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USAF'S ROLE IN LATIN AMERICA: MILITARY ASSISTANCE,
EDUCATION, AND PREVENTIVE MEDICINE CIVIC ACTION

NOVEMBER-DECEMBER 1966

AIR UNIVERSITY REVIEW



THE PROFESSIONAL JOURNAL OF THE UNITED STATES AIR FORCE

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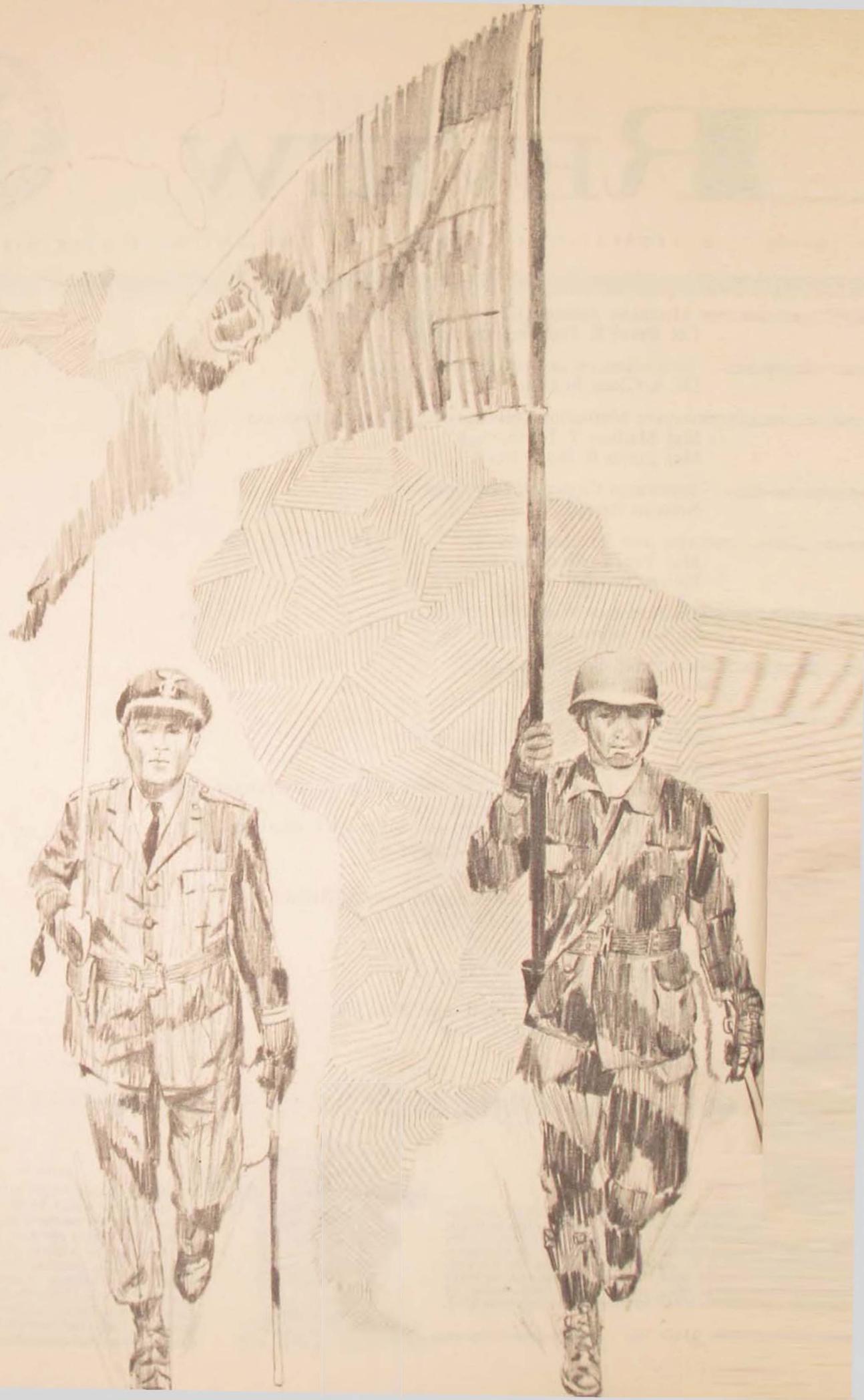


the cover

As Winter's breath begins to chill our temperate clime, one thinks fondly on the warmth of our neighbor countries to the south. The Review, in a more practical look southward, considers several aspects of USAF relationship with Latin America: Col. Frank R. Pancake's "Why Military Assistance for Latin America?" Dr. A. Glenn Morton's "The Inter-American Air Forces Academy," and Majors Mathew T. Dunn and James B. Jones's "Preventive Medicine Civic Action Training Program."

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THE United States, as one of the eighteen Western Hemisphere nations that signed the Inter-American Treaty of Reciprocal Assistance (known as the Rio pact) in 1947, is committed to a policy of preventing and repelling threats and acts of aggression against any country of the Americas. In accordance with Joint Chiefs of Staff plans, the United States Air Forces Southern Command (USAFSO) is responsible for the capability of U.S. air forces to back up that policy. Besides this primary military mission, USAFSO has the advisory role of assisting in the development of country air forces under the U.S. Military Assistance Program (MAP). Throughout all these efforts, the aim is to foster friendly relations, strengthen hemispheric solidarity, and promote a community of prosperous nations whose governments reflect the will of their peoples. USAFSO's task is as big as the territory of Central and South America, as complex as the geographical, economic, and ethnic features are diverse, and as tricky as Communist subversive activities can make it. In this issue Air University Review presents three articles spotlighting several phases of Air Force activities in Latin America: "Why Military Assistance for Latin America?" by Colonel Frank Pancake, "Inter-American Air Forces Academy" by Dr. A. Glenn Morton, and "Preventive Medicine Civic Action Training Program" by Major Mathew Dunn and Major James Jones.



WHY MILITARY ASSISTANCE FOR LATIN AMERICA?

COLONEL FRANK R. PANCAKE

ONE of the stubborn facts about the United States in the mid-twentieth century is its lack of genuine concern about what is going on in Central and South America. It is perhaps not surprising because the people of the United States historically have looked either to the East or to the West. Most have their family origins in Europe or in Asia. The tremendous wars of this century underscored antagonism and dangers across

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the Atlantic and Pacific. In the aftermath of World War II, the revolution of ideas and the emergence of a whole family of new nations have again tended to emphasize the Middle East, Africa, and the Indian Ocean basin. More recently the war in Vietnam has again diverted attention from this nearer region that has come to be called Latin America.

Even the phrase "Latin America" is in itself a reflection of our indifference, since it provides a convenient term by which to describe a vast area that we tend to think of as an entity whereas in reality its member countries are very different in background, resources, state of development, and form of government. People in the United States refer to residents from Mexico to Cape Horn as "Latin Americans" because, after all, aren't they all swarthy, small in stature, mostly Spanish-speaking, and generally agreed that the best time to get things done is *mañana*? Such is the stereotype that comes to mind when the average *Yanqui* stops to think about his neighbors to the south.

Even a cursory examination of this image reveals that there are a good many *Latinos*—notably in Brazil, Uruguay, Chile, and Argentina—who are neither swarthy nor small. In Brazil, which is as large as the United States

and has over 80 million inhabitants, the language is Portuguese; in the tiny Guianas three languages are spoken—French, Dutch, and English. And although there is undeniably a *mañana* attitude in many areas, still the number of Latin American achievements is notable. To name but one, a listing of the seven largest cities in the Western Hemisphere in 1960 included four south of the Rio Grande: Buenos Aires—third, São Paulo—fourth, Rio de Janeiro—fifth, and Mexico City—seventh.

Nevertheless, there is an undeniable common denominator in the area, and that common denominator is underdevelopment with its inevitable companion, limited communications. ("Communications" here is used in its broadest sense to include roads, railroads, canals, air routes, wire services, etc.) These and other factors have perpetuated widespread illiteracy and a chronic state of poverty. Nor is the poverty that exists in Latin America the kind known by the people of the United States, where poverty is an affliction of the minority. In Central and South America it is the condition of the majority. For the principal curse of this region is that its resources have always been controlled by a relative few, and the benefits of natural abundance have been de-

United States Air Forces Southern Command C-130's have airlifted more than a million and a half pounds of road-building equipment in Peru and Brazil. U.S. participation in the civic-action program has enabled Latin American military forces to continue their own civic-action projects of opening remote interior regions to surface travel and commerce.



nied the great majority of the people. The plight of the *campesino* and the Indian in this part of the world is incalculably worse than that of the poor in the United States. Also, there is a much smaller base of the well-to-do from which to produce the capital, the management, and the development required to alleviate the poverty of the masses. To put it another way, the industrial revolution that changed the whole way of life in Europe and America has yet to take place—in any complete sense—in Central and South America.

Thus the problem facing the governments of these countries is to increase, in a very major way, the development of their natural resources. This growth will create new businesses, stimulate commerce, and provide the revenue that will pay more wages to more people and supply taxes for more development. Such a program requires (1) capital, (2) industrialization, (3) a higher level of education, (4) an opening of the vast interior lands, and (5) internal security and stability.

The United States Government is not unaware of these requirements, nor is it without a program to meet them. The major element of the program, the Alliance for Progress launched by the late President John F. Kennedy, is endeavoring both to prime the economic pump in all nations of the Organization of American States and also to require some basic reforms without which meaningful progress is impossible. The United States has pledged its full support—running into billions of dollars—to make this program work. In conjunction with this program are the related technical assistance, development loans, and Military Assistance Program (MAP). Together these various programs make up “foreign aid.” To many U.S. taxpayers the whole matter of foreign aid is viewed with great suspicion, and it is annually attacked in Congress with varying degrees of vehemence and hostility. Aid to Latin America seems, for reasons not clear to Latin Americans, the most suspect of all.

The most criticized component of Latin American foreign aid is the Military Assistance Program. Its purpose is to raise the effectiveness of the military forces of the recipient na-

tions to a level that will give reasonable assurance of internal security and provide certain elements of hemispheric defense. Stress is placed on support of units that have “nation-building” characteristics, such as construction and transportation units. Congress has decreed a ceiling of \$55,000,000 on military equipment for this area. The oft-voiced questions are many: Why should we invest good U.S. dollars in military aid when what is really needed is economic aid? Why strengthen Latin American armed forces when their strength is frequently used to overthrow civilian government? Aren't we just encouraging them to fight among themselves? Who else is there to fight? Why do such small nations need air forces? Does it make sense to give them modern sophisticated weapons like jet aircraft? And so on and on. The remainder of this article will seek to answer these questions.

Why should we invest U.S. dollars in military aid when what is really needed is economic aid?

The quick answer is that both are needed. To see why, let us review the stated requirements, starting with the need for capital, without which stepped-up development cannot take place. When the U.S. provides military aid, it frees indigenous government funds, which can be added to available capital. Perhaps it is important to clear up, right here, a widespread impression that Latin American governments spend a lopsided portion of their budget on defense and that then U.S. MAP piles on another massive chunk. Such is not the case. In the period from 1960 to 1964 the average defense expenditure ranged annually from 12.6% to 13.9% of total expenditures. This is not to say that individual countries did not spend more, but the highest figure for any country in that five-year period was 23.4%, and the lowest was 3.3%. Needless to say, individual country budgets vary from year to year, but it is significant that in no case could the percentages be labeled exorbitant or even excessive. During the same five-year period, the extent of U.S. military aid averaged from 3.5% to 5.3% of the various defense budgets. Again, this is an average, and in individual countries in spe-

cific years the figures have been much higher. For example, in one country MAP amounted to 32.5% in one year but only 3.8% for the same country in another year. The point is that the Military Assistance Program is not augmenting Latin American military budgets on a grand scale. But to the extent that the United States *does* supply military aid, country funds are released for economic programs.

To return to the examination of requirements for progress, regarding industrialization we will only point to the fact that military facilities are contributing to limited industrial development: for example, the Argentine Air Force depot at Córdoba is manufacturing light commercial aircraft, and the Peruvian Navy is building a commercial cargo vessel in its yard at Callao.

Concerning the next requirement, education, What does military assistance have to do with education? Quite a bit. The recent comments of a Peruvian officer provide an illustration:

In your country when you need a motor vehicle driver, you can draft a lad 18 years or older who has probably graduated from high school, has been driving a car for 2 years or more, and may own an MG. You show him where the gadgets are on a 6 x 6 truck, you give him a couple of lectures on ground safety, and he is ready to go. In Peru we take an Indian boy who can neither read nor write and who may never before have ridden in any vehicle except the bus that brought him down out of the hills. So we begin with teaching him to read and write. It's a long process.

There is a key point here. The military are providing their personnel the basic stimulus that underlies all real progress: education. Not only are the armed forces engaged in education; in many countries they are also teaching a trade to those whose military service is almost at an end. Thus when a young man is mustered out and returns to civilian life, he is able to perform as an automobile mechanic, electrician, or radio technician or in some other useful trade. The armed forces contribute to civilian learning as well. In recent years they have devoted a major effort in a number of countries to building schools in which boys and girls can

receive an elementary education. Particularly noteworthy have been the programs in Bolivia, Ecuador, Guatemala, Colombia, and Honduras.

It is difficult to overemphasize the need to open up underdeveloped areas. Here again the military are making a real contribution with equipment provided through MAP. Transport aircraft are flying new settlers into lands that have never been cultivated. New air routes to backcountry grass strips are opening up areas that have never before been in direct contact with civilization. In Peru army bulldozers and graders, flown to interior points and manned by construction battalions, will make possible the first overland highway to connect a Pacific port with the vast region of the Amazon River basin lying east of the Andes. Thus in a short while the city of Iquitos, more than 400 miles northeast of the port of Chiclayo, will be connected to that city by a highway permitting travel between the two in a matter of a couple of days. Right now, any bulk cargo that cannot move from Chiclayo to Iquitos by air must travel by ship via the Panama Canal, around the northern coast of South America, and up some 2200 miles of the Amazon River. The time required is reported to be eight months.

Similar examples of road building could be cited in Colombia, Brazil, Paraguay, and other countries. And in a country like Paraguay, for example, there is no local civilian contractor available for major road-building projects; hence almost the entire effort is borne by the Paraguayan Army. Similarly, almost all of the Paraguayan Air Force transport force is devoted to airlift and liaison to remote areas.

But even the foregoing arguments for military aid do not focus on its major purpose, which is to meet the requirement for internal security. The threat of subversive insurgency is widespread in Central and South America today. It is promoted and supported by Castro, the U.S.S.R., and Red China. The insurgent effort spawns acts of terrorism, sabotage, riots, and kidnapings. The most recent evidence of Communist aims and efforts was the first Tri-Continental Conference of Communist and leftist organizations held in Havana from 3 to 15 January 1966. Soviet Delegate Rashidov boasted that combined Communist operations

Establishment of joint operations centers in Latin American countries has done much to increase cooperation and understanding among military forces.



in the Western Hemisphere would soon capture Peru, Venezuela, Guatemala, the Dominican Republic, Puerto Rico, and the three Guianas.

Our Military Assistance Programs are aimed not only at providing the kinds of equipment best suited to resist insurgency but also at training in the tactics and techniques of counterinsurgency warfare. This training places great stress on coordination of the entire resources of a nation to control these threats. The job requires quick reaction and careful teamwork among all military forces, the police, and government economic and information agencies. In summary, we can say that military assistance funds supplement economic aid. They make possible the environment in which economic aid can get the best results, and they contribute directly to the improvement of the economy.

Why strengthen Latin American armed forces when their strength is frequently used to overthrow civilian government?

This question seems to proceed from the premise that if U.S. military aid were withheld, Latin American military forces would become impotent and hence there would be no further military coups—or *golpes*, to use the Spanish term. The percentages already cited of military budgets supplied by MAP underscore the fallacy of this premise. Obviously the military

arm by its very nature is the strongest arm of any government, and in Latin America there will never be a lack of sufficient arms to oust unarmed civilian leaders. It is, of course, quite likely that other countries would be happy to provide some arms if ours were withheld.

A tradition in the countries of Latin America, different from any in the United States, is that military leaders look upon themselves as guardians of democratic constitutional government. The feeling dates back to the achievements of Simon Bolivar and José de San Martín in the early part of the nineteenth century, when the Spanish empire was finally overthrown. Though we in the United States have trouble understanding the viewpoint, we must realize that the Latin American military leaders look upon it as their duty to step in and rescue their nation from inept or incompetent leadership. Undeniably, the overthrow of some civilian-led governments, far from being a catastrophe, has been a blessing. There have been over 35 *golpes* in Central and South America since World War II. It is not within the scope of this article to argue the merits of each of these. There are recent examples, notably in Brazil and Ecuador, where civilian leadership clearly did not meet the needs of the people or of the nation and a change in leadership was long overdue. But the real answer to the question is that we really have no choice. We do not want new



The helicopter plays an increasingly vital role in Latin American counterinsurgency and rescue operations. Venezuela and Colombia in particular have used the chopper to excellent advantage in antiterrorist efforts. . . . One of USAFSO's primary objectives is to help improve search and rescue capability in its area of responsibility, and throughout Central and South America by tie-in with national centers. The USAFSO Aerospace Rescue and Recovery Center, under the Military Assistance Program, provides rescue-control training to participants.



Castros in Latin America. These countries deserve help in the fight against internal subversion. They need improved equipment—things like good communications gear, helicopters, and more modern aircraft tailored to their requirements. They need training. Perhaps most of all they need streamlining of their military organization. Without these things they will not control insurgency. And if these things become the tools of a *golpe* here and there, we must be mature enough to realize that the tools would have been obtained from other sources if not from us.

Aren't we just encouraging these countries to fight among themselves? Who else is there to fight?

There is no denying that certain historic enmities exist between neighboring countries in this part of the world, just as they do elsewhere. Chile and Argentina periodically develop a crisis over border incidents. Landlocked Bolivia is still smarting from its defeat in the War of the Pacific and the annexation of its coastal lands by Chile. Ecuador and Peru have a continuing boundary dispute. But it is encouraging that there have in fact been

no recent conflicts between Latin American countries, and today there is reason to believe that the likelihood of such conflicts is lessening. There is, for one thing, in a very real sense, a common enemy: Communist-sponsored insurgency. Though the threat varies in degree and though in a few countries it is hardly discernible, we have the statements from Havana, Moscow, and Peking to underscore the likelihood that no country shall continue to be immune. The Organization of American States has obviously promoted a greater feeling of friendship and understanding among the member nations. But beyond the political realm, the Military Assistance Program has brought about some very tangible contributions to peace and friendship.

An excellent example of cooperative effort is the annual combined exercise involving army, navy, and air forces of as many countries as are able to participate. These exercises are planned and executed by a combined staff under the leadership of the host country. The most ambitious exercise held to date was Operation Ayacucho in December 1964. The participating nations included Argentina, Colombia, Paraguay, Peru, Venezuela, and the United States. This exercise involved more than 7000 troops and lasted three days. Of particular significance was the fact that its scenario was based on support by neighboring countries to assist the host country in putting down an insurgency which had grown to major proportions. It therefore represented a significant departure from past exercises, which had been predicated on the classical invasion from outside the country.

Another contribution to peace and friendship is the two schools which the United States operates in the Canal Zone: the Army's School of the Americas and the Inter-American Air Forces Academy. Both are in continuous session and offer numerous courses, which are made available without charge through the Military Assistance Program. These schools provide a bonus benefit over and above education and training by bringing into close association members of the various air forces and armies, so that they get to know something about their neighbors from other countries by

living and learning with them as classmates. It is indeed an inspiring occasion at each graduation to hear the student body sing together "The Hymn of the Americas," clearly revealing a sense of unity of which they had never before been aware.

A third contribution of MAP is the major training effort now being undertaken by the U.S. military services stationed in the Canal Zone in the techniques and tactics of defeating either incipient or actual insurgency. To this end the 605th Air Commando Squadron and the Army's 8th Special Forces send mobile training teams—both jointly and separately, depending on the need—to work with counterparts in the various Latin American countries. In addition, a great deal of emphasis is placed on streamlined organization to provide quick reaction when trouble arises. The concept of a joint operations center has been adopted in countries like Venezuela, Colombia, and Guatemala, to unite and coordinate all military and paramilitary forces. This innovation did not come easily, for military rivalries make cooperation difficult.

Stress is laid on the importance of civic actions by military units, to convince the Indians and *campesinos* that the armed forces and the government are not only interested in their welfare but also willing to work directly for their betterment. One of the most useful programs has been the work of medical teams which are flown to remote areas, where they provide instruction in sanitation, give immunization shots, and administer medical and dental treatment within the limits of time and personnel available. Paraguay, for example, flies its Cessna 185 (bought and supported by MAP) to 10 different villages. In 1965, 15,000 patients were treated in the remote areas, and 187 patients were air-evacuated. Honduras, with its Cessna, provides visits each month to 13 villages, and 50 patients were air-evacuated in 1965. Both Honduras and Paraguay give free treatment and medical care and return the patients to their village by air.

A regular program has been established for training medical technicians at the Inter-American Air Forces Academy, and light aircraft and medical kits are provided to partici-

pating air forces to be utilized by the technicians when they return to their country. In 1965 the school sent out 20 medical teams on combination demonstration and working visits to various backcountry areas, including the Perlas Islands south of Panama. These teams, assisted by graduates from the school who had returned to their countries, treated 18,778 patients, filled 47,381 prescriptions, took care of 1895 dental patients, including 3860 extractions, and performed 3277 laboratory examinations and 4620 immunizations. Apart from the humanitarian aspects, efforts like these impress the natives and create good will toward the armed forces. And it is hoped that they point the way to an expansion of such efforts by public health agencies of the host governments.

A final example, though not directly related to MAP, is the annual meeting in a selected capital of all the chiefs of air forces. The sixth such conference was held this year in Lima, Peru. Similar conferences are convened for the leaders of the armies and navies. These are not simply social affairs; they are working conferences, usually lasting for a week or more. Military leaders get to know one another and discuss their problems frankly and freely. These discussions have produced tangible results, a good example embodied in recent decisions to implement an area-wide search and rescue system, spearheaded by the air force in each country. The USAF Regional Center at Albrook AFB, Canal Zone, has already commenced on-the-job training of selected personnel from the various Latin American air forces, and steps are being taken to establish rescue centers in each country and subregional centers as required. To support this system and to provide direct communications among Latin American air forces, the Inter-American Air Forces Tele-Communications System (SITFA) has been established. Seven countries have already established stations in this voice net, and the remaining air forces are expected to join it in the near future. Thus for the first time it is possible for the air forces to talk to each other without going through commercial facilities. The United States has provided the communications gear to make this system possible. Also as a result of the annual conferences, studies

are under way to make recommendations on a mutual logistics support system and an international central flying training school.

Why do Latin American nations need air forces?

This question is raised particularly with respect to those smaller nations whose air forces are about the size of one USAF squadron. Our previous discussion has already provided some of the answers to this question, but a few additional observations should be made. The first reason for air forces—and the one most often overlooked—is that each of these countries has a basic pride in its armed forces and a realistic concern for its national security. Each is determined to have some form of air power, even though—as in Costa Rica, for example—it amounts to only four light aircraft. Other small countries are satisfied to have a limited number of propeller-driven fighter-type aircraft and some transports. These serve limited objectives in providing airlift of troops to trouble spots about the country and in providing reconnaissance and close support if needed. The more advanced countries have moved into jet fighters and have sent considerable numbers of their pilots to jet training schools in the United States. There is no question that the factor of pride as well as concern for security has been a driving force in the acquisition of jet aircraft. However, these aircraft have, for the most part, been tailored to the ability of the country to support them, and only the larger countries have acquired jets in significant numbers. These jets have a limited air defense role in those countries of the Caribbean basin which are directly threatened by Castro, and they are useful air-ground support weapons in areas where organized insurgency provides targets. The helicopter has assumed an increasingly important role as a counter-insurgency weapon and has been a major factor in many successful efforts against insurgents and terrorists in Colombia and Venezuela.

One need only glance at a relief map of Latin America to realize how crucial the airplane is in helping to solve the transportation problem. It is also invaluable in opening up the vast heartland areas of the Orinoco and Amazon basins. Air forces serve other auxiliary

roles not normally thought of in the United States. For example, the air force pilots of most Latin American countries perform regular tours of duty with domestic commercial airlines. As the airlines are operated by the government, for the most part, this use of air force personnel does not involve any change in employer. In countries where agriculture is an important element of the economy, military pilots are given extended leaves of absence to do crop-dusting. But it must be stressed that the real reason for these air forces is to provide for the security of the country by furnishing the necessary air member of the total defense team.

Why do Latin American air forces need sophisticated aircraft?

There is undoubtedly a great deal of misunderstanding about the nature and quality of Latin American air forces. This is due in part to the tendency to lump all Latin American countries together and to consider their military forces as having the same requirements. This obviously is a grievous error. There is no more similarity between the kind of equipment required by the Brazilian Air Force and that required by the El Salvadorean Air Force than there is between the air forces of the United States and Denmark. Determining the kinds of aircraft a country needs depends on its geography, its resources, and the threats to its security. Those who pose the question have not defined the meaning of the word "sophisticated," but somehow the term has been taken to mean jet aircraft. It is quite true that some of the Latin American countries do not need jet aircraft. Some of them, realizing that they do not need them, do not have them. Other countries have obtained a few jet aircraft, usually the T-33, to satisfy national pride and the urge to progress; but these aircraft have also been given the armament to make them useful as ground support weapons. They can be quite effective against guerrillas or for rapid reconnaissance. The larger countries have already arrived at the level of the F-86, the Hawker Hunter, and the Canberra jet light bomber, which provide tactical air support for their armies.

The question is not whether these obsolescent F-86's, Hunters, and Canberras will be replaced, because these countries have made up their minds that modernization is vital to their security and progress. The only question concerns the type of aircraft that should replace them and from what country. The Latin Americans are not interested in high-priced, high-performance fighter aircraft like the F-105 or the F-4C. A number of them, however, are interested in an aircraft with characteristics similar to those of the F-5. It would not be inexpensive—the price of an F-5 is about a million dollars—but it would be less expensive than other modern fighter aircraft. Jets with modern design features, including simplification of maintenance, ruggedness, and reasonable ordnance delivery capability, would be very suitable weapon systems in Latin America. Our neighbors there prefer U.S. equipment. It reduces their logistic problems, it enables them to work out flexible arrangements as between sales and grant aid, and they admire and respect our products. It should be remarked parenthetically that while some countries want a modern jet fighter and are prepared to operate it effectively, others would be content with something much cheaper and with lower performance characteristics, provided it could fill the role of a "counterinsurgency fighter." This need is not peculiar to Latin America, and the United States has been aware for some years of the pertinence of an aircraft of this kind. There are many countries that could use it if it is ever produced. But regardless of what types of new aircraft are selected, the replacement of the present assortment of aging and fatigued fighter aircraft must begin—and soon.

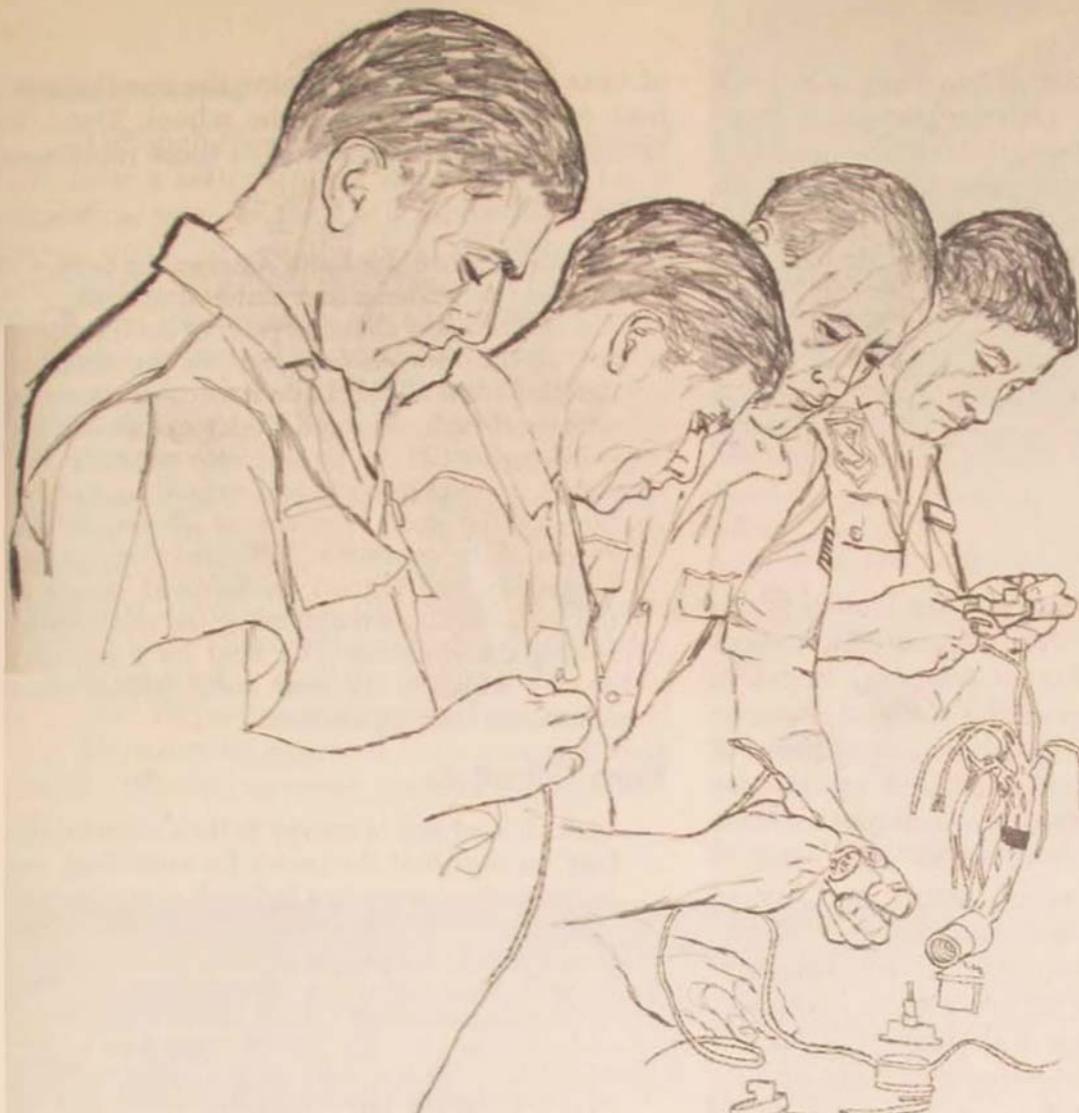
A word should be said about "sophisticated" transport aircraft. The C-47 continues to be the backbone of most Latin American air forces. Though some say the marvelous Gooney Bird will go on forever, Latin American requirements, particularly in the civic-action field, dictate the need for something bigger and better. There are, of course, some C-54's in service, and some C-118's are beginning to appear. The transport whose performance best suits the needs of most South American coun-

tries is the C-130. It can carry heavy payloads over the Andes. It is relatively easy to operate and maintain. It is simple to load and unload. And on the basis of the cargo ton-miles it can produce, it is reasonably economical—more economical in fact than the C-118. But it is expensive, costing upwards of \$2,000,000. Brazil has arranged to purchase five C-130's, but the price tag makes it almost prohibitive for other nations. Thus there is a great need for modernization of the C-47, but no one has yet produced a low-cost twin-engine version of the C-130 that might fill the gap. Perhaps a solution may be found in a condominium arrangement to support a multinational C-130 airlift organization that could haul freight for all the member nations.

THE Military Assistance Program in Latin America yields an excellent return on the U.S.

investment of about \$70,000,000 annually (the difference between this figure and the ceiling of \$55,000,000 finances the training of Latin American personnel). There is no question that this money is providing the means and the know-how to fight Communist-inspired insurgency, to promote civic-action projects which benefit the economy, and to cultivate ever closer ties among the countries in the area and between those countries and the United States. The Military Assistance Program, in short, is not a wholesale give-away program as some would have us believe. It is an investment in the security of the United States. For unless we are willing to help our neighbors overcome the current efforts of subversive elements and reap the harvest of fully developed resources, we will soon find that we have other neighbors besides Cuba who are members of the Communist bloc.

Hq United States Air Forces Southern Command



THE INTER-AMERICAN AIR FORCES ACADEMY

DR. A. GLENN MORTON

THE Inter-American Air Forces Academy at Albrook Air Force Base, Canal Zone, exists specifically to serve the needs of the Latin American air forces and, therefore, indirectly all of the Latin American peoples. Its stated mission is to ". . . provide training in Air Force occupational specialties for personnel of the Latin American Air Forces and provide Spanish translation service for Air Force training publications." In practice the

school goes beyond a narrow interpretation of its mission and provides resident training in English, management, OJT supervision, special air operations, and athletics, as well as the occupational specialties. All instruction is conducted in the students' native languages, Spanish and Portuguese, by United States Air Force instructor personnel and guest instructors from some of the country air forces. In this respect, the Inter-American Air Forces Academy is

unique. By maintaining outstanding standards of performance, the school makes major contributions toward strengthening hemispheric solidarity, improving the defense posture of the Latin American republics, and creating friendship and good will for the United States.

Formerly known as the U.S. Air Force School for Latin America, the school was renamed effective 8 September 1966 to reflect more appropriately the joint efforts of the many Latin American nations toward achieving its hemispheric goals.

hemispheric solidarity

The interaction between the United States and Latin America which culminated in today's Inter-American Air Forces Academy began in 1939 when the Commanding General, Panama Canal Department, initiated a program of courtesy visits to the Canal Zone by military representatives of Latin American nations. One of the chief purposes of these visits was to counteract "the residue of distrust and fear of the United States in the minds of many Latin Americans, particularly the Latin American military." The idea of trying to engender mutual understanding and good will and of working toward hemispheric solidarity was inherited by the School for Latin America when it was formed, as an implicit, and at times since then explicit, part of its mission. The school has been successful in this extremely important facet of its mission. As early as 1943 the Commanding General, Sixth Air Force, received a message from the Commander, Talara Air Base, Peru, concerning the favorable reaction of the first group of Peruvians who had been trained at the Panama Air Depot:

In addition to being impressed by American methods and standards, they are apparently deeply pleased by the friendly attitudes, generosity and hospitality of all with whom they come in contact. There could be no doubt that during their tour in Panama they have formed a genuine and lasting friendship for America and Americans.

Nearly ten years later, in July 1952, the public information officer of the Caribbean Air Command conducted a poll through the chiefs

of USAF Missions, to determine the reactions of host Air Force officials to the school. The following comments are typical of those received.

From Bolivia:

The USAF School for Latin America not only has trained the students in a material manner, but has also brought about a center of confraternity among the Americas, since there are students enrolled from all the Latin American countries who meet each other and work together in close collaboration. It can be said with certainty that this is an evergrowing and expanding institution for the good harmony of all the Armed Forces of the continent, cultivated through the hospitality and mutual brotherhood shown to the students and strengthening the relationship among the countries who fight for a common destiny which is the most solid defense for a democracy and civilization.

From Colombia:

I am pleased also to convey to the Commandant [my feeling] that the center for moulding aero technicians represents a bulwark of continental solidarity, now constituting a symbol of unity among the Latin people of America.

From Venezuela:

In addition to the educational mission of the USAF School for Latin America, there are two important by-products of its operation; I refer to the tightening of the bonds of friendship among the representatives of the armed forces of the different Latin countries, and to the standardization of operating procedures, which constitutes a big step toward the formation of an American hemispheric bloc.

Today, as in 1943 and 1952, the school promotes and cultivates the spirit of cooperation and friendship and the mutual exchange of ideas through an active cocurricular program of cultural presentations, field trips, picnics and other social functions, and a vigorous sports program. Students from nearly all the Latin American nations live together, play together, and work together. The students' attitude is well summarized by the motto of Class 65-A, written by a Mexican student: *Nuestro designio, hermandad—nuestra meta, la paz* (Our path, brotherhood—our goal, peace).

technical training

Although the courtesy visits were initiated to create a better United States image in Latin America, some of the Latin American nations were quick to see the practical advantages that might be gained from them. In December 1939, just nine months after the visits started, Ecuador requested instruction for its visiting personnel in all fields of interest deemed appropriate by the U.S. Army Air Corps in the Canal Zone. In August of 1940 the Peruvian Ambassador to Panama made a similar request for Peru's visiting officer pilots, expanding the scope of the request by asking that they be permitted to remain for one month in order to observe techniques and methods of operation.

In September 1940 the Commander, Panama Canal Department, requested and received War Department approval for a program that would authorize courtesy visits of the type de-



Inter-American Air Forces Academy students representing the air forces of Latin America assemble in front of their barracks at Albrook AFB before class.

A valuable by-product for students is the opportunity to learn English during their six-month stay. To assist them, the academy operates one of the finest language laboratories in the United States Air Force.



sired by Peru. Invitations to the same training program were then extended to Cuba, Haiti, Dominican Republic, Venezuela, and Ecuador. During 1941-42 this program of training and observation visits continued, Colombia, Uruguay, and Guatemala being added to the list of countries participating.

In 1943 Peru initiated another official request, this time asking that Peruvian aircraft mechanics be given formal instruction in the techniques and procedures used in maintaining the aircraft and associated equipment which had been obtained by Peru under the Lend-Lease program and which was deteriorating because of inadequate maintenance. Approval was granted, and on 15 March 1943 one officer and ten enlisted men arrived at Albrook Field for three months of apprentice training in a formal course designed especially for the Peruvian students. This is the first recorded effort by the United States to conduct formal training courses in aeronautics for Latin American air forces. On 23 April plans were made for the addition of five Nicaraguans to the training course. By the end of June the follow-

ing six-week courses had been established at the Panama Air Depot: air command radio (operations and maintenance), aircraft armorer, teletype maintenance, bombsight maintenance, power turret maintenance.

After two classes had been conducted, the six-week courses were revised and extended to three months. Two facts had become apparent almost immediately: a period of six weeks was not long enough for the training in aircraft mechanics, and the language of instruction should be Spanish, since the English language proficiency of the students was more limited than had been anticipated. These first formal courses were apprentice training in which the student worked beside the instructor and engaged in maintenance activities, and it was necessary for them to be able to talk with each other.

By August 1944 it was felt that the increasing number of students and the language difficulties nullified the advantages of the apprentice training system. There were some bilingual supervisors available but not enough to meet the demands. For these reasons the depot in-

Curriculum of Inter-American Air Forces Academy

Aircraft Training Department

- aircraft propeller repairman
- aircraft pneudraulic repairman
- instrument repairman
- aircraft electrical repairman
- helicopter mechanic
- aircraft mechanic (reciprocating)
- aircraft mechanic (jet)
- aircraft maintenance supervisor
- jet engine mechanic (axiol and centrifugal)
- weapons mechanic
- airframe repairman
- reciprocating engine mechanic (January 1967)

Electronics Training Department

- communications-electronics fundamentals
- aircraft radio repairman
- aircraft communication-navigation equipment repairman
- air electronics supervisor/technician

- ground communication-navigation equipment repairman
- instrument trainer specialist C-11

Medical Training Department

- aeromedical specialist
- medical service specialist
- medical laboratory specialist
- public health specialist

Support Training Department

- special air operations orientation course
- inventory management and warehousing specialist
- inventory management and warehousing supervisor
- administrative and personnel specialist
- administrative supervisor and personnel technician
- management course for air force supervisors
- technical instructor course
- OJT administrator supervisor course
- fundamental English
- intermediate English
- advanced English

struction was replaced with a curriculum separate from the maintenance activities. The new curriculum of eight courses was directed by civilian instructors. Three months later one officer and ten enlisted men were authorized as supervisors and instructors for the "Latin American School"; the school, after five years of natural, evolutionary growth, had a name.

The nature of the school's evolutionary, almost organic growth, is illustrated by the fact that a search of records and directives late in 1944 for authorization to issue supplies to the school revealed that not only was there no authority for issuing supplies but there was none even for the existence of the school. This omission was rectified, and training continued until 26 January 1946, when the program was suspended because of reductions in manpower following World War II.

A number of the Latin American air forces protested the closing of the school; they were depending on it for continued training, and so later in the year the Commanding General, Caribbean Defense Command, directed the reopening of the Latin American School. To the officers of the Panama Air Depot and the Sixth Air Force who had been directing the school, it had been intended as a wartime measure in support of hemispheric defense; to the countries training airmen in the school, the peacetime need for and uses of the school were just as critical as they had been during the war. It should be noted that both the original founding of the school and its reopening were in answer to the requests and needs of our sister republics in Latin America.

The school was reopened in February 1947 and during the next three years went through a period of organization and reorganization, emerging with a 20-week curriculum schedule which is still in effect.

In 1949 a significant change was made in the statement of the school's mission:

The mission of the school is to train enlisted men of the Air Forces of the various Latin American countries in technical specialties as required by the country concerned.

Through 1948 the commandant of the school had been required to provide instruction in accordance with directives from the Caribbean

Air Command. The six words "as required by the country concerned" placed the school and the countries it served in a proper relationship to one another, since one of the purposes of the school was and still is to meet the training needs of the Latin American nations.

From this brief historical summary it can be readily seen that the school and its training concept of 1949 evolved from a need recognized 10 years earlier.

As the needs have increased since 1949, so have school operation and capacity. Many plans and programs were established between 1949 and 1964, for the most part in order to achieve relatively short-range objectives. During that time no study was made to determine the basis for a USAF training concept for the Latin American air forces; training was based upon and justified by the implicit concepts that had evolved over a number of years.

In 1964, however, the Commander of the United States Air Forces Southern Command directed that such a study be made. From this study, Project Vision, has come a more cohesive USAF training concept for the Latin American air forces, with 28 specific recommendations pointing out new directions for the school.

Integrated Training Program

One of the more important recommendations, and one which should have far-reaching results, reads in part: "... establish as an intermediate goal a posture whereby realistic courses in apprentice skills (3 level) and technician/supervisor skills (7 level) only are offered by the USAF School for Latin America to the Latin American Air Forces requiring them, with all upgrading to the journeyman skill (5 level) conducted in-country through Career Development Courses, OJT . . ."

The concept embodied in this recommendation has been adopted and developed by the school and designated the Integrated Training Program. The school has aligned all resident courses offered to the 3 and 7 skill levels to conform with this training concept. By July 1966 a 5-level follow-on Career Development Course had been translated into Spanish for each 3-level specialty taught at the school. This early

The close rapport of students at the Inter-American Air Forces Academy and their instructors has promoted much good will between the United States and the 13 Latin American countries that regularly send students there. USAF instructors at the academy conduct all classes in the native language of the students, Spanish or Portuguese, enhancing rapport.



target date was made possible by the combined translation assistance of Ecuador, Colombia, Peru, Venezuela, Chile, Bolivia, and Spain. The Career Development Courses are to be studied in-country while the student is receiving on-the-job training in a system very similar to the USAF Dual Channel OJT concept of training.

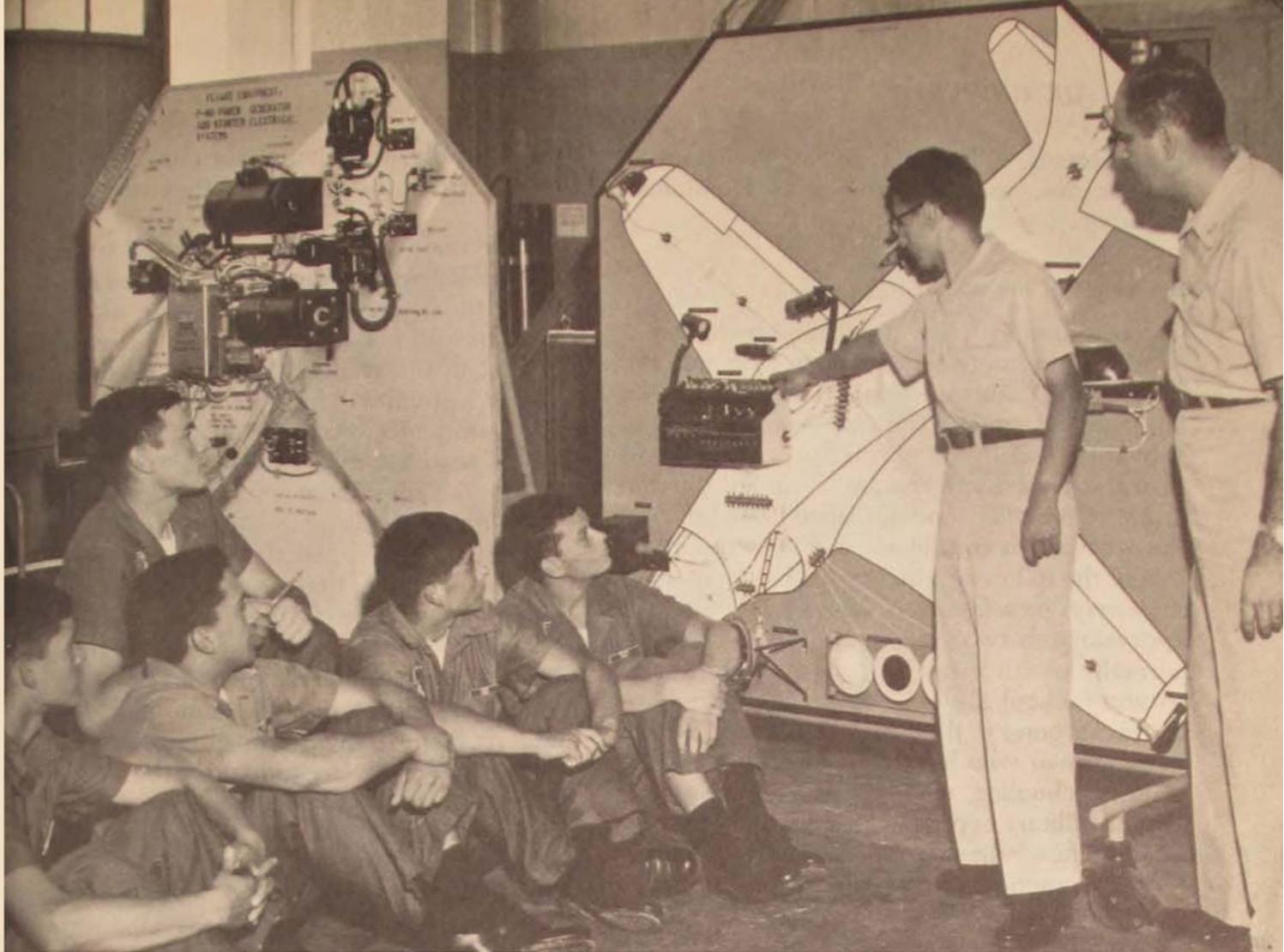
The Integrated Training Program is actually an approach toward an improved system of overall personnel management. It is involved with the procurement and screening of airmen, classification, training, assignment, career skill progression, promotion, and career guidance.

If the Integrated Training Program is accepted by the Latin American air forces, U.S. Air Forces Southern Command will provide the translated Career Development Courses, Job Training Standards, Specialty Knowledge Tests, and Enlistment Screening Tests (Airman Qualifying Examination), and will offer assistance from mobile training teams (MTT's) or other advisory services from within the facilities

of the academy to establish classification systems and on-the-job training systems. The success of the Integrated Training Program ultimately depends upon the Latin American air forces' acceptance and adoption of a similar classification system which groups related positions into standard career fields and provides for skill progression from the unskilled to the supervisor-superintendent level.

The Integrated Training Program represents the first complete training assistance plan made available to the Latin American air forces. It is completely adaptable to any air force in the hemisphere, regardless of size.

A disinterested observer might ask why the different Latin American nations should adopt a standard training plan when, as independent, sovereign American nations, they should no more be expected to do so than should, say, Russia, France, and England as independent, sovereign European nations. There are reasons: first, the Latin American nations, with the ex-



ception of Haiti and Brazil, all speak a common language; second, all have a common cultural heritage; third, all are what might be called "developing nations" and require some organizational and material assistance; and finally, most equipment and training assistance come from the United States. These four factors make an integrated training plan logical and feasible, and there is reason to hope and believe that it will be adopted by the Latin American nations.

faculty

Manning for the Inter-American Air Forces Academy includes 11 officer, 112 enlisted, and 48 civilian positions. All the instructors are bilingual, and all technical instruction is offered by USAF enlisted personnel. Some of the civilians are employed both as English teachers and translators. All personnel at the academy are keenly aware of the unique importance of their positions as receivers, transmitters, and inter-

After completion of instruction students will return to their countries ably trained to perform the maintenance vital to their air force's mission. At the present time students are enrolled in more than twenty different technical training courses at Albrook.

preters of two or more cultures in addition to performing their normal duties.

student body

To date, well over 7000 students from all the countries of Latin America and from Spain have been graduated from the school. Instruction has been offered in French and Portuguese as well as in Spanish. In the fall of 1966 the class consisted of 1 Argentinian, 34 Bolivians, 51 Brazilians, 62 Chileans, 35 Colombians, 59 Ecuadorians, 7 Mexicans, 7 Nicaraguans, 23

Panamanians, 1 Paraguayan, 39 Peruvians, 8 Uruguayans, and 23 from the Dominican Republic.

the future of the school

It is anticipated that with the realignment of courses to implement the new USAF training concept for Latin America, greater use will be made of the school. The class which began in July 1966, for instance, was 20 percent larger than the preceding class and included the first group of Brazilian students since 1956. Much of this increase in enrollment is due to the inclusion of the following categories of students: (1) *Aspirantes* or *soldados alumnos* who have had approximately two years of military experience, normally as students in the host country preparatory school, and who have a limited practical background in their technical field. (2) The basic airman who has received little or no in-country schooling, who has approximately one year of military experience, and who has a very limited knowledge of his technical field gained through practical on-the-job performance.

The school's 3-level courses are designed to accommodate these two groups of students, taking them from the helper level of proficiency to the semiskilled (3) level and perhaps a little beyond and providing the graduate with the fundamental skills and knowledges to perform on the job. The immediate response from the Latin American countries to this first step of the Integrated Training Program indicates that with full implementation will come a greatly increased participation in our mutual effort to achieve a better life for the American people.

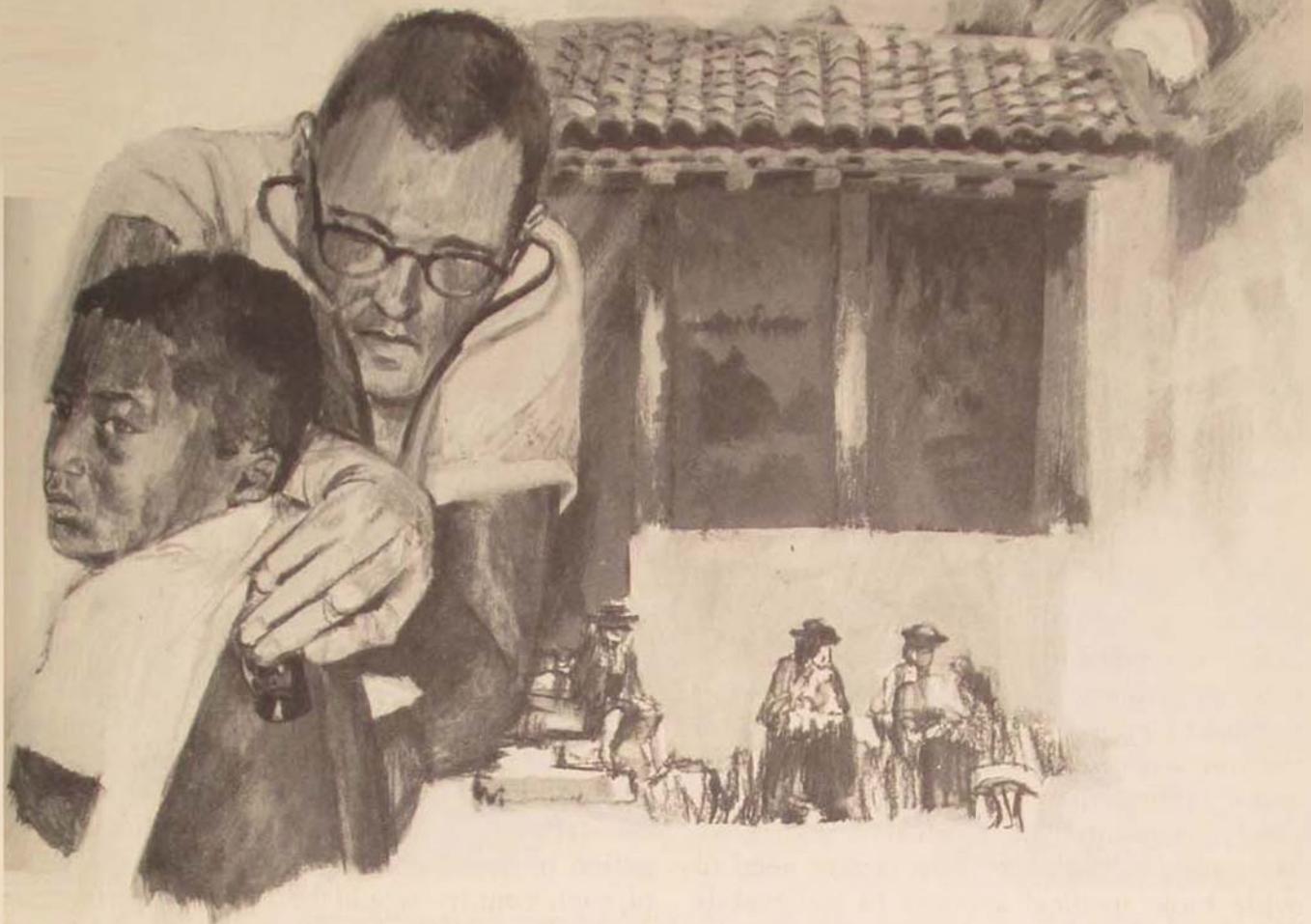
We believe that numerous and far-reaching benefits to the Latin American air forces, and consequently to the United States of America, derive from a school of this sort strategically located in the Canal Zone. The Inter-American Air Forces Academy provides concrete evidence of our interest in Latin America, and its location within a Latin American nation, Panama, adds to the evidence: Students from all the countries of tropical America feel at home here, in a geographical sense. Those from both the temperate zone of South America and the mountain countries feel at home

here culturally, even though the climate is quite different from that to which they are accustomed.

Our reasons for giving technical training in the student's own language go beyond simply making the learning situation easier, although it does that, of course. The strongest reason for teaching in the student's language is that the material learned will be more meaningful within the student's own cultural framework or perception of reality. Scholars of language and culture are generally in agreement that what a person understands as the "real world" is to a large extent built upon the language patterns of his society and that no two languages are similar enough to be considered as representing the same social reality. In a very real sense, the worlds in which different societies live are different worlds, not just the same world with different names attached to things and ideas. The Latin American student at the academy assimilates his technical education in terms of the realities of his "world," and for that reason its value is multiplied many times.

Finally, the benefits accruing to the United States in terms of mutual understanding and good will, resulting in the strengthening of hemispheric solidarity, should not be underestimated. The use of a common language among differing groups serves as an especially powerful symbol of the social solidarity of those who speak that language despite differences of nationality. A moment's reflection on the feeling of kinship between North Americans and other English-speaking peoples will show the preceding statement to be valid. Consequently, when the U.S. Air Force instructor lectures, discusses, converses, jokes, and sings in Spanish with his students, he is forging a bond with his fellow Americans possibly stronger, more real, and longer lasting than the most solemn official political treaty. The Inter-American Air Forces Academy recognizes these contributions to the social, political, and military solidarity of the Western Hemisphere as serving our enlightened self-interest by helping to forge a world in which freedom and democracy can flourish.

Hq United States Air Forces Southern Command



PREVENTIVE MEDICINE CIVIC ACTION TRAINING PROGRAM

A Changing Image for
Latin American Air Forces

MAJOR MATHEW T. DUNN and
MAJOR JAMES B. JONES

ONE of the major efforts of the U.S. Air Forces Southern Command is to encourage Latin American air forces to adopt aggressive civic-action programs and so identify themselves with projects designed to accomplish social and economic improvement. The basic requirement of each project undertaken is that it be in the country's interest and directly beneficial to the local populace.

During 1963, as one step toward achieving a broader image of the military, United States Air Forces Southern Command (USAFSO) established a Preventive Medicine Civic Action Training Program for Latin American air forces. The goal of the program is to train and equip Latin American air forces to provide preventive-medicine services to remote and



A Honduran Air Force C-47 Gooney Bird offloads personnel and supplies for a preventive-medicine field trip. The team of USAF personnel and preventive-medicine students was joined by a Honduran Air Force flight surgeon, dentist, and two Honduran graduates of the preventive-medicine course. . . . All available transportation assists Preventive Medicine Civic Action teams in moving medical supplies from airstrip to village. The carreta or oxcart may be the only transportation available.

normally inaccessible areas, primarily through the use of airborne medical teams.

From routine preventive-medicine and sanitation surveys conducted by the command in those Latin American countries where U.S. Air Force personnel have been stationed, it became apparent that there is an urgent need to provide basic medical services to indigenous populations. This was substantiated further by information and statistics obtained from nutrition and health surveys on the area published by the Department of Defense¹ and from other pertinent documents relative to health conditions in Latin America.²

This research indicated that Latin American air forces, by providing properly trained and equipped preventive-medicine teams, could do much to reduce the high sickness and fatality rates in remote areas of their countries. The air forces would then be identified as having a humanitarian interest in the local populace and would gain support in their effort to counter Communist insurgency and unrest.

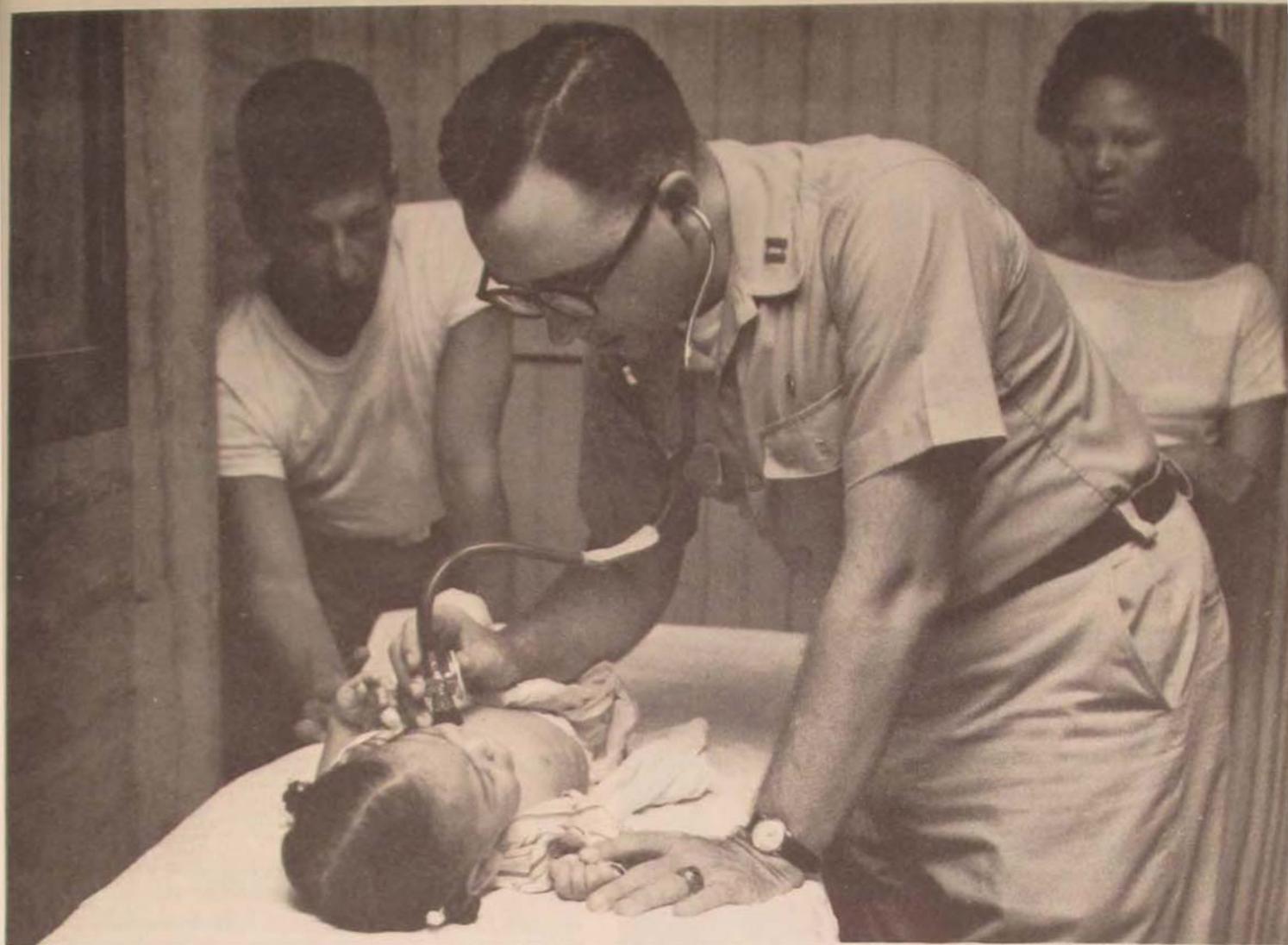
five-phase plan

Headquarters U.S. Air Forces Southern Command, in cooperation with Latin Ameri-

can air forces, then developed a five-phase plan in which the USAF would provide training, medical supplies, and equipment to those countries willing to participate. The program gradually increases the extent of the host country's capability to undertake medical civic-action projects. It was intended that the goal of each country would be to develop its own medical-specialist training program and form additional preventive-medicine teams.

Basically, the program is to train five-man teams composed of two preventive-medicine veterinary technicians, two medical service technicians, and one medical laboratory technician for six months at the Inter-American Air Forces Academy (formerly USAF School for Latin America), Albrook Air Force Base, Canal Zone. Upon completion of training, the teams return to their respective countries and through the Military Assistance Program are provided medical equipment, supplies, and an aircraft for transportation. With the addition of a host country physician, a team has the capability to function as a small dispensary, to provide basic medical care (including air evacuation, if necessary), and instruction in preventive-medicine techniques.

In the first phase, these five-man teams



During a preventive-medicine field trip to Chimán, Panama, a U.S. Air Force doctor revived this seven-month-old child suffering from advanced stages of pneumonia. The doctor was assisted by a USAF medical service technician instructor of the preventive-medicine program, as the anxious mother looked on. No doctor had visited the village in months.

are trained and then issued a medical equipment and supply package. Included in the package are drugs, chemicals, biologicals, surgical supplies, dressings, laboratory equipment and supplies, some air evacuation equipment, and tents and sleeping bags for team members to use while working in remote areas.

In the second phase, medical service specialists are trained in the techniques of first-aid instruction and sent back to their respective countries with first-aid training kits. They, along with other air force medical technicians, can then travel to villages of the interior or to isolated communities and teach a nucleus of personnel in each community the fundamentals

of first aid and disease prevention. As an impetus for learning first aid, team commanders will issue first-aid kits to the villages visited during the expanding program.

In progressive phases, countries participating in the Preventive Medicine Civic Action Training Program are provided U-17A aircraft. This light plane was selected because of its adaptability to a variety of missions and because it permits easy operation in and out of short, rough landing strips.

From light aircraft mobility, the program expands to include a C-47 flying dispensary with field equipment, supplies, and air evacuation potential, including a generator set, an X-ray,



Public Health Instruction

A Bolivian Air Force medical technician lectures Ecuadorian villagers (above) on proper preventive-medicine and sanitation procedures. . . . Ecuadorian and Bolivian airmen instruct the people of a remote Ecuadorian village in how and where to build latrines to prevent well and stream contamination.

dental equipment, and other supplies necessary for the operation of a mobile dispensary.

on-the-job training program

The plan was presented to U.S. military commanders in the area and at the Conference for Latin American Air Force Medical Chiefs held in March 1963 at Albrook. It caught the imagination of Latin American air force officials as a vital cold war weapon of potent force in fostering democratic ideals and principles

and as a counter against Communist-inspired unrest.

The plan was submitted to Headquarters U.S. Air Forces Southern Command, where it was approved and forwarded to Hq USAF, the Department of Defense, and the Joint Chiefs of Staff. DoD gave the necessary approval for implementation and provided the initial funding of \$250,000. Overall costs of the program are funded by the U.S. Military Assistance Program.

Public relations aspects of the program

called for building upon fundamental attitudes, especially the Latin American air force medical chiefs' natural attitude toward medicine and their desire to increase medical assistance throughout their countries. Their response resulted in overwhelming support of this program that promised to add trained medical technicians to their resources.

The chiefs of the Latin American air forces saw in the program an opportunity to enhance the role of their air forces, to win friends and support in counterinsurgency activities, and at the same time to gain prestige and recognition for their air forces. These air forces had everything to gain, since both they and the people would benefit from the program.

But what of the people in remote areas singled out to receive this aid? How would they react?

The program was designed as a "we-help-you-to-help-yourselves" project, in which the entire community participates in a combined group effort. In-village demonstrations and assistance point out new facts, knowledge, and ultimate rewards not previously experienced by these people.

Working from the premise that maximum benefit and progress are achieved when people work together as a group, we saw the program accepted and highly praised. Although it is too soon to measure the full impact of the long-range five-year plan, the program's success so

far can be measured by what has been accomplished since it was implemented.

the start

In July 1963 the first increment of air force personnel from nine Latin American countries was enrolled at Albrook AFB in the Preventive Medicine Training Program. Enrolled in the first six-month course, conducted entirely in Spanish by USAF instructors, were 40 trainees from Bolivia, Paraguay, Venezuela, Nicaragua, Dominican Republic, Honduras, Guatemala, Ecuador, and Panama. These students were definitely a cut above the average, and they displayed great zeal, interest, and aptitude for the preventive-medicine curriculum. Six additional classes have since been conducted for 140 more students.

field trips

As part of their training and after completing five months of classroom instruction, the students, accompanied by USAF medical and Latin American air force personnel, have made field trips to Chimán, Chica, and the Perlas Islands in Panama, to Ecuador, Bolivia, Paraguay, Honduras, and Guatemala. Additional countries visited during 1966 included El Salvador and Colombia. The trips take the students into remote, almost inaccessible areas

U.S. Air Force personnel, Latin American air forces students, a member of the Panamanian Guardia Nacional, and villagers join to aid and carry an injured citizen to an airstrip for evacuation to a Panama City hospital.



where they face real-life situations and conditions like those they will encounter when working in their home countries. Without exception, the students performed better than anticipated.

Before a team was airlifted into its designated operational area, a U-10 Air Commando aircraft dropped pamphlets announcing the intended visit and made a follow-up flight broadcasting by loudspeaker in Spanish that the medical team would arrive.

In Ecuador, the group, including thirteen students, was divided into three separate teams, which were airlifted by helicopter over the dense jungle to the villages of Grama Natal, Villanueva, and Santa Rosa, all located on banks of rivers that empty into the Rio Guayas, the main waterway leading to Guayaquil. The three-day operation, in which more than 1000 patients received medical care, was an outstanding success. Doctors and students were unstinting in their aid to the villagers, who came en masse for assistance. An Albrook flight surgeon and his team kept clinic hours in dirt-floored huts from sunrise to sunset. On the last day there were still so many patients waiting for care that the team worked without rest until 0400 hours. The other two teams—one headed by a Paraguayan doctor and the other by an Ecuadorian doctor—had similar experiences. Accompanying one of the teams was a USAFSO dentist, who, after extracting 140 teeth, was unable to continue because of a swollen hand. A student technician relieved him and performed extractions on the remaining 25 patients.

The report of this Ecuadorian exercise cited lack of preventive-medicine and sanitary procedures as a major cause of epidemic parasitosis, tuberculosis, malaria, dysentery, and various gastrointestinal disorders. The primary purpose of the trip was to impress on the people the need to undertake preventive-medicine programs on a self-help basis. This purpose was achieved.

The field trip to Chimán, in the interior of Panama, was similarly successful. During the visit, 439 patients received care. One of these was a baby suffering from pneumonia, who is alive today because of treatment provided by a team doctor.

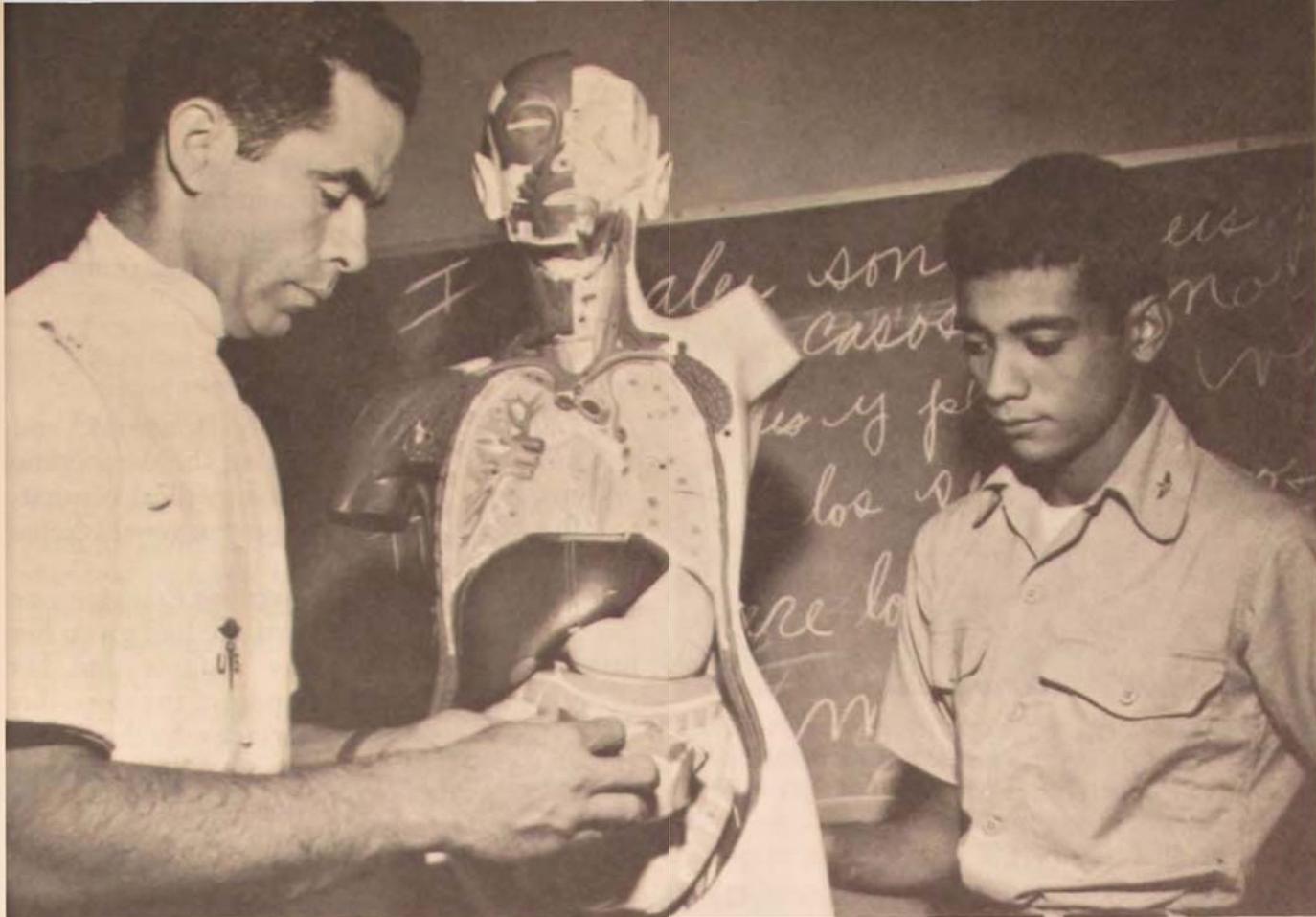
In Guatemala, the results of air force efforts have been quite gratifying. Chahal, a remote settlement that can be reached only by air or by days of travel overland, is typical of the program's acceptance. Visits of the preventive-medicine team are practically the only contact the village of 1200 population has with the government. On a recent medical visit, when the Guatemala Air Force C-47 with the air force chief of staff on board landed on the rough airstrip, the entire village was on hand, a welcome banner held high. Following sick call, attended by hundreds, the air force chief talked to the villagers and pledged that the program would be continued on a permanent basis.

home country operations

The third and fourth phases of the plan have already been implemented in several countries. Bolivia, Ecuador, Honduras, Costa Rica, and Paraguay have obtained U-17A aircraft; the Dominican Republic, Chile, Argentina, and Peru each has a C-47 for use in their preventive-medicine programs. The aircraft were provided by the USAF, at the country's request, through the Military Assistance Program.

Paraguay. The first report from returned students came from Paraguay. There, under the capable direction of Paraguayan Air Force Dr. Heriberto Zarate, who was one of the on-the-job training students at Gorgas Hospital, C.Z., Paraguayan Air Force preventive-medicine teams have put their training and knowledge to work through several highly successful trips to the interior of the country. The Paraguayan Air Force has also been active in flying doctors and medical supplies on humanitarian missions to otherwise inaccessible areas. This country has also designated a military doctor as Chief of Preventive Medicine Civic Actions.

Dominican Republic. Reports indicate that the first Dominican Republic graduates of the Albrook AFB course are actively engaged in preventive-medicine activities. In addition, the medically rigged C-47 was a vital asset



during Hurricane Flora, providing medical aid and air evacuation for the storm victims. As an adjunct to the preventive-medicine civic-action effort, the Dominican Republic Air Force has undertaken a project to build dispensaries in towns and villages for use in these activities.

Bolivia. Bolivia has utilized the training and personnel to excellent advantage. Four technicians have been assigned to Santa Ana de Huachi to work with a public health doctor. A dispensary is under construction at this location. Four technicians have been assigned to Villa Montes and are working with the inhabitants there without assistance from a doctor. Other technicians have been dispatched to Tarija to work with public health doctors combating a polio epidemic. Two technicians were retained at the Preventive Medicine School at Albrook AFB to train as instructors, and they will ultimately return to their country and instruct other Bolivian Air Force personnel in preventive-medicine techniques.

Ecuador. Upon the return of its trainees, Ecuador took immediate action and has had several preventive-medicine expeditions into

A U.S. Air Force instructor explains the internal workings of the human body to a Nicaraguan preventive-medicine student. The preventive-medicine program includes six months of classroom training and field trips to isolated areas of Latin America.

the interior regions of that country to treat less fortunate countrymen. In addition to using the U-17A, the Ecuadorian Air Force has obtained helicopters to assist in transporting technicians to remote areas and evacuating patients.

Guatemala. The Guatemalan Air Force has been actively engaged in preventive-medicine civic-action programs. Its efforts have been so well received by the people that additional programs have developed from initial preventive-medicine visits. These include the building of schools and providing a school lunch program for children. The Guatemalans refer to these medical team visits as *jornadas de medicina* (journeys of medicine).

Colombia. During 1964, eight field trips to the interior were made. More than 6000 people



After a busy day of treating patients, team members of a group of preventive-medicine specialists catalog laboratory samples taken at a Panama village.

received medical care. Four military medical personnel are permanently assigned to preventive-medicine activities.

Costa Rica. The air section of the Costa Rican *Guardia Civil* is using U-17A aircraft in medical civic-action missions. The *Guardia* also uses eight mobile sanitary units that travel to outlying areas and provide medical treatment, X-ray facilities, sanitation inspection, and immunizations.

Honduras. In addition to flying preventive-medicine teams to remote areas on a continuing basis, the Honduran Air Force is training military personnel in nursing techniques and furnishing veterinary technicians to villagers to assist in raising poultry and livestock. The air force uses U-17A, L-13A, and C-47 aircraft. Since the program was initiated in Honduras, more than 480 flights have been made and 60,000 people treated.

Uruguay. The air force has established medical and dental dispensaries in the interior areas to provide services to the civilian population. Approximately 15 preventive-medicine field trips are scheduled per year, using light aircraft and helicopters. The air force has also been actively involved in insect-spraying missions.

These are only a few examples of how air forces of Latin American countries are participating in civic-action programs, including preventive-medicine projects, to assist in economic and social development.

a look to the future

In villages of Ecuador, Honduras, and Panama the inhabitants, using the democratic process, have elected special medical committees to head up continuing preventive-medicine programs.

As the teams were departing Ecuador, one peasant woman, whose hard life had given her little education yet many insights into her people, summed up the impact of the three-day trip to the Ecuadorian interior as she thankfully shook the hand of a USAF medical instructor and said, "Señor, the people are crying. The medicine is gone and, worst of all, you are leaving."

During the field trip to the interior of Ecuador, the preventive-medicine teams were flown to their base of operation in USAF Air Commandos flown by Ecuadorian Air Force pilots. Following the completion of airlift of personnel and supplies, one of these pilots, Lt. Enrique Lavanan, said, "I feel a bit tired, going in and out of these areas so many times. But the folks in the villages really appreciate our efforts, and that good feeling makes the whole project worthwhile." (The Ecuadorian pilots spoke excellent English, thanks in part to their flight training in the United States.)

A schoolboy in the village of Villanueva, gleaming with enthusiasm, summed up the village response as he said to one of the U.S. Air Force instructors, "*Señor, todo esto es tan interesante. Nunca habíamos sentido tan entusiasmo en nuestras vidas. Esto es mejor que echar una fiesta.*" (Sir, it is so interesting. We have never known such excitement in our lives. It's better than a fiesta.)

Senior Master Sergeant Arnold May, formerly noncommissioned officer in charge of the Preventive Medicine Program and a member of one of the medical teams, saw the trip from another point of view:

The technician students, the Paraguayan Air Force doctor, and I were relative strangers to

these people at first, but in only a few hours we got to know each other and the people. We're men from three widely separated countries, getting preventive-medicine civic actions into a fourth country we had never seen before, yet we were a team. We did not think of nationalities nor countries, only that we were a team working together to help people who have one foot in the 1960's and one foot in the past.

THAT THE USAFSO Preventive Medicine Civic Action Training Program has achieved outstanding success is evidenced by the Latin American air forces' acceptance of it. The program has provided the needed impetus. Its future is unlimited.

Civic actions are doing much to allay the *campesinos'* fear of the military. The preventive-medicine part of the program has proven to be a vital tool.

In Honduras, a high-ranking air force official stated:

The attitude of the people has always been very cold toward the military. Although we have been trying to get into these areas for some time, the Preventive Medicine Civic Action Program gave us our first real opportunity. The villages have long been a breeding ground for Castro trainee infiltrators. Prior to our medical visits the people were harboring and protecting the bandits; now they are turning them in. At last the people have confidence in us.

Colombia was continually harassed by a serious bandit problem. After initiating a sound civic-action program, including preventive medicine, the military obtained the cooperation of the people and was able to reduce the banditry to a controllable level.

In Guatemala, the air force found that direct benefits to the people in the form of preventive-medicine functions have resulted in an obvious change of attitude toward the military. Concentrations of insurgents in remote areas are diminishing rapidly.

Years ago, Headquarters USAF forwarded copies of the program plan to Air Force commanders in the Pacific and European areas for their consideration and possible adoption. The cover letter cited the program as "... an outstanding example of an imaginative and constructive military civic action program ... [which] employs the unique characteristics of air power to satisfy a real need of an underdeveloped area."

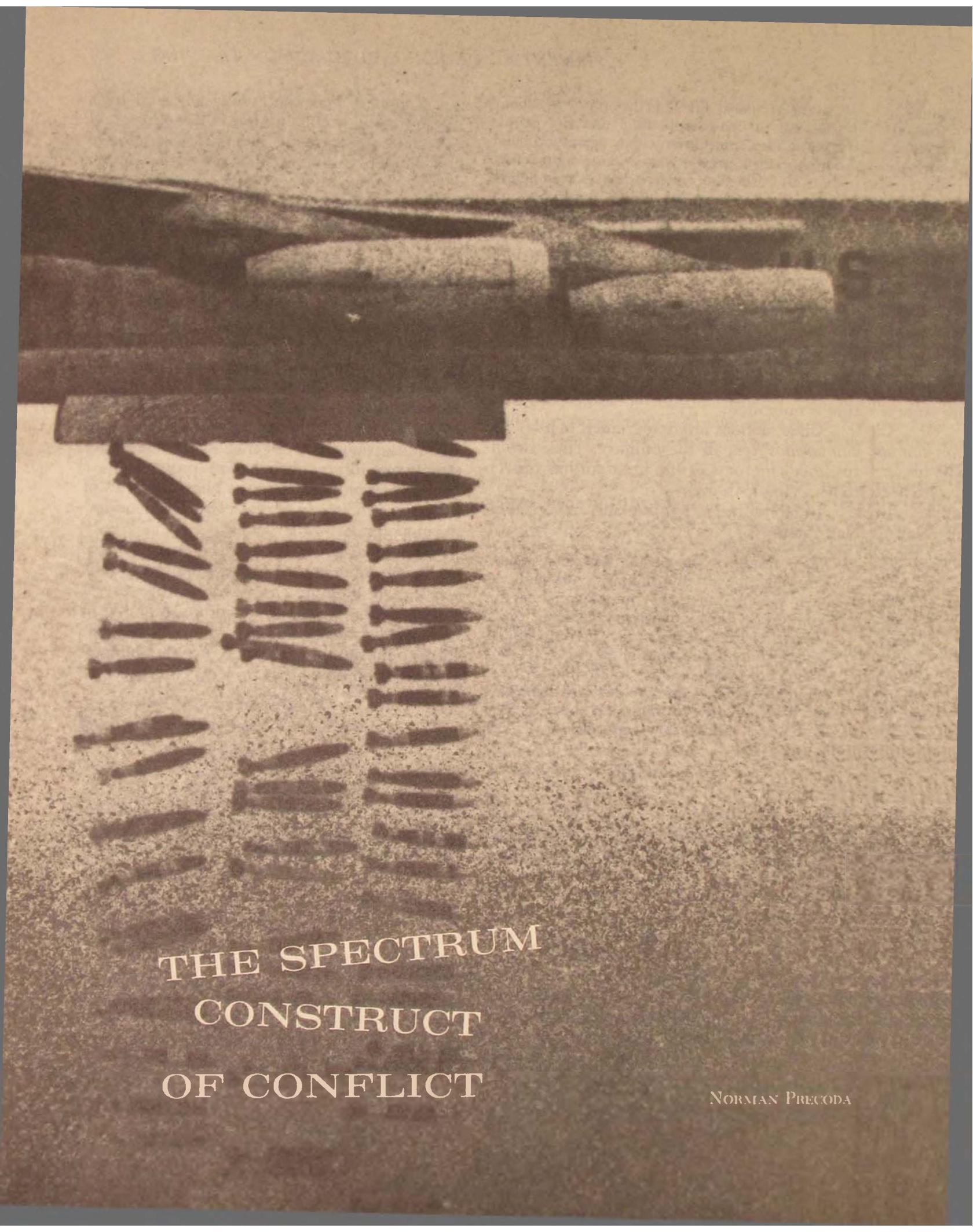
The goal of broadening the image of U.S. and Latin American air forces to include public service will be more easily reached because of this program. It is an outstanding example of community/public relations effort being put forth to maximum advantage. For the minimal cost involved, few other projects could accomplish more for more people.

Hq U.S. Air Forces Southern Command

Notes

1. Nutrition Survey Reports by the Interdepartmental Committee on Nutrition for National Defense, Deputy Assistant Secretary of Defense for Health and Medical.
2. *Summary of Four-Year Reports on Health Conditions*

in the Americas 1957-1960, prepared for the XVI Pan American Sanitary Conference, Scientific Publications No. 64, July 1962, Pan American Health Organization, Pan American Sanitary Bureau, Regional Office of the World Health Organization, Washington, D.C.



THE SPECTRUM
CONSTRUCT
OF CONFLICT

NORMAN PRECODA

IT HAS been said that the most important single judgment a political or military leader can make is to forecast correctly the nature of the war upon which the nation is to embark, for all else depends on it. One subscribing to the spectrum view of conflict and accepting the intrinsic interconnection of events in time is led to rephrase this observation. Since tomorrow's activities are intimately connected with, and in fact are more or less a consequence of today's, and today's of yesterday's, the most important judgment is to assay correctly the nature of the conflict—yesterday's and today's. If dangerous and destructive conflicts are ever to be avoided or their most damaging effects moderated on other than a random basis, it can only be after better understanding has been achieved. Further, this understanding must be repeatable and widely diffused; "repeatable" means that second, third, and fourth observers perceiving the circumstances must be led to approximately the same judgments.

The world has been and remains in a kind of ferment. Widening political consciousness—the idea that the future need not be a repeat of the past—fueled by the advance and spread of education and remarkable mass communications technologies, assures that the ferment will grow and change and spread. This ferment, showing up in numerous and varied low-scale conflicts around the world, presents opportunities and dangers. They are dangerous, for while shrinking from direct nuclear confrontation, the great powers are likely to feel obliged, when certain of their interests are deemed involved, to send arms or advisers or otherwise commit themselves, and the local low-scale action is in danger of escalating to the confrontation that neither great power wants.

Those of us who do not accept the idea of "laws of history" must accept that it is also not foreordained that our own democratic form of society will continue relatively unscathed or even survive this worldwide ferment. Our hope and indeed our responsibility lie in striving to understand the nature and circumstances of these conflicts, for our attitudes and all our subsequent judgments and actions to a great extent follow therefrom, as the night the day.

These attitudes, these judgments, and these actions strongly influence, if not govern, not only the choices of aims and objectives but also the methods and means used to achieve them.

The Spectrum of Conflict

We accept here the spectrum concept of conflict or interaction states, a relativistic view of international relations and, as well, of human affairs. This is to say that, given a sizable number and variety of interaction states arranged in hierarchical order of relative strength, potency, and/or intensity, the whole takes on the appearance of a spectrum. The larger and more varied the assemblage, the more nearly it approximates a spectrum. We call this the conflict spectrum. Given a suitable representation of interaction states, the totality, albeit simplified and imperfect, is a relativistic portrait or mirror image of reality—a reality containing an infinity of forms and gradations of states.

Figure 1 illustrates this conflict spectrum in terms of what we here call international interaction states.^o The potential usefulness of this spectrum rests on the premise that its imprecision is outweighed by the added insight obtained from observations which otherwise seem heterogeneous and often only obscurely related if not contradictory. By comparison with its predecessor in a previous article on the subject,¹ this array of conflict states incorporates numerous, though relatively minor, changes, primarily in the interest of clarity and concision. The word "conflict" replaces "war" in the title for two reasons: first, war and peace activities are easier to define in the abstract than in practical affairs. This fact, plus their juxtaposed interactions (often extremely complex and subtle), argues the probable futility of attempting clean separations. Second, it seems preferable to use the term "conflict" because of the strong emotive connotations associated with

^oFamiliarity and convenience notwithstanding, it is easy to read too much from the adjective "international," for it is not at all clear that sharp distinctions can be drawn between intranational and international conflict. If ever there was a sharp line between them, it is exceedingly fuzzy today. It is hard, for example, to conceive of intranational conflict or civil war in the present-day world without international reverberations, especially if such conflict continued for a long time without intervention taking place in one form or another.

The Conflict Spectrum

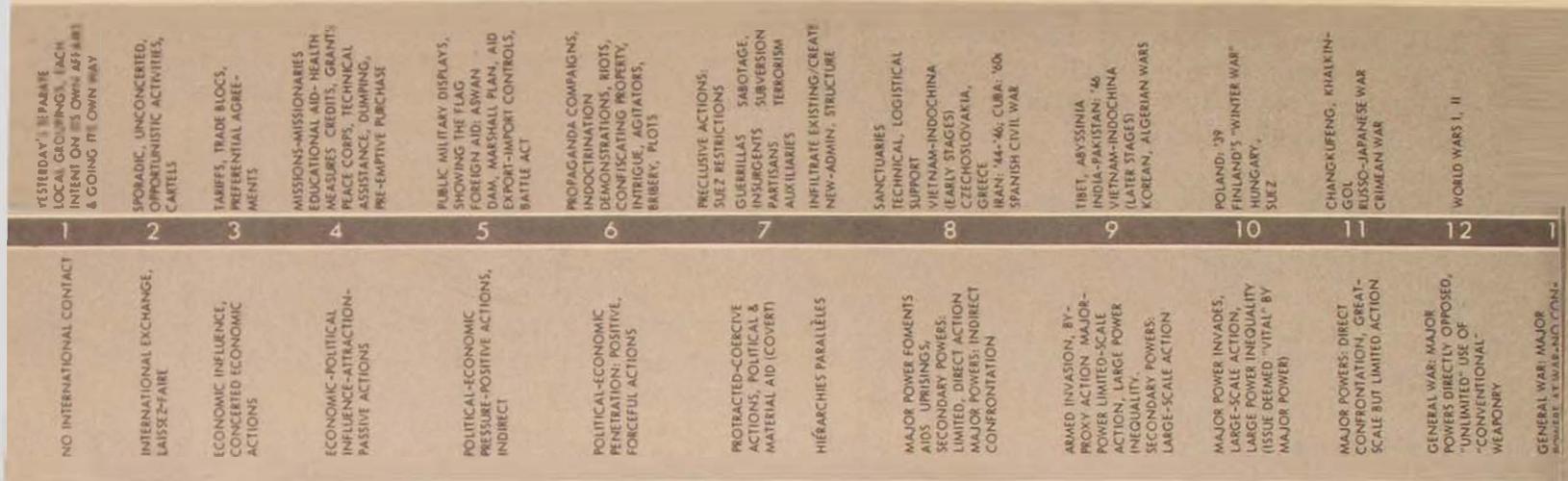


Figure 1. Conflict spectrum. International interaction states (in hierarchical order of intensity, potency)

"war." War, surely, is too serious a matter to be viewed through lenses that vary according to the individual and his prejudices. The stakes are too high, the possible consequences too fateful.

index scale

To recognize the need for some index or yardstick of conflict is one thing; to achieve it is something else. What characteristics of the conflict states are we to use? How detailed and discriminating should the scale gradations be? Figure 1 is our answer. To help clarify and define the scale positions, each is described twice: once conceptually or in what might be called theoretical fashion, and then pragmatically, by historical example, in terms of experience. Thus, reading across the scale from left to right, each spectrum "wavelength" is described by both the lower and the upper texts for that scale position. (The numbers 1 to 13 are merely a visual aid for later reference.)

The question of how fine the scale gradations should be (how numerous the wavelengths) is related to the representativeness of the arrayed states and, of course, to the repeatability of the observation. A finely gradated scale has the advantages of specificity but im-

plies precision observations, which, if they are not objectively achievable, means that the scale may be deceptive, possibly dangerously distorting. A smaller number of gradations means greater differences between them, differences which are more easily perceived and consequently likely to be repeatable.^o Until more accurate measuring techniques come to hand, it seems wise to hold to something like our smaller number of scale wavelengths. One further point: Absolute scale positions are not inferable from this index. Thus, for example, the fourth wavelength position from the left is not to be interpreted as twice as far as the second or halfway to the eighth position. Assignment of absolute scale values or magnitudes to the intervening scale segments would be most useful but cannot now be supported.

symptoms and causes

The interaction states shown on Figure 1 are in the nature of symptoms, not causes—that is to say, they represent the consequences. Quite in contrast to causes, conflict symptoms are usually overt and visible and hence more

^oRepeatable, in contrast to subjective or single sense observations, means confirmable; that is, relations between two or more sense impressions, particularly statements of equality, can be confirmed by different observers.

likely to satisfy the repeatability requirement.

It is important to be quite clear on war and peace and on their causes and symptoms. We define peace as the free exercise of activities in accordance with basic principles that are generally and freely acquiesced in. Since what fundamental principles are acceptable is a subjective judgment and therefore can range widely among individuals, a workable consensus is most likely to exist, if at all, where there is a widespread sharing of determinant religious and/or ethical principles. To the degree that members of a society do not share these fundamental principles, tensions and antagonisms will be present, and peace will be a less attainable state. Without this prerequisite condition of fundamental principles freely and generally acquiesced in, self-determination and majority rule are unworkable; majority rule may be merely legalized subjection. In countries where significant fractions of the population hold dissimilar and strongly opposed beliefs, symptomatized by lack of basic trust or confidence in each other—the Greeks and Turks in Cyprus; Mohammedans and Hindus in British India; Moslems and Christians in the Sudan; montagnards and lowlanders, Buddhists and Catholics in Vietnam—unless this lack of agreement and trust is eliminated or moderated, there will be continuing strife and disintegration, leading finally to (1) political fragmentation, (2) some form of legalized bondage, or (3) rule by outsiders in whom the differing groups have a measure of confidence.

The U.S.A. exemplifies the fact that heterogeneous peoples can live side by side and, so far as national politics (working consensus) is concerned, in fruitful unity. But, as Sir Arthur Bryant suggests,² this relatively fruitful unity in the U.S.A. is not so much because the people have gotten used to one another and their differences as because, living in a new land without visible reminders of ancient racial or national differences, rivalries, and antagonisms, they have made a new start emotionally and psychologically as well and feel themselves to be Americans, rather than Anglo-Saxons, or Irish, or Germans, Italians, Scots, Slavs, Celts, or Scandinavians. Thus for different reasons

and in a different way, a national identity or workable consensus on basic principles has evolved in the U.S.A.

Where there is no general consensus or where the area of basic agreement is exceedingly small, there is no peace; and where peace is not, there is war. A relationship wherein men or groups of men refrain from activities otherwise deemed legitimate (in accordance with fundamental principles freely and generally acquiesced in) is therefore not a peaceful one. No matter the action or inaction, the presence or absence of violence, the state is that of war. The presence of violence is a mere technicality, an accidental occurrence or a judgment of the moment as to the most persuasive means for resolving the dispute.

The habit of taking political stability for granted, although possibly justifiable in well-established societies, may give rise to the idea that such a discussion as this is something abstract, something which has little immediate relevance to present-day affairs. Such an idea is dangerous. The existence of underlying differences between men or groups of men with respect to acceptable basic principles shows up as civil unrest, insurgency, wars of national liberation, revolutions, etc. Just what are these differences? What do they mean? How best to cope with them and the resultant symptoms necessitates clearer understanding of the underlying forces, the causes, and the processes. For these low-scale conflicts around the world are dangerous in that they tend to refuse to stay local and low scale.

Conflict symptoms are usually overt and visible and, consequently, likely to be "repeatable." They are expressions of attitudes, expressed grievances, actions themselves.³ They may be concrete and specific, as a U-2 overflying the U.S.S.R., the blockade of Berlin, long-range missiles in Cuba; or abstract and ambiguous: "our national honor," "freedom and democracy," "the victory of socialism." Conflict causes, on the other hand, run far deeper, since they have to do with fundamental outlooks and attitudes, with ethical and/or religious principles. It has been argued that conflict causes are not usually overtly expressed.⁴ This may be because such expression

is compromising. For example, it has been suggested that Indonesian aggression against Malaysia was largely to divert attention from Indonesia's own grave internal problems. It is likely that the real Soviet concern at the time of the 1939-40 Winter War was far more with the strategic situation vis-à-vis Nazi Germany than it was with the unfriendliness or hostile actions of the Finns on their common border. Then perhaps even the protagonists—either or both—may not be aware of the causes. For example, it is argued by some that man's innately aggressive drives bias him toward war.³ If so, the argument continues, the problem of avoiding war is one of sublimation. Art, play, and work are recommended outlets for the aggressive urges—the idea of “a moral equivalent of war.” It has been suggested that World War I was far more a struggle for world markets than for self-determination and democracy. Alexander Kerensky, in a recently published book devoted to that historical event, asserts that World War I was basically a struggle for world domination.⁴ Whatever the precise reason—if ever there is but one—truly the causes of conflict run deep.

The fact that some basic differences are never settled, that some fade away unsolved or are revived at a later time to be fought over again and again, supports the view that the causes of conflict are deep-running and are affected by many influences in many ways. All this is to say that our limited vision and understanding and the intractability and apparent permanence of certain differences are not warrant for resignation and despair. To point out that Figure 1 is made up of conflict symptoms and emphasize the distinction between causes and symptoms has for some an air of abstraction and digression when clear and present dangers call for direct action. The long and tragic record of human conflict at least suggests that such a view and the failure to look to the deeper causes assure continuation of that record. In both world wars, for example, many held the view that the eruptions were caused by certain men, rulers, or ruling groups whose elimination would lead to a bright and peaceful world. The point is that one's view

of the causes does guide if not govern the choice of objectives, the choice of means, and hence to a significant degree the shape of the postwar world. Certainly differing opinions regarding U.S. participation in Vietnam reflect, among other things, differing views of the basic causes of that unhappy conflict.

This conflict spectrum, made up as it is of symptoms, has certain utility and certain limitations. Its limitations stem at least in part from the fact that symptoms are not causes, so care must be taken not to press these data too hard. Its utility derives from the power of order and perspective, the power of “repeatable” observations. In the following sections we proceed with applications of this spectrum scale, striving to remain within these general constraints and resting on the hope, in the longer view, that the method outlined will be helpful for further and deeper investigation into causes.

Conflict Action-Limit Lines

The spectrum view of interaction states (conflict actions) between nations, as presented in my previous article, shows that the most intense or highest on the scale—according to its hierarchically ordered array—of the concurrent actions in a given region can be represented by an action-limit line that is continuous with respect to time. To this concept of conflict and the action-limit line we gave geometrical form, utilizing conflict data from more than a century of the eventful history of the China region. We develop the concept further here.

Some prefatory observations must be made. First, it is important to keep in mind that the word “line” in “action-limit line” is in no way as divisive and sharply delineating as the term might suggest. “Band” might have been a better choice, since it has in it the idea of width and this width connotes something of the imprecision of the data, that is to say, the uncertainties both in observation and in recording. “Line” is therefore a simplification

only partially offset by the qualifying words in "action-limit line" implying a bound in one direction. A second point to keep in mind has to do with the great number and variety and possible indirectness of the causes and also the symptoms of conflict. Direct and indirect, the effects of certain forces are often far-reaching. Thus it would seem useful to broaden the action-limit line's area of representation to decrease the chances of excluding at least the significant forces. On the other hand, increasing the area represented has a blurring and diluting effect on the significance of the action-limit line. Some compromise seems called for.

The historical example (see the figure on p. 53 of my previous article) is based on data from the record of "the China region" and not on the much more restricted (however defined) geographical bounds of "China." The vagueness of Chinese frontiers and the importance and even inseparability of causes and effects in that immense region argue for the larger and more comprehensive representation. Yet, as we have suggested earlier, there is also

loss in great-area representation; so in seeking a least-losses approach, we resort to a dualistic presentation: using action-limit lines by country, then superposing them in combination.

action-limit lines

Figure 2 shows a group of action-limit lines, each representing a country (with no attempt at relatedness in this grouping). By preparing each limit line on a separate transparency and identifying each according to, say, whether or not Communism plays a major role, they can be superposed for viewing in combinations. One could in this manner portray action-limit lines for the Middle Eastern countries (geographical grouping); action-limit lines for a situation primarily fomented and fueled by Communist forces (ideology-based grouping); and so on. Surely one errs in viewing Vietnam, Cambodia, Thailand, Laos, *et al.*, as isolated scenes. It may be that the greater and graver significance of the activi-

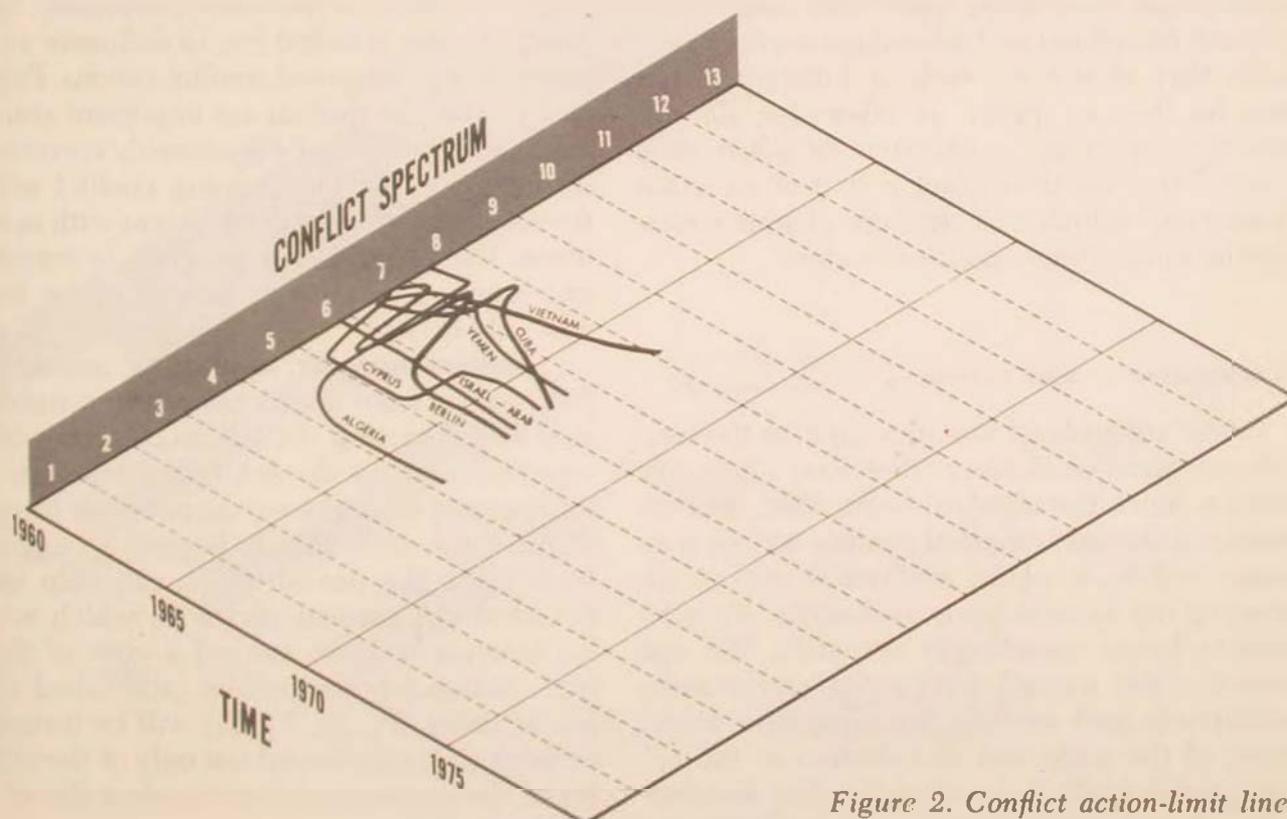


Figure 2. Conflict action-limit lines

ties of these Southeast Asian countries lies more in what they portend or reflect of the relationships between major world powers than of activities within the individual countries. It is quite likely, for example, that the ultimate directions and determinations there are much more dependent now on agreement, tacit or otherwise, between the United States and China than upon individuals and events within any of those strife-ridden countries themselves.⁷ It should be noted that the ominousness of the 1962 Cuban incident stemmed not from Cuba, the land, or the people but from what it implied of U.S.-U.S.S.R. interactions. Fidel Castro notwithstanding, it was the confrontation of the United States and the Soviet Union that mitigated the situation.

That the interaction states between world powers may be most clearly discernible in "third" countries probably reflects the fact that the interests and influences of great powers, inexorably perhaps, extend considerably beyond the limits set by mere cartographic bounds. With certain exceptions—and doubtless there are always exceptions—collisions between major powers are likely to be observed most frequently and earliest far from their homelands. There is the added and advantageous consideration that, since these early and distant activities, be they by proxy or otherwise, do not directly impact on or threaten an adversary's "vitals," the practical effect is that of a certain "sea room," valuable to big ships of state coursing the international political waters.

encompassed conflict actions

The action-limit line presupposes the concurrent existence of many other, lower-intensity actions. Since the number, form, scale, and intensity of the encompassed conflict actions may range widely, a useful additional step in increasing our knowledge is to describe the concurrent lower wavelength activities. We can describe the overall interaction states more definitively and usefully by indicating something of the scale and distribution of the encompassed conflict wavelengths. But development of meaningful measures of conflict action

is difficult. One has only to contemplate some of the indicators commonly used to describe operational situations—number of sorties and missions flown, tonnage of bombs dropped, number of artillery rounds fired, weapon counts, kill counts, and so on—to appreciate their crudeness. One can but wonder at the range of possible meanings that a mission might have, that kill counts might have, at the vital difference between effort and effect—between measures of effort expended and those of effect achieved. But, willy-nilly, such measures are used and reported and do influence decisions, for actions do not wait; they are impatient.

Bernard B. Fall comments briefly on the "now famous incident counts"—the use of decreasing incident counts as indexes of progress toward pacification or control of the population, observing that although decreasing incident counts might mean increasing control, the same relationship holds regardless of which of the contending sides achieves the increased control.⁸ The conventional military factors, he says, are meaningless in "counterinsurgency" actions, and in their stead he suggests what he calls Fall Insurgency Nonmilitary Indicators (FINI) to reflect events more accurately. Something like this is called for, to delineate and express the encompassed conflict actions. Political and military judgments are important and difficult enough. Without a reasonably correct view of the nature of the ongoing conflict actions, they are precarious indeed. But as with so many ideas, the putting into practice is something else again, for "How is the cat to be belled; who is to do it?"

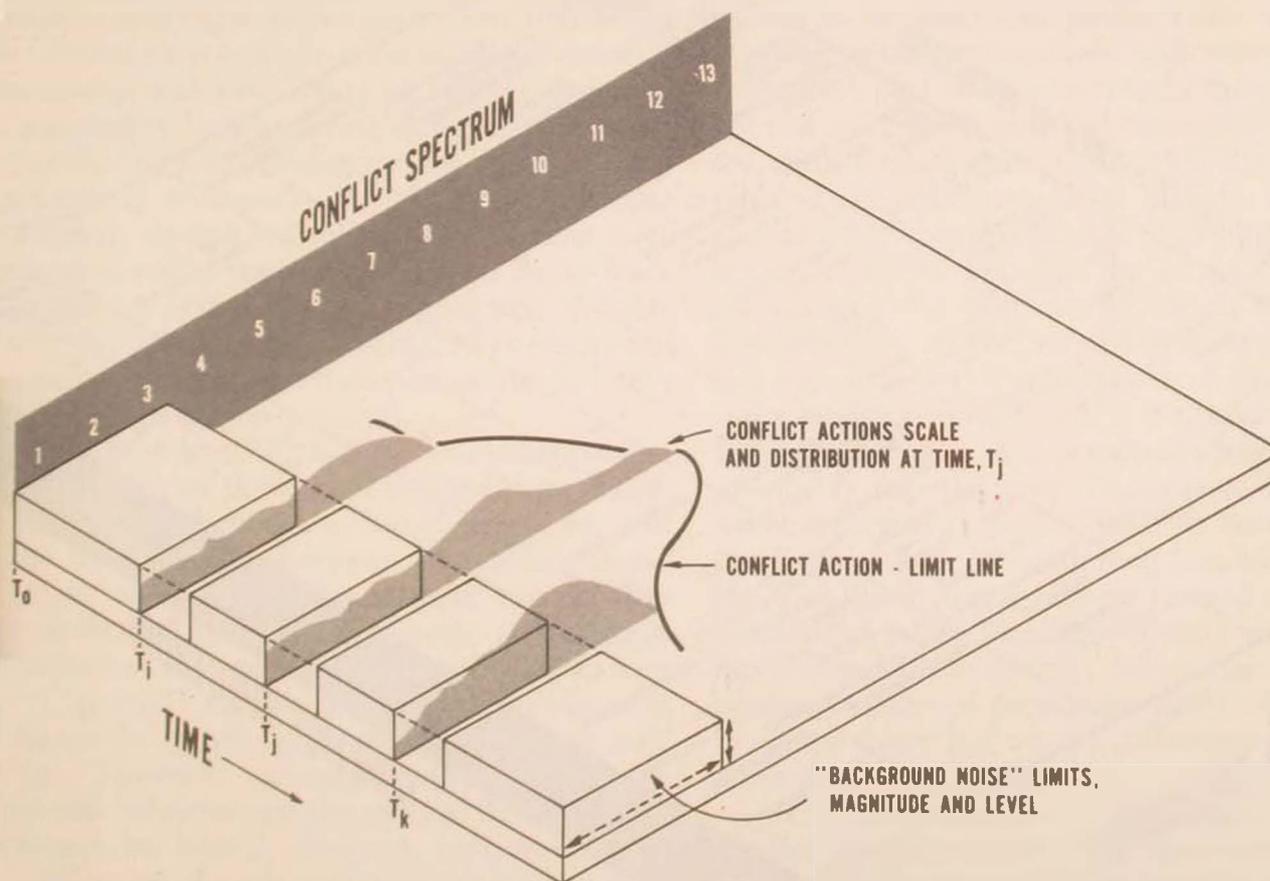
Surely, however, appraising correctly the past and present conflict states is a necessary step to forecasting the future correctly. Stated conversely, if we do not understand the past and present conflicts, we cannot hope to understand those still ahead. Figure 3 suggests a framework the use of which can help us understand the present and with which we can systematically move toward a view of the future. Action pattern profiles established at different times (T_o , T_i , T_j , T_k) will be instructive in what they may reveal not only of the character of the encompassed actions but also of possible trends.

Information regarding the "background noise" level (What is the normal state?) for a particular country is also an important piece of the overall picture. It is well known that what may be widespread eruptions and a sign of serious unrest in one country may be only a rough presidential campaign in another. It is important therefore to establish this "background noise" by magnitude scale and level, and this, too, is illustrated on Figure 3.

Conflict actions may evolve slowly or rapidly. They grow, change, and spread; sometimes toward obscurity and ultimate nothingness; then again, gathering momentum and glowing redly with the sweep and power of an idea and vision. Certainly in their earliest stages, guerrilla activities possess many of the characteristics of simple banditry—and in fact may in reality be only that. Both guerrillas and

bandits are likely to be against the existing order, with perhaps the principal distinguishing feature between them being the former's interest in and concern for popular support. This derives from the guerrillas' basic aim: to control and/or constitute the government.⁹ A grave and potentially fatal complication in efforts to cope with or adjust to challenges to existing governments arises from both the difficulty and the necessity to know and distinguish between revolutionary movements, to recognize the existence of grays as well as blacks and whites, of pinks as well as reds. There is in the long run no really good substitute for distinguishing quickly and accurately between banditry and revolutionary guerrilla activities—and perceiving the essential character of the latter. Too little concern with need for perceptivity and misjudgments is likely to prove painful and

Figure 3. Encompassed conflicts. Country X record



the way of filling in the grid of Figure 4, but even so it illustrates relationships between means of persuasion and conflict actions, the former defined and divided according to means family and spectrum scale level. Means are grouped according to whether they are primarily political, economic, sociological, force-supporting, or force-striking, reflecting the notion that minds are changed and behavior influenced through pressing on any of a number of different "nerves."

Since each grid space is defined in terms of means family and characteristic conflict, analyses of relative worth are appropriate and valid in dealing with the alternatives competing for allocations within a given space. Comparative appraisals of different but corresponding-level means families are more hazardous inasmuch as each family effects pressure in areas and through channels that are not easily or directly assessed. The means families are of course not uniquely definable and separable, for the very idea of a spectrum connotes an infinity of variants. But it helps to visualize, assemble, and organize comprehensive lists and at the same time helps to accentuate the possible existence and availability of options. Strategic planning or "orchestration" is the science or art of selecting and utilizing various tools and techniques of persuasion in light of a particular problem confronted or anticipated. The two-dimensional schematic provides a framework by which systematic inferences and insights into the nature of relationships between means (tools and techniques) of persuasion and conflict actions can be achieved.

It is at least implicit in the means-conflict schematic that there must be a measure of correspondence between means of persuasion and the conflict state—between the conflict interaction state and its underlying causes. The existence of this correspondence or commensurateness is something which probably cannot be "proved" unambiguously in the sense of "scientific" proof, since this presupposes controls. However we might wish it otherwise, human behavior and the onward flow of events cannot be halted, reversed, and rerun with another set of tools and techniques of persuasion to see how events would otherwise turn

out, thereby enabling comparison of the respective merits of alternative choices. Each wavelength segment along the conflict spectrum defines a type of interaction state—that is, a type of mission or "problem"—for which the indicated commensurate means are deemed appropriate. Practically speaking, this says that performance of that type of mission is the primary criterion by which alternative possible means are measured. The assumption of commensurateness is in part, perhaps, something of a judgment, too. This is one side of the matter. On the other some arguments, although indirect and general, can be made for reasonableness of the assumption.

The commensurateness-of-means point is succinctly illustrated in the story of the sledgehammer and the fly. True, one hit from the sledge would smash the insect; but wouldn't the great disparity in speed and maneuverability render a hit doubtful, or, given a hit, wouldn't the damage to the furniture be too high a price to pay for liquidation of the fly? The question is two-pronged: whether the means to be used can perform the task and whether such performance will result in an integrated plus when one weighs the pros and cons of the overall political objective. The latter consideration has to do with the cost of ends. Thus, for example, it may be open to question whether the defense of South Vietnam is very much advanced in the long view if the mechanistic and relatively wholesale effects of highly sophisticated United States means (tactics and weapons) lead to fewer of the inhabitants' wanting to be saved. It is thinking along these lines that lends a certain credence to the possibility that the great numbers of refugees streaming from the countryside to South Vietnam's cities may be motivated less by fear of the Viet Cong or friendliness toward the government of South Vietnam ("voting with their feet") than by fear of mass destruction and impersonal means of persuasion and their desire to escape them. But what a difference in interpretations!

The effectiveness or useful span (on the conflict spectrum scale) of nuclear warheads is another case in point. It may be, for example, that nuclear-based striking forces are appli-

cable only to the far right end of the spectrum scale, in or close to the general-war region. It may on the other hand also be, as has been argued, that nuclear warheads have far wider span application across the spectrum scale, down-scale to include what are variously called "local conflict," "local war," "limited war."¹⁰ But the efficacy and appropriateness of given means reflect not only the possessor's appraisal but that of the antagonist as well. Thus the 1956 Egyptian strike to seize the Suez Canal despite Britain's possession of nuclear weapons and realization that the canal was deemed by the British of vital importance suggests a narrower effectiveness span for nuclear warheads than the wide-span proponents might concede. Similarly the Hungarians rebelled against the U.S.S.R. despite its possession of nuclear weapons.

There is danger, in the event of great disparity between the protagonists, that the superior will think that his great power for destructiveness appears as formidable to his enemy as it does to him. Consequently the superior is tempted to show off his superiority, to parade his power; e.g., to smash patches of rain forest to show that he can do it. There is the vague thought in all this that one increases pressure, perhaps doubling the overall persuasive pressure toward attaining a political end, by doubling the force exerted; the belief that campaigns can be decided, that law and order can be established, by force. Granted that force plays an increasingly important role, going up-scale on the conflict spectrum has its reverse, going oppositely—that is to say, strategy must rest on increasing (relative) use of nonforce means proceeding down-scale. As Malcolm Browne observes, "[we] have failed to grasp the fact that the really unconventional part of [the Vietnam war] is that its major weapons are words. . . ."¹¹

Fine judgment is still called for, since planning strategies are superposed onto particular problem situations, particular conflict states. Figure 4 lists various means, by families and scale gradations, which seem appropriate and hence applicable to each conflict level. (This may also be useful as a means check-off sheet.) The comprehensive array illuminates the

possibilities of "orchestration"; since persuasive pressure is cumulative, it follows that all means used contribute to the total. Pressure can be increased by stepping to higher rungs ("escalation"), by expanding sidewise to other means families commensurate with the conflict scale level, and by exploiting hitherto unutilized means across the board in the lower-scale levels. One must not forget that, though obscured at times by spectacular and seemingly dramatic events, persuasive pressures are by nature cumulative. Stated otherwise, a series of low-scale actions may be just as effective, overall, as the single major action—and may in fact be considerably more difficult to combat. Bernard Fall came to the heart of the matter in discussing lessons of Vietnam: "When a country is being subverted it is not being outfought or outgunned, but it is being out-administered—particularly at the village grassroots, where it counts."¹² Surely, the immense range and variety of possible means leave much room for imaginative thinking and orchestration—and the comprehensive integrated view of means and conflict shown on Figure 4 presents a systematically ordered structure toward this end.

The great variety, intrinsically, of means for persuasion, the diverse, often subtle channels through which effects are sometimes produced, the numerous, often complex interactions which occur cry for—indeed demand of the strategic planner—the larger and integrated view of the scene. It is easy to overlook the point that the on-the-spot effect of a decision and action may be of considerably less importance than that achieved in the larger context. Consider for example the present U.S. B-52 bomber missions in Vietnam. Whatever the operational aims and the destructive effects on mountain passes and rain forest, the fact that these aircraft were used may be considerably more influential in political terms to Peking than to either Hanoi or Saigon. Use of B-52's in Vietnam, an appreciably lower-scale action than that shown as "commensurate" on Figure 4, suggests the possibility that their originally contemplated and designed method for persuasion, force-striking, is not that in this instance but rather is in the political/psychological family. (The point is more clearly visible in the case

of the Soviet May Day parade, shown on Figure 4 in the sociological category.)

Our choice of labels in Figure 4, viz., "force-striking" and "force-supporting," warrants comment. It must be recognized that "military" can have very different meanings to different people. The roles played by the military and popular attitudes toward them are likely to vary markedly according to whether one is in a relatively well-established and stable society or not. In the undeveloped and developing countries the armed forces are likely to be far more than military functionaries. They may be the largest if not the only organized and reasonably cohesive group, constituting the principal stabilizing influence and source of national leadership. Since it is the only large, relatively cohesive group, with members drawn widely from across the country, the peaceful purposes role of the armed forces (nationwide development) may be far and away their most important.¹³ This is not to suggest that such leadership is the wisest but rather that where the competing groups are small and highly fragmented, each jealous and convinced of its own superiority, there is grave, perhaps fatal, weakness in the country's political fabric. The armed forces can play dramatically differing roles according to their political and social environments. The conflict spectrum does not separate the relatively well-established and stable societies from those that are not so; and there are so many of the latter that it is desirable to avoid the possible ambiguity of "military" and instead use "force."

R&D Projects and the Conflict Spectrum

What fraction of the budget is to be allocated to research and development and, given this, what projects are to be pressed and with what relative priorities? These are difficult and searching questions. They seem to be growing ever more urgent and difficult. Whether and how these grave questions are answered is not nearly as clear as the fact that their consequences will one day have to be faced. It is the purpose here to suggest a framework, based

on the conflict spectrum scale, for viewing research and development efforts in a more orderly and perhaps at least partially integrated fashion. The construct may help obtain clearer insight into an exceedingly vital and otherwise seemingly so much more complex and disconnected scene.

Figure 5 presents planned and programmed research and development projects in terms of mission and of estimated time for achievement. Placement along the spectrum scale of conflict implies a certain relationship between project aims—capabilities and/or knowledge sought—and type of conflict activities feared and/or anticipated. Stated otherwise, it is the mission or conflict activity envisioned that constitutes the *raison d'être* of the sought-for capabilities. Placement along the time axis ought to be reasonably straightforward inasmuch as project planning involves at least some references to estimated progress rates. Association of project objectives with particular segments of the conflict spectrum scale's activities is, of course, a considerably less straightforward and precise determination. Probably most large-scale programs have multiple objectives, unequal in relative weight and priority; not all are always stated explicitly or remain equally important for a long period; and, finally, program objectives are not always consistent with one another and may on occasion even be contradictory.

One can visualize program objectives which for one or another reason are unique, perhaps aimed at a very specific and limited application. The relatively imprecise long-range mass-destruction weapon system is one such, for it points to a particular type of operation contained within a narrow band on the spectrum scale, that of general war. There are others, such as are contained or implied in the national space program or perhaps in studies of earth's atmosphere, the consequences of which may have many and diverse purposes. In these there may be significant contribution in the domain of general war (reconnaissance); variegated possible contributions to a broad range of actions in the limited-war domain deriving from progress toward modification and "control" of weather and of climate; and, lastly,

achieved the project objectives and possessing the sought-for capabilities, we will presumably deal more competently with or avoid the feared and/or anticipated conflict activities. Plotting on Figure 5 each of a number of projects according to relevant type of interaction state along the conflict scale and according to time of attainment, we can present the whole in insightful fashion. Relating project aims and conflict actions will seldom be easy and unchallengeable. The difficulties are even greater for multiple-objectives projects, which may make significant contributions to each of many types and levels of interaction states by a variety of means. It is possible that something like an applications-distribution curve would be a superior, more eloquent method for expressing net worth.^o The simple representation of Figure 5 is distorting, since placement of the text, even though purposely set perpendicular to the time axis, may still imply relatively narrow and contiguous wavelengths span of applications. Nevertheless the schematic enables organized and comprehensive presentation and hence helps obtain some insight into the larger and extraordinarily complicated scene. Further,

^oAppraising the respective merits of narrow "band" projects is one thing; of broad band capabilities, quite another. Toward the latter, one might make allocations of contributions over a range of wavelengths and then integrate the whole. In this manner one can envision constructing an applications-distribution curve or, say, profile for the project in the sense, perhaps, that Figure 3 provides depth to Figure 2 data.

one can hope that the logic of this simple, integrating construct will help set the stage and provide impetus for the larger, deeper, and less simple analysis. In expanding the construct to encompass more research and development projects, together with a deeper study of each, we force attention to consideration of purposes; we should have a clearer view of the coverage, viz., gaps (in time and wavelength level) and overlaps. Finally, we should have an orderly procedure enabling organization and scrutiny of others' research and development programming. There is a kind of circularity here which seems worth exploring. The selection of research and development projects and the priorities accorded each reflect the planner or planning agencies' hopes, fears, and expectations—the planners' image of the future. Spoken otherwise, doesn't this mean that with the R&D array we have clues to intentions? And if so, can we not say something about yet-to-be-plotted conflict action-limit lines and encompassed action distributions?

Many questions need to be answered and obstacles overcome in constructing and carefully filling in a Figure 5. Simplifications can be visualized, such as considering only publicly supported projects, only those over, say, five to ten million dollars, only those DOD-funded, and so on. The aim, of course, is to hold the task to something commensurate with available time and effort and yet "prove" the general concept.

Santa Barbara, California

Notes

1. Norman Precoda, "What Is War?" *Air University Review*, XIV, 4 (September-October 1963), 46-55.
2. Arthur Bryant, *The Illustrated London News*, 30 August 1958, p. 330.
3. *International Conflict and Behavioral Science*. Roger Fisher, editor, *The Craigville Papers*, Basic Books, 1964; Anotol Rapoport, pp. 13-26.

4. *Ibid.*

5. Marjorie Hope, who has devoted many years to the study of war, differs. She argues that while aggressive impulses are part of our biological makeup, a deeper look suggests that armed conflict is rather the result of socially learned patterns. Depending on institutional patterns and the particular experiences of the individual, aggressive impulses may be developed

into fighting techniques or chronic grumbling, or they may be overlaid by quiet self-control. See Marjorie Hope, "The War Urge," *War/Peace Report*, September 1965, pp. 3-6.

6. Alexander Kerensky, *Russia and History's Turning Point*, Duell, Sloan and Pearce, 1965, pp. ix, xiv.

7. Robert Shaplen, in his *The Lost Revolution* (New York: Harper and Row, 1965), argues that this was not always so; that during the earlier years of the past two decades or so the West—in particular the United States—neglected important opportunities to foster democracy in Vietnam. This also illustrates the escalatory tendencies of what are originally local, low-scale actions: continued for long, they seem inexorably to involve major powers.

8. Bernard B. Fall, "Insurgency Indicators," *Military Review*, April 1966, pp. 3-11.

9. Bernard B. Fall, *The Two Vietnams, A Political and Military Analysis* (New York: Frederick A. Praeger, Inc., 1963), pp. 133-34. The French *hiérarchies parallèles* has something of this meaning and in practice may be conceived of in two ways: (1) Wherein the existing administrative structure is infiltrated by members of the challenging movement. This is illustrated by Nazi-occupied France where anti-Vichy resistance members worked into key posts of the pro-German government. Here the aim was to mitigate or counter governmental actions. It is illustrated in post-World War II Czechoslovakia where Communists infiltrated the Czech government so thoroughly as

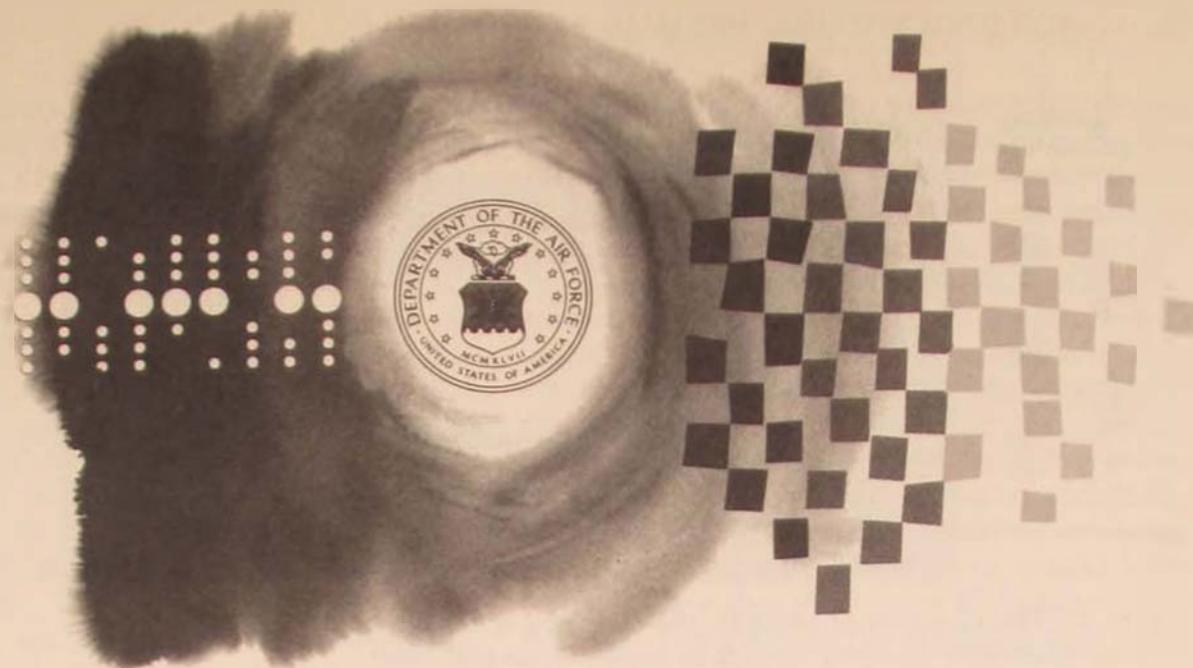
to take over completely upon signal. (2) Wherein a new organizational structure is created, designed to take over full administrative control. It can be illustrated by Nazi-occupied France, where in 1942 the Conseil de la Résistance began creating a full-fledged nationwide parallel network of underground administrative organs. Another example has been during both the first and second Indochina wars (1945-54 and 1954-), where a large part of the South Vietnam population and countryside came under complete Viet Cong administration and where also the VC administrative structure coexisted more or less clandestinely with Saigon's.

10. As among those expressing this view, see "USAF Doctrine and National Policy," a speech by Air Force Chief of Staff General Thomas D. White, reprinted in *Air Force Magazine*, January 1958, pp. 47-51; *Nuclear Weapons and Foreign Policy*, by Henry A. Kissinger.

11. Malcolm W. Browne, *The New Face of War* (New York: Bobbs, 1965), p. 38.

12. Fall, *Military Review*.

13. Hugh Hanning, "The Peaceful Uses of Military Forces," *Statist*, I, 8 (October 1965), reprinted in *Survival*, January 1966, pp. 28-32. Mr. Hanning points out not only that the armed forces in developing countries are often by far the most effective body in the country but also that its young officers are often "the most go-ahead, the most cosmopolitan, and the most nationally ambitious members of the community."



ANALYSIS AND TECHNOLOGY

MAJOR PAUL L. GRAY AND MELVIN TANCHEL

ANALYSIS, which had its genesis as a formalized technique during World War II, has since matured considerably. In the past, the analyst dealt with equipment and systems whose characteristics were known or readily available, since the systems existed and could be tested if necessary. Unknowns were at a minimum and could readily be treated parametrically where desired. Today, the systems and equipment with which the analyst works are largely conceptual or paper designs. He must still apply rigorous experimental and scientific techniques to help the decision-maker evaluate potential options, but his main role today is to separate fact from opinion and label each accordingly for proper evaluation by the decision-maker. In the highly complex area of research and development this function requires a blending of technical and analytical skills. The technological race may well depend on the application of our extremely critical R&D manpower and material resources to only important areas of high potential return. Systems analysis plays a big part in identifying those areas.

The proven steps embodied in the time-tested, experimental, scientific problem-solving

procedure quite naturally form a proper basis for an objective approach to the application of the analysis technique. A predetermined, rigorous process which can be duplicated by knowledgeable practitioners is followed. It can be readily assessed in critical examination and can be readily modified as new information becomes available. According to E. S. Quade,¹ the major problem-solving elements of analysis are as follows. (See Figure 1.)

The Objective(s). Analysis is undertaken primarily to suggest or reveal a course of action. This effort has an aim or objective. Policies, strategies, forces, equipment, etc., are examined and compared on the basis of how well and how cheaply they can accomplish this aim or objective.

The Alternative(s). The alternatives are the means by which the objectives may be achieved. They need not be obvious substitutes or perform the same specific function.

The Costs. Each alternate means of accomplishing an objective involves certain dollar costs or specific resources used up.

The Model(s). The model is a set of relationships—mathematical or logical—relevant to

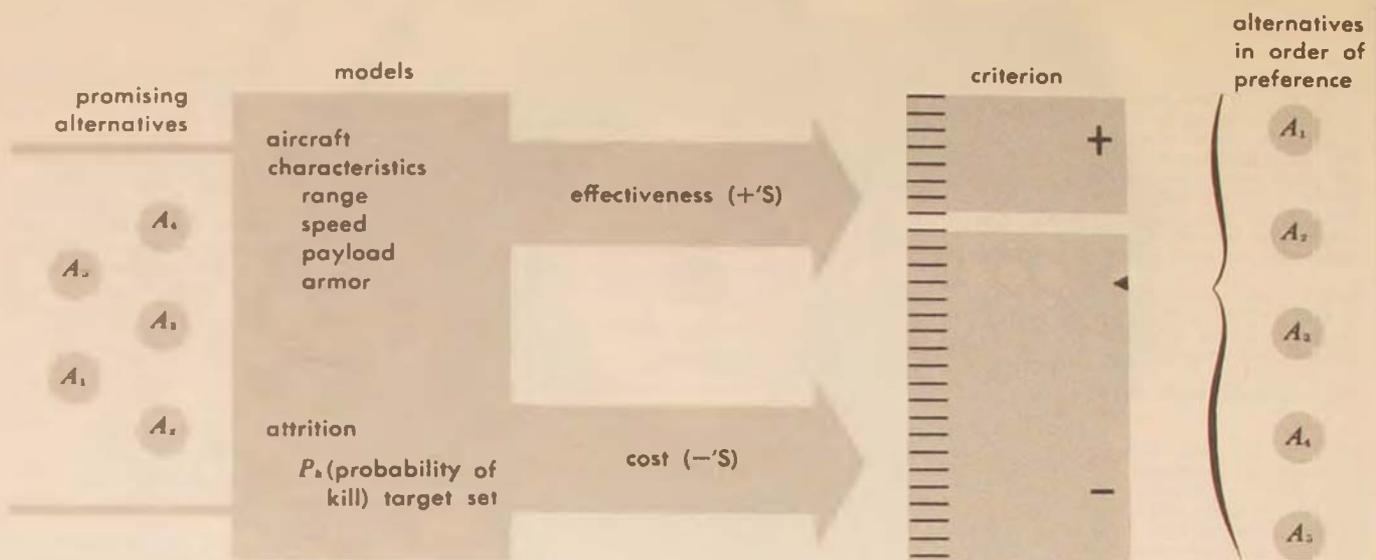


Figure 1. The elements of analysis, the objective of which is to array alternative delivery aircraft in some meaningful order

the problem at hand. The model provides, for each alternative, the means for estimating costs incurred and the extent to which the objectives are attained.

The Criterion. The criterion is the rule or test needed to tell how to choose one alternative in preference to another. For each alternative, the criterion attempts to measure the extent to which the objectives are attained as compared with the costs or resources used up.

In our society the highest overall intellectual skills exist within the formalized professions. Ideally, the analysis organization should be composed of representatives from these professions, where each member is a specialist in his given field or subfield. In this aggregation we find engineers, physicists, mathematicians, statisticians, operations researchers, psychologists, political scientists, economists, etc., *as required to fulfill the needs of the decision-maker.* As analysis problems originate, teams composed of the pertinent professional skills are formed as elements within an ongoing, hard-core analytical group that maintains continuity of knowledge and capability.

Analysis is a continuous, *iterative* process in which a potential concept is evaluated and insight is gained regarding just what constitutes an effective solution as well as the contributions made by the various components

making up the whole. The knowledge thus gained may provide the basis for generating new contenders that outmode original concepts being considered. The intellectual interaction of thought and idea, where theory and concept are tested, tried, and improved, forms the very essence of the analysis method. Progress comes from trying an idea, testing it, combining judgment, logic, and reason—often failing and trying again—until all the contending alternatives have been fully explored and their advantages and disadvantages fully revealed.

In analysis, as with most formalized disciplines, certain ground rules must be practiced. The analyst must

- have freedom to do objective, unbiased work,
- have access to all information relevant to his analysis subjects,
- have freedom to reveal his findings just as they fall, reporting them to a decision-maker at a level high enough in the organization to employ effectively the insights revealed by his analysis.

analysis for research and development

In our free-enterprise society decision-makers attempt to maximize the return on resources expended. However, research and de-

velopment decision-makers probably have the most difficulty in determining *what* to maximize. More often than not, quantitative relationships between variables will not exist. It is not always clear how technology goals and objectives can best support national goals and objectives. Inherent in the development and proper use of technology outputs is a higher degree of uncertainty than in most other ventures. Many problems possess a complexity beyond intuitive comprehension and assessment. In this environment the rigorous processes of analysis can provide a common means of bringing judgment to bear on the maximization of return.

In R&D, analysis functions in two ways. The first is the evaluation of alternative or competitive systems to determine optimum effectiveness and/or technological force structure for either minimum costs or some fixed or constrained cost level. Here each new proposal is contrasted with other contenders to determine which provides the greatest gain in marginal utility per resource expenditure. Normally, this analysis is done at higher-level agencies based on the inputs from lower echelons. A very important by-product of these technological-force and effectiveness comparisons is the guidance returned to the lower echelons through the evolved criteria and measures of effectiveness.

Second, analysis provides a means of clarifying and optimizing a particular system. These efforts are intimately related to system design, and logically they are best performed at lower echelons in direct consonance with the pertinent scientific and technical skills.

Both these applications of analysis have a useful by-product whose value has been largely underplayed in the past. In the process of analysis, some system characteristics may be found to have major influence on measures of value. The determination of these sensitivities is significant in the analytical process. By focusing R&D attention on these areas of sensitivity, significant advances may be made and entirely new concepts formulated. This important aspect of analysis can be illustrated by the following fictional example. In the course of analyzing a new bomber in the strategic war

role, one of the measures of value is the degree of flexibility offered the commander in the use of this system. In other words, in an all-out war, the commander in chief has flexibility with his ICBM's and Polaris missiles in that they have a degree of invulnerability while he makes up his mind as to what portion he will order to fire and what portion he will hold back. On the other hand, bombers on the ground are considered extremely vulnerable to enemy action in a total war. Therefore, two alternatives must be considered. One alternative is that the aircraft would have to be flushed on warning, and then a decision to use them would have to be made within the limited flight time of the bomber. This reduces the flexibility to a number of hours rather than days or even weeks. The sensitivity of the flexibility measure of value to time aloft is quite apparent. Ignoring all other factors, this would indicate that our R&D efforts should concentrate on providing technology to keep aircraft aloft for days to weeks. The second alternative would be to disperse the bomber aircraft over many airfields or sites. The value of each target (airfield or aircraft site) would then be so low that its destruction would no longer be a lucrative objective for an opponent. Again, considering flexibility as a measure of value, under this alternative reduced take-off distance (in order to increase potential airfield availability) becomes a driving consideration. Ignoring other factors, this would indicate that our R&D efforts should concentrate on providing technology to permit aircraft either to take off from short runways or to attain the ultimate in short take-off, VTOL (vertical take-off and landing). Both these alternatives might introduce completely new bomber concepts for consideration. Obviously, there are other factors bearing on decisions of this nature. But these oversimplified examples illustrate the impact of analysis, sensitivities, and driving assumptions on command and guidance.

In their iterative processes, analysts search out, identify, and highlight new technological alternatives in the offing. They estimate technological breakthroughs and provide some insurance that the worth of new knowledge is properly assessed. The iterative flow in ana-

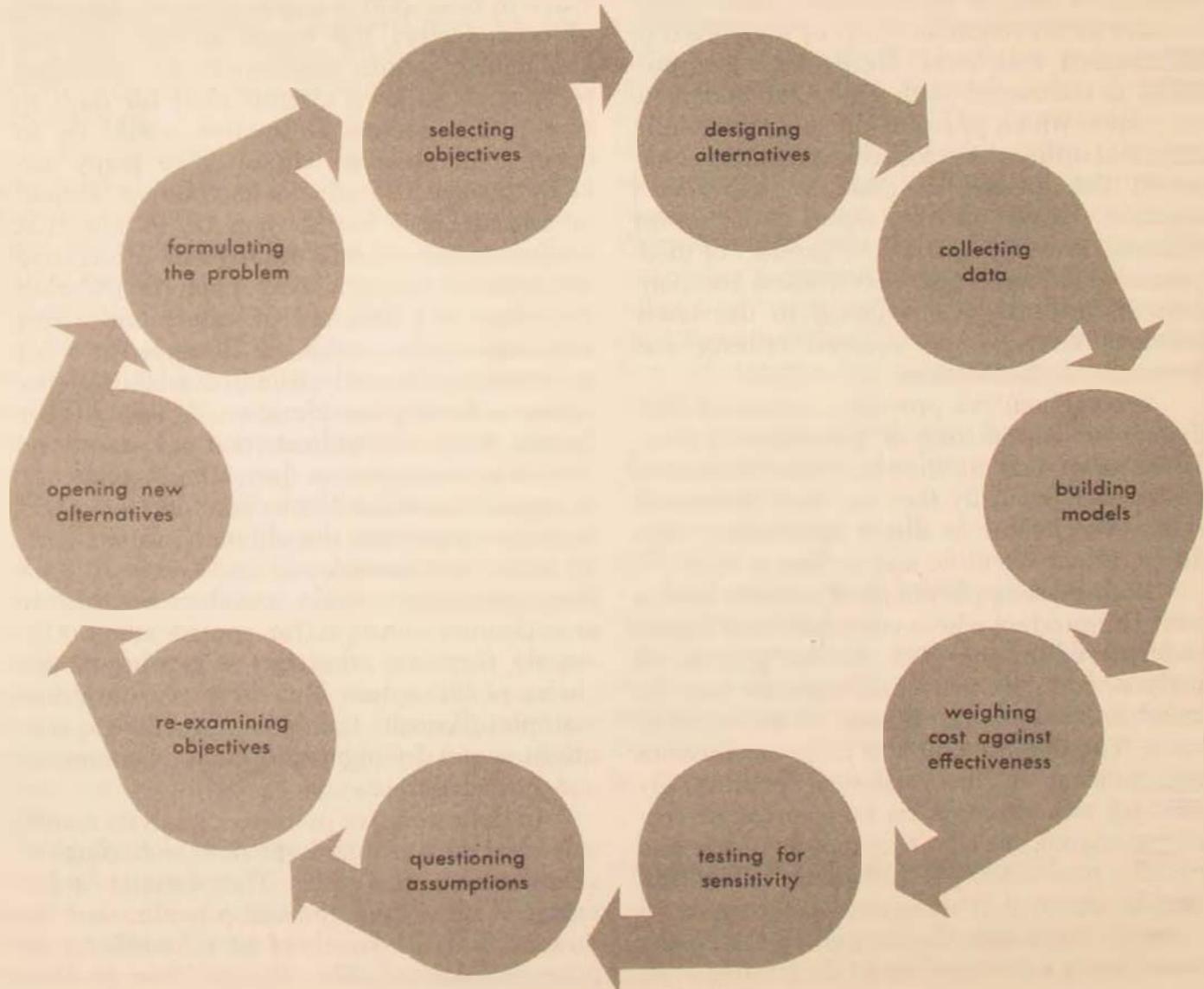
lytical efforts prompts enhanced objectivity in this discipline. (See Figure 2.) In the process of evaluating a potential system, insight is obtained regarding just what would constitute a more effective system. This, in turn, provides the basis for new contenders that may out-value the original system that was being evaluated. Analysis objectivity requires that the analyst bring these facts to the decision-maker's attention so that the more cost-effective contenders can be exploited.

In most situations it is not possible to identify initially a one-best solution. More often there is a trade-off or balancing between

the desirable and undesirable conditions involved in each alternative course of action. The trade-off between cost and effectiveness is inherent in the budget-constrained search for optimal systems and force structures. As shown in the accompanying diagram (Figure 3), usually a gain in effectiveness (E_1 to E_2) is accompanied by an increase in cost (C_1 or C_2 to C_3) and vice versa. On the other hand, when we are cost-limited, the analysis centers around identifying the greatest effectiveness for a given cost.

Within this general and overall trade-off there is often a balancing of subfactors. If an

Figure 2. Iteration, the key to analysis



aircraft system is the subject of the analysis, both range and payload factors will probably be involved. It is seldom possible to obtain the maximum in both long range and high payload, and if one is emphasized it will be at some expense to the other. The end result is usually a trade-off based on total problem constraints.

The dominant objective of analysis in research and development is to identify initially a course of action consistent with a wide range of alternatives and then to narrow the choice as development proceeds.² This process is often confused with the operational type of analysis, where the problem is essentially one of choosing among specific end-product alternatives. When we are dealing with environments of 10 and 15 years hence, it would be extremely fortunate if, early in a development program, our initial choice was one that would yield an optimal final product. If we could, the limited R&D budget would go much further. Components such as aircraft engines and electronic systems could be designed and developed to meet the requirements of the specific aircraft for which they are ultimately intended. Development schedules would be much more orderly.

But the operational environment for weapon systems of 10 and 15 years hence cannot be accurately predicted now. Neither is it possible to forecast how and where large technological advances will be made. Even if we studiously plan to develop a fighter with performance higher than that of the best experimental model, or a bomber whose speed is in excess of today's fastest fighter, or a missile with range and circular probable error (CEP) twice as good as last year's, the certainty of attainment is largely unknown now.

Often the R&D manager's most practical method of approaching this problem is to choose initially a course of action that is consistent with a wide range of end products. Then, as more knowledge is gained, he can narrow the range to the best single alternative later in the development process. Sometimes analysis may indicate that early development of a certain class of weapon system is necessary. Here this same analysis can provide

a rational basis for estimating these future system needs and guiding technology toward this goal.

Performance, cost, time availability, and the utility of the various alternatives are all highly uncertain during the early time period of a system concept. Yet these are precisely the factors that are crucial in determining which alternative is best. Most often it is possible to balance and trade time along the development cycle for more information—information that will enable the decision-maker to discriminate better among the alternatives. Then the problem changes from one of choosing an end product directly to one of selecting possible courses of action that will ultimately produce a system concept and that will, more immediately, require the "buying" of information to enable the decision-maker to improve his choice.

To illustrate, assume that we have two R&D decision-makers, Mr. Rigid (R.) and Mr. Flexible (F.). Assume that analysis has indicated a need for an anti-intercontinental ballistic missile (AICBM) ten years in the future, and each man is responsible for developing such a system. Mr. R. sits down at the outset and systematically analyzes and compares all the alternative final systems that he thinks are most promising. He carefully estimates the state of the art over the time period for each component and tries to incorporate the best of each into his system. He tries to be comprehensive by considering all alternatives and factors. Finally, based on his best estimate of the future operational environment and appropriate criteria of choice (such as cost, accuracy, mid-course or terminal-phase intercept), he decides which end product will be best.

Mr. R. is committed from this point on. True, he can efficiently allocate his resources, optimize component design and mating for his system, and probably avoid many development delays. But he is very much limited in the number of alternate components and systems that can be developed because developing duplicate items as final hardware is expensive.

By contrast, Mr. F. does not try to resolve at this time which alternative final system will

be best. He selects a strategy that is consistent with a wide range of final systems. His analysis considers the possible alternatives, but he does not try to simulate the uncertain future operational environment in any great detail. He has little confidence in his estimates of the production and operation costs of future missile defense or which intercept phase is optimum. Therefore, he utilizes analysis to determine the sensitivity of various parameters to be developed.

While Mr. R. probably defined his defense system by selecting specific performance factors, such as a terminal-phase intercept and a weapon CEP of 50 meters, Mr. F. has conceived of the optimal defense over a range of performance factors, such as intercepting the incoming missile as early as possible and with weapon CEP of between 10 and 60 meters. He does not try to define the optimal more specifically because there is not even expert agreement as to which combination of propulsion, boost guidance, and warhead is the best. In this situation he maintains an open choice of combination of alternatives. If continuing analysis reveals that propulsion is sensitive and that the engine needed to provide extremely high velocities is lagging, then he can concentrate on this area and through concentrated use of resources possibly improve this particular technology. If he is considering three types of propulsion units, he may contract for a prototype of type one and a test version of types two and three. Then, at a later time he can choose, with increased confidence, the type that most nearly meets his needs.

Using the "building block" concept, Mr. F. does not delay development action for the details of the final configuration but instead attempts to mature ideas to practical application potential. He intentionally keeps his course flexible in the early stages of development until he can capitalize on an increase in knowledge. Then, as development proceeds, the range of alternatives can be narrowed on the basis of the knowledge gained, and eventually the final optimal system is selected.

The need to evaluate continually the cost effectiveness of new technological alternatives

can be found in the history of aircraft systems development. For instance, in the first two developmental years of the B-52, both the contractor and the Air Force planned for it to be a turboprop aircraft. But during this period the comparative potentials of the turboprop and the turbojet changed. Fortunately the Air Force had exercised sufficient objectivity and had supported the alternative propulsion system so that we were able to take advantage of the new possibilities. The B-52 gained the more effective turbojet system. Similarly, new aerodynamic data obtained during development of the B-47 prompted a major design change in the wing and led to use of the more advanced sweptwing. The same situation occurred during the development of the F-102 when it was discovered that aerodynamic qualities of the early models would not permit supersonic flight. Evaluation revealed the necessity of changing the configuration to conform with the area progression rule in order to achieve the desired effectiveness.

In some instances, Mr. R.'s method can be more efficient; that is, if his early estimate should turn out to be correct, he will win that round of play. However, in the long run or the equivalent of a game with a number of plays, it is much more likely that Mr. F.'s method will be more effective. Stated another way, if Mr. R. is correct, his costs are 25 percent lower than Mr. F.'s and he attains an earlier initial operational capability (IOC); but if Mr. R. is not correct, his costs will be double those of Mr. F. and his IOC considerably delayed.

We can see many other examples of the wisdom of a flexible course in early development, coupled with continuing and rigorous analysis. One summary of 24 Air Force and Navy aircraft developed after World War II showed that in only three programs was the final engine the one initially planned. Most of these changes occurred because better engines became available. In 12 airborne electronics programs, it was found that both cost and time factors were less when preliminary models were tested, knowledge was gained, and then selection and final development for operation were accomplished. In the early ICBM program, guidance problems were so severe

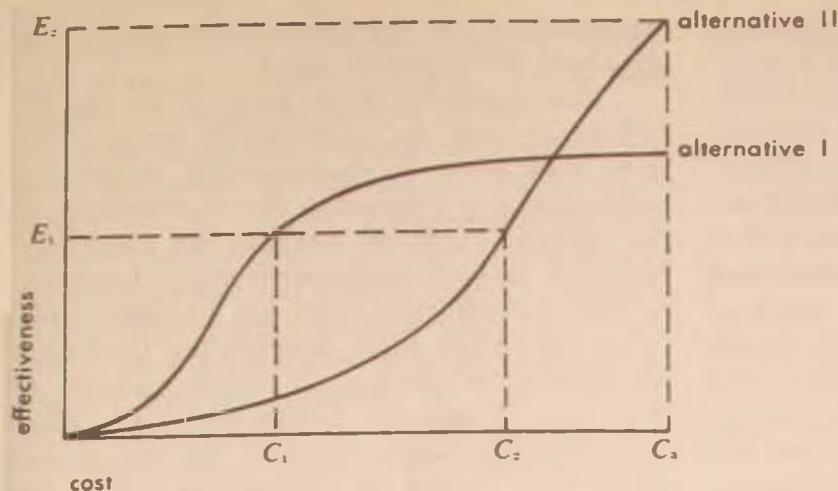


Figure 3. Cost and effectiveness

that the rest of the program was not pushed. When the H-bomb made less accurate ICBM's useful, we were in no position to benefit from this development. However, because an alternate system—the rocket booster in the Navaho cruise missile—had been so much further developed, it was possible to use it as a basis for ICBM propulsion. Thus we can see the need for flexibility early in the R&D cycle, in combination with a continuing pervasive application of analysis to identify or promote the most cost-effective alternatives.

the R&D cycle

Let us examine the foregoing discussion in the context of an R&D programming cycle, to illuminate more clearly the salient factors. If we consider time along the abscissa of Figure 3, the start of the R&D cycle begins with the consideration of new ideas, basic research, threat, policy, and roles and missions. No one group or organization has a corner on the market for new ideas. They may emanate from industry, from universities, from laboratories, or any one of many sources. Quite frequently, basic research may create new concepts of technology which must be considered and which may generate new ideas.

The threat has many aspects. Basically, the most important is knowing what your potential opposition is capable of doing, as well as what he plans to do. This is a chess game in which the offense is played off against the defense for the ultimate attainment of Air Force,

Department of Defense, and national goals, the object being to provide a defense against his offensive threat and at the same time make your offense more effective so that his defense becomes more complex and costly. The complexity of threat evaluation can be realized when we change from a two-sided game to a three-sided game, or to an n -sided game. The policy established by higher echelons, be they USAF, DOD, or the national government, has a major influence on the direction of the thrust of our efforts. For instance, if the major policy goals appear to be "stabilization" rather than "revolution," this decision will determine the direction of our overall efforts and influence assumptions going into analysis as well as measures of criteria.

The roles and missions have an important effect on our analysis in that they determine somewhat varying bounds (not hard and fixed ones) on our proposed alternatives. All the above factors enter into the initiation of the R&D cycle.

Exploratory Development. All efforts directed toward the solution of specific military problems short of major development projects are classified as exploratory development.

The first following step can be either the conceptualized study or the cost-effectiveness analysis. This is a chicken-and-egg situation—it cannot be determined which comes first. In some cases the conceptual study can be first, and in others the analysis leads to a new concept which is then studied. In the example of the airborne platform for early warning, as a

result of the analysis a *study* could be initiated to conceive of a platform that would remain on station from three days to two weeks, depending on broad design trade-offs. In a different example, assume that technology advances make practical the emanation of coherent energy from the nucleus of a given atom rather than from the electron shells. The attendant high energies associated with the nucleus source would represent a significant breakthrough. Here a study to conceive of a kill system using this new technological development would be in order. Then, if a new kill system concept evolves, a cost-effectiveness analysis is in order to evaluate the new potential.

At this stage a system is conceptualized in broad aspects, not in detail. The varying technologies that in combination make this system possible are considered and their capabilities, limitations, and trends recognized. This conceptual study provides the basis for exploratory development programs. This does not mean or imply that all exploratory development derives from a conceptualized system. Exploratory development, by its very nature in many instances, must be carried out based on the best judgment of the project engineers and the laboratory directors. Exploratory development is not, however, carried on in a vacuum. The degree of guidance provided by the conceptualized system varies from technology to technology, but this is the end objective or goal for which exploratory development is conducted. Before much effort is expended in developing projects to support the conceptualized system, some evaluation must be made as to the value of that system in the time frame projected. This value determination is attained by a cost-effective analysis. Using the rigorous scientific process previously described, we evaluate the system concept against the contenders and against the existing systems for the time frame in which it is determined to be potentially operationally possible. This is a first determination as to whether the conceptualized system has any real merit.

Advanced Development. Those projects involving the development of hardware for

experimental or operational test are in the advanced development stage.

The feasibility study looks at the specific system concept in considerably more detail than previously. It examines the supporting technologies in relation to the requirements of the system. Trade-off analyses are conducted between varying components and subsystems, so that a confidence level can be determined as to the attainment possibilities (technical attainment) of the overall system concept. At this time it may be determined that, while varying technologies needed for the system have been shown to be possible within the laboratory, there is insufficient confidence that these laboratory-proven techniques will, in actuality, provide the same or similar capabilities under a working environment. Or there may be insufficient confidence that the combination of separately identified laboratory-proven techniques and components, when combined into a subsystem, will give the estimated capability. This provides the guidance and justification for the advanced development program.

Advanced development is, to a considerably larger extent than exploratory development, system concept oriented. This does not mean that the system has been clearly defined. It means that advanced development is conducted because it is necessary or desirable to raise the confidence level in the ability of that system concept to provide the effectiveness postulated. It is at this time that the system, which is now better defined, is evaluated in the context of a force structure analysis. Varying numbers of this system are postulated to determine the effect on the overall force posture. This does not mean that the decision-maker is faced with a decision to build so many of that given system; it merely means that in the context of a total force it is necessary to postulate varying numbers of a given system in order to determine resource requirements and to determine the incremental change in force effectiveness. At this stage we enter into the DOD Instruction 3200.9 controlled area of formalized procedures.

Engineering Development. Programs be-

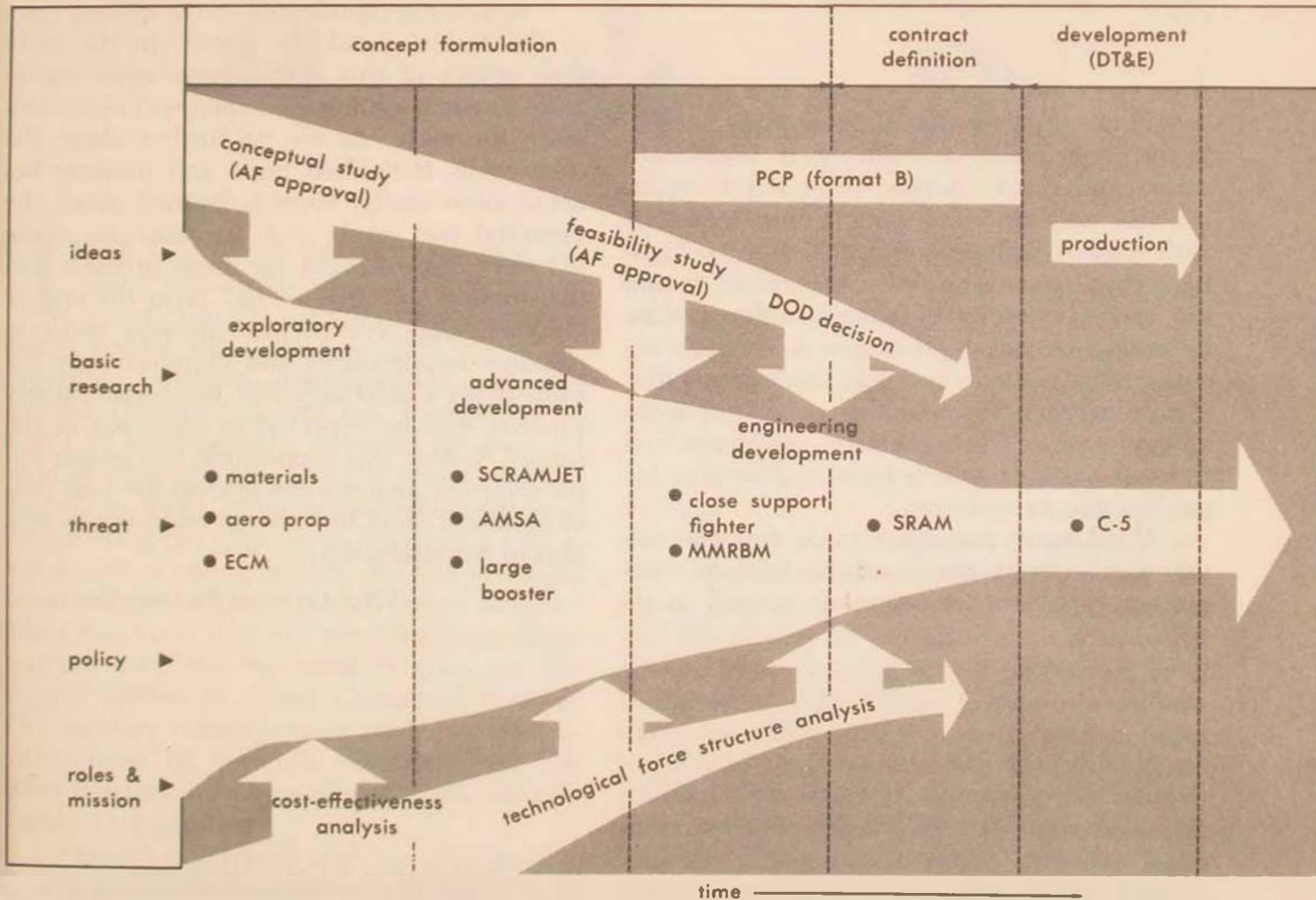
ing engineered for service use but not yet approved for procurement or operation are classified as in engineering development.

After sufficient advanced development has been performed to establish the desired confidence level on specific components and subsystems and after the evaluation of any specific system proposal has shown its worth in technological force structure analysis, formal documentation is prepared to pass the concept into engineering development.³ In fact, Department of Defense Directive 3200.9 specifies several stringent prerequisites that must be satisfied before the system can progress further along the programming cycle:

fied before the system can progress further along the programming cycle:

- The system must be within the state of the art, and mainly engineering rather than experimental effort must be needed.
- Mission and performance limits must have been established.
- The best technical approaches must have been selected.
- A thorough trade-off analysis must have been made.
- Analysis, evaluating cost effectiveness

Figure 4. R&D programming cycle



across the complete spectrum of competing alternatives, must have revealed a favorable advantage for the proposed system.

- Cost and schedule estimates must be credible and acceptable.

The engineering development phase, then, represents the big "moment of truth" for analysis within the R&D programming cycle. If credible analysis has subjected a high-potential proposed system to a "survival of the fittest" environment over the variable time span from inception, passing this acid test can be a routine formality. Obviously, a low-potential system with inadequate analysis will be culled here, if not earlier. However, one combination must be guarded against: if a high-potential proposal should suffer from inadequate analysis, it may never arrive at this point; or it can easily be lost here and thereby insidiously undermine national effectiveness.

ANALYSIS should not be viewed as a one-time event in its service to the decision-maker. Within the funnel lines of Figure 4, it works both across and down. Across, from left to right, analysis aids in identifying system concepts with high payoff potential. It serves to highlight those promising ones that are in among the myriad number of ongoing efforts. Also, by assessment of possible force deficiencies occasioned by changes in threat, analysis can illuminate alternative means of achieving technology goals. Thus analysis can provide a rational basis on which to base decisions for guiding the R&D process.

Working up and down in the funnel, analysis very early exposes a candidate to its competition, showing up its weak as well as its

strong points. With the passage of time, analysis refines and redefines each candidate. This is done by evaluating its contribution in changing environments while assessing its cost effectiveness in the technological force structure. In short, it helps decision-makers reject the losers and gives more force to the winners.

Since successfully passing the formal prerequisites can lead to contract definition and acquisition, through top-level decision, it is essential that effective communication exist among all levels of analysis and decision. The greatest benefit comes from the proper mating of national objectives with technology potential through the communication, understanding, and use of *common criteria*. The proper flow of these decision guidelines, both up and down, can well be the difference between concerted and directed technology development and a confused, stagnated science pool.

Again, the significance of the closing lines of the funnel should be noted. In the early time stages of this cycle, many more small-scale projects are initiated than will ever complete the cycle. As we go further along the time scale, individual tasks and projects become more costly. More is learned about the potential end result, and decisions are made to select those having the most promise and the greatest payoff potential. Near the end of the time scale, systems become very costly in resource requirements and therefore only the best—often a relatively few large-scale, costly projects—can be expected to come out of the funnel. Within this framework, the proper applications of analysis can lead to the best possible allocation of technology resources in support of national goals.

+ Hq Air Force Systems Command

Notes

1. E. S. Quade, *Military Analysis* (Santa Monica, California: The RAND Corporation, November 1965), p. 7.
2. B. Klein and W. Meckling, *Application of Operations Research to Development Decision* (Santa Monica, California:

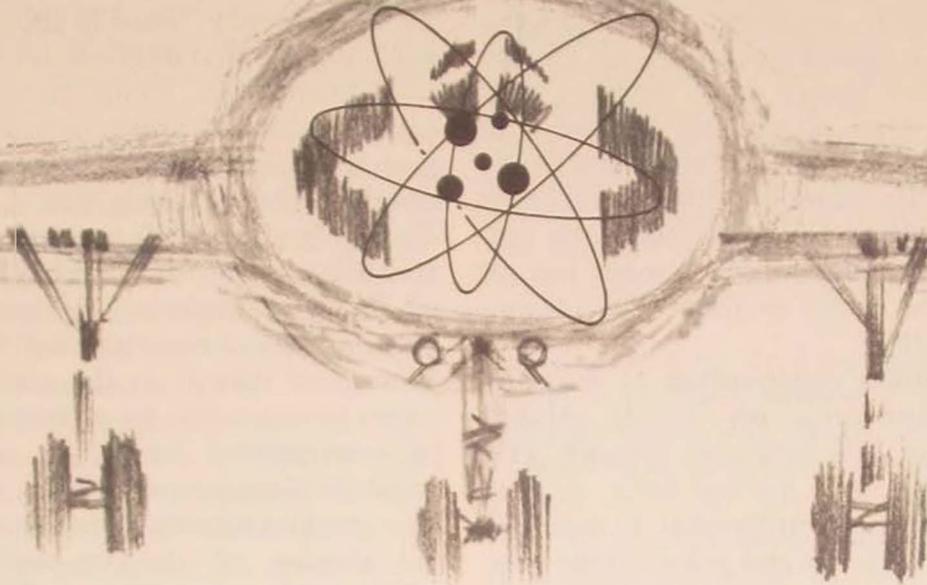
The RAND Corporation, P-1054, 3 March 1958).

3. Department of Defense Instructions 3200.9 and 7045.2. Format B refers to the formal documentation used to register conditional approval for proceeding with engineering development.

FRENCH

NUCLEAR WEAPONS POLICY

LIEUTENANT COLONEL NORMAN D. EATON



THE CRISIS in the NATO alliance has been developing over the past several years. The French government has regularly voiced dissatisfaction with the NATO structure (without, unfortunately, offering specific alternatives) and has backed up its words by systematically reducing the commitment of French forces to NATO commands. All the while, NATO spokesmen have discounted the growing disarray, even suggesting that it was a sign of robust health. But the problems can no longer be glossed over: France has now taken measures that are resulting in a major realignment of the command structure and the logistic system in Allied Command Europe. The military consequences of these realignments must be carefully considered by the other fourteen members of the North Atlantic Treaty Organization.

France's differences with her allies are not limited to military questions. In fact, more often than not France is on one side of any

issue and her allies on the other. Outside Europe, France seems to oppose U.S. policy on every possible occasion.

However exasperating this may be, it is a logical enough consequence of France's desire to play a major role in world affairs. In the following discussion of French nuclear weapons policy, French foreign policy objectives are assumed to be (1) to play a crucial, if not dominant, role in European affairs; (2) to reduce American influence in Europe and Europe's dependence upon the United States; and (3) to play an independent role in world affairs. These are ambitious objectives for a nation of only 50 million people. To achieve them, the French think possession of an independent nuclear force highly desirable, if not indispensable. France already has her modest *force de frappe*, equipped with fission weapons and the Mirage IV bomber, and she looks toward a thermonuclear/ballistic missile capability.

The purpose of this article is to explore further the rationale behind France's development of an independent nuclear force and to investigate the French strategic concepts for making that force support French policy.*

The French nuclear weapons program has absorbed a very considerable amount of resources and has involved some real sacrifices. Just as some Americans might prefer an expanded antipoverty program to an expensive lunar landing, so some Frenchmen will tell you they would rather have a super highway than a super bomb. One appreciates the point of view when he compares the French *autoroute* system, still in its infancy, with the excellent Italian *autostrada* and German *autobahn* networks.** But the French government has set its priorities and sticks to them; the reasons must be compelling.

France justifies construction of an independent nuclear force on closely related political, military, and economic grounds. Possession of even a small nuclear force, so goes the argument, is a guarantee that France will be heard by both friends and potential enemies. The nuclear weapon is a *jeton de présence*¹—a token entitling the holder to representation on the highest councils, to membership in the club of first-class powers. "The only stable and permanent advantage that possession of nuclear weapons gives," observes a French officer, "is a certain augmentation of political influence in international relations."²

Directly related to considerations of political prestige is the question of economic power and influence. In the short run the French nuclear weapons program is very expensive and is requiring sacrifices in other sectors of the national economy. However, as a French general not long ago reminded an American television audience, a nuclear weapons program stimulates development and production of mis-

sile and space systems and is therefore the basis for the advanced technologies essential to modern industrial power.³ Thus, as nuclear weapons are essential to first-class citizenship in the political sense, so the technology which they develop and support is essential to economic and industrial leadership.

The French rationale also rests on the fundamental responsibility of a government for its own security. Since in the realm of foreign relations national interests are more permanent than friendships, France is unwilling to rely upon the United States to furnish the weapon that is the key to her own as well as Europe's defense. One suspects that it also serves the French government's purpose to impugn the reliability of the United States as the bulwark of European defense. Moreover, experienced observers have reported that American policy has raised doubts in the minds of the other NATO governments by insistence on a buildup of conventional forces, by large-scale force augmentation exercises (such as Big Lift), and by a general reluctance to permit any meaningful sharing of decision-making in nuclear affairs within the Alliance. These remarks are not in judgment of U.S. policy but rather to cite some consequences of it. At any rate, military defense is the first responsibility of any government, and this is particularly to the point when related to French political objectives.

French writers advance purely military arguments in support of an independent nuclear capability. French planners are attempting to develop a rationale for considering nuclear weapons as inseparable from conventional arms and as an essential part of a modern armed force. General Ailleret, who occupies a position approximately equivalent to the Chairman of the U.S. Joint Chiefs of Staff, has made an analogy between military operations and construction techniques. Modern construction techniques require mechanical shovels and bulldozers for the *gros* work, he observes, but men with hand tools are still required for the *détails*. He describes nuclear weapons as necessary for the heavy work of destroying large concentrations and for creating general havoc on the battlefield; but he insists that the infantryman, rifle in hand, is still indispensable in

*French views are presented directly from French printed sources and from discussions with many French officers with whom I worked during my assignment as a staff officer at Supreme Headquarters Allied Powers Europe (SHAPE).

**This remark prompted a French officer in NATO Standing Group who reviewed this article to make the following observations: (1) The *autobahnen* were built by slave labor under the Nazi regime. (2) Costs of the nuclear weapons program affect other military expenditures more than they affect funds available for civilian projects. (3) The nuclear weapons program has popular support in France.

the role of cleaning up the battlefield and occupying the terrain. His views on the essential unity of conventional and nuclear weapons are summarized in this statement:

It is therefore of very great interest that not only the Army but also the entire nation be convinced of the fundamental unity which necessarily exists between these complementary elements—nuclear and conventional—which are by the very fact of nature totally inseparable things in the accomplishment of the defense of the nation.⁴

General André Martin says about the same thing: "To the essential arm which conquers and occupies the terrain by shock, the conventional forces cannot be any longer but the instrument of support and exploitation for nuclear actions."⁵ There is, however, an interesting difference in emphasis in the two articles just cited which is not apparent from the material quoted. General Martin is Chief of Staff of the French Air Force, whereas General Ailleret is an Army officer. General Martin's article stresses the pre-eminence of air operations in nuclear warfare, while General Ailleret is considering the unity of conventional and nuclear weapons in the general sense.

In the following discussion it will be noted that French nuclear strategy emphasizes the deterrent role of nuclear weapons (essentially a political role) over the operational use of nuclear weapons (basically a military problem). Nevertheless, French planners have thought out carefully the operational aspects of war in the nuclear era. In their consideration of operational questions, Generals Ailleret and Martin seem to visualize a general war in which an exchange of strategic blows and battlefield nuclear operations take place simultaneously. Indeed, it is for just this kind of war that SHAPE has planned. High-level American policy-makers have stressed the need for a capability to mount a nonnuclear defense of Europe against conventional attack, at least initially. As has already been mentioned (and it will be touched upon again), this U.S. policy has raised some doubts in the minds of the NATO allies.

Before turning to a discussion of French nuclear strategy, we should touch upon a final

argument to justify France's independent nuclear force, though analysis of the strategic implications of the argument will come later. This is a concept, developed in great detail by General André Beaufre, that the effectiveness of nuclear weapons in the deterrent role requires that there be several centers of nuclear power, each capable of loosing nuclear warfare.⁶ Such a concept obviously accepts proliferation of nuclear weapons—at least a degree of proliferation. It would be assuming too much to say that France's decision to build her nuclear force was much influenced by the Beaufre concept, but Beaufre's views do support French policy. Furthermore, as will be seen shortly, the Beaufre concept emphasizes some significant differences in U.S. and French strategic thinking.

In summary, the French rationale is a synthesis of political, economic, and military arguments supporting the conclusion that an independent nuclear force is essential to the role France wants to play in world affairs. "One cannot," writes General Martin, "be at the same time black and white, nuclear and dependent, on the world chessboard."⁷

It was just noted that French nuclear strategy emphasizes deterrence (in French, *dissuasion*) and that a policy of deterrence may be construed to support a degree of proliferation of nuclear capabilities (at least it has been so construed by General Beaufre). These observations highlight some areas in which French and American policies differ and which are worth separate analysis.

French strategy: the application of nuclear force

Insofar as the defense of Europe is concerned, French nuclear strategy is sharply at odds with that of the United States. France's strategy rests on the threat of unrestricted retaliation with nuclear weapons, even if the enemy possesses the capability to destroy France with a counterblow. This is "massive retaliation" of a sort, although France is unlikely ever to have a "massive" capability vis-à-vis the only power that now threatens French vital interests. Is such a strategy sound, and is such a threat credible? To those who are accustomed

to the nuances of counterforce, countervalue, damage limitation, flexible response, multiple options, and escalation (called by General Ailleret "a great subtlety"), the French strategy looks altogether too simple—and out-of-date.

But isn't there another side of the coin? Having divested herself of her colonies, France's vital interests lie in Central Europe. That is not to deny important interests elsewhere but rather to emphasize that the French deterrent operates directly in Europe and is elsewhere more a matter of prestige. In Europe, France rejects the idea of limited war. She of course recognizes the possibility of border incidents, easily recognizable and readily distinguishable from a premeditated act having official sanction. General Ailleret uses the expressions "apparent" aggression and "characterized" aggression, to make this distinction between an incident and "real" aggression.⁸ He states that a defense of Europe without the general use of nuclear forces, or with nuclear operations limited to the battlefield, is possible but not practical. He points out that large and vital areas, perhaps everything east of the Rhine, would be lost before Warsaw Pact forces could be stopped, since they would possess superiority in ground forces, advantages of geography and interior lines, and the initiative. Thus, says General Ailleret, clearly attempting to speak as a European:

[A defense by conventional weapons alone], which would culminate in allowing the aggressor to seize a part of Europe which might not be recaptured for a long period of time, or even recaptured at all if conventional methods were held to, does not seem satisfactory to us, Europeans that we are, as a method for defending Europe and should in our opinion be ruled out.⁹

The United States insists that Europe can be defended successfully with conventional forces against a nonnuclear attack, if only the NATO countries are willing to provide the forces; that NATO assets can match Warsaw Pact capabilities, if a real effort is made. But General Pierre M. Gallois argues that the Soviets would not attack in Europe without having considered the risks of nuclear war and would therefore be prepared to shift to nu-

clear operations rather than give up their offensive.¹⁰

Furthermore, American enthusiasm for a conventional defense in Europe (or for a nuclear defense not including a strategic nuclear attack on the Soviet homeland) raises doubts in the minds of Europeans concerning U.S. willingness to hold to a deterrent policy that would risk destruction of American cities. A Frenchman who chooses to remain anonymous has this to say:

The Americans will be touched directly only if the "escalation" takes place. The Europeans will be so touched certainly—and hard—even if it does not take place. The Americans have time to bargain on "escalation"; the Europeans, who would enter at once into the catastrophe, want above all to avoid it; in their eyes, it is that which counts, much more than the re-occupation later of a mass of ruins and a long series of cemeteries. . . .

If all the inhabitants of Mayence [Mainz] had to submit to atomic fire that would reach them in a second, would they die more content in telling themselves that the New Yorkers continue peacefully taking care of their business?¹¹

Notwithstanding his insistence that the European area does not admit a limited-war strategy, General Ailleret does not categorically rule out the flexible response.⁶ Rather, he defines the circumstances wherein it is admissible.

[Under certain circumstances]—which means that nuclear weapons are not used necessarily to solve secondary or minor problems, and which are not therefore directly vital to those possessing nuclear weapons—French strategy does not dispute the theory of the flexible response.¹²

But concerning the defense of Europe, the French view is clear. It is well summarized in a statement by General Beaufre.

⁶It is interesting to note that there is not a good, short equivalent in French for the expression "flexible response" and General Ailleret uses the English. "Flexible response" has of course become a cornerstone of U.S. defense policy. The term itself, however, has undergone its own metamorphosis, which further complicates the problems the NATO allies have in understanding U.S. military doctrine. It is reasonable to argue that in the early days of the Kennedy Administration (1961-63) the concept included tactical nuclear war and perhaps even selective counterforce exchanges with strategic weapons.

. . . Europe is by instinct resolutely hostile to all formulas which admit a limited war, which would render the outbreak of war more likely. While the Americans, justly fearful of the menace which weighs on the continent, are disposed to explore the possibility to control the conflicts and to keep them local in character, the Europeans know that every conflict would open for them unforeseeable consequences and would prefer to safeguard the peace in that part of the world by the threat of general war. Without always having a very clear notion, they prefer generally total peace through great danger, rather than to see Europe become again a theater of even minor operations.¹³

And not only does General Beaufre rule out limited war in Europe, he suggests that one should not even discuss it, since to entertain the idea weakens the nuclear deterrent:

That tendency [to consider a nonnuclear defense of Europe], logical in its ensemble if war broke out, unhappily is contrary to the efficacy of the deterrent: in rendering war acceptable, one renders it possible.¹⁴

Some critics of French nuclear policy argue that the French independent nuclear force will never be large enough to reckon with. Noting that the nuclear world is essentially bipolar, they insist that French options are completely circumscribed by the two super powers. But a counterargument holds that it is precisely within this framework that the deterrent force of a medium power can function:

The deterrent between the two great powers does not in all cases operate, but only where their vital interests are involved. Thus we see the framework for the medium size power. The great power wants to avoid a risk, even with a medium power, when the interests of the latter are at stake. Thus we have the double condition [for a medium power to benefit from its nuclear deterrent]: the vital interests of a medium power are at stake, but not those of one of the great powers.¹⁵

In a similar pattern of logic but with different emphasis, General Martin sets the parameters of influence of French nuclear power as follows:

It must be underscored that, contrary to certain affirmations, the objective aimed at is not disproportional to the means and resources of our country. It is not a question in fact of deploying a nuclear force comparable in volume to that of the two great atomic powers, which would be beyond our possibilities.

But that is not the objective. It is for us, in the game infinitely more subtle than a simple balance of forces, to have the means to inflict on the adversary, destruction at least of the same order and preferably superior to the benefit that he would gain from an occupation of our country.

The volume of our nuclear forces, or more exactly, our capacity for a nuclear strike, must therefore be not comparable to that of the enemy forces, but rather calculated in proportion to the stake which our country represents in the eyes of the enemy.¹⁶

Thus, we see that the French strategy for the defense of Europe differs rather sharply from American policy, which contemplates meeting a Soviet nonnuclear attack, even if it be "characterized" aggression, with a conventional defense—at least until a nuclear counter-offensive becomes necessary to prevent serious NATO reverses. At the root of this difference is the French (and generally European) conviction that any "characterized" aggression will inevitably result in serious reversals.

a controversial concept: stability through proliferation

To a less easily defined degree, one finds another difference between French and American thinking. The U.S. has a profound, almost emotional, commitment to nuclear non-proliferation. But there is a French view holding that the efficacy of nuclear weapons in the deterrent role requires several centers capable of making the terrible decision to loose nuclear war.

General Beaufre has developed this concept in great detail. It is a concept of pure deterrence, with almost no attention given to how nuclear operations would be conducted—and this is an important point, since General Beaufre accuses the United States of having devoted so much attention to the problems of

employing nuclear weapons that it has failed to appreciate fully the problems associated with deterrence.¹⁷

General Beaufre is concerned that the nuclear weapon in its deterrent role is in danger of losing its effectiveness. He points out that practically speaking the present nuclear environment is bipolar. He argues that the standoff has become almost complete, with the U.S. and the U.S.S.R. in agreement that almost anything is preferable to nuclear war; and he argues that this situation compromises the deterrent. Thus, says General Beaufre:

... if one of those opponents were to think that such weapons would not be used in any circumstances, the resulting situation would be even more dangerous, for there would then be the risk of the loss of the advantage of the stability which the mere fear of a nuclear conflict has imposed upon Europe. . . . That is why special efforts need to be made to preserve for nuclear weapons that capacity for engendering fear from which we have hitherto so greatly benefited.¹⁸

This leads General Beaufre to the conclusion that the world needs several centers of decision, each capable of initiating nuclear war, and that this condition would restore a desirable "state of uncertainty" in international affairs. Some interesting considerations follow from the Beaufre thesis. A French independent nuclear force, for example, serves the interests of France's allies. On the other hand, the multilateral force would not; it would not be an independent center of decision, since its employment would be decided ultimately by the United States.¹⁹

Beaufre's arguments expand upon ideas advanced some years ago by General Gallois. In October 1959 he noted the difficulty of making the American deterrent credible as concerns the defense of Europe. He suggested that the solution

... resides partly in a decentralization to the national level of certain nuclear arms. As soon as the thermonuclear guarantee accorded the Allied Nations becomes hazardous, the national level can impose itself. It is not necessary to have a powerful atomic arsenal, but a small supply, the effects of which, also small, the

aggressor will have to consider—with the limited benefits he would be able to realize from the use of force. . . . That is why a policy of decentralized deterrence, at the national level and founded on the possession of some nuclear weapons, could some day be added to a system of collective defense of which the American guarantee of nuclear intervention is the trump.²⁰

Quite clearly the Beaufre thesis holds that a degree of proliferation is desirable. But where does proliferation begin to become unacceptably dangerous? Beaufre argues that independent nuclear forces which are coordinated with one another (but not under a unified command, of course) simply augment the deterrent and that to this extent proliferation is a positive good. Furthermore, he says, possession of nuclear weapons by peaceful and responsible countries, such as Switzerland, Sweden, and the Netherlands, would not really add to the danger. Cuba, the United Arab Republic, and Indonesia present a totally different problem, Beaufre admits: "It is necessary to avoid putting matches in the hands of children."²¹ He insists that proliferation must eventually be arrested and argues that the nuclear powers will be able to enforce worldwide control through some kind of concert of nuclear powers.²² In the final analysis General Beaufre seems to consider that proliferation applies to those countries which do not have the capability of producing nuclear weapons in the near future.

AT A TIME when French policy is disrupting the NATO alliance and is in conflict with U.S. objectives elsewhere in the world, there is a strong tendency to react emotionally to every instance of Franco-U.S. difference. But it would be unfortunate not to treat objectively the differences in nuclear policy which are fundamental and which are not going to be reconciled by deploring them.

There is nothing the United States can do to keep France from continuing her construction of a nuclear force, and there probably never has been a chance to influence this course of action since General Charles de

Gaulle came to power in 1958. The objectives which De Gaulle has set for France make an independent nuclear force almost indispensable. If U.S. policy-makers were in the same political framework, it seems certain that they would decide upon the same kind of program.

Nor is there probably very much the United States can do now to influence French doctrine and strategy for the use of the French force, although it may be argued that there was a time when U.S. offers of technical and material assistance (such as was given to the British) would have permitted some bargaining. It may not be too late yet, because the U.S. could still save the French some of the immense costs of research and development connected with thermonuclear/ballistic missile systems, at practically no cost to the United States.

But assuming that French policy has been irrevocably determined, realism suggests certain courses of action. In the first place, it is essential to understand the French nuclear strategy (almost pure deterrence) and to real-

ize that it fits logically the French view of how to defend Europe (to deter war; that failing, to fight a nuclear war). And this strategy fits the nuclear resources of France (limited). Second, the United States must encourage French nuclear power to serve U.S. and NATO interests, to the extent that this is possible, through policy and operational coordination. Policy coordination should be possible through normal government-to-government channels. Operational coordination might be effected through the SHAPE representation to the U.S. Joint Strategic Target Planning Staff (JSTPS). The same machinery used to coordinate the nuclear effort of the Allied Command Europe could be used to coordinate the national forces of an ally.

In short, it would appear that it is time to accept the French independent nuclear force as a reality, to understand the French rationale and doctrine, and to try to make the French nuclear capability compatible with United States interests.

Hq United States Air Force

Notes

1. "La Dissuasion Française," *Revue de Défense Nationale*, June 1965, p. 993.
2. Général Ollion, "Comment Utiliser la Force des Armes l'Ere Nucléaire," *Revue de Défense Nationale*, July 1965, p. 1205.
3. General Pierre M. Gallois (Retired) discussed French nuclear weapons policy with Mr. Eric Sevareid of CBS in a television presentation, "Our Friends the French," 8 March 1966, 10:00 P.M. Eastern Standard Time. General Gallois, whose articles appear often in American periodicals, is a well-known authority on nuclear policy and strategy. He has had extensive experience on French and Allied staffs and has served as advisor to the French Minister of Defense.
4. Général d'Armée Charles Louis Ailleret, "Unité Fondamentale des Armements Nucléaires et Conventionnels," *Revue de Défense Nationale*, April 1964, pp. 568, 577.
5. Général d'Armée Aérienne André Martin, "L'Armée de l'Air dans le Contexte Nucléaire," *Revue de Défense Nationale*, October 1964, p. 1517.
6. General André Beaufre is the author of two important books on strategy, *Introduction à la Stratégie* and *Dissuasion et Stratégie*, which were recently reviewed in these pages; see Dr. Joseph W. Annuziata, "General Beaufre on the West's Need for Common Political Goals and a Common Strategy," *Air University Review*, XVII, 5 (July-August 1966), 53-59. Beaufre's articles appear frequently in both English and French language publications. He is particularly concerned with the problems of nuclear weapons in the deterrent role. He was formerly French representative on the NATO Standing Group and is now Director of the French Institute for Strategic Studies.
7. Martin, p. 1517.
8. Charles Louis Ailleret, "Opinion sur la Théorie Stratégique du Flexible Response," address at NATO Defense College, Paris, 26 June 1964, published in *Revue de Défense*

Nationale, August-September 1964.

9. *Ibid.*
10. Général Pierre M. Gallois, