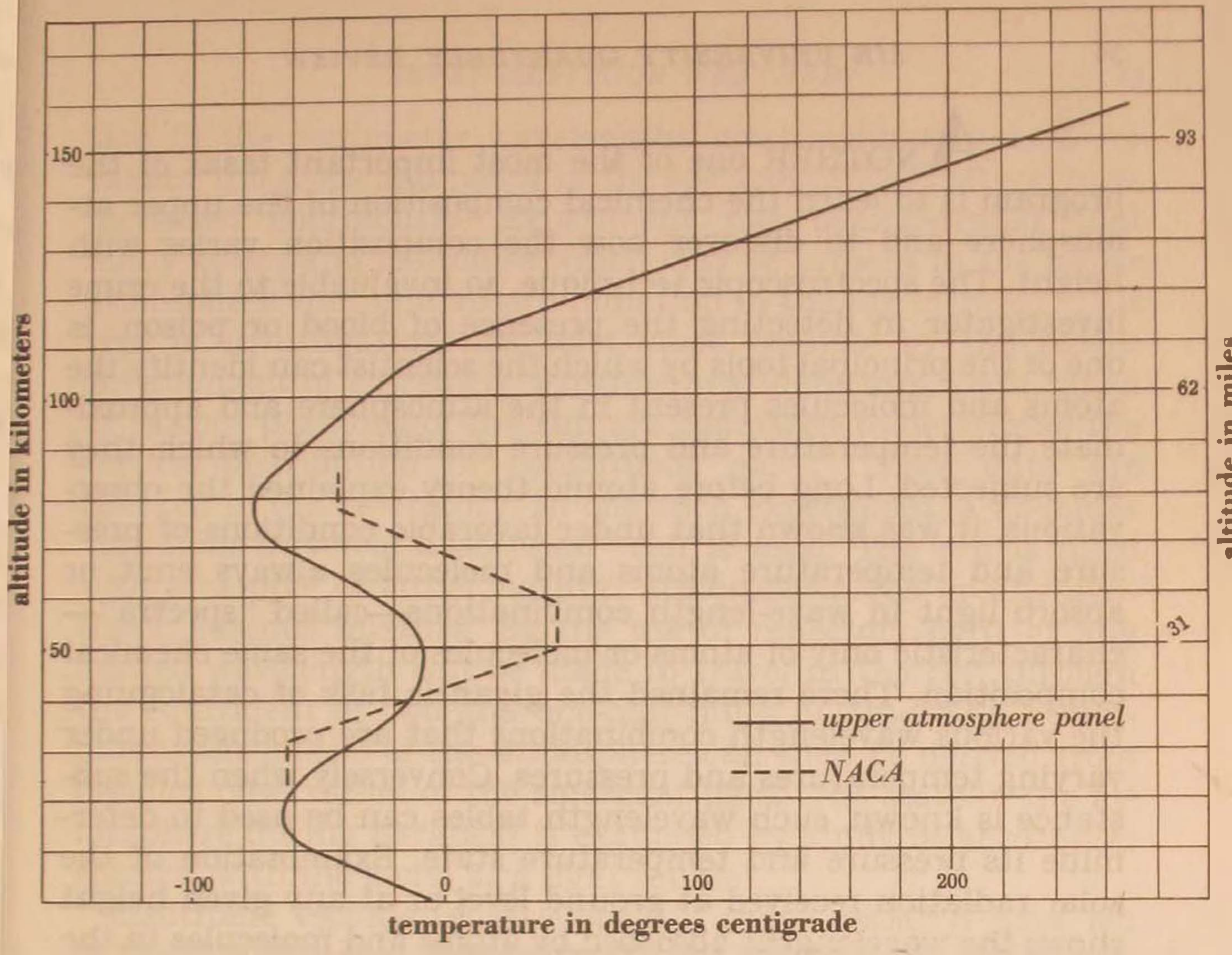


Figure 2. This chart shows the latest information on the temperature of the atmosphere at various altitudes over Tularosa Basin in New Mexico. The curve represents average temperatures compiled from data obtained from sixteen rocket flights and from numerous ground observations of meteors. The National Advisory Committee for Aeronautics (NACA) curve represents the previously-held version of the atmospheric temperature curve formulated from theory derived from older ground observations.

A ground-station system for measuring winds in the stratosphere is currently in operation near Holloman Air Force Base, New Mexico. Remarkably powerful telescopic cameras track the paths and velocities of meteors. From these data wind velocities can be calculated. Although simple theory had predicted the absence of winds in this region of the atmosphere, Picard noted stratospheric winds in his balloon exploration, and it is now expected that their speeds may rise to very high values.

ANOTHER one of the most important tasks of the program is to learn the chemical composition of the upper atmosphere and to discover how the composition varies with height. The spectroscopic technique, so invaluable to the crime investigator in detecting the presence of blood or poison, is one of the principal tools by which the scientist can identify the atoms and molecules present in the atmosphere and approximate the temperature and pressure conditions to which they are subjected. Long before atomic theory explained the observations, it was known that under favorable conditions of pressure and temperature atoms and molecules always emit or absorb light in wave-length combinations—called "spectra"—characteristic only of atoms or molecules of the same chemical composition. There remained the gigantic task of cataloguing the various wavelength combinations that are produced under varying temperatures and pressures. Conversely when the substance is known, such wavelength tables can be used to determine its pressure and temperature state. Examination of the solar radiation received at ground level or at any given height shows the wavelengths absorbed by atoms and molecules in the atmosphere alone. At some levels light is actually emitted by atmospheric constituents. Such spectra have proved the existence at certain levels of the upper air of molecules unknown in the terrestrial atmosphere—the familiar ozone, for example, and, more recently, a molecule consisting of one atom each of oxygen and hydrogen, detected from its infrared light in the glow of the night sky.

The emission of light by atmospheric gases, as evidenced by the aurora, provides an excellent means of identifying constituent gases and their physical states at the heights at which the aurora is observed. The latter phenomenon and its associated magnetic storms have other extremely important significance in solution of the general puzzle of solar-caused terrestrial disturbances. The Aurora Borealis is under intensive observation by spectrograph, radar, and radio at a site in Saskatchewan. Intensity variations of the auroral light with time are being measured systematically at selected wavelengths for correlation with the time variations of other geophysical phenomena such as ionospheric disturbances, radio propagation characteristics in Arctic regions, magnetic anomalies, and earth magnetic currents.

As devices have become available for detection of ultra-violet and infrared light and, most recent, of electromagnetic radiation in the centimeter wavelengths most commonly used for radars, the scope and power of the spectrographic method have increased enormously. Experiment has demonstrated that many atoms and molecules which may be present in the upper atmosphere emit and absorb radiation in the far infrared. This type of investigation has been made possible by the recent development of extremely sensitive heat detectors. Data taken at various positions of the sun are compared to determine the vertical distribution of constituent gases. These data are checked in the laboratory. In one such experiment, a 22-meter "multiple traversal absorption" cell is used. The cell is filled with a sample of either natural atmospheric gas or any synthetic gaseous mixture. By the use of reflectors light of any desired wavelength can be made to travel in the cell through the equivalent of two and one-half miles of absorbing atmosphere. The effects of the atmosphere can then be derived from detailed observation of the emergent light. The state of the atmosphere during darkness is examined by study of absorption spectra, with the moon as a light source.

Electronic techniques developed in radar research have led to the discovery that some atmospheric gases are the sources of characteristic ultra-high frequency radio-wave spectra. In this very new field, especially, comparison standards are entirely lacking, and one of the first steps must be to identify in the laboratory the radio-wavelength combinations characteristic of the gases. Twenty-five oxygen absorption lines have been found near 60,000 megacycles. Investigation of the atmospheric molecule ozone in the region between 20,000 megacycles and 60,000 megacycles has resulted in the discovery of seventeen ozone absorption lines.

IT has long been recognized that energy emitted from the sun is the primary activating agent for physical processes that occur in the upper atmosphere. Consequently, the study of the sun itself is a necessary part of upper-air research. Almost everyone is familiar with the fact that commercial radio stations transmit over greater distances at night. This phenomenon is caused by the diurnal change in ionization and shift in the height of the reflecting layers after sunset. When we experience all sorts of freak reception and are bothered by excessive radio noise, the newspaper may announce the cause, in cabalistic tones, to be an unusually active sunspot. Actually many terrestrial disturbances—magnetic storms and aurorae, as well as ionospheric storms and bursts of radio noise—do have very marked correlations with solar disturbances such as sunspots. The solar astronomer has lacked sufficiently detailed data to explain these observations. He feels quite sure that other solar phenomena that can be observed with special telescopes—sudden bright flares, prominences that look like volcanoes on the rim of the sun, excessive emission of particular wavelengths of light from the coronal regions that extend beyond the sun's upper atmosphere—will prove more important than sunspots themselves in explaining the nature of the sudden fluctuations in the sun's radiation and the ways in which they affect the earth's atmosphere. Observations of the corona are particularly few; until the coronagraph was invented in 1930 the corona could be seen only during a total solar eclipse.

The Air Force has very great need to solve the solar-terrestrial mystery, particularly to obtain dependable methods for forecasting upper-atmospheric disturbances that affect radio-wave propagation. Accordingly, as part of its geophysics research program, a solar research station has been established at Sacramento Peak, New Mexico, near the firing ground for the upper-air research rockets. In addition to the more conventional optical equipment, there will be a more powerful coronagraph than has ever before been available, as well as radio receivers designed to record solar noise. For the first time continuous records of solar noise, sunspots, and flare and prominence activity, as well as coronal records, will be taken simultaneously. Special observations will be taken during related rocket experiments. From an understanding of what actually is happening during periods of unusual solar activity, the major clues upon which to base solar forecasts will be discovered, and hence accurate predictions of the resulting terrestrial disturbances will be possible.

RESEARCH on problems in the upper air has, then, as its immediate objective the expansion of scientific knowledge in advance of any likely requirement the Air Force may have to operate in regions where the characteristics would otherwise be unknown. Much of the slow, laborious, ground-breaking work is now past. There now exists not only a considerable amount of data on the operating characteristics of the rockets, but the techniques of designing and operating equipment in such vehicles are fairly well known. Many of the delicate machines basic to such research have now been designed, built, and operated, and the engineering experience thus gained will be of help in solving future problems.

While the rocket is not the only source of information on the structure and behavior of the upper air, it remains to date our one means of making direct measurements and of verifying and correcting theoretical and ground-based probing data. Although some of the areas of general investigation and much of the specific information derived from the program up to now are classified, a few of the general results can be indicated. The over-all shape of the temperature curve up to something over 100 miles is well known, temperature at higher altitudes being measured by the energy of the gas molecules. Direct measurements of the solar constant made above 40 miles have indicated that more energy has been received in the earth's atmosphere from the sun than was previously contemplated. The "E" layer of the ionosphere has been found not to be a homogeneous atmosphere but apparently to be composed of clouds of ions with spaces in between. A study will be made in the comparatively near future which will allow for the computation of the temperature of a body at various altitudes based on the interchange of radiation between it, the sun, the earth, and space. Radiation from the upper atmosphere is being studied to indicate what spurious signals from electrically charged ion patches can be anticipated so that the instruments designed to control future rockets will not be affected. Another five years of research should fit most of the pieces into the puzzle.

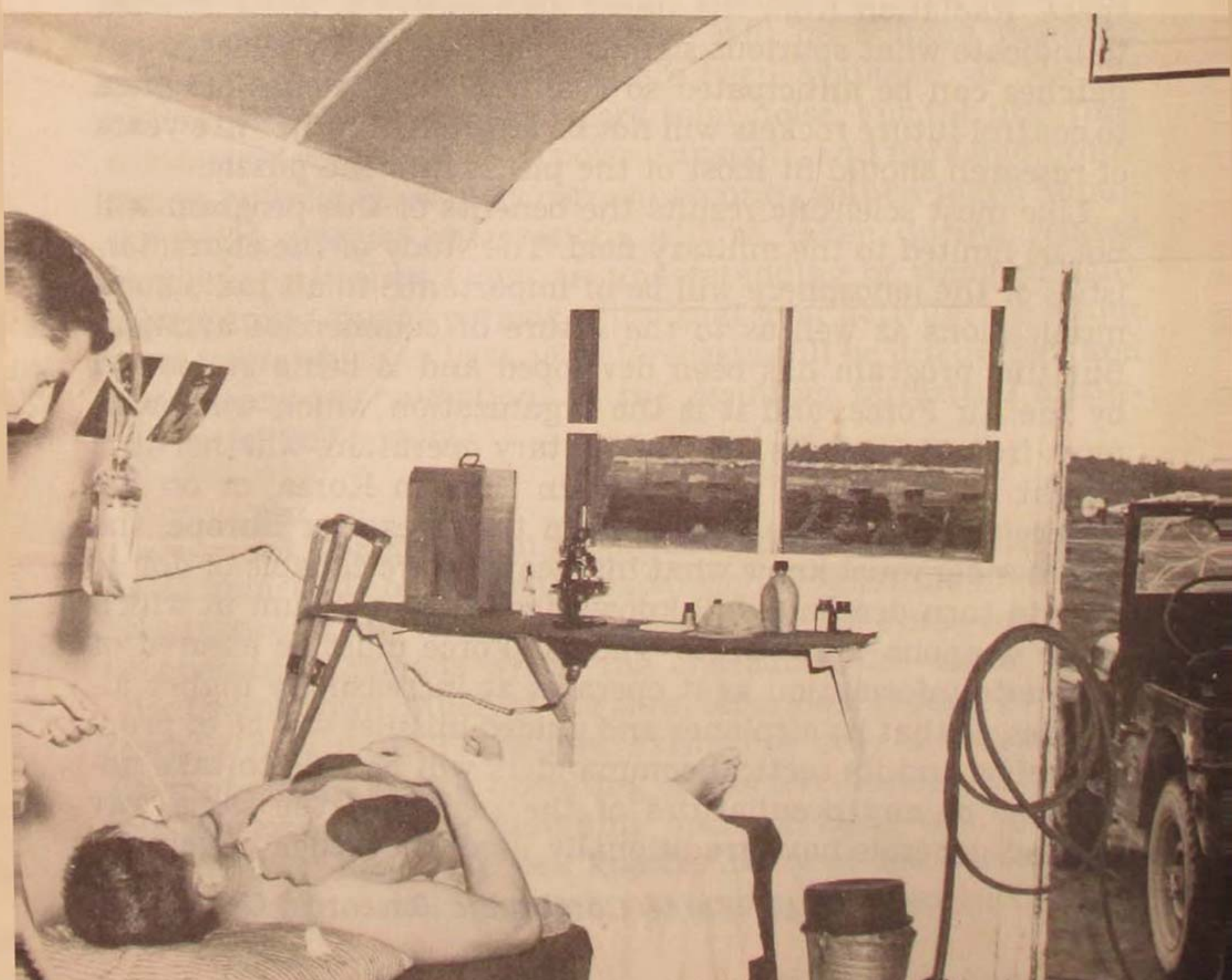
Like most scientific results the benefits of this program will not be limited to the military field. The study of the characteristics of the ionosphere will be of importance to all radio communications as well as to the future of commercial aviation. But this program has been developed and is being supported by the Air Force, and it is the organization which will profit most from the results. In any military operation, whether it is fought up and down the mountain sides in Korea, or on the watery reaches of the Pacific, or in the skies over Europe, the commander must know what his weapons are capable of doing. This in turn demands full knowledge of the medium in which those weapons will operate. The Air Force must be assured of adequate information as it operates at increasingly higher altitudes, so that its airplanes and guided missiles will be of proper design and its tactical commanders will be able to take advantage of any peculiarities of the region in the same way ground generals have traditionally used knowledge of terrain.

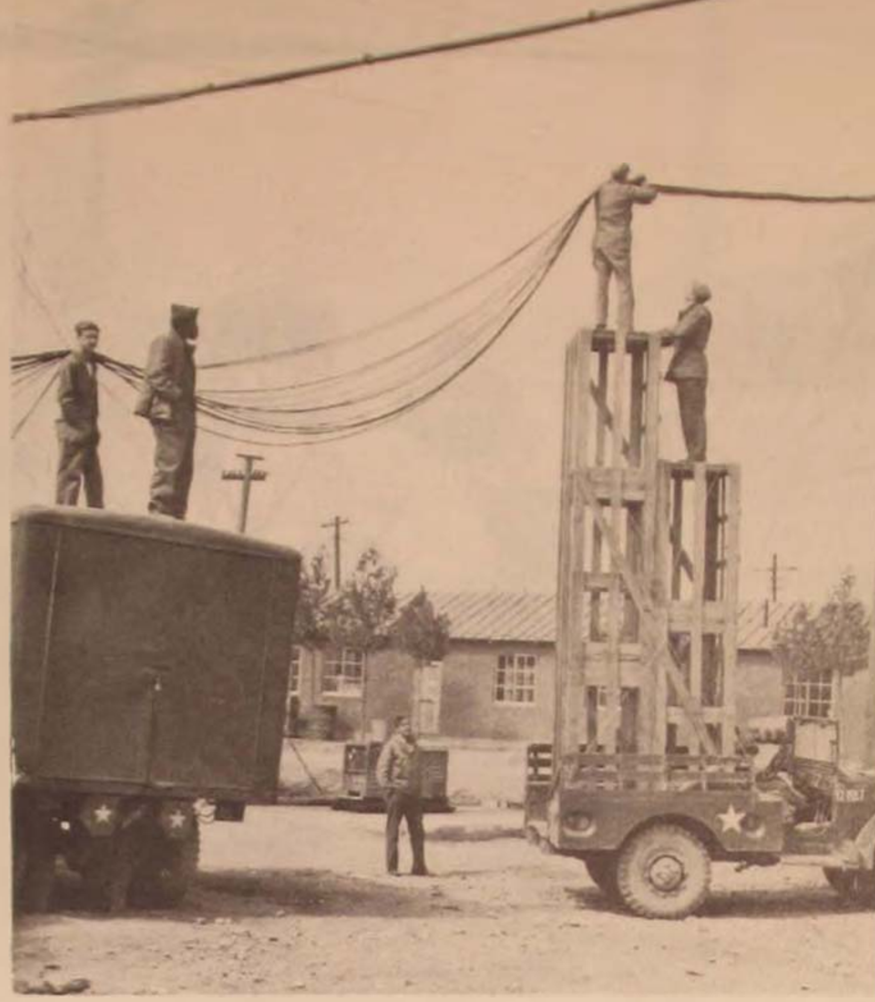
Air Force Cambridge Research Center

Ingenuity in the Field

The ability of the average American to apply original thinking to the solution of unusual problems has long been a source of pride and benefit to our nation. This tradition is being continued under field conditions in Korea. Although in many ways our forces in Korea are better equipped than ever before, situations are bound to arise, especially in a comparatively primitive country, where the tools on hand are not fitted for the job which has to be done. It is here that the American capacity for improvisation comes in handy. Some of the more spectacular cases—the laying of communications lines to inaccessible front-line ridge-tops by helicopter, the development of the tetrahedron to puncture enemy vehicle tires, the frequent impromptu psychological warfare tactics of U.N. aircraft which induced numbers of enemy troops to surrender—have been noted in newspapers and magazines with much approval. But there is another kind of

This flight surgeon at an advanced airbase was faced with a problem demanding immediate solution when a patient was brought in with his chest partially crushed. Nonc of the medical equipment necessary in such a case was available, and there was no time in the emergency to fly it in. Acting quickly, the flight surgeon had the medical station jeep backed up to the door of his office, hooked a long rubber tube to the jeep's windshield wiper connection, and used the engine vacuum to withdraw the blood from the patient's collapsed lung. At the same time he administered life-giving oxygen, using a plasma bottle for a vaporizer. So successful were the twin emergency measures that the patient was recovered enough a few days later to be evacuated in one of the FEAF air evacuation transports, thanks to the flight surgeon's quick presence of mind.



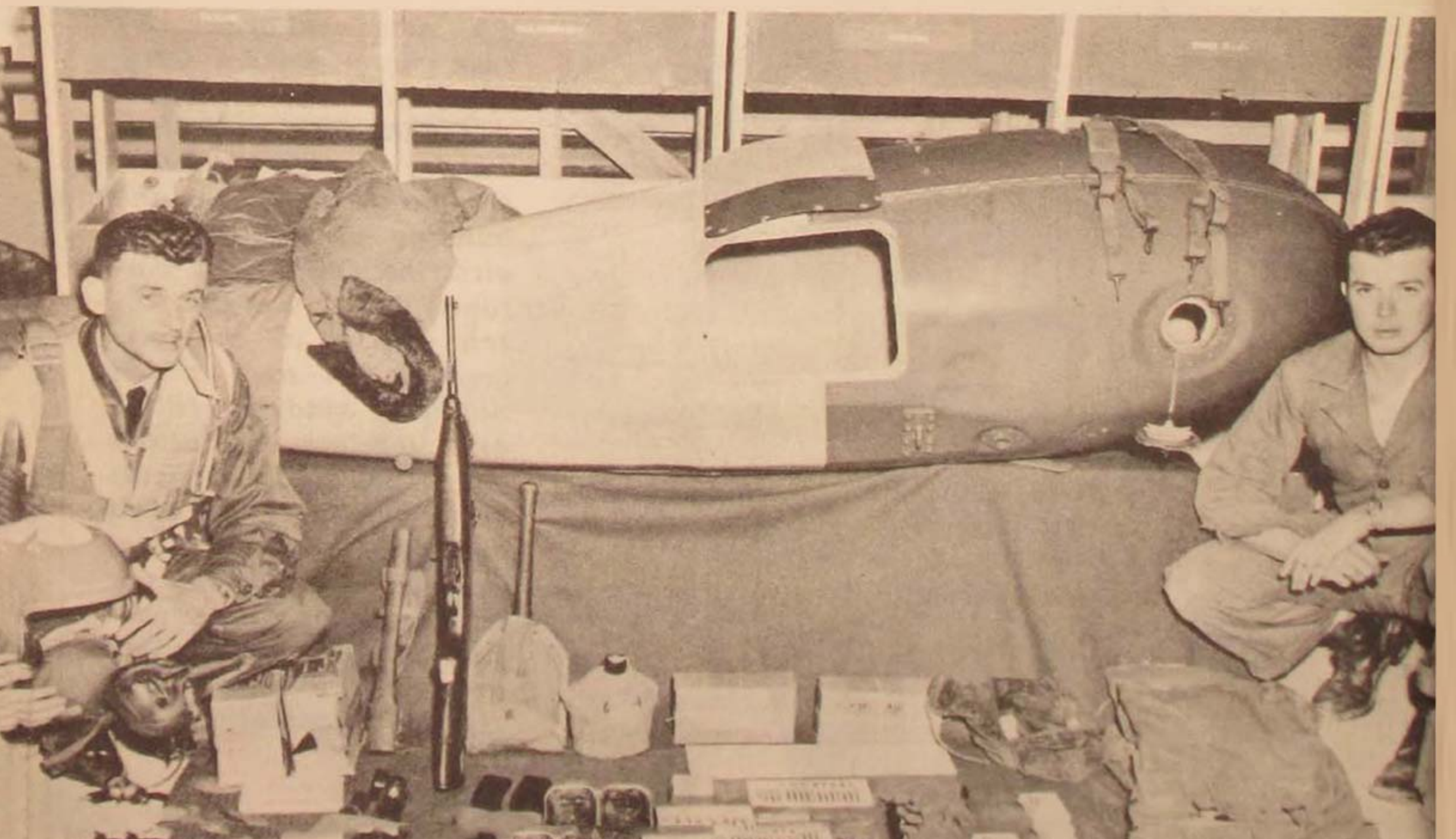


This portable, improvised rack made of packing cases speeds the work of a communications crew as they hook a heavy rope of wires to the supporting cable. Rapid construction of durable, dependable communications, even under adverse field conditions, is vital to the precision timing of ioday's air warfare.

ingenuity, less spectacular but perhaps more important in the aggregate because of the number of times each day that it is repeated, which also deserves attention. This kind is the product of the man who thinks independently and who is willing to step out of the normal routine to get the job done today which otherwise would not be done until tomorrow or next week—when it might be too late.

The bitter cold of the Korean winter posed a series of problems, especially under the fluid conditions which forced frequent troop movements and the building of new forward airstrips. One of the major problems was the frozen ground at the new construction sites, which not only hindered filling and leveling operations but even made difficult such nominal tasks as sinking holes for tent pegs. Pictured here is a novel solution to the tent-peg hole problem. Frozen ground is nothing to the sturdy pneumatic drill.

The usual pattern of air evacuation of wounded soldiers includes a helicopter trip from the front to one of the mobile army surgical units—such as can be seen in the background here—then a trip in an air evacuation transport to a rear area hospital in South Korea or Japan. This system affords transport from the front to a modern hospital in a matter of hours and saves the patient days of jarring, tortuous travel. In an effort further to smooth the trip for the patient, tubular skiis have been fixed to this Hiller helicopter to lessen the pitching and tossing of landings and take-offs on the rough, wave-like plowed fields which are the helicopter's usual stopping points.



Rescue by helicopter has become a commonplace in the news from Korea, but here is one which is out of the routine class. On a practice paratroop jump by the 187th Regimental Combat Team, five troopers landed in the water off the shore of Japan. The helicopter which was standing by to pick up anyone who went in the water lowered its cable to pick up the men. Four paratroopers hooked their deflated parachutes to the hoist, but this left no hook for the fifth man. Here the helicopter pilot's ingenuity came into play. He hovered his aircraft in such a position that the swirling wind from its rotor blades inflated the trooper's parachute and "sailed" him to the shore.

Although air rescue has been able to retrieve most of our pilots downed behind enemy lines in Korea, there are times when the pilot has had to live on the countryside before he can be rescued. The napalm tank shown here has been modified to provide a stranded flier with the equipment necessary for survival. The nose compartment is stuffed with warm clothes, a shelter-half, a poncho, and a sleeping bag. These items not only keep the flyer warm in the severe Korean winters but cushion the rest of the supplies when the tank strikes the ground. The main compartment is packed with a complete medical kit, a three-day emergency food ration, a carbine and ammunition, a fishing rod, a stove, and signaling equipment, including a flashlight and a radio.

What is Morale?

COLONEL DALE O. SMITH*

THE problem of morale—what it is, how a high level of it can be maintained, what combination of factors really governs its ebb and flow—has plagued military commanders ever since the dawn of history. It has been recognized for thousands of years that there was this mysterious force which made some troops fight better than others—even in laboratory-like situations where the relative numerical and armament strength, the terrain, and at least the surface qualities of leadership were equal. Its strength was appreciated and it was agreed that all armies should have a high degree of it. But there the agreement ended. When it came to formulating a definition of morale and devising means of controlling it, the divergent opinions were legion.

In recent years analyses of morale have been offered by an increasing number of specialists in the relatively new scientific fields of sociology and psychology. Here again, there has been infinite variety in points of departure, methodology, and factors taken into consideration, with the natural result of a wide disparity in conclusions. This confusion is no reason for despair. Out of the welter of more and less informed discussion, there are emerging certain standards which, as evidence mounts and reassessment becomes more objective, may furnish the basis for a clear, concrete approach to this age-old problem.

Let us examine some of the major schools of thought on the subject of morale, try to winnow the chaff from the wheat, and then consider the results as they apply to the Air Force.

There are perhaps as many definitions of morale as there are writers who have tackled the subject. Morale has often been confused with happiness and well-being. A grumbler, for example, may be said to have poor morale by those who hold the view that happiness is an essential factor of good morale. This point of view resulted in the wartime effort to entertain soldiers with vaudeville shows and movies to "raise their morale." Recreational activities may have had some influence on morale (just as any activity might), but possibly they had little direct bearing on the ultimate psychological attitudes that caused men to fight together effectively.

*Edited by the Quarterly Review from Colonel Smith's Stanford University doctoral dissertation (1951).

Many rather arbitrary definitions of the make-up of morale appeared during the early years of the war. At the beginning of World War II the Armored School at Fort Knox published a manual which asserted morale factors were feelings of Army desirability, known reasons for Army practices, adequate training, job assignment, work recognition, impartial treatment, living conditions, health and personal problems, free time, and individual acceptance by the unit. Nowhere is the objective of the organization mentioned. It is only obliquely implied. Other writings of the period also avoided the essential relation of morale to the organization mission. Numerous armed services manuals and courses of instruction enumerated similar unrealistic factors of morale—usually drawn from college texts or doctrines of scientific personnel management.

Some experts glimpsed the use of group goal as an approach for evaluating morale but erred by identifying the goal from some such civilian standpoint as the national cause for fighting. One list of morale factors included belief in the cause, contribution toward cause, and working together for selves and home.[1] This rather doctrinaire concept of the wellsprings of morale was roundly scoffed by returning veterans. Some polls indicated that combat veterans, more than noncombat soldiers, doubted the worthiness of cause. This doubt seemed to increase with combat service, but morale, and certainly organizational effectiveness, also increased. As a rule ". . . the more closely men approached the real business of war the more likely they were to question its worthwhileness."[2] Yet morale in active theaters was generally higher than in noncombat areas. Speaking from the battleground of Sicily, Major General Terry Allen, one of the American army's outstanding division commanders, declared that men do not fight for a cause but because they do not want to let their comrades down. This statement seems well supported by evidence from the fighting men themselves. If the goals of a nation at war are narrowed down, however, made specific and concrete, so that they have meaning for the individual soldier and then are related to observable objectives for his fighting unit, a relationship between these narrowed goals and troop morale is more readily noted.

Recent morale investigations have stressed morale as the psychological attitude which encourages effective group activity. Or, if examined in terms of behavior, morale consists of

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[1] L. A. Pennington, R. H. Hough, Jr., and H. W. Case, **The Psychology of Military Leadership** (New York, 1943), p. 249.

[2] S. A. Stouffer, et al., **The American Soldier** (Princeton, 1949), pp. 421 ff.

those aspects that indicate group effectiveness. Just what these behaviors might be are somewhat in doubt. One study suggests group cohesiveness, liking for the leader, minimum intra-group strife, agreement upon group objectives, and confidence in equipment.[3] Only the first and third of these can be considered as behavior, although the others can be inferred from behavior. But regardless of their validity as measuring sticks for morale, there is an over-all agreement on the basic relationship of morale to group effectiveness.

Nine essential components of morale were interpreted from public opinion studies before the last war. They included awareness of objectives, agreement with objectives, faith in attainment of objectives, realistic picture of the job ahead, determination to achieve objectives, confidence in leadership, satisfaction with progress toward objectives, extent of unification, and feelings of useful contribution to objectives.[4] It can be seen that, with the exception of confidence in leadership, all other components of morale are directly related to the group objective. In other words, if the individual's objectives are part of the group objectives, morale is high.

A study of two naval air squadrons which reputedly had outstandingly high morale included factors such as positive goals, satisfaction of accessory needs, sense of progress toward goals, relation between levels of aspiration and achievement, time perspective related to goals, equality of sacrifice or gain within the group, and feelings of solidarity, identification, and involvement.[5] This list shows that objective-directed attitudes are dominant in current thinking on morale. Even so, there is still a residue of the older concepts which dwell on happy living conditions (accessory needs).

There is undoubtedly a growing agreement on what constitutes morale and how it might be measured. Morale is "wanting to do what you have to do."[6] An Army study found "belief in mission" to be an essential component.

Because of the many controversies on morale measurement, a more clinical approach to the problem has been suggested, using direct observation and non-directive interviewing, and including measurements such as the nature and extent of interpersonal contacts, performance on the job, verbal expressions

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[3] R. L. French, "Morale and Leadership," reprinted from **Human Factors in Undersea Warfare** (Washington, 1949), Ch. XXII.

[4] H. Cantril, "Public Opinion in Flux," in T. M. Newcomb, and E. L. Hartley, eds.,

[5] D. Kretch and R. S. Crutchfield, **Theory and Problems of Social Psychology** (New York, 1948), p. 438.

[6] E. G. Boring, ed., **Psychology for Armed Forces** (Washington, 1946), p. 325.

Readings in Social Psychology (New York, 1947), p. 591.

concerning the group, reactions to rumors, leisure activities, and manner of behavior in crowds.[7] Although these behaviors may be related to morale, it remains to be proved that they offer an index to the problem of effectiveness of group activity. If effectiveness of group performance is the ultimate standard. studies are needed for comparative and objective measurements of such performance. Morale factors might then be more specifically established for certain group situations.

AN abundance of evidence supports the idea that the skillful leader is one who achieves the designated goals. General Eisenhower said, "In war about the only criterion that can be applied to a commander is his accumulated record of victory and defeat. If regularly successful he gets credit for his skill, his judgment . . . and his leadership."[8] Field Marshal Montgomery wrote that the best way to improve morale and to gain the confidence of soldiers is to give them victories and then they will follow the leader anywhere. He cited the rise of Cromwell from Captain to Lieutenant General in less than two years because of his ability to win engagements, in spite of his great personal unpopularity. Cromwell was a rigid disciplinarian, a hard-driving martinet with a quick and vitriolic temper. It is doubtful that the opinion poll as a measurement of leadership would have rated Cromwell very high. Yet his leadership ability has been adequately established by history.

The concept that morale and leadership are integral parts of success is also supported by General Eisenhower, for he has stated further that "military leadership is the indispensable ingredient of victory."[9] The investigator of leadership is hence faced with a closed chain of factors, leadership-morale-organizational success, each largely the cause and each the result of the others. Where can he break the chain to permit any analysis? In order to examine group activity, he must control the variables in at least one of the links in the chain. Only the link of organizational success seems to permit any measure of rigid control.

A survey of the records of wartime submarine patrols adds support to the aphorism attributed to Oscar Wilde that "nothing succeeds like success." Morale seemed to vary directly with

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[7] J. L. Child, "Morale: a Bibliographical Review," **Psychological Bulletin**, XXXVIII (1941), 393-420.

[8] D. D. Eisenhower, **Crusade in Europe** (Garden City, 1948), p. 178.

[9] D. D. Eisenhower, letter to Representative Paul Kilday, published in the **Congressional Record**, reprinted in **Army Information Digest**, Aug., 1949.

the tonnage of enemy shipping sunk. There is little argument among modern researchers that morale is closely related to group effectiveness, but it has been difficult to measure accurately the degree of success of a military organization. Most military group situations, for example, present so many extranéous factors affecting group success, such as opportunity for targets, weather, and degree of enemy effectiveness, that other measurements (like those to be found in the normal relationships between individuals by use of opinion polls) have been sought. The validity and reliability of such artificial standards have not been outstanding, although they have gained considerable prominence.

One is forever being confronted by the example of a leader who broke every recognized principle of good leadership, yet still achieved notable success and high troop morale. How can such success be explained? Are relations between individuals so exceedingly complex that it is impossible to find one basic characteristic of successful leadership? Researchers have pursued leadership traits to the reasonable limit with no conspicuous agreement in conclusions. On the contrary history is full of successful leaders who displayed in a negative fashion every "essential" trait suggested in literature. The traits themselves defy precise definition and have widely different implications even among the social scientists.

Members of the Harvard Psychological Clinic made a gallant effort to weld all the sophisticated social-psychological systems into one theory of personality. They came up with forty-four variables,[10] which seemed to compound further the confusion in regard to the slippery elements of personality. At about the same time Gordon Allport published his famous study, which was less selective and less precise but perhaps more applicable to group situations and leadership problems. He saw the futility of depending solely upon character traits to explain behavior; instead he emphasized the situational forces and spontaneous elements of group activity.[11] It is evident that little further progress will be made in leadership study by considering only the isolated personality traits of the leader himself, but the situational or in-context approach to leadership has offered a new picture. This approach views the leader's behavior as it operates in a particular set of circumstances.

[10] H. A. Murray, et al., Explorations in Personality (New York, 1938), p. 143.

[11] G. W. Allport, Personality (New York, 1937). Murray likewise considered situational components.

GROUP activity consists of a complex of interactions between group members and the leader; hence the leader's behavior is in part determined by his reaction to his followers and by their reactions to him and to each other. Neither leader nor group operates in a vacuum, and ever-changing attitudes must be contended with. This interplay of human forces, together with the military variables of every situation, has much influence upon personality traits and courses of action. Productive results are accruing from this fundamental social-psychological approach, and the evidence produced by its method of examining an organization as a whole rather than by piecemeal analyzing of the leader alone promises some startling revisions in established concepts.

For example, one study using the over-all approach to morale and leadership examined morale in five shipyards during the war. It was found, surprisingly enough, that in two yards good living conditions were in reverse correlation with production. One yard had poorer living and commuting conditions than another, yet produced ships three times as quickly. But in all five yards, nearly every measurable morale factor related to *attitudes* correlated positively with production. The authors stress the "circular causal relationships between morale and production."[12] From this it might be inferred that if a leader loses sight of production he may lose control of morale as well.

Because it is so obvious that morale and production are closely related, the implicit assumption usually is that if the leader does something to raise morale he will at the same time be taking action to raise production. The nineteenth century and early decades of this century found management emphasizing production at the expense of morale. This point of view eventually led to labor strife, strikes, and consequent reduction of productivity. At that point it seemed logical to reverse the orientation and consider morale before production. Such has been the modern approach. The pendulum has swung to the opposite end of its arc.

But recent texts on personnel management stress the maxim that management has a dual purpose: production *and* morale. These works point out the goal of human welfare as a primary managerial concern, of equal if not more importance than production. Since production is industry's *raison d' etre* (if produc-

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[12]D. Katz, and H. Hyman, "Morale in War Industry," in Newcomb and Hartley, op. cit., pp. 437-447.

tion fails, industry certainly fails), some managers, especially those of the quick-profit variety, would question this extreme emphasis on morale. They might point out in addition that morale is so closely intertwined with production that one cannot be separated from the other. Nevertheless, the human fondness for separating ideas into neat, mutually exclusive bundles has resulted in morale being considered separately from production.

As previously noted, military experience leads us to believe that morale is almost invariably raised with victory. Yet the parallel is not always true in industry, as judged from the lowering of morale with increased production in the early part of the century. Why does morale nearly always increase with military success but only sometimes increase with industrial success? The difference might lie in the worker's attitude toward, and personal identification with, the end-product. In the military situation the soldier's personal interest in victory is vital. Victory means that his very life will be spared, or at least that it is less likely to be lost. It means that his family, friends, home, and crucial values of every nature are being protected from a dire threat.

On the other hand the industrial worker may be completely indifferent to the number of gimmicks his factory produces. As long as his job is secure (and in a large organization his job may seem only remotely related to the end-product), he has little other personal concern. Many industries produce services rather than material products. Telephone and telegraph companies are examples where the actual product is so intangible that the individual can scarcely grasp its personal significance, let alone become vitally concerned. Peacetime military service suffers comparable handicaps because the purpose of training is so intangible to the individual serviceman.

Many analysts have recognized this aspect of industrial life and have suggested ways in which the worker can be made to feel more essential to production. Various schemes have been tried by business to create in employees a personal interest through direct participation of workers in the risks and profits of their organizations. Over three hundred such corporations are now operating employee representation plans, most of which have been eminently successful.

The voluminous evidence of plummeting soldier morale at the end of every war draws an obvious parallel between morale and victories. Victories in past wars quickly lose their vitality in the toils of history and become nothing with which the individual soldier can identify himself or his future. Years are usually required to reorient the soldier to the objectives of peacetime training and to associate those objectives with himself. Even then morale can rarely be raised to the point it reaches in wartime when the objectives are so clearly visible.

In the immediate post-war period morale seemed geared to individual identification with the military mission, regardless of such factors as living conditions, time off, working conditions, confidence in equipment, or satisfaction with "accessory needs." In many cases even financial security and social prestige were insufficient to keep an officer in uniform. A great many military personnel appeared wholly satisfied with service life but could not interest themselves in the new training goals. Feeling no personal identification with the revised military objectives, they often left the service to take civilian jobs at lower pay but with more immediate and concrete objectives.[13]

This evidence would indicate that one of the leader's essential responsibilities is to do everything he can to make the organizational goal tangible for every person in his organization, and then to influence each man to accept that goal as his own. And if the goal is a worthy one, it is worth prodigious striving to achieve it. Thus from a morale standpoint it would follow that the leader must advance toward whatever goal has been set for him and his subordinates. Subordinates with interest in the goal should have good morale as long as progress is maintained. Those who are indifferent must be drawn into feeling personally responsible in some degree. Morale then will follow the advance. Once this unity of purpose has been established in the organization, an atmosphere of approval will likely exist in leader-follower relationships simply because the group will feel that it is under steam for the benefit of all.

History shows that the leader who operates in an atmosphere of approval can exact almost any standard of discipline without loss of morale. The leader may be strict or lax, stern or friendly, plodding or mercurial, rough or kind, preoccupied or alert, lazy or energetic—and still lead a successful, productive team which retains high morale. If such be so, the leader's attitude toward his men can have only minor influence on the atmosphere of approval. Paradox disappears when one considers the importance to morale (psychological atmosphere) of individual iden-

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[13]Interviews by the author with over 300 AAF officers being discharged at the March Field Separation Center, California, 1946.

tification with the organizational mission. When a unity of purpose exists toward unit objectives, and when progress is being made, general approval follows regardless of the tactics used to achieve such unity of purpose. Here, then, seems to be the key stone, the *sine qua non*, of both the morale and leadership problem. If each man personally identifies himself with the goals of his organization, and if progress toward those goals is apparent to him, his morale will normally be high.

Headquarters, Air University

Battle Damage

The ability of jet fighters to sustain serious battle damage and remain flyable has contributed much to USAF accomplishments in the aerial warfare over Korea. Jets returning from combat have displayed battle wounds ranging from minor skin lacerations to crumpled or bullet-riddled wings and torn fuselages with gaping flak holes three feet in diameter. This durability has brought the highest praise from the pilots who fly them and attests to the jets' rugged construction. Much of the damage is received on ground-support missions from flak or small arms fire, from striking obstacles like high tension wires, cables, or trees, or from the flying debris of bomb and rocket blasts. In one instance an F-80 Shooting Star of the 49th Fighter Bomber Group hit the ground on a "low-level" strafing attack and bounced back into the air—returning to its base with the lower section of the fuselage a mass of twisted metal and jagged holes. Durability at high altitude and high speed was demonstrated by an F-86 which received a direct hit from a 37 millimeter cannon shell during aerial combat with MIG-15's near the Manchurian border. The exploding shell hit the left wing

The ability of the jet fighter to take punishment and keep flying is demonstrated in this photograph of an F-80 which landed safely at its base with several feet sheared off its wing. The speedy fighter struck an overhead cable on a low-level ground-support mission in North Korea. The heavy structural support which takes care of the terrific stresses of high-speed flight was also strong enough to withstand the impact and prevent the wing from shearing off. Even the damaged flap remained workable

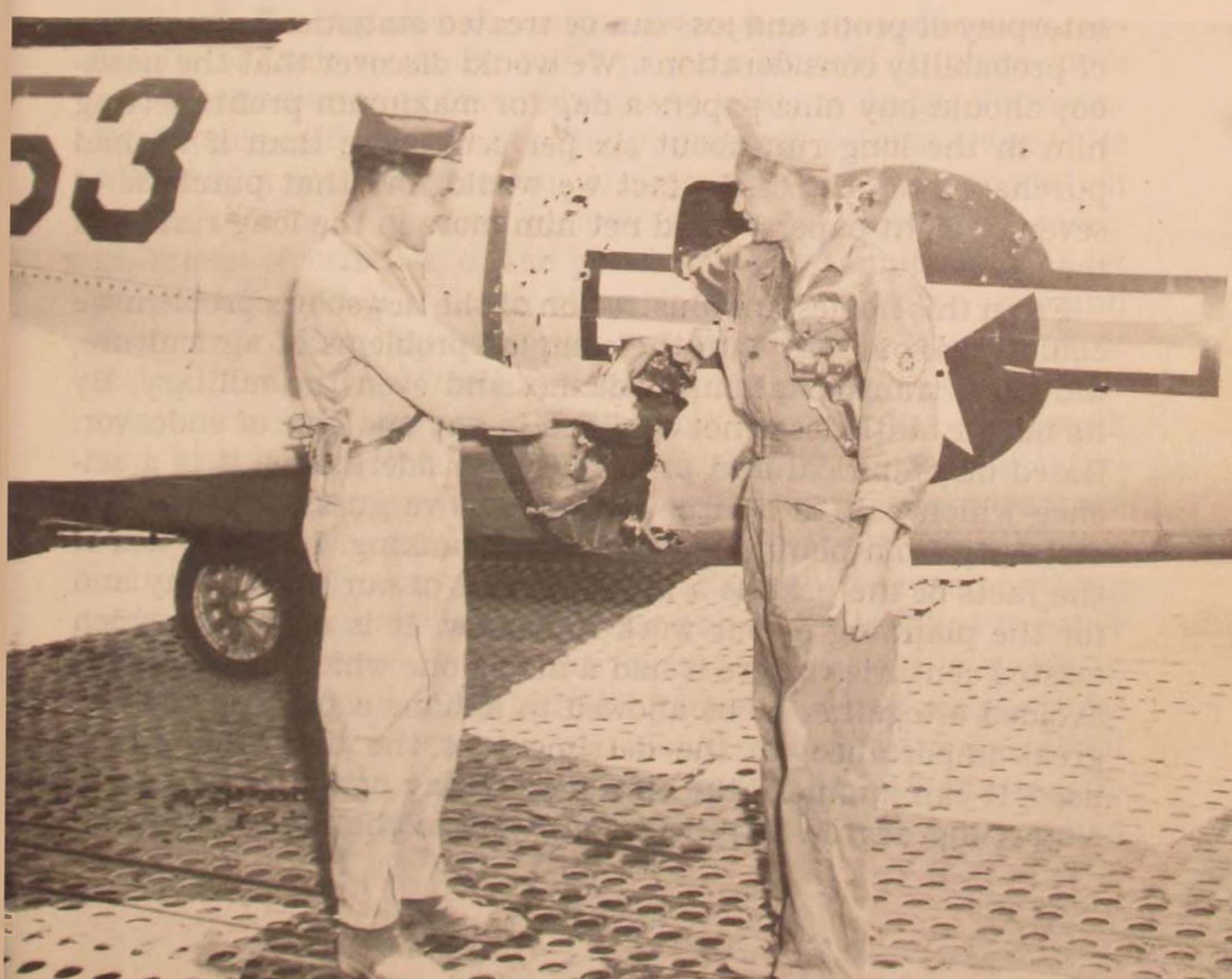
Returning from high-altitude aerial combat with MIG-15's over North Korea, this F-86 landed with only a sliver of its rudder remaining. The impact of the shell flipped the high-speed Sabrejet completely over but the pilot was able to regain control, stabilize, and bring it home safe—testimony to the sturdiness and durability of his aircraft in times of emergency.

The wing-root section of this F-84 Thunderjet was hit by automatic weapons fire during a low-level strafing attack on dug-in troops in North Korea. Rugged construction and greater stability of jet fighters prevented another loss to increasingly accurate Red ground fire.

near the fuselage. The blast sent fragments tearing through the wing and shattered the cockpit canopy. The pilot and Sabrejet returned safely to their base. In addition to battle damage, many jet fighters have withstood stresses far in excess of design limitations without structural failure. Pilots report registering as high as 13 "G's" while pulling sharply out of a dive.

The great durability of jet aircraft is partially due to the increased speeds at which they operate. Flying two hundred miles per hour faster than the fighters of World War II, the jets had to be built of more rugged materials and with greater strength throughout. World War II aircraft had very thin outer skins, with a maze of internal bracing to carry most of the primary structural loads. Now the outer skin is tougher and thicker, bears a good part of the structural load, and requires considerably less internal bracing. This spread of the structural load over a much greater area minimizes the damage caused by a hit even from large-bore cannon. Another element of safety is the basic simplicity of the jet engine, which means that there is less of the aircraft area where a hit will vitally affect the operation of the aircraft. In terms of aerial combat against the MIG this reduction of vital areas offers a smaller target to the three cannons of at least 20 millimeter caliber which are mounted on the MIG. Although these cannon fire more rapidly than do ours of similar caliber, they are still far below the rate of fire of the six .50 caliber machine guns on most U.S. fighters, an important factor in the split-second firing period in modern jet battles.

The near-mortal flak hit pictured here was caused by a 20-millimeter cannon shell. Over 150 shrapnel and bullet holes were counted in the vital section of the fuselage of this F-80 Shooting Star after it returned from a combat mission over North Korea.



Statistics-Your Business

LIEUTENANT COLONEL R. M. HORRIDGE

ON a wind-swept street corner the young newsboy was yelling, "Read all about it!," and asking solicitously of each passerby, "Paper, mister?" He was learning the hard way, acquiring business acumen at an early age by a hit-and-miss process. Gradually he had learned where to sell, how many papers to buy, when to begin and end his sales, whether to operate in bad weather, and what to say to prospective customers. Could mathematical statistics have helped him in any of his decisions? The answer is definitely yes.

As a hypothetical example, suppose that he sells ten papers on the average each day, has no regular customers, buys the papers for two cents each, sells them for three cents each, and cannot return leftovers for credit. How many papers should he buy each day? The answer apparently is he should buy ten papers. As usual the answer is not that simple. Against the one-cent profit he could make on an additional paper we must weigh the two-cent loss he would suffer by not selling it. This interplay of profit and loss can be treated statistically by means of probability considerations. We would discover that the newsboy should buy nine papers a day for maximum profit, netting him in the long run about six per cent more than if he had purchased ten copies. In fact we would find that purchase of seven or eight papers would net him more in the long run than ten.

From this homespun illustration of the newsboy's problem we could work our way into the complex problems of agriculture, industry, transportation, medicine, and even the military. By its nature statistics is not confined to any one type of endeavor. Based on empirical and probability considerations, it is a science which can to a large extent remove guesswork and uncertainty from planning and decision-making. It makes use of the facts of the past as a measurement of our work today and for the planning of our work tomorrow. It is a science which existed centuries before it had a name, one which can either be avoided altogether or be allowed to assume a position of over-great importance, to the detriment of the user. But wisely used, it can augment the efficiency of any operation—often to a startling degree. It provides answers to the important questions of what, when, where, why, how, and how much. It enters into our personal lives and into our working lives. It is often a decisive factor in determining the clothes we wear, the food we eat, the entertainment we pursue, the manner in which we travel, the hours we work, the job we do, the operations we undergo, and thanks to the sum of these improvements, can even increase the number of years we live.

The proper question now is, "Interesting, but how does statistics apply to us as Air Force officers?" Not many years ago an officer of the armed services might easily have disproved me if I had told him that some knowledge of statistics was essential to the proper discharge of his responsibilities. Yet how many of us today have not heard or seen the words *correlation, mean, normal distribution, probability,* and *statistics* itself in the routine affairs of the day? From a fighting force in which each commander could know his men, equipment, and techniques intimately, we have developed into a complex, technical, and integrated force of men and machines: pilots and submariners, frogmen and rangers, pioneers and paratroopers. As an officer matures in the service today, he must learn to understand the problems, to appreciate the methods and capabilities—as well as the limitations—of the scientist and technician, and especially of the statistician, before he can use intelligently the results of their work. He must prepare himself to place more and more reliance on their advice and wisdom. As Dr. Vannevar Bush once said concerning the planner of a future war, "He will need a reasonable grasp of atomistics, some appreciation of the trends of modern biology, and a knowledge of many aspects of electronics, of the possibilities and limitations of jet propulsion, and of a dozen other fields in applied physics and chemistry. More important, he would call for a knowledge of statistical theory, something concerning probable errors, correlation factors, sampling theory and the like. For guesswork and hunch are nowhere near good enough when the interrelations of complex systems, such as those of modern war, are involved, as was amply proved in the last encounter."

Unfortunately many of us have a sharp aversion to anything mathematical unless it resembles a game or is cloaked in other vestments as horse sense. For example, consider a game in which you pay one dollar to roll a pair of dice and receive three dollars for every seven you roll. Would you play the game? Of course you would refuse—that is, until the pay-off was increased to six dollars or more. You would then feel that you had a fifty-fifty chance and would probably be willing to risk a few dollars in the hope of rolling some sevens early in the game. On the other hand if someone offered to bet his choice of a team to win the American League pennant against yours after the season was underway, would you pick a team at random? Again the answer is no. You would very carefully study the records of the leading teams and then make your choice on the factors you considered important. No doubt you would give weight to such items as present standing of the clubs, the number of games ahead or behind for each, the relative power and strength of each team, whether it seems to be struggling, coasting, or just hitting full stride, the number of injuries in a club, the depth in good pitchers and batters, and so on. You might even delve into past records in an attempt to determine club policy or ability to fight in a close battle. Then you would pick your team. Statistics? In the first example you would have applied the theory of mathematical probability and expectation; in the second the theory of statistical probability and the rudiments of statistical methods. In fact you are a statistician. Convince yourself of that and then try to develop this latent power and ability. You will find yourself on speaking terms with a science and scientists that search into nearly every walk of life.

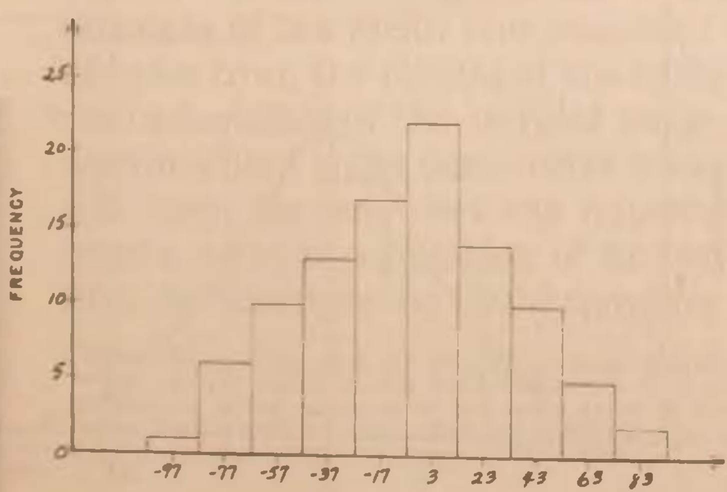
LET us take a short journey into the realm of the statistician to examine a few of the problems and tools of his trade, to witness some of his methods, and to admire some of his achievements. We will soon discover that he is not a magician but a conscientious, thorough worker who is methodical but ingenious, demanding yet tolerant. He must not only be prepared to answer direct questions in many fields but often must also be equipped to hunt down the problem itself before determining possible solution. Here are some of the typical questions which may confront him: How many shoes of each size should be ordered for an expanding armed force? What shall we do to improve results for this particular type bombing mission? What method of inspection shall we adopt for acceptance of proximity fuses? How shall we control the production quality of electronic tubes? What is wrong with our present antisubmarine tactics? Is this new rifle superior to the one now being issued? Can we reasonably predict tensile strength of a metal specimen from a measure of its hardness? What policy shall we adopt for rotation and replacement of combat crews? How can we reduce the accident rate of this type aircraft? Let us examine his work in greater detail to see how he approaches the answers.

