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ATTENTION

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General Otto P. Weyland
Commander, Far East Air Forces

At the request of the Editors of the* Air University Quarterly Review *to discuss the air action in Korea, General Weyland has written a document of foremost importance to the understanding of military air power today. He not only reaffirms the soundness of USAF doctrine but, for the first time, authoritatively interprets the employment of air forces in the Korean War.

The Air Campaign in Korea

General Otto P. Weyland

On Sunday, 25 June 1950, at 0400 hours, the North Korean Communists launched a military campaign with the political purpose of unifying all of Korea under Communist domination. The military objective was the capture and control of South Korea.

Since capture was the objective of the North Koreans (and capture has been the traditional objective from time immemorial in the offensive employment of armies), their military offensive was primarily a land campaign. In designing their military forces for this campaign, the Communists took account only of those forces actually facing them in South Korea.

In April and May 1950 large shipments of military hardware flowed from the U.S.S.R. into North Korea: heavy artillery, trucks, tanks, and automatic weapons for the North Korean Peoples' Army (NKPA) and some outdated aircraft for the North Korean Air Force (NKAF). The NKPA was fat; supplementing the Soviet deliveries, North Korea itself provided light arms, ammunition, and food. For its basic combat strength the NKPA had nine fully equipped and trained infantry divisions and one armored division on the line on 25 June, augmented to approximately 13 divisions during the first two months of the war. The NKAF's strength at the outbreak of hostilities was approximately 150 obsolete Russian planes, mainly YAK-7's, YAK-11's, and IL-10's. In comparison the Republic of Korea ground forces (ROKA) comprised six infantry divisions, organized primarily for border and internal security. The largest weapon at their disposal was the 81 mm mortar. For all practical purposes, the Republic of Korea Air Force (ROKAF) was nonexistent, although there was an Air Force organization with ten T-6 trainer aircraft.

The North Korean Communists and their Russian advisers apparently anticipated no resistance from the U.S., or from other nations. Furthermore the Reds probably felt that intervention by others could not be effective before they accomplished their military objectives. They were wrong on both counts. Far East Air Forces (FEAF), the air component of the United States Far East

Command (FEC), was in action over South Korea less than eight hours after the U.N. voted to intervene.

The United Nations Command (UNC) was organized soon after hostilities began. Its mission was support of the Republic of Korea, whose armed forces were integrated into it. In addition to the U.S. ground forces, the UNC eventually incorporated ground units from Great Britain, Canada, Turkey, Greece, Luxembourg, Ethiopia, France, Belgium, the Philippines, Australia, Colombia, Thailand, New Zealand, and the Netherlands. Augmenting FEAF units were U.S. Marine Corps and Navy air units, as well as British, Australian, South African, Greek, ROK, and Thai air elements. Denmark, Norway, Sweden, Italy, and India contributed medical units.

The Commitment of Air Forces

As we review what UNC air power accomplished in the Korean War, it is most interesting to speculate about what the course of events might have been if a North Korean Air Force had been developed with an eye to the potentialities of modern air power. The Communists may not have anticipated intervention but, if they did, they certainly underestimated the mobility and flexibility of air power and its effectiveness against an advancing army.

Let us take a brief look at the Far East Air Forces as they were when the North Koreans attacked, and before the UNC was organized. FEAF's mission as part of the occupation force had been directed toward internal security and air defense. Its tactical training program had been preoccupied wth practice interception missions, exercises, and so on.

FEAF combat units consisted of eight wings: five fighter, two bomber, and one transport, plus various support units, comprising an aggregate of some 1172 aircraft. The wings were located mainly in Japan, with single wings located on Okinawa, Guam, and the Philippines. Although FEAF was committed to the Korean effort, it was not relieved of its air defense mission in the Far East. One medium and one light bomber wing and eight fighter squadrons were committed to the Korean effort, while ten fighter squadrons remained in defense of Japan, Okinawa, and the Philippines.

At the time hostilities began, many of these units were engaged in summer squadron maneuvers away from their home bases. Because of the suddenness of the emergency, some units were committed to combat without returning to their home bases, and

others were committed with simultaneous move orders. At no time did a unit have to cease combat operations in order to complete these moves.

While the intra-theater movement was taking place, an accelerated augmentation program was initiated from the ZI. In less than ten days after the decision was made, two medium bomber groups had moved to the Far East and flown combat missions over Korea. Within thirty days the Navy carrier BOXER arrived with 145 F-51's to supplement existing FEAF aircraft.

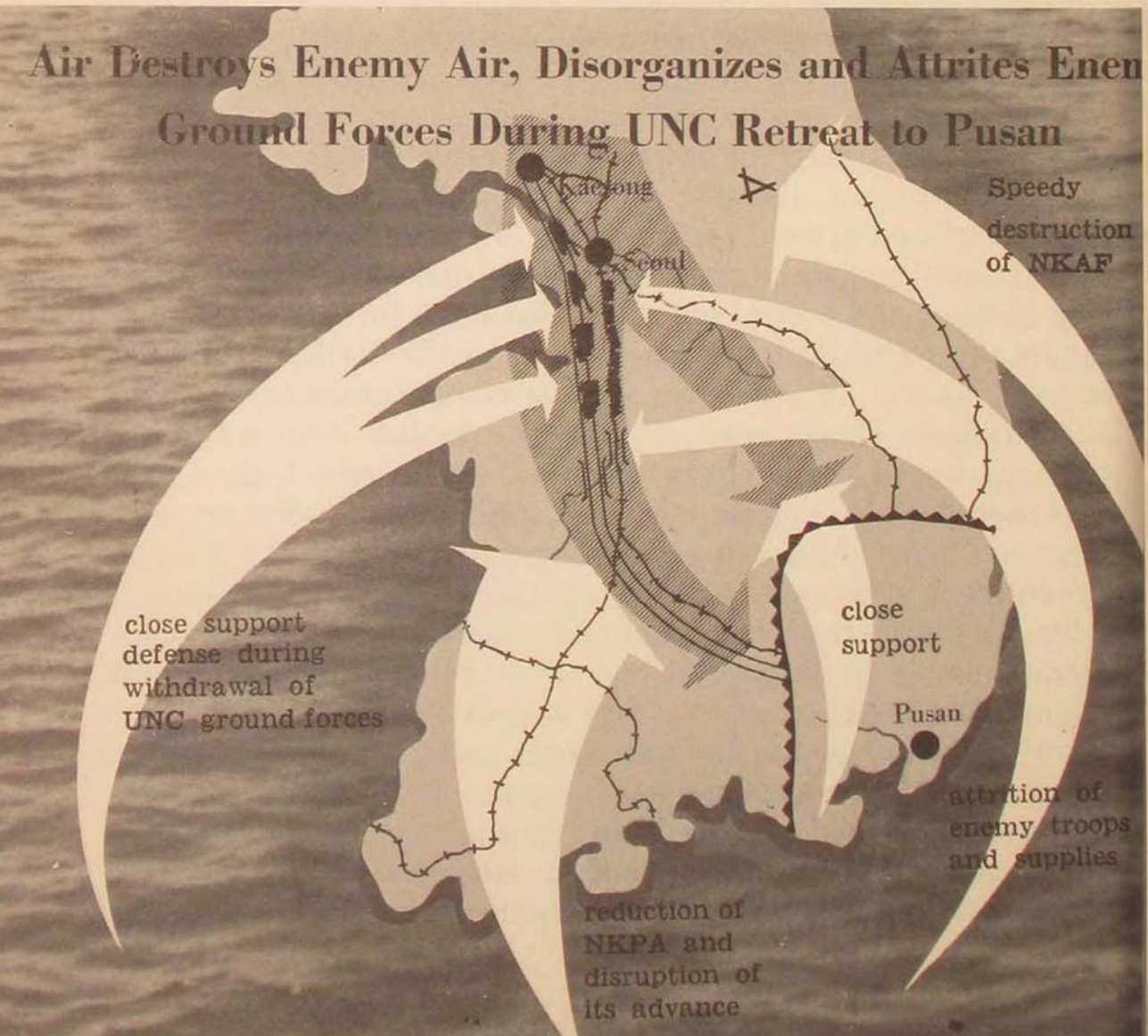
I should like to turn now from these aspects of inherent mobility to the firepower of modern air. This may be seen by tracing the course of events and refreshing our minds concerning important facts.

Defeat of North Korea: Firepower of Modern Air

On 25 June 1950 the NKPA launched its assault on South Korea and by 29 June had overrun and captured Seoul. The ROKA, hard hit, retreated southward in the face of a continuing drive by the NKPA and was on the point of dissolution when the United States entered the war.

During the first two days (25-26 June) of the conflict FEAF's main effort was directed towards the evacuation of American nationals and escort missions. The following two days were limited to air attacks on ground targets south of the 38th parallel and a limited number of air engagements. Elements of the 24th Division were airlifted and committed to combat on 4 July, not as a unit but by the plane load, and together with the ROKA, initiated delaying actions. These forces were later reinforced by the U.S. 25th Division. Despite this, the NKPA was able to continue its drive southward until it was forced to halt in mid-August, and the Pusan perimeter was established. On 29 June, after the Air Force was given the green light to operate north to the Yalu, a concentrated effort was directed against the North Korean airfields. By the latter part of July FEAF's destruction of the enemy's aircraft, mainly on the ground, had reduced the NKAF to no more than a token force, estimated to be approximately 18 serviceable aircraft. Control of the air over Korea had been gained, with a minimum of effort and loss on our part. From then until the armistice was signed, the air attack by the NKAF could be considered strictly of a nuisance variety. Had the NKAF not been destroyed it could have been a potent force against the ROKA.

Here and in the succeeding graphics the *Quarterly Review* attempts to recapitulate the main phases of the Korean air action and to portray the great lesson of the war, as interpreted by General Weyland. The United Nations Command air forces played a decisive role and became the primary offensive weapon of the Korean War. By volume of fire power delivered over the whole of the enemy's forces, they weakened and pinned down the initial NKPA advance until the UNC ground forces could be reinforced and consolidated on the Pusan perimeter. By an interdiction program so comprehensive and sustained that it amounted to vertical envelopment of the enemy's ground forces "as sure and decisive as if an army had been introduced behind him," they opened the way for the ground break-out from Pusan and spearheaded the mop-up of the NKPA. By a progressively more-crushing attrition as the enemy rolled southward and exposed long supply lines and large rear areas to air attack, they disrupted and reduced the CCF drive from the Yalu until the ground front could be stabilized. By a round-the-clock air offensive during the two-year pre-truce period, they attrited and immobilized the enemy until he was brought to an armistice on acceptable terms. In summation General Weyland declares that clear-cut war objectives, the threats posed by the enemy, and the opportunities to exploit our capabilities must inspire strategy and govern employment of forces.



In the meantime the remainder of the UNC air effort was being directed against the advancing NKPA and in close support of the UNC Army. Although it would have been highly profitable for air to interdict the main supply routes (MSR) behind the front lines, it is doubtful if the UNC Army could have held until the the full effects were felt. The air effort had to be committed to reinforce the hard-pressed ground forces. Close support by air had to make up for a lack in Army organic support fire. This use of air power enabled the combined ground forces to trade space for time and prevented the NKPA from accomplishing its mission. As a prime illustration of the UNC air effectiveness, on 10 July an enemy column was caught bumper to bumper at a bombed-out bridge near Pyongtaek. The ensuing air attack cost the enemy 117 trucks, 38 tanks, and seven halftracks. Similar attacks reduced the sole NKPA armored division to remnants before it reached the Pusan perimeter.

In late July UNC air attacks began to concentrate on MSR's in the rear areas as the first real planned interdiction program was initiated. This was to be an around-the-clock effort, since the enemy had begun to use darkness as protection for moving supplies and personnel. The enemy not only geared his logistical system to night operations but also turned to fighting primarily at night. The B-26's bore the main burden of this night effort. Higher headquarters continued to direct the majority of air effort toward close support in August and September at a time when it had become less profitable than other attacks. The small effort that remained to be devoted to interdiction reduced the enemy's forward flow of supplies from a 206 ton average in early July to a mere 21.5 tons during the period of the Pusan perimeter defense.

In the meantime, since the middle of August, the UNC ground forces in the Pusan perimeter had been steadily augmented to a total of four U.S. infantry divisions, seven ROK divisions, and one British brigade. With this build-up, on the 15th of September the ground forces started the break-out from the Pusan perimeter. The Inchon landing was begun that same day by the First Marine Division and the Seventh U.S. Infantry Division. At this time it became readily apparent that the air force had done its job well. The NKPA around the Pusan perimeter was nothing more than a skeleton which had been depleted by direct destruction and starved by the interdiction program. The UNC forces pushing north met little organized resistance. The forces landing at Inchon likewise met no determined opposition and in addition were protected by

the immobilizing effects of previous UNC air attacks and concurrent strikes on enemy reinforcement routes. In fact the UNC air interdiction had been so effective that the northward movement of friendly forces and supplies was considerably impeded. There were insufficient trained and equipped engineer forces to repair promptly the railroad bridges as friendly forces advanced.

Our rapidly advancing army out-ran its supply system. The air forces airlanded and airdropped much needed ammunition and supplies. This resupply was provided by C-119's, C-47's, and C-54's from Taegu to the Yalu. UNC ground forces reached the Yalu the latter part of October 1950, hard on the heels of the fleeing personnel of the former NKPA. This drive northward saw only sporadic and weak resistance by air-battered NKPA units, which at no time in their rapid retreat were able to organize a solid coordinated front. Elements of the U.S. X Corps, landing at Wonsan on 20 October in an attempt to cut off the enemy, arrived too late. The ROK Army was already there.

In the four-month period, July to October 1950, that elapsed before the remnants of the NKPA were driven to the Yalu, destruction from the air made it a high priced war for the enemy. As I have said, FEAF entered the Korean War with one medium bomber wing. By the first week in August four additional B-29 wings had been committed. The nature of the North Korean economy was such that there were few big industrial targets. These to a large extent had been destroyed by 2 October 1950, and two of the medium bomb wings had been returned to the Z1. During the period the enemy airfields were knocked out and kept unserviceable, and ports, marshalling yards, communication centers, and supply areas were kept under constant attack, preventing the build-up and stockpiling of war materiel. In other phases of the UNC air activity, incomplete statistics show a minimum of 39,000 enemy military personnel killed by air attack. There is no record of the wounded who were moved away before the UNC Army took the territory. The 39,000 figure came from direct air and ground observations and does not include bomber strikes or night attacks where observations could not be made. This figure represents about one third of the original ten divisions that attacked on 25 June 1950. Air attacks were also credited with the destruction of 452 tanks, 76 per cent of the total destroyed by all forces. In the interdiction program 75 bridges were rendered unserviceable and five damaged by continuous air attacks. The enemy transportation

ir Envelopment and Ground Offensive Destroys Enemy Ground Forces: Breakout from Pusan Perimeter

system also suffered the loss to air attack of more than 6000 vehicles, over 1300 freight cars, and some 260 locomotives. To complete the destruction of the NKPA, the ground forces killed and wounded large numbers and captured more than 100,000 prisoners. In addition to personnel of the thirteen divisions finally committed, many of those casualties and prisoners were support troops.

As elements of the UNC Army reached the Yalu in late October the Chinese Communist Forces (CCF) were preparing to launch their unexpected counterassault. Some of its units had been committed. In spite of this the original war was over. The North Korean military forces had been defeated, and the country conquered. But a war with a new enemy was about to begin.

Rear Guard from the Yalu: Reduction of the CCF

By late November the Chinese Army had swelled to nine self-supplied armies, supported by two artillery divisions. Each army had the equivalent of six artillery battalions. The total estimated strength was more than 250,000, and the potential of further reinforcements was obvious. Opposing these forces were eleven UNC divisions. UNC units elsewhere in Korea brought the total to 267,000, of which 130,000 were United States, 127,000 ROK's, and 10,000 other U.N. personnel.

On 26 November the CCF launched its offensive that was to push the UNC ground forces south to the 38th parallel. Since the first commitment of CCF units in October, air strikes against the enemy build-up and reinforcement had not been possible because the bombline was actually on the Yalu River in several places. In between, only small areas were open to attack. Feeling the pinch caused by this lack of air attacks, the UNC ground forces were compelled by the overwhelming enemy force to fall back with severe losses. That this defeat was not a complete disaster can be largely credited to the air support by UNC air forces The enemy was slowed down in his advance sufficiently for the Eighth Army to make an organized withdrawal with a minimum of casualties. Air strikes forced the CCF to travel only at night. Again we traded distance for time, and again extension of the enemy rear enabled the air forces to fight effectively.

By the time that the CCF Armies intervened in the Korean conflict FEAF's contribution to the UNC Air Forces had been expanded to three medium and two light bomber wings, 13 fighter

squadrons, and four transport groups, plus general support units. The medium bombers were flying from Okinawa and Japan, light bombers from bases in southern Japan, and fighters from airfields in the Seoul and Pusan perimeter areas. All Korea was within easy striking distance of all types of combat aircraft—the B-29's, B-26's, F-51's, and F-80's.

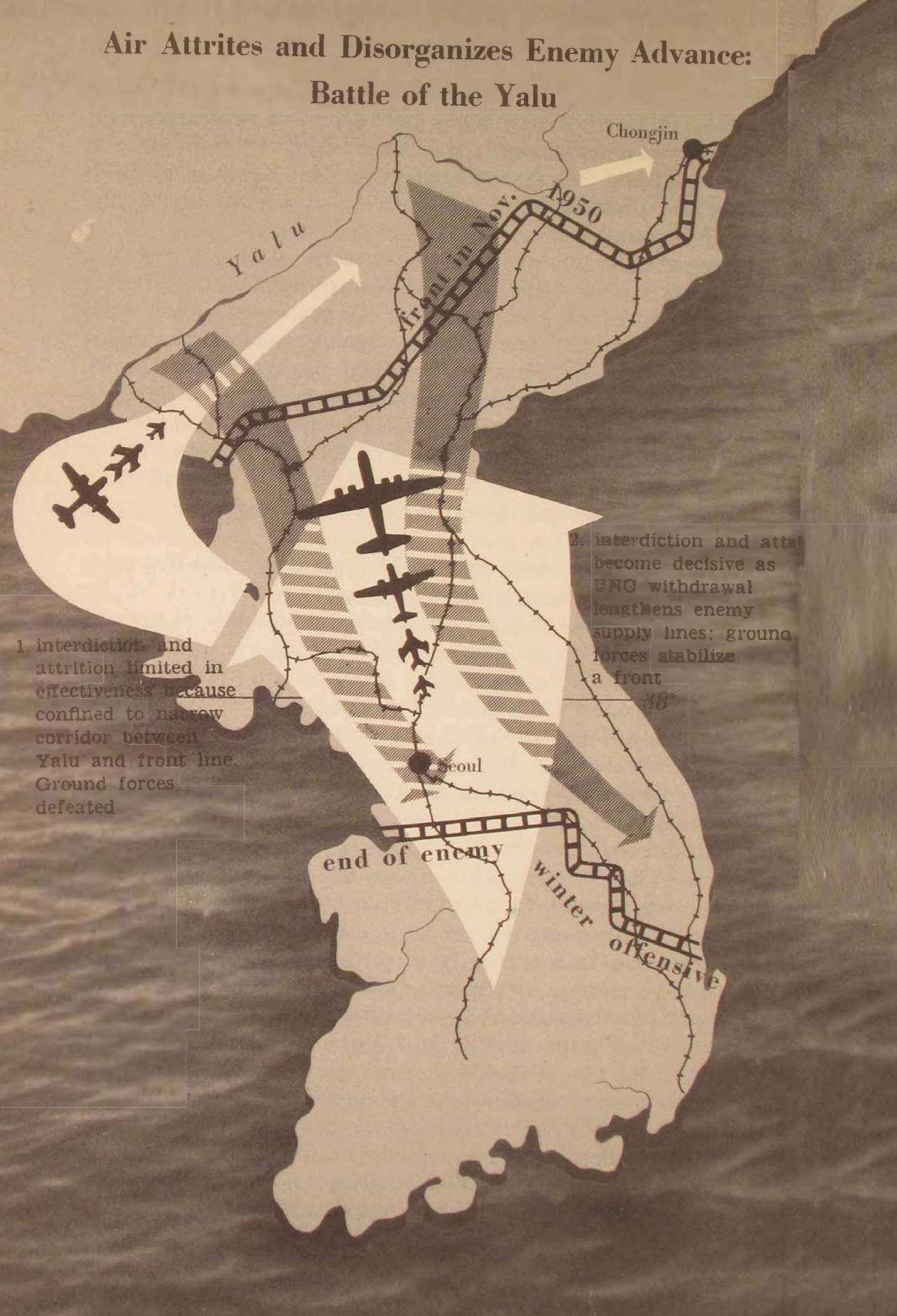
During the two months subsequent to the CCF intervention, the Air Forces reverted to their first Korean mission, as the effort was directed toward preventing the Army's envelopment as it withdrew. Here again interdiction and concentrated close support allowed UNC ground forces a "breather" during daylight hours, as the enemy was forced to move and fight at night for his own self-preservation. It was not until the UNC Army was able to stabilize its line in the vicinity of the 38th parallel that the interdiction program was again initiated in force. By this time the destructive attacks over the greater distances had had the effect of slowing down the CCF drive.

The UNC Army's stand on the 38th parallel in mid-December was short-lived. Although limited to night travel by UNC air strikes, the enemy was able gradually to build up sufficient strength to renew the offensive on 1 January 1951. In the face of this threat the UNC ground forces withdrew. Seoul fell on 4 January, and the friendly ground forces fell back to the Pyongtaek-Wonju line. This main line of resistance (MLR) represented the farthest southward withdrawal of friendly forces.

As the enemy was advancing, the cumulative effects of the UNC air strikes began to be felt. Forced to move over secondary roads and overland trails, mostly at night, the CCF logistic system finally collapsed. The enemy could not support a general offensive because back-up supplies were denied him by intensified air attacks. Reinforcing units required two and one-half to four months to travel from the Yalu to the front, according to prisoner-of-war reports, and arrived in no physical condition for combat. Constant harassment of overextended supply lines prevented adequate materiel support. On the western flank of the UNC MLR the enemy never attacked the UNC Army line south of Seoul. Friendly patrols encountered no enemy, and none was seen south of Suwon.

Taking advantage of this situation, the UNC ground forces initiated a counteroffensive which carried them by the first of April to a line just north of the December MLR. Here the enemy was able to make a stand. With a relatively static line, he was able to build

Air Attrites and Disorganizes Enemy Advance: Battle of the Yalu



up supplies sufficiently to make two more attempts to drive the UNC from Korea. Both failed because the CCF logistic system could not operate under UNC air pounding. Furthermore these offensives brought the enemy troops into the open and exposed them to air attacks. The result was that the enemy suffered extremely heavy materiel losses and enormous casualties. An example of these destructive air attacks was the pinning of two CCF armies against the Hwachon Reservoir and the subsequent around-the-clock battering by UNC air of these forces as they strove to escape.

Having fallen back to a line just north of Seoul, the Eighth Army broke the enemy's attack, and in turn on 22 May launched an offensive which was to carry them north again to the general area of the MLR for the next two years. The enemy was on the run and badly beaten. Faced with this UNC threat, he decided to take advantage of U.N. willingness to negotiate.

On 10 July the first session of the armistice talks was held. From this time on the UNC ground strategy was defensive for the purpose of saving lives pending the achievement of the expected armistice. It was also considered best not to overextend the front lines and the supply lines—at the same time shortening the enemy supply lines. The terrain gained by the operations thus far conducted was deemed to offer excellent defensive positions, from which long-range patrols, raids, and limited objective attacks could be launched. The objective of these limited attacks would be to keep the enemy off balance and also to secure the terrain most vital to a strong defensive position.

The cost to the enemy of the second phase of the Korean War was high. During the period of November 1950 to June 1951, at which time the enemy was chiefly the CCF, air power for the second time within a year proved its effectiveness against an enemy on the move. Continued air pounding of enemy forward areas and rear communications lines, both day and night, brought death to 117,000 additional enemy troops, destroyed 1315 gun positions, 296 tanks, and over 80,000 buildings used as troop and supply shelters. The transportation system was crippled by the destruction of over 13,000 vehicles, 2600 freight cars, and 250 locomotives. The further restriction of troops and supplies to night travel forestalled any possibility of the enemy building up sufficient strength to drive the Eighth Army from Korea, so long as control of the air was maintained by UNC.

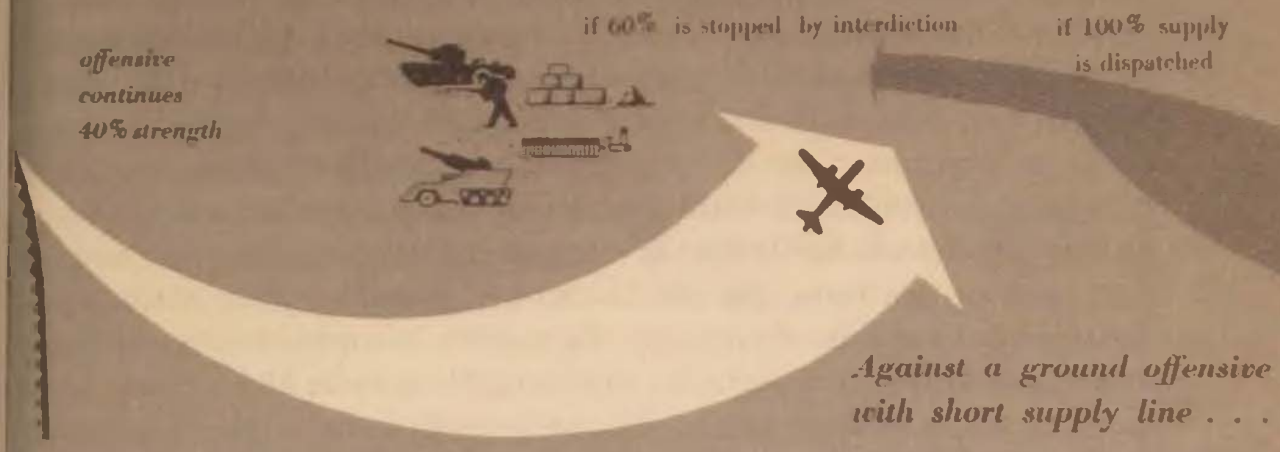
Air Envelopment: Defeat and Destruction of Field Forces

LET us now review the first and second phases of the war to see if we can get proper perspective on what actually happened. The air operations were begun with unsatisfactory communications and control systems for joint operations and with a very limited force with little training for the mission. Yet its mission was accomplished successfully. Credit for this, however, is due as much to the Communists' lack of foresight in developing an adequate NKAF as it is to UNC air capabilities. The most significant fact of the entire phase is that the enemy air force was completely destroyed, leaving our air bases and ground forces free from air attack, our extensive logistics and communications completely secure, and the bulk of our air force free to attack the advancing army at will. It is easy to see what would have happened if the shoe had been on the other foot, or even if the UNC air forces had had to spend most of their effort in a continuing battle with the NKAF.

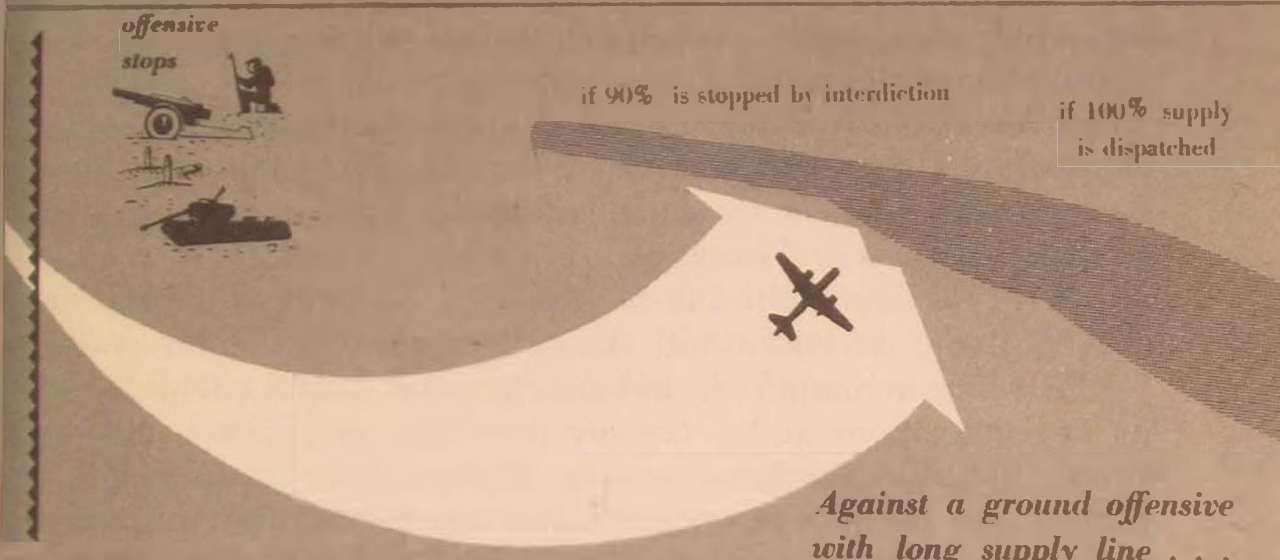
Air forces and surface forces, when committed to action in a theater, are each charged with accomplishing those tasks within their inherent capabilities. The security of the theater of operations, its geography, its people, and its military forces, is the responsibility of both air and surface forces. The air forces provide security from air attack, by destruction of the enemy air forces and with final air defenses. If the situation permits or if the strategy is properly designed, air forces can provide strategic security to the theater of operations. This security comes from decisive destruction and disorganization of an approaching army before it enters the theater or before it engages friendly ground forces in a climactic action. The effectiveness of such air action is directly proportional to the time, space, and fire-power available for the air attacks. In this kind of attack the effects are immediate and devastating.

The outset of air operations in Korea was a classic example of such opportunity for disrupting and disorganizing an enemy advance. The withdrawal of the ROK Army, as precipitate and disorganized as it was, gave the air forces an opportunity to reduce the overwhelming ground force odds against the ROKA by air attacks on the advancing enemy. When the two ground forces finally joined on the Pusan perimeter, the relative capabilities were such that the ROK Army, reinforced with American and British forces, could stabilize their positions.

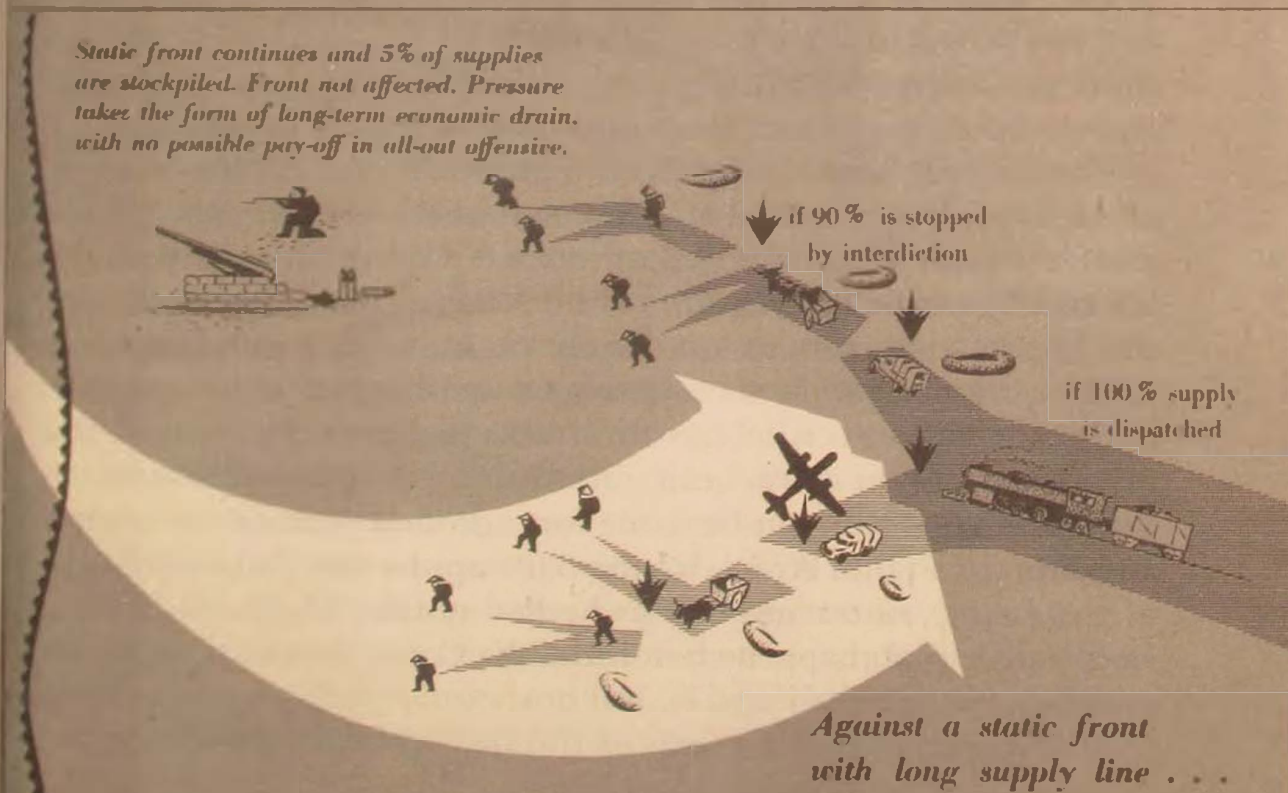
Capabilities of Air Attack against Ground Forces



Against a ground offensive with short supply line . . .



Against a ground offensive with long supply line . . .



Against a static front with long supply line . . .

We have discussed the interdiction program that was initiated to cut off the logistic flow to the enemy troops at the Pusan perimeter. To be successful, an interdiction campaign must be sustained with adequate fire power for a long enough period to reduce or eliminate the enemy logistic capability. When such a campaign is combined with continuing destructive attacks against enemy personnel and organic equipment both in the rear areas and in the front lines, the effects can be turned to great advantage by a proper combined strategy. In reality it constitutes a vertical envelopment of the enemy as sure and decisive as if an army had been introduced behind him. But the tactics of the friendly army must be modified to capitalize fully upon the unique effects of air envelopment, whereupon it can be just as effective as a lateral envelopment by ground forces.

The break-out in modern warfare is not as costly as it was in the days before air power. Neither are the risks of flanking attacks as great, because an enemy under air attack has not the required mobility—witness St. Lo and Patton's advance in World War II as opposed to ground action in World War I. Such was the case in our break-out at Pusan and the subsequent destruction of the NKPA. The immobilized and disorganized NKPA, denuded of its heavy weapons and relatively immobile, was effectively destroyed in place as the advancing Eighth Army captured great numbers of troops. Practically all of the remaining equipment was captured or destroyed well south of Seoul.

I am afraid that too little attention was given at the time to what had happened to the enemy as a result of air attacks. It was not until our army had broken out of the Pusan perimeter that its leaders became aware of the magnitude of the air destruction.

The Inchon landing had been planned for the precise purpose of accomplishing a lateral envelopment of the enemy. But I think the facts show that its actual effects were quite secondary to the air attacks in the destruction of the NKPA. Of course it showed the enemy commanders that their position was quite hopeless. They certainly would have retreated in the face of this threat. But if the full effects of the air attacks had been recognized, the new forces might have been introduced to better advantage at Pusan. A good case can be made for a ground strategy envisaging a reinforced Eighth Army driving hard up the east and west flanks of the enemy, outracing him as he fled north. This was, in fact, essentially what happened, for the X Corps was overtaken by events in both its landings.

Be that as it may, the effects of the Inchon landing partially be-

clouded those of the air attacks. There was not time for UNC commanders to stop and appraise the true role of air power as we launched our land campaign for the capture and control of North Korea. without questioning the wisdom of the objective, we can examine the facts of the campaign.

We have discussed the UNC Army advance to the Yalu and the subsequent overwhelming attack by the Chinese Communists. This time the shoe was on the other foot. It was we who had failed to provide for the contingency of intervention. The political restrictions and the ground forces movement to the Yalu had effectively put the air forces out of action against the opposing army. The air forces did maintain vital command of the air, but there was not the time and space available between the Yalu and our army to reduce the odds against our ground forces.

It is important for us to appreciate that this enemy ground force, so overwhelming at the Yalu, was the same force that failed to complete the envelopment of the Eighth Army after making such an auspicious start; the same force that failed to threaten seriously our final line of resistance; and the same force that was pushed back north of the 38th by our forces. It was the same yet a different army. Given the time and space, the air force had repeated the pattern of destruction and interdiction.

There is a tendency among many to regard all such air operations against ground forces merely as support of the army. This generates misguided concepts of organization, control, and employment which tend to affect adversely a smoothly functioning team. But more basically it prevents us from seeing the possibilities of employing both air and surface forces in the most effective combined strategy. I think there is a much clearer view we can take of the problem. Would it not be better to recall that land, sea, and air forces are committed in support of the over-all mission of the theater commander? Each must counter those threats that it is best equipped to counter. Each must exploit those opportunities for offensive action that will pay the biggest dividends. Each must capitalize upon the professional skill of its leadership. And each must support the other. We would then speak of the firepower delivered by air on the battle line, which is integrated with the maneuver and fire of the army, in terms of support of the army in its mission. If we take such a view, it should also be less difficult to see that over-all strategy must be geared to the air situation and the capabilities of the friendly air forces as much as to ground forces concepts of maneuver and fire. There should likewise be no stigma attached to the concept that ground force strategy may be

designed to exploit the effects of air strategy. If the objectives and situation are such that, in order to be successful, air power must be exploited to the fullest, then the ground forces must support the air forces.

Strategy Forces Armistice: The Air Campaign

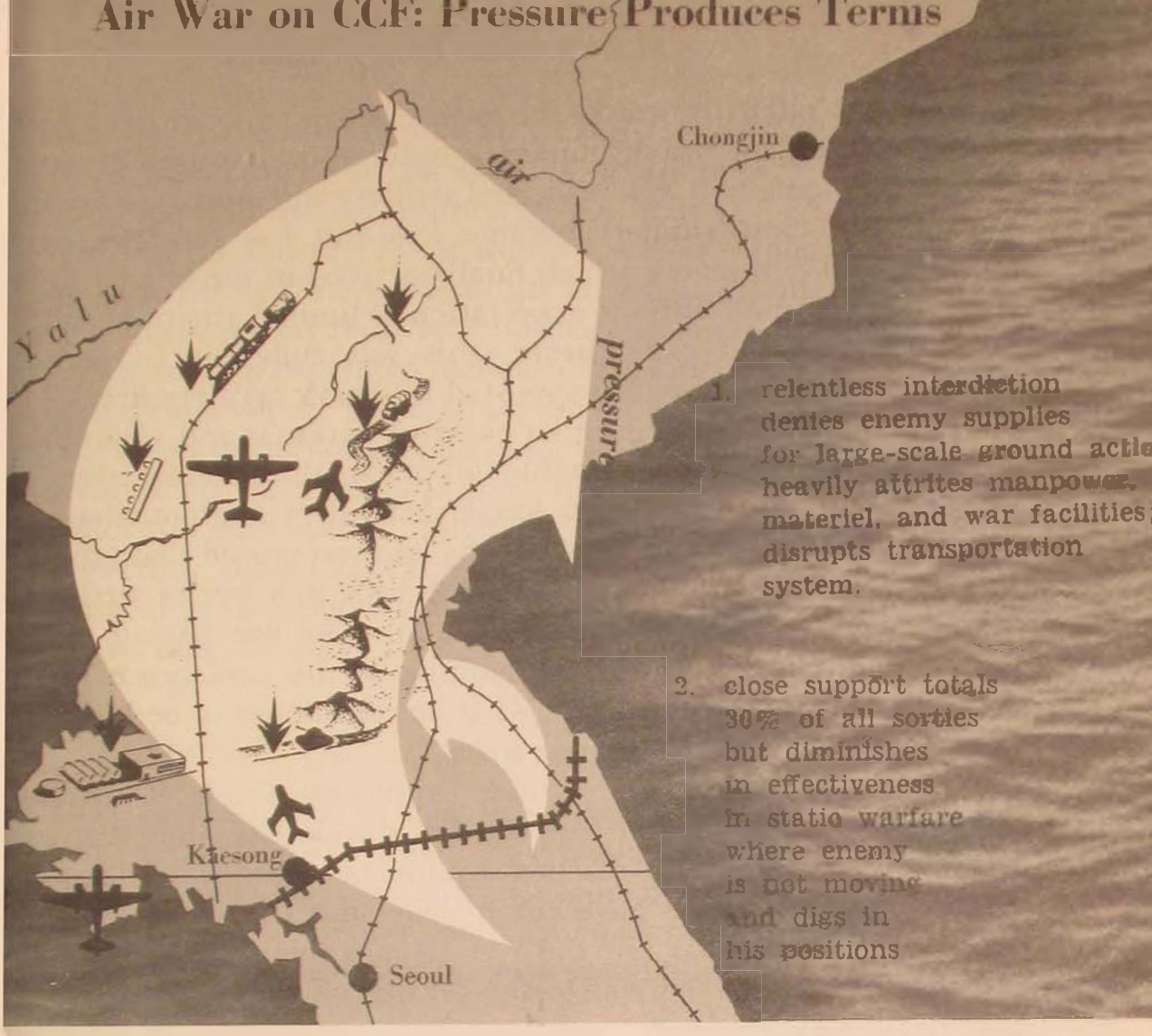
JULY 1951 ushered in a new phase of the war. When the delegations from the opposing sides met at Kaesong, they were implementing earlier decisions concerning political objectives, military objectives, and strategy. In fact it was such a radical change that we can almost call it a new war. Both the enemy and we had abandoned our identical political objectives of unifying all of Korea by force, and both had given up the military objectives of capture and control. The political and military objectives for each side became the same—the accomplishment of an armistice on favorable terms.

As a result UNC military strategy was changed. The UNC air forces were given the mission of denying the enemy the capacity to maintain and sustain further decisive ground attack, to maintain maximum pressure on the enemy in North Korea, and thus to create a situation conducive to a favorable armistice. The ground forces were to stabilize and maintain a strong defensive line. The UNC air forces were the offensive component of the combined forces, and the air attacks the offensive element of the combined strategy. In the sense that the air offensive was designed to obtain the final objective, an armistice, we can properly refer to it as a strategic offensive, and this phase of the war can be called an air campaign.

These realities were obscure to many. Among those who did understand the changes there were many who disagreed with the new objective. Again we do not need to challenge the objective to discuss profitably the meaning of what did transpire under the established policy.

Each side had paid a heavy price for the war up until this time. But by far the greatest price had been paid by the enemy. He was prepared to accept what he thought to be our terms when he came to the conference table. When he found the terms to be less favorable than he thought, the long negotiations began.

There is no doubt that there were times throughout the past two years when the UNC wished to return to the objective and strategy of the first and second phases, and there was much military and civilian pressure to change the political limitations on the war. The Communists must also have considered such courses, but their



situation was different, as I shall try to show. Regardless of these doubts and temptations on both sides, the thing we must understand is that the objectives and strategies were not changed.

As the armistice talks continued, a large portion of the air effort was devoted to establishing and maintaining the greatest possible interdiction of enemy logistics. The relatively static front presented fewer opportunities for destruction of enemy troops and equipment, but close support missions were flown whenever there was a possibility of helping friendly troops. From a strategic point of view, however, friendly ground forces had complete control of the ground situation. The close support was directed toward saving as many lives as possible, pending an armistice.

It did not take the enemy long to recognize that UNC ground force strategy was following the same defensive pattern as his own. He began to probe with patrols and to launch relatively heavy limited attacks to secure defensive posts and salients. The UNC Army also kept up its patrols and counterattacks, while friendly air forces roamed up and down the lines attacking any target that came

into view. Under the attacks the enemy began an extensive effort in construction of heavy bunkers, underground supply centers, trenches, tunnels, and well protected artillery and mortar positions. As a result, close support became less and less remunerative. Supplies and equipment which finally arrived in the enemy lines could be stockpiled with the expectation of limited attrition. With carefully regulated expenditure, this was sufficient to permit limited attacks in strength supported by heavy artillery fire.

These attacks launched under cover of darkness and completed before dawn exacted a regrettable toll of casualties among friendly troops. UNC equipment was lost and artillery ammunition was expended at a rapid rate. The enemy had recognized that ground attacks were his only means of striking back in a war of attrition. This was his attempt to equalize the costs he was paying to air attacks, and his weapon for bargaining at the conference table. Moreover the enemy was using what he considered to be his most expendable commodity—human lives.

It was only natural, under these conditions, for UNC ground forces to call for more close support; but the close support that was being given had already reached a point of diminishing returns. A greater effort would have cut heavily into the more effective attacks in the rear areas, and the over-all gain along the front would not have been proportional to the greater effort. This of course was difficult for the army man to appreciate. Now there were no forward movements to drive the enemy out of his dug-in positions by day and by night, nor were there large continuous advances by enemy units. As a matter of fact, because of earlier successes in fluid situations, we had come to expect too much of air in close support. Nevertheless FEAF and Fifth Air Force leaned over backwards to provide more than adequate close air support when ground forces became actively engaged, and at other times maintained a rather high level of effort on close support in order to maintain the air-ground teamwork and know-how in a state of well-oiled proficiency.

I might suggest that all of us should keep in mind limitations of air forces as well as their capabilities. Continuous close support along a static front requires dispersed and sustained firepower against pinpoint targets. With conventional weapons there is no opportunity to exploit the characteristic mobility and firepower of air forces against worthwhile concentrations. In a static situation close support is an expensive substitute for artillery fire. It pays its greatest dividends when the enemy's sustaining capability has been crippled and his logistics cut to a minimum while his forces are

immobilized by interdiction and armed reconnaissance. Then decisive effects can be obtained as the close-support effort is massed in coordination with determined ground action.

Thus in the fall of 1951 it would have been sheer folly not to have concentrated the bulk of our air effort against interdiction targets in the enemy rear areas. Otherwise the available firepower would have been expended inefficiently against relatively invulnerable targets along the front, while the enemy was left free to build up his resources to launch and *sustain* a general offensive. Such a general offensive, if it could have been sustained with adequate supplies and ammunition, might well have been decisive. Failure to appreciate these facts caused some adverse comment about the amount of close support given the army, particularly during late 1951 and early 1952.

The Air Offensive: Pressure and Results

Now let us go back to what was happening in the rear areas as the armistice talks began. In accordance with the objective to deny the enemy the capability to launch and sustain a general offensive, the interdiction campaign had been intensified. This kind of attack had dealt the enemy a lethal blow in the fast-moving ground battle during the first year. The successes had closely paralleled those in Europe during World War II. With these successes in mind enthusiastic air force planners hoped to isolate the enemy so effectively that he would not be able to sustain his forces on the line. At some time—I cannot find when or where—Air Force officers or newspaper writers dubbed the first phase of the interdiction program "Operation Strangle." I do not know just what degree of "strangle" this caption was supposed to denote. In retrospect I do know that it was an unfortunate selection of words, for it gave some who did not understand the real objective of the interdiction program a vehicle for proclaiming its failure.

If one assumes that the objective of the road and railroad interdiction was to deny the enemy the long-term capability to launch limited objective attacks, or even more, to deny him the capability to conduct an obstinate defense, then it did not do the job. On the other hand, it was an unqualified success in achieving its stated purpose, which was to deny the enemy the capability to launch and sustain a general offensive. Moreover the attritive effects of the interdiction program directly supported the other parallel objective of punishing the enemy to the maximum extent possible. He suffered considerable losses in motor transport, rails, bridging

materials, and rolling stock. When these losses are added to the destruction of airfields, supply centers, small manufacturing plants, and other facilities and to the huge recuperative labor effort, we can better appreciate what the air offensive was costing the enemy.

In time the pressure from air attack came to be recognized as the prime objective of the air offensive. The weight of effort was shifted so as to exact the greatest possible toll of enemy materiel and human resources. This attrition also effectively supported the more definite interdiction in denying the enemy a capability to launch and sustain a general offensive.

What was the pattern of enemy reaction to the air campaign? And what were some of the costs? You have probably noticed that no mention has been made of enemy air activity since early in the first phase of the war. The MIG-15's were committed to combat in November 1950, and as the Chinese Communist Air Force was built up, they were committed in greater strength. The story of the war in the air has been well told. UNC Air Forces killed over 840 MIGs at a greater than 10-to-1 ratio. What is not so well known is the determined effort the enemy made to establish the force on forward air bases in Korea. He surmised that if he employed his air force from China and Manchuria against UNC air bases and troops, the UNC Air Forces would strike back across the Yalu. He felt compelled to take some action to ward off the continuing air attacks. Therefore, late in 1951, he planned and started building an extensive system of airfields reaching well down toward South Korea. When UNC Air Forces set out to destroy these fields just as they were nearing completion, the enemy reacted violently. His greatest protective fighter attacks were launched against the destroying bombers and fighters. Some of his heaviest antiaircraft concentrations were thrown up around the airfields. Repeatedly he tried to repair the damage and complete the job, and just as often the bases were destroyed.

By early 1952 the enemy had learned the basic lesson that an air force cannot be reconstituted or developed in an area where his foe has won air supremacy. His remaining effort was directed toward trying to keep the northern-most fields in quickly repairable condition. It was his hope to have them ready to receive a substantial air force just as an armistice was signed and to be permitted to keep this force in Korea during the armistice, where it would be immediately available for effective action in the event he resumed hostilities. The fields were not in operational condition when the armistice was signed. Adjacent to the runways, however, were sod areas that were suitable for limited daylight landings.

The enemy reacted quickly in an all-out effort to recuperate from the interdiction program. He developed remarkable ingenuity and perseverance in rehabilitating his railroad and bridge system and in dispersing and hiding his supplies and equipment. An earlier story in the *Quarterly Review* has covered his camouflage technique. By way of repair and management he prefabricated rail sections and bridge spans; developed spoofing, such as using a bridge span at night and removing it during the day to give the appearance of unserviceability; used barges and underwater fords; forced more than 500,000 North Korean slave laborers to remain in place in repair gangs and made them work among delay-fused bombs as they repaired the damage; loaded freight in individual packages for shuttling by hand from freight car to truck and back again; transported supplies on A-frames on the backs of people; hid his trains in tunnels; and moved the bulk of his supplies by night.

In spite of this ingenuity UNC Air Force claims, destroyed or damaged, were:

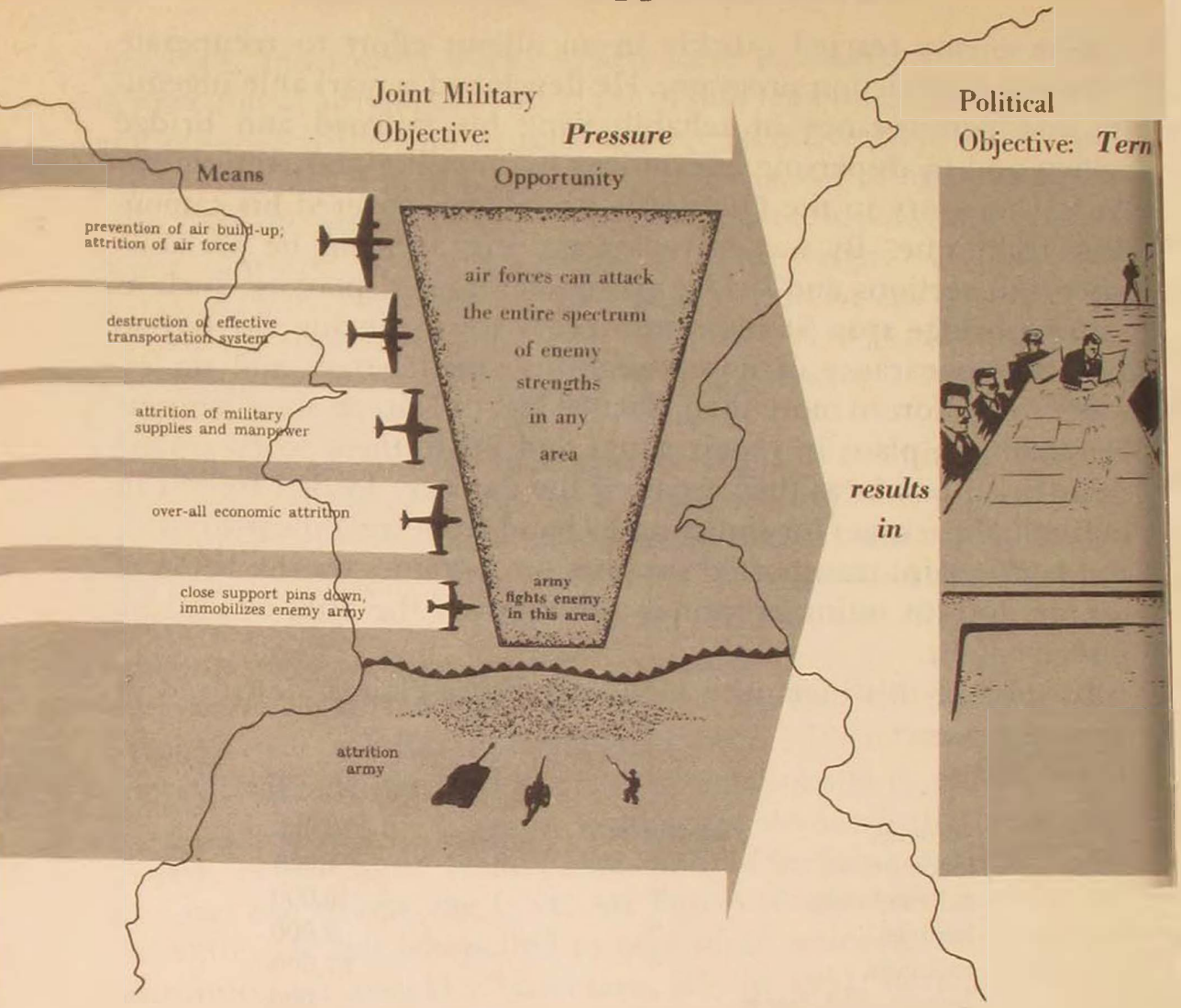
		July 51 to June 53
vehicles,	more than	75,000
locomotives,	"	1,000
railroad cars,	"	16,000
bridges,	"	2,000
rail cuts,	"	27,000
barges and boats,	"	600
troops,	"	28,000
tanks,	"	300
gun positions,	"	12,000
bunkers,	"	15,000

To date we have not estimated the equipment and supplies destroyed in air attacks.

Again I wish to point out that reported troop casualties were only those observed. Most of these were in the front areas. No firm estimate of enemy troop casualties resulting from the hundreds of thousands of sorties flown against targets listed above has yet been made. We know of course that tens of thousands of troops and drafted laborers were killed or wounded.

Under the relentless air attack the enemy further dispersed his supplies and facilities. He integrated his repair facilities with small Korean shops and moved his troops, supplies, and small manufacturing enterprises into caves and into buildings in the local villages and cities. As the UNC Air Forces pursued him,

Objectives and Opportunities



tens of thousands of buildings in use by the enemy were destroyed in the large urban areas and small towns along the main supply routes.

The direct effects of the air campaigns were felt as far as Moscow. A steady replacement of much-needed equipment was required from Russia, and, for example, we know that the Manchurian and Chinese rail development program was brought to a standstill. But in what kind of position did the enemy find himself in Korea?

His civilian life and to a lesser extent his military organization were reduced to a cellular system. Military supply arteries were cut, and the army came to be supplied by a system of osmosis. By carefully regulating expenditure, and at times by moving whole divisions back into a more easily supplied area, it was able to maintain a 30- to 60-day stockpile of the most essential supplies. This was not a mechanized, mobile army but dug-in hordes of infantry and hundreds of field artillery pieces. Since there was no danger of large attacks by UNC army forces until the political situation

changed, this kind of situation was not critical. The enemy was not only able to move troops back into more easily supplied areas, but he even used them to take the place of drafted North Korean labor battalions in gathering crops.

There are several aspects of the air campaign that should be examined in order to obtain a clear view of what transpired. Two have to do with interrelated considerations of the kinds of targets attacked and the force available. The North Korean supporters had put at risk valuable military equipment and trained troops, but their risks could be governed by their commitment. On the other hand all of Korea, down to the smallest manufacturing or mining facility and most of the populace, was at risk of attack.

The small size of the UNC Air Force required that a high degree of selectivity be exercised in choosing targets. The air force employed in Korea was not balanced to the concept of an air campaign; therefore there was insufficient force to attack many marginal targets. This primarily, along with some questionable considerations concerning the role of the North Koreans in the war, led to the policy of attacking systems of targets which would have a direct military effect. There were numerous small manufacturing and mining enterprises that were never attacked. There were many small North Korean villages which we were reasonably sure contained troops and supplies but which were never attacked because there were enough other targets of known value to absorb the available firepower. We know that in the aggregate the manufacturing and mining represented a sizeable contribution to Manchurian economy and to the support of the troops in the field. Individually they were all marginal in view of the air forces available.

Let me hasten to add that the policy of attacking only targets directly related to the military structure and its immediate support may be completely invalid for another situation. If the nation under attack were the primary instigator and supporter of the aggression, or if the ground forces were not committed in the air campaign, or if the air forces were balanced to the concept of completely investing the enemy by air, the systems chosen for attack might be, and possibly would be, quite different. For example, the two large North Korean irrigation dams that were destroyed primarily to wash away rails and military supplies could have been attacked for another purpose. Not two, but thirty or more could have been destroyed to turn North Korea from a heavy exporter of rice to an importer for survival.

Another aspect of the force problem has to do with the balance of force as between the UNC Army and the UNC Air Force. I

think the record definitely shows that effective employment of air forces can permit a great reduction in the size and composition of friendly ground forces. How much reduction can be safely effected depends upon the extent of defeat of the enemy air force and how completely the friendly air force can exploit opportunities for attacking ground force organizations, logistics, and facilities. Nothing is so bad in air campaigns as not to have enough force to do a job completely. For example, all but 4 or 5 per cent of pre-war rail traffic in North Korea was stopped, but this was sufficient to form a solid base upon which to add enough truck and A-frame transportation to maintain a static supply line. Armed reconnaissance and highway interdiction required an even greater number of sorties. In all three tasks the effects accrue geometrically as the force is increased arithmetically. The last 10 per cent of interdiction or armed reconnaissance gets the real pay-off.

Close-support requirements are over and above these, and the effects follow no such pattern. In the Korean War close support substituted for artillery at times, and at other times it was used extensively on marginal targets. During the last two years about 30 per cent of all air force sorties were flown in close support, as opposed to roughly 10 per cent in the European War. This cut heavily into the force available for attacks in rear areas, where it has been definitely shown that the cost to the enemy per sortie was higher. It should be our aim to reduce the expendable amount of enemy firepower before it gets into the front lines rather than to try to destroy it after it arrives. In contradistinction to conditions of static warfare on the ground, I should like to make clear that I believe strongly in all-out close air support of ground forces when they are engaged in major operations to achieve decisive objectives.

The armistice brought the third phase of the Korean War to a close. Now we have entered the fourth or political phase. We know that the enemy hoped to wear down the nations supporting the UNC through a costly attrition of friendly lives and resources. That he came out on the short end of this strategy in the last two years is largely due to the air campaign. His whole military structure was dispersed and geared to a defensive strategy, his air force was effectively blocked out of the war, and the cumulative total of his losses since the beginning was an unacceptable burden. His efforts to reestablish his air force on forward air bases had failed and he could see no hope of a successful ground offensive.

At this point I am reminded of the flattering public statements that the air force had won its war in Korea. This was in reference to the complete defeat of the NKAF and the maintenance of air

supremacy in the face of the large Chinese force behind the Yalu. Unfortunately these friendly commentators failed to realize that the air campaign against the enemy military structure in Korea was an air war in its own right. It was fought relentlessly around the clock up until the last moment. A large fraction of the air effort was in support of the Army, but the bulk of the offensive was directed toward the over-all objective—the attainment of an armistice on favorable terms.

Origins of Strategy

As we look back at the recent Korean phase of the global struggle with the Soviet Union and her satellites, we can see that a proper frame of reference is required for a sound appraisal of experience. In air warfare sharp delineation of our objectives is critical because the mobility and firepower of modern air forces open up many opportunities for their offensive employment. At the same time the nature of the enemy and the immediate threats he poses to friendly nations and forces demand action that may distract full commitment to our own objectives. Our opportunities and vulnerabilities, our capabilities, and our war objectives must always govern the strategy of employment.

The determination of the relative vulnerability of the various segments of the enemy structure is a process of weighing probable effects against capabilities to inflict damage. If we visualize the enemy air, land, and sea forces in being, we can see that our air forces may be employed against the personnel and organic equipment of these forces. This may be done simultaneously or in turn according to the immediacy of the threats they pose and our own capabilities. There are battle area supplies, communications, and control systems common to two or more of the forces which may be destroyed or interdicted. There are the sustaining national industrial, social, and political control systems to be attacked. Finally the cumulative effects of these combined actions may be exploited in conjunction with propaganda to obtain desirable psychological effects.

To a greater or lesser degree each one of these factors had to be weighed and decided upon during the recent phases of the Korean War. Each had to be considered in the context of the unusual political and military circumstances under which we fought. Each had to be considered in the light of the changing objectives. In spite of the general opinion to the contrary, the Korean War has been a very complex one. It has been a laboratory study of limited

military action in the support of a very difficult political situation. Furthermore it has provided the air forces in particular with an opportunity to develop concepts of employment beyond the World War II concepts of tactical and strategic operations.

Many of our earlier operations were attended by controversies about the use of so-called strategic bombers in tactical air roles, by discussions as to whether or not so-called strategic targets existed in Korea, and by chafing at the political limitations on the employment of air power. I have attempted to show how we learned to live with the problem of a limited war and how the war has pointed up some of the things we should have seen more plainly in the beginning. It is most important for us to understand that the last two years of the war were fought to secure favorable terms under which to cease hostilities. With this kind of objective the door is open for completely new patterns of air employment. The war to date has represented a short step in the direction of using air power as a persuasive force to attain limited objectives.

One thing that should be clear to everyone by now is that air power is indivisible. It can put at risk all important elements of a national structure. Attempts to classify it by types of aircraft, types of operations, or types of targets have led to confusion and misunderstandings. For that reason I have tried to think of it in terms of objectives, threats, and opportunities. The results desired, balanced against threats and opportunities, determine the weight, timing, and phasing of air attacks. Successful integration of these considerations into a pattern of employment is a complex business. Successful resolution of these problems is the primary aim and responsibility of the airmen.

Headquarters, Far East Air Forces
1 September 1953

Long-Range Missile Testing

In the autumn of 1944 the German V-1 and V-2 weapons rained down on London and southern England. For the first time the realization was brought home to the American people that we were woefully behind the Germans in the development of *pilotless aircraft* (unmanned aircraft guided to their target by an auto-pilot-navigator), *pilotless spacecraft* (guided ballistic aircraft most of whose flight path lies beyond the earth's atmosphere), and *guided aircraft rockets* (self-propelled aircraft armament launched from piloted aircraft and guided to target).

In 1945 the Committee on Guided Missiles of the Joint Research and Development Board recognized the necessity for a long-range guided missile development program and launching site. One of the immediate problems was the matter of long-range testing facilities. Security dictated that the range should be within the United States. It also had to be relatively free from habitation and obstruction along the entire 1000-mile-long-200-mile-wide course that is presently required for missile testing. If this had been the only requirement, it would have been simple to put the testing area on any part of the coast line and fire out to sea. But a test range, to be effective, must have tracking stations along the entire line of flight. For permanency and economy the tracking stations should be land-based installations rather than ships or aircraft. Finally there must be room for lengthening of the range as future weapons soared greater and greater distances.

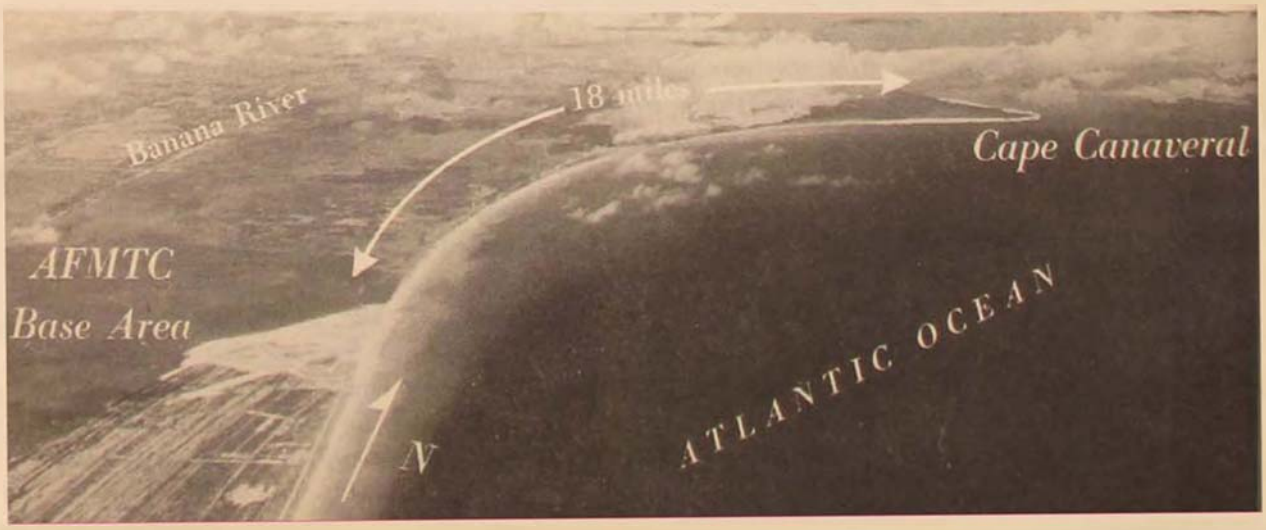
After an extensive survey the site chosen for the new range was Cape Canaveral, Florida, a barren sand spit curling out into the Atlantic Ocean midway between Jacksonville and Miami. It was suitable for year-round operations. The myriad islands of the Caribbean would supply any number of tracking stations. A tracking range on azimuth 127°30′ would not lie directly across populous islands and would end beyond Puerto Rico. If longer range is eventually required, the course azimuth could be shifted to 124°, thus missing the bulge of South America, passing to the seaward of the tip of Africa, and having a clear 10,000-mile track to its end in Antarctica.

The recommended site was approved by the Joint Research and Development Board in July 1947. When activated on 1 October 1949 the Long-Range Proving Ground was administered by the USAF, as executive agent for the Department of Defense. In May 1950 the project was put completely under the Air Force in the status of a major air command, with the proviso that it was available for use by any of the services or their civilian contracting agencies. On 30 June 1951 it was redesignated Air Force Missile Test Center and assigned to the Air Research and Development Command. The Air Force short-range testing ground at Holloman Air Force Base, N.M., was put under AFMTC. In October 1952 Holloman was also made a center and assigned to ARDC as the Holloman Air Development Center.

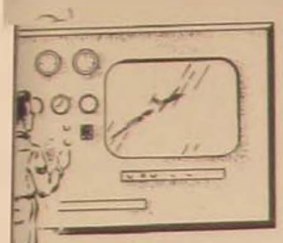
Extensive construction has been under way since 1949 at both Patrick AFB, formerly the Banana River Naval Air Station, and the launching site at Cape Canaveral. Canaveral Auxiliary AFB (AAFB—the tracking stations are also designated as auxiliary Air Force bases), now comprises some 12,000 acres. Concrete launching platforms and control buildings are in various stages of construction. Seven down-range tracking stations were contracted for and should be in full operation by 1954, about the same time as the major construction is finished at the base and at Cape Canaveral. Since the tracking stations are completely instrumented only as far as Eleuthera, about 312 miles from Canaveral, all weapons have been destroyed by radio signal or by impact on pre-selected target after they pass the Grand Bahama or Eleuthera site. When the remainder of the stations are completed, the weapons will have a thousand-mile course to run.

On 24 July 1950 a German V-2 rocket, carrying the American WAC Corporal missile on its nose, rose majestically and described a mighty arc out to sea. This was the first firing of a test vehicle from the Canaveral site. Since then, in addition to other V-2's, tests have been made with various types of pilotless aircraft, including the Air Force's Matador, the B-61 (production model of the Matador), the Navy's Lark, and others still on the classified list. By mid-1954 it is planned to fire one or more tests a day. This sharp rise in testing operations indicates not only that the facilities of AFMTC are nearing completion but that the preliminary build-up of the whole supporting base—industrial, technological, and personnel—is also reaching full growth.

From these closely-controlled tests the Air Force is learning a great deal about the aerodynamics of various configurations, performance data on different types and different fuels, etc. But most important, these tests may help resolve the great difficulty of all pilotless weapon programs—the problem of guidance. Not until accuracy and reliability can be built into guidance systems will the guided weapons family become effective in war.



What Can We Gain from the Use of Pilotless Aircraft?



altitude? speed? maneuverability?

These qualities would be limited only by the amount of stress on the airframe. No human physical limitations are involved.

range? accuracy?

greatest problem is guidance. tiveness of guided weapons nds on accuracy and range.

attrition?

Only weapons would be attrited, not irreplaceable aircrews with years of training and proficiency.

Do pilotless aircraft and guided aircraft rockets offer us an improvement over our present weapons system that warrants expenditure of millions of dollars and man-hours and allocation of a considerable slice of our industrial and scientific capacity? Can they take on certain jobs that our current weapons cannot do? Or can they perform present assignments more economically or more efficiently than present weapons? Specifically, what can they contribute to the combat efficiency of the three major Air Force commands: Strategic Air Command, Tactical Air Command, and Air Defense Command? A positive answer about the superiority of a pilotless weapons system over conventional weapons is yet in the future. Major problems remain, and the degree of their solution will determine the final efficiency of guided weapons. But past accomplishments and experimental and theoretical data permit certain conclusions.

The short-range or medium-range surface-to-surface pilotless aircraft is for SAC and TAC a potential pilotless precision bomber capable either of being a huge, self-destroying, remote-controlled bomb or of dropping its bomb load and returning. Once completely developed, the Matador or its successors would have the same flexibility in short- or medium-range attack and in choice of targets that any conventional bomber possesses. Limitations would be fuel supply and effective range of the guidance system. Limitations on conventional aircraft are fuel supply and the physical endurance of the crew.

For ADC and for TAC and SAC overseas base defense, the surface-to-air weapon would combine the virtues of antiaircraft artillery and short-range, high-speed local-defense fighter-interceptors with an accuracy neither of the conventional weapons possesses. Altitude and range might be limited only by the ability of radar to pick up approaching enemy aircraft and the maximum distance at which the guidance apparatus could home the weapon on its target. Accuracy will depend upon the success of research in refining the aim of the homing device. Eventually 100 per cent hits may be scored.

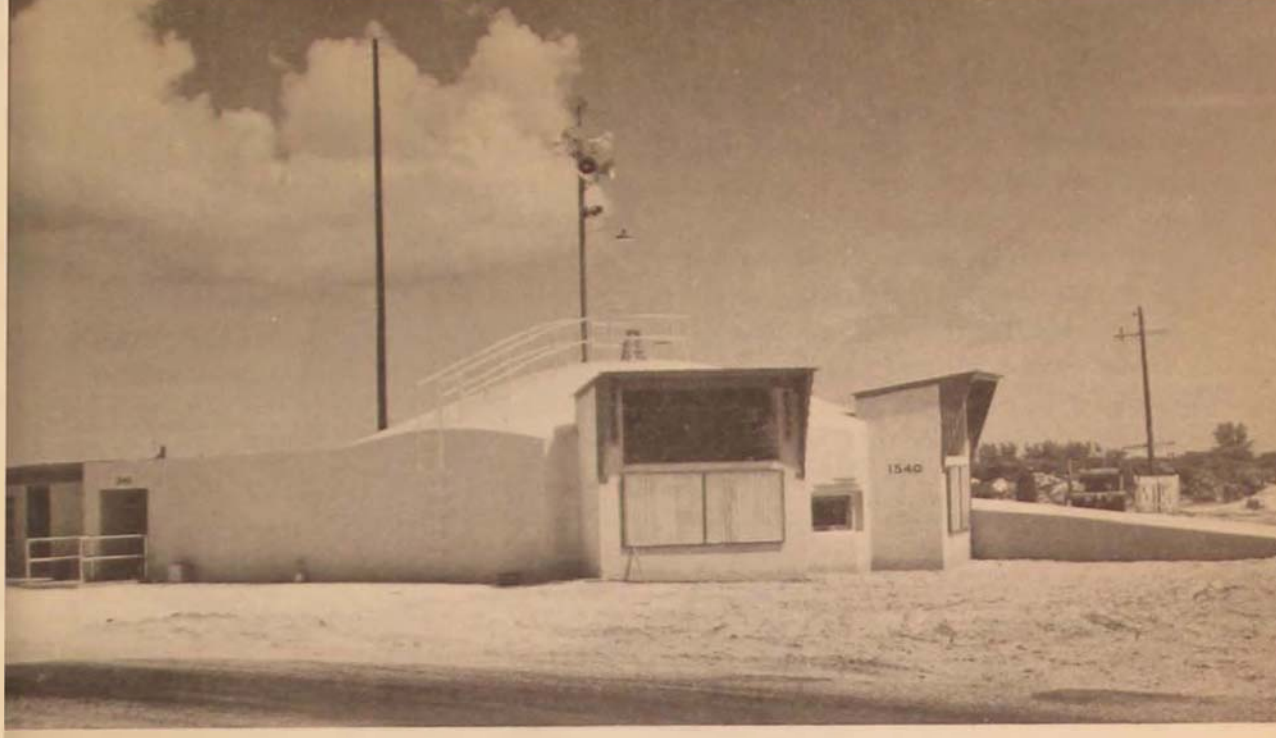
The other two categories of guided weapons and rockets, air-to-air and air-to-ground, extend the range, accuracy, and firepower of USAF air weapons. Air-to-air weapons, self-propelled and guided in-flight to their targets, promise sharp increases in interceptor kills. Air-to-ground weapons guided to their targets promise a similar accuracy in interdiction and close-support strikes.

The potential of the pilotless aircraft and rocket complex is so great that a modern nation does not dare neglect to develop it.

One of the four concrete launching pads now in operation at the Canaveral site. This pad is used primarily for firing weapons from operational mobile launching platforms. Other pads support fixed and portable launching racks for specific types of weapons. To withstand the pressures and intense heat of the exhaust blast during take-off, the 100-foot-square pad must be two-and-one-half feet thick. The four nozzles at the sides of the pad are automatic fire extinguishing equipment. A 5 x 7-foot tunnel connects the pad to the blockhouse and houses electric cables to control the firing of the weapon and hydraulic hose that feeds the fire extinguishers. Pads lie in pairs, served by one blockhouse 100 feet distant from each pad.

The Launching Site

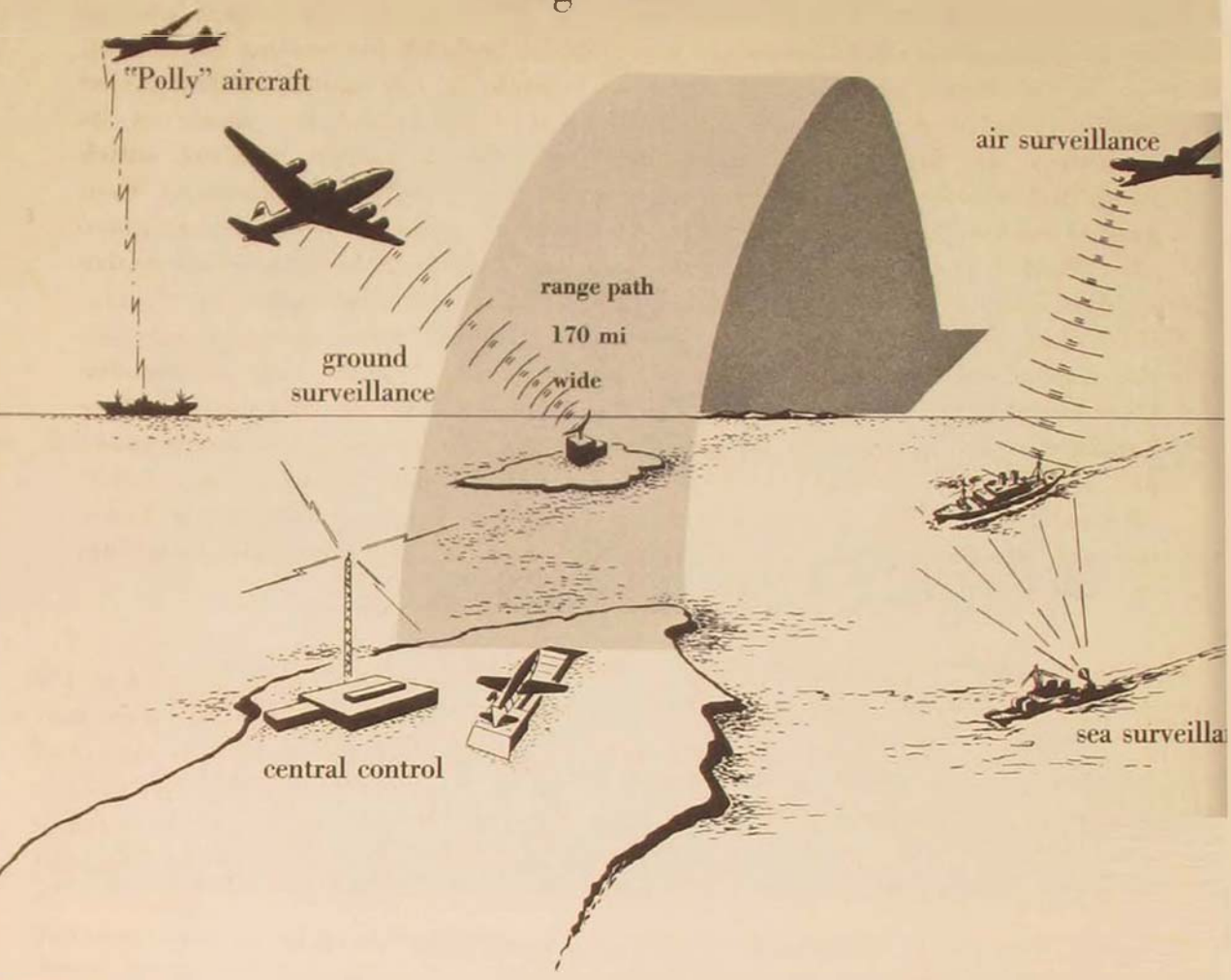
Long-range pilotless weapons are launched from Cape Canaveral, 18 miles from Patrick AFB. Aside from the vehicle itself, principal components of any launching are the pad, the blockhouse, and the central control building. The vehicle is set up and fired on the launching pad, a thick, 100-foot-square slab of concrete. Periscope windows in the squat, concrete blockhouse that houses the firing controls offer the crew in the subterranean control room a safe view. Once the pilotless weapon is in the air, the central control building near the site takes over. Receiving data telemetered from the weapon and tracking it with radar, central control electronic equipment guides the weapon until it comes within the orbit of the first down-range station.



Blockhouses shelter the firing crews. Designed to withstand any explosion except a direct hit from a falling missile, the concrete dome is three and one-half feet thick. From control rooms below the level of the protruding periscope windows, control officers check all equipment before firing and actually fire the weapons. Control then passes to the central control building. Much of the in-flight data is relayed to the blockhouse for recording. Other rooms in the blockhouse contain air-conditioning equipment necessary for preserving the delicate electronic devices.

The central control building is approximately three miles from the launching site, the terminal of a vast communications network. Behind mazes of dials and radar-scopes, the test control officer and his assistants coordinate range clearance, guide the weapon, and direct all in-flight operations. CPS-5 surveillance radar is on the right end of the building. The two cone-shaped, SCR-584 radar screens on the left end of the building track the vehicles to the point down-range where tracking is picked up by the next station. In normal operations the vehicle is destroyed at the point of "impact" with a preselected target. If the vehicle gets out of control, the in-flight safety officer at base or in the appropriate down-range station also detonates the explosive charge within the vehicle. Steel towers on the control building roof provide for radio communication and interference control.

Range Clearance



Aside from the preparation of the vehicle itself there are other preliminaries to firing. The most intricate is range clearance. To avoid any possibility of accident while the weapon is in flight, the 170-mile wide, 1000 mile-long range must be clear of unnecessary shipping and aircraft. B-29's equipped with APQ-13 radar units go aloft several hours before firng and patrol the range and its perimeters. They report back to the central control officer the location, course, and speed of all shipping in the area. These data are plotted on a huge plotting board. Then each ship that would be within the range area at the time of firing is contacted, and an alternate course is suggested. Contact is made by the shore radio station if possible; otherwise by "Polly" aircraft—C-45's or C-47's carrying radio and loudspeaker equipment—or by speedy crash boats equipped with megaphones. Aircraft approachng the area are spotted by the CPS-5 surveillance radar and are warned by ground radio. If it appears that the volume of necessary shipping in the area at the time of firing will be large, the test may be postponed. Another preliminary operation involves electro-magnetic radiations. The interference control tower analyzes all radiations in the area and assigns the clearest frequencies to the types of electrical waves required during a test for guidance, remote control, telemetering, radar tracking, and communications. A final clearance obtained before firing is weather clearance. The base weather station and those at the tracking stations must determine if storm areas will occur at any point in the long flight path, if visibility will be good enough for the cameras to record the flight, and if cloud cover is not excessive. Range clearance has been so carefully performed that no accidents or near-accidents have been reported.

Firing

Two types of weapons have been tested at AFMTC's Florida range: rockets and pilotless aircraft. The rocket is a ballistic weapon depending on violent, short-lived thrust and on the angle of launching for speed, altitude, and range. The pilotless aircraft has continued thrust along the whole of its trajectory or flight path. There will always be targets against which unguided missiles and rocket weapons can be used more effectively than guided rockets or pilotless aircraft. Ballistic weapons are conceivably more effective for short-range tactical use over mountainous terrain where radar guidance is not precise. Rockets can fly at speeds and altitudes so tremendous that as yet there is no defense against them. But for most missions the guided weapons can achieve an accuracy far beyond that of rockets. Over suitable terrain they can attain far more accuracy in surface-to-surface bombardment. Controlled weapons home on the target with much more precision than free-flight weapons for air-to-air and surface-to-air interception and air-to-surface attacks. The primary interest of the Air Force in such weapons is for air defense and tactical and strategic bombing.

The 14-ton, 56-foot Bumper Number 8 (WAC Corporal mounted on a German V-2 rocket) being fired from the launching pad. The vehicle is nicknamed "Bumper" because it employs the step-rocket principle, in which a smaller vehicle is launched from the nose of a larger vehicle at high altitude and speed. This is the test vehicle from which may come future pilotless spacecraft. It has attained the highest altitude ever reached by any man-made object—over 250 miles. Unlike the Matador and GAPA, the bumper rocket is not guided but is a ballistic missile operating on the same trajectory principle as a mortar shell. Bumper Number 8 was launched from a perpendicular position rather than on the angle of the trajectory. Small motors in the V-2 rocket turned it to the predetermined direction of its flight.

Angling toward horizontal flight (right) Bumper Number 8 passed through the clouds 20,000 feet above the Atlantic. Sixty-three seconds after launching, while the huge rocket was flying horizontally at over 2600 mph, the WAC Corporal, capable itself of over 2800 mph, was fired ahead. Seventy-seven seconds later the V-2 was detonated, its debris falling into the sea 48 miles from the Florida coast.

The Matador

The Martin "Matador," experimental model of the tactical B-61 now in production, is an American-developed surface-to-surface weapon. Launched from a special tractor-drawn trailer, the weapon has a Rocket Assist Take-Off cylinder attached to the tail to provide the additional initial thrust to get it into the air. Then the RATO unit drops off, and power is furnished by a turbojet engine. Matador's nose section is filled with electronic equipment that telemeters in-flight performance data to ground stations.

Test flights to date have been for experiment and for training operating personnel. Results have been of great value in the design and construction of the B-61 and of future tactical and strategic weapons. As in all pilotless weapons, one of the big hurdles is guidance. Whether remote control or built-in homing devices are employed, the only result that counts is accurate terminal guidance—pinpointing the weapon at an enemy target on the ground or in the air. When this difficulty has been completely mastered, the day is close that will call pilotless aircraft "conventional" weapons.

Seconds after the initial thrust from the RATO cylinder, Matador surges forward at an 18° angle from its mobile launching platform, as the forward cradle support arms drop away. Radar in the down-range stations will soon pick up "blips" marking the approach of the vehicle and its two F-86 escorts. Telemetering equipment is caged in the nose section which, with the wings and tail surfaces, is joined to the fuselage at Patrick AFB. The guidance equipment is installed at the factory. Frequency settings for guidance equipment are separately determined for each flight.

Clear of the launching platform and the concrete pad, the vehicle drops its RATO unit as its turbojet engine kicks on. Up to 400 different types of in-flight data, such as engine performance, fuel consumption, speed, altitude, and skin temperature, are telemetered to ground receiving stations. Tracking radar can distinguish the test vehicle because it is instrumented to return radar waves of altered frequency. A 7000-foot, high-crested skid strip has been constructed near the launching site. Future vehicles can be equipped so they can land relatively undamaged.

GAPA

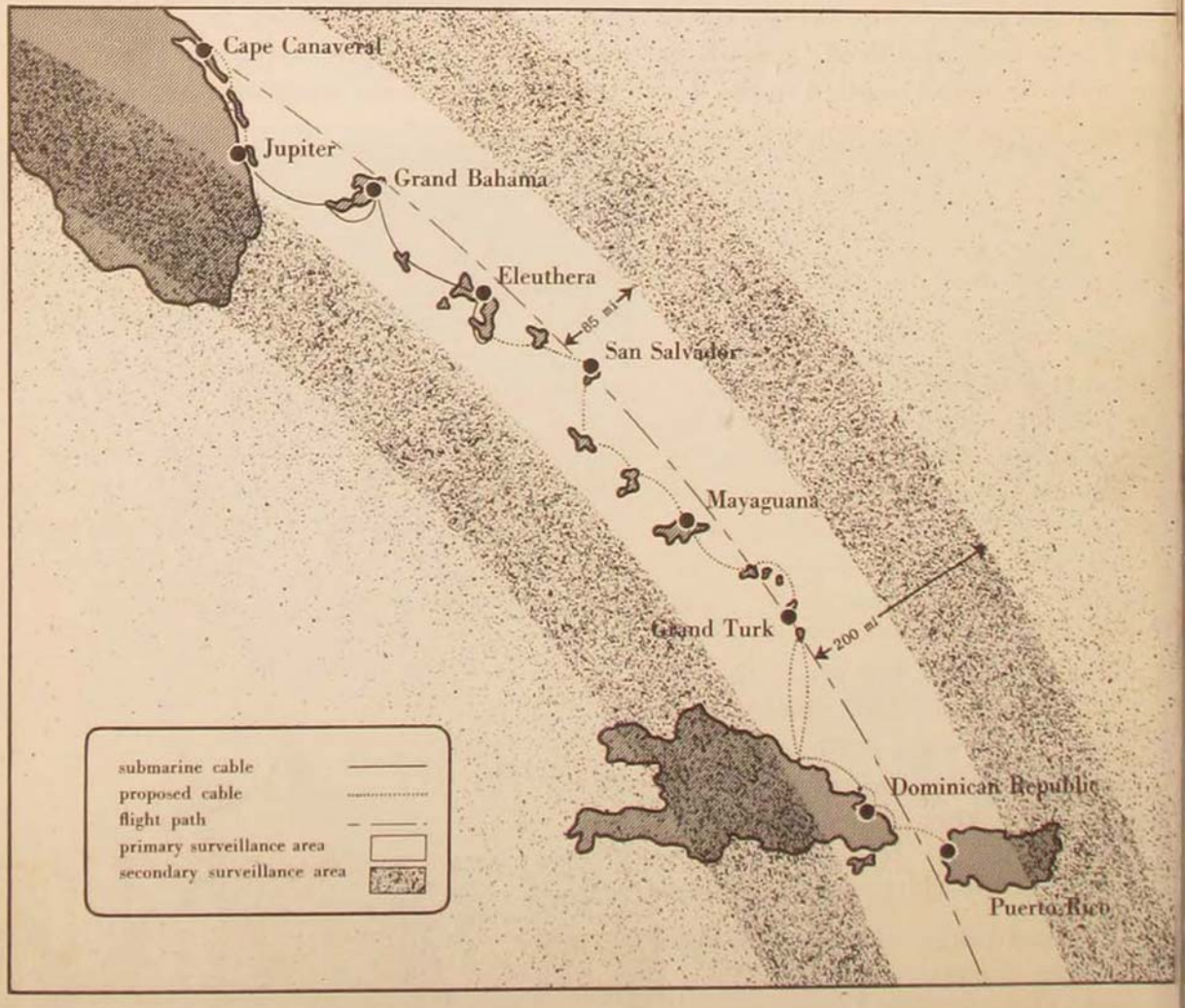
GAPA derived its name from its type, "ground-to-air pilotless aircraft." An element in USAF research on new defense weapons against bomber attack, GAPA was assigned to Boeing Airplane Company in 1945 for design and construction. The supersonic weapon was tested at Holloman AFB, New Mexico, the Air Force's other guided weapon testing range, because instrumentation was more intensive there than at the partially-completed Canaveral range. When the project was completed in 1949, over 100 of the sleek test vehicles had been built and fired. Knowledge gained from the closely-controlled GAPA tests is now being applied in the development of advanced weapons of its kind.

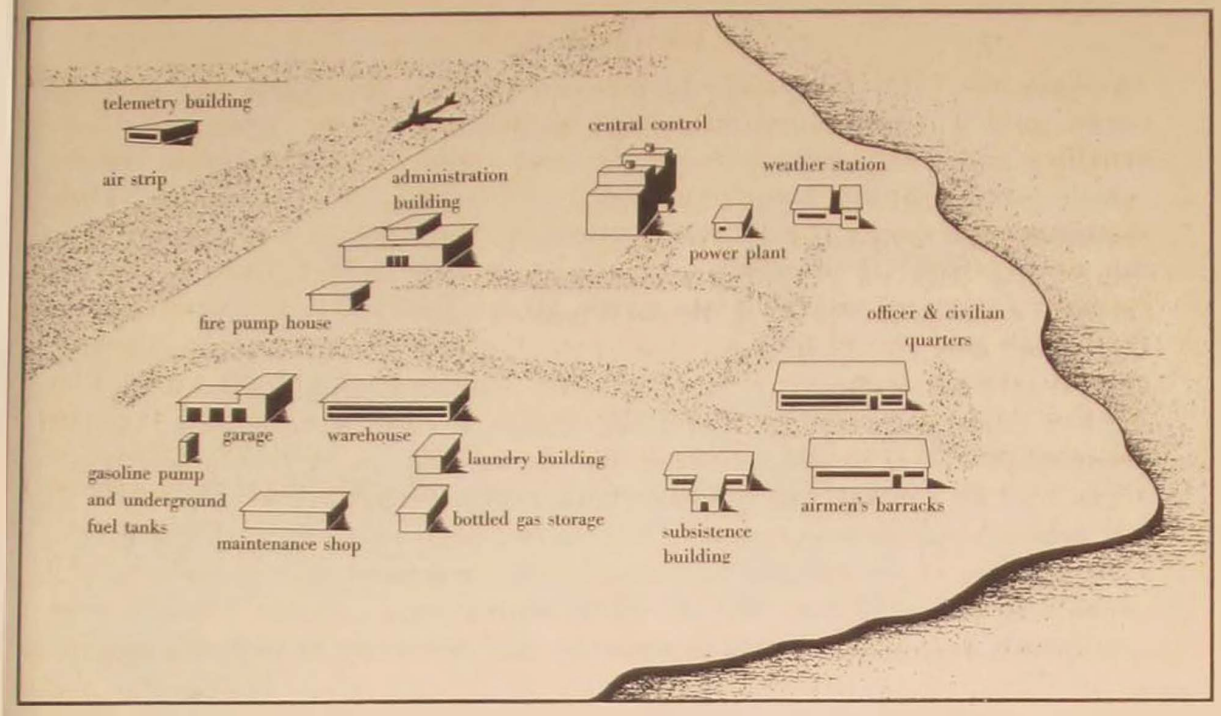
Poised under its launching mount, a GAPA pilotless aircraft gets a last-minute check prior to launching. Fixed and portable launching platforms necessary for firing high-speed pilotless aircraft were specially designed for GAPA. In the course of over 100 tests, the slim rocket-propelled vehicles achieved speeds of more than 1500 miles per hour. Like all air defense ground-to-air pilotless aircraft, GAPA is launched in the general direction of its target and then zeroed in by its homing devices.

Down Range

Auxiliary air force bases, or down-range stations, are important in long-range guided weapon testing. They participate in the range clearance activities with their surveillance radar and radio communications. As the vehicle soars off the launching pad at Canaveral, they are alert. Their tracking radar picks it up as it comes over the horizon and follows it to the far horizon. Throughout the flight, control passes from station to station. Telemetry receiving units pick up the flight data telemetered from the vehicle and record the signals on tape alongside timing signals. Cameras at each station focus on the vehicle and record its flight on timed film. All this data is transmitted to the data reduction center at Patrick AFB for collation and evaluation. A continuous, accurate, and detailed account of every weapon test flight is available a few hours after the flight is completed.

Mapping the range shows that it describes a huge arc of 1000 miles from Cape Cana veral to Puerto Rico. At present only the first four stations—Canaveral, Jupite Inlet, Grand Bahama Island, and Eleuthera Island—have complete instrumentatio and permanent facilities. Other stations shown are in construction and will all b completed by mid-1954. A ninth station has recently been arranged for in Puert Rico. Jupiter Inlet, originally a down-range control station, is now used primaril as an instrumentation training center for down-range replacement personnel Trainees at Jupiter track and telemeter all vehicles launched from Canaveral





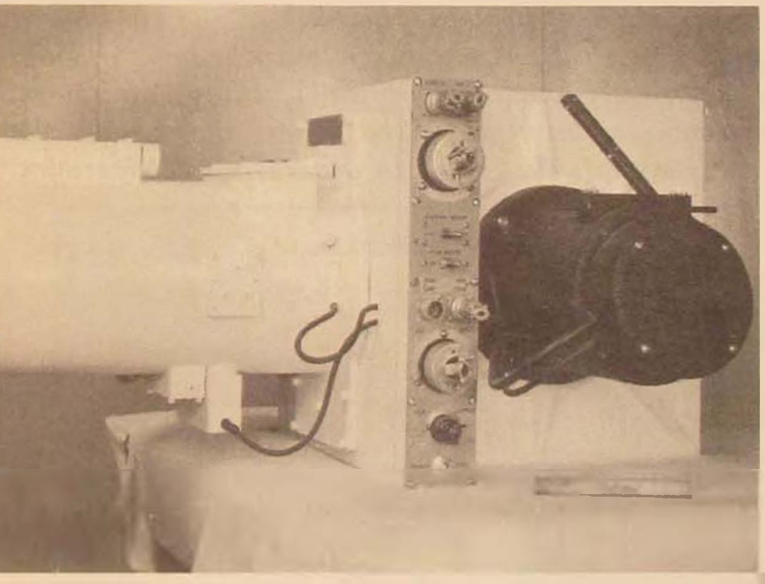
The typical down-range station consists of the elements shown in this diagram. Aside from the essentials of auxiliary air base support, the bulk of the equipment is electronic—both radio and wire communications, the surveillance radar, the guiding and tracking radar, and the electrically-controlled optical tracking equipment. The landing strip provides for communication with the other islands and the mainland and is used by the "Polly" aircraft that assist in general range clearance.

Central control building on Grand Bahama Island resembles but is less complicated than the control building at Canaveral. The building at far left is air conditioned for delicate electronic equipment.

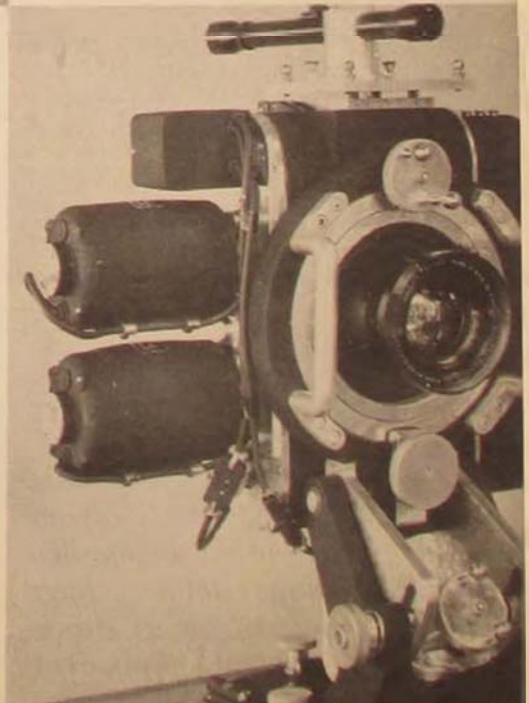
Eleuthera Island telemetry building. As many as 400 different types of telemetered data are received from weapons in flight. At the yet uncompleted down-range stations, huge mobile trailers mount tracking and control equipment.

Tracking

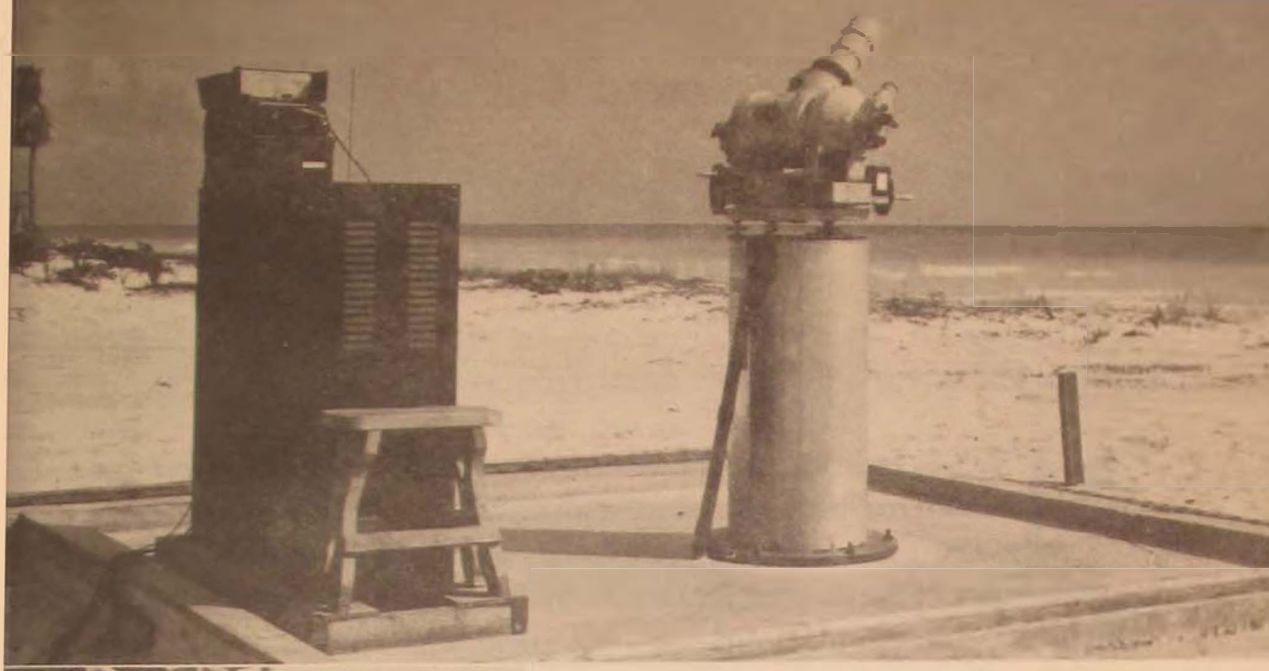
A permanent, visual record of each test flight is afforded by the use of a wide range of cameras. Launching is filmed by batteries of still and movie cameras, shooting from several angles. Four special types of cameras are also used at various stages of the test. CZR-1 Bowen cameras and Clark Ribbon Frame cameras take high-speed movies of the launching. These precisely-timed pictures give data on positioning, acceleration, and performance in the first critical seconds of flight. A Mitchell motion picture camera with a 120-inch telephoto lens gives a close-up view of the vehicle as it approaches each down-range station. Askania tracking cameras are located at the launching site (Cape Canaveral) and the terminal station (Eleuthera). A cine-theodolite camera perfected by the Germans, the Askania has an elaborate mechanism, regulated by central timing, that photographs the vehicle, its elevation, and its azimuth, all imposed on one film strip. Triangulation of the films from two or more of the Askania cameras at one site determines the position of the vehicle to within 15 feet. For the whole testing range, a central timing system uniformly regulates all radars, cameras, and telemetry receiving equipment.

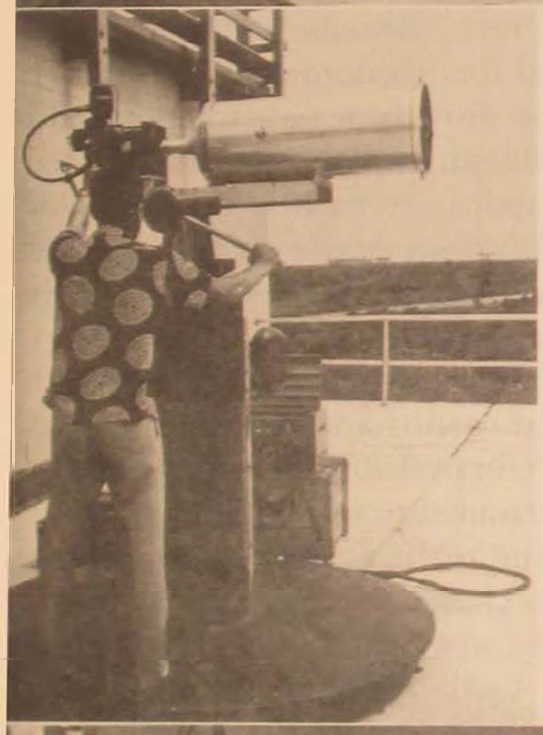


The CZR-1 Bowen camera, like the Clark Ribbon Frame camera, is set up at the launching site to take micro-second photographs of the vehicle during the first two-and-one-half seconds of flight.



The Clark Ribbon Frame camera has a wide field of view, each picture frame being 5/16-by-5 inches. Lens shutter action is precisely controlled by central timing and each film frame shows a black and white target board at the left of the image, making it possible to calculate the vehicle's velocity and acceleration with accuracy and relative ease.





A cine-theodolite Askania camera with its timing mechanism in position on Grand Bahama Island (above). The Mitchell 120-inch telephoto tracking camera (center) is shown without film reels on top. Designed for high-altitude and distance photography, it picks up a vehicle as it comes over the horizon and records yaw, pitch, and roll with respect to the trajectory. The electronic plotting computer (below) records radar tracking. If the test control officer sees that the vehicle is deviating from its course, he can immediately detonate its own destructive charge.

The Support of Strategy

COLONEL JOHN R. MANEY

MANY factors affect military strategy. Some of them we can control and some we cannot. In our efforts to establish the air concept clearly and to gain recognition for it, we must understand which factors we can change and which we cannot.

The air concept is comparatively new. Because it tends to displace older concepts, it has run afoul the phenomenon of military conservatism which acts to retard the growth of new weapons and new approaches to war. Admiral Mahan explained military conservatism on the basis that new weapons are usually the result of the efforts of one man or of a small group, while strategy results from the collective experience of all the military. Consequently when the capabilities of new weapons do not fit the general conception of war, these new weapons are opposed. Hence the growth period of any new concept is one of thrusting and elbowing its way into rightful recognition. Air Force expressions of dissatisfaction with current strategy stem largely from our recognition of those features of strategy that do not fit the realities of the air concept. Thus we find it necessary to propose changes, bearing in mind the admonition contained in the war planner's prayer:

> O Lord, give me the vision to see
> that which must be changed,
> The courage to change
> that which can be changed, and
> The wisdom to distinguish between the two.

This supplication hangs framed in the Air War Planner's office in the Pentagon, and for good reason, as all former war planners can testify.

It is easy to criticize our strategy and planning and easy to recommend changes. But to be useful these recommendations must not only *suggest* changes but must *achieve* changes. To accomplish this, we must understand the nature of the factors which oppose the kind of changes we will suggest. To contribute to this understanding is the purpose of this discussion.

Surely of importance equal to the making of changes is the wis-

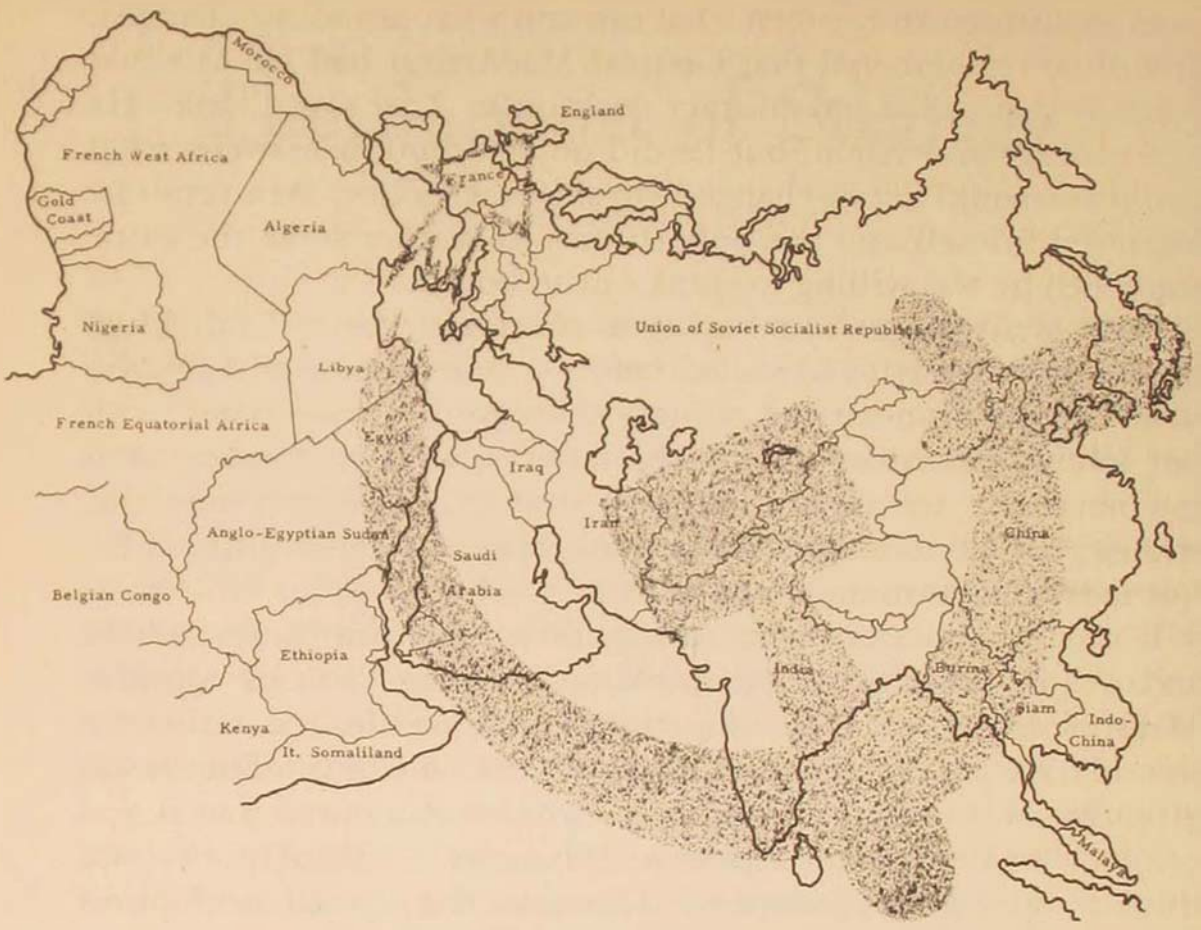
dom to distinguish between what can and what cannot be changed. It will be remembered that General MacArthur had an Asia-first concept that called for military decision in Korea or China. He had courage and vision, but he did not distinguish between what could and could not be changed—in this case, policy. As a result he sacrificed himself and the opportunity to further serve the cause for which he was willing to speak out so boldly.

Among the larger number of us there may be no individual MacArthurs likely to be called before a joint session of Congress to air our views on current military strategy. But collectively, with our fellow officers throughout the services, we are what one man can never be; we are the military strategy. The only way this strategy can be sound, deriving from this composite source, is for our individual thinking to be sound.

If our current strategy is wrong, then there are those both in and out of uniform whose thinking is wrong. Let us consider MacArthur again. There is a considerable feeling today that we should have put increased military pressure on China. The reason given by most military people as to why we did not is that it was contrary to our national policy. When we think of policy, we think of the State Department. Therefore the general assumption is that the State Department made this policy. But the military can claim at least 50 per cent credit for the decision behind the policy, and my guess is that they could probably get 100 per cent credit without too much effort. The man who said, in connection with MacArthur's proposal, that spreading the war in China would involve us in "the wrong war, at the wrong place, at the wrong time" was General Omar Bradley. He was not speaking for the State Department. He might be right. For our purpose it is not so important to recall who said it, as why. My guess as to why he said it

If there is an image in the public mind of the deliberations of our war planners, it is that of a group of incisive men nodding agreement to a master plan of strategy mapped out in the clear light of experience and knowledge of the enemy's intentions. Colonel John R. Maney, presently a member of the faculty of the Air War College, draws on his three years' experience, from 1948 to 1951, in the War Plans Division of Hq USAF to challenge this image. Taking the reader behind the scenes, he shows that war planners, however devoted, are, like the rest of us, human beings. Each of the three services represents a different philosophy of warfare, and the end product of their joint deliberations will show compromise in proportion to how well each service grasps the capabilities of the other two. The challenge to the air planner, says Colonel Maney, is to present the true potentialities of air power to the other services so cogently and persuasively that they will be convinced of the major part which air power must play in future strategy.

Communism's Short Route to the Conquest of Western Europe



Lenin's thesis was that the economies of the Western powers are based on the exploitation of their colonial resources in South Asia and Africa. The Communist strategists believe that by inspiring the traditional hatred of the ruled for rulers, appealing to growing nationalist feelings, and aggravating the colored-white race problems, the colonies can be detached from their allegiance, ready for the receiving grasp of Communism. The resultant loss of revenue to the home countries is intended to cause economic dislocation and political instability, in the hope of Communist "coups" in Western European countries, without resort to military force.

is that he believed it and that he believed it for these reasons:

1. He envisaged war as a prohibitive land campaign pitting scarce American manpower against the Chinese.

2. Like others at that time, he did not recognize that the Korean War was designed to secure the Red flanks for Communism's main drive, in accord with Lenin's avowed strategy "That the shortest route to Paris and London is via Peiping and Calcutta."

3. A defensively minded military strategy breeds a horror of offensive action, military or political.

4. And most important for our present discussion, a realistic concept for air war against China had never been presented to him.

While we are on the subject of the State Department we must look at another policy it usually gets full credit for—the containment policy.

In 1948 the containment policy called for developing a position of superior military strength relative to the Soviets and from this position of advantage to increase our areas of agreement under the compelling logic of superior military force. The big fallacy of this premise is that—at least from an atomic standpoint—we were stronger in relation to the Soviets in 1948 than we are now. No one knows what the State Department and the President would have done if the military had said at that time, "Go ahead and launch your diplomatic offensive, we have an atomic advantage which will deter them from reacting," but we do know the military reply was, "Wait. Militarily we are woefully weak. The time to act is not now." In other words the military said time was on our side, not on that of the Soviets. At a minimum the military should be given 50 per cent credit for the containment policy as we have it today, and 100 per cent might not be too much. Why this evaluation by the military? A good guess is:

1. At least two thirds of the Joint Chiefs of Staff saw military force as tanks and ships, backed up by tactical airplanes, in which case we were weak, and

2. At least two thirds of the Joint Chiefs did not feel the atomic advantage was a sufficient guarantee to deter the Soviets.

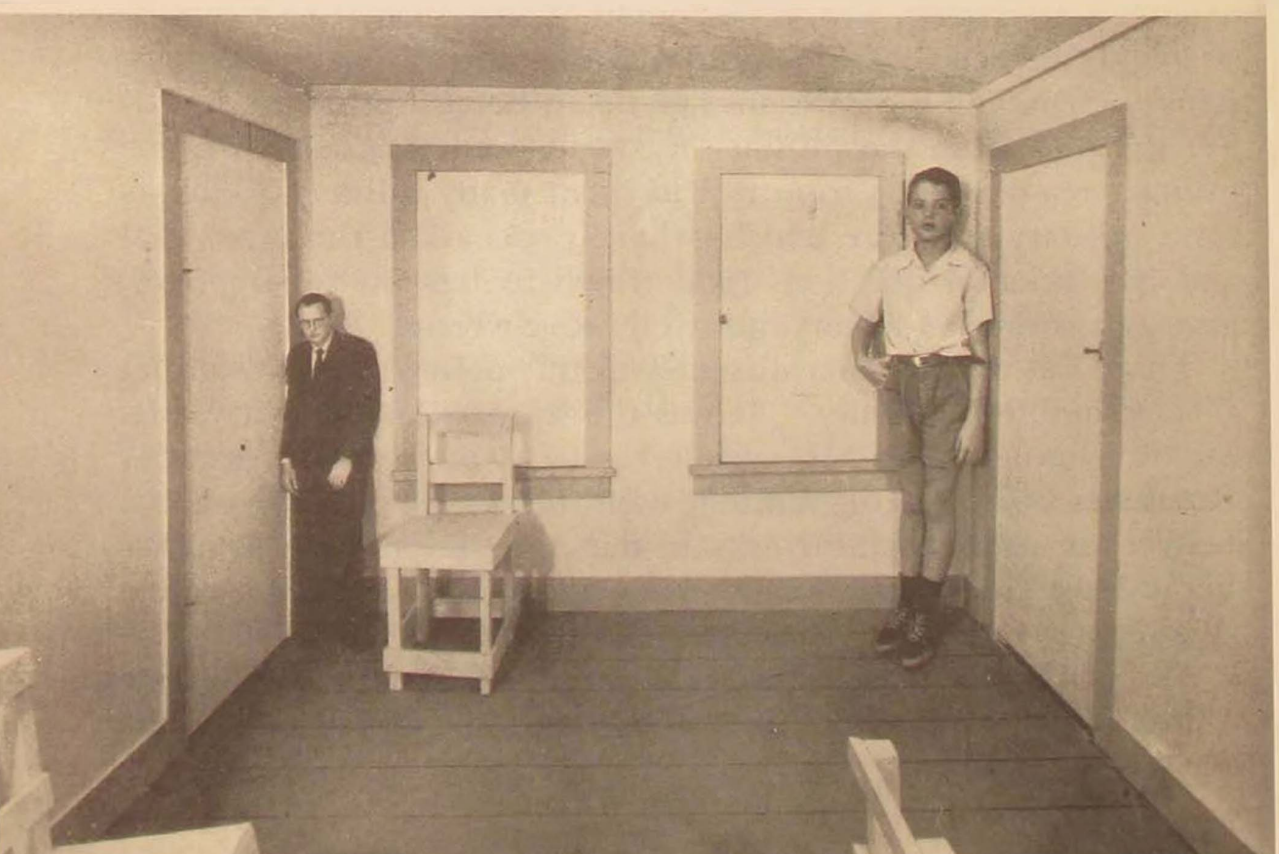
Thus we were fighting the cold war according to the decisions of surface strategists, just as we fought World War II to a surface strategy. We had the bombs and delivery capability and the Russians knew it, and the Russians had no air defense and we knew it. Yet the plea from the military was wait—and this delay was for military reasons. The country had spent many billions of dollars for a military structure which, when it was asked the most vital and fundamental question upon which to base national policy, gave an answer that history may well prove wrong.

There was one primary dissenter to this policy of "wait and let them crumble internally." It was the former Air Secretary, Mr. Stuart Symington, in his capacity as head of National Security Resources Board. Being familiar with the atomic capability and a believer in it, Mr. Symington said that the time to act was now—because we already had the military advantage we were seeking. Again surface thinking prevailed, and he was overruled.

Mr. Symington's viewpoint was later shared by Sir Winston Churchill when at a briefing at the Pentagon in January 1952 he

Your frame of reference can mislead you. *1. Hunched in a corner of a distorted room, the six-foot man seems to be three times as tall as the five-foot boy.*

2. With positions reversed, boy dwarfs man. Although floor and ceiling converge, the room looks rectangular when seen with one eye from a certain close-range position. Rectangularity dominates the mind that dwells in right-angled rooms.



was given the facts concerning the effects of an air counteroffensive by the U.S. Strategic Air Command. His conclusions, to the extent they can be ascertained by his later actions, were that the real balance of military power rested with the U.S. atomic superiority and not with the Red Army. In a speech in July 1953 Churchill justified the British stretch-out of its armament goals on the basis of "a new assessment" of new weapons. The precarious financial and geographic position of the British forced them to choose the most effective military course of action. They could not afford the extravagance of the U.S. method, which attempts to prepare for every eventuality.

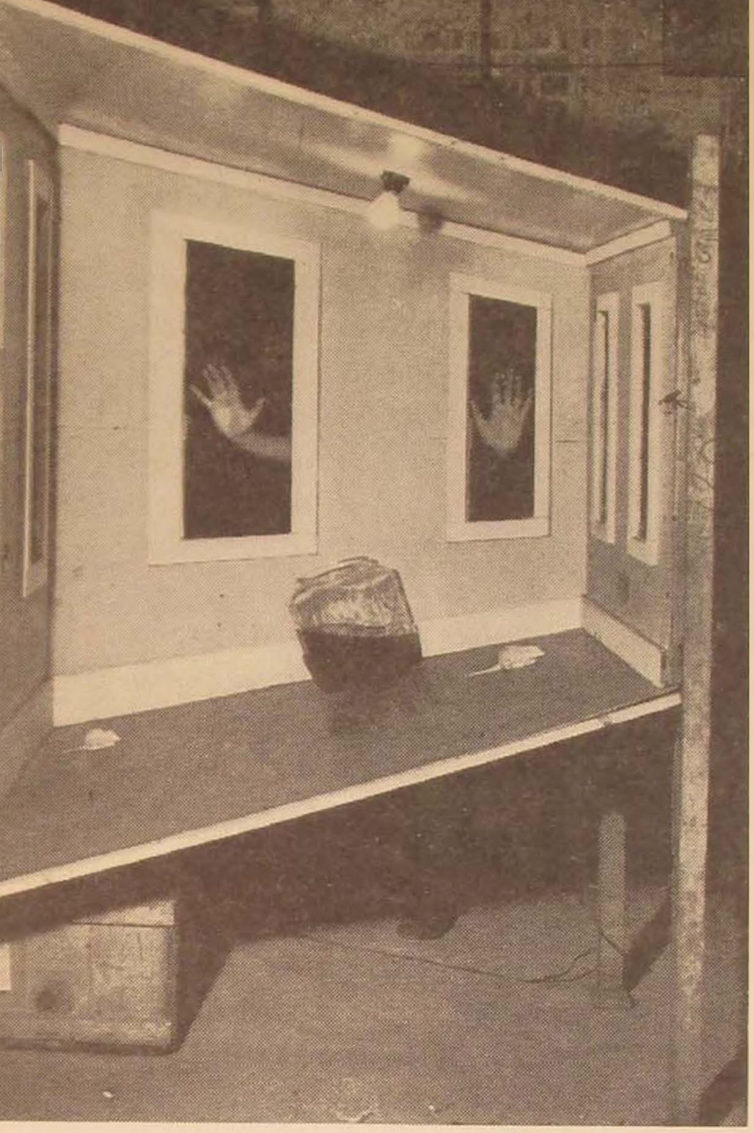
These two instances are mentioned because (1) they illustrate the interdependence of military strategy and policy, and (2) they indicate clearly the subordination of the air concept to surface thinking. This is not a condemnation of either air or surface concepts. But it illustrates the point that merely to recommend changes does not bring those changes about.

From the air point of view there are many changes that would be desirable in our strategy. But from a ground or naval point of view these changes may not be desirable at all. The important thing we must remember is that we change strategy by changing people's minds. Whether the difference of viewpoint is the result of logic on your part or illogic on the other fellow's part is immaterial. To him his illogic seems logical and your logic, illogical. In the nebulous field of military theory and strategy, where the only final proof is the test of war, the sole frame of reference for judgment is the experience of the individuals concerned and the evidence of history.

These criteria, fashioned from experience, are usually centered around the capabilities of the weapons with which each individual theorist is familiar. As in the fable of the blind men and the elephant, we individually tend to visualize a small part of war as the whole. The impact of new weapons is judged by their effect on the limited concepts with which we are familiar. Douhet described this compartmented approach to war as follows:

> There are army experts, navy experts, and aerial experts; but there are no war experts. And war is indivisible and so is its purpose.

To illustrate the importance a frame of reference plays in giving value to our judgment, we might consider an experiment recently performed by a Princeton psychologist. Photograph 1 shows the



3. But if the observer lengthens his range and opens both eyes, a wider frame of reference is revealed to dispel the self-imposed rectangularity and destroy the distorting illusion.

six-foot psychologist and his five-foot son.* The impression from the picture is that the father is very tall and the son very short.

Let us take a look at these two again in photo 2. The only difference between this picture and the last is that the father and son have changed places.

The psychologist explains this illusion by the fact that we judge relative sizes by comparison with surroundings. In a normal, square room an object appears taller or shorter than another in accord with how close the object comes to the ceiling. Photo 3 shows how the illusion is created. As can be seen, the right wall is just half as high as the left. This experiment demonstrates that the simple act of judging an object's size requires a deductive process of relating the object to a known frame of reference that has been established by experience. Here the frame is a room, which normally we expect to be rectangular.

This experiment may help explain how honest and qualified

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*Photographs 1, 2, and 3 are from *Life*, 16 January 1950, pages 57 and 58, courtesy of the Editor.

men do not always agree. Its moral is that differences of opinion stem from different mental frames of reference. If you seek agreement on any deeply rooted ideas, don't try to convince a dissenter that he is wrong. Understand that his frame of reference makes his conclusion logical to him. Your objective should be to influence his frame of reference instead of criticizing his conclusions.

This tactic implies, of course, that you have a well-oriented mental framework by which he can arrive at your judgment. General Vandenberg must have been thinking of such a framework when he said that we need people who understand air power and not just people who only give it lip service.

A thorough understanding of the full capacity of air power by persons both in and out of the Air Force might well have served as the basis for a different policy in Korea and for the containment policy in general. When we criticize our political guidance, we should not overlook our own short-comings in providing the correct military evaluation. Let us recognize that whereas we can do much to modify this policy by convincingly representing our true air capabilities, we shall probably get nowhere by labeling every errant policymaker a fool and every surface strategist an arch conservative.

Let us apply to some other features of strategy this principle of not criticizing conclusions but of understanding the background against which they were made. Public opinion is a good example. Military planners sit in the granite tower on the Potomac surrounded by the doom-mongers of the "never underestimate the enemy" school of intelligence. Chilled by fatalistic prophecies, the planners come to the conclusion the threat is both imminent and great. Consequently a plan is developed to meet this menacing challenge. At the same time the Kremlin decides to play footsie, and John Q. Taxpayer reads in his morning newspaper that some cherubic comrade has just reassured the world that people have nothing to fear except fear itself.

Just prior to Korea we were at only 48 groups in the Air Force and further cuts were contemplated. At that time the Air Force requirement plan was for several times as many groups. The difference between the paper requirement and the 48 groups in being was largely one of interpretation of the threat. This divergence resulted from the different backgrounds of experience against which the interpretations were made. It does no good to deplore the public's apparent indifference to the threat if its evaluation is based on entirely different information and understanding. The

public proved later that it was willing to support a reasonable force when the Soviet threat expressed itself in the unmistakable terms of Korea.

There is evidence that the present administration is receptive to reasonable proposals for increasing pressure on China. Such a change would require unqualified assurance from the Air Force that it could produce certain effects. This assurance will be accepted only if those offering it have an effective air concept clearly in mind upon which to base it. They must also have the patience and courage to ensure that this concept is given a fair hearing and is not held back by the inertia of vested interests and historical prejudice. The development of an effective air concept is our collective and continuing responsibility.

We can sum up our observations on the interrelationship and responsibilities of the military with the policy makers by resolving that before we start casting stones, we will examine our own contributions to whatever we would correct. Again let us concentrate on what is in our power to change. For the Air Force this means that the full capabilities of the air weapon must be reflected in those decisions that commit us to, or restrain us from, certain actions. As Mr. Gill Robb Wilson, the editor of *Flying*, has said: "Airpower needs no advocacy beyond a dispassionate appraisal of its true status in relation to the rest of the military structure."

The initiative is an element of strategy and policy that the airman looks on with more concern than do others. This is because of the way he looks at war. The airman sees in the opening atomic attacks of a war the elimination of one combatant nation or the other. But to the man who envisages war the way it has always been, with the phases of build-up, decision, and exploitation following in orderly sequence, the airman's preoccupation with the initial attack naturally seems out of balance.

There are other questions affecting strategy—such as what constitutes the overt act and whose side is time on—that interest the air strategist more than other strategists. But the few examples we have mentioned should illustrate why certain features of our present national strategy, viewed from the framework of the air concept, are unacceptable.

We may summarize our thoughts on the penetration of national policy and military strategy by the air concept as follows:

1. The air concept is new and must be established partly at the expense of older concepts.

2. It is our collective responsibility in the Air Force continually to develop this concept.

3. The first requirement is to understand thoroughly the full potential of air weapons and to recognize and understand just as thoroughly the frame of reference identified with other military concepts.

4. To effect changes which will make national strategy more compatible with the air concept we must influence and modify the frames of reference against which objections are raised.

5. Finally time is the most important element we must consider. Differences not reconcilable in a reasonable time should be presented to the highest authority for solution.

Air War College

The Arctic: Challenge to the Air Force

Lieutenant Colonel Joseph O. Fletcher

THE free world's dashed hopes and bitter lessons since the Second World War have more clearly defined the one possible transgressor on world peace than at any time in recent history. World communism is the threat and its heart and muscle are Soviet Russia. This fundamental has turned the air planner's globe on its side. One wall of his office is covered with a map which most Americans have not seen since their school days. The map is a polar projection, showing the Northern Hemisphere as it appears from above the North Pole. An almost unrecognizable view of the world as we are accustomed to think of it, this map holds the key to much of our future. Over its bleak expanse lies the shortest air route between the U.S.S.R. and the United States. Alaska and Greenland reach from each flank of the American continent toward the Arctic Circle like giant pincers. Their shores are dotted with American air and naval bases, advance outposts of our ring of defense. But the great center of the map is white, almost blank. Sketchily charted, its secrets for the most part still shrouded in ice and snow, the Arctic now assumes a new prominence in the eyes of the military planner. If we will adapt our technology to its demands, the Arctic offers us a new military frontier.

Since World War II the threat of swift and complete retaliation posed by our Strategic Air Command has been our most effective argument for preserving peace. To maintain our superiority, we must hold the lead in imagination, flexibility, and resourcefulness. This cannot be done merely by maintaining a force of conventional weapons confined to predictable tactics. It is not enough to concentrate on increasing the punch of our striking force. We must also constantly strive to reduce its vulnerability both at home and over the target. We must do this with the smallest investment of men and money. Planning for the military future in our age of phenomenal scientific progress is bewilderingly difficult. Hardest of all is the task of standing away from the present world and see-

ing it in perspective. How have power patterns shifted since the last war? What do these shifts mean to the geography of a future war? Have these shifts and the recent advances of science offered us new strategic and tactical possibilities? Have we done all we can to reduce our vulnerability and increase our offensive power? Can we build more flexibility into our deployment and tactics? He who answers these and similar questions most imaginatively, efficiently, and concretely will hold high cards for cold war or total war.

The polar map shows that the United States enjoys a mighty geographical advantage over Soviet Russia. Unlike the Soviet, which offers many tempting targets within easy range of her Arctic shore, we are insulated by 2000 miles of land. Perhaps we have also been too much insulated from reality to make effective use of this space. Until recently we seemed resigned to writing off the Arctic as a region in which nature was so intractable that its use would forever be denied to ourselves and our enemies. But we had forgotten the versatility man acquired when he learned to fly.

For more than two thousand years, men had sailed against the pack in ships. Hundreds of expeditions spent their vessels against

"Many of the problems remain, but today the overriding consideration is that we must develop our capability in the Arctic . . . Should war come, we may do much of our fighting in the Arctic and there it will be on nature's terms. . . . In this war of maneuver the keynotes of strategy will be mobility, concealment, and striking power. The advantage will lie with the offense. Elaborate fixed bases will be in imminent danger of atomic destruction. Our offensive capability will depend on our ability to operate without them. . . . In recent years the growth of our technology has presented us with new advantages for effective Arctic operations. . . . Sooner or later the airplane and the submarine will take their places as the instruments for controlling this strategic area. . . . The basic unit might be built around the all-weather fighter as an atomic-bomb delivery vehicle supported by long-range air transport or by submarine. Such a widely dispersed force would be at home anywhere in the Arctic Ocean, would possess unparalleled destructive capability, and would be relatively invulnerable to counter-measures, since it could fade away into the trackless expanses of ice and water easier than an Arab in the Sahara. . . . The weapon that could thus be forged would be an economical one by modern standards and would advance our offensive capability to the very shores of Asia." **In such terms does Lt. Col. Joseph O. Fletcher envision the future of the USAF in the Arctic. Pilot, meteorologist, and engineer, Colonel Fletcher organized and led the USAF expedition which established a weather and geophysical station on floating Ice Island T-3 100 miles from the North Pole.**

the ice. Thousands of lives were sacrificed to cold, hunger, scurvy, exposure, and privation in man's longest and most arduous struggle against a geographical region. Yet the Arctic pack withstood the assault. Steam replaced sail and steel replaced wood, but the ice held its own. Men everywhere saw the Arctic as a grim, unyielding foe, yet, being men they redoubled their efforts to conquer it. Beneath the ice the waters of the sea are like other seas. Above the ice gulls soar with the same ease as above other oceans. The fish of the sea do not shun the Arctic pack; to them the ice is a bountiful hunting ground and a shield from their airborne enemies. But the surface of its ocean is impassable. As long as man was constrained to move on the surface, the pack ice presented an impassable barrier.

The airplane can not only fly over the ice, but with proper equipment it can land on the ice and take off from it. Our first sustained effort to operate in the Arctic Ocean entirely supported by aerial resupply was made known to the public in March 1952, when the Air Force announced the establishment of a semi-permanent station only one hundred miles from the North Pole. The USAF had taken a long step toward extending our frontier to include the Arctic Ocean. The amount of public interest was astonishing, especially to those of us who planned and carried out the operation. To us, while the project was not routine, it represented a straightforward application of the tools of our trade. Although none of us were polar explorers or arctic experts, all of us had acquired some experience and judgment in air operations in Alaska. We had learned to anticipate and compensate for extreme environmental factors, and to judge their effects upon our equipment and upon ourselves. We had learned that it is prudent to study nature carefully, to anticipate her foibles, to win her as an ally rather than face her as a foe. Our plans did not represent a hopeful gamble but rather a carefully calculated risk on which the odds had been patiently weighed before the die was cast.

To those who wish to investigate the Arctic Basin, the ice island presents a reliable base of operations. Aircraft can come and go with relative ease, carrying parties to areas difficult to reach from established bases on land. To scientific personnel the island affords unique opportunity for study of the region. The imagination of the public was stirred by the realization that another of nature's great barriers was being surmounted. The Arctic pack ice, which had withstood for centuries the determined onslaught of man, was yielding to a technology too versatile to be turned aside.

It is no accident that man's progress in the Arctic has been closely tied to the development of modern aviation. As our growing air technology provided new means of transport, economic necessity has made us quick to apply new tools to practical tasks. The bush pilot has become the Marco Polo of the North. Men who have never seen an automobile accept the airplane with the same familiar appreciation as they do the dog team. Yet military aviation has been hesitant in exploiting its capabilities in the Arctic. Operating techniques have been slow to evolve. New tactical concepts adapted to the Arctic environment have received little attention.

This is not surprising. Although two desperate wars have taken place since the introduction of the airplane, both, except for isolated engagements, were fought outside the Arctic regions. Our Air Force learned to combat the dust and sand of North Africa and the creeping corrosion of the tropics, but we did not worry much about the Arctic. Our Navy developed new tactical concepts around the aircraft carrier, but aircraft carriers do not operate in the Arctic basin. The development of operating "know-how" and tactical doctrine for Arctic air operations has been retarded by several factors:

(1) Until recently there has been no recognized war threat in the Arctic to spur the development of military effectiveness.

(2) After centuries of failure with surface ships, we have been slow to realize that the Arctic is a natural theater of operations for aircraft.

(3) Lacking extensive Arctic frontier, we have had limited facilities and tactical operational experience in the Arctic.

(4) The relatively large size and complexity of military aircraft have necessitated complex support and maintenance facilities unless we developed special techniques.

(5) Our rotation system has made it difficult to develop and retain experienced personnel.

Many of the problems remain, but today the overriding consideration is that we must develop our military capability in the Arctic. We must constantly bear in mind that, in a future war, we may well engage a new enemy across the Arctic basin. We must remember that with atomic weapons a single fighter can deliver a devastating blow which will reduce a large and remote military base to a smoking liability. We must consider carefully the expense, vulnerability, and recuperative power of the elaborate bases and defensive systems required to support conventional

operations. When we consider the vast, white world over which our air power must be effective, it is clear that we must exploit to the utmost whatever natural advantages the Arctic offers.

WHAT sort of a region is the Arctic Basin? What are its natural characteristics? First of all, it is big—millions of square miles of tumbled ice, churned constantly by the wind, with new open leads and new pressure ridges forming everywhere. The average thickness of the ice is only a few feet but may be scores of feet under pressure ridges. Between pressure ridges giant floes of drifting ice, some capable of supporting our largest aircraft, meander lazily over the top of the world. Compared with other regions, weather conditions, although varying between wide seasonal extremes, are remarkably uniform and predictable over vast areas. Almost half of the year, from September to March, the Arctic basin is in continual darkness. During the remaining half year, it is mostly blanketed by low clouds and fog except for a few weeks in early spring.

To the military airman these operating conditions demand drastic revision of our normal procedures but offer in return unlimited possibilities for camouflage and concealment. During all except a few weeks in the summer, surface temperatures are below freezing. Low temperatures create new problems in lubrication and plague the airman with hydraulic and fuel leaks. In return, we are offered the advantages of snow and ice as engineering materials. Thanks to the frigid temperatures, the water pump replaces the concrete mixer in the construction of runway surfaces, and an inexhaustible supply of sea water lies only a few feet away. The tumbled pressure ridges crisscross the surface and impede surface travel on the pack, but they also provide concealment from the prying eyes of radar. Every natural factor from the unpredictable ionosphere to the rugged floor of the sea suggests possible advantages as well as handicaps. Should war come, we may do much of our fighting in the Arctic, and there it will be on nature's terms. Success will come to those who meet her terms with greatest resourcefulness and imagination. It will not be easy, but it can be done. In this war of maneuver the keynotes of strategy will be mobility, concealment, and striking power. The advantage will lie with the offense. Elaborate fixed bases will be in imminent danger of atomic destruction. Our offensive capability will depend upon our ability to operate without them.

In recent years the growth of our technology has presented us with new advantages for effective Arctic operations:

The terrain of the Arctic presents many obstacles which would have to be overcome before widespread air operations could become a reality. The surface of the ice pack is corrugated with pressure ridges and gashed with black where open leads expose the Arctic Ocean to view. Snow cover, on the other hand, is less than would be expected, seldom exceeding two feet in depth and sometimes as little as one inch. Because its fresh-water ice presented a smooth landing surface, Ice Island T-3 was chosen as the site of the first Arctic camp. The scene above shows the results of the one attempt to land an aircraft equipped with conventional wheel landing gear on the island. After rolling several hundred feet the C-54 broke through the crust of the hard-packed snow and came to an abrupt halt. To clear a strip long enough for the big plane to take off, men worked for eight days with shovels and a small bulldozer flown in by a ski-equipped C-47. Such experiences emphasize the need for special equipment to operate in the Arctic and show how much more practical knowledge of the region we must acquire before we can operate in it. But if we will use our technology to take advantage of the natural features of the Arctic, the region itself may solve many of our problems for us. We have only begun to exploit the potentialities of using ice and snow as building materials. For example, a water pump drawing from the ocean which is only a few feet beneath the pack ice anywhere in the Arctic can provide the water which will quickly freeze into an ice runway. From these temporary runways, small, mobile aerial task forces could slash through Soviet defenses and scurry back into the Arctic wastes.

(1) The development of the turbo-prop engine for heavy aircraft can simplify outdoor operations and maintenance in extreme cold. Lubrication problems can be reduced.

(2) The development of multi-purpose landing gear can free us from confinement to a few prepared bases and loose our aircraft to range across thousands of miles of Arctic ice.

(3) The development of the high-speed, all-weather fighter is increasing our mastery over weather and navigational problems, thus adding to our tactical versatility.

(4) New developments in electronics, in fuels and lubricants, and in auxiliary equipment are adding to our fund of technical resources, giving us increasing operating flexibility.

(5) Our progress in geophysical knowledge of the Arctic is rapidly adding to our ability to understand and adapt to its environment. If we make use of these new resources, we can properly equip, maintain, and operate aircraft anywhere in the Arctic. Also the submarine must take its place as an important weapon of the Arctic Ocean, for the submarine, like the airplane, is a tool naturally suited for that area. To the submarine the pack ice, which restricts its access to the surface, also offers protection from detection and attack from the air and prevents the heavy seas that accompany gales in other oceans. From the shelter of the pack forays against thousands of miles of strategic coastline can be made. Sooner or later the airplane and the submarine will take their places as the instruments for controlling this strategic area.

Basic to our national policy is the assumption that we will suffer the first attack. If this attack succeeds in neutralizing our retaliatory force, we shall be gravely crippled. The Soviet will then be free to launch attacks with atomic weapons on our cities while we will be powerless to strike back. Unless our retaliatory force is invulnerable to this first attack, its value in the time of need will always be questionable. Even assuming that our domestic bases are safe, what about our ability to deliver a counter blow? To assist in this mission, we have built advanced bases in Western Europe, North Africa, Asia, and the Arctic. If the U.S.S.R. strikes the first blow with atomic bombs, it is possible that these advanced bases may be eliminated as assets before we can use them. In some cases our allies, faced with the choice of neutrality or obliteration, may decide that neutrality is their only salvation. Already we hear talk from some of them. What does this mean to us? It means that while we hope for the best from our forward bases, we must prepare to launch our attacks from the heart of our homeland.

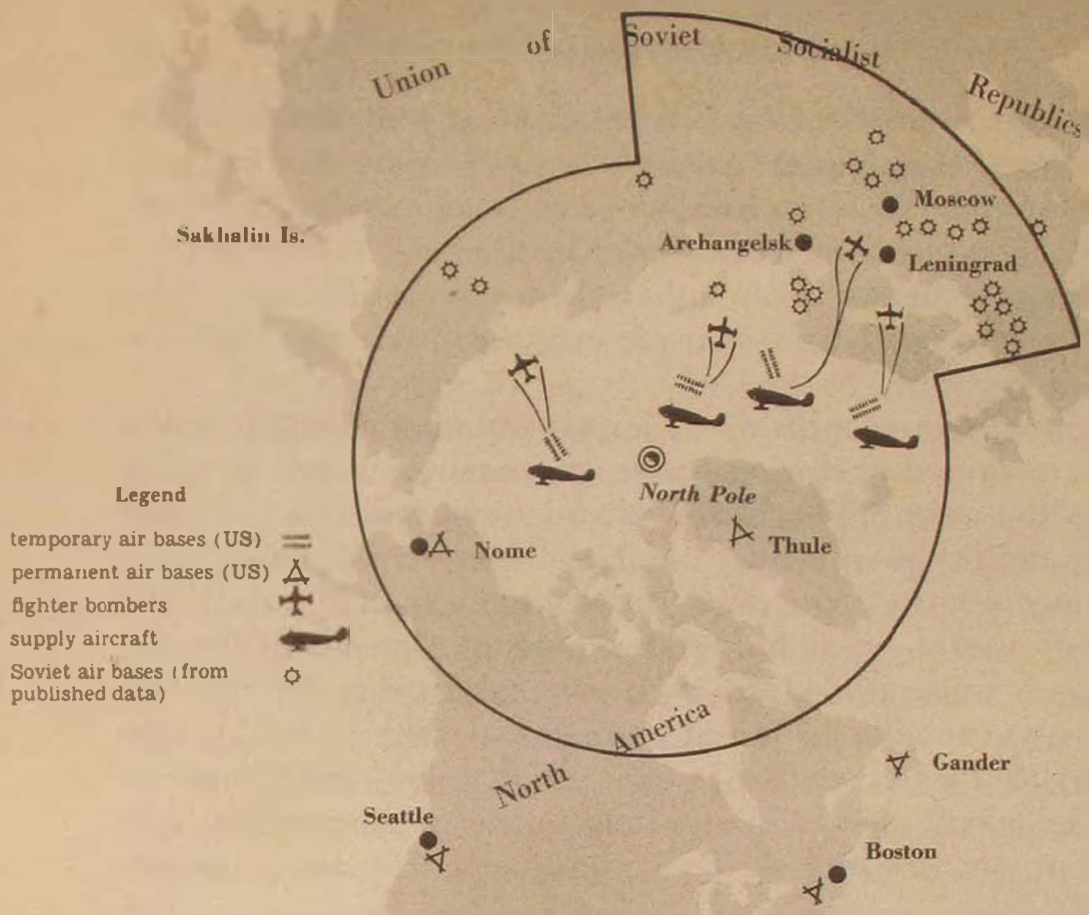
In the Arctic the situation is especially acute. Some of our for-

ward bases can be reached by surface ship for only a few weeks during the year. The rest of the time they can be reached only by air. For example, our air route from Westover to Thule is over 2000 miles. The recuperative power of such an installation is low. Yet with our present Arctic capability, the loss of our forward bases would push our northern offensive frontier back to Southern Canada and the U.S.

We can reverse this condition by forming small tactical air teams capable of sustained operations from ice and snow, and, in some cases, from the water. The basic unit might be built around the all-weather fighter as an atomic-bomb delivery vehicle, supported by long-range air transport or by submarine. Such a widely dispersed force would be at home anywhere in the Arctic Ocean, would possess unparalleled destructive capability, and would be relatively invulnerable to countermeasures, since it could fade away into the trackless expanses of ice and water easier than an Arab in the Sahara. Here, if anywhere, military competition will be a game of wits in which flexibility and versatility will win over brute force.

We may visualize a typical team as consisting of an all-weather fighter on ski wheels, supported by a long-range transport on ski wheels. The support aircraft would contain equipment for assisting the fighter with low visibility approach, VHF homing, fuel transfer, and servicing. For limited periods of time (say between major inspections) such a team could range across the Arctic at will. Properly camouflaged, it could lurk within short distances from enemy shores without fear of detection. Major scheduled maintenance requiring base facilities would be performed at home base, which could be securely and accessibly located in the heart of our country. How would our enemy cope with such a threat? Countermeasures would be expensive and frustrating to say the least.

There are no technical obstacles formidable enough to prevent the development of such a tactical capability. Admittedly it would take time. Modified landing gear must be designed, auxiliary equipment developed, aircraft modified for Arctic use, organization and training accomplished, tactical doctrine formulated and tested, geophysical factors studied. But it can be done. The weapon that could thus be forged would be an economical one by modern standards and would advance our offensive capability to the very shores of Asia. To the defeatists who insist that it could not be done, we can now give a powerful answer: *the general feasi-*



This map shows the geographical advantage offered the United States over the U.S.S.R. in vulnerability from the polar air route. Rimming the Russian shore of the Arctic Ocean are many industrial targets and, more important, most of the reported bases of Soviet long-range aircraft capable of carrying the atomic bomb. Only our perimeter bases in Alaska, Newfoundland, and Iceland are comparably exposed, the heart of SAC being protected to the north by some 2000 miles of land.

Colonel Fletcher's Arctic experience convinces him that a natural advantage could be enormously reinforced if we took advantage of the unique features of the Arctic region in any war with the U.S.S.R. It is within our technological grasp, he believes, to operate small, elusive aerial task forces from highly temporary bases anywhere on the Arctic ice pack. Taking off from ice runways, lone all-weather jet-fighter aircraft could slip into hostile territory, drop an atomic bomb, and speed back into the protective blanket of darkness or fog which obscures visibility for eleven months of each year. The heavy line on the map encircles the area that tactical aircraft could cover on either side of the Pole. Whereas it includes prime Soviet targets as far south as Moscow, only a few targets of any real significance lie in the desolate expanses of northern Canada. Such a mobile striking force would be an ideal complement to our longer-range strategic air forces.

bility has already been demonstrated. Under the leadership of Major General William D. Old, units of the Alaskan Air Command and Air Rescue Service have shown that with proper direction such operations are practical and safe. What was done with obsolete aircraft and equipment can be enormously improved upon if we apply our modern technology to the task. But first we must dare to try!

Fundamental to the growth of air power in the Arctic is the development of a high-performance transport capable of landing on unprepared snow and ice surfaces. This capability would free us from our established bases and open the door to exploitation of several million square miles of presently inaccessible territory. Ice runways suitable for wheel-gear aircraft could be prepared on short notice almost anywhere in the Arctic and the use of snow, ice, and water as engineering materials would take on new significance. With these means of experimenting, Army, Navy, and Air Force strategists could then evaluate new concepts for the employment of military force in the Arctic. Science would quickly unravel environmental mysteries if the regions were easily accessible. At some manned locations we could forego the costly conventional air strips; other locations now denied us would become practical sites for radar or communications stations.

Navigational aids and rendezvous points could be set up on short notice anywhere in the Arctic and could vanish as suddenly as they appeared. Is this fanciful? Not at all! From an engineering standpoint it is well within our grasp. Yet our present capability is limited to the ski-wheel C-47, a crudity but the best we have.

To rectify this situation we must visualize our future in the Arctic clearly enough to formulate requirements for aircraft and equipment. What are the more obvious characteristics we would desire in a general transport for use in the Arctic?

General Flight Characteristics

- Maximum range and pay load (nominally 30,000 pounds, 3000 miles)
- All-weather operating capability
- Low landing speed
- Maximum speed and altitude, efficient operation at low altitude (a turbo-prop engine is indicated)

Special Characteristics

- Good three-engine take-off performance with one half gas load (to avoid engine changes in forward areas)
- Reversible propellers (for maximum control on ice and snow surfaces)
- Capability of diverting internal heat to engines

Special Configuration

- High wing (for maximum propeller clearance)
- Ski-wheel gear retraction into fuselage (to make room for use of ski landing gear when a low surface load is desired)
- Maximum cabin space (for low-density loads)
- Capability of loading and unloading without auxiliary equipment

These and many other desirable characteristics are well within our present engineering capability. It remains for us to face the basic question. Do we need to expand our capability in the Arctic? If so, we must decide what our objectives are and set about achieving them. It may be later than we think.

Headquarters, Air Research and Development Command

MDAP Air Training

COLONEL BENJAMIN H. SHIFFRIN

UNDER United States leadership the free world is fast mobilizing its human and material resources to meet the Soviet threat. This great collective effort is backed by the United States Mutual Security Program (MSP), under which all of our foreign aid programs—military, economic, and technical—have been consolidated. The military portion of MSP is commonly called "MDAP" (Mutual Defense Assistance Program).

The immediate aim of our Mutual Security Program is to build military forces adequate to deter aggression or to defeat it wherever it strikes. The ultimate purpose is to help establish a stable, peaceful, and prosperous world community in which there is no fear of war.

MSP has three basic components: (1) direct contributions to military security, primarily military equipment and military training of foreign nationals; (2) raw materials, commodities, and machinery in support of the military effort; (3) economical and technical contributions. These components are inseparable. Military and defense support assistance work together to a single end—helping our allies build adequate combat-ready forces without wrecking their civilian economies.

The importance of MSP as a major program implementing U.S. foreign policy cannot be overstated. It is a hard-headed program that recognizes the interdependence of nations and the fact that the national security of each depends upon the security of the others. This is a lesson which history taught the democracies in 1939 when each stood helplessly alone and watched totalitarianism march from conquest to conquest by the ancient strategy of divide and conquer.

The Mutual Security Program was authorized by the Mutual Security Act, enacted into law on 10 October 1951, currently amended in July 1953. The act brought the component parts of U.S. foreign aid under the unified direction and supervision of a single person in the Executive Office of the President—The Director, Foreign Operations Administration. The Director is re-

sponsible for the economic and technical assistance programs, as well as for the military aid program.

Within the framework of the military component of the Mutual Defense Assistance Program or MDAP, there are two related activities: the Materiel Program and the Training Program—the latter, of course, being directly in a support role.

While it is generally correct to state that MDAP has no precedent in U.S. military history, it must be remembered that the military aid rendered to Greece and Turkey in 1947, and since continued under MDAP, was really the genesis of MDAP. It has been said that World War II lend-lease is really the same as MDAP. But there are certain basic differences which are so fundamental that they must be understood if MDAP is to be understood. First, MDAP is primarily a grant-aid program, *i.e.*, out-and-out giving of materiel and training with no strings attached, except for certain stipulations as to the use of the equipment. Second, lend-lease was a war-born system of providing assistance to our allies not on a regular programming basis but rather on war-time principles of over-generous shipments in order to ensure adequate deliveries. MDAP is required to carry out an operation during peacetime without any of the generosity caused by war, on rigidly enforced annual programming cycles built around stated deficits in the capabilities of our allies to provide the hardware and training from their own resources. While MDAP is generally known as a grant-aid program, significant quantities of materiel and training are provided our allies on a reimbursable basis. Percentage-wise, however, grant-aid MDAP assistance accounts for almost all of the U.S. military assistance to the free world.

At this point it is appropriate to discuss the objectives of the MDAP air training program. As directed by the Joint Chiefs of Staff, the three primary objectives are:

1. To ensure the proper maintenance and operation of MDAP-provided equipment.
2. To assist in the establishment of self-sufficient national training programs at the earliest possible time.
3. To assist in the attainment of combat effectiveness at the earliest possible time.

One of the less-known, perhaps because one of the less expensive, phases of the Mutual Defense Assistance Program is the training offered by the USAF to officers and airmen of NATO nations. Colonel B. H. Shiffrin, Chief of the Organization and Training Division, Asst. for Mutual Security, DCS/M, Hq USAF, reviews the role of MDAP in the NATO build-up, demonstrates that our allies must have trained people to maintain and operate equipment furnished them, and points out reciprocal features of training intended to strengthen the soft spots in NATO air power.

The first objective is basically a mandate from Congress requiring that the recipient nations must be able to accept, maintain, and gainfully employ the materiel. To protect U.S. interests in each country in this respect, we have Military Assistance Advisory Groups (MAAGs) under the provisions of the bilateral agreements between our governments.

The second objective has two facets: first, early development of training capabilities within the military establishment of each of our allies, thus preserving and strengthening their sovereignty; and second, early relief from the costly MDAP air training program which up to now has cost the U.S. hundreds of millions of dollars.

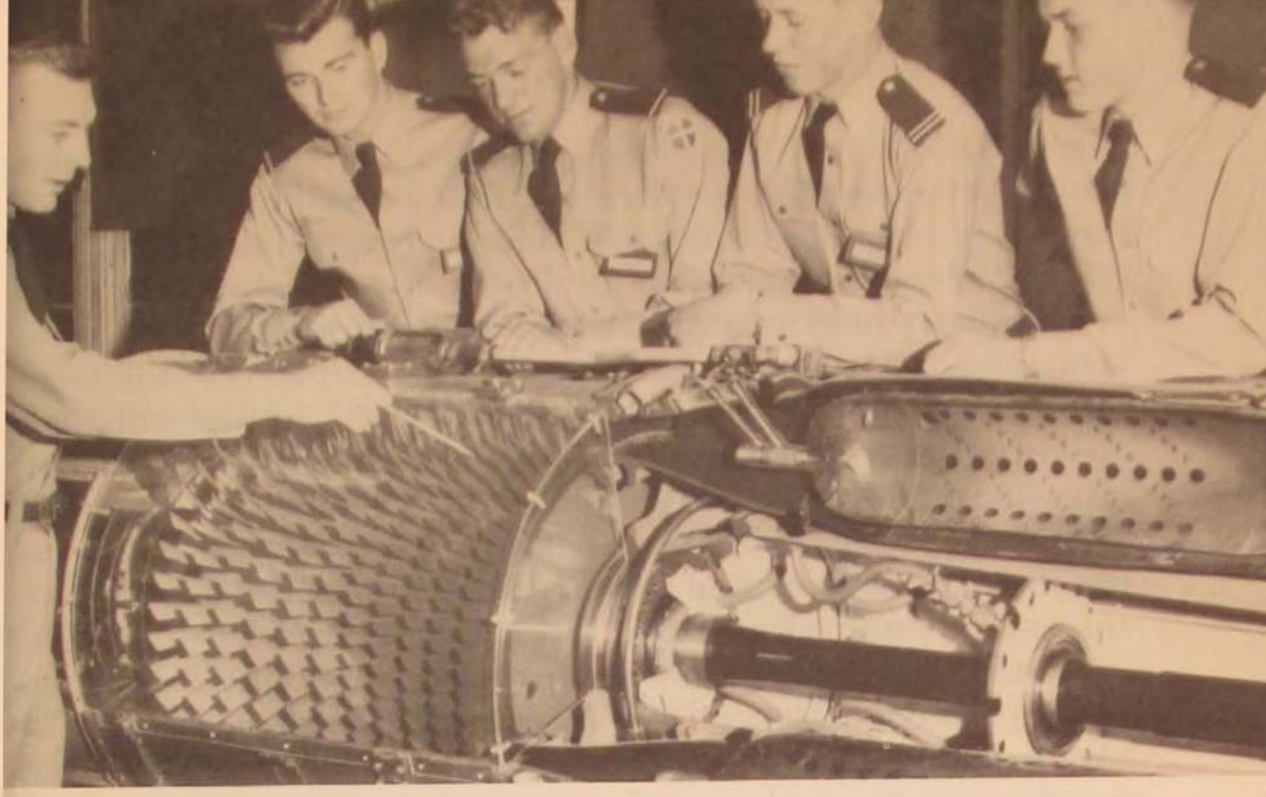
The third objective is, of course, the ultimate. The combat effectiveness of our allies is growing daily as unit after unit is being outfitted with the most modern equipment and is being trained to use this equipment in the most effective manner. When it is considered that the size of the air effort being supported by MDAP is approximately 64 tactical wings, the scope of the task can be measured against tangible yardsticks.

To achieve the objectives outlined above, the training capabilities of the MAAGs are fully exploited. Normally the MAAGs are small organizations staffed principally with military technical specialists accredited to Air Ministry level. Others like MAAG Formosa, JAMMAT Turkey, and JUSMAG Greece, provide assistance and advice down to unit level; these are in the minority. In either case, where the MAAG is not able to provide advice on certain specific equipment or doctrine, such assistance is made available through specialized training teams on temporary duty to the air force concerned. The temporary-duty period is usually of six months maximum. Normally the recipient country pays all expenses of such personnel while in their country and provides first-class return travel to their normal duty station.

THE great bulk of the MDAP training funds goes to the training of individuals, both in ZI training establishments and USAF overseas installations. Upwards of one hundred million dollars have already been spent on the training of pilots alone. Allied students are given exactly the same training as USAF personnel, and since the equipment we are training against is the

most modern, so must the training be. MDAP-trained pilots today are flying F-84 aircraft world-wide. Likewise the very latest GCA equipment, AN/CPN-4, is being operated and maintained world-wide by MDAP-trained crews—in fact, several "saves" of USAF aircraft have already been credited to our allies. Percentage-wise, foreign training loads in the USAF Air Training Command and at the Air University are small, but it must be remembered that each of the national air forces concerned has its own training establishments and that the students we are training are either instructors, in numbers clearly beyond the training capabilities of national programs, or are the U.S.-trained "hard-core" of professional airmen. The success of the instructor program has obvious end-results. The deficit program will inevitably lessen as national programs become geared to the complex equipment. The "hard-core" program is one which, although not originally contemplated by the architects of MDAP, is paying great dividends. An example of "hard-core" training is jet pilot training for Turkey and Italy. The Turkish and Italian Air Forces can train their own pilots, as far as numbers are concerned. But the jet combat-crew training they receive in the United States is presently beyond national capabilities. To fully exploit the fighting potential of the F-84, it is highly desirable that a nucleus of U.S.-trained F-84 pilots be assigned to each squadron. These will form the "hard-core."

Air University is currently playing a critical role in the development of key commanders and staff personnel in the air forces of our allies in the same manner as in the USAF. When officers in the allied military organizations are divided into three main groups, it becomes evident where Air University plays its most important part. The first group, the youngsters, are being provided training and guidance either in USAF schools or in national schools monitored by U.S. MAAGs. The senior group, or top commanders and staff officers, are beneficiaries of orientation visits to the United States and other USAF facilities overseas, or are the very people to whom the MAAGs are accredited. The third group, the middle group, is made up of today's intermediate commanders and staff officers—tomorrow's leaders. Since these men are normally already highly skilled in their professional fields, the flying and technical training program cannot reach them. Here then is the opportunity for Air University to provide the latest doctrine and thinking to tomorrow's allied air leaders. It is felt that the Air University program should continue and perhaps be expanded long after the individual flying and technical training ZI program has ceased.



Air Training Command and Air University Command bear the chief responsibility for training personnel of allied air forces. The flying and technical training provided by the Air Training Command do not overlap the training programs of the individual nations. They help to train a quantity of specialists larger than U.S. allies could produce, or they offer training in technical subjects not available in the students' own countries. The program develops logically from the need for trained personnel to operate and maintain the equipment furnished under MDAP. Above, a Training Command instructor explains jet engine operation to American, Danish, Dutch, and Belgian cadets. The Air University program is aimed at the allied officer who has completed his technical studies and is ready for training in the doctrine and employment of air forces. Below a British RAF wing commander is being briefed at Air University by an Air Command and Staff School instructor on how the capabilities of a certain type radar affect the planning and conduct of air actions.

The Air Materiel Command (AMC), which of course has the primary responsibility for the MDAP Materiel Program, plays a very important role in the MDA Training Program as well. While AMC conducts no formal technical training per se, it does provide on-the-job training to key foreign personnel in its vast depot complex. It is to the mutual advantage of the recipients of the huge quantities of MDAP materiel and of the USAF to have all allied air forces pattern their maintenance and supply systems after our own. The primary reason for this is the common use of supply and maintenance "bibles," such as Air Force Manual 67-1 and pertinent USAF technical orders. The most logical approach to this end is to train allied personnel in such procedures.

A specific example of how this pattern can be followed successfully is the establishment of two jet engine overhaul facilities in Europe and North Africa. These facilities are intended to overhaul every jet engine needed by NATO F-84 and T-33 aircraft. To begin with, selected teams of foreign key personnel were assigned to the Air Materiel Command, at Tinker AFB, Oklahoma, which is the jet engine overhaul center of the USAF. Certain AMC technicians were assigned to temporary duty with the MAAGs concerned, to advise on such matters as proper facility layout, production line methods, and assembly and disassembly procedures. Through the combined efforts of the countries concerned, training in AMC, and the assistance of the temporary-duty specialists, the facilities are now operative. When it is remembered that the alternative to setting up these facilities was a continuation of the grant-aid pipeline of jet engines from world-wide sources to Tinker AFB, the success of the program becomes much more real.

The equipping of allied air forces has followed one or both of two principles: the first, the re-equipping of already organized units; the other, the activation and equipping of new units. In either case the recipients acquired the same types of sleek, modern, and complex equipment which was currently being delivered to USAF units. Thus in many cases we had to learn together. In order to take up the slack between equipment deliveries and production from technical schools, factory technical representatives were assigned to all allied air forces by Air Material Command. The main differences between technical representatives assigned to USAF units and those to MDAP countries is the additional requirement that the MDAP representatives were required to set up and initially supervise technical schools on the equipment or systems they represented. This was in addition to their normal

responsibility in trouble-shooting and keeping the equipment operative. As the MDAP pipeline gushes ever-increasing amounts of new types of equipment, more and more technical representatives will be programmed. Their number will diminish gradually and will be directly proportionate to the increasing capability of the allied air forces to operate and maintain the equipment properly.

From time to time other ZI major commands than Training Command and Air University are given certain MDA training responsibilities. These responsibilities largely follow an on-the-job training pattern, and more often than not the foreign students have graduated from ZI formal training elsewhere and are taught practical application of theory. One notable exception to this is the training provided by the USAF Air-Ground Operations School at Southern Pines, North Carolina. This fountainhead of tactical air doctrine plays a major role in the inculcation of USAF doctrine in NATO air forces and its facilities are used to the maximum. While it is impossible to assign all foreign officers to this school prior to return to their homelands, every effort is made to assign the middle group of officers.

THE role of USAF overseas installations has been touched on previously. While MDAP is not intended to become such a load on our overseas facilities as to interfere with their primary missions, nevertheless MDAP has become a major effort overseas. A prime example of the growth of overseas training is the role now being played by the United States Air Forces in Europe (USAFE). Initially USAFE got into the training business because it had several wings of F-84 aircraft—the very aircraft with which our NATO allies were being equipped. Naturally our MAAGs sought advice from the F-84 units on maintenance and operation of the F-84. Gradually more and more USAFE pilots and technicians were being assigned on temporary duty to new NATO units and more and more NATO nationals were assigned to USAFE units for on-the-job-training. While this satisfied the unit aircraft requirement, the problem of field and depot maintenance on aircraft and related equipment, plus the new and more complicated problems connected with electronic gear, required more intensive participation by USAFE. Faced with growing demands for assistance, USAFE accepted its place in the MDAP training picture and organized new courses which were published

in a training prospectus. This prospectus contained courses in all fields of maintenance, including aircraft and engine, electronics, armament, and accessories, plus all levels of supply. In addition to flying units, USAFE air control and warning squadrons provide on-the-job-training to NATO personnel.

To illustrate the mutuality of the program, a Central Electronics School was established at Friesing, Germany, in 1952. Both USAFE and MDAP countries were being equipped with the new AN/CPN-4 GCA. Not only was Keesler AFB incapable of training all of the required mechanics and operators, but time would not permit. Accordingly USAFE and MDAP teamed up and organized the new school. USAFE provided the physical facility, the overhead, and supervision. MDAP provided the training equipment, factory technical representatives, and the foreign students. The objectives of both agencies were achieved, and the school is a landmark in international progress. The school was such a success that plans were laid to expand its facilities to include courses on equipment which USAFE itself is not scheduled to receive. This raised a new problem—how long shall USAFE be required to train foreign nationals? It was determined that where USAFE had no requirement for such training, the school would have to be located in one of the NATO countries, with that country playing host to the others. This has already happened in Italy. Several of the NATO countries are scheduled to receive certain heavy early warning radar, whereas our USAFE units are equipped with mobile counterparts. Consequently all trainees would be foreign nationals. Italy, being very proud of its growing electronics capability, offered to set up a NATO school to train not only its own students but all other NATO students as well. MDAP would be required to train the instructor cadre, provide factory technical representatives, and furnish the training equipment. Students from other countries would not be MDAP students but would be trained under bilateral agreements. Thus two primary objectives have been attained: self-sufficiency within the family of nations and proper operation and maintenance of U.S.-provided equipment. It is recognized that there will be growing pains in the establishment and operation of such a school because of historic national jealousies, but it is felt that this school alone will do much to alleviate such jealousies. In any event MDAP has discharged its responsibilities by establishing a capability to train within NATO. Any continuation of individual training under MDAP after the establishment of individual national or combined training facili-

ties is contrary to MDAP policy and can lead only to indefinite dependency upon the United States.

Thus we have seen the various ways in which the MDAP Air Training Program assists in the training of allied air forces. In order of events, not necessarily in order of importance, they are as follows:

MAAG training capability
TDY training teams
Individual training, both in ZI and overseas
Factory technical representatives
Joint and combined training facilities

While the bulk of the training effort has been directed at NATO nations, the rest of the world cannot be overlooked when one considers MDAP. In addition to the NATO nations of Belgium, Denmark, France, Italy, Netherlands, Norway, Portugal, United Kingdom, Greece, and Turkey, others in the same and other geographical areas—Yugoslavia, Iran, Thailand, Philippines, Indo-China, Formosa, and several Latin-American nations—are in the MDAP family. Other countries in various parts of the world are expected to participate, but at this writing they cannot be disclosed. Priorities in training change from time to time as the world situation changes. For example when the invasion of Laos took place in the Spring of 1953, aid was increased to French Indo-China, Thailand, and the National Government of the Republic of China.

After all of this effort and the billions poured into the foreign aid program, the question might be raised: have we any concrete evidence of success? Any answer which does not consider some of the failures as well as the successes would serve no purpose but to confuse. The ultimate test of the organization being built would come, of course, only in active warfare. It is hoped that the very success of the world-wide effort will avert World War III. At no time has it been contemplated that the forces being raised with the assistance of MDAP would ever be used in unprovoked offensive action. Its very strength lies in the fact that the free world stands ready to assist one another to resist aggression and, if attacked, to fight on to victory.

Realistically there are certain problem areas which require attention. In Europe, for example, national laws generally provide for a shorter term of service of military personnel than will effectively utilize prerequisite skills. The Supreme Allied Commander, Europe, is well aware of this problem and is constantly trying to

persuade the various governments to change the laws in order to have more effective forces. Some nations now raising standing forces have never had standing forces, and their military service has no tradition except on the basis of militia. That is, arm oneself only to resist aggression from a known source, then disarm when the danger is over. It is foreign to some of these peoples to maintain sizable peacetime forces and to reconcile themselves to the cost, not only in wealth but in manpower as well. While there are still some countries with this problem, others have recognized it and have taken action to increase the length and desirability of military service.

Naturally the U.S. has a decided interest in the effective use of trained military manpower since the Congressional mandate requires that the recipient be capable of proper maintenance and operation of the equipment. Under current policy MDAP training assistance may be provided only during the build-up phase of the forces to be raised. Once the forces are achieved, their maintenance is a national responsibility. There are instances where recipient countries have already demobilized pilots and technicians who had received their training under MDAP. Should this release from active service take place after the build-up period is over and national training establishments are in gear, mutual interests are satisfied. But where such release occurs during the build-up phase, the U.S. has definite interests.

Another problem area is the language difficulty. Despite great attention to selecting foreign students with an acceptable knowledge of the English language for assignment to training in U.S. installations, this problem cannot be totally overcome. It may be that in comparison with USAF or English-speaking foreign students, the student with language difficulty does not assimilate all technical instructions. But most of the training is bound to rub off on him and will stand him in good stead when performing in his skill.

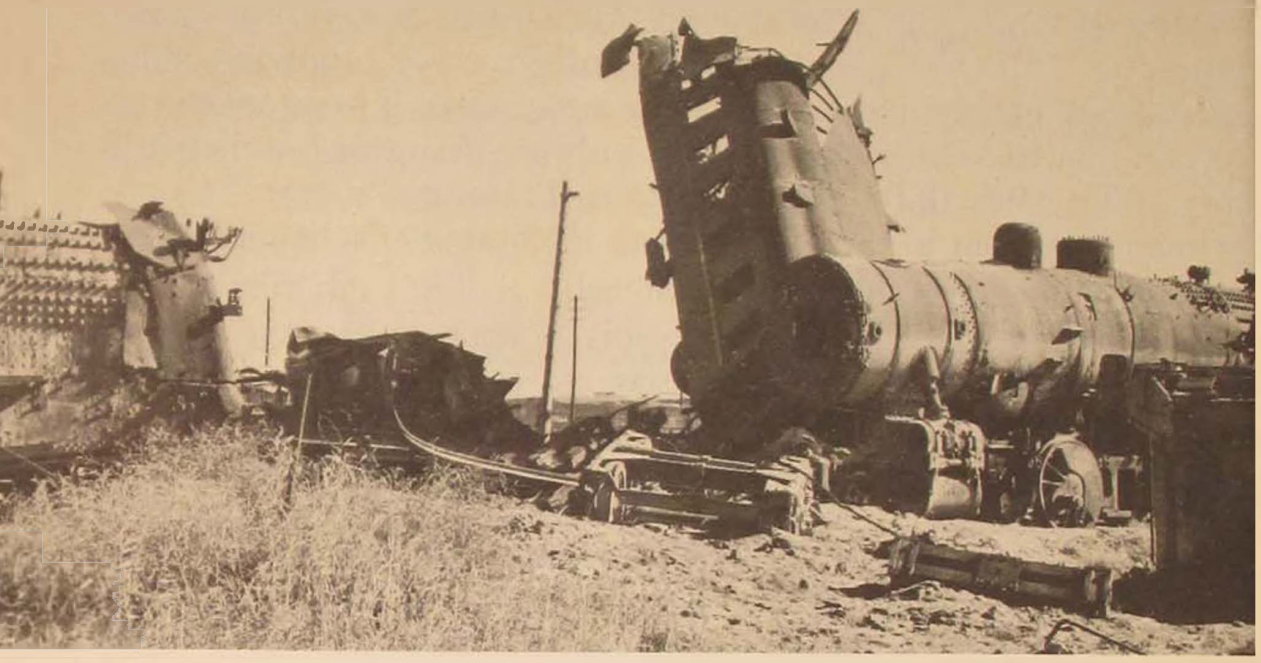
While MDAP training is in the nature of a short-range military effort, there is a long-range benefit to be reaped by the U.S. forevermore. It is a side effect of effort toward the primary purpose but one which will assume increasing importance and one which will leap into prominence should war break out again. This is the goodwill being created as a by-product of the training of many thousands of foreign military personnel in the United States, and the small islands of U.S. influence and friendship that are thus created when the students return to their homelands. The ability

of U.S. military personnel to get along and function on combined staffs will be greatly enhanced when those international staffs contain foreign officers trained in the U.S. Singleness of purpose and mutuality of interest will bring them together in a manner which will lead to greater effectiveness.

Moreover, when it is considered that United States units committed to NATO will be flanked by units of other countries, and, if required, will fight along side these other units, it becomes more certain that friendship and trust not only are desirable but mandatory. The Mutual Defense Assistance Training Program is the prime instrument in the development of combat effectiveness and mutual trust and confidence.

Headquarters, United States Air Force

The Cumulative Effect of Interdiction



Aerial interdiction of the enemy's lines of supply is generally and properly considered as a supplement to strategic bombardment of the enemy's war economy. In Korea it took the place of both strategic bombing and—in the last two years of the war—of the attrition provided in the past by full-scale ground action. Although the immediate purpose of interdiction was to deny the opposing front-line troops supplies of ammunition, food, gasoline, and equipment, adequate to sustain a general offensive, it had another aspect, as strategic and cumulative in nature as the bombing of enemy factories. This is the effect of the economic and material drain visited upon the enemy not only by the loss of supplies moving to the front but by the destroyed railroad rolling stock, the blasted truck convoys, the tremendous loss of manpower tied up in repairing bridges, tunnels, railcuts, and open stretches of track relentlessly pounded from the air. In North Korea, Communist losses on railroads alone were enormous. By 27 July 1953 the enemy had lost the following totals to air interdiction: railroad locomotives, 963 destroyed and 1171 damaged; railroad cars, 10,407 destroyed and 22,674 damaged; vehicles, 82,920 destroyed and 33,131 damaged. Damage to their lines of communication also confronted the Communists with staggering figures: bridges, 1153 destroyed and 3049 damaged; tunnels, 65 destroyed and 939 damaged; railroad cuts, 28,621. Losses like these would cause concern to an industrialized Western country with an extensive transportation network and large replacement capacity. In transportation-poor Asia they are even more portentous. Since all known repair and servicing facilities were methodically bombed, the only repair facilities left operating in North Korea were in tunnels, carefully hidden and protected from air attack. Relentless attrition of the enemy's

rolling stock and rail facilities reduced his tonnage capacity to a fraction of pre-war figures, as the following compilation displays.

Hauling Capacities of North Korean Rail Lines
Rated in Tons per 24-Hour Period

	Pre-War	*May 1953*
Sinuiju to Sinanju	6700	2400
Sinanju to Pyongyang	10,000	3000
Sakchu to Chongju	2200	1200
Pyongyang to Kaesong	10,000	100*
Manpojin to Kunu-ri	5600	2500
Hyesanjin to Kilchu	2000	1000
Wonsan to Pyongyang	3000	0†
Chongjin to Wonsan	10,000	3000

*shuttling and truck transfer †south of Singosan

Tonnages drop sharply on the lines farther south. Most important, these lines funneled into a dead-end, since the system east and south of Pyongyang had been completely severed. Gratifying as it was, this result largely affected the immediate situation. It did limit the enemy's ground action to small objective attacks and to obstinate defense. It did force the Communists to operate their remaining trains almost exclusively at night. It did divert much rail traffic to truck convoys which must also operate at night, and the mounting losses in rails and trucks frequently forced him to use human conveyor belts—thousands of men packing supplies on their backs over the rugged Korean countryside. Yet the long-term picture must have discouraged the Communist warlords even more. Economic slowdown became inevitable for the Asiatic continent as the limited rolling stock of China and eventually of the U.S.S.R. was siphoned off into the long one-way street called North Korea. The dismal prospect of continued drastic losses of their equipment and supplies with no hope for a pay-off in terms of a big offensive was undoubtedly a major factor in the enemy's decision to come to terms.

Wreckage-strewn marshalling yards and choke points were routine sights to U.N. pilots flying over North Korea. Over 100 wrecked and damaged railcars and five locomotives are visible in these pictures alone. When these scenes are multiplied by the hundreds of places in Korea where similar havoc fell upon Communist railroad rolling stock, they begin to reveal the vast economic and strategic significance of the destruction or damaging of 33,081 railroad cars and 2134 locomotives.

Destruction of rolling stock is only part of the drain which the aerial interdiction campaign inflicted on the Communists. A total of 1002 tunnels were destroyed or damaged. Mile after mile of railroad track was cratered at intervals (as at right) for a total of 28,621 rail cuts. The necessity for repairing this incessant interruption of rail service occupied the attentions of an army of laborers—an army which otherwise might have been in the front lines. Diversion of tremendous manpower to repair work in turn compelled the Communists to draw more men from the distant reaches of China.

Unremitting aerial assault on the numerous rail bridges in mountainous North Korea caused another drain on the short supply of steel available to the enemy. As bridge after bridge was knocked out, by-pass bridges had to be built. By-passes could seldom be as short as the original bridge had been. More track was needed; new spans were needed. How short the supply of structural steel became is evidenced by the considerable number of important long bridges the enemy did not attempt to replace.

As on the railroads, so on the highways. Bridges, tunnels, junctions, and embankments were blasted by the ever-returning U.N. aircraft. When the damage to the railroad network became decisive and more and more freight had to be hauled by truck, the toll of vehicles destroyed on the roads rose proportionately, until some 116,051 vehicles were destroyed or damaged. Attacks on road and railroad bridges accounted for 4202 bridges destroyed or damaged. This is the cumulative effect of 37 months of aerial interdiction—an aggregate important enough to make Communist leaders think again.

Too Much Detail or Too Little Management?

LIEUTENANT COLONEL GERALD T. SMITH

THE multi-billion dollar budget requests of the military services, the generally unsettled world conditions, and the press stories continually alleging military waste have led the American taxpayer to ask, through his elected representatives in Congress, for a more and more detailed justification of the funds requested. He is certainly entitled to have it. The Air Force seeks to provide it by preparing programs and computing budget estimates in ever-increasing detail. But appropriate as this practice may be in view of the ground rules imposed by higher authority, it imposes a heavy and sometimes apparently futile work load on those responsible for programs and budgets. Air Force personnel —some merely bitter, some genuinely interested in better management—have suggested new short-cut methods of budget estimating.

Is the present budget-estimating system a stumbling block in the path of good management? What are the characteristics of a better system? Can the budgeting process be improved now or are suggested revisions premature? This article will describe the present system in terms somewhat more simple than those used by the professional programmer or budgeteer, outline the revisions which have been suggested, and suggest a line of thinking by which the Air Force might approach acceptable solutions.

Under the present Air Force system of justifying budget requests, the objective is to go to Congress and other review agencies armed with enough supporting data to be able to answer any question. When a line item request for dollars is questioned, we

The Air Force is ultra-big business. Its budgeting is unbelievably complex. With Congress demanding more and more detailed justification for planned expenditures, complexity seems destined to spiral upward toward even earlier estimates, more revisions, and a myriad man hours. Lt. Col. Gerald T. Smith, Chief of the Procedures Division, Asst. for Programming, DCS/O, Hq. USAF, shows the time sequence and steps in budget preparation, review, and approval. He feels superior management and new procedures would simplify the budgeting process.

trace back through the computation methods (which involve considerations of basis of authorization, rate of consumption, and cost of acquisition) to the many details of an Air Force program which schedules the cost of getting from where we are to where we want to be.

Since the potential questions of budget reviewers are almost infinite in number and cover a tremendous range of details, the Air Force publishes programs in ever-increasing detail and computes requirements in the same minute detail. To illustrate the volume involved, the Fiscal Year 1955 budget cycle has already required some 6000 pages of primary programs and tens of thousands of pages of supplementary program data. When it is finally submitted to the Air Staff, the budget estimate will be supported by hundreds of thousands of pages of worksheets, summaries, narrative justifications, and so on. Production of all this detail costs us a tremendous number of man-hours. A prime point to remember is that this mass of detail is based on one set of beginning guide lines or assumptions. When these are changed, the details must change, and in far less time than was available for the original compilation.

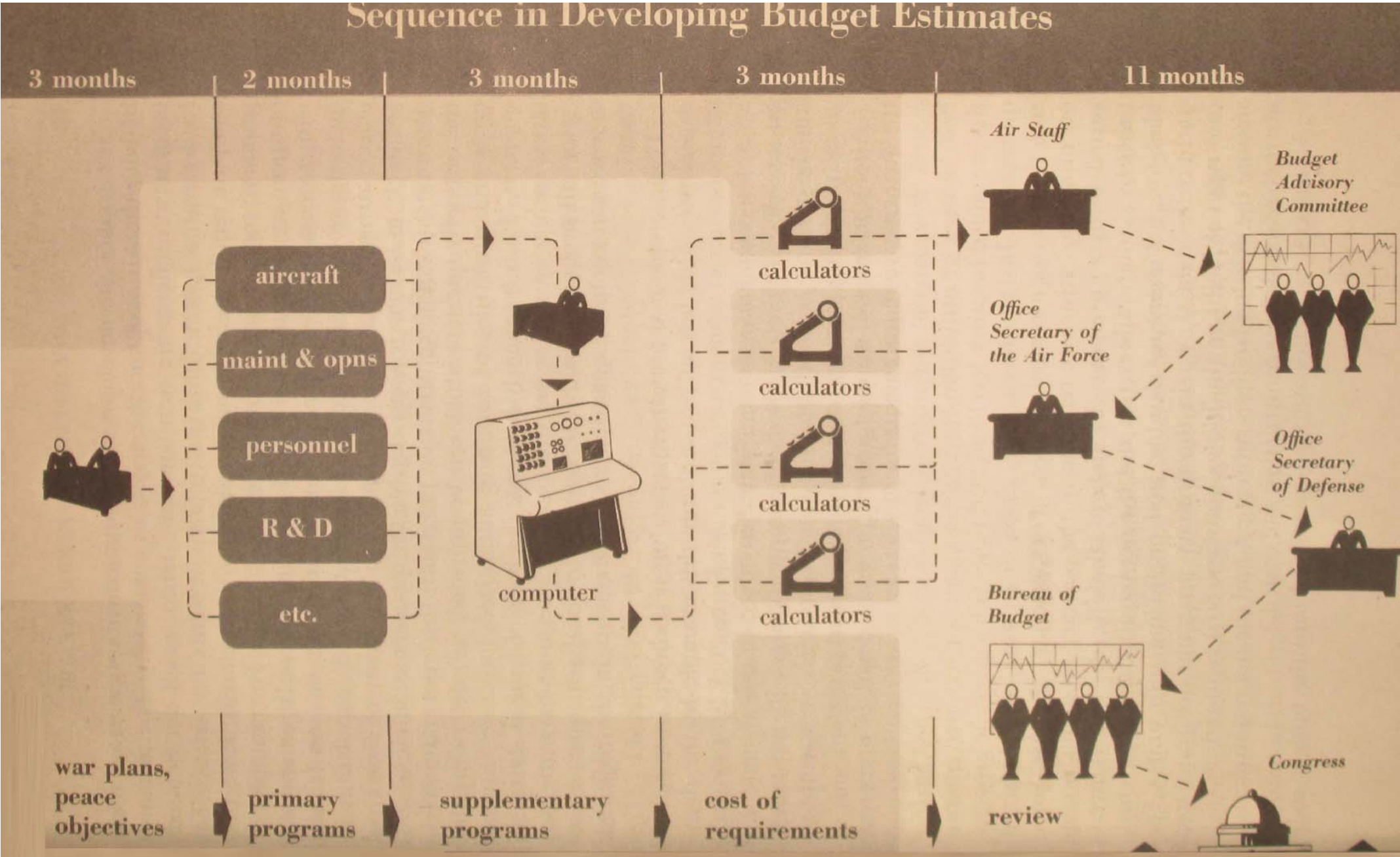
Let us examine the sequence of events in developing a budget estimate, first as it theoretically *ought* to happen and then as it almost always *does* happen.

The theoretical sequence should begin with an answer to the question: "What must the Air Force be capable of doing during the period under consideration?" The authority and responsibility for providing the answer are vested in policy-making levels of government outside the Department of the Air Force. The task of translating these policies into dollar requirements is large and complex. It can be described generally as a series of steps.

First the policies must be translated into Air Force war plans and joint war plans. These show how the Air Force would conduct its share of a war which might occur at any time up to three or four years in the future. Also there are parallel sets of plans for accomplishing the peacetime mission, should we be fortunate enough to avoid war.

Next we must examine the peacetime and wartime plans to develop schedules for the time-phased acquisition of required assets. This is the step in which the Air Force program documents are published by the Air Staff. They show the time-phased relationship or "mix" of prime assets such as aircraft, personnel, units, and stations and of the common-denominator operating rate, expressed in terms of flying hours.

Sequence in Developing Budget Estimates



Next comes the development of supplementary program data by both the Air Staff and the major air commands. The primary program documents are translated into terms which can be used to determine specific quantitative requirements for assets. To compute requirements in minute detail, we must break down the primary programs into a similar degree of detail. For example, if our primary programs show base X as having Y population and we wish to compute requirements for furniture for on-base family quarters, we must (1) determine how much of Y population is officer, airman, or civilian; (2) determine how many of each type are likely to be married and eligible for quarters assignment; (3) determine (through construction programs) the types and quantities of family quarters which can be provided; (4) determine the types and quantities of furniture authorized for issue to such quarters. If, as frequently happens, the basis of issue is stated in terms such as "1 mirror per upstairs hall," we must have an "upstairs hall program, worldwide, by base, by fiscal year quarter" so that we can compute quantitative requirements in the required detail.

This example may appear extreme, but it is chosen from actual experience. One has only to multiply this example by the thousands of materiel items carried on the Air Force stock list to visualize the tremendous volume of detail involved in this system. To be sure, less detailed methods of computation are in use today, but the example still indicates the lengths to which we attempt to go in translating primary programs into detailed programs.

After the mass of supplementary program detail is prepared, the quantitative requirements for physical assets are computed and costed. For materiel the program detail is usually matched against basis of issue or utilization rate, and previously computed quantities are added for stock level and lead time. This gives the gross requirement. Inventories on hand or on order are then subtracted and the net requirements costed. For personnel the Air Force organizational structure reflected in the primary programs is converted into requirements by individual skill. Personnel inventories by skill are subtracted, and the net requirements are scheduled for procurement, training, and organizing into units. For stations the data shown in the primary programs are translated into types of facilities (buildings, runways, etc.) required on each station, the existing facilities subtracted, and the net requirements are then scheduled for construction and costed.

All the cost estimates are next assembled into the budget code

structure and are subjected to successive reviews first by the subcommand, then by the major command of preparation, by the Air Staff, the Budget Advisory Committee, the Air Force Council, the Secretary of the Air Force, the Secretary of Defense, the Bureau of the Budget, and finally the Congress.

The time involved in this *theoretical* sequence of events is about 22 months, divided into 3 months for war planning and stating peacetime objectives, 2 months for primary programming, 3 months for supplement programming, 3 months for computation and costing of requirements, and 11 months for review.

Several factors cause the actual sequence of events to differ significantly from the theoretical sequence just described. For one thing the time at which the theoretical cycle must begin (22 months prior to the beginning of the year being budgeted for) is much too early to obtain from higher authority the necessary major policy decisions on Air Force objectives. The previous year's budget request is still being considered by the Executive Branch, and will continue to be for the first 6 months of the theoretical cycle. Lacking both the approved over-all objectives and final status of the previous year's budget request, the Air Force is faced with a choice of evils. It must either delay the beginning of the cycle and thus allow insufficient time to everyone, or else begin the cycle on time without anything more than a considered judgment as to what the objectives and fund availability will eventually be. If the latter course is followed, several months' work is devoted to running out plans, programs, and budget estimates, all based on Air Force best judgment, only to find just as the tremendous task is completed:

a. There have been changes in the world situation or in the political atmosphere or in the tentative decisions of top Air Staff officers,

b. Congress has acted on the previous year's budget, and

c. Approved OSD guide lines and joint warplans are now available.

These events necessitate revisions—sometimes very substantial ones—in the planned programs and therefore the budget estimate. Since the estimate was computed in detail from detailed programs, the logical way to revise the estimate is to prepare a new set of detailed programs. But there is not enough time between the compilation of the initial budget estimate and the deadlines for submission of the final estimate to higher authority to allow either the preparation or use of such new detailed programs. Consequently

the Air Staff goes into a "flap," working many overtime hours to produce as complete a revision of the program data as possible. The dollar estimates and supporting data are then adjusted to conform to the revised programs, a difficult process again involving extra hours and exercise of the highest levels of judgment and experience. By the time a budget estimate has undergone several such adjustments, it is extremely difficult to give Congress a clean-cut detailed justification for funds requested.

Other factors further complicate the usual cycle. Since the assumed basis for programming is subject to change, preparers of program data delay publication to incorporate the latest known policies and assumptions. This lost time must be subtracted from the time available for requirements computation or the time devoted to budget review. Either case increases the difficulties of doing the job. Decreasing the time allowed for computation of requirements also decreases the computer's use of detailed programs, so he must resort to some averaging or computing in less detail. Even if by skill and experience he produces relatively accurate results, such procedures make it difficult to trace line item dollar requests to specific program data in justifying funds to Congress. A third point is that in busying itself with the minutiae of preparing and supporting budget estimates in such detail, the Air Force has fewer man-hours to devote to its principal task of conducting actual operations. This preoccupation with budgeting is especially costly to the major air commands which provide support for our operations. Especially is this the case in the Air Materiel Command.

In summary, the Air Force is currently committed to preparing budget estimates in great detail, following a programming cycle which is developed in logical steps. But the cycle has not provided optimum results because certain actions could not be taken at the times they were required.

MANY Air Force personnel associated with the complex programming and budgeting processes have expressed dissatisfaction with the present system. They point out that the flaws in such a system can be readily identified and that new systems should be devised to eliminate the flaws. Let us examine three recent proposals made unofficially by members of the Air Staff. Each proposal seeks to simplify the program-budget system so as to:

1. Reduce the amount of detail required.

2. Provide a means for rapid recomputation of the budget estimate whenever necessary.
3. Produce accurate results.
4. Provide adequate supporting facts in justification of the budget request.

The so-called "standard planning table" scheme envisions standard packages of manpower and materiel, graduated around the basic functions of the Air Force according to some measure of work load. For example, the operation of a single-engine jet pilot training base might require a certain amount of permanent party manpower and a certain amount of materiel if the training rate were 500 students trained per year. At some point of increased work load, say 750 students per year, the same base might require additional manpower and materiel. If standard tables could be prepared to show the requirements for personnel and materiel at each level of work load, then once the *programmed* level of work load is known, the tables can quickly furnish the gross requirements.

Some work has been done in developing such standard packages or planning tables for the manpower side of the picture. No materiel planning tables have yet been developed, but our present detailed programming system is producing a mass of raw data from which such tables could be constructed. The Unit Allowance List-Base Allowance List System, the consolidated UPREAL (Unit Property Record and Equipment Authorization List) report, the Standard Facility Equipment Lists for Communications-Electronics Equipment, and several others are excellent sources of data for building standard materiel packages around functions. Identification of basic functions is being standardized by way of tests now under way in the Air Staff. Results of the tests will be incorporated into the appropriation and expense accounting system, the statistical services reporting system, and others.

The data such a system would provide in support of a budget estimate are of course contained in the standard planning tables themselves, which in turn are based on experience in past operations. While this does not furnish the level of detail that the theoretical approach might, it is possible that such tables could be accurate enough to satisfy the taxpayer that our requirements are based on sound management.

The second approach would use electronic computers to do the detailed part of the programming and most of the computing and costing of net asset requirements.

appropriated funds are expended, and what controls insure that operating actions produce an adequate combat-ready force. The responsibility for getting this information before key Air Staff officers and higher-level executives lies with the Air Staff itself, which is comprised of offices responsible for knowledge of all phases of Air Force operations.

The second step to improvement is the appraisal of current management practices. Top civilian executives are all men with wide business experience, and key Air Staff officers have wide military experience. The judgment of these two groups of people, when applied to the information obtained in step one, can determine which of the present management practices are not efficient. It should be remembered that efficiency cannot be measured by low cost alone, but by the proper balance between cost, quality, quantity, time, and method. If top management should judge present practices to be out of balance, improvement is required.

Once the practices requiring improvement are isolated, the next step is to fix responsibilities for research and development of new practices. Earlier in this article suggestions for improving budgeting techniques were described. These emanated from different Air Staff offices, each of which was evoking more or less independently on solutions to a common problem. A more desirable approach would be the concentration of effort in one office having both the functional interest and the technical competency to produce results, with other staff offices making their contributions as part of a coordinated effort. It is axiomatic that the rate of progress toward improvements varies directly with the pressure applied through the chain of command from the top down. Therefore the directives from top management to offices selected to conduct research and development of new practices should be firmly stated, be specific as to acceptable rates of progress, and be followed up by periodic checks on progress.

The final step is the development and adoption of the improved management practices themselves. This step of course entails considerable effort and time. The voluminous data now prepared at each point in the management of Air Force operations, must be collected, sifted, combined, and correlated in an effort to find more efficient management practices.

The four steps to management improvement may be more readily understandable when applied to a hypothetical example.

Suppose that in the first step key Air Staff officers presented to appropriate executives at Departmental level an accurate descrip-

tion of the present budgeting procedures, tracing through the effort and time required to get from a statement of objectives to a detailed budget estimate.

In the second step top management might examine the present practices closely. The costs of preparing the initial estimate could be weighed against: first, the quality of the estimate (*i.e.*, the balance between the component requirements); second, the time required to prepare and subsequently adjust the estimate; third, the validity of the methods used to compute individual quantitative requirements; and fourth, the facility with which the requirements can be related back to the desired end products, *i.e.*, combat-ready wings. As a result of thorough appraisal, top management might determine that the following improvements were required in the budgeting process: first, that preparation time of initial cost estimates should be reduced; second, that methods of computing quantitative requirements should be simplified; and third, that the budget estimate as finally presented to agencies outside the Air Force should be supported in terms of related component costs to facilitate appraisal of changes in any component part.

The third step in this hypothetical example would be the issuance of directives by top management to the Air Staff offices selected for the research and development work in each of the three areas, and perhaps also to a fourth Air Staff office selected to coordinate the efforts of the other three. The directives would state clearly the improvements to be sought as well as a time table for completion of the work.

In the final step the hypothetical example will be divided into three parts corresponding to the three areas under development.

The office responsible for reducing time to prepare initial estimates might turn first to the records of past operations as reflected in the accounting systems. The actual costs of past operations might be plotted against elements of past programs to discover close correlations. It might be found, say, that the number of civilian employees hired to perform depot maintenance varied with the flying hour program. When suitable program elements had been found for all parts of the budget structure, time tests could be conducted by recomputing past years' budgets on the basis of correlation between program elements and costs. Such research might develop a faster method of arriving at an initial budget estimate within acceptable limits of accuracy.

The office selected to improve methods of computing quantitative requirements would evaluate Air Force-wide efforts to state

standard costs of operations in terms of personnel, materiel, and real estate. This office would examine authorization documents such as Tables of Organization, Unit Allowance Lists (UAL), Unit Property Record and Equipment Authorization Lists (UPREAL), Standard Facility Equipment Lists, and Standard Designs for Installations Facilities to determine how well standard costs are stated and how such costs can be related to program elements. The operations of equipment review boards and the use of bulk allotment personnel to support combat organizations could be studied. The office might try grouping such costs around functions or weapons systems, consolidating low dollar cost items to eliminate detailed computations.

The office responsible for improving the "packaging" of the final budget estimate would study the improvements developed by the two offices described above. Statistical research might be done on the behavior of certain cost elements when other related cost elements are changed. For example, do maintenance and operations costs increase when construction expenditures are reduced? Further research might be done on the size of the combat and supporting force which can be supported within selected major program element or dollar "ceilings" imposed by higher authority. This research would seek to identify the units or activities which would be eliminated from the Air Force program as the ceilings are lowered. It might be shown, for instance, that in order to maintain a balanced combat-ready force, combat units instead of support units would be eliminated if the total numbers of personnel, total flying hours, or total dollars are reduced beyond certain points.

The foregoing hypothetical example is only one of many applications of a plan to seek management improvement. The four basic steps are neither new nor original with the author of this article, but do constitute a simply-stated, logical plan for approaching our management problems. If pursued vigorously and continuously they should make the Air Force a better managed enterprise and ultimately lead to relief from the programming and budgeting burdens which many now find so onerous. At the same time such relief would force more man-hours for use in managing current operations.

Headquarters, United States Air Force

Books and Ideas . . .

Generals in the Rise and Fall of Germany

DR. EUGENE M. EMME

"One can do everything with bayonets except sit on them."
—Talleyrand

NO other military organization has played a more significant role in a modern nation's history than the General Staff of the German Army. Its prominence, stemming from the days when Frederick the Great pulled Prussia up by its own bootstraps into status as a major European power, rose steadily until Adolf Hitler's war which became global and pulled the entire nation down around him into the chaos of total defeat.

As a means of appreciating the significance of our own current and future events, the springboard of historical experience is nowhere more valuable than in an examination of the General Staff of the German Army. Current problems in Western Europe still revolve around the traditional problem of Germany: united it dominates, divided it weakens all Western Europe. The physical fate of Western Europe may hinge upon the manner in which Germany sheds its disarmed and neutral status. The grim memory of two world wars during which Germany sought by force to dominate its neighbors still haunts those Western nations who today ought to be concentrating on the present threat of the Soviet Union. Indeed the thorny problem of Germany often appears as the central problem of Europe itself.

The specter of a modern totalitarian state as seen in the late Nazi Reich also provides object lessons for democratic nations facing the problems of maintaining realistic physical security and reasonable internal prosperity. In the rise of Adolf Hitler, in the bloodless diplomatic victories of the "Appeasement Period," in the startling *Blitzkrieg* victories of 1939-40, in the barbarization of Germany under Nazi leadership, and in its devastation and total defeat by 1945—in all of these prominent historical matters the generals of the Army General Staff played significant political and military roles. In searching for the American political organization which will best ensure the proper balance and employment of military forces while remaining consistent with our political principles, the German experiences provide us with many clues to how and how not to organize, command, and employ land, air, and sea forces for warfare as we understood it before the nuclear weapons and global-ranged aircraft drastically altered military technology.

American students of military affairs now have the opportunity of reading two well-substantiated volumes on the history of the German General Staff. One of these volumes is written by a liberal German historian, who skillfully traces the General Staff as a determinant factor in the story of the fortunes and misfortunes of Germany. It is the best historical treatise available in English and, as such, may be considered an invaluable reference work of last-

ing value.* The other volume, written by an informed American, focuses its analysis upon the years between the World Wars. It attempts to establish that the political alliance of Germany's professional military technicians with unprincipled Hitler not only sealed the fate of Germany and cast the die for World War II, but also caused the devitalization of Europe and all that this has meant to contemporary world affairs.** This volume is more of a politico-moral analysis by a non-German than a purely historical study.

From the 18th century onward Prussian military discipline and battle-tested doctrines have been closely studied by professional military officers of all nations. In particular the General Staff system of the German Army was to serve as the model for the staff organizations of most major nations by the turn of the 20th century. This included the United States. In the beginning the quartermaster or logistics officer, charged with the responsibility of supplying troops in the field, became the first specialized staff officer. With the French Revolution came the democratization of war, the growth of mass conscripted armies which placed a vast host under a single commander. Bureaucracy in command developed inevitably. The organization of armies into the tactical unit of division and the decentralization of command rapidly followed. In the German experience the partnership of a naturally gifted field commander with his highly-schooled Chief of Staff became indispensable to the orderly command of large forces in battle (*e.g.* Blücher and Scharnhorst, Hindenburg and Ludendorff, and Mackensen and Seeckt). The bureaucratization of Army command and the division of labor among professional military specialists evolved steadily as the firepower and the maneuverability of armies increased with technological advances. It was after this monolithic and self-motivated Great German General Staff had established itself institutionally, had formulated its basic doctrine and its *raison d'être*, that the submarine and the airplane rose to demand their place in the strategy of war.

DURING the 18th century the art of war was generally considered to be a matter of mathematical calculation, a conceptual world of abstractions arranged in geometric relationships. Parade-ground formations were geared to the rapid concentration and orderly movement of forces on the battlefield. These theories were destroyed in the political crucible of the French Revolution and by the military "unorthodoxy" of Napoleon. The crushing defeat of Prussia by Napoleon at Jena served as an intellectual challenge which brought forth the response found in the doctrines of Scharnhorst and Clausewitz. As Director of the *Militärakademis* Scharnhorst educated the generation of officers who later formed the kernel of the Prussian General Staff. Clausewitz's post-humously published studies, as well as the theories of Moltke and Schlieffen,

***History of the German General Staff, 1657-1945, by Walter Goerlitz, translated from the German by Brian Battershaw (New York: Frederick Praeger, 1953, $7.50), pp. 508. This is an abridgement of the original edition *Der Deutsche Generalstab: Geschichte und Gestalt* (Frankfurter Hefte, 1950, pp. 707).**

****Sword and Swastika: Generals and Nazis in the Third Reich, by Telford Taylor (New York: Simon and Schuster, 1953, $5.00), pp. 431. Brigadier General Taylor served as Chief of Counsel for the prosecution of the major war criminals at the Nuremberg trials.**

have long served those who hold to immutable principles based upon the primacy of ground warfare.

In modern Germany the business of the conduct of war thus came into the hands of specialists. Little restrained by civil authority, much less subordinated to the dictates of a democratic government, the Prussian General Staff likewise developed its own self-righteous and aristocratic moral code embracing the virtues of total obedience and Christianity. Clausewitz's view of war as national policy continued by other means was permanently ingrained in German military thought by the brilliant victories of 1864, 1866, and 1870. Bismarck's "blood and iron" initiation of surgeon-like limited wars created the German nation, itself under Prussian hegemony. This success bred arrogance internally and emulation for Prussian military efficiency abroad. The monolithic structure of the Great German General Staff was to become an anachronism keeping alive the hope of a national general staff dominated by the concepts of land-locked European military thought.

After the defeat of 1918 the small Reichswehr served indispensibly as the protector of the Weimar Republic. As a whole the German officer corps in the 1920's was most vitally concerned with the re-establishment of German military prominence in Europe. It advocated the destruction of the "chains of Versailles" and the restoration of Germany's frontiers and military security. It found Nazism, after Hitler was named Chancellor in 1933, the fount of unlimited military appropriations and professional promotion. This became the fatal political flaw of the German Army generals. For Hitler was neither "a puppet who danced on strings pulled by the generals," nor was the reverse completely true until the cumulative intensity of defeat in World War II became apparent.[1] The working agreement between Hitler and his Army generals but briefly faltered through the Rhineland, *Anschluss,* Munich, and Prague victories of the "cold war" of the 1930's. In each case Hitler overruled the objections that his military specialists based upon Germany's unpreparedness and reaped bloodless strategic victories. General Taylor establishes a rather convincing thesis that Hitler was finally supported by his Army generals in his conquest in Poland. But in this case the political objective of limiting the extent of the war was not achieved. World War II did not end in October 1939. Britain and France unpredictably accepted Hitler's challenge of a general European war and refused to "localize" the Polish question. The chain-reaction of events subsequently brought the Third Reich brilliant battle victories but failed to win decisions in the air over Britain, deep in the heart of Russia, and in the air over Germany itself. Thus the initial use of war to achieve Hitler's ambitions in Poland led to a war which far exceeded Germany's capacities and in the end brought wholesale destruction and humiliation to Germany. Both Taylor and Goerlitz offer much new information for those who are intellectually curious about the role of German generals in the making of Hitler's strategy. The valiant but tardy and unsuccessful attempt of Beck, Stauffenberg, Rommel, and others to end the lost war by removing Hitler, receives valuable treatment in Goerlitz's volume.

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1 Another worthy volume to be considered here is B. H. Liddell Hart's *The Other Side of the Hill* (London: Cassell, 1951). This volume is a revised and enlarged edition of *The German Generals Talk* (New York: Dutton, 1950).

THE historically unique features of the higher direction of German military affairs, not to mention the traditional lack of civil control or the dominating personalities of Hitler and Goering in the Third Reich, should not be confused with useful observations and mental perspective gained on the crucial problem of creating and coordinating land, sea, and air forces to promote a nation's strategy. Almost until the outbreak of World War II the pattern of organizational development in Germany was characterized by the device of a single general staff, that of the German Army. Its domination of the potentially strong Navy developed by von Tirpitz before World War I merely reaffirmed the land-rooted nature of past German military experience.[2] With the emergence of the German Air Force under Hitler's right-hand man, Hermann Goering, the General Staff of the German Army was perforce shorn of part of its power.[3] In 1938 Hitler created the High Command of the Armed Forces (*O.K.W.*), unifying land, sea, and air forces in principle but not so in practice. This form of a national general staff was virtually circumvented by Goering, ignored as much as possible by the Army General Staff—though *O.K.W.* was staffed principally by Army officers—and was animated in its actions primarily by Hitler. The early Blitzkrieg victories resulted under this system. As the war reverses mounted, however, Hitler increasingly reserved for himself the power of decision. Eventually he was making decisions for absurdly-low echelons in all three services. This habit was catastrophic.

The influence of the German High Command structure upon the course of World War II requires an objective and penetrating study quite beyond any volume yet available. The memoirs and apologia of German generals, particularly Halder and Guderian, generally submit the thesis that Hitler was primarily responsible for Germany's defeat.[4] American readers have recently been barraged with criticism of—and occasionally admiration for—the German system of unification (minus Hitler and Goering) in seeking guidance on our own interservice problems. The arrogant Prussian features as well as the self-motivated actions of a monolithic staff structure have been legitimately dismissed as inapplicable to the American circumstances.[5] A post-war German Army concept which proposes a totally unified military structure minus Hitler has appeared to be more than lightly examined in this country.[6] Indeed the detailed study of the proper role and joint employment of modern military forces in this age of atomic bombs and supersonic aircraft must adequately consider the recent experience of Germany, as loser of the last two major

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2 Documenting from the German experience, Lt. Col. S. D. Hittle, USMC, states, "A national general staff and strong sea power cannot, at the same time, exist in the same country." See his "Sea Power and a National General Staff," *U. S. Naval Institute Proceedings*, LXXX (October 1949), pp. 1091-1103. Also see the excellent study written from German naval documents by F. H. Hensley, *Hitler's Strategy* (London: Cambridge University Press, 1952).

3 For brief discussion of the political and military influence of Goering, who served both as Air Minister and C-M-C of the Luftwaffe, see E. M. Emme, "The Reichsminister and the Luftwaffe," *Air University Quarterly Review*, Vol. V, No. 1 (Winter 1951-52), 113-117.

4 See Franz Halder, *Hitler as War Lord* (London: Putnam, 1950); Heinz Guderian, *Panzer Leader* (New York: Dutton, 1952).

5 See "Should the U.S. Adopt the German 'General Staff' Plan?—an Interview with Thomas K. Finletter," *U.S. News and World Report*, 15 May 1953, pp. 46-55. See article written from naval point of view by Arthur O. Sulzberger, "Concept for Catastrophe," *U.S. Naval Institute Proceedings*, LXXIX (April 1953), 399-407.

6 See "U.S. Tests German Staff Idea," *U.S. News and World Report*, 10 February 1952, pp. 26-27.

wars. It is to be hoped that the German people themselves, including the generals, have learned something from historical experience.

After studying not only the German experience but also that of the Allies in both World Wars, one prominent student of high command concludes:

> The democratic system of government is not unsuitable in time of war. A free people knowing as much of the truth as can be told them without giving too much help to the enemy, will endure more patiently, will work and fight better, than an enslaved and deceived totalitarian populace.
>
> The real danger of war to a democracy lies in the initial blow. Totalitarian nations, especially in this atomic age, are better fitted to plan and deliver a sudden and powerful assault than a democracy. If this trump card fails they become inferior to democracies, but the democratic state must be able to survive the first murderous blows. We must be defended by adequate and scientifically up-to-date forces. Our machinery for the higher direction of war must be capable of operating immediately under war conditions.[7]

This realistic statement challenges the serious student of military command in all the services as well as our civil leadership in whose hands rest the ultimate control of our military structure. The Soviet announcement of their possession of a "hydrogen bomb" in August 1953 only makes the problem more crucial.

Air War College

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7 From lecture given at London University by Air Marshal Sir Robert Saundby, "The Higher Direction of War," *The Aeroplane*, 20 February 1948, pp. 210-211.

. . . Air Force Review

THE SQUADRON OFFICER COURSE

"Will proceed . . . TDY . . . Maxwell AFB, Ala . . . purpose attending Sq Off Crse . . . report . . . Comdt AC&SS . . . NLT . . . ."

WHEN First Lieutenant Joe Doakes received his orders he muttered, "Why me? I'm not a desk jockey, I'm a pilot! What's this course like? What's in it for me?"

The assignment was not the matter of chance Joe seemed to think it was. His commander had personally placed "First Lieutenant Joseph J. Doakes" at the top of a list of his officers eligible to attend the Squadron Officer Course (SOC) and inclosed a special recommendation. Joe's commander could have taken the easy way—let Personnel select those eligible officers who could be spared—but the colonel was conscientious. Having often had reason to be grateful for the time he had spent in the old Air Tactical School, he felt strongly that selection of the best available officers to attend this course is a wise investment in future Air Force growth and effectiveness. His decision to recommend Joe was based not only on Joe's records but to a great degree on his personal observation of Joe at work and play.

Doakes was well-liked and respected by both officers and airmen in his group. A thirty-year-old veteran fighter pilot of World War II, he had earned several years of college credit before he was recalled to active duty in 1950 and served a combat tour in Korea. When he returned from Korea and was assigned to his present unit, Joe decided to sign "indefinite" and make the Air Force his career. But in both periods of active duty, he had been called upon

The Squadron Officer Course is the first rung of the Air University Command's ladder of professional schools for Air Force officers. Its vital mission is to improve the versatility and quality of junior officers for an Air Force which must vastly increase its combat strength with a minimum increase in personnel. Armed with a unique variety of formal, visual, and laboratory teaching methods, the Squadron Officer Course drives home theory and first principles with extensive practical applications in real situations. Big-school facilities are combined with a small-school personal touch, as SOC subdivides each 700-man class into 12-man sections. Under the same instructor for the 10-week course, the section works and plays as a unit. In the classroom and on the athletic field the unit competes against the other units, developing a remarkable degree of spirit and cooperation which in turn has an important bearing on the success of the learning process. The *Quarterly Review* staff, in collaboration with the faculty of the Squadron Officer Course, with the Air Command and Staff School, and with Headquarters, Air University, surveys the purpose, philosophy, workings, and value of the Air Force Squadron Officer Course.

to do little more than fly. Although Joe was a top-notch pilot, he ran into trouble in performance of duties other than flying. The problems which bothered him were those requiring judgment and perspective. When, for example, he served as adjutant, supply officer, and later as acting squadron commander, he made several hasty, impractical decisions on squadron administration and policy. What Joe needed was training in the skills of logical, organized thinking and problem solving.

There were other ways in which Joe felt uncomfortable and unsure of himself. In writing readable staff reports, in speaking articulately and convincingly, and in cooperative staff work demanding organization and direction of a group effort, Joe's deficiency and uncertainty was reflected in the caliber of his work. But then Joe was a pilot. His training for a specialty, like that of thousands of other young Air Force officers, had never developed the wide range of skills needed by commanders and staff officers. What Joe and most squadron-grade officers of today need is basic professional training for greater over-all versatility, regardless of job assignment or AFSC.

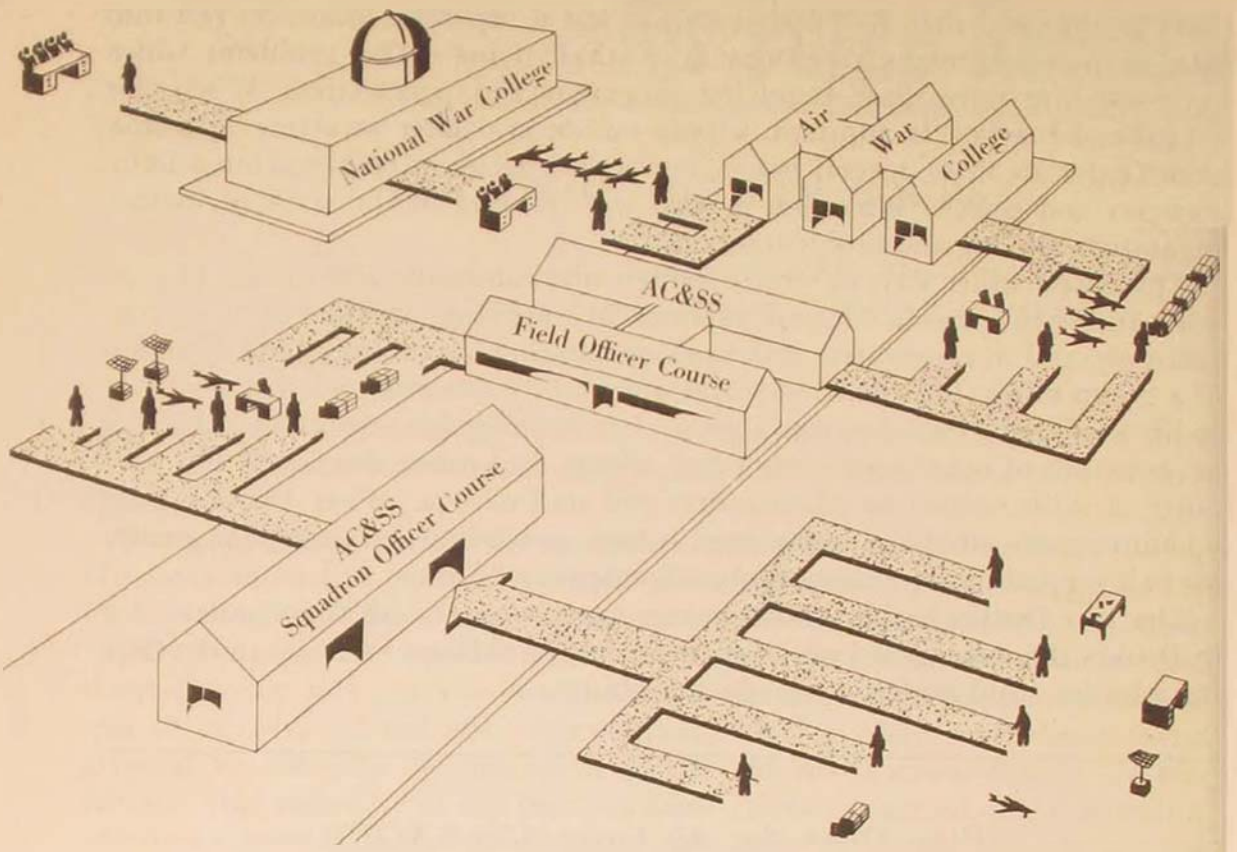
That Joe Doakes had his shortcomings was obvious to his commander. But in Doakes the colonel had observed those native abilities essential to developing a leader. And leaders are made, not born.

Why Does the Air Force Need SOC?

The outbreak of the Korean War in the spring of 1950 signaled another rapid build-up of the Air Force. It differed from World War II expansion in that it was proposed for the long haul. It would require more careful planning; wiser utilization of facilities, resources, and manpower; and greater competence and efficiency on the part of the individual officer than the previous emergency mobilization had permitted. The lean post-war years had pared the Air Force's trained officer manpower to the bone. When sudden expansion came again, thousands of reservists were recalled, offered indefinite service status, and scattered throughout the Air Force, many into squadron command or staff responsibility.

The influx of these thousands of Joe Doakes sharpened a problem already serious—the lack of fundamental, professional training among veterans of World War II. Most of these officers had originally been procured and trained for a specialized duty, had served their period of active duty in their specialized slot, and had returned to civilian life. They had no broad indoctrination in the principles, organization, employment, and operation of air forces—no sound training requisite to command and staff duty—no broad perspective and competency. And the Air Force had greatly changed since the end of World War II. Recalled reservists were confronted with new aircraft and equipment, with revised organization, administrative procedures, and regulations. To make effective use of their skills, broaden their professional background, and develop them for future leadership, the Air Force had to provide a well-rounded and meaningful system of professional education.

The Air Tactical School, reactivated in 1945 at Tyndall Air Force Base, was transferred to Maxwell AFB in 1950 and reorganized into the Squadron Officer Course. Re-designed to provide balanced training for the recalled reserve officers, SOC's program now provides the first step in the Air Univer-



sity program of professional education for both the regular and the reserve officer.

The Squadron Officer Course proposes to improve the young officer, regardless of his specialty or assignment. It is concerned that the student learn principles rather than facts, for principles remain relatively unchanged. It is built around the teaching of a few basic disciplines which any good officer should master.

Every Air Force officer must be able to think clearly and logically to arrive at sound conclusions, decisions, and recommendations. In most instances he must apply these decisions and recommendations in some way. He must communicate them clearly and effectively, either orally or in writing, to the people who are to take action. For the action to be effective, he must know how to cooperate with others and how to extract cooperation from others.

At SOC the student officer finds that factual knowledge is presented not as an end in itself, but as a means to improving his ability to think, to communicate his thoughts, and to cooperate with others. The course seeks to give him maximum opportunity to apply what he has learned. Based on the view that experience in actual situations, with solutions reached through trial and error, is the best teacher, it puts the student through simulated real-life situations that require conscious, studied application of the principles and data received from lectures and reading assignments. Finally the curriculum is organized to treat each subject as a part of an interrelated whole. The student realizes the relationship between various principles and skills and their application to the complex organism of the Air Force.

The heart of the SOC program is the hypothetical 177th Fighter Wing, introduced by platform instruction early in the course. Later, as a member of

the 177th Wing staff, the student will apply what he has learned in lectures and seminar discussions by participating in a series of realistic staff actions. These include (1) activation of the 177th Fighter Wing, (2) training the Wing for combat, (3) moving it overseas from an Alabama air base, (4) directing it in an air defense role in Japan, and (5) employing it in combat in Korea. Interspersed in the 177th Fighter Wing problem series are wing staff exercises involving a medium bombardment and a troop carrier combat operation in the Far East.

In each of the separate sequences of the 177th Wing's history and other staff exercises the student is assigned different staff positions. During the activation of the 177th Joe Doakes may be the wing commander, directing the students of his section, who compose his staff, in all phases of activating and locating the wing at an assigned ZI airbase. During the training-for-combat staff problem, Joe may be CO of one of the wing's combat squadrons. In the overseas movement he may be a maintenance and supply officer. In the Japan air defense problem he may be a radar and communications officer. In the Korean combat employment exercise he may be a squadron operations officer. Scheduled lectures and briefings, plus voluminous sets of handout materials, give the student wing staffs all the data necessary for organizing and conducting their various staff problems. These staff actions are the culmination of SOC training. Since they are scheduled at intervals from the middle to the end of the course, the student has had adequate preparation for the responsibilities he must assume as a member of a combat unit's planning and operational staff.

Thus the student learns by doing. Doing is application. Completed staff work on each exercise must also be drawn up in official written staff report form and submitted to the instructor, who is acting as the higher headquarters. If the staff work is rejected by the instructor, the wing staff must work on their own time until its work is acceptable.

Curriculum of SOC

World Affairs: The position of the United States in the current international picture. Role of the military forces in supporting national policy. The officer is encouraged to plan a program of reading and study to improve himself professionally.

Communication: Systematic and objective solving of problems. Causes of and how to avoid poor decisions. Inductive and deductive reasoning. Problems in listening, reading, writing, and speaking. Problems in representation. Some solutions. How to get better results in group effort. Planning for self-improvement.

Human Relations: Human behavior. Why people act the way they do. How to work with people.

Organization: Relationship of wing-base units to the Air Force organization and the national security structure. Principles of organization and their application to wing-base units. Staff organization. Authorization tables.

Command and Staff Considerations: Sources of command authority. Commander and staff officer responsibilities. Leadership principles. Standards of conduct and ethics. Military justice and discipline. Integrated staff action.

Operations: The organizing, training, and planning functions of operations, intelligence, communications, and weather staffs. Current concepts of employment of air power. Air Force application of the principles of war. Combat operations of Army and Naval forces.

Personnel: Principles of administration and management. Classification and assignment. Duties of the materiel staff. The Air Force officer's responsibility for materiel. Transportation and movement.

"Project Tiger": Combat orientation. Motivation for developing leadership ability and Air Force discipline. Practical experience in analyzing simulated combat situations, solving problems, and applying solutions. Physical conditioning and competitive team athletics to foster an aggressive and cooperative team spirit, increase individual confidence, develop sportsmanship, and increase unit pride.

Joe Goes to School

When Lt. Doakes arrived at the Air University and saw some 700 squadron officers reporting to SOC from all sections of the Air Force, he seriously doubted the value of large-scale training of such a widely varied group. Remembering other service schools with large classes, Joe often wished that just once he could be an individual and be known as an individual to his instructors, not merely as a seat number or a body. Not to mention that large classes always meant personal inconvenience and the intangible pressures of military control.

But Joe soon learned he was not to be submerged in the pack and that his integrity as an individual would increase rather than diminish.

He realized something was different about the system when he started processing. The lines were long but moved rapidly. In less than an hour Joe had drawn school supplies, bedding, and quarters assignment. Within several days he received his travel pay and was notified of a schedule for flying. It was just as easy to arrange for an instrument or link trainer check. There were other conveniences—the large multiple dining halls, the branch officers club and PX, and the huge theater—all located in the SOC area.

Something else, more than system, also made its immediate impression—the attitude stemming from the entire faculty and soon picked up by the students. Joe soon realized that attitude development was one of SOC's major aims. This was the first school he had attended where from the outset he was treated as an officer. Interwoven throughout the course, in lectures, seminar work, athletics, and off-duty social functions, the stress was on developing a broad, positive, mature mental outlook towards his position, his fellow officers, the Air Force, his country, government, sister services, and most important, toward combat and leadership in combat.

This going-to-school as an officer and gentleman was something new for Joe. Military routines, such as inspections, formations, restrictions on off-duty hours, were absent. A school with as many students and so tight a schedule must require rigid adherence to school regulations. But here it was done by putting Joe on his honor to comply with them. The academic atmosphere was similar to that of the university he attended after the war. It was an environment conducive to learning. The sense of loyalty, respect, honor, and determination to accomplish a mission that descended from the top authorities downward paid large dividends. Later Joe would recall many of the morale-building principles he observed working at SOC and would adapt them to the military situations in his own outfit.

His first impressions of mass education and his fear of being lost in the mob rapidly disappeared when Joe learned that his class (or section) consisted of 12 officers. This small group was to retain the same instructor throughout the course. In some 240 hours of intimate classroom contact, in informal scheduled individual counseling periods, and in relaxed social situations, the same instructor would offer Joe constructive personal criticism on his work. About half of Joe's time at SOC would be spent under direct personal observation of his instructor. In effect the relationship became that of a commander and a member of his staff. This approach created an atmosphere of realism. In the field the commander rates his subordinate officers on the basis of performance and potential. In like manner Joe's instructor would rate him.

he daily formal instruction enlivened by various techques of platform presentaon. Seminar groups attend is instruction in a body, ch group occupying a row seats. The straight lecture op right) disseminates facts d "absolutes." Discussion nels (middle) present diverent viewpoints where the hool objective is a broader orking knowledge of the bject. Skits (lower right) are th popular and effective eans of teaching working inciples. Here a squadron O and staff discuss preparaon for "Readiness Inspecon." The CO dresses down e highly-decorated officer, ho is "always ready for visitg firemen" but is invariably und wanting. Some subject eas are presented by two cturers, one on each side of e stage. While one instructr lectures, the other corrects roneous statements, requests rther clarification, demands n explanation of "why" or where did you get that," ueries questionable or diffult points, and throws in pplemental material. As ight be expected, this roune has no trouble keeping p the interest of the audince. Unorthodox as this nstruction may seem, it is a ost effective learning process nd is based on the sound ducational philosophy of learning by repetition."

Much care was taken to provide Joe's 12-member section with a diversified range of service background, experience and job skills, personalities, education, and rank. During the 10 weeks this cosmopolitan group would work together, Joe could learn much from Bob, a regular AF B-36 aircraft commander; from Bill, a radar and communications expert; from Roy, a Marine pilot; from Mohammed, a Turkish Air Force officer; from Tom, a personnel officer; and from Earl, an Air Force instructor with a Ph.D. in political science. Others in the section were rated and non-rated Korean veterans of various job skills. Each member of the section could learn much from the other in close classroom and off-duty association. How they worked together as a unit depended on what each was willing to contribute to the group. If unit effort totaled more than the sum of the individual efforts, Joe would very likely see his section receive special awards at graduation.

Of special interest and value to Joe were the techniques employed by his instructor in molding this diversified group of 12 individuals into a tightly-knit, efficient, and high-spirited unit without sacrificng individual integrity, respect, or rank. This lesson in leadership was another important by-product Joe could later adapt to situations in his outfit.

Formal Training. Joe quickly adjusted himself to the rigorous and varied class schedules. Part of his mornings and afternoons were spent in the large auditorium where the entire student body assembled for the three-hour lecture period. Here Joe and his fellow section members were given Air Force doctrine, principles of employment, interpretations, and facts. Presentations included lectures, dramatizations, discussion panels, and educational films. He was pleased to learn that many of the speakers, both military and civilian, were authorities in their specialized fields. Lectures on as varied topics as effective speaking and reading, readable writing, ethics, principles of logic, world geography, global strategy and geopolitics, and international communism were on a par with those at a civilian university. The dramatizations or "skits" produced by the SOC instructors were extremely effective devices for vitalizing principles and practices of military ethics, cooperative staff effort, squadron organization, administration, leadership, and courtmartial procedures. In the panel discussions Joe and his fellow students heard the viewpoints of foreign exchange officers on such subjects as MDAP, NATO, Russian communism and the Russian threat, world strategy, and points relating to the United Nations and collective security. Lectures on the same subjects provided them a broad background for understanding these different viewpoints.

Occasionally part or the whole of the morning was devoted to written examinations on blocks of material previously covered by formal instruction and by assigned collateral reading. These tests were graded by the section instructor and were followed by seminar discussion of the tests and by personal conferences where errors were corrected and further reading and study suggested. Tests were unscheduled to eliminate cramming and the usual examination tensions.

Seminar Discussion. When not attending auditorium instruction, Joe usually spent his afternoons in seminar. Here, grouped about a conference table, he and his section had the opportunity to discuss, test, and apply the ideas advanced in morning platform instruction. Here Joe learned the tech-

niques of group discussion and problem solving and the value of listening, weighing the thoughts of others, and speaking advisedly.

These seminars were conducted as a military commander would conduct a meeting of his staff officers. Each meeting had an objective, whether it was group discussion of an outside reading assignment, practice exercises in creative, readable writing, impromptu speaking, problem solving, or the activation of an air base wing.

At times the instructor would turn the seminar chairmanship over to a student. When Joe took his turn, the chips were down. Could he lead a group discussion? Could he conduct a staff conference? He was aware the group depended on him for conference guidance and command decisions, and that this was a different kind of leadership than had ever been required of him in the past. And it was one which he would be faced with again and again as he acquired more responsibility in his outfit.

Under the patient, observant gaze of his instructor Joe conducted his first staff conference, applying as best he could the rules and advice received in lectures and in previous conference situations where he had sat as one of the group. Occasionally the instructor would interrupt with constructive advice on the progress of the discussion or would throw out a thought-provoking question to see how Joe handled it. Several times he helped Joe bring the conference back to the subject. This was a learning situation for Joe, and it gave him new confidence. He realized that decisions were best arrived at by thorough investigation of the problem, careful consideration of all points of view, the free exchange of all ideas and interpretations, and most important, the application of first principles.

Joe Learns by Doing

One of Joe's troubles had been his deficiency in logical thinking when dealing with situations outside his specialty. He solved problems hastily, overlooking the more practical solutions because he lacked a methodical

A section seminar room. "In my opinion the principle involved here is - - - ." Communication and conference techniques are applied to War or Peace *by John Foster Dulles. Later there will be a discussion of de Seversky's* Air Power—The Key to Survival. *SOC stimulates the officer to analyze current national policy and the use of air power. The school neither defends nor condemns authors or their ideas.*

approach to the situation. When SOC introduced Joe to the "scientific method of problem solving," it provided him with an organized thinking process applicable to work-problems or personal-problems that he would face in the future.

The first step in Joe's training for organized thinking was a series of formal lectures on logic. These lectures explored the types and methods of reasoning, their value in the thinking process, and their proper application. Building on this background other lectures outlined the scientific method of problem solving, analyzing its principles and illustrating them with simple examples. In seminar Joe's section discussed these principles until the working of each was clearly understood. Then Joe's instructor set up several hypothetical problems and walked the group step by step through the solutions. Joe was amazed at the relative ease at which correct solutions emerged as a matter of simple ordered thought. From then on group problem-solving was a familiar seminar assignment.

One such assignment was a full-dress staff study, called the "NCO Problem," based realistically on the long-felt need for professional development of Air Force non-commissioned officers. This real problem stems from the relatively rapid advancement of technical and specialist NCO's in rank, who are as a result not prepared for the responsibilities and supervisory duties of their higher rank. Since by rank and duty assignment the squadron-grade officer is more closely associated with the non-commissioned officer than are higher-ranking officers, his recommendations for NCO professional training are of considerable value in the search for an Air Force-wide solution. Hq USAF and Hq Air University have directed SOC to require each class to explore in turn the many considerations relative to establishing an Air Force NCO Academy. Joe's section was given the task of drawing up a proposed cur-

Systematic Problem Solving

1. Recognize the Problem
   - Analyze the situation
     - Determine the effects
     - List the causes
     - Define the goal
   - Limit the problem
   - Tentatively state problem
   - Determine the criteria
   - Define words and phrases
2. Gather Data
   - What information is needed?
   - Where is this information?
   - Secure data
   - Evaluate data
3. List Possible Solutions
   - Include all possible solutions that might change the causes
4. Test Each Solution
   - Test each solution against the criteria for suitability, acceptability, and feasibility
5. Select the Best Solution
6. Apply Solution to Problem
   - A problem is not solved until the solution has been applied and the problem overcome

Think . . . Communicate . . . Cooperate

Formal training is valuable to the student only if he can apply it. Knowing the facts does not lead to successful doing, if basic principles that govern the facts are not understood and correctly applied. The Squadron Officer Course seeks to provide understanding of principles and their correct usage by devoting much of its curriculum to "learning by doing." Formal instruction is driven home by extended examples in application, an educational technique rigidly adhered to by SOC and long recognized by leading educators as one of the most effective of learning processes. By requiring the student to translate theory into practice, to adapt his factual knowledge to a wide range of real or hypothetical situations, and to apply working principles in a variety of factual settings, the Squadron Officer Course trains him in the fundamentals of command and staff duty in the United States Air Force.

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riculum that would provide the best type of training for today's NCO's. Other student sections studied such matters as location of the academy, facilities and physical plant required, and proposed organization. The results are drawn up in official staff study form and the better studies are forwarded to Command and Air Force Headquarters for further consideration.

Other assignments dealt with ethics, discipline, and attitude. Joe helped to analyze case histories of squadron situations where improper officer ethics, poor discipline, and wrong attitude had affected mission performance. Hypothetical and real-life problems in each of these areas required group discussion and solution.

Each problem-solving conference was followed by a critique in which the instructor suggested improvements and the students evaluated each other's performance. Criticism by his fellow students sometimes hurt, but Joe found it was extremely helpful.

Integral to logical thinking and critical evaluation was Joe's required reading, paralleling the curriculum and supplementing the lectures and seminars. Collateral reading not only gave him a broader understanding of the Air Force but, since he had to give critiques of the reading, taught him to read for meaning and interpretation, thus developing his powers of critical review. Lectures on the importance of wide reading to the Air Force officer and on methods of reading for meaning and perspective revealed a new world of fascinating and informative books. By adopting regular reading habits Joe could establish a self-improvement plan that would greatly aid his professional advancement and stimulate his thinking.

Outdoor Problem Solving. Joe's training in thinking included several scheduled outdoor problems designed to test and improve his skill in practical problem solving. Project "X" is a series of 12 physical tasks, each simulating a combat problem calling for a quick but correct group solution and action. For example, Joe's group was given 15 minutes to move a 55-gallon drum of gasoline across a heavily mined field and over 4-foot barrier with the use of two 15-foot sections of steel pipe, a plank or two, and a piece of manila rope. The group, the drum of gasoline, pipes, planks, and rope had to be safely on the other side of the field when the time was up. Stepping on any part of the simulated mine field or dropping any part of the equipment theoretically would blow the group sky high. These exercises require clear, quick thinking

and give practice in cooperative problem solving. Though no group leader is appointed, one individual always emerges to direct the activities of the others. Originated by the Germans and used by the British in World War II for training commandos and testing potential officer material, SOC's Project "X" is an excellent training laboratory.

Project "X" was followed by "Tiger Trek," an all-night field problem built around escape and evasion. This is problem solving under stress. Transported into the country surrounding Maxwell Air Force Base, Joe's section was dumped "behind enemy lines" and required to make their way back to the base through "enemy territory" heavily patrolled by "Red" sentries and guards. Tired, wet, hungry, and a bit frustrated by a heavy rainfall and swollen creeks, Joe and his buddies got through undetected. Unlike the sections that were captured and penalized, Joe's section planned and tested each move prior to taking action—a consequence of their classroom and seminar instruction in problem solving and original thinking.

Writing and Reading. Since thinking and planning must be communicated concisely and clearly before they can be translated into action, training in readable writing and clear, articulate speaking is important to the development of the young Air Force officer. SOC does not attempt to produce professional writers or speakers, but it does attempt to instill the basic principles of clear, concise, and understandable written and oral communication.

Like other parts of the SOC curriculum this training occurs throughout the whole course in two-step technique—theory and practice, with emphasis on learning by doing. Instruction in obtaining clarity through simplicity and in proper methods of written communication show how confusing sentences and impressionistic "gobble-de-gook" can be transformed into clear, simple sentences. The principles of readable writing are discussed in seminar. After a series of instructor- and student-graded practice exercises come a number of creative writing assignments.

Throughout the course Joe practiced composing various types of military

Project X. Here a group of "escaped POW's" with supplies (heavy log in background) cross a deep, swift river with aid of three planks and piece of frayed manila rope, none of which are long enough to span the river. Logs spanning middle of river (lower left corner) are pilings from a bombed-out bridge. Working from left bank (out of photo to left) to pilings, then to the right bank, the students get themselves across with the log and materials used in crossing. Touching the water in any way disqualifies the group. Time is limited. Each task has several

Crouched beneath a bridge deep in enemy territory undetected by an enemy guard who has been ordered to "shoot to kill," crew members (downed in attack on a "Red" airbase) plan their next move in their trek back to friendly base. By skillful, organized, cooperative planning, this crew evaded enemy patrols, surmounted hazardous physical obstacles—and "returned."

correspondence, writing messages, reports for the commander, office and squadron memoranda, official letters, requisitions, estimates, plans, special orders, and operations orders.

Joe's biggest writing assignment was the course thesis—a five-paragraph staff study with supporting tabs. This major individual course project put to use formal lectures on staff-study preparation, seminar work in problem solving, and training in logical thinking and readable writing. Since the problem Joe chose for his staff study was an actual one, his proposal was reviewed and approved by his instructor and other school officials before the study was begun. Joe spent many hours in the big Air University library gathering his data and collecting substantiating evidence. Since much of what Joe learned at SOC was reflected in this staff study, it was evaluated by various members of the faculty and bore importantly on his final grade. As many SOC students had done in the past, Joe could take his study back to his station, where the solution could be applied to an existing unit problem. SOC officials also forward the best and most significant studies to Hq Air University and Hq USAF for review and possible application. Student-authors of prize studies are given special awards and recognition at graduation.

Instruction in oral communication follows patterns similar to college training in public speaking. Lectures cover the techniques and basic principles for effective speaking, speech organization, audience motivation and attention, and platform behavior. Speech demonstrations by the lecturers illustrate principles applied to different types of speeches, such as speeches to inform, to convince, and to stimulate.

Of greatest help to Joe was the actual practice he received in delivering to

The problem: Move the 177 Fighter Wing from Alabama Japan by air and water in a tw stage operation. Students wo out the many details of th 177th's Consolidated Moveme Plan. Aircraft must be flown the west coast and loaded c ships for the Far East. Arrang ments must be made with Mi tary Air Transport Service f shipment of the air echelon ar its equipment and with the po for the overwater transportatio

The problem: Deploy the 177th's combat squadrons and support units, defend an area of Japanese cities, military installations, and industrial sites. The staff (right) is testing intercept time to a possible weak spot in the early warning radar perimeter. The map shows students have located one combat squadron in South Korea and two in Japan. When challenged by the "general," the staff proved the feasibility of their deployment and were commended for thorough planning.

As a break in the 177th Fight Wing problem series, each se tion plans and conducts a tw wing three-day medium bo bardment operation (left) and troop carrier paratroop drop ar resupply mission. The bombi operation, a long overwater m sion from Japan to Southea Asia, requires joint planni with Air Rescue Service, Na and bases in Okinawa and t Philippines. The troop carri plan is coordinated with Arm

The combat employment phase of instruction is capped by the final fighter operations exercise — the real test applying SOC instruction and integrated staff action. Directed from realistic, elaborate tactical air force Joint Operations Center (JOC) set up in the main auditorium (right), student sections conduct a simulated 6-day wing, group, and squadron combat operation in Korea. Telephone, wireless, and courier communication between the physically dispersed headquarters create a realistic chain of command. Air raids interrupt busy planning conferences, destroying buildings and parked aircraft. Combat losses require replacement crews and aircraft. Operations orders and mission plans need approval by JOC. In this fluid operation, SOC classmates plan, check, recheck, and plan again. Missions are "laid-on," cancelled by JOC, and laid-on again. To complicate the situation, the unit is ordered to move to forward bases without interrupting its operations. Such exercises pay big dividends for the Air Force by increasing the squadron-grade officer's over-all effectiveness. In future the SOC graduate will benefit from his ability to adapt himself to similar situations in the field.

The busy wing-staff (left below) of the fighter exercise draws up maintenance and supply requirements and prepares "frag orders" for squadrons. Wing commander (standing, center) is non-rated and was given the job to broaden his knowledge of combat operations. After briefing (right below), the mission was "flown," the instructor determined the results, which then went to group, to wing, and back up to JOC.

To the solution of the problems Joe brought information drawn from his own service and combat experiences and those of his unit. The experience he gained from these sessions he could transfer with great facility to future situations in which he might be called on to participate in a unit's activation, training, movement, or employment in combat. The instructor was absent from the problem scenes. The students now carried the ball.

If Joe had paid close attention to previous instruction, he, as wing commander of the activation exercise, was now equipped to guide his staff through intricacies of activating and locating the new 177th Fighter Wing on an Alabama air base. Joe was also prepared when he and his fellow-student staff of the 177th Wing planned and drew up a training program and put it into effect to bring the 177th to a stage of combat readiness, with a combat readiness inspection by the air force commander and his inspector to follow. He was also prepared for the realistic air defense exercise and the grand finale, the simulation of six days of combat operations in Korea. His experience in leading group discussion, conducting staff conferences, preparing staff reports in clear readable language and correct form was invaluable to him now in drawing up the completed staff report for submission to higher headquarters (the faculty).

The combat fighter exercise concluded the academic course. Before graduation there was a day or so in which SOC friendships could be toasted in a series of group parties and section "dining-ins." "Field Day," SOC's humorous version of Olympic game athletic competition, was followed by an evening of ceremonies in the auditorium where awards and honors were presented to individual and section winners in SOC's numerous academic and athletic contests. The climax of the evening was a carefully prepared, all-student satirical skit. This was the student's day. School officials and instructors seated in the auditorium saw themselves recreated in surprising dramatic roles. The next day a dignified graduation ceremony featured the awarding of the Chief of Staff athletic trophy to the school's top section in athletics and sportsmanship.

This was SOC. For Joe it was not to become merely a memory of rich experiences but would mark the acquisition of the tools he would need when he took that next step forward in his profession. For himself, for his unit, and for the Air Force, SOC had been a good investment.

A Quarterly Review Staff Study

Look to the Future

SOC today is a smooth-running system for training the Air Force squadron-grade officer in the fundamentals of the complex, disciplined art of aerial warfare. But this system at best is under handicaps—obstacles which must be eliminated if the bold planning and visions of the ideal SOC of tomorrow are achieved.

The present physical plant, composed of converted temporary and semi-permanent World War II buildings would be supplanted by new, permanent structures built to fit SOC's needs. The school would become a complete entity, including dormitories and mess halls, comfortable and fully-equipped buildings containing lecture rooms and staff cubicles. Located across the airfield from the present base it would offer room for all aspects of the program without infringing on the congested base facilities.

The course would be lengthened—not to spread out the present program but to increase the scope and intensity of training, especially in the field exercises. This would require a large maneuver area, where students could apply principles and factual knowledge acquired in the classroom. From the maneuver area students would plan and operate realistic air operations. Field exercises would include a wide variety of sustained offensive maneuvers. Air raids with realistic fly-overs would test defense problems worked out in class. The maneuver area would make a more strenuous course in escape and evasion complete with water survival, weapons training, and air base defense tactics. Training in leadership would create situations where leaders actually lead, with students "commanding" squadrons, groups, or wings for short periods of time. More chances to develop and practice the ideals of the officers' code and ethical behavior would be afforded. Greater emphasis would be placed on the basic skills of writing, speaking, cooperative staff work, and above all, on original thinking. More instruction would be given on the theory and meaning of air power, on its employment in the modern military structure, on air doctrine, strategy, tactics, and related techniques.

The plans for tomorrow's SOC are, and will remain, flexible to include new areas of instruction, devices for training, and changing programs. Today SOC conducts its intricate operations with only the bare essentials. When new buildings and expanded facilities are available, SOC will delve deeply into live problems that at present can only be skimmed.

The Squadron Officer Course will become a requirement for all regular squadron-grade officers. When the present hump of older squadron-grade officers is depleted, SOC will become to the younger officers—young in age and new to the Air Force—the first year of graduate training in their military profession. Perhaps the old Air Tactical School with its customs, heraldry, and tradition will be back to carry the doctrinal torch again.

The bold planning exists. How much of such a program time and future budgets will translate into actuality is a question not yet answered. But one fact remains: the value of SOC training to support an aggressive combat-oriented Air Force has been proved.

Air War in Korea: IX

ENGINEER AVIATION FORCES IN KOREA

COLONEL R. I. MILLBERRY

ENGINEER Aviation forces in Korea have played a steadily expanding role in support of the combat effectiveness of the Fifth Air Force. From 11 July 1950, when their first representatives—Company "A" of the 802nd Engineer Aviation Battalion—arrived in Korea from Okinawa, until the present time, they have steadily improved Air Force facilities.

Much of their early work involved rehabilitation of demolished facilities and placing of pierced steel plank for airfield traffic surfaces over old runway surfaces or on new sites with minimum base preparation. This was satisfactory during the early stages of the war when rapid changes in the front lines limited the period of intensive use of most airfields. But when the truce negotiations stabilized ground activity, pierced steel plank runways deteriorated badly, making it necessary to replace them with a more permanent wearing surface. In general, new surfaces have been asphalt penetration or hot-mix asphaltic concrete, and Portland cement concrete. During the calendar year 1952 seven operational runways were reconstructed or resurfaced with hot-mix asphaltic concrete, two concrete runways were built, and a third was under construction. When this one was completed only one major tactical airfield of the United Nations Forces remained with pierced steel plank surface.

Fifth Air Force has also improved its support facilities. Prefabricated buildings such as quonset huts, tropical shells, warehousing, maintenance shelters, and Butler hangars have replaced tentage, open storage, and primitive maintenance areas. Roads, drainage, aircraft fuel facilities, aircraft revetments, base flood protection, ammunition storage areas, and water and electrical distribution facilities have been constructed. Mountain-top radar and radio installations were developed, complete with access roads.

The future trend of engineer construction effort in Korea is largely one of minimizing hazards for tactical aircraft—extending runway lengths, improving overruns and runway approaches, and increasing aircraft parking areas to provide better dispersal and more revetments.

New Factors in Runway Construction

THERE are two marked differences in the operations of Engineer Aviation troops in Korea from those undertaken by similar units during World War II. The first and the most noteworthy development is that of airfield traffic surfaces for jet aircraft under combat conditions. Much has been learned and is still being learned about these specialized requirements. Runway lengths, approach clearances, and type of traffic surfaces differed extensively from previous ones for conventional aircraft. The need for long high-cost runways led to the development of the two-wing air base to provide maximum traffic density for the expensive runway. But this involved circulation taxiways and dispersal, as well as housing and utilities for two wings. The end result was

a construction project of much greater magnitude than had been previously assigned to Engineer Aviation units.

The second major difference results from the use of heavy cargo aircraft, specifically the C-124. Although the footprint pressure of this airplane is comparable to lighter aircraft, the tremendous gross load presents a very difficult weight-bearing problem. Unit bearing strengths can be developed on rice paddies and other high-water-table terrain by use of sand pads and selected fill material with proper compaction. The gross weight of an aircraft transmitted through the base course into the sub-base will cause some displacement of the sub-base. If the design is right, this displacement is too small to induce early failure. Loads above designed strength increase displacement and result in pumping from the sub-base up into the base. When this occurs, an element of failure is present, although imminence of actual failure can be determined only by continued observation. So the planner must either design for extremely heavy aircraft or accept a calculated risk and design for operational aircraft on the assumption that limited use by heavy transport aircraft will not cause sufficient damage to restrict tactical operations. Runway design for tactical aircraft can cut many corners, since construction will not anticipate a life expectancy greater than two years. The selection of runway wearing surfaces follows these general rules:

a. For most rapid construction time, use pierced steel plank.
b. For new jet airfields when time is not the prevailing factor, use concrete.
c. For rehabilitation of old runways, use hot-mix asphalt.

Local conditions may vary these principles. Rehabilitation of strips will vary according to contemplated use, but in general the choice of method is between fast placement and short-life for pierced steel plank or long construction time and maximum life with minimum maintenance for concrete. Asphalt surfaces do deteriorate with jet fuel spillage, but the deterioration can be kept within reasonable maintenance costs. Careful gradation, control of mixtures, compaction, and sealing will produce an asphalt surface highly resistant to jet fuel. The type of aircraft also influences the life of asphalt pavements. An F-80 aircraft spills a great deal more fuel than an F-86. The angle of the aircraft axis with the horizontal causes variation in the amount of jet blast heat applied to the runway. If an aircraft keeps rolling, this heat will not harm the seal coat, but on short runways, where maximum power must be applied from a standing start, the seal coat will burn off. Concrete pads are the best solution, but asphalt resealing of local areas is a minor maintenance problem. Old Japanese concrete airfield traffic surfaces have been built up with an overlayer of hot-mix asphalt.

Since pierced steel plank deteriorates less rapidly on aprons and taxiways than on runway wearing surface, its use on many of these surfaces continues and some expanded parking facilities are constructed with pierced steel plank. Pierced steel plank has the advantage of retaining its surface despite jet fuel spillage, but it permits loose gravel and other foreign material to be picked up by jet intakes, with damage to the engines. Asphalt penetration is used with pierced steel planking on runways. It is customary to lay a blanket of rice bags or burlap over the base course and shoot this with asphalt. While not a permanent seal. it lengthens the time before loose material works up through the holes of the steel planking.

Problems of Organization and Operations

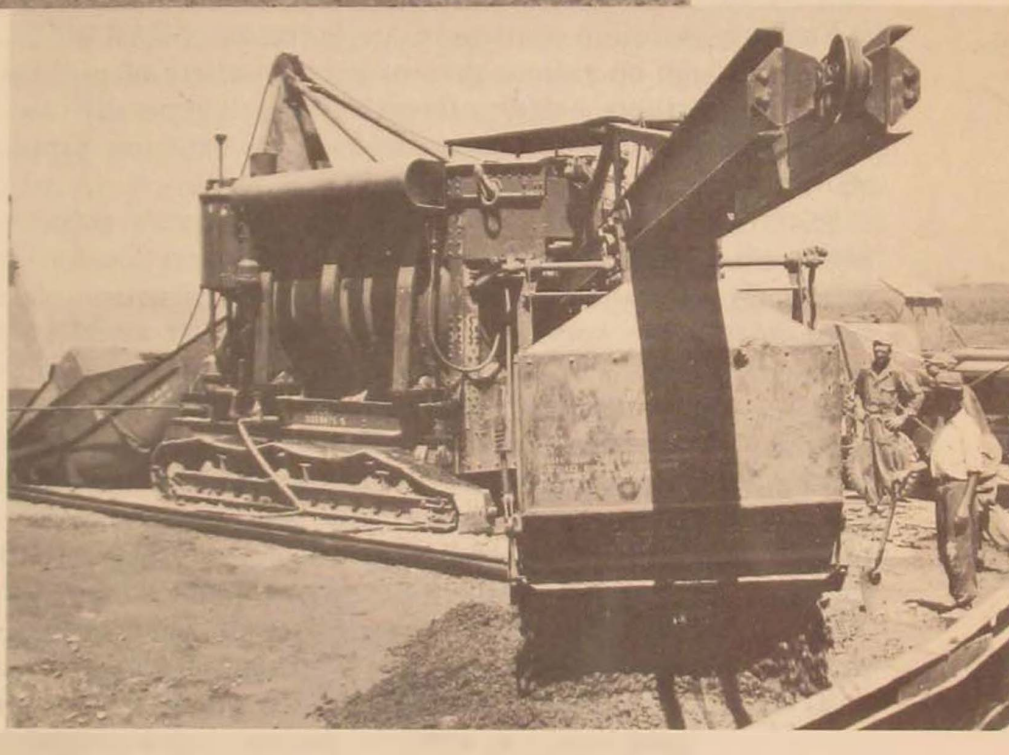
As Special Category Army Personnel with Air Force (SCARWAF), Engineer Aviation units present many logistic problems, since they are organized under the Department of the Army but operate under the Department of the Air Force. Modifications of equipment authorizations are determined essential by the Air Force, but must be processed to the Department of Army for final approval. The units are equipped partly through Army and partly through Air Force sources. The Air Force should become the sole agency responsible for authorizing and equipping Engineer Aviation units, because it originates the changes in requirements. This arrangement need not change the basic

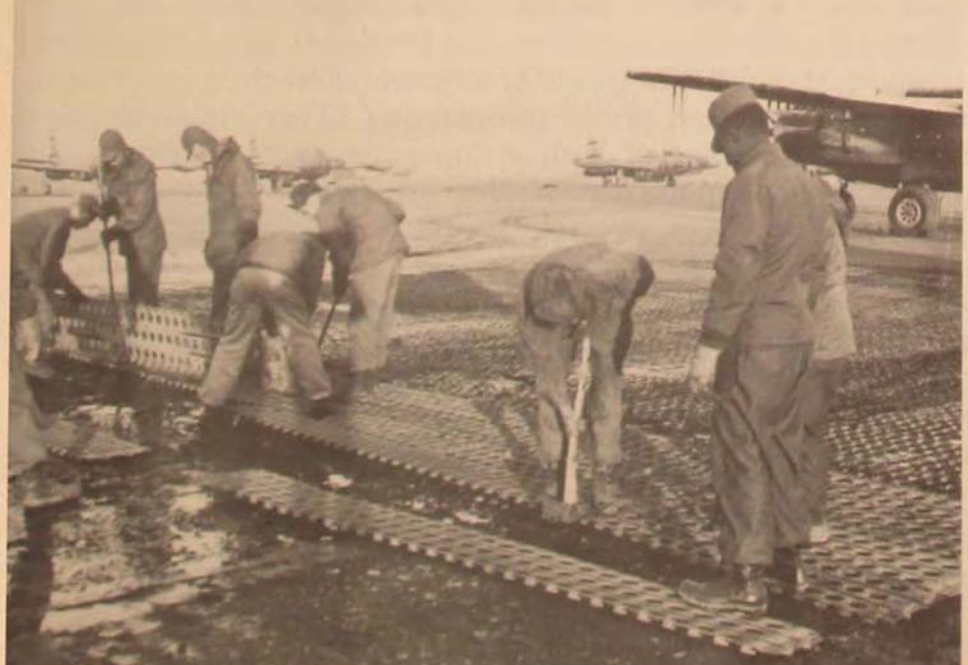
Building a Jet Air Base in Korea

Air base construction for jet aircraft in Korea posed some new problems for engineers. Jets required long runways built to withstand the shearing action of high-pressure jet tires. Soggy rice paddies (below), usually the only flat land available for airfields, required intensive sub-base and base preparation before runways could be laid down. To get maximum use out of the long, expensive runways, two wings were based on one runway, entailing large parking areas and much additional construction. While concrete runways were always preferable, the photographs at right show the usual pattern of airfield construction when time was short.

Hot-mix asphalt runway surface was laid down on sturdy sub-base and base layer.

Concrete was used in pads at ends of runways to stand heat of jet blast on take-off.





Pierced steel plank was laid on asphalt-penetrated burlap for taxiways, aprons, and parking areas.

equipment procurement responsibility from the Department of Army, since economy recommends that Army and Air Force engineers standardize their equipment.

The organization of the Engineer Aviation units under Department of Army Tables of Organization also presents complications. The tables of organization of a numbered Air Force do not provide for inspection of a SCARWAF organization of the size of the 417th Engineer Aviation Brigade, and no personnel are familiar with the Army directives under which the Engineer Aviation units must operate. Similarly no provision is made for ground safety programs; Fifth Air Force has found it necessary to improvise a ground safety organization. No provision is made for trained fire prevention and fire-fighting personnel, yet Fifth Air Force has frequently had separate Engineer Aviation camps of 1000 to 2500 personnel which need internal fire protection. As no security personnel are provided, primary mission personnel must be used for this purpose. These problems of equipment authorization and internal organization could be much more readily resolved if Engineer Aviation units were Air Force, not SCARWAF.

Construction operations present a wide variety of problems which must be solved by Engineer Aviation forces. They fall generally into one of five major categories: site selection, raw material, construction supplies, training, and technical knowledge.

Selection of airfield locations is the Engineer's primary siting problem. Many other facility sites depend entirely on operational requirements, and no leeway for construction factors can be allowed. One mountain-top communications installation continues to be supported by aerial resupply because an access road cannot be built. Many others are primarily dependent upon the Korean laborer and his familiar "A"-frame for supplies.

It is seldom that all raw materials are found at any airfield site. Rock, water, and sand are basic requirements. Some areas of Korea have no rock suitable for concrete or bituminous aggregates. In rice paddies, runway construction requires an initial blanket of sand, then selected fill followed by the base course, and finally the aggregate and sand required for concrete. These are sizable quantities of raw materials. The crushed rock required to produce base course and concrete aggregate became a major effort and is now the primary problem in all airfield construction in Korea. The twenty-five ton crushers were too small to support major construction. The 50-ton crushers were untried under field conditions and developed many deficiencies. Difficult to transport, they were incapable of long travel on their own chassis. Two 150-ton crushers have been placed in operation. They are much more satisfactory from the standpoint of both maintenance and production, but are far from mobile and require considerable installation time. They are used only when a sizable job, or several jobs, can be supplied from a single quarry.

Every effort is made to take major quantities of construction supplies straight from supply source to job site to minimize intermediate handling points. But usually projects begin on a shoe-string start, with earth work as the prime expended effort, and end with such a rapid influx of construction materials that it is a tremendous job to unload, segregate, handle, and store them.

The unit training and the individual training of the Engineer Aviation battalion is the balance point for any construction job. A good battalion

commander can improve an average battalion, but in a combat theater he cannot give them the training they must have to do their job. Lack of individual training on construction equipment and lack of unit training on coordinated construction projects seriously detract from construction efficiency. Untrained, inexperienced basic soldiers cannot be substituted for experienced non-coms without loss in efficiency. Also an untrained individual starts a chain reaction which cannot be broken. The untrained operator not only is unable to operate his equipment properly, but abuses it because of his ignorance. This aggravates wear and tear on parts and increases maintenance work. The end result is an excessive consumption of spare parts, excessive delay in maintenance, and a great reduction in construction effort. This ballooning effect of untrained operators, mechanics, and supervisors is a major problem that can only be overcome by an adequate replacement program of trained engineer aviation soldiers and officers.

But even with a trained working force, additional technical knowledge must be furnished by commissioned and non-commissioned officer supervision. Frequently the officers have not had the necessary technical knowledge, and the Brigade or Headquarters, Fifth Air Force, have had to send emergency help to carry a unit over purely normal situations which had become critical for lack of technical know-how. Civilian technicians can plug an occasional gap. Currently Fifth Air Force has on contract a civilian asphalt engineer who has done much to improve the asphalt paving work. The former criterion "if a little asphalt will make a good runway, twice as much will be twice as good" has given way to a coordinated program with materials, mixtures, placement, compaction, and sealing all controlled phases of an over-all job. Manufacturers' technical representatives also furnish aid, but it is intermittent and rapid personnel turnover does not permit sufficient retention of technical knowledge. The only permanent answer is widespread diffusion of technical knowledge among the officers and non-coms of our Engineer Aviation units.

These two requirements—training and technical knowledge—cannot be over-emphasized. Fifth Air Force has certain construction requirements which must be met. There must be an actual construction potential mustered to meet these requirements, not a theoretical potential. The 417th Engineer Aviation Brigade is a construction force equipped at a cost to the taxpayer of fifty million dollars. It must be staffed with personnel who can produce the results warranted by the investment.

Recommendations

THE Air Force has a vital need for the Engineer Aviation Forces. They are not combat engineers and not construction engineers, but specialists in the art of building airfields. As such, tactical unit commanders recognize them as a critical support element. They are rich in equipment which, if operational, provides a tremendous construction potential. Because they are self-sufficient, their administrative overhead is high. They need to be integrated into the Air Force. They need training—the technical training of trades which the Air Force is offering in its aircraft maintenance fields. They need training as units. They should be building all the peacetime construction of the Air Force as training for wartime construction. They can do it. They can build anything the Air Force needs for combat operations and build it well. They have done it in Korea.

Headquarters, Fifth Air Force

TACTICAL AIR RESCUE IN KOREA

DURING World War II the importance of air search and rescue was recognized. But since there was no centralized direction of air rescue, the emphasis placed upon it depended upon the local commander, equipment available, and many other factors.

After the war General "Hap" Arnold wanted an organization to tie the individual rescue units together. The Air Rescue Service was organized, equipped, and deployed for USAF rescue coverage. Its concepts were derived from the experience of World War II. Its organization, equipment, and deployment were fitted to support of lines of communication and Air Force deployment. Long-range search was stressed in training.

When the Korean War started, it was almost immediately obvious that tactical operations were to be the main Air Force effort. The U.N. forces had air and sea superiority and the limits and bounds of combat were well defined, but new tactics and procedures for Air Rescue had to be developed rapidly. Almost all air activity would occur over or behind enemy lines. Under such conditions the importance of speed in reaching a downed airman nearly doubled; delay meant his capture. Rescue aircraft had to have fighter support. Search for a downed airman was all but eliminated. If not in sight, he had to be communicating with the U.N. aircraft or agents. These were the concepts which guided tactical air rescue in Korea.

Types of Aircraft

ANOTHER major change brought about by the Korean War was in the types of aircraft used for rescue operations. When the war began, the 3rd Air Rescue Group in Japan had to extend its coverage to the Korean peninsula. Following the USAF long-range support concept, SB-17's equipped with lifeboats cruised over the coastal waters. An SB-17 could drop its boat to survivors and then guide surface craft to the pick-up. But when an airman was downed a few yards off enemy-held shores, this system merely kept him afloat until the enemy came out and captured him. The SB-17's were replaced with SA-16's, and Air Rescue had a craft which could land on the water, pick up the survivors, and take off again before the enemy could get boats out to the spot.

One of the more spectacular military developments of the Korean War was the improvement in air rescue and front-line air evacuation. From the sporadic, loosely-organized efforts of World War II, air rescue has developed into an efficient world-wide organization which has earned a high priority for its work and the respect of all the military services. This review of the experience of the 3rd Air Rescue Group, as it tested the new concepts of the Air Rescue Service on the battle-fields of Korea, is based on information furnished by Captain Norman F. Williams, Headquarters, 3rd Air Rescue Group, and by Headquarters, Air Rescue Service.

The speed and range of the SA-16 made it very suitable for this tricky operation. It was rugged enough to withstand the rough coastal waters, and on land its reversible props allowed it to operate from short runways. Longer-range SB-29's replaced the SB-17's in support of bomber strikes.

Helicopters had been a part of all rescue units before the Korean War, but their real value was not appreciated until one of them made a dash behind enemy lines to pick up a pilot who had crash-landed his damaged fighter in a river bed. It soon became obvious that as long as the U.N. had control of the air the helicopter could do valuable and unique service in land rescue and front-line evacuation of wounded. As more helicopters were sent to Korea, a special detachment was formed to maintain and operate them. Field operation of helicopters was not an easy assignment, since their slowness and limited range made it necessary to disperse them along the front lines. In time the first H-5's were supplemented with larger, faster, and more powerful H-19's. In the early days the helicopter would locate the downed airman, lead him to a suitable landing place, land, take him on, and head for home. But as the Communists lost their fear of helicopters, ground fire increased sharply and these tactics became too leisurely to be safe. Coupled with the need for faster pick-ups was the battle against the tortuous Korean landscape. A number of rescue attempts were foiled because landings could not be made. The sling-hoist was developed to remedy both these problems and used very successfully in both land and water rescues. As the helicopter hovered, the large sling attached to a cable could be electrically lowered to the downed airman, who slipped into the sling and was raised into the aircraft.

Originally helicopters and SA-16's in Korea operated on the concept of strip-alert aircraft answering a distress call, whether it was a behind-the-lines pick-up or an evacuation. But as the number of calls increased, better communications and one point for receiving and coordinating rescue efforts became necessary. The Rescue Control Center was formed to monitor rescue efforts. The RCC was manned by people familiar with ARS equipment and was located in Joint Operations Control. Its mission was to receive and evaluate distress calls and dispatch rescue aircraft.

Helicopter Operations

Evacuation by helicopter developed a new concept of medical evacuation of combat wounded. Air Rescue Service flight surgeons and medical technicians have introduced new techniques that will aid in reducing fatalities. The helicopter itself provides two major improvements over land transportation of wounded—speed and the absence of jolting over rough roads or ungraded terrain. Added to these was the practice of administering blood transfusions in flight. A wounded man could be picked up at the front line position, a blood transfusion started before the helicopter left the ground, and the transfusion completed by the time the helicopter arrived at the Mobile Army Surgical Hospital in the rear. Out of each 1000 wounded men who reached a hospital alive during World War II, 45 died. In Korea only 25 out of each 1000 were lost. Air Rescue Service alone evacuated almost 10,000 wounded in Korea, and the other services evacuated thousands more. In addition the helicopters contributed toward saving other lives by quickly transporting whole blood and plasma to where it was needed.

Helicopters already in Japan were sent to Korea to perform evacuations of wounded. They were deployed along the front lines at division command posts at first and then in rear areas. The demand for evacuations increased until some control had to be placed on the use of the limited number of helicopters.

The corps surgeons began to perform functions similar to those of the rescue control centers by limiting helicopter evacuations to men suffering head, abdomen, or chest wounds. Units on the front lines whose men had suffered such wounds would advise the corps surgeon. The surgeon would ascertain the seriousness of the wound and the recognition signals the unit would employ when the helicopter arrived. He then alerted the Air Rescue Service helicopter and passed to the pilot the pertinent information.

Telephone or radio communications facilities common to the division air liaison officer, the division command post, and Mosquito aircraft were also available to the helicopter pilot. Through this communications network he could learn of artillery fire and impending air strikes and stay clear of these areas en route to and from the position of the wounded man. Flights into and from the battle area were made at low altitudes to avoid enemy observation.

Behind Enemy Lines

Rescue of airmen downed behind enemy lines presented problems other than the ones experienced in air evacuation. Many pilots parachuted behind the lines or in the water and were never located again, because the balance of their flight of friendly aircraft was low on fuel and had to come home before they could pinpoint the downed airman for rescue aircraft. To coordinate rescue activities with scheduled air strikes, an "orbit" procedure was initiated. SA-16's were scheduled for orbits in position off the Korean sea coast as near to the target of the fighter strike as they could get in order to give aid promptly. If a fighter was too badly damaged to get home, the pilot, having been given the location of the orbit, could head for the orbit point and the rescue plane waiting there.

Other difficulties were to bridge the gap between the departure of the friendly combat aircraft and the arrival of the rescue plane, to provide armed escort for the rescue plane, and to furnish cover for the downed airman and the rescue plane during the pick-up. The solution was the establishment of Rescue Combat Air Patrol—a flight of fully armed, piston-engined fighters orbiting near the SA-16 or helicopter position. RESCAP had a twofold mission: (1) to locate and stay over a downed pilot until rescue; and (2) to escort the helicopter or SA-16 to his position. Assigned its daily task by the Fifth Air Force, RESCAP assisted in the pick-up of more than 1000 United Nations personnel from behind enemy lines.

With central direction of rescue activities, adequate communications, orbited amphibious coverage of tactical missions, helicopters for land rescue and evacuation, and armed cover for rescue planes, air rescue functioned smoothly in Korea.

In addition to the changes in rescue tactics, changes in organization were also necessary to shape air rescue to the needs in Korea. Detachment 1 was the only rescue organization in Korea, all other Air Rescue Service units being based in Japan. Since Detachment 1 had to be highly mobile and deployed throughout Korea, it could not be saddled with heavy maintenance

equipment. In the system worked out, units in Japan furnished in-commission SA-16's to replace those due for inspection. The detachment broke its flying section into small elements deployed along the battle lines. In-commission helicopters were maintained at these points, with periodic inspections performed at the air base where the detachment was based. Detachment moves were made in 3rd Air Rescue Group C-47's from Japan, while the elements were self-mobile.

This was tactical air rescue in Korea. Its mission became increasingly difficult as the enemy became familiar with equipment and tactics and as their forces built up a static, concentrated area. Early successes were aided by the ignorance, superstition, and poor marksmanship of the enemy and by the driving motivation of the American to take care of his own. As the enemy overcame his deficiencies, it was necessary to evaluate closely missions in concentrated areas. Even though rescue and rescue-cover pilots were ready and willing for highly dangerous missions, they had to be held back when the odds were too much against them.

The chief problem that faced air rescue in Korea at the end of the war was that of continuing its operations after nightfall. Successful air interdiction must also deny the enemy freedom to move supplies under cover of darkness. Since the "truck-busting" attacks continued around the clock, there was every reason for air rescue to do likewise. But the dangers of the rugged Korean landscape and the difficulties in locating the downed airman in the black of night limited even the fully-instrumented H-19's to day operations over land. Some night work was done over water, but even this was highly limited. Work on the problem continues, and Air Rescue Service feels sure that it will eventually be solved.

New equipment and new situations will bring new rescue techniques. But the concept of air rescue as an integral part of U.S. fighting forces has been firmly established.

AIR FORCE PROCUREMENT IN JAPAN

Colonel Hugh J. Mattia

THE expansion of military procurement in Japan, born of military necessity and nurtured by resolving numerous economic and cultural problems, has proved the validity of current logistic theory and strengthened the position of the free nations in the Far East.

This expansion consisted of two complementary yet separate procurement developments. One program was that of the United States Army operating through the former Japan Logistical Command. Since the reorganization of the Far East Command, these functions have been assigned to the Japan Procurement Agency subordinate to Headquarters, Far East Command. The other segment consisted of Air Force procurement under Far East Air Materiel Command, later redesignated Far East Air Logistic Force.

Prior to 25 June 1950 Air Force dollar procurement in Japan was limited to the purchase of those items which were necessary for the "base support"

of the occupation forces—supplies normally authorized for local purchase at any air base in the United States or elsewhere. Usually referred to as "off the shelf" items in the United States, these items were not available from standard commercial stocks in Japan, although it was possible to have some of them manufactured. Because many of the items were required at all air bases in Japan, and because all air bases did not have access to equally favorable markets, authority to purchase them was centralized in the Far East Air Materiel Command. Thus paper towels and various other items normally authorized for local purchase by AFR 70-16 were centrally procured to meet immediate demands and to maintain normal stock levels at all bases. It was not an efficient system.

Impact of Hostilities

WHEN war came in Korea, the entire Air Force procurement functions changed in character and scope. The logistical support of the ever-increasing forces overloaded the limited facilities. Stockpiles accumulated during the occupation period dwindled quickly. Requisitions in ZI depots mounted. It became a fight against time. Follow-up action on ZI requisitions was answered by "Unable to guarantee delivery in less than —— days, request the possibility of procurement in Japan be investigated."

FEAMCOM, the principal Air Force procurement agency in the Far East Air Force, consisted of a very small number of officers, civilians, airmen, and Japanese clerks. Most of the air bases had no contracting officers. Even Headquarters, Far East Air Force, was without a procurement staff officer. This was the state of procurement in the Far East Air Force in June 1950 when the Far East Air Materiel Command was authorized to procure napalm tanks in Japan, the first of many locally procured supplies that were previously procured solely by the highly specialized Procurement Division of Air Materiel Command.

In the ensuing months numerous changes took place. Air Force contracting officers were appointed by the Commanding General, FEAMCOM, for nearly every Air Force base in Japan, Korea, Okinawa, Guam, and the Philippine Islands. This decentralization of local purchase authority permitted the procurement personnel of Far East Air Materiel Command to concentrate their efforts on the emergency purchase of the highly technical items of operational importance. Between 1 July and 31 December 1950 the Purchasing and Contracting Section, FEAMCOM, expended $7,800,000 on the emergency purchase of critical items which could not be obtained from the United States because of transportation shortages and production bottlenecks.

The inadequacy of the procurement organization became more apparent as time passed. Quality control amounted to placing maintenance inspectors in the contractor's plants. They assisted the contractors as best they could, but had no testing equipment, no specifications, and little if any knowledge of the principles of quality control. No production personnel were assigned to the procurement organization. As a result production had little planning, control, or follow-up. The fact that the Air Force procurement organization accomplished the feat it did is a tribute to the ingenuity, wholehearted cooperation, and business integrity of the Japanese contractors.

But for all their goodwill, Japanese contractors had to be taught American

production methods. Their inability to produce items in large quantities without jeopardizing quality was evident from the high rate of rejections and numerous requests for the extension of delivery schedules. Since qualified Air Force personnel were not available, contracts were let with commercial consultant engineer firms to perform "in-process" inspections upon request of the Chief, Quality Control Division. Air Force inspectors supervised the commercial inspection agencies and made acceptance inspections. Statistical quality control methods were instituted in so far as the modified production methods permitted. The Chief, Quality Control Division, was made the final authority on deviations from specifications which were not provided for in the contract. Thus changes in the availability of particular materials did not prevent prompt delivery of an acceptable item, if suitable substitutions could be made.

Organization and Operations

THE Procurement and Contracting Division was given three principal functions: contract review, technical supervision, and purchasing and contracting. The Contract Review Section was established to safeguard the interests of the United States Government. All contracts exceeding that limit stated in the contracting officer's appointment had to be approved by the Commanding General, Far East Air Materiel Command. This section also provided legal advice to all procurement personnel in the theater.

The Technical Assistance Section sent qualified procurement personnel on regular and frequent visits to all Air Force bases in the Far East Air Forces to assist the local contracting officer in technical problems. Through the guidance and supervision of this and the Contract Review Section, decentralization of local procurement was completely successful.

The Purchasing and Contracting Section negotiated, executed, and administered all contracts. In March 1952 the administration of contracts was made a function of the procurement field offices. With the establishment of the Quality Control and Industrial Planning Divisions, the Purchasing and Contracting Section was finally in its proper position as one member of the procurement team. The success of each procurement action depended upon well-coordinated action in conjunction with the other team members. The new specialization of effort paid dividends in the form of contracts which embodied in specific terms the responsibilities of the contracting parties. A price analysis unit now analyzed product and production costs to be sure that the contractor's price was within reasonable limits.

With the establishment of the Industrial Planning Division the capability of various firms to produce items was no longer a "guess" proposition. Through continuous investigation of industrial organizations, inspection of plant facilities, and analysis of raw materials, the Industrial Planning Division could advise the Air Materiel Command on items which could be economically procured in Japan.

By the end of June 1951 the newly established Procurement and Industrial Planning Directorate had completed 1536 procurement actions, totaling $25,855,860. Although procurement was still limited by the lack of qualified personnel, such items as dropable fuel tanks of various sizes, napalm tanks, hand tools, M-34 modification kits, AN-ARC-3 transmitters and receivers,

M-157 igniters, portable air compressers, and anti-ricochet devices were purchased in large quantities to meet immediate operational requirements.

By September 1951 the Far East Air Materiel Command was procuring various items from industrial concerns scattered throughout Japan. To provide the necessary technical assistance to these firms and to insure high-quality production, Quality Control field offices were opened in Tokyo, Nagoya, and Osaka. The value of a decentralized quality control was reflected in the ability of contractors to perform contracts in accordance with specifications, in prompt deliveries, and in the greater willingness of contractors to do business with the Air Force.

When Japan's production potential was analyzed, it became evident that its facilities could not only supplement the immediate logistical support of the military forces, but could also implement other aspects of U. S. foreign policy. The "off-shore" procurement program was set up to make foreign emergency purchases for the Mutual Defense Assistance Program. It was intended to decrease the industrial burden on the United States by using available foreign production capacity, to conserve the United States' critical materials, to promote the economies and self-sufficiency of friendly nations, to lessen long U.S. procurement lead time, to reduce distribution pipe-line time, and to provide sources for re-supply other than the United States.

Under this program military procurement in Japan enabled a minimum amount of American capital to stimulate Japanese industrial activity, thereby creating a strong democratic foothold in the Far East and at the same time strengthening other free nations by providing them with critical items which Japan could produce. The expansion of Air Force procurement in Japan thus became even more significant.

The increase in local procurement brought on several changes in organization and procedures. In February 1952, the United States Air Force, Army, and Naval forces in the Far East entered into a joint procurement agreement whereby the Army and the Air Force acted as sole procuring agencies for certain specified items. This agreement made possible the economy of centralized purchasing and prevented interservice competition.

Procurement field offices were established in Tokyo, Nagoya, and Osaka in March 1952 with the quality control field offices already established in these cities serving as nuclei. The production sections of these offices compiled information on the industrial potential in their respective geographical areas for transmission to the Production Division. The Production Division then made recommendations to the Purchasing and Contracting Section on the qualification of sources. The production section of the field offices also followed up on all contracts in their area.

The Contract Administration Section, working with the Production and Quality Control Sections, was responsible for the complete administration of all contracts assigned to each procurement field office. Contractors seeking Air Force business were advised to contact the nearest procurement field office. And Air Force contractors could receive technical advice or assistance from their procurement field offices.

Both the Air Force and the contractors benefited from this arrangement. The Air Force received prompt delivery of high-quality products, and the contractor received technical assistance and prompt payment. Understanding between procurement personnel and Japanese contractors was assured by the

presence of bi-lingual interpreters. The work of the field offices has resulted in better procurement-contractor relationship, fewer late deliveries, higher-quality products, and lower unit prices.

Of particular significance is the fact that many lower unit prices were obtained even though material costs had been rising. The lower unit price may be indicative of the willingness of the contractors to accept a lower rate of profit. A contributing factor has been the lower financing cost made possible through prompt payment.

The efforts of the Directorate of Procurement and Industrial Planning were not limited to purchases of supplies and equipment. To augment the efforts of Air Installations to keep up with the vast expansion of military installations, personal and professional service contracts were used to provide architect-engineer services. Since June 1952 the Far East Air Logistic Force has executed all professional service type contracts required by commands subordinate to the Far East Air Force. Approximately seven million dollars was spent on procurement of this type in Fiscal Year 1953.

Contractual services have been valuable in supplementing the Air Force depot maintenance program since the beginning of the Korean conflict. Since Fiscal Year 1951, non-personal service contracts maintained motor vehicles, cargo parachutes, and aerial cameras. During the first half of Fiscal Year 1953 maintenance and overhaul contracts were executed for electric motors, transformers, generators, fire-fighting equipment, office machines, and several types of aircraft.

The success of the military procurement program in Japan gives new assurance to all people of the world that cultural differences need not impair international cooperation and good will. It is a symbol of hope to those countries desperately struggling to restrain Communist encroachment. Further attempts of the aggressor nations to absorb the weaker nations, may, as in the case of Korea, increase the strength of the free world rather than weaken it. It is a tribute to the Japanese people who have earned their economic recovery by the sweat of their brow and the strength of their backs.

Headquarters, Far East Air Logistic Force

The Quarterly Review Contributors

General Otto Paul Weyland (B.S., Texas A&M) has been Commander, Far East Air Forces, since 24 May 1951. Previously he had served as Vice Commander, FEAF, from July 1950 until April 1951. At the outbreak of the Korean War he was Commanding General of the Tactical Air Command at Langley AFB, an assignment he served in but a few weeks before his call to FEAF as Vice Commander. General Weyland was Deputy Commandant, National War College, from February 1948 until July 1950. He was Director of Plans and Operations at USAF Headquarters when the Air Force was reorganized in 1947. In the Second World War his principal combat assignment was as Commanding General of the XIX Tactical Air Command, the air unit which gained widespread recognition for its classic air support of the Third Army in its dash across France. General Weyland's career in the Air Force began soon after his graduation from college, when he accepted a commission as second lieutenant in the Air Reserves. Following a tour of active duty at Brooks Field, Texas, he was commissioned second lieutenant of the Air Service, Regular Army. Upon completion of his flying training he was assigned to Fort Sam Houston, Texas. He became an instructor at the advanced flying school, Kelly Field, in 1937. He is a

graduate of the Air Corps Tactical School at Maxwell AFB, Ala., and the Command and General Staff School, Fort Leavenworth, Kansas. His numerous decorations include the Distinguished Service Medal, Silver Star, Legion of Merit, the Bronze Star Medal, and the Air Medal. He also holds many foreign decorations, including the French Legion of Honor and the Croix de Guerre with Palm, the Belgian Croix de Guerre with Palm, and the Brazilian Order of Aeronautical Merit.

Colonel John R. Maney (B.A., University of Iowa, Iowa City, Iowa) is now a faculty member, Air War College, Maxwell Air Force Base, Ala. His early war service was in operations staff assignments with the IV Bomber Command where he assisted in organizing the Operational Training Unit program. Moving from Group operations to Wing A-3, he became Deputy for Twentieth Air Force Operations from January 1945 to May 1947. He attended the Air Command and Staff School, Maxwell AFB, in 1947-48, was assigned to the War Plans Division, Deputy Chief of Staff, Operations, Headquarters USAF, 1948-51, and was a student in the Air War College in 1951-52.

Lt. Colonel Joseph O. Fletcher is currently assigned to Hq. Air Research and Development Command. He organized and led the United States Air Force expedition which established a Weather and Geophysical Station on floating Ice Island T-3 in 1952. His introduction to the Arctic had come in January 1950 when he was assigned as Commanding Officer of the 58th Strategic Reconnaissance Squadron, Eielson Air Force Base, Alaska. During 1950 and 1951 Colonel Fletcher pursued his interest in geophysics as a hobby and submitted several reports on arctic ice and ice islands. The first Air Force announcement of the existence of ice islands was presented by Colonel Fletcher to the Alaskan Science Conference, Washington, D.C., in November, 1950. Before his assignment to Alaska, he was Director of the Air Force's Geophysical Research Laboratories, Cambridge, Mass.

Colonel B. H. Shiffrin is Chief of the Organization and Training Division, Assistant for Mutual Security, DCS/M, Hq. USAF. Colonel Shiffrin graduated from flying school in August 1941. In January 1943 he was assigned to Greenland as a base commander and Commander of the 1st Arctic Search and Rescue Squadron. Later he commanded the 44th Troop Carrier Squadron in the Pacific. Released from active duty in late 1945, he was associated for two years with a civilian airport at Bethany, Conn. He was recalled into the Regular Air Force in 1947 and assigned to Hq. First Air Force, then to the 51st Fighter Wing, Naha, Okinawa, and in 1949 to the 3500th Pilot Training Wing, Lubbock, Texas. Since late 1950 he has been on Pentagon duty.

Lt. Colonel Gerald T. Smith (B.A., University of Oregon; M.B.A., University of Michigan) is chief of the Procedures Division, Assistant for Programming, DCS/O, Hq. USAF. A former infantry reserve officer, he served during World War II as a bomber pilot in China. Before assignment to his present position he was engaged in combat crew instruction, air inspection, weather reconnaissance, and graduate study in business administration. He is a graduate of the Air Inspector's Course (1947) and the Post Hostilities Staff Officers' Course (1945).

Colonel R. I. Millberry (A.B., Stanford University) is Deputy for Installations, Hq. Japan Air Defense Force. He received an engineering degree and a reserve 2nd lieutenant's commission in 1936. He was employed by several major oil companies as a petroleum engineer during the next five years until called to active duty in April 1941. He served at several bases and headquarters within Fourth Air Force until January 1943, at which time he departed for overseas for duty with the Eleventh Air Force in the Aleutian Islands. He returned to the U.S. in November 1945, was integrated into the Regular Air Force, and served at bases of the Air Training Command and as Deputy Chief of Staff for Installation, Flying Training Air Force, until his departure for Korea in May 1952. He was Director of Installations for the Fifth Air Force for one year and was recently reassigned to Japan Air Defense Force. He is a graduate of the Air Staff Course of the Command and General Staff School and briefly attended the Air Command and Staff School, Maxwell AFB, Ala., until withdrawn because of the Korean situation.

Captain Norman F. Williams (Univ. of California) is presently assigned to Third Air Rescue Group as Assistant Group Operations Officer. He served two and one-half years in the infantry before World War II, when he was commissioned in the AAF and flew 59 combat missions as pilot of B-26 Pathfinder in the ETO. Released from active duty in 1945, Captain Williams was employed as Air Route Traffic Controller, CAA, until his recall in April 1950. He is credited with rescue of 3 U.N. aircrewmen from the waters off North Korea.

Colonel Hugh J. Mattia is now Director of Procurement and Industrial Planning, Far East Air Logistic Force, Japan. During World War II, at the time of the expansion of the AAF in England, he opened three Air Force stations, assisted in activating a truck transport regiment, and was deputy of a supply depot. Upon his return to the ZI, he was with the Office of the Inspector General, USAF, performing procurement inspection activities. Prior to his present assignment, he was Director of Procurement Administration with the Southern Air Procurement District of the Air Materiel Command.

Dr. Eugene M. Emme (Ph.D., Iowa) is Air University Professor of Modern European History and International Politics and is currently Director of the Graduate Study Group, Air War College, Maxwell AFB, Ala. During World War II he was civilian flight instructor at AAF contract schools, and U.S. Naval aviator and historical officer. He was formerly instructor in European History at the University of Iowa (1946-48) and a research historian with AU Research Studies Institute (1949-52). Dr. Emme is the author of *Air Power and International Politics; Hitler's Blitzbomber; German Air Power, 1919-39;* and other studies and articles.

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