Bomb No. \ Airplane No.	1	2	3	4	5	6	7	8	9	10
1	-95	6	+25	+25	-30	+60	+50	+20	+10	+30
2	+15	-50	0	-10	-10	-15	+25	+30	+10	+20
3	-85	-20	-30	-85	-5	-75	+5	+10	-30	-50
4	-5	-30	+5	-5	-10	+5	-45	-55	-30	-35
5	+35	-10	-20	-15	-60	-5	-20	+70	+70	-55
6	-60	-30	0	-30	+20	-15	-55	-65	+40	-75
7	+40	+70	-60	+80	0	+50	-40	-15	-70	+10
8	+40	-30	+40	-20	-25	-20	+20	-85	+10	+10
9	-5	-5	0	-20	-45	-20	+15	+50	+80	+15
10	+25	-60	+5	+65	+5	-25	+30	+35	-35	+50

Table I. Bomb Trail in Yards (short: −; over: +)

For the purpose of illustration, consider the problem of determining the trail of a new type of bomb at a prescribed airspeed and altitude. Bomb trail or lag is the horizontal distance between the point of impact of the bomb and a point directly under the aircraft at the time of impact. Trail is caused by air resistance to the flight of the bomb, and measurement of its magnitude is necessary, since it varies for each type of bomb. We shall assume that the statistician has already used the theory of *sampling techniques* to decide that ten bombs dropped by each of ten different crews will constitute his sample, the ten different crews being employed in an attempt to eliminate personal errors. Each crew will make ten runs on the target, the runs evenly spaced in direction around the clock in order to minimize wind effects. Each run will be carefully controlled for temperature and pressure corrections. Once these factors are taken care of, the trail readings due to the ballistics of the bomb are recorded as shown in Table I. This measurable characteristic, the trail of each bomb, is called the *statistical variable* and is usually designated by the symbol x. Each particular value of the variable shown in the table is a *variate*. The set of 100 variates constitutes the sample taken from the population, universe, or lot, which in this example would be the errors in

Figure 1. Histogram of Trail Errors



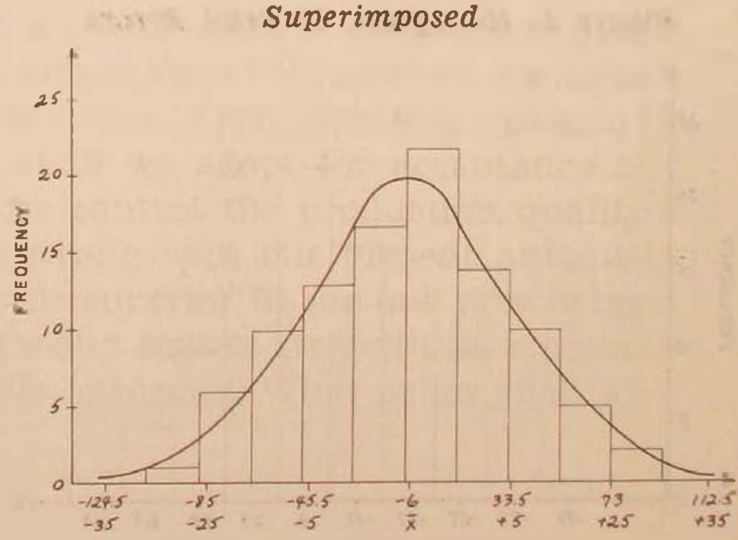
CLASS MARK	CLASS BOUNDARIES	FREQUENCY
	−107	
−97		/
	−87	
−77		~~////~~ /
	−67	
−57		~~////~~ ~~////~~
	−47	
−37		~~////~~ ~~////~~ ///
	−27	
−17		~~////~~ ~~////~~ ~~////~~ //
	−7	
+3		~~////~~ ~~////~~ ~~////~~ ~~////~~ //
	+13	
+23		~~////~~ ~~////~~ ////
	+33	
+43		~~////~~ ~~////~~
	+53	
+63		~~////~~
	+73	
+83		//
	+93	

Table II. Bomb Trail in Yards (grouped data)

range of all possible bombs of this type. After ascertaining that each bomb dropped is free from gross error, the statistician next groups or classifies the data for ease of computation. The entire range of variation, from −95 to +80 yards from the target, is divided by equidistant boundaries into classes as shown in Table II. All variates falling within each class are considered to have the value of that *class mark* or center value. Generally between ten and twenty classes will facilitate computations without too great a sacrifice in accuracy. The next step might be to draw a *histogram*, showing graphically the number of variates falling within each class. Figure 1 shows the histogram for the observed data after classification. This pictorial representation is excellent for demonstration but of little value mathematically or statistically. The statistician must determine certain attributes pertinent to the data if he is to extend his observations to other data, test certain hypotheses, or make decisions on a mathematically sound basis.

He computes the *arithmetic* or *weighted mean* of his data, the average value of the measurements. This mean or average, represented by the symbol $\bar{x}$ is the single value about which the variates tend to cluster and can be considered representative of the variates. The mean of the classified data pertaining to the bomb ballistics is calculated by multiplying each class mark by its frequency, totaling these products, and dividing the total by the number of observations (100), giving an $\bar{x}$ of −6 yards or a trail of 30 feet. In some cases the *median** or the *mode*** may be used if either describes the data more accurately. For example, in a small factory in which each of ten workers receives $4000 per year and the general

Figure 2. Histogram with Normal Curve Superimposed



manager receives $15,000, it would be much more descriptive of the average wage to use the mode or median of $4000† rather than the mean of $5000.

The statistician's next step is to calculate some measure of the dispersion of the variates about the mean. The most common measure employed is *standard deviation*,‡ represented by sigma (σ) and calculated by: (1) subtracting the mean ($\bar{x}$) from each variate (x); (2) squaring each of these differences and adding them together; (3) dividing this sum by the number (n) of variates; and (4) taking the square root of the quotient. Or expressed mathematically, $\sigma = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(x_i - \bar{x})^2}$. For grouped data the standard deviation is approximated by using the class marks as the values of the variable and the class frequencies as the number of observations of each. Calculations based on the grouped data for the bomb trail would give, $\sigma = 39.5$ yards. It has been shown that trail errors have a *normal* or bell-shaped distribution in their variation, one characteristic of which is that approximately 68 per cent of the variates will lie in the interval $\bar{x} \pm \sigma$, 95 per cent in the interval $\bar{x} \pm 2\sigma$, and 99 per cent in the interval $\bar{x} \pm 3\sigma$. In the long run, we could then predict that of 100 bombs of this type dropped under the stated conditions and after the trail of 30 feet had been set into the bomb sight, 68 will fall within 39.5 yards of the target in range, 95 within 79 yards, and 99 within 118.5 yards. For the grouped data of the sample 65 per cent, 96.5 per cent, and 100 per cent are the observed percentages, indicating close agreement with the predictions. In Figure 2 is shown the histogram of the sample data with the normal curve superimposed. A better fit between the histogram and the curve could be realized by taking a sample of larger size.

From this routine beginning, the statistician can go in many directions, depending on the requirements. He may give an estimate of the mean and standard deviation of the population directly from the results of the sample, or, using the probability characteristics of the normal curve, he may predict the limits within which these descriptive measurements of the population will vary. He may test the hypothesis that this sample came from a certain population of known mean and standard deviation; for example, he could compare the dispersion in the previ-

*The center value of a set of variates arranged in order of magnitude.

**The variate which occurs most frequently in a set of variates.

†[Both of which compute to the same value in this example—Ed.]

‡The square root of the arithmetic mean of the squares of the deviations of the various items from the arithmetic mean of the whole.

ous sample against that experienced with a similar type bomb now in service to determine if these new bombs are superior, inferior, or about the same in ballistic quality. He may test the results of this sample against other samples (for instance, samples from a modified version of the bomb) to determine if the accuracy of one is greater than the other or if the difference in dispersion could reasonably result from purely chance fluctuations.

In arriving at many of his conclusions, the statistician frequently works with theoretical distributions or *probability functions*. These are mathematical curves or models about which everything is known and has been tabulated for easy reference. Thus, in the example of the bomb ballistics, the statistician could readily find the *normal distribution* which is shown and which most closely approximates the observed data. It would then be an easy matter for him to prove or disprove his contention that trail readings do have a normal distribution and then to state his conclusions regarding the characteristics of this type bomb. The probability functions he most commonly deals with are the *normal*, *binomial*, *Poisson*, and *chi-square*, because many of the variables of nature, man, and machine follow very closely one of these models in their variation. By way of example, the number of sixes thrown with ten dice is a variable with a binomial distribution; range and deflection errors of guns, the weights of men of the same height, and the lengths of blades of grass a week after mowing are variables with normal distributions; the number of deaths of troopers caused by kicks from horses in a cavalry corps would have a Poisson distribution; and the variances, or squares of the standard deviations, of various samples from the same population will have a chi-square distribution. To understand more about statistical methods, let us look at some of the military applications which have realized excellent results in the past few years.

During World War II, B-24's equipped with radar for low-altitude night bombing of enemy shipping were sent to the Pacific. Their first efforts were not too satisfactory, and as was later discovered, there was very little uniformity of method among the various crews. Operations analysis personnel were called upon to improve the bombing results. After collecting what data they could from previous operations, they set up an operational experiment to determine the optimum bombing altitude and measurements of the dispersion of the bombs. It was found that dispersions both in range and deflection followed very closely the normal distribution and the standard deviation was calculated for each. The optimum altitude was determined to be 1500 feet. The next step was to analyze the major variables which entered into the bombing results. Some of those considered were size and kind of enemy shipping, angle of attack, number of bombs dropped in train, spacing between bombs, and evasive action taken by the target. Based on the preliminary discoveries and calculations, a grid was constructed similar to that shown in Figure 3. Since the probabilities of a hit in range (or along the line of flight) or a hit in deflection (or that part of the target on either side of the line of flight) were independent of each other, the probability of a bomb falling in each square was easily calculated and placed on the grid. The next step was to classify Japanese shipping into four major types and to make a transparent overlay of each to the same scale as the grid. To compute the probability of a hit with a single bomb was then the simple matter of adding the separate probabilities of the squares covered by the silhouette on the overlay, the center of the overlay being placed over the center of the grid. Various angles of attack were provided by rotating the overlay about the center of the grid.

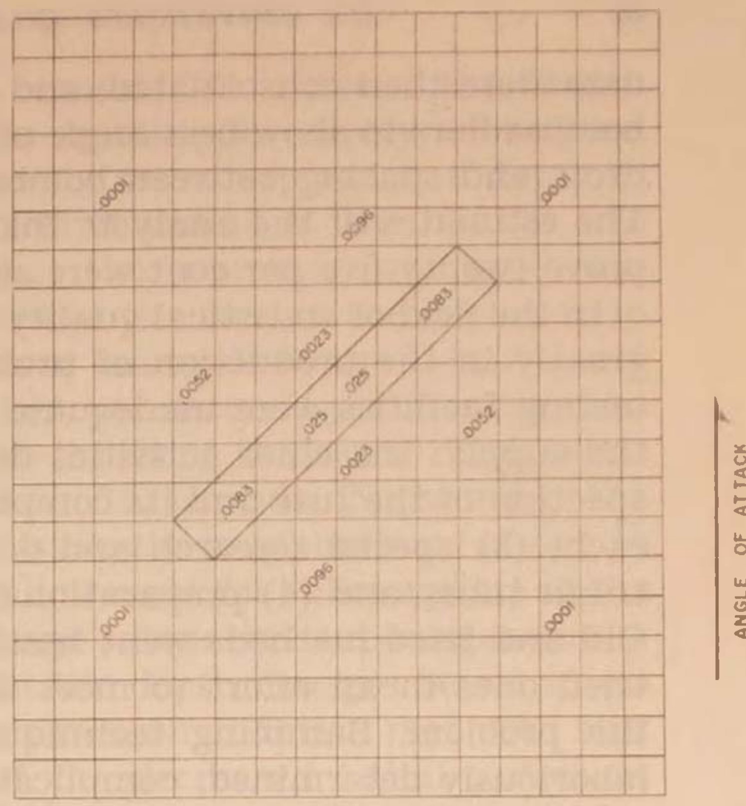


Figure 3. Probability Grid with Ship Silhouette Superimposed

In determining the number of bombs and the spacing be-between bombs, an extension of this technique was used. Assuming the second bomb of a train of three is aimed at the center of the target, the probabilities of a hit with the first or third were calculated by shifting the overlay above or below the center of the grid by an amount equal to the spacing between bombs. Again by simple addition the probabilities of at least one hit were computed for various angles of attack. These data were then consolidated, and tables were prepared for the bombardiers to show best angle of attack, number of bombs to drop, and spacing between bombs for each class of shipping. The estimates of the analysts that bombing results would improve twenty-five per cent were subsequently confirmed.

In the field of statistical quality control the statistician aided greatly in the production of proximity fuses at a time when testing facilities were inadequate and when demand exceeded the supply. His chief activities dealt with (1) acceptance inspection of the fuse and its components, (2) quality control of each, (3) special research and development tests on the electronic tubes, and (4) preparation of performance specifications. Old and tried methods went hand in hand with new and untried ones in an effort to meet the exacting requirements of the problem. Sampling techniques were very carefully and laboriously determined, complicated as they were by the fact that the only positive method of testing the fuse itself resulted in its destruction. The development and maintenance of a high quality level was effected by use of various control charts, showing the per cent of the product that was defective, the dispersion of the mean values of the samples, and the range of values of the variables within each sample. These tools of the trade not only disclosed defective production but also showed when the quality of the product was deteriorating and approaching rejection limits. They thus served as reporters of the present and forecasters of the future. In the special tests on the miniature tubes to determine their ruggedness, it was necessary eventually to fire them in a container from a gun. But here an extra safeguard had to be devised, for sometimes the shock on impact was greater than that in the gun. A special measuring device was developed to indicate the tests on on which this occurred; these tests could be ignored, preventing the possible rejection of a good lot. Finally, in the preparation of performance specifications, the statistician aided greatly in the development of adequate tests and in setting up the desired levels of quality. One production man stated that statistical analysis "probably saved several million dollars in the tube project alone."

Another field in which the operations researcher achieved remarkable results was the early air warfare against German submarines. Although the solution itself seems simple enough, too much credit cannot be given to the exhaustive research which preceded it. The analysis was underway when the Battle of the Atlantic had begun in earnest. One phase of the British tactics at that time was, upon sighting an enemy submarine, to drop depth charges which were set to explode at a depth of 100 feet.. At this depth the lethal radius of the charge was about 20 feet. This meant that the submarine must be submerged between 80 and 120 feet at the time of the explosion in order that it be destroyed. It was known that the U-boat could dive at the rate of about 2 feet per second, yet investigation showed that in more than two-thirds of the cases the U-boats had been submerged less than 30 seconds. No wonder the chance of a kill at that time was in the neighborhood of one in a thousand! By making time allowances for submergence of the depth charge and for the average submarine submergence, the researchers recommended that the depth charges be set to explod at a depth of 20 feet. This recommendation met with stiff opposition, chiefly because of the decreased lethal radius in shallower water, but it was finally put into effect. U-boat kills increased to about twenty per month and in a short time the Germans were reporting that the British were using a much more powerful depth charge. This simplified account of the episode omits many of the phases of the investigation and analysis, of which one of particular note was the advance made in searching technique. Complete statistics on the behavior of the human eye were gathered, probabilities of detecting an object at various distances under varying conditions were computed, and optimum altitudes for search were determined. Thus the antisubmarine air crews were instructed not only on how to attack their target but also on how to find them. This points up remarkably well how the operations researcher not only attacks the problem at hand but also explores many allied facts to perfect an operation as much as possible. It is evident that the statistician is a key member of such a team.

ANOTHER branch of statistics of which most of us have heard and read and which we have sometimes applied unknowingly is the subject of correlation or covariation. Basically correlation is the mutual variation between two or more variables that is not accidental. To take the simple case of two variables, perfect correlation would indicate that the value of one exactly determines the value of the other, as is true of the x and y coordinates of a mathematical curve. Likewise zero correlation means that the value of one variable has no influence whatsoever over the value of the other. For any practical problem the starting point is usually the scattergram, a plot on rectangular coordinates of the corresponding observed values of the two variables. If these scattered points appear to be concentrated along a certain path, a curve based on the method of *least squares** can be fitted to them in such a manner as to minimize the sum of the squares of the residuals.**

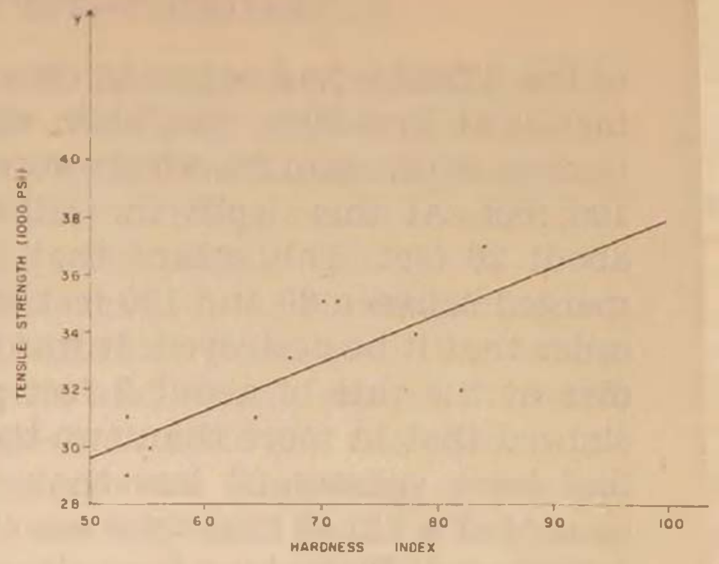


Figure 4. Scattergram and Regression Lin

Once the best curve has been decided upon, it is then a simple matter to estimate the value of the dependent variable from an observed value of the other. In the simplest case this curve will be a straight line, called the *line of regression* and expressed by a simple mathematical equation. The goodness of fit can be evaluated and is measured by the standard error of estimate, which in effect is the standard deviation of the residuals. A frequently usesd quantity is the *correlation coefficient.*† It varies from 0 to ±1, from no correlation whatsoever to perfect positive or negative correlation. When the coefficient is positive, the two variables increase or decrease in value together, and when negative, one increases while the other decreases. Consider a simple example of determining tensile strength from hardness index in order to reduce sampling costs by substituting an inexpensive test for one which results in the destruction of each specimen in the sample. Figure 4 shows a straight line fitted by the method of least squares to a scattergram of values taken from specimens of aluminum die castings. Although more values should be obtained before actually extending the results to die-casting lots, this small sample does seem to indicate a fair degree of correlation. In fact the correlation coefficient is 0.77 for these data, and the regression line shown could be used with the desired accuracy to approximate the tensile strength of a casting from its hardness index.

Caution must be exercised in the interpretation of results

*A method of deducing from a number of slightly discordant observations of phenomena the most probable values of the unknown quantities.

**The differences between actually observed values and the corresponding predicted or estimated values of the dependent variable as read from the curve.

†A measure of the strength of the relationship between variables. The number which measures the degree of correlation between two attributes of a group of individual observations.

of correlation studies, for the variables may have no causal relationship but may both be dependent upon one or more other independent variables. For example, studies have indicated a high degree of correlation between the national consumption of liquor and the average salary of school teachers. Is it proper on this basis to conclude that liquor purchases depend on the ability of teachers to buy it? No, for this is a simple example of the case into which one must look closely for an underlying causal variable. It would be quickly discovered that both variables are controlled to a great extent by the general prosperity level of the entire population. You have often heard how one can prove anything with numbers if he selects his figures carefully. On the surface this is true. Be on guard, demand explanations, inquire into the sources of the statistics, prove to yourself before blindly accepting someone's conclusions. You would probably scoff at the idea of not reading critically every word of a contract before signing it. Adopt the same critical approach to statistical results. It is a healthy attitude.

As mentioned before, the path of the statistician depends on the demands of his problem. In the following application of statistics, corrective measures rather than numerical measurements of correlation were the prime requirement. During the war in the Pacific a great amount of variation in the efficiency of search radars was experienced. These radar sets determined the position of approaching enemy aircraft. For efficient transmission of radar waves it was essential that the reflecting earth surface surrounding the transmitter be smooth and level. The ocean provided such a surface much more satisfactorily than did the mountainous islands. Thorough investigation showed beyond a doubt that performance was very good during high tide when the adjacent tidal shelf was covered and that it was poor at low tide when the rough coral of the shelf was exposed. A high degree of correlation was definitely indicated by graphs of tide height versus radar efficiency, making a numerical measure of the degree of correlation unnecessary. The problem then fell into the hands of electronic experts for further study and solution. If the enemy had realized this deficiency of our search radars and had capitalized on raids at low tide, he could have inflicted greater damage on our forces with a less risk for himself.

Thus as a working science, statistics demands our attention. Even though it is a complex subject requiring intensive study for mastery, we can readily obtain a reasonable grasp of its underlying concepts and fundamentals. In the meantime, day by day, it challenges our ingenuity for its proper exploitation in trouble-shooting, policy-forming, and decision-making.

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Return to Duty

ORON P. SOUTH

WHEN a plane is forced down or the crew is forced to jump, it is ordinarily taken for granted that the survivors will make intelligent efforts to keep alive until they are picked up or until they can make a return. This expectation is based on the assumption that each man has a strong instinct for self-preservation and that he feels under some compulsion to return to his home base. What happens, though, when this instinct encounters fear—fear of a landing in the nontemperate regions of the world, fear of the enemy, fear of the unknown?

Consider the following case. A pilot was ferrying a fighter aircraft over one of the northern routes during World War II. En route he became lost and ran out of gas. Luckily he found a frozen lake to land on and brought his plane down without injury to himself. Despite the fact that he knew search planes would be looking for him (at least he had been briefed that they would), he ended his own life with his pistol. He made no attempt to set up camp. Before he even got out of his airplane fear of the cold seemed to drive all other considerations out of his mind.

Often during war aircraft are forced down behind enemy lines. Here again one would expect crew members to make every effort to return to American lines or to head for neutral territory. But incidents during World War II showed that although many men made every effort to return home, others gave up without a struggle of any kind. The ones who did make the effort to escape were often successful, particularly if they were bold and seized every opportunity.

Over Holland during World War II a B-17 had been damaged by flak. The order to bail out was given. One man landed in the walled-in backyard of a home and just as he landed, a German motorcyclist drove up to the house and ran to the backyard. The American airman sized up the situation on his way down, and as the German came in the back he went out the front. He jumped on the German's motorcycle and rode off honking the horn, accompanied by the cheers of the native populace.

Not all Americans attempted such feats of daring and quick thinking, and of those who did, not all were successful. Of those men captured and placed in prisons or in stockades, some escaped but others remained captive for the duration of the war. Were opportunities for escape denied some prisoners, or did some prisoners create their own opportunities?

Take the case of the flyer captured by the Germans in France. He heard, *via* the grapevine, that chances for escape were better from the prison hospital, and that if he placed aspirin in a cigarette and smoked the cigarette, he could feign appendicitis. He tried it. The ruse worked like a charm. In fact his symptoms were so genuine that the doctors removed his appendix. (It took five men to put him on the operating table.) Ten days later he escaped from the hospital.

Under all these circumstances the most valuable asset a man can have is the will to return. With it he can accomplish miracles. Without it he can, or will, do practically nothing, even though he may have the most elaborate equipment the Air Force can furnish him.

One man dragged himself across the mountains from France to Spain with a broken leg and a broken back. Unbelievable? Yes, but true. This man was escaping from the Germans even though he had broken his leg while parachuting from his burning airplane. Because of his injured leg, he could not find a guide willing to take the risk of moving him across the border into Spain. Determined to return to England, the flyer started across the border and eventually reached safety. Sometime during his escape he broke his back and for the last two days before reaching help, dragged himself along with his hands.

Other men in the hands of the underground or with the partisans stayed in solitary confinement for as long as six weeks. That does not sound difficult, does it? But solitary confinement is hard on a healthy, active man. The Germans reported that the most solitary any American in prison could stand was eighteen days.

It seems that the desire to continue a struggle under adverse circumstances comes naturally to some men and not to others. To some the desire can be imparted, but it must be imparted in such a manner that the will to return becomes paramount. A variety of means can be used, but the best is to build up in each individual a feeling of confidence in himself and his equipment. The best survival equipment in the world is useless if the individual does not know how to use it, has no confidence in it, or does not have it available.

The latter point would seem too obvious to require stating. Yet the facts are that the majority of men forced down during World War II did not have all of their survival equipment with them when they hit the ground. A surprising number had none at all. Unfortunately this situation has not been completely corrected in our post-war Air Force. Any unit commander or airplane commander who allows an aircraft to take off without adequate survival gear aboard should be disciplined for neglect of duty.

AIRCREWS must be made to understand that as long as they are in the Air Force they have a duty to discharge to their country and to their fellowmen. Their responsibilities do not cease when they are forced down. Each individual should exercise the utmost effort to return to American forces, for the United States has a large investment in every man that goes up in an airplane. To find, train, and equip his replacement may be a matter of years, whereas the return of any given individual may be only a matter of hours, days, or at the most, months.

This point must be emphasized repeatedly while the individual is being trained. To acquire confidence in himself and his equipment he must be trained to its use. While much of this training can be conducted on the base, particularly physical conditioning (not the type acquired on a golf course), real familiarity with escape equipment is best acquired through at least two or three weeks in the field under field conditions with competent instructors available. (This training should be given only to those who are destined for combat—or who actively participate in aerial flights.)

When the chips are down, a man instinctively does what he has been trained to do. This is the object of all training—for the battle that is the payoff. Otherwise when a man realizes that people are shooting at him with intent to kill, he may go to pieces. But if he has been trained to fire a gun, pilot an airplane, take sextant readings, or operate a radio, he is much more likely to do his job until the time comes to abandon the airplane.

Similarly, if a man has been trained to guide his parachute, he will almost always instinctively guide it, even though he may be barely conscious of his movements. When he arrives on the ground he will do what he has been trained to do. If he has not been trained or taught to do anything, the chances are that whatever he does under the stress of the moment will be wrong.

Proper training is extremely valuable in helping an individual to act automatically while he is in a state of shock. Medical observers may well discover that shock resulting from an airplane crash is entirely different from that experienced when a man has been shot or burned. It is a mental shock brought on by the realization that the happenings of the next few minutes may bring sudden death. Probably every man who goes up in an airplane accepts the possibility that at some time that airplane may become so inoperative that the only alternatives are a crash or bail-out. Yet, when he is suddenly confronted with that actual condition, he may be thrown into a state of shock.

This phenomenon has been observed many times by men engaged in rescue activities. In this connection Air Rescue Service says:

> " . . . It must be assumed that there is not even one able-bodied logical-thinking survivor at the scene of the aircraft accident. This may be a startling conclusion because every man thinks, 'If I am forced down, I'll make the best use of my equipment,' but the records of actual rescues include numerous accounts where supposedly able-bodied logical-thinking survivors failed to accomplish extremely simple tasks in basic logical order and thus hindered, delayed and even prevented their own rescue.
>
> The explanation is that shock following an aircraft accident is often so great as to cause those of strong mind to think and act illogically."*

This shock may last only a matter of minutes, or it may last several days, particularly if it is combined with the shock from an injury or wound.

If there is a possibility that an airplane may go down in snow-covered terrain where the temperatures are −40°F or below, the men on that plane must be trained to provide for body warmth as soon as they reach the ground. At that temperature an exposed hand or foot may be frostbitten in a matter of minutes. Training will not guarantee that the individual will not become a casualty from the cold, but it will offer the best safeguard against it.

If we assume that an individual has been well indoctrinated in his duties and responsibilities and that he is subjected to a continuing, well-planned training program, there is still one

*"Down at Sea," Flying Safety, VII (May 1951), 1.

element lacking that will help him acquire the will to live. That element is *general knowledge*.

The airman must have a good knowledge of the geography of the world, and particularly of those areas over which he expects to operate. He must know the general orientation of mountains and rivers. He must be familiar with the flora and fauna of different regions. He must have some idea of the type of people he can expect to find in the different areas. Some of them will help him, others will not. Much of this type of information may be obtained from survival manuals. Detailed information of particular areas must be supplied by competent briefing.

The airman must also know what to expect in the event he is captured. He must know what sort of treatment he will generally receive and how he will be interrogated. During the late war American soldiers were briefed on how to resist enemy interrogation, but most of them had not the slightest conception of the manner in which a skilled interrogator operated. "Forewarned is forearmed." If the airman knows what to expect, he will be better prepared to conduct himself accordingly. In most cases it is fear of the unknown that is the airman's greatest enemy.

All of these together—indoctrination, training, and knowledge—combine to build up the will to resist. Without any one of these the airman may be lost. And with his loss goes not only the loves and hopes of many individuals but also a part of our defense effort.

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In My Opinion . . .

ORGANIZATION AND TRAINING OF THE CIVILIAN COMPONENTS

COLONEL GERHARD J. SCHRIEVER

THE recurrent world tensions and crises of the last few years, culminating in the Korean war and the consequent build-up of American arms, have given new immediacy to the problem of maintaining the civilian components of the armed forces at peak proficiency and readiness. And the large-scale recall of Reserve units to active service has provided a basis for judging the effectiveness of Reserve training and the ability of Reservists to perform the missions assigned to them. It is most important that we revise the Reserve program in the light of our experience so that, if the final crisis of world war does come, this second line of defense can be quickly, efficiently, and usefully meshed with the Regular forces. There is mounting evidence that this could not be done with the present organization and training of the civilian components.

The two main civilian components of the Air Force are the Air National Guard and the Air Force Reserve. The official mission of the Air National Guard is the maintenance of reserve units capable of fighting anywhere in the world, but actually the fact that most of its units are fighter-interceptor units argues that its real contribution in emergency would be to the air defense of the United States. Like all National Guard commands, the air units are basically state-controlled organizations except in times of national emergency. Higher headquarters may have jurisdiction over several states, but their actual authority is somewhat tenuous.

The primary mission of the Air Force Reserve is to supply effectively organized and trained units and personnel to meet the mobilization requirements of the Regular Air Force. Its training program is broken down into several categories. The Air Force Reserve Training Centers, located at airports in thickly populated areas, each support a Reserve troop carrier or light bombardment training wing made up of four squadrons and support units. When the Reserve Wing is called to active duty, the Training Center is deactivated. As a result of the call-up of most Reserve Wings, the Training Center program is now almost defunct. The Corollary program is also unit training, but the units vary in size and have no equipment. They are supported and trained by the Regular Air Force units to which they are attached. The Volunteer Reserve Training Unit program involves groups of Reservists with similar specialty qualifications. Operating under the command of the numbered air forces, these groups meet once a month for lecture sessions. Individual training is accomplished in the Mobilization Assignment programs. Here an individual is given an M-Day assignment with a Regular Air Force unit and trains with that unit. The Air Force Reserve Training Center and the Mobilization Assignment programs entail an annual two-week tour of active duty in addition to the regular meetings.

This organization of the civilian components appears at first glance to be well rounded and well planned. But like many decentralized organizations where supervising and administrative authority is a fiction rather than an actuality, the Air Reserve system functions much better on paper than it does in the field. In fact both the present organization and the training of the civilian components of the Air Force are weak—even dangerous to the defense of the United States. The theory that these units are M-Day forces is false and could lead to national disaster. This is not intended to imply that the civilian components are valueless to the Air Force; the need for reserve strength and its potential value is unquestionable. Rather it is intended to point out how the Reserve can be employed on a more realistic basis. In the event of all-out war, the creation of the forces necessary to repell the enemy would be one of the first problems to confront our planners. The civilian components of the Air Force must be relied upon to furnish a large percentage of these forces. All this is of course axiomatic and would make it seem logical to assume that the Reserve Forces would be organized to be of maximum value in a war. But our experience with Reserve units recalled to active duty since the outbreak of the Korean war has shown this to be far from so.

The most obvious discrepancy is in the logic of the organization of the Air National Guard. It is not unreasonable to expect that the initial attack in a full-scale war would be an atomic bomb strike against the industrial and governmental structure of the United States. Furthermore such an attack would probably be launched with no declaration of war for maximum surprise. This means that only forces in being could be employed against the enemy bombers. Furthermore an M-Day fighter-interceptor unit must be capable of operating day or night and in adverse weather, must be radar controlled, and must have the ability to hit its target at altitudes from tree-top level to 40,000 feet and above. It is obvious that such a mission is a highly specialized one which requires constant practice and study. Yet prior to the Korean conflict approximately 85 per cent of the total personnel in the Air National Guard were assigned to fighter-interceptor units. For these forces to be effective M-Day forces in reality, M minus one must be the criterion.

The Korean war has demonstrated the low state of readiness of the alleged M-Day forces of the Air National Guard. The units were not organized in the same manner as those of the USAF. A wing headquarters was located in one state, group headquarters in another, and the subordinate squadrons were scattered over one, two, or three states, with no one headquarters having legal authority to cross state boundaries. The result was confusion. In several cases the wing commander was not even qualified in the type of combat aircraft used by his wing. Several months of training were required after the units were federalized before they could be considered combat operational—months in which the defense of American cities and industry would be in its most critical stage. Forms maintained by the Air National Guard did not correspond to those of the USAF. Though there has been some improvement made in standardizing records since the Korean conflict, there is nothing to indicate that any further improvements in this field or other fields are contemplated.*

A similar, though less critical, situation has existed in the Air Force Reserve units. Prior to the Korean conflict the Air Force Reserve wings were troop carrier or light bomber organizations. None were combat operational upon being called to active duty. In their case, however, it had been realized by the Air Force and by the organizations themselves that considerable training would be required before they became effective combat units.**

*Recommendations made from a comprehensive study of the civilian components known as the "Gray Report" and submitted to the Secretary of Defense on 30 June 1948 are agreed with. Particular attention should be given to the first recommendation: "1. National Security requires that all services have One Federal Reserve Force. This should be accomplished by incorporating the Air National Guard and Air Reserve into the Air Force Reserve under the name of 'The United States Air Force Reserve.' "

The following excerpt from the March 1951 issue of the **Air Reserve Forces Review shows how quickly the commanding officer of the 433rd Troop Carrier Wing realized his unit was not combat operational: "The transition from reserve to active status was not easy. It was filled with growing pains and many lessons learned the hard way. We had considered ourselves a 'hot' outfit back in Cleveland, particularly after our excellent record with simulated combat missions on air maneuvers last summer. . . . [But upon activation, the problems of active duty] were considerably greater than we had anticipated. We were shaken by the realization of the immensity of the task ahead which had to be accomplished if we were to contribute to the rapid build-up of our defense establishment." The Navy experienced the same kind of difficulties with their recalled reserve units (see **Naval Aviation News**, March 1951, p. 2).

The Commanders of the Strategic Air Command and Air Defense Command should not be dependent upon organizations they would be unable to employ during the most critical period of hostilities—the first phase of the war. The Air National Guard organizations with an air defense mission did nothing more than confuse the issue as to the potential forces available for the air defense of the United States. It is necessary that the air defense and strategic bombing missions be left to Regular Air Force units.

It is time we recognized the obvious difficulty of maintaining combat proficiency in a unit or an individual on Reserve status. To ensure that Reserve personnel will be of value to the Air Force, they should be organized into units not necessarily maintained as M-Day forces. It is much simpler for the Reserve organizations to maintain operational efficiency in troop carrier and transport type aircraft than in any other. There is no doubt that upon the outbreak of hostilities the Military Air Transport Service will have to be expanded many times, and as the war progresses, a greater demand will be made on troop carrier aviation. Because the need for expanding these categories would become greater as a war progressed, they would be much less affected by the activation time lag than the Air Defense Command or the Strategic Air Command. The Joint Chiefs of Staff should determine the number of additional groups which would be necessary on M-Day and on through at least M plus 365.

To have genuinely effective Reserve wings, it will be necessary to reestablish training units such as the Air Force Reserve Training Center (AFRTC) which existed prior to the Korean conflict. Each AFRTC should be given the following mission with regard to its Reserve wing: "To recruit, train, furnish logistical support, and administer for the Reserve wing."

In the past unit commanders have been more concerned with recruiting sufficient personnel to qualify their units for pay status than with acquiring *qualified* personnel for which a T/O&E vacancy exists. To alleviate this situation, recruiting of Reserve personnel should be the responsibility of the AFRTC commander. The AFRTC commander would then be required to set up a classification board to determine the following: (1) the actual or potential qualifications of the applicant, (2) the existence of a vacancy for him, and (3) his deferment status in event the unit is called to active military service.

The responsibility for training the Reserve wing and its subordinate units must be vested in the AFRTC commander. Past experience has shown that where the responsibility for the training of the Reserve wing was largely vested in the Reserve wing commander, training in many cases did not meet the desired or required standards. When such deficiencies have been noted by the AFRTC commander, his only available action has been to make a recommendation rather than to issue a directive. This has been further complicated by the fact that the Reserve organization met as a unit only one weekend a month, which resulted in a time lag of at least 30 days between the recommendation for corrective action and any such action by the Reserve unit. Much is forgotten over a period of 30 days. Lack of authority for the AFRTC commander to direct corrective action when administration was found to be below standard resulted in poor maintenance of records. Familiarity between the Reserve officers and airmen contributed somewhat to the low standard of administration. To counteract the difficulties and problems which arise in administration, the AFRTC commander must be directly charged with the responsibility for administration within the units of the Reserve wing.

The system of logistical support of the Reserve units by the AFRTC is adequate. The outstanding logistical difficulty in the past has been the low priority given these units by the Air Force.

Many of the undesirable conditions which now exist in Reserve training and organization could be remedied by requiring certain positions in the organizational structure of the AFRTC and the Reserve wing to be filled by the same individuals. Although the following plan will not produce a wing staffed completely by inactive Reserve personnel, it will utilize a large number of Reserve personnel and should produce a reasonably efficient operational unit within twelve to eighteen months after activation if equipment is made available.

The executive officer of the AFRTC should also be the Reserve wing commander while the unit is on an inactive status. Should the wing be called to active duty, the AFRTC commanding officer would then become the wing commander and the AFRTC executive, his executive. While the wing is not on extended active duty the AFRTC commanding officer should not act as Reserve wing commanding officer because his responsibilities, as defined above, plus maintenance of the airdrome facilities, are too numerous to allow him to concentrate sufficiently on wing problems. The advantages of the AFRTC executive officer serving also as the Reserve wing commander are many. The AFRTC commanding officer and the executive officer both realize that when the Reserve wing is called to active duty its success or failure is dependent upon their effectiveness during the time it was inactive. Friction between the wing commander and the AFRTC commander is eliminated. Substandard performances can be remedied on the spot, without fear of hurting someone's feelings. Closer liaison will be maintained with the numbered Air Force headquarters, and the replacement of unsatisfactory wing commanders is simplified.

The operations and training, flying training, and ground training officers of the AFRTC should also be the operations and training, flying training, and ground training officers of the Reserve wing. Since training is the primary mission of the Reserve wing and AFRTC, it is imperative that the training officers be on a full-time status. The success or failure of the Reserve wing depends largely upon the ability of these officers to obtain competent instructors. Their selection should therefore be given careful consideration by the numbered Air Force, since unsatisfactory performance in any one of these three positions could vitiate the efficiency of the wing.

Second only to the training mission of the AFRTC is the logistical support of the Reserve wing. As the AFRTC director of materiel is in the best position to determine the logistical requirements of the wing, he should also be the wing A-4. The advantages of this dual assignment range from proper maintenance of AFRTC aircraft to being sure that the last recruited reservist can be fitted with shoes.

The necessity of one active-duty officer serving as director of personnel and administration for both the wing and the AFRTC is also apparent. Not only is the DPA for the AFRTC in the most favorable position to supervise recruiting, but he can expedite classification, assignment, and many other administrative processes. In so doing, he remains up-to-date on Air Force procedures and could keep the wing current in all personnel and administrative matters, whereas it would be difficult for an inactive reservist to keep himself up-to-date. This dual assignment would ensure smooth transition of the wing from inactive to active status.

Finally, in order to tie the AFRTC and the Reserve wing together and properly place the responsibility for good work and bad, the air inspector of the AFRTC should also be the air inspector of the Reserve wing.

Only the public information officer of the AFRTC need necessarily be from the local community. This officer should be widely known and generally liked and respected by local leading citizens and should have connections with local newspapers and radio stations. Recruiting programs and public relations, both invaluable assets to the AFRTC and the Reserve wing, will be materially assisted by a locally known PIO.

The remaining personnel of the AFRTC should be called to extended active duty with the wing. They should spread evenly throughout the wing, combat group, and supporting groups, with emphasis on the supply and maintenance organization.

In addition to purely administrative correctives, there are a number of other matters which should be regularized. It must be realized that Reserve wings can be successfully organized only in heavily populated areas. Troop carrier and transport organizations should be located where good flying facilities are available, with ample warehouse and shop space at their disposal. A full squadron complement of transport aircraft should be made available to each wing. Pilots assigned to the wing must be required to fly Air Force minimums (100 hours per year annually). If this plan is closely supervised, instrument, formation flying, and navigational proficiency can be maintained at least to a fair degree of that desired by the Air Force.

The wing must be called to active duty on a two-week training period each year. If possible, this training should be conducted at the home station to avoid the loss of three to four days in traveling to and from another active-duty training station, time that could well be used in training the wing to function as a unit. During all training periods the personnel of the AFRTC must be impressed with the importance of their assistance in training the wing. Emphasis must be placed on the fact that they will be assigned to the wing if it is called to active duty.

With the above organization, on M-Day plus two a wing should have one squadron of aircraft in combat readiness, functioning from its own base. The entire wing of three tactical squadrons could become combat-ready as rapidly as the full complement of aircraft is delivered. By M plus 30 the wing should be available for transfer with full complement of aircraft.

The second category of Reserve wing considered feasible is a fighter-bomber wing with a Tactical Air Command mission. The organization of the AFRTC and the wing should be the same as that recommended for the troop carrier or transport Reserve wing. The fighter-bomber wing must be located in a heavily populated area with good jet-flying facilities and ample warehouse and shop facilities. A gunnery range in the immediate vicinity is absolutely necessary, if proficiency is to be maintained. Staging to other air bases which are adjacent to gunnery ranges is not satisfactory. Frequently a week's work is washed out because the range radio jeep fails. Such hit-or-miss efforts are at best a surface job of training which looks good on charts in war rooms but are of little real value. Even with optimum facilities and employment of training time, the fighter-bomber organizations must not be considered M-Day forces nor near M-Day forces. They should be called to active duty at the same time the ground forces are being mobilized. If equipment becomes available, concentrated training should keep a wing well in advance of the build-up of the ground forces.

It is imperative that the fighter-bomber units train with ground troops in an air-support mission while on their two weeks' active-duty tour. Permanent sites near Army installations such as Fort Benning would facilitate such training. Then the wings would know where they are to train each year, and the choice of training site would not be left up to the organization. Training of the units for their primary mission must be the dominant factor in choosing bases for their two weeks' active-duty tour.

These air bases for Reserve training should be complete, with good living quarters and mess halls, as well as supply, maintenance, and operation facilities. Personnel should be required to bring only a minimum amount of supplies and equipment. The goal should be to ensure units a maximum amount of training toward their primary mission, not to test their ingenuity in primitive survival. If practice in digging slit trenches and foxholes is necessary, it can be done during one of the weekend training programs.

The Volunteer Air Reserve Training (VART) program as now organized should be abandoned. In the Fourteenth Air Force, which covers twelve states, there were 121 VART squadrons and 23 groups in October 1950. To this program alone were assigned approximately 169 airmen in the grade of staff sergeant and above, and 30 officers. For this effort not more than five per cent of the units have accomplished anything worthwhile toward preparing its Reserve personnel for active duty. In most cases the meeting places are nothing more than bare rooms. No equipment for showing training films is available. Except in those organizations which are located at colleges or in large cities, competent lecturers cannot be found within the VART program. Consequently the meetings generally break down into "bull sessions," the main topic being how poorly the Air Force is treating this VART squadron.

In place of the present Volunteer Air Reserve Training program, specialized units should be organized. For example, in Tulsa and Houston, where a large percentage of the population has some association with the petroleum industry, volunteer squadrons specializing in petroleum, oil, and lubricants could be organized. Time spent on military personnel experienced in this field would pay dividends in an emergency. At Los Alamos and Oak Ridge, units have been organized which will fit well into the atomic energy program in an emergency. Air depots would be logical places at which to organize aircraft maintenance and supply units of potential value to the Air Force. Training in these specialized units should be of a kind which would enable the Reservist to fit into an assignment with minimum delay. There should be no thought of trying to call the units to active duty as units. Their personnel should be used as fillers wherever needed.

The Mobilization Assignment and Corollary Unit programs are also unrealistic. Though the majority of personnel assigned to them were called into active military service within a few months after the Korean conflict began, they were seldom assigned to jobs or organizations for which they supposedly had been trained. Many field grade officers in inactive status were assigned in the programs, but later it was found that company grade officers were in greatest shortage. Thus the field grade officers who were being trained for a specific purpose were actually surplus to the needs of their units. The Mobilization Assignment program can be more realistic if the authorized Tables of Organization and Equipment of Regular Air Force units are carefully studied. The number and rank of personnel assigned to mobilization positions should be determined by the difference between the peace-time column and war-time column of the pertinent T/O&E's. Numbers and grades of personnel assigned to these positions should not exceed authorizations.

POLICY MAKERS for the civilian components must be cautioned that these organizations are civilian and frequently it is advisable to make haste slowly when policy-making season comes along. But a patient, thorough presentation of the case for the Air Force will do much to soften the initial resentment to changes. It must be stressed that the following recommendations are not the result of a whim or a power complex of the Air Force but are submitted out of a deep concern that the United States Air Force be fully capable of defending our country.

(1) All civilian components of the Air Force should be reorganized under the name of the "United States Air Force Reserve" and controlled by the United States Air Force.

(2) A complete study should be made of the Reserve's capabilities and missions to determine realistic requirements which, when established, can be met and maintained.

(3) The Executive Officer of the Air Force Reserve Training Center should act as commanding officer of the Reserve wing while the wing is on inactive status. The key members of his staff should also be active-duty officers.

(4) Air Force bases should be established with best possible facilities, and adequate assistance should be given to ensure maximum training for units during their two weeks' active duty tours.

(5) Recruiting policies should be established so that personnel who are assigned to the Reserve wing will not be deferred in event of hostilities and only those with proper qualifications or potential are assigned to fill T/O&E vacancies.

(6) The present Volunteer Air Reserve Training program should be abandoned and replaced by a few units in specialized critical categories and located in areas where technically qualified personnel are available.

(7) Programs should be initiated only if it is honestly felt that a dollar's worth of national defense will be derived for each dollar spent.

Parked at an airbase in Japan, the giant C-124 dwarfs a group of spectators. This aircraft has just completed its first medical evacuation flight from Korea with 127 medical patients aboard, a load normally requiring at least three C-54's. Air evacuation capacity of the C-124 is 136 litter patients plus 35 medical attendants, with space for a portable surgery room. Despite its size the C-124, which joined the Korean airlift 27 September 1951, can operate out of airfields used by smaller transports.

The C-124

The C-124 Globemaster II is an important step toward mass air transportation of ground armies and complete air logistical support for whole combat units. Designed by the Air Force in conjunction with the Army so that it would incorporate the specifications of both organizations, the C-124 is the first cargo aircraft which can transport 94 per cent of all types of military vehicles without disassembly. It was originally designed to have a gross weight of 175,000 pounds, including a 50,000-pound payload. In a recent successful test at Edwards Air Force Base, to determine maximum load-carrying capabilities, the 127-foot long, three-story-high C-124 carried a gross weight of 210,000 pounds, of which more than 70,000 pounds was cargo, for a round trip of 2000 miles without refueling. Although the Air Force will normally operate the C-124 at or under its original design weight, the recent load test proves the aircraft's tremendous capabilities under combat or emergency conditions.

The electrically operated clam-shell doors and inclined loading ramps in the nose of the aircraft give the C-124 the characteristics of a flying LST, affording an entrance for almost all types of vehicles in the Armed Services. The main cargo compartment has an effective volume of 10,400 cubic feet. It is approximately 12 feet wide, 12 feet high, and 77 feet long. Well doors in the rear of the cargo compartment permit fork-lift loading or truck loading with the aid of the built-in electrically operated traveling cranes. These aft doors can also be opened in flight for aerial resupply operations. The huge cargo compartment can hold the largest types of earth-moving equipment, such as bulldozers, scrapers, and graders; all types of trucks and trailers, including the large radar trailer; the newest light tanks, including the 25 ton T-41 Walker Bulldog;

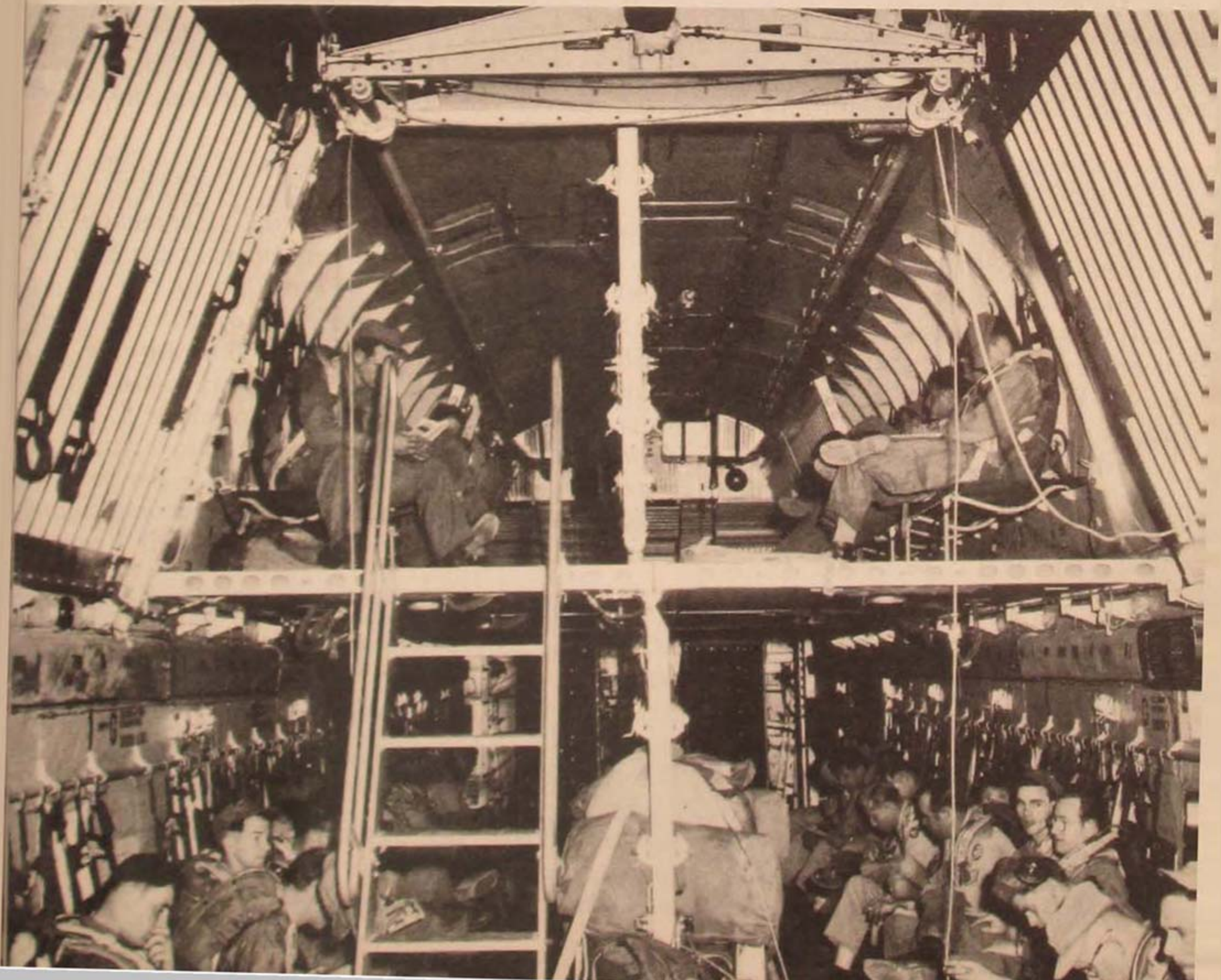
all types of artillery pieces; and unwieldy items of engineer's equipment. It can carry whole or partially disassembled fighters, helicopters, or liaison aircraft, and can accommodate any of the major components of the B-36.

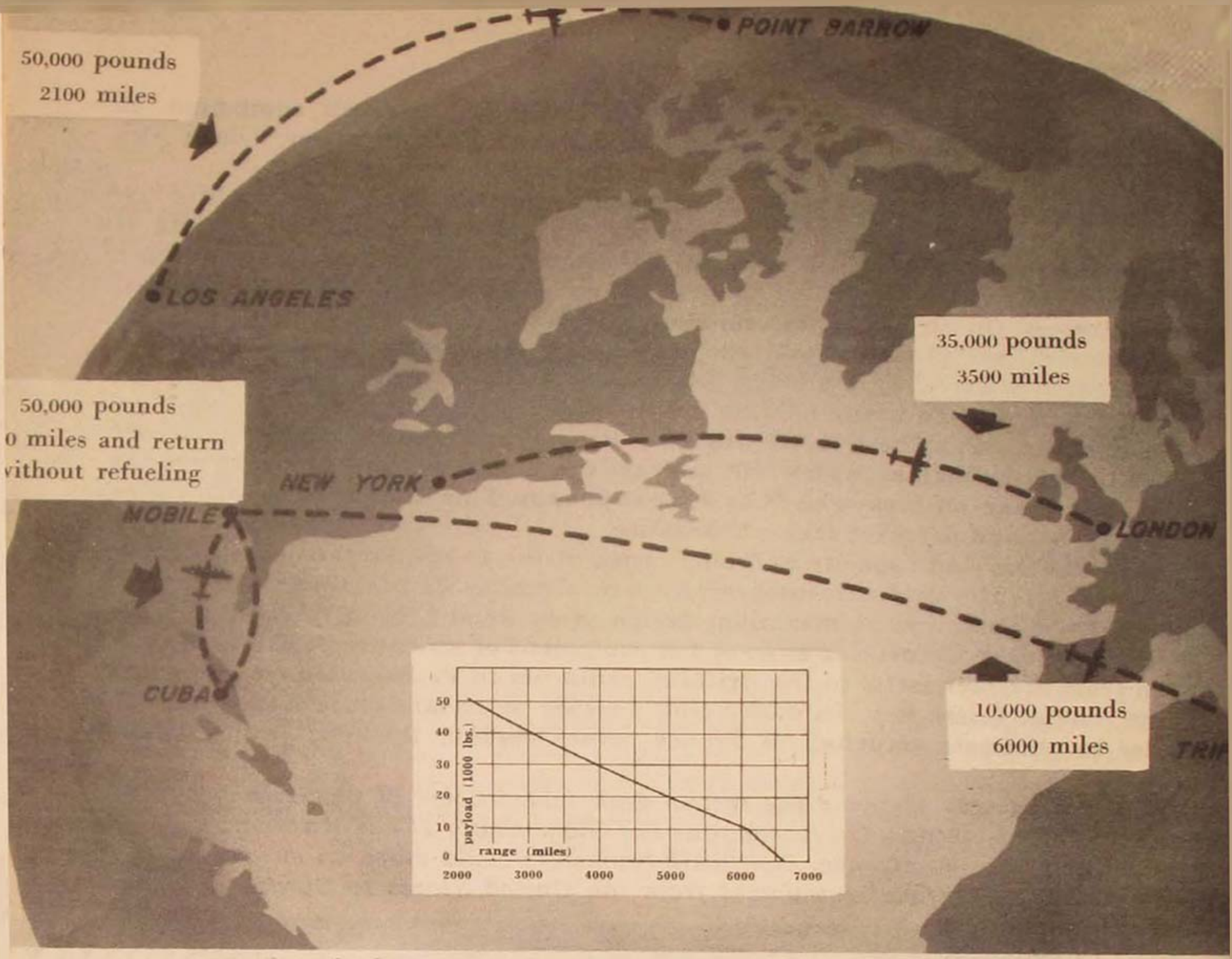
As a personnel carrier the C-124 is equally versatile. Inside the main compartment a second floor folds up against the fuselage when bulky cargo is transported but can be folded down for passenger, air evacuation, or paratrooper missions. Recent tests included a five-hour mission carrying 240 fully equipped paratroopers. On air evacuation missions the C-124 can haul 136 litter patients with 35 medical attendants and still leave space for a portable operating room.

Presently powered by four 3250 horsepower Pratt-Whitney Wasp Major engines, the C-124 can easily operate out of 5000-foot airstrips currently used by C-47's and C-54's. The C-124B will have four Pratt-Whitney 5500-horsepower T-34 turboprop engines, which will increase the design payload to 75,000 pounds and design take-off gross weight to 200,000 pounds. This will increase both range and payload and decrease take-off distance.

With the payload capacity and long range of the C-124, large-scale air movements of infantry and paratroopers are now a reality. It is estimated a fleet of 160 C-124's, operating at maximum design gross weight, could transport, in 24 hours, all the personnel and most of the equipment of an entire 16,000-man division from Massachusetts to the Brittany peninsula in France with two refueling stops, one at Goose Bay, Labrador, and another at Iceland—the latter made in order to eliminate refueling in France before making the long return flight.

Interior of the C-124, showing the second deck folded down in place when additional personnel space is needed. On recent tests the Globemaster II has transported 240 fully equipped paratroopers at once. Eighty Globemasters could move an entire 16,000 man division with full personal equipment from the United States to Europe in 24 hours.

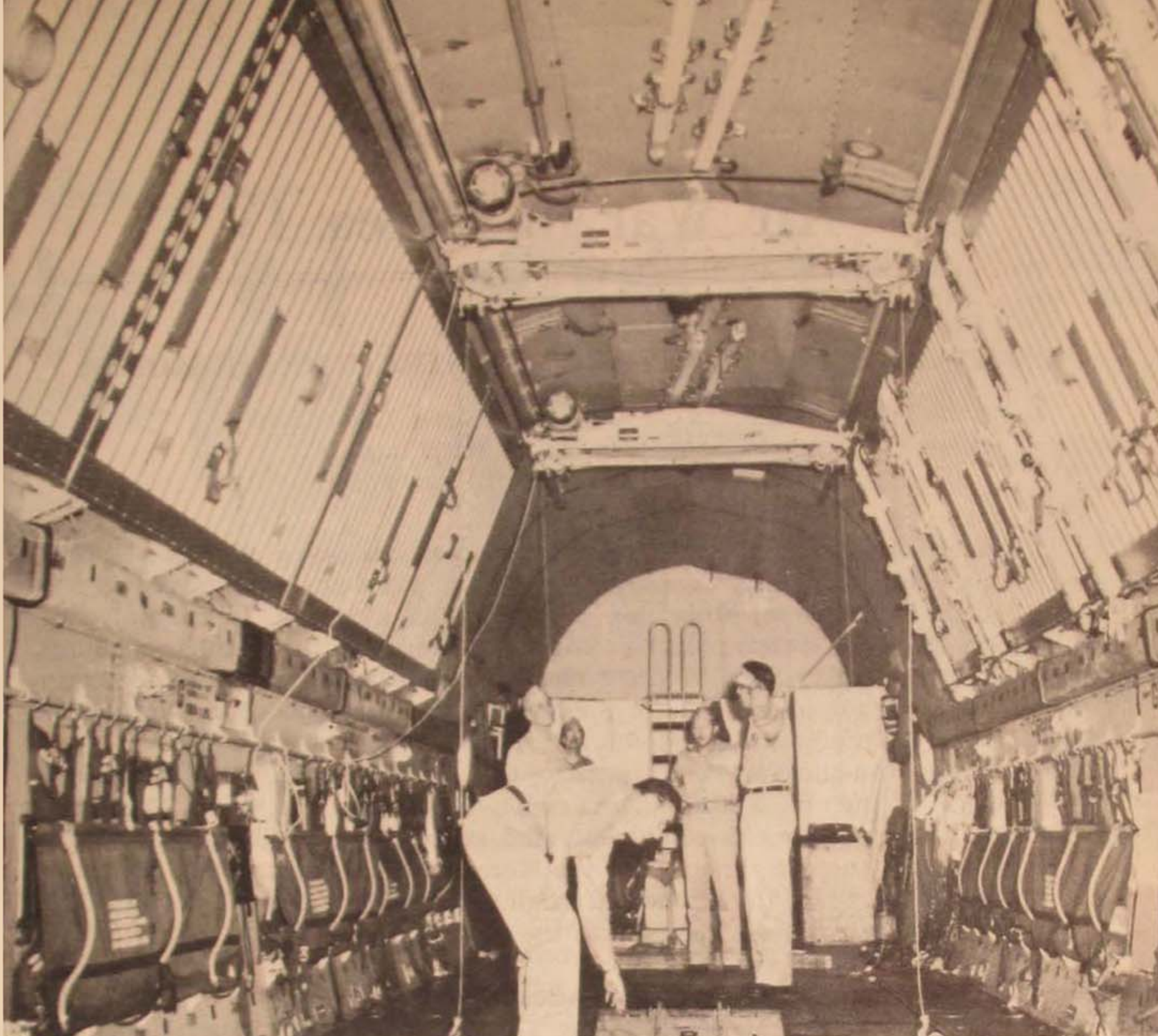




This chart shows the payload which the C-124 Globemaster can carry on flights from 2000 to 6000 miles in length and still retain reserve fuel for climbing and maneuvering.

Part of the interior of the 10,400 cubic foot cargo compartment of the Globemaster II. On each side of the fuselage are the folded-back metal sections of flooring which can be lowered to form a second deck. Mounted on track along the ceiling of the cargo compartment is the 8-ton capacity traveling crane used for hoisting operations. Also incorporated is a towing device which pulls trailers or sled pallets up the ramp. A 13-foot-4-inch by 7-foot-8-inch elevator platform in the aft well doors has a 4-ton capacity and makes possible dual loading operations. The cargo floor can handle a 20,000 pound single-axle load or 40,000 pounds on tandem axles, and allowable unit loading on treadway areas is 11,520 pounds per square foot as compared to 250 pounds per square foot on commercial cargo aircraft. Pulleys in the cargo hold enable a prime mover located outside the aircraft to winch a 50,000 pound vehicle up the ramp.

Operating from airstrips used by the C-54 and other USAF cargo aircraft, the C-124 can give almost complete air logistical support to frontline ground units. Outstanding features of this second largest USAF cargo freighter (exceeded only by the experimental XC-99) are the electrically operated clam-shell doors and movable drive in the ramp. They permit accommodation of 94 per cent of all types of ground force vehicles in any 70,000-pound combination. This 22,600 pound M5A3 Prime Mover with the 29,820 pound 8-inch M2 Howitzer and M1 carriage and even the 22½ ton truck-mounted crane in the background can be carried without disassembly. With loads like these the C-124 can fly 1000 miles and return without refueling. Eighty C-124's can transport all the equipment of a standard U.S. division to Europe in 24 hours.




UNITED STATES AIR FORCE

Air War in Korea: IV

PROBLEMS OF AIRFIELD CONSTRUCTION IN KOREA

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Headquarters, Fifth Air Force

For the Air Force engineer the war in Korea has posed a series of problems, some only more intensified versions of problems encountered in the Second World War, other new and painfully awkward. In general they stem from the geographical position of Korea and the peculiar qualities of the Korean terrain, from the major engineering adjustments necessary in construction of airfields for the new aircraft developed since World War II, and from organizational changes during the last six years.

Korea and the Far East are many thousands of miles from the United States, at the end of the longest supply pipeline in the world. The small amounts of personnel, equipment, and supplies that dribbled out of the pipeline in the early months of the Korean fighting meant that the engineer not only had to be schooled in all phases of engineering but also had to be a near-magician to perform the work required of him with what he was given in the way of tools.

Installations and Engineer Aviation units had very little equipment on hand at the outbreak of hostilities. This was particularly true of engineer heavy equipment. Bulldozers, cranes, shovels, motorized graders, and scrapers were not obtainable for several months. Most of the existing equipment had been in constant use for several years and required constant maintenance and replacement of parts to be kept operational. No equipment was available at the outset to fill Table of Organization and Equipment shortages of organized units nor to equip organizations formed after hostilities began. Parts supply was and still is a critical problem. In many cases it was necessary to cannibalize dead-lined equipment to keep other equipment operational. To make matters worse, much engineer heavy equipment was lost during United Nations withdrawals.

Many units were short equipment kits and sets that were vital to proper operations. When these items eventually began to arrive, it was found that essential parts were missing. In most cases these kits had been packed for use during the Second World War and were not inspected prior to shipment to the theater of operations. At the beginning of the Korean campaign, construction and repair materials were in low priority for procurement and transportation in comparison with the relatively high priority given other war materials. Consequently units were forced to resort almost entirely to the purchase of most items of construction supplies and materials on the Korean market. As the supply channels broadened, many articles gradually became available in limited quantities. But when units moved from one location to another, equipment had to be transported primarily by the weird Korean rail system. Without guards for each piece of equipment, thieves would remove every part they possibly could before

This picture of a runway construction job shows the methods used by a Korean contractor. Small rail cars bring the fill material from the quarry on narrow-gauge rail track which extends the length of the runway. Horse and ox carts, shovels, and a series of crude lift devices are used to spread the fill over the runway. The left half of the runway has been completed and is in operation while work continues on the right half.

it arrived at its destination. At times equipment was in such condition upon arrival at its destination that it had to be salvaged.

The shortage of trained engineering personnel has been equally acute. Since none of the other United Nations participants has been able to furnish its own airfield construction units, the Engineer Aviation and Installation units have had to construct airfields for all the United Nations air forces in Korea. Enough Engineer Aviation units to cope with the work load have not been available. Working on a twenty-four hour per day schedule, the few units in Korea have concentrated their efforts primarily on airfield traffic surfaces. Through their untiring effort and ingenuity, many new, converted, or rehabilitated Japanese airstrips have been added to the list of cargo and tactical fields.

The shortage of Engineer Aviation units has thrown responsibilities for construction of major airbase facilities and in some cases for airfield traffic surfaces on wing installation squadrons. But their mission, as outlined in their Table of Organization and Equipment, is to repair and maintain buildings and grounds, to operate and maintain base utilities, to provide structural and crash fire protection, to train auxiliary fire fighters, and to provide organizational maintenance on assigned powered equipment. Their equipment and personnel authorizations are based on the normal requirements at prepared operating bases. Thus the construction responsibilities assumed by the installation squadron constituted an almost impossible work load.

This problem has been partially surmounted by both types of unit through the use of locally hired labor and native contractors. The construction capability of Korean personnel generally is good when they can be given proper supervision. But because of their lack of knowledge of American construction methods and standards, the uses to which they can be put are limited. Highly skilled Korean labor is scarce. A few trained equipment operators, draftsmen, and engineers are available. Carpenters, electricians, plumbers, mechanics, painters, typists, and others are available in various stages of skill, but the majority of the labor supply is in the "pick and shovel" class. Interpreters, of course, are essential and have proved invaluable. Labor battalions have been organized and have performed well in such jobs as ditching, filling, earthwork, and filling bomb craters. This help has been of great importance on some jobs because of shortages of equipment or inaccessibility of the site to heavy equipment. At one installation the placing of a complete runway fill was accomplished by local contractors using native hand labor. Continuing experience in Korea is leading to better and more effective use of indigenous labor. But we have

The ancient and the modern frequently work side by side in the construction of airfields in Korea. This picture shows a quarry where Korean boys are loading ox carts with hand shovels, while the power shovel loads modern trucks. Both types of vehicle are transporting fill material to the runway construction site, where another old and new combination of hand methods and bulldozers will spread the fill over the runway.

been slow to realize the effectiveness of methods that appear crude, slow, and wasteful of manpower when compared to those employing modern construction equipment.

WITH these underlying restrictions established, let us consider some of the more physical problems. The Korean terrain is perhaps the foremost difficulty facing the Air Force engineer. Rugged mountain terrain always presents serious obstacles in locating new airfield sites. Valleys are narrow, cut into the mountains by winding streams channelized by high dikes. The small amount of level area is occupied by terraced farm lands which for centuries have been flooded the year round for the growing of rice. The average California Bearing Ratio* of these bottom-land soils is in the extremely low range of 3 to 5. This means that as a soil with a California Bearing Ratio (CBR) of 30 normally requires a 6-inch base course layer, this layer in Korea must be increased to five times that thickness to provide the necessary support on these soils.

Before construction can begin, the entire area of the proposed airfield must be drained—a tremendous task. On this land which is water-logged to a depth of many feet heavy construction equipment mires down or sinks completely from view, creating serious recovery problems and delays.

Precise tailoring of airfields for specific aircraft types, such as was possible in World War II, and for fighter aircraft is a time- and labor-saving scheme, cannot be realized in Korea. All major airfields are used jointly by fighters, bombers, and heavily-loaded transports. Gross weights have more than doubled since the Second World War, and the use of dual and tandem wheel landing gear has only partially relieved the consequent pavement construction problems. High-speed jet aircraft, with their small wheels, have increased tire pressures from the World War II maximum of 80 pounds per square inch (psi) to 200 psi. Consequently the total depth of base material must be sufficient to support heavy wheel loads, the shearing resistance of the upper base layer must be sufficient to withstand the terrific surface shears imposed by the jets, and the length must provide adequate ground run for the over-burdened jets. Construction to these specifications requires three times the engineer effort in battalion months that was needed in World War II airfields.

Although runway design curves used in World War II have been slightly modified and are still in use, new methods of runway design have not kept pace with aircraft design. The present design curves are inadequate. Indicated thicknesses of upper base layers are misleading and the necessary California Bearing Ratios for these layers are not given. Also the charts, which at present have limited families of curves for two tire pressures only, require excessive interpolation. In addition there is no design feature to provide for short-life forward tactical strips, since these charts are predicated for long-life zone of interior bases. Current design procedures are based upon an average of three thousand landings on a strip per month. This average, considering all Korean airbases, has proved these procedures to be valid. Yet statistics reveal that some bases exceed this figure by 100 per cent and one field occasionally averages between 9 and 10 thousand landings per month. A set of design curves enabling the engineer to make

*An empirical formula for rating soil for its ability to resist shear. This method is used in pavement design for determining the thickness and type of materials required in the subbase, base course, and pavement.

The first task at this captured airstrip in Korea was to fill in the numerous bomb craters which pockmarked the runway. Because the site was inaccessible to heavy equipment, the bomb craters had to be filled in entirely by hand. Later the entire subgrade and base course were placed with hand labor. Even the compacting of the base course had to be done by hand, using hand tampers made from heavy lengths of telephone poles with handles on each side. The primitive had to replace the modern.

a comprehensive and intelligent design must incorporate data on the length of pavement life desired, maximum average monthly landings desired, climatic conditions, and degree of maintenance required. Moreover sufficient charts should be provided to cover the range of tire pressures in use. The thickness and California Bearing Ratio of the upper base layer for each wheel load in the family of curves for each tire pressure should be clearly defined.

From the viewpoint of the engineer small tires with high pressures are not desirable for combat tactical operations. If time does not press and excellent construction materials not locally available can be shipped to the site, suitable strips can be constructed. But in a combat zone time is always short, and the base course for strips must be constructed with the best material available locally. With construction designed for large wheels and lower tire pressures, suitable materials can usually be found near any strip site. But small wheels with high tire pressures demand a support material with a much larger inherent natural strength. Such materials are not commonly present. Even when it is found, this material must be laid and compacted to a density far in excess of that necessary for large wheels with low pressures. The time involved in preliminary preparation of this material and the added time necessary to compact it to greater density precludes rapid construction of forward tactical fields—at least by battalions equipped with World War II equipment. The difficulty is compounded by the fact that all taxiways and parking areas for jets must be highly stabilized. The advent of the small, high pressure tire accounts for a large portion of the increased construction time for modern tactical airstrips. Another engineering headache brought on by the use of jet aircraft has been the considerable difficulty experienced with jet-blast erosion of the base under runway surfaces of pierced-steel-plank landing mat. When the subsurface is affected, continued usage, which is sometimes unavoidable, results in uneven foundations, rutting and buckling of the planks, shearing of the plank bayonets, and a surface too rough for satisfactory operations. Many types of materials and methods have been tried with varying success in an attempt to eliminate jet-blast erosion. The most successful remedy to date has been a one-half inch asphalt pavement under the pierced steel planking.

As a result of these complications, today it requires about four and one-half battalion months to construct a 9000-foot runway for modern jet fighters, as against the World War II average of one and one-half battalion months required to construct a 4000-foot fighter runway. To build a complete airfield requires about two and one-half times the construction effort needed for the runway alone. This factor has remained constant for both World War II and the present. With the best conditions eight to ten battalion months are required for the construction of a runway, taxiway, and parking aprons for a jet-fighter group.

Modern runways for fighter aircraft have doubled in length over World War II models, yet the time for construction has tripled. What accounts for this extra one-third time factor? As previously discussed, several contributing factors are predominant: jet-blast erosion preventatives, procurement and previous preparation of a material for the upper base courses that has the natural strength to resist the shears imposed by small wheels with high tire pressures, and the additional time necessary to compact this material to the high density required. Then too, sites readily adaptable to 4000-to-6000-foot strips necessitate greatly increased earth work, drainage, and preparation for extension to 9000 feet. If the runway is to be used jointly by fighter, bomber, and cargo aircraft, construction time is considerably increased over the four and one-half battalion months required for the fighter runway alone. With the type construction needed in Korea, at least one engineer aviation battalion per operational group is required to achieve maximum combat effectiveness and efficiency. It is quite evident that in the event of World War III the Air Force could not adequately support the construction required in the limited time which would be available. Since it is not likely that aircraft of the future will be any better suited to runways and airfields which can be quickly built by the present methods of construction, it seems obvious that new and more efficient methods of runway design and construction must be devised.

The design criteria for runways and taxiways as outlined in Air Force Regulation 86-5, "Aircraft Movement and Approach Area Criteria," have proved desirable and have been followed whenever practicable. But terrain, construction effort limitations, and operational requirements have dictated that clearance and approach criteria be violated many times. The tactical situation has often called for forward airfields in areas where roads and railroads were inadequate or totally lacking, and has forced a choice of sites that were far from ideal and below the desired standards for even limited operations. These sites had bad cross winds, high water tables, poor glide angles, obstructions in the clear zones, and limited area for parking and future expansion, but were considered acceptable to support tactical operations. Locations where runways up to nine thousand feet in length could be built and where proper logistic support could be furnished were extremely scarce.

Some airfields in current use were originally sod landing areas constructed by the Japanese. As these were usually located in the best available sites, they were rehabilitated by building up a strip with selected fill of sufficient strength to carry the heavier wheel loads and then covered with pierced steel planking. Occasionally more permanent airdromes of asphalt or concrete had been constructed by the Japanese. These strips were constructed for light wheel loads and low tire pressures, and under intense traffic they soon showed signs of failure. Some of these have been maintained by patching, but rehabilitation has usually required a filling on top of the old runway and then a covering of steel planking. All the existing strips were too short for current requirements and had to be extended. The number of strips needed was considerably increased by the short range of the jets. Maximum combat efficiency for such aircraft demands bases as close behind the lines as possible. The seesaw movement of the Korean war has made this a large order.

A FINAL SET of problems has been posed to Air Force engineers by the shift in engineering responsibility as a result of the separation of the Air Force from the Army. The Korean conflict has given the Air Force its first experience in field operations since it became autonomous. Heretofore Air Force commanders had little or nothing to say about their bases from the engineering standpoint. When the Air Force was a part of the Army, commanders moved into prepared operating bases, both in the zone of interior and in theaters of operations. The engineering services were provided by the Corps of Engineers, and Air Force commanders did not concern themselves with engineering problems. The services were taken for granted. Few realized the work necessary to provide even the simple luxuries of life such as electric lights, running water, and waterborne sewage. The only Air Force concern was whether the water ran when the faucet was opened or whether the light burned when the switch was tripped. In Korea the Air Force has had ample opportunity to observe the tremendous amount of work and the problems connected with the complete engineering development of air bases. The lack of knowledge of these things on the part of the average Air Force commander, officer, and airman was readily apparent. An Air Force-wide program should be instituted to acquaint personnel with the engineering problems encountered on bases both in the zone of interior and theaters of operation. Particular emphasis should be placed on the complete development of theater-of-operations air bases. With a basic understanding of these problems, Air Force commanders would be much better qualified for combat operations.

Naturally for security reasons it cannot be stated how many fields have been built or rehabilitated. Specific information cannot be given on the number or identity of construction units, the past or future work load, or the size of the engineering force presently available. But it can be stated that American ingenuity has performed miracles in this United Nations action. The lessons we have learned here and, more important, the shortcomings we have realized, may be of paramount importance if we are suddenly confronted with a similar situation on a much larger scale.

Air Force REVIEW

SAC Rotational Plan in England

One important lesson learned in the Second World War was that a unit's combat efficiency showed marked improvement after it had settled down overseas and had adjusted itself to the conditions and environment under which its missions were to be flown. The peace-time counterpart to advance familiarization of crews with all potential theaters of operations is the Strategic Air Command (SAC) Rotational Training Program. Unit operational training has been practiced in the Pacific, Alaskan, Caribbean, North Atlantic, European, and other strategic areas in the world.

The rotational program in England began in July 1948. By agreement with the British government a maximum of three bombardment wings and one fighter-escort wing were to train in England simultaneously, with arrival and departure of units to be staggered. Although the number of units in the United Kingdom has varied during the last three years from one to three wings, the basic schedule of rotation has never been altered. The normal tour of temporary duty is ninety days, but some tours have been extended to as long as seven months when rotation as programmed was not practicable. Great Britain furnishes the SAC units rent-free facilities on Royal Air Force bases under an informal agreement between the two governments. The only cost borne by the U.S. government is a nominal charge for utilities and the expense of bringing the bases up to the operational requirements of the American aircraft. Excellent cooperation from the RAF has been a major factor in the success of the training program in England.

The SAC units rotated include medium bombardment wings, fighter-escort wings, tanker units used for air-to-air refueling, and reconnaissance squadrons. The medium bombardment, refueling, and reconnaissance units operate from East Anglia at Lakenheath, Mildenhall, Wyton, Bassingbourn, and Sculthorpe. Fighter-escort units use the famous World War II base at Manston, Kent. Around Oxford four wartime RAF airdromes—Brize-Norton, Upper Heyford, Fairford, and Greenham Common—are being modified for use by the USAF. Runways are being lengthened and strengthened to accommodate medium bombers.

The SAC units in the British Isles participate in various types of operational training: joint aerial exercises with the RAF, simulated interceptor missions and bombing raids over English industrial cities, long-range navigational training flights extending to Africa and the Gulf of Aden, live bombing missions, and air-to-air refueling flights over the North Sea. All training flights are coordinated with the RAF air defense warning system.

The rotational program was originally under the direction of the 3rd Air Division, located in South Ruislip, Middlesex, England. On 1 May 1951 the 7th Air Division (SAC) was activated and the 3rd was raised to the status of an Air Force. In this reorganization the 7th took over many functions previously performed by the 3rd Air Division, particularly the operational control of the rotational training program. This redesignation of authority and responsibility gave SAC closer control over its units in England. The 7th was a SAC organization reporting directly to Headquarters, Strategic Air Command, whereas the 3rd formerly had been responsible directly to Headquarters, USAF, in Washington. The Third Air Force still provides administrative and logistical support for the program and maintains liaison with the British Air Ministry and the RAF.

There are several important training advantages in the rotational program. It is invaluable experience to cope with the operational, logistic, and administrative problems encountered in the overseas transfer of a combat unit. Operational experience and coordination are gained through joint training exercises with the RAF and other N.A.T.O. powers. And crews become accustomed to weather, terrain features, and navigational aids in possible future combat areas.—*Hq., Third AF and 7th Air Division*

Air Force Training Program in Psychological Warfare

The Korean war, the first combat testing of the Air Force as a separate service, has been valuable in pointing out organizational gaps and training weaknesses. One of the largest of these voids existed in the field of psychological warfare (PW). In its aircraft the Air Force had the weapons for the most far-reaching and effective employment of psychological warfare of all the services. But there was no unified program for PW and the shortage of personnel specialized in planning, direction, and execution of psychological warfare was acute.

The Air Resupply and Communications Service (ARCS) was activated on 23 February 1951 to remedy these deficiencies. A component of the Military Air Transport Service, ARCS was ordered to plan a comprehensive psychological warfare program, organize ARC wings, and train specialized PW personnel. In April 1951 the first Air Resupply and Communications Wing (ARCWing) was activated. Its training began in July at Mountain Home Air Base, Idaho, fifty miles southeast of Boise.

Charged with the responsibility of preparing, producing, and distributing PW materials for a theater of operations, the wing has its own communications equipment, photographic equipment, and printing equipment. It is assigned its own aircraft. There are four major divisions within the wing:

(1) The reproduction squadron composes and produces printed matter, including photographic and art work, in whatever languages are required. The squadron can print four million 5-by-7-inch leaflets daily.

(2) The packaging squadron can package and load several hundred tons of PW material per month. It must work out the best methods of packaging and dropping the leaflets so that the pamphlets will be evenly and thoroughly distributed over as wide an area is possible.

(3) The aerial resupply squadron maintains and flies the wing aircraft. These aircraft deliver the pamphlets behind enemy lines and to enemy cities, carry the radio and loudspeaker equipment for voice PW, etc. Because of the variety of its missions and the different terrains over which it may operate, the squadron is assigned bomber, cargo, helicopter, and amphibious aircraft.

(4) The communications squadron is equipped not only to broadcast its own propaganda but to intercept and monitor enemy broadcasts. Its many

types of electronic and communications equipment demand highly trained operating personnel.

Within these four squadrons there are many jobs in photography, printing, communications, and flying which require highly trained personnel but which have long been specialties within the Air Force. The shortage is not as acute there as it is with the PW specialist. The combination of a knowledge of foreign languages and psychological warfare is not an easy one to find. To attract officers to this new specialty ARCS has set up an interesting career field for PW officers and has organized a training school at Georgetown University. Prospective officer trainees should have a wide range of education or experience in one or more of such diverse fields as journalism, advertising, opinion analysis, mass-psychological studies, anthropology, foreign languages, history, political science, sociology, economics, international relations, and psychological warfare. There is no age limit for ARCS, the idea being to fuse men of varying experience, skills, and education into units which will benefit from the very latitude of diversity.

Officers selected for ARCS go first to Georgetown University for formal classroom instruction in one of the two fields—language or psychological warfare. The student is then assigned for practical apprenticeship to some agency such as the Voice of America, Army PW School, Advanced Language Center, or the Armed Forces Information School—all of which employ PW techniques—before he is given his final assignment as an area specialist.

The present academic program for ARCS at Georgetown University is an outgrowth of that university's well-known School of Foreign Service. The language course, fourteen weeks in length, offers introductory, intermediate, and advanced courses in all the more familiar foreign languages and in a number of less widely spoken tongues—Lithuanian, Estonian, Arabic, Hebrew, Modern Greek, Serbo-Croatian, etc. Officers completing the course are classified Foreign Language Propaganda Officers, Class I, II, or III, depending on their degree of proficiency. The psychological warfare course is also fourteen weeks in length. The twenty-two hours of lectures each week are supplemented by group meetings which deal with specific PW problems. A partial list of the lecture topics indicates the sweep of the course material:

Survey of World Cultures (a series of lectures giving a historical review of the major cultures of the world); *Values at Stake in the Present Conflict; Psychological Warfare Techniques and Practices; Special Psychology* (a study of mass reactions to various types of propaganda); *Governmental Structures and Practices* (with special emphasis on the representative system of government and on the Soviet structure); *Major Aspects of United States Foreign Policy; Economic Factors in the Present World Crisis; Geography of the Major World Areas; Analysis of Current Developments in the Light of Psychological Warfare.*

The duties of a psychological warfare officer are to advise his commanding officer in psychological warfare matters and to originate proclamations, pamphlets, posters, and other such materials. Also he must devote much time to reading, research, and building up PW intelligence files on his particular area. He is to use his background experience and specialized training to spot the chinks in the enemy armor and, by skillful use of propaganda and its related techniques, to undermine the military and civilian will of the enemy to resist. Since psychological warfare seems to be only in its infancy, it offers a stimulating and diversified career field to the officer with the necessary background. At present there is a particular need for field grade officers. Any officer interested in further details is referred to Air Force Regulation 36-53, or he may write to Headquarters, Air Resupply and Communications Service, Washington 25, D.C.—*Hq., Air Resupply and Communications Service*

Airborne Operations by Helicopters

Although the United States Air Force has had a recognized concept of troop carrier aviation for over eight years, the tactical employment of troop carrier components is still highly controversial. Troop carrier activities in the Second World War offer no real guide to the present. At that time airborne operations were greatly restricted by the lack of suitable equipment. But recent developments in cargo aircraft and helicopters have greatly increased the potentialities of mass movement of troops by air. High-performance, high-density cargo aircraft with wide versatility in all troop carrier requirements are now a reality in the C-124, C-119, and C-123 aircraft. Several helicopter types designed for assault missions are in various stages of development. These will greatly increase helicopter capability in the air drop of personnel and aerial delivery and landing of heavy cargo.

In the primary stages of an airborne offensive speedy and accurate mounting of the assault is frequently the deciding factor in ultimate success. The capability to air-land masses of personnel and equipment at a prearranged point and time is fundamental in tactical air transportability. In the past gliders have been used extensively as a primary means of delivery in the assault phase of troop carrier tactical operations. But each glider can only be used one time. It cannot be used to evacuate the troops it has landed, and in many other ways it lacks the versatility demanded of an assault weapon. Recent developments in "vertical envelopment" omit the glider in planning tactical operations.

A stage of development beyond the primary glider is the powered fixed-wing assault aircraft. These aircraft can airlift personnel and equipment under adverse conditions into and out of unprepared terrain. Tug aircraft are not required to tow them, like gliders, to the combat assault zone.

Further improvement of assault weapons is found in the large, high-cargo-load helicopter. The tactical use of this aircraft is still in the early stages of study. As yet such a helicopter is not in production, but development has reached a point where definite operating factors can be assumed for tactical planning.

Initial experiments with rotary-wing aircraft were carried out by Igor Ivan Sikorsky at Kiev, Russia, as long ago as 1910, but it was not until recently that research and development began in earnest. Much of this impetus was brought on by present-day military requirements. But many problems must be solved before the helicopter can support mass airborne operations as they are visualized in the ideal vertical envelopment. Although many of its early disadvantages have been corrected—compass stability, control problems, etc.—the relatively slow forward speed and limited range must be overcome. Present helicopters operate under major tactical restrictions because of their inability to live in the air against enemy aircraft and antiaircraft fire at their current altitude limitations and low speed. Additional developments in tactics and techniques are needed for the commitment of masses of personnel and equipment to an assault in rotary-wing aircraft. Another problem is that variance in temperature is reflected in the lift efficiency of the helicopter. Hot, dry conditions reduce the lift efficiency of the helicopter rotor by as much as 40 per cent. This somewhat intangible and unpredictable fluctuation in performance handicaps planning of mass helicopter operations even over a restricted area.

The helicopter's chief distinction, of course, is its ability to take off and land from zero position on any type of terrain. Throughout all phases of an airborne offensive the helicopter offers obvious advantages. Its inherent capabilities to deliver to confined spaces and its extremely great versatility of development and control simplify problems of tactical and logistical support of a battle area. Its configuration offers excellent adaptability to any type of load, including sling loads, troop pods, field hospital units, armored vehicles, fuel containers, and other necessary equipment for an airborne offensive.

These unique properties of the helicopter have led many military planners to the conclusion that it is the ultimate vehicle for airborne operations. Many present tactical limitations can be overcome by the development of bigger, more efficient rotor-powered aircraft with more powerful conventional or jet engines and with additional power-boost installations for assisted takeoffs and landings under heavy load. Twin-rotor helicopters such as the H-21 and H-16 are examples of possible development trends for assault helicopters. The ultimate in rotary-wing design may be the convertiplane type, which embodies the advantages of both fixed and rotary-wing aircraft.

A limited number of H-12 helicopters are presently assigned to Tactical Air Command for the exploration and development of tactics and techniques of assault missions. The H-12 helicopter is a new model presently undergoing operational tests under the direction of the Air Proving Ground at Eglin Air Force Base, Florida. Air crews are receiving valuable training through the operational testing of the H-12. Three of the H-12 helicopters were used in the air evacuation mission during the joint Air Force/Army Southern Pines Maneuver. Despite the lack of a sufficient number of H-12's and of trained operating and maintenance personnel, this field maneuver demonstrated the suitability of rotary-wing-aircraft for air evacuation.—*Hq., Tactical Air Command*

Automatic Weather Stations

One of the major problems of weather forecasting for military operations of the U.S. Air Force and U.S. Army has been the insufficient number of weather observations from remote or isolated areas. Reliable weather forecasting requires data from a multitude of locations, including those in geographical areas from which observations are not normally available. In such areas it has been necessary to establish isolated weather detachments. These detachments were often located in arctic or subarctic areas and had to be supplied by ship or special airlift. In addition to weather personnel a communication detachment was required at each location to transmit the weather data and maintain contact with the outside world. These isolated stations were expensive to maintain and difficult for personnel.

In an effort to remedy these problems and to increase the efficiency of its coverage, the Air Weather Service (a component of the Military Air Transport Service) has developed automatic weather stations. The first of these stations to be placed in regular operation was installed at Amchitka, Alaska, in August 1951, and additional stations are planned. The station at Amchitka measures barometric pressure, wind velocity, temperature, humidity, and the amount of rainfall and sunshine. Two radio transmitters, operating at high and low frequencies, transmit the coded weather data at three-hour intervals. A gasoline power unit, automatically started by batteries, supplies the power for operation of the transmitter and other equipment. A coding and programming unit selects the station call sign and arranges the weather data for transmission in proper sequence. The entire equipment, except for the weather-sensing mechanisms, is housed in a well-insulated shelter, and the power unit supplies the heat necessary to keep the equipment above freezing when the outside temperature is low. Receiving stations monitor the transmission, and the received data are placed in regular weather code for retransmission to local weather stations.

The automatic weather station can be transported by ship or airplane. Designed to operate for a minimum of six months without attention, it has sufficient fuel for one year's operation. To assure good radio reception at the receiving stations, transmitter frequencies are selected on the basis of propagation studies. Two transmitters are used, operating simultaneously on different frequencies. Each antenna is specially designed for its location to ensure maximum transmission.

Although the automatic weather station provides the most essential weather data from remote areas, it does not yet supply the complete observation as obtained by a weather observer. Visibility, ceiling, cloud cover, pressure tendency, and cloud types are not observed by the present station, but further equipment development will provide most of these data. Another limitation is that the receiving station must monitor the transmission, and any change in the timing mechanism of the station can delay or advance transmission. This difficulty will be eliminated when equipment is perfected to enable the receiving station to interrogate the automatic weather station.

The automatic weather stations provide weather data comparable in accuracy to man-made observations. They can be installed in isolated areas which now must be manned by detachments and even at locations where manned stations are impractical. To a large extent they can supply surface observations at a saving in manpower, transportation facilities, and over-all cost.—*Hq., Air Weather Service*

Observer Training Program

The Air Force took a new step in the training of aircrew officers when the first observer training program went into effect on 12 September 1951. On that date seventy-two students entered the first class of the Air Force's only observer school, located at Ellington Air Force Base, Texas.

The increased use of electronic equipment in today's aircraft brought about the new program. Former navigator training was inadequate for new aircraft, which require a crew member who combines navigational training with the ability to operate and maintain the growing complex of electronic devices. Also standardization seemed desirable for nonpilot officer flying ratings. Henceforth the terms bombardier and navigator will be replaced by the one term *aircraft observer*.

The new school operates much like the pilot training schools. The cadet or student officer is first given 28 weeks of basic training at Ellington AFB. Then he is sent to one of several advanced schools, depending on Air Force needs at the time. Each advanced school concentrates on a different subject—heavy, medium, or light bombardment, transport, reconnaissance, interception, electronics countermeasures, flexible gunnery, radar, or flight engineering. While the rating given all graduates is "observer," individuals may have specialized in only one of many different skills covered by the program.

The basic program has two main objectives: first, to train the prospective observer in military discipline in preparation for a career as an Air Force officer; second, to instruct him in navigation and electronics. The academic course totals nearly 600 hours of study, some 270 hours of theory and practical application of electronics and 250 hours on navigation. Students also spend 78 hours in the air to apply knowledge gained in the ground school. The navigation and flying will cover all types of aerial navigation for proficiency in dead reckoning, radio, radar, Loran, and celestial navigation. The electronics course includes a complete review of mathematics and physics, since there are no special educational requirements in these subjects for admission to the school. Detailed courses are given in direct current, electro-magnetism, vacuum tubes, circuit analysis, scope interpretation, and ground maintenance.

One of the innovations in the new program is a series of indoctrination flights. One flight offers experience in turbulent air flying; another provides for briefing on emergency procedures. A flight surgeon accompanies at least one flight and reports on each student's adaptability to flying.

Requirements for admission to the course are the same as for pilot training except for a lowering of the sight requirement. Applicants with 20/50 vision are accepted for observer training. Cadets taking the course are not given their wings and commissions until they have completed the advanced phase.—*Ellington Air Force Base, Texas*

TAC Passive Defense Program

Air Force bases in overseas theaters are particularly subject to all types of enemy air attack in event of war. In preparation Tactical Air Command is emphasizing a comprehensive passive defense. The new TAC defense program trains every unit and every individual in prevention or minimization of casualties and damage from air attack with atomic, biological, chemical, or conventional weapons. An important phase of the program looks to continuation or restoration of vital operations. The defense organization is to be incorporated into the existing command framework, but since the number of personnel now authorized for defense is limited most positions in the defense program will be filled by additional duty assignments.

In the Command headquarters the Radiological Defense Section has been enlarged to form the Radiological, Biological, and Chemical (RBC) Branch of the Directorate of Operations and Training. It will administer the over-all program, prepare defense training directives and manuals, determine materiel and personnel requirements, and supervise the command defense schools. This new branch, composed of three officer specialists in the RBC field, will be directly responsible for the implementation of AFR 355-3, "(Unclassified) Passive Defense," and TAC Reg. 355-1, "Defense."

At Air Force and wing headquarters levels the presently authorized Passive Defense Officer and the Radiological Specialist airmen will be the key men of the defense structure. As the only headquarters personnel with primary duty in defense, they will be responsible for base passive defense plans and for preparation and supervision of individual and unit training.

Each wing will have an officer with the primary duty of passive defense. Training of units and individuals in the lower echelons will be supervised by additional-duty personnel. Squadron-sized units will designate six biochemical defense specialists (2 officers and 4 airmen) and four radiological-conventional defense specialists (1 officer and 3 airmen). In addition to instructing, these specialists will serve as crew or squad leaders in survey, first aid, damage, and fire-control work. The unit defense specialists are trained in the Command Defense School located at Langley Air Force Base, Virginia. The course lasts two weeks and covers in detail all defense equipment, procedures, and techniques.

The TAC program requires each individual to receive two hours of passive defense training per month, including individual and collective defense measures and instruction in decontamination procedures during and after atomic, biological, chemical, and conventional attacks. The proficiency of all TAC personnel in defense measures will be determined by a quarterly written test which covers all phases of passive defense. Gas masks have been issued to all personnel for extensive training. One full day per month will be designated as Passive Defense Day to familiarize all personnel with the defense plans, alerts, and defense equipment. On this day all personnel will drill and rehearse under the direction of the Wing Passive Defense Officer and unit specialists. Defense equipment and materiel requirements for the program are small, since a training mission does not call for a full complement of equipment. Representative pieces of defense equipment will be demonstrated and explained.

It is the object of TAC to make the program realistic and interesting. By presenting some historical background to the need for defense precautions, both from the individual and Air Force point of view, and by making the lectures short, interesting, and informational, TAC hopes to gain enthusiastic support for an essential training program.—*Hq., Tactical Air Command*

Innovations in Operational Training

The 21st Air Division, activated 16 February 1951 at Forbes Air Force Base, Kansas, is an organizational innovation in the Strategic Air Command. Rather than disperse operational training of medium bombardment and reconnaissance wings among various units, it was concentrated in one command charged with the specific mission of training and was directly answerable to Headquarters, SAC. The organizational unit of an air division seemed best suited for the training requirements of activated units and for best use of available resources.

The 21st Air Division has two bases: Forbes AFB, Kansas, and Lake Charles AFB, Louisiana. Each is assigned a permanent bomb wing to conduct the operational training program. The 90th Bomb Wing is the permanent wing at Forbes; the 44th Bomb Wing at Lake Charles. At intervals a training wing is assigned to each base to be made ready for combat. Activation and training of such wings require about four months, during which the wing administrative structure is assembled and fitted as overhead for the crews.

The first month is largely taken up with organization and ground training. During the second and third months the new wing operates as a unit under the immediate supervision of the permanent wing. For the last month the training wing operates almost independently, but still under the watchful eye of the parent wing. At the end of four months the newly trained wing goes to its own base as a combat-ready unit.

The Division places great emphasis on mission preparation and briefing. Sometimes three and four days are devoted to briefing and study for a mission. Trainee crews are sent on close duplications of possible combat missions, and every available type of target is used. Unknown to their residents, many of our own cities are regularly "bombed" by training crews. Standards are constantly being revised and improved, and lessons learned through research or in actual combat are quickly incorporated into the training program.

Great care is also taken to secure experienced and thoroughly qualified instructors. A new training organization, the Instructor Training Section, has recently been originated at Forbes AFB. This section trains all SAC instructors in acceptable methods and techniques of instruction. It was established by SAC, not to duplicate other USAF facilities, but to meet the peculiar problems of the command and to streamline the training program so that instructors will be away from their duties for a minimum time. The Instructor Training Section also provides refresher and extension training for SAC instructors and conducts supervisory visits to all SAC bases to determine the quality of instruction and recommend improvements.—*Hq., 21st Air Division*

Photo Notes

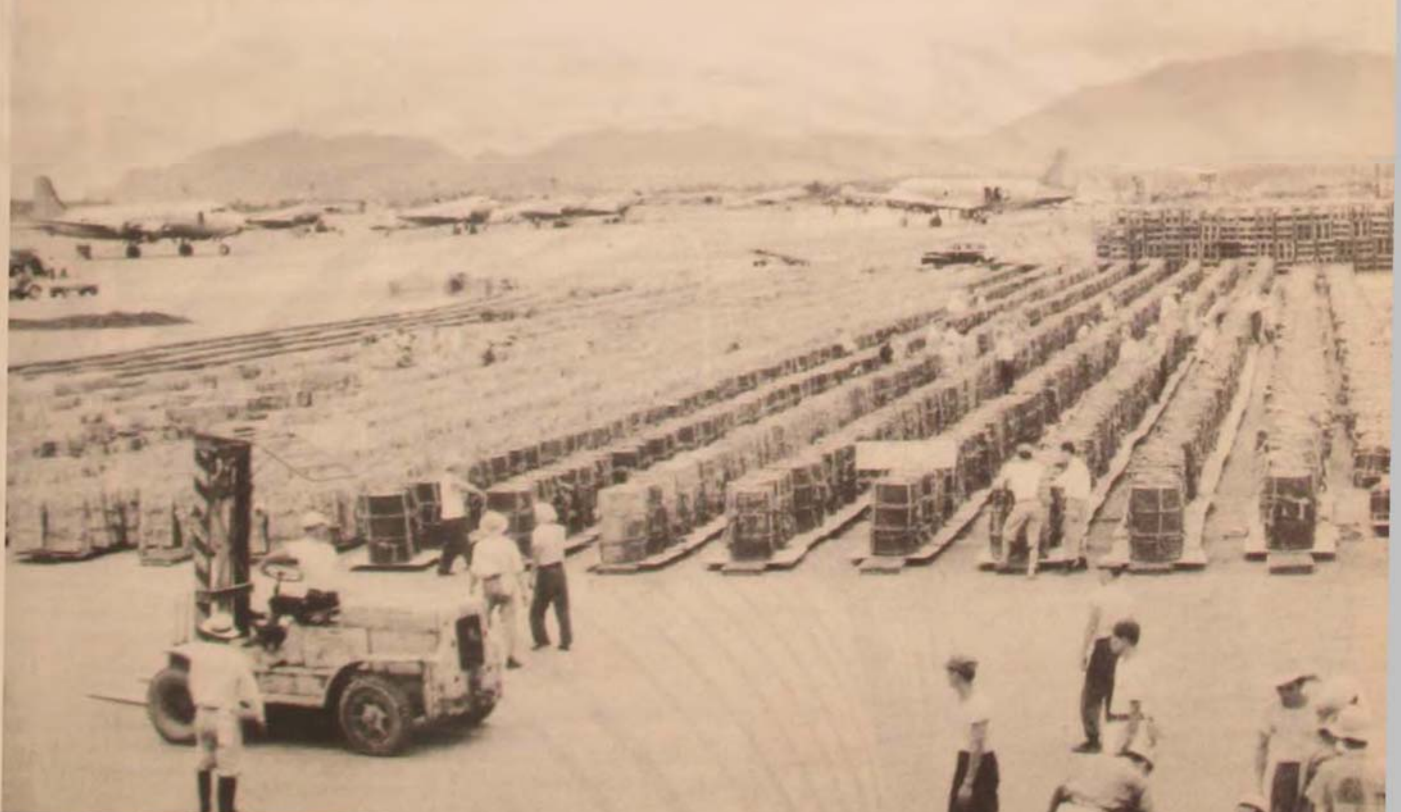
The entire landing strip at this advanced Korean airbase is ankle deep in water as an F-80 pilot prepares to take off on another patrol mission over Communist-held North Korea. But condition of the runway is of secondary importance to him if visibility is fairly good and he will have a reasonable chance to spot enemy targets. At other advanced airbases along the United Nations line, air crew members were climbing into the cockpits of fighters and light bombers to take advantage of this break in the rains, lowering clouds, and poor visibility which had given the enemy cover from air attack.

This enemy marshalling yard at Masan-ni, near Sinchon in North Korea, is being subjected to a triple dose of fire power from a B-26 light bomber. At the top, smoke from rockets and .50 caliber machine-gun fire shrouds a large portion of the important railhead. The white-hot flash at right center is a tank of napalm at the moment of impact with the ground. In the foreground a 5-inch rocket has just driven through a loaded boxcar. The napalm fired the stockpiled supplies on the loading platform, and the rocket, which completely pierced the boxcar, set it and two other cars ablaze. Other rockets and strafing started huge fires in various sections of the railyard. Interdiction strikes have destroyed thousands of tons of enemy ammunition and supplies.

Twisted rails and debris, empty shell cases, and warped, shrapnel-pierced steel plates are the remains of an American ammunition train which exploded upon being strafed by North Korean aircraft in the Pyongtaek railroad station back in July 1950. The scene is eloquent of what can happen to the supply system of fighting forces which are forced to operate, even momentarily, without the protection of air superiority.

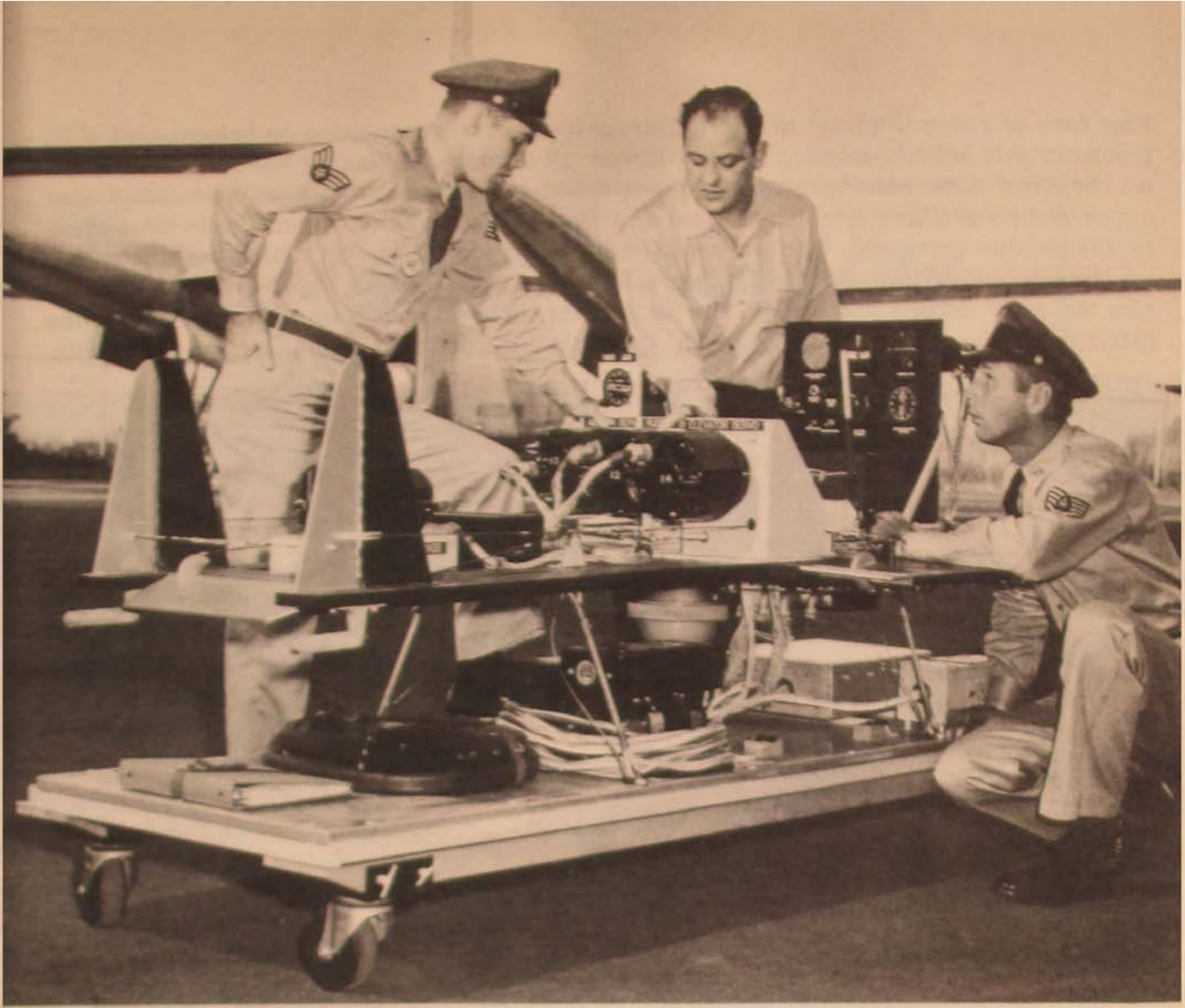
This North Korean T-34 tank had sought refuge and camouflage under a small bridge near Waegwan. But alert Fifth Air Force pilots spotted it and swooped down on its hideout. Bombs and napalm gutted the tank and brought the bridge down on top of it, leaving the wreckage festooned with communications lines. Note how the combination of the destructive force of the bombs and the intense heat of the napalm fire has started the welded seams of the tank. Two birds in the same bush is not bad shooting.

This sea of supplies at an airbase in Japan stands ready for loading into C-119 Flying Boxcars for delivery to front-line areas in Korea. Sturdily packaged, the various categories of materiel rest on wooden pallets. These in turn are mounted on long platforms which are raised just enough so that the prongs of the fork-lift shown in the foreground can pick up the pallet and lift it away to waiting cargo aircraft. In addition to the long rows of gasoline, C-rations, and medical supplies shown in the foreground, the tall stack of crates in the upper right background contain napalm tanks awaiting distribution to forward airstrips. Packaging continues in the foreground.



Operation Flit Gun

Operating as giant flit guns, C-46's and L-5 liaison planes of the 315th Air Division have been credited with greatly lowering the incidence of mosquito and fly-borne diseases among U.N. personnel in Korea by spraying areas infested with disease-carrying insects. Under the direction of the Fifth Air Force Air Surgeon and in cooperation with the Eighth Army, over 370,000 acres have been sprayed—making it the largest aerial fly-mosquito spraying operation ever conducted.



This Mobile Training Unit for the C-119 Flying Boxcar is being explained by a factory representative to Air Force ground crew members who soon will have the responsibility for maintaining some of the giant cargo carriers. Training units are not new. They were employed during World War II, but it was often two and a half years before they got into the field, sometimes even lagging behind production of the airplane. Now rigid time schedules are followed by the factory and Air Force engineers who jointly fit mobile units to the maintenance problems of each type of aircraft, and the maximum time allowed for the units to reach field use is five months. Each set consists of actual duplicates of the airplane's hydraulic, fuel, oil, electrical, radio and navigational, and other systems. Operating quirks are demonstrated to ground crews at airfields that are soon to receive airplanes of the related type. The Air Force feels that the units greatly assist in ground crew training and appreciably reduce costs and man hours required for other training methods and, later, in actual maintenance.

Circling low over a South Korean village this C-46 is shown spreading a thin trail of DDT from two small jets below its tail assembly. An even layer of insecticide, spread over a large area by aircraft, kills millions of flies and mosquitoes which infest the Korean cities and countryside and prevents breeding of additional millions. More than 100,000 gallons of DDT have been used in Operation Flit Gun.

Securely mounted in the cargo compartment of a spray-gun equipped C-46, the huge tank pictured here will hold 1000 gallons of DDT. The liquid is being pumped into the tank from fifty-five gallon drums drawn up on the ramp outside the aircraft.

Five tons of 155-millimeter artillery ammunition were parachuted to beleaguered U.N. troops in this heavily-wooded area in Korea. The wooded hills and valleys were chosen as the drop zone rather than the open fields to the right, because the sector was under enemy artillery fire at the time and the narrow defiles offered better protection to the troops retrieving the parachuted ammunition. Also, by threading their way up the narrow valleys, the C-119's were protected from enemy small-arms fire. Attention to such details may spell the difference between success and disaster in the intricate but urgent business of aerial resupply for advanced front-line ground troops.

Airman's Reading

Chinese Communism

PROFESSOR JOHN M. H. LINDBECK

IN its development in China, Communism has gone through several stages. Each has had its own characteristics and problems. But throughout its history, linking together its various stages, there have been certain constants: Marxist-Leninism, a centralist and authoritarian party, a drive for power, and exploitation and manipulation of social forces and revolutionary trends. Of these enduring elements the foremost in importance is the Party: the bearer and interpreter of truth, the organizer and director of power components, the vehicle and stimulus for revolutionary changes.

The appearance then of a detailed and scholarly examination of the Chinese Communist Party "in terms of its doctrinal frame of reference and its internal political relations" from its inception to the end of 1933, when Mao Tse-tung's leading position in the Party apparently was assured, is of major interest. *Chinese Communism and the Rise of Mao** is a pioneer study, based on much of the essential available sources in this country, which sets a pace for further work on Chinese Communism. The difficulties in undertaking such a study are revealed perhaps in some of its limitations: too much neglect at some points of the external Chinese factors affecting the internal affairs of the Party; incomplete treatment of the role of Comintern agents in intraparty struggles and the development of policy and doctrine; and inadequate consideration of the place of nationalism and Sun Yat-senism in Party debates and political alignments. But these caveats do not detract from the seriousness and responsibility of the author, though his work may be difficult to follow for those not thoroughly familiar with modern Chinese history because of its concentration on the internal developments of a party whose history is not too well known.

The first stage in the history of the Chinese Communist Party was marked by its essential dependence upon the Kuomintang (Nationalist Party) for its political existence and operational or organizational opportunities and achievements and by its complete dependence upon distant Moscow for its leadership, policies, and programs. Lacking an administrative apparatus, armed forces, substantial and independent economic resources, and control of effective political, labor, or mass organizations, the Party was unable to seize power from the Kuomintang leadership when it was instructed to do so from Moscow in 1927.

Once outlawed, the Party could not exist as a purely political organization, as the first leader of the Party, Ch'en Tu-hsiu, had hoped. Driven

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***Chinese Communism and the Rise of Mao, by Benjamin L. Schwartz (Cambridge: Howard University Press, 1951, $4), pp. 258.**

from the urban centers and lacking strength to return to them by forceful seizure, as Moscow first thought might be possible, it could no longer retain its organic connection with China's emerging but organizationally and politically weak proletariat. The needs of survival dictated the importance of the basic feature of the strategy espoused by Mao Tse-tung, then the leading Communist organizer of peasants and a lesser member of the Politbureau: "the imposition of a political party organized in accordance with Leninist principles . . . onto a purely peasant base" (p. 189). The scattered Party leadership needed time and opportunity to recruit new strength, for through anticommunist purges and defections by pro-nationalist and Trotskyite elements the membership declined from about 58,000 in 1927 to perhaps as low as 10,000 in 1930. Those Party groups who followed Mao or adopted his policy were the only ones who began to recoup some of the losses which the Party had suffered. Dr. Schwartz concludes that this "political strategy of Mao Tse-tung was not planned in advance in Moscow, and even ran counter to tenets of orthodoxy . . . at the time this strategy was first crystallized; that it was only the force of circumstances which finally led Moscow to provide a facade of rationalization for this new experience" (p. 5).

The exploitation of a peasant mass base depended upon and, in turn, made possible the other features of the Moaist strategy in this period: a program of Soviet agrarian revolution and peasant organization; the establishment of an independent territorial base with manpower and economic resources; and the development of "a strong Red Army for, in an environment in which military power was decisive, a Soviet base could survive only by possessing its own military force" (p. 190). These policies led inevitably to civil war, to the militarization of the Party (more than three fourths of its members were estimated to be in the army in 1935), and to the abandonment of Lenin's key idea that in colonial and semi-colonial countries the revolution must be shaped in a nationalist, anti-imperialist, bourgeois-democratic form.

The Soviet period ended in 1934-1935 with appalling losses and retreat. The scattered Red Armies, dependent upon the resources of a primitive economy and an economically dissatisfied but socially conservative peasantry, could not hold their rural bases against the mounting power of the Kuomintang armies and ascendant nationalism. Among the weaknesses of Chinese Communism during this period were its geographic decentralization, with the emergence of semiautonomous Soviets, Party disunity, and lack of political discipline and indoctrination. The results were seen in increasing peasant discontent and rejection of Communist leadership and weakening Party control over some army units. Against these disintegrative trends Mao struggled. His success was achieved after 1935, when he finally centralized Party authority and discipline in his own hands and those of his close associates, brought all the Red Army units under the control of the Revolutionary Military Council which he chaired, and consolidated the scattered units of the Party and Army in Northwest China.

The importance of Mao's achievement of complete control of the Party can not be overemphasized. This Bolshevization of the Party centralized rather than democratized the Party organization, a virtual necessity in a Party whose membership was made up so largely of peasants, partial illiterates, and those who were ideologically and politically naive. With the rank and file under control the Party itself became a flexible instrument of its leadership and was expanded after 1936 into a mass Party, the chief vehicle for mobilizing and directing the extensive political, military, social, and economic organizations developed by the Communists. By 1950 over a million Party members were brought within the so-called "military supply system," in which they served as political professionals, a new kind of bureaucracy, without pay and accepting Party assignments under military-type discipline.

Once the Party elite under Mao[1] was in firm control of the Party apparatus, Party strategy could be redefined to try to recapture a leading position in China's political life and revolutionary movements and to return to Lenin and Stalin's concept of achieving power through an alliance with non-Communist, nationalist elements. The promulgation of a united-front strategy by the Cominterm in 1935 was a compelling incentive in revising the Chinese strategy; the inroads and insistent threat of Japanese imperialism provided an opportune occasion. In a round of intellectual activity, the organization of numerous research commissions, and much discussion the Party elite, under Mao's supervision, reassessed the situation and attempted the formulation of a popular political strategy to achieve power in China. Mao and his colleagues regard the results of this effort as a genuine contribution to the body of Communist doctrine: the New Democracy, a synthesis of Marxist-Leninism with the "concrete practice of the Chinese revolution." The basic political strategy of the New Democracy was the formulation of "different policies to be applied at different times to different allies," in order to undermine the sources of opposition strength and mobilize adequate support to defeat rivals.

This New Democracy policy, but not the equally significant policy of Party centralization and monopoly of power by the elite under Mao, caught the imagination and won the support of millions of Chinese, suffering first from Japanese coercion and then Kuomintang ineptitude, and was widely acclaimed by numerous foreign writers who saw the external manifestations but not the internal developments of Chinese Communism.[2]

If the Chinese Communists rode to power between 1947 and 1950 on a tide of political popularity, there were more substantial factors which made its final success possible. The situation was favorable for the relentless

[1]The elite group is composed of those who worked with Mao in building the Party and its organs. Many of them carry their association with Mao back to the Kiangsi Soviet, established in 1931. Among the most prominent now seem to be Liu Shao-ch'i, member of the Politbureau and vice-chairman of the Central Committee, perhaps second only to Mao as a Party theoretician; Chou En-lai, Prime Minister of the Chinese People's Republic, and Mao's diplomatic representative since the middle thirties; the heads of the administrative regions—Koa Kang, Jao Shu-shih, Peng Teh-huai, Lin Piao, and Liu Po-Ch'eng. The three latter are commanders of Field Armies as well. Ch'en I, mayor of Shanghai and Commander of the Third Field Army, is the only major military commander without a regional administrative post. Largely dependent on military power for political survival, the Party elite is notable for the prominence of military figures. Military experience of some sort is so characteristic of China's Communist leaders that it might be regarded as a distinguishing feature of the Chinese Party.

[2]Perhaps the most useful and informed of the recent books which document the success of Communist policies during the period from 1948 to 1950 is by Derk Bodde (**Peking Diary**, New York, 1950). Of the three authors of **New China: Three Views** (New York, 1951), only Robert Guillain seemed to have some appreciation of the trends within the Party, whose ruthless deprivations of personal rights and interests he is now delineating in the **Manchester Guardian** and **Le Monde**. The White Paper (**United States Relations with China, 1944-1949**) might also be mentioned, for while it presents extensive and substantial information on the Chinese situation and the success of Communist policies, it lacks adequate coverage of the developments and trends within the Party, as do the other books.

use of its carefully built and husbanded instruments: the Party bureaucracy and the Red Armies, both linked with and sustained by a network of military, political, and economic peasant organizations in scattered territorial bases. External military aid was unable to buy time for political rejuvenation or to redress the political and economic losses suffered by the Kuomintang during the war.[3] The superior organizational achievements[4] and broad political strategy of the Communists in this situation enabled them to neutralize popular opposition and win significant support from elite groups. Operating in this favorable context, the Party consolidated its locally based armies and resources in a final test of arms with the Kuomintang.

The military victory they achieved in 1949 and 1950 gave the Communists control of a national administrative apparatus, the final element they needed for exercising complete power within China. The Party elite, possessing in addition an experienced and disciplined Party with almost six million members and an Army under Party control (1,200,000 Party members were reported to be in the Army in 1950), and having laid the basis for consolidating its power in urban and rural localities through its mass organs, no longer needed popular support. Its power pyramid was complete. With a monopoly of military, governmental, and effective political power, the Chinese Communist leadership has now undertaken to increase its control over the Chinese people and to press for the rapid development of China's economic and military potentials.

The final prerequisite for power, which the Chinese Communist elite still lacks, is industrial and economic strength. Apparently resolved to create this strength under forced draft and with the maximum exploitation of Chinese labor and natural resources, China's new leaders are introducing a program which calls for extensive state control of labor and production and a ceiling on or even a lowering of the Chinese standard of living to wring capital from present poverty. The most violent propaganda can not mitigate nor conceal the coercion and terror which such policies entail. Chinese military operations in Korea have not, apparently, altered this trend but have merely intensified the drive towards the forcible mobilization of wealth, manpower, and resources and have increased emphasis on the development of military strength.

These internal policies leave no room for private institutional developments and are so antithetical to Western methods and values that no fruitful relations with the non-Soviet world are possible. This has led to the lowering of an iron curtain and to the promotion of closer relations with Russia, from which China must get essential technical assistance and industrial equipment as seed for her industrial growth. This exclusive Russian orientation also gives the Chinese leaders a free hand to pursue

[3]Between the Communists and the Japanese, all other political forces had been eliminated during the war in large parts of China. With the defeat of Japan, and the disintegration of the Japanese-supported groups, who in any case were not strong in the rural countryside, all local power fell to the Communist-controlled organizations. The Kuomintang, forced to maintain the formal institutions of government and power to prevent their falling to the Japanese, who then would have been in a position to use their well-developed puppet techniques to drive all Chinese resistance, both Communist and Nationalist, underground, contracted its base and emerged from the war with the marks of military, political, and economic defeat.

[4]The organizational competence of the Chinese Communists, to which much of their success can be attributed, is briefly but broadly dealt with by R. de Jaegher, "Technique d'une Dictature: L'organization Communiste Chinoise," **Bulletin de l'Universite l'Aurore** (Shanghai, 1948), pp. 49-57.

imperial aims and expansionist political tactics in the non-Communist lands of Asia, for without an economic stake to lose, military and political tactics can be fully exploited. The economic losses will be borne by the Chinese people for the political advantages China's leaders hope to gain.

An extremely useful current assessment of China appears in the September 1951 issue of *The Annals of the American Academy of Political and Social Science*. Twenty-two specialists, each covering some aspect of the Chinese situation, have, with minor exceptions, written discerningly of major trends and institutional developments. Aside from these articles and articles elsewhere, no book comparable to Schwartz's deals with developments in China prior or subsequent to 1933. Harold R. Isaac's revised and extended edition of *The Tragedy of the Chinese Revolution* (Stanford, 1951) presents a broad, interesting, and perceptive picture of conditions in China during the last thirty years but one frankly possesing a good deal of personal interpretation as well. The French journalist, Jean-Jacques Brieux has written a fact-laden book,[5] but its interpretations are distorted by the author's revolutionary romanticism.

The biographical literature on Communist leaders is poor. Mao Tse-tung has aroused, quite rightly, a good deal of interest, but Robert Payne[6] and Pierre Fromentin[7] are superficial in their treatment and impressed by the color more than by the real implications of Mao's achievements. A more reliable but somewhat spotty and unsystematic account of some of the prominent leaders is that of Robert S. Elegant's *China's Red Masters* (New York, 1951). Two books on special aspects of the Communist movement in China are Edward Hunter's *Brain-Washing in Red China. The Calculated Destruction of Men's Minds* (New York, 1951), which is sensational but based on facts, and Lieutenant Colonel Robert B. Rigg's *Red China's Fighting Hordes* (Harrisburg, 1951). Lynn and Amos Landman's *Profile of Red China* (New York, 1951) and Harrison Forman's *Blunder in Asia* (New York, 1950) are reporters' books with many descriptive details drawn from their recent experiences in China. The former is fairly broad in scope; the latter deals primarily with Shanghai and is written to convey a message.

Yale University

The Reichsminister and the Luftwaffe

DR. EUGENE M. EMME

SERIOUS students of military affairs concerned with the judicious employment of air power in modern war can profit well from historical reflection upon the German experience in World War II. The war-effective capabilities of aircraft have been dynamically magnified by technological progress since 1945. However, the fundamental concepts around which the organization, command, and employment of military forces revolve in national strategy remain, in effect, timeless. The critical relation-

[5] La Chine, du Nationalisme au Communisme, Paris, 1950.
[6] Mao Tse-tung, Ruler of Red China, New York, 1950.
[7] Mao Tse Tung, Le Dragon Rouge, Paris, 1949.

ships between military and political instrumentalities, particularly those determining the role of the air arm in national strategy, are provided useful perspective by an examination of the fate of the German Air Force in the aggrandizement and eventual collapse of Nazi Germany.

Willi Frischauer's well-written, though not definitive, account of the rise and fall of Hermann Goering* performs the worthy service of destroying a great number of the exaggerated symbols employed by cartoonists to form the "German Nero" image of Goering popular among Americans during the passion of the late war. Goering's historical importance in German history from the end of one war until the end of another, as this volume helps demonstrate, was only partially determined by his twelve-year dual capacity as Air Minister and Commander-in-Chief of the German Air Force.

Last commander of the famed Richthofen *Geschwader* of the First World War, Goering early became a member of the small group of discontented souls who rallied around Adolf Hitler's warped program for the solution of Germany's internal ills and its subordinated position in European affairs. The first leader of the Storm Troopers, Goering eventually became a leading politician of the Third Reich, second in popularity perhaps only to Hitler himself. From 1928 onwards his was the voice of the Nazi Party in the Reichstag of the Weimar Republic which preached from the gospel according to *Mein Kampf* on current political issues. Once Hitler was appointed Chancellor, it was Goering who ruthlessly smashed the Communist Party through the device of the Reichstag fire. He extended this ruthlessness with such thoroughness that all organized political opposition to the Nazis (particularly in Prussia) was swept away. Military and economic affairs increasingly became responsibilities of this efficient Reichsminister.†

Goering gained the almost perpetual gratitude of the Fuehrer for his usefulness during the first six years of the Third Reich's existence. When corpulent Goering asked the German people to give up their butter for guns, or when he, bundled in expensive furs, collected pennies for "Winter Help" on the snowy sidewalks of Berlin, he demonstrated his unique political ability in German affairs, as he appeared to symbolize the arrogant and lavish leadership of the Hitlerian Reich abroad. In the field of foreign affairs, Goering personally directed the so-called "rape" of Austria. Goering effectively exploited British and American contacts (*e.g.* British Ambassador Henderson, Charles A. Lindbergh, *etc.*) and boastfully trumpeted the myth of the Luftwaffe's overwhelming aerial might during the fateful Munich crisis. On the eve of the invasion of Poland he conducted unofficial negotiations for the continuance of peace with Britain. Throughout the prewar and early-war period, as perhaps may someday be examined in greater detail, Goering took part in most of the discussion and planning of official, domestic, and foreign activities of the Third Reich. The breadth and scope of Goering's interests, however, grew so manifold as to bloat his

***Willi Frischauer, The Rise and Fall of Hermann Goering (Boston: Houghton Mifflin, 1951, $3.50), pp. 309.**

†Among Goering's official positions may be listed: President of the Reichstag (1932-45); Prime Minister, President, and Interior Minister of Prussia (1933); Air Minister (1933-45) and Commander-in-Chief of the Luftwaffe (1935-1945); Reich Chief Forester (1933-45); Reich Commissioner of the Four Year Plan; head of the Hermann Goering Works (1936); Chairman of the Ministerial Council for Defense of the Reich; member of Secret Cabinet Council; as Reichsmarshal, the highest ranking officer in the German armed forces; successor-designate to Hitler (nominated 1 September 1939).

personal ambitions and spread thinly his attention to official duties. This process, as the stern demands of war were to demonstrate, eventually weakened Goering's effective position among the Nazi hierarchy. Objects of art, the comforts of narcotics, and the mysticism instituted at Karinhall were to become increasingly important interests for Goering as the magnitude of German military defeats mounted on the Eastern Front and over Germany itself. At the Nuremberg Trials, Goering's political genius, albeit opportunistic and relativist, was again fleetingly but masterfully demonstrated before he committed suicide.[†]

For the professional military student Goering's responsibility as titular head of the Luftwaffe will perhaps be of greatest interest. Goering's personality and favored political position in the Nazi leadership brought immediate prosperity to the young Luftwaffe from the beginning of its build-up in 1933. Because cf his numerous other official duties Goering instrusted the overwhelming bulk of Air Force administrative details to the capable hands of his Deputy, Erhard Milch, old wartime comrades such as Ernst Udet, and ex-Reichswehr officers such as Wever, Kesselring, and Stumpf. Hours after the death of President von Hindenburg in 1934, Goering dramatically led all high Luftwaffe officers in taking a new oath pledging allegiance to the Fuehrer rather than to the German state itself. Although Goering's slogan for foreign consumption and domestic morale that Germany was to become a "nation of fliers" was never realized, Germany entered World War II with an air force startlingly war-effective in the brief and Army-coordinated campaigns of 1939-40 which became known to the world as the "Blitzkrieg."

An instructive historical lesson can be observed by examining Goering's responsibilities for air matters as they influenced the command relationships between the Luftwaffe and Hitler's High Command. For better or for worse, Goering was, perhaps above all, the political representative of, rather than an informed military spokesman for the Air Force view. As Frischauer's volume helps substantiate, Goering's duties and actions as Air Minister were never distinct from those powers he exerted as Commander-in-Chief of the Luftwaffe. His enthusiasm for the capabilities of what he often referred to as "my air force" was unbounded. After the Polish and French campaigns Hitler also believed that the Luftwaffe could do no wrong. Subsequently the German Supreme Commander was led by Goering to an optimistic view of what the Luftwaffe, in spite of its limited equipment and tactical organization, could achieve. The failure of the Luftwaffe to achieve effective air superiority over Britain in 1940, a failure partly the result of poor air leadership and employment of forces itself, provided a harsh lesson for the German command. This lesson went unheeded. The Luftwaffe was subordinated to the prosecution of the war as conceived by Hitler and his Army generals, who dominated the unified High Command of the Armed Forces (OKW) and who became preoccupied with the problems of the Eastern Front.

Neither Hitler nor his generals had any more than a superficial appreciation of the nature of air power. Throughout most of the war the Luftwaffe representative in Hitler's High Command was a colonel, who attempted to maintain working relations with a cluster of Army generals. Goering thus

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[†]Read Goering's shrewd and capable testimony in **Trial of the Major War Criminals, IX,** (Nuremberg, 1947), pp. 235-657.

had the primary responsibility to counteract the dominance of the traditional land-rooted strategy and the absence of over-all strategic planning in the directives of Hitler's staff for the conquest of Russia, the securement of the Mediterranean, and the air defense of the Reich. In fulfilling this responsibility in the interests of the over-all German war effort, Goering was a failure. Ever loyal to Hitler, Goering lacked the moral fiber and the military vision to oppose Hitler or his principal advisors consistently with any vigor.

When Hitler ordered the German Sixth Army encircled at Stalingrad to hold at all cost, Goering promised, in spite of the qualifications of his staff (OKL), that the Luftwaffe could provide adequate logistical support. The concentration of all available aircraft from all fronts in the Stalingrad airlift, however heroic an effort, was a catastrophe for the Luftwaffe as well as for the forces of Field Marshal Paulus. Goering's prestige, as that of the Luftwaffe, fell to rock bottom, never to rise again. The 1000-plane raids of Bomber Command on the cities of the Ruhr basin, and particularly the Hamburg raids of July 1943, brought Hitler himself into direct intervention into internal Luftwaffe affairs and technical details as well. Hitler's decision of May 1944 to employ Germany's advanced turbo-jet fighter, the Me-262, as a "blitzbomber" was supported by Goering in opposition to the studied recommendations of air defense, technical development, and production officers of the Luftwaffe for its use as a fighter-interceptor. Once Hitler decided the Me-262 was a fighter, the moment when it could have decisively been employed had passed.

As an instrument of Hitler's command, the Luftwaffe, operationally on an all-out basis from the moment the war began in 1939, was forced to maintain operations on three fronts at the same moment, and possessed, by decision of the High Command, the lowest priority of any service for manpower and industrial production from 1941 until mid-1943. The lack of distinction between Goering's responsibilities as Air Minister and as the Commander-in-Chief of the Luftwaffe, taking into account his personality traits, proved of historical import for the entire war effort of the Third Reich. Hitler was never to view the over-all air war situation with sufficient clarity to consider seriously the removal of faithful Goering until it was too late.

Although the role of Goering in the German High Command is worthy of a more detailed and systematic study, Frischauer nevertheless provides insight into critical institutional problems of the command and the employment of the air arm in modern war to be found in the German experience. Sir David Maxwell Fyfe, British Prosecutor at Nuremberg, has aptly described Goering as follows:

> "He had a quick brain, an excellent memory, a complete mastery of political approach to mass German opinion, courage and power to get himself liked by the great majority of the people that he met. When these qualities are coupled with complete ruthlessness, vanity and greed, you have a figure that could not be laughed off."

The Rise and Fall of Hermann Goering is written to substantiate this characterization and is skillfully studded with pertinent anecdotes.

Mr. Frischauer's biography of Hermann Goering deserves a wide audience as well as a critical one. A Viennese journalist who helped to reveal the "Schickelgrueber" story of Hitler's origin, Frischauer has supplemented his personal knowledge with valuable information from individuals most intimate with Goering. Most important among these were Emmy

Goering (his second wife), Robert Kropp (his valet), the late Karl Koller (last Chief of Luftwaffe Staff), and Karl Bodenschatz (Goering's military adjutant in 1918 entrusted with the task of being his liaison officer with Hitler). In combination with the great amount of raw documentary material and a few systematic studies on the organization and operations of the German Air Force, Mr. Frischauer's volume can profitably be read by the professional military reader. Thought and planning on contemporary and future problems will be assisted by the serious study of the Luftwaffe and by reading this best existant biography of any Air Minister.

Air University Research Studies Institute

Soviet Economy

Professor Alfred A. Skerpan

THE First World War disclosed dramatically the vital military significance of national economic capabilities in the new industrial age. From that time on any assessment of the military power of a nation has had to deal directly not only with political combinations and the size of the forces, but also with the capacity to create and maintain vast quantities of mechanized equipment for three-dimensional warfare. The problem was made even more difficult than this, because economic capacity is capacity for normal civilian supply as well as for war. Production for modern war, therefore, directly affects also the living standards of the "civilian" or, more exactly, the "noncombat" segment of the population. This, in turn, involves the factors of popular morale, of the degree of popular acceptance of the existing social-political order, and of the determination and resourcefulness of the government. The collapse of the Russian Empire in 1917 was, in fact, the result of the failure to learn the lessons of the new "total war."

The particular merit of Schwartz's *Russia's Soviet Economy** is that it is the best one-volume study now available on the subject of the Soviet national economy and its capacities, not only for peace but also for "total war." It shows evidence of great labor, although it is not as scholarly or as thoroughly digested a study as Alexander Baykov's *Development of the Soviet Economic System* (1947). In fact there are signs of hasty preparation: repetition of material and ideas, failure to bring together related developments, oversimplified presentation of some subjects, and unnecessarily turgid presentation of others. The last fault is particularly to be regretted when it appears in such an important a section as that on the ideological background (Chapter III).

Schwartz, in comparison with Baykov, is however generally far more readable and is broader in scope. He includes such additional matter as

*Harry Schwartz, Russia's Soviet Economy (New York: Prentice-Hall, 1950, $6.65), pp. 592.

afforestation and irrigation plans and the developments under the first post-war five-year plan. Also, the value and effectiveness of Schwartz's writing have not been vitiated by sympathetic neutralism toward the Soviet regime. He thus deals effectively with human costs of undoubted economic achievements and the relation of these to morale; he treats of the existence of slave labor: and he suggests directly and indirectly the terrible implications of the joining together of unexampled political power with unexampled centralization of economic control.

About one fourth of *Russia's Soviet Economy* is devoted to background material, including surveys of natural resources, ideology, and the overall development of the Soviet economy. There is in addition a valuable, though occasionally faulty, brief survey of prerevolutionary economic history. This should make known more widely the significant fact that Russia was experiencing, prior to the First World War, a broad economic growth which laid the foundations for later Soviet achievements.

Following the background material, there is a careful analysis of the operation of planning. This in turn is succeeded by an examination of the various branches of the economy, including, first, the organization and growth of industry and agriculture, which occupies a quarter of the book, and then transportation, trade, finance, labor, *et cetera*. The material is rather fully illustrated by seven economic-geographical maps, six charts and lists on organization. production, and trade, and sixty-five tables of data on all aspects of the economy. There is one serious omission: there is no chart on the complex organization and operation of Soviet industry. The index is satisfactory, but instead of a bibliography there is a "Reference Index" of limited usefulness. Dr. Schwartz has prepared, as a separate publication, *The Soviet Economy: A Selected Bibliography of Materials in English* (1949).

Some of the significant lessons about the Communist order, to be drawn from *Russia's Soviet Economy*, are to be derived only indirectly. This is true in respect to the consequences of replacing almost completely the price function in an economy by a virtually total political direction. As example after example in Schwartz indicates, it is just this that is mainly responsible for the almost universal governmental intervention in every aspect of Soviet economic and social life. Once policy and plan are determined from above, any criticism from below, by political activity or by the exercise of purchasing power, is simply out of the question. Nevertheless, plans are faulty and emergencies arise continually. When dislocations take place that in a relatively free economy would be adjusted through the operation of the price mechanism, corrections can be made only by additional bureaucratic action and usually after expensive confusion and delay.

It is noteworthy, too, that while the autocratic Czarist regime was able to promote industrial and military growth—the very same objectives of the Soviet regime—with little difficulty over investment matters, the problem of investment decision is still acute in the Soviet Union and is resolved, as a rule, arbitrarily. Also, before the revolution, despite the emphasis on capital goods, living standards grew markedly, while no one can state convincingly, today, that the living standard of the Russian citizen is above that of 1913. Without any particular difficulty Schwartz manages to point up the existence in the present-day Soviet Union of gross inequalities of earnings and savings among peasants and workers and the truly low level of real earnings as contrasted with ruble earnings. The evidence seems clear that, however retarded and inefficient, the political and economic order of the old Russian empire was able to accomplish relatively more for the state as well as for society, and at a great deal less human cost.

Apart from the weaknesses in the book that have been cited above, there is not much one can quarrel with. The reviewer, for one, does feel that Dr. Schwartz should have pointed out in his historical review that as notable as Czarist economic development was, it—like the economies of England and France without American aid—was insufficient to meet the unexpected strains of industrial age wars. It was this factor, indeed, as well as the ineffectual leadership of the dynastic rulers, as has been suggested, that produced the revolutionary situation at the beginning of 1917.

Then again, the reviewer feels that the six-page statement on prison labor does not come as fully to grips with the question as it might have. While it is probably true that "political rather than economic factors explain the genesis" of the system (p. 489), it does appear—admittedly on very limited evidence—that economic factors have come to play at least as great a role in maintaining the institution of forced labor. German and Japanese prisoners of war were held in the Soviet Union at least as much for economic as for political reasons. There does not seem to be room for much doubt also that a great deal of necessary construction work in Siberia and elsewhere could only have been done under compulsion. Free labor could hardly be attracted to work under highly unattractive climatic and living conditions.

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The Periodical Press

Harold S. Quigley, "Our Dilemma In The Far East," The Virginia Quarterly Review, Autumn 1951, pp. 498-519.

As a consequence of revolution in Asia we have been left with the necessity of choosing between one of "two oligarchic-bureaucratic systems of government and society—one of the right, the other of the left—that are in conflict for power in every Asiatic state," neither of which is in any form a representative government. Although this dilemma is not new in American international relations, it is made more difficult today because the leftist oligarchies in Asia face towards Moscow while the rightists (many of whom have been globally discredited) call themselves disciples of democracy. It cannot be truly solved on the battlefields nor in an ivory tower because of the differences between civilizations—differences difficult to evaluate and more difficult to adjust to in policy making.

All Asia has been simmering with revolution for decades. It began in China with the overthrow of the Manchu dynasty. Modern technology and industry have added fuel to the revolutionary fire fanned by a century of colonial domination and unequal treaties. For Japan the eruption occurred at Pearl Harbor. For centuries Chinese political theory has justified revolution to right injustice and restore economic equilibrium.

American policy since V-J day has been self-determination for Asia and military neutrality—attempting to avoid taking sides between left and right—playing for time and hoping that over a period of years the right and left would resolve their antagonisms, that Asian Communism would become modified by traditional cultures, and that the dilemma would then disappear. Our hopes have not been realized. The gulf between left and right is becoming greater. The Asian revolution, until Korea, was limited to fratricidal conflict. Korea broke the surface for international intervention but did not prompt a change in American strategy. Political tactics, however, did change. Military neutrality was discarded, Quigley holds, when the Seventh Fleet was sent to Formosan waters. Only with the entrance of the Chinese into the Korean war and the appearance of Chinese-manned Russian aircraft did America begin to modify her basic policy by shifting to the right in what appears to be all-out support of anti-revolutionary regimes.

Forced into the conviction that revolutionary movements in Asia are Russian Communist imperialism in disguise, we have grasped the rightist horn of the dilemma, "and whether or not we are to be impaled upon it the future will decide." It is hoped, the author concludes, that our course of action will be sufficiently flexible to exploit any evidences of separatism which may appear between Oriental and Soviet principles and policies. Should they appear we must use "every practicable means of promoting such separatism."

"World War III, Russian Style, is Here," U.S. News and World Report, November 2, 1951, pp. 11-15.

THE announcement of the "Truman Doctrine" on 12 March 1947, which set forth U.S. intentions to organize international resistance to world-wide Communist expansion, initiated what the editors of the *U.S. News and World Report* call "World War III, Russian Style"—a war, they assert, that Russia is winning hands down. Czechoslovakia fell to a Communist coup, Poland was taken over by the Russian military, purges in Bulgaria and Rumania strengthened the Communist hold, bids for power in France and Italy failed but revealed the strength and size of the Communist party in those countries. When America channeled aid to bolster the decrepit European economy, Stalin quietly and cunningly shifted to Asia. The Communists consolidated their control of China, initiated guerrilla war in Indo-China, Indonesia, Malaya, and political unrest in other Asian areas. Hints of American disinterest in Korea caused Stalin to authorize his North Korean puppets to seize South Korea. In 1951, the fifth year of this new war, while the West is struggling to contain Communism in Europe and the Far East, the Arab world and the Middle East begin to rumble with terror, assassination, and revolt—announcing the opening of new fronts by the Kremlin in Iran, Pakistan, French Morocco, and Egypt. While this subtle Russian offensive rolls on unimpeded, America and Europe frantically gird their military might for a shooting war which Russia will never fight. It would be foolish, the authors claim, for the Kremlin to meet the West on the battlefields when, without commitment of a single Russian soldier and with relatively small drain on her resources, she has conquered over 600 million people and gained the second largest industrial complex in Europe.

Ideas disseminated by propaganda are the major weapons in this war. Incessant repetition of the magic word "peace" has gained more than scores of divisions might have won. Assassination, terror, and mass demonstrations prepare the ground for well-indoctrinated, organized, and Moscow-trained fifth columns to seize power. When this strategy fails, one of three types of "shooting war" are resorted to: guerrilla war (as in Indonesia and Malaya), civil war (as in China), and international war (as in Korea).

The only effective counterattack the West can employ, the *U.S. News and World Report* feels, would be to use the very same weapons and techniques—a stepped-up propaganda campaign appealing to the populations behind the Iron Curtain and offering freedom in practical terms, while encouraging and subsidizing sabotage, fifth column activities, and support for actual revolt.

Robert Shaplen, "Indo-China: The Eleventh Hour," The Reporter, October 2, 1951, pp. 6-10.

FRENCH General Jean de Lattre de Tassigny claims, Mr. Shaplen tells us, that France has abandoned her colonial position and is undertaking an unselfish crusade for the salvation of the Vietnamese people. The paradox, however, is that this immense French sacrifice is being made for a people who do not believe in the salvation offered them and who hate the white race. The independence offered by France for the three Associated States of Indo-China (Vietnam, Cambodia, and Laos), is not complete freedom, but a nebulous version of the British Commonwealth of Nations, with France retaining decisive political and economic influence.

The Vietnamese people are bored and mistrustful and silently watch Chinese Communism and the "rising wrath against the supremacy of the white man in all Asia." According to Shaplen, French generosity is highly suspect, mainly because Bao Dai, the French-enthroned Emperor, has done little toward actual material help or reform in a country which needs an abundance of both. The Bao Dai government needs new blood to make it truly non-French and independent, with real rather than fictitious autonomy. Otherwise it cannot hope to draw popular support away from the Communist Vietminh. The most popular national figure in all Indo-China today is Ho Chi Minh, an international Communist (not the Moscow brand), a leftist liberal who in 1946, during his negotiations and subsequent agreements with the French, was "weanable." Bad faith and lack of self-control on the part of the French, Shaplen says, drew Ho Chi Minh to the Peking-Moscow axis. Today he is "honorary chairman" of a solidly reconstituted party which has been taken over and controlled by Moscow-trained Dang Xuan Khu, alias Truong Chinh, and the young Communist extremists. Relegated to a relatively insignificant "power" position in the party structure, Ho and his Vietminh intellectual support constitute the most likely potential "Tito" group in Asia and could give the Bao Dai government the necessary weight with the Vietnamese people, if the two could be joined in good faith. But French acquiescence to this admixture is improbable, for it would have to carry with it complete Indo-Chinese independence.

With the Vietminh Communists no longer merely a "popular front" but a strong, well-armed organization which controls two thirds of the Vietnam countryside, including the Chinese frontier, actual Chinese participation, as in Korea, would deal the death blow to free Indo-China. In an eleventh-hour attempt to salvage this strategic corridor to southeast Asia, the United States has authorized a 300-400 million dollar military aid program and at the same time a three-year 70.5 million dollar program for economic and social assistance. The French welcome the former but bitterly resent the latter, which by-passes them and is given directly to the provinces, who are not inclined to accept French good will. The American dual role, warns Shaplen, is dangerous.

"Center of Soviet Aspirations," Fortune, August 1951, pp. 93-98.

The State Department published in 1948 a collection of documents found in the German Foreign Office archives at the end of the Second World War. One of the most interesting was the draft of a proposed four-power pact between Germany, Italy, Japan, and Russia. In November of 1940 Russia had assented to the draft with certain conditions, the most significant of which was baldly stated: "Provided that the area south of Batum and Baku in the general direction of the Persian Gulf is recognized as the center of the aspirations of the Soviet Union."

In this sentence the editors of *Fortune* read the historic longing of Russian rulers to extend their southern perimeter around the land from the Dardanelles south through the countries bordering on the Red Sea and Persian Gulf. Since this area is on the global East-West dividing line, it belongs, they believe, in the Soviet plan for conquest, and Russian hunger is immensely sharpened by the smell of Near East oil—fifty per cent of the world's known reserves. The natural result of heightened Soviet interest has been a corresponding increase in American concern for the Near East. The *Fortune* article summarizes the situation with emphasis on what the U.S. should do about it.

Most of the countries of the Near East were created out of the collapse of the Ottoman empire after World War I and the decline of the French and British empires after World War II. These new countries, antipathetic toward their former rulers, have turned for help to the United States, chiefly for capital and technology to develop industry in the midst of a feudalistic society. American oil companies have responded with one billion dollars in investments. Learning from experiences in Mexico, the American companies have signed 50-50 royalty contracts with local rulers and have devoted considerable time and money to good-will projects having little to do with the oil business—road building, company schools, technical assistance, etc.

In addition to the oil industry, a variety of American businesses have recently built plants in the Near East to supply a growing market. But the general feeling is that loans, Point Four, and private business are not enough. The basic reforms needed in the Near East are in fiscal and tax policies, in land reform and improved agricultural technology, in reduction of disease and illiteracy. Although several of these problems have been attacked piecemeal by various official and private organizations, the big need, *Fortune* says, is for an official U.S. policy which embraces all these points and works on them intelligently and comprehensively.

Vincent Sheean, "The Case for India," Foreign Affairs, October 1951, pp. 77-90.

Even though the right to free and honest difference of opinion is cherished and advocated by Americans, disagreement from abroad with American foreign policy is fiercely resented in both private and public quarters. This paradox, which is as old as our nation, was recently exhibited when India refused to support the American proposal to brand Chinese Communists as aggressors before the United Nations. Because Mr. Nehru could not go along with the American proposal, he was looked on with deep suspicion and mistrust, and he became the object of private and public condemnation.

Mr. Sheean believes that India's friendship is invaluable because her "principal strength is psychological; it comes from the prestige won in a great national revolution accomplished by non-violent means. It comes from the moral interest of all Asia in that national movement, and from the leadership under which it was achieved." Asian peoples are proud when they see a free, self-governing India steering a course in the troubled international waters where most European observers predicted it would fail.

Mr. Nehru's foreign policy, Sheean explains, has invariably aspired to "friendly relations toward all countries which are willing to reciprocate; and a firm refusal to join any military alliance of one group against another." Each decision is made on the merits of the question involved, regardless of the alignment of other powers. Realizing that if Asia goes Communist the danger to India is great, the Indian government feels that it faces not recognition of danger "but the choice of method by which that danger may be faced." Should Nehru align himself militarily and economically with the United States, he would invite invasion from the vast Communist territories of Eurasia. Since India has no geographical security on a continent engulfed by Communism, no realistic Indian could consent to such an alliance. In addition, "India has a moral legacy of considerable persuasiveness which sets its mind against military combinations and involvements."

In no way, claims Sheean in his analysis of India's foreign relations, can any of her actions be interpreted as a deviation from normal Indian antimilitary policy. The use of force in self-defense, approved by Ghandi, was responsible for India's vote in favor of a stand against North Korean aggression. The Indian support for U.N. action in Korea flagged as U.N. troops crossed the 38th parallel towards the Chinese border. In the Asian view the U.N. crossing of the parallel ceased to be resistance and became aggression. Branding the Chinese Communists "aggressors" was objected to as gaining nothing and possibly provoking a flare of temperament that might inhibit a peaceful settlement. American intolerance of this purely academic difference of opinion, says Sheean, resulted in the branding of Nehru as a Communist or a Communist sympathizer—a fact far from the truth. India's recognition of Mao Tse Tung's Communist government was decided up at the Colombo Conference with all British Commonwealth powers in attendance. The action, not protested by the U.S. State Department, was justified realistically by Nehru when he stated that India was concerned with the *de facto* existence of government in China—not with the political color of the existing government. Asia, the author states, is neither capitalist nor Communist but peasant, and "starving peasants take little count of our paleface ideologies." Furthermore Nehru has imprisoned 12,000 to 15,000 Communists without the privilege of bail, *habeas corpus*, or any other of the traditional safeguards.

Nehru's strength in foreign relations stems, Sheean feels, from his understanding the tangled elements in Asia better than any other democratic statesman. He is not hypnotized by technology nor economics. He represents an ideal force to all Asians who believe in freedom. His government is dedicated to two things—to guarding India's independence and improving the lot of her people, and to saving the peace of the world—since war "might engulf everything that has evoked the energies of man since time began." Disagreement in detail is to be expected between India and the United States, but we should acknowledge our common devotion to democracy and peace by honoring difference of opinion.

BRIEFER COMMENT

Jean-Marie Domenach, "Leninist Propaganda," Public Opinion Quarterly, Summer 1951, pp. 265-273.—Domenach discusses the purpose and content of the two fundamental forms which Lenin prescribed for Communist propaganda—slogans and omniscient political revelations—and describes the development of the total propaganda which now embraces virtually every state and individual activity in Communist states.

Sir Hartley Shawcross, "Why We Trade With Communists," United Nations World, November 1951, pp. 18-19.—Britain's trade with Communists is not subject to moral or ideological judgments. Viewed realistically, it is a matter of economic necessity, brought on by the erratic disposition of food and minerals around the globe.

Paul E. Zinner, "Problems of Communist Rule in Czechoslovakia," World Politics, October 1951, pp. 112-129.—The major problems confronting the Communist rulers of Czechoslovakia since their coup in 1948 are consolidation of power, development of the economic bases of "socialism," and inculcation of the party and the whole population with the "proper" spirit.

G. W. Long, "Journey into Troubled Iran," National Geographic, October 1951, pp. 425-464.—An excellent pictorial trip through Iran with accompanying narrative, colored plates, and map. There are photos of Abadan—the city built by the Anglo-Iranian Oil Company.

F. H. Soward, "The Korean Crisis and the Commonwealth," Pacific Affairs, June 1951, pp. 115-130.—How the Korean war uncovered the different opinions, attitudes, and outlooks of the Commonwealth nations towards Korea, China, and the Far Eastern crisis, why they existed, what they were, and how they were partially resolved.

"The New Israel," Focus, September 15, 1951, pp. 1-5.—A good, brief description of Israel, its geographical, political, social, and economic composition, together with maps showing this new country in relation to the Middle East.

Roy Harrod, "Hands and Fists Across the Sea," Foreign Affairs, October 1951, pp. 63-76.—A discussion and evaluation of Anglo-American relations.

"Report on China," The Annals of the American Academy of Political and Social Sciences, September 1951, pp. 1-223.—Presents a well-rounded and detailed background for present China and the Chinese people. The volume is made up of articles divided into five categories: Revolutionary Ferment in China, 1911-51, Political Structure of Communist China, Economic and Social Policies of the Chinese People's Republic, Foreign Policy and International Relations, and The Non-Continental Chinese.

Charles Issawi, "The Wave of the Future in the Near East," United Nations World, November 1951, pp. 21-24.—Widening political reform in the Arab world, bringing with it mob violence and terrorist murders, will satisfy neither the radical elements who want more drastic change nor the conservative elements who oppose any change.

A. Th. Polyzoides, "Iran-America and the Middle East," World Affairs Interpreter, Summer 1951, pp. 134-144.—Discusses motives and reasons for American interest in the Middle East, presenting the historical background for the present tension and the oil crisis. America's position in the Near East has traditionally been one of aloofness from political controversies, with help for the underdog. Consequently we are liked and respected there.

John W. Riley, Jr., Wilbur Schramm, and Frederick W. Williams, "Flight from Communism: A Report on Korean Refugees," Public Opinion Quarterly, Summer 1951, pp. 274-286.—A report of a psychological warfare team sent to Korea by the Human Resources Research Institute, Air University, to make a study of the human factors and problems connected with the war in Korea. Both North and South Korean reactions to Communism are explored.

"The War in Korea—a Chronology of Events, 25 June 1950—25 June 1951," The World Today, August 1951, pp. 317-328.—A chronological compilation, by day and month, of political and military events of the Korean war. Handy for future reference or research.

Bruno Lasker, "Freedom of Person in Asia and the Pacific," Pacific Affairs, June 1951, pp. 143-169.—Deeply embedded, centuries-old customs, mores, practices, and institutions have a profound effect and direct bearing on freedom of person in the vast Pacific and Asian areas. Lasker believes freedom of person cannot be achieved without a major revolution in ideas, as well as in political and social thinking.

Norman D. Harper, "Security in the South Pacific," Pacific Affairs, June 1951, pp. 170-178.—A discussion and evaluation of the possibilities of a Pacific pact, portraying Australia's leadership.

Thomas E. Dewey, "Why the U.S. is Losing the Cold War," U.S. News and World Report, November 2, 1951, pp. 34-36.—After his trip through the Far East Mr. Dewey concludes Russia is outspending us for propaganda and outsmarting us in the cold war. Ideas, according to Dewey, are more important than bullets.

W. H. Forbes, "What Will India Eat Tomorrow," The Atlantic Monthly, August 1951, pp. 36-40.—India has eight to ten people per unit of natural resources compared with one per unit in the United States. Housing conditions are appalling—thirty per cent of the population of Bombay live with twenty or more people per room. Total population has increased eighty-eight millions between 1921 and 1941. Unless custom is breached and birth control established, India's future offers no alternative to starvation.

Lester B. Pearson, "The Development of Canadian Foreign Policy," Foreign Affairs, October 1951, pp. 17-30.—Traces the development of Canadian foreign policy from World War II to the present, including Canada's participation in N.A.T.O. Points out why Canada is interested in the Far East and other critical world areas.

Sa'id B. Hunadeh, "Economic Factors Underlying Social Problems in the Arab Middle East," The Middle East Journal, Summer 1951, pp. 269-283.—The author believes poverty to be the root of the problems he treats. He discusses the economic aspects of the many social problems in both rural and urban areas.

S. L. A. Marshall, "Our Army in Korea—the Best Yet," Harper's Magazine, August 1951, pp. 21-27.—A study of the Eighth Army, the battle conditions it has faced, and its ability to adapt itself successfully to new situations and peculiar innovations in warfare.

John Carr-Gregg, "Building Democracies in Africa," The Survey, October 1951, pp. 422-425.—Describes the long forward step toward self-government in the Gold Coast and Nigeria and how illiterate citizens mastered the procedures of registration and voting.

C. J. Webster, "The Growth of the Soviet Arctic and Subarctic," Arctic, May 1951, pp. 27-45.—The growth and development of the Soviet Arctic and subarctic regions in transportation, mining, fisheries, timber, furs, game and agriculture, population, settlements, emigration, etc. Charts and maps illustrate past growth and present size. There is some discussion of ethnological groups.

Frederick Osborn, "The USSR and the Atom," International Organization, August 1951, pp. 480-498.—A study and evaluation of the Russian position during the United Nations negotiations for international control of atomic energy. Why the Russian demands were unreasonable and unacceptable to the United States and why they would not provide for an iron-bound guarantee of atomic control.

Wallace E. Pratt, "The United States and Foreign Oil," The Yale Review, Autumn 1951, pp. 94-113.—Recounts past U.S. policy and attitude toward foreign oil and summarizes American overseas oil industry and development. Explains why, in the light of our past attitude toward foreign oil, the U.S. approved both expropriation and nationalization of Iran's oil.

Sergey Levitsky, "Soul and Mask of Bolshevism," The Scientific Monthly, September 1951, pp. 183-187.—Analyzes and evaluates Stalin's brand of communism in contrast with that of Marx and Lenin. A study of the outward and inward appearance and the composition of communism.

Nathaniel Peffer, and George E. Taylor, "What Should Be Our Policy Toward China," Foreign Policy Bulletin, September 15, 1951, pp. 4-6.—Peffer of Columbia University argues that the U.S. should drastically change its policy toward China, admitting the Peiping government to the U.N. if a Korean truce is achieved. Taylor, Director of the Far Eastern Institute, University of Washington, opposes recognition of the Red regime, as well as any other measures which comfort Communist China.

Joseph S. Roucek, "The Geopolitics of Greenland," The Journal of Geography, September 1951, pp. 239-246.—A brief, lucid discussion of Greenland as an important strategic land. The article is divided into three sections: geography—climate, topography, minerals, resources, size, etc.; general history of Greenland; U.S. world strategy and Greenland.

William H. Hessler, "Turkey—Russia's Gift to NATO," The Reporter, October 2, 1951, pp. 14-16.—The most spectacularly successful examble of American postwar foreign policy and geopolitics in action was the winning of Turkey to the West. When the Russian tactics of using pressure without readiness to use power backfired, the United States extended money and materials to Turkey.

Vladimir Dedijer, "Albania, Soviet Pawn," Foreign Affairs, October 1951, pp. 103-111.—Albania, the smallest Soviet satellite, holds a much more important place in the Kremlin's plans than generally has been realized. Not only is it the terminal of a passageway to the Mediterranean from which Italy and the Mediterranean area can be dominated, but it is also a dagger in Tito's back and a propaganda platform in southern Europe.

John H. Wirorinen, "Democracy Gains in Finland," Currrent History, October 1951, pp. 208-211.—Wayne S. Vucinich, "Communism Gains in Albania," Current History, October 1951, pp. 212-219.—Two companion articles which remind the reader that the cold war is not restricted to major nations but also rages fiercely in the smaller European countries.

Bernard Lewis, "Recent Developments in Turkey," International Affairs, July 1951, pp. 320-331.—A political analysis of the 1951 Turkish elections in which the democratic party (founded in 1946) overthrew the Kemal Ataturk Republican People's Party—indicating a development of political maturity in Turkey. This article shows how and why various economic, racial, religious, and social factors determined this current political swing.

Jean Marabinia, "Spain Against Franco," Harper's Magazine, September 1951, pp. 23-31.—A report on the Spanish underground—the anti-Franco forces—by a French journalist who traveled extensively through Spain and talked to many of the underground leaders. Portrays Franco's hold in Spain as weakening.

The Quarterly Review Contributors

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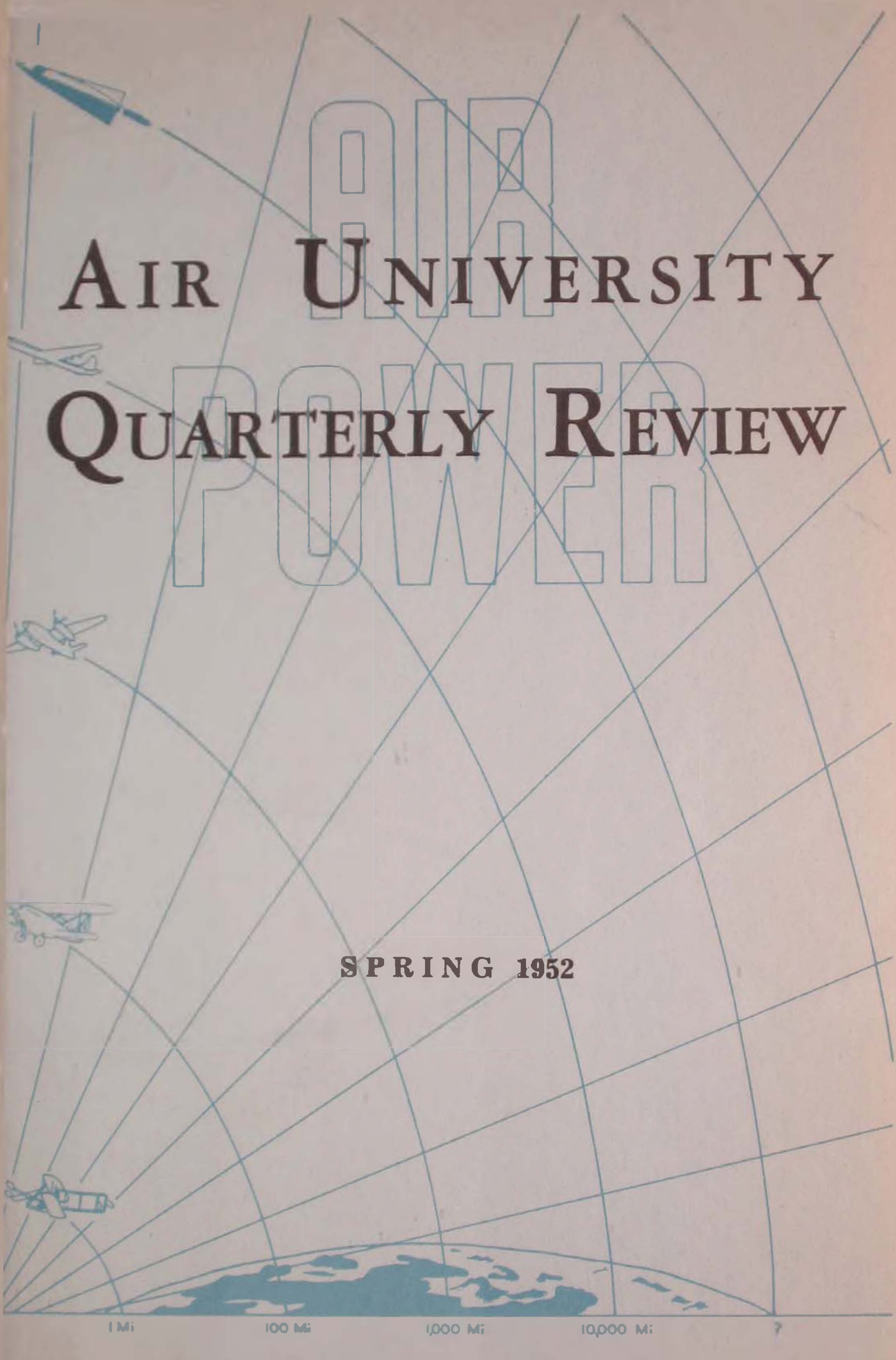

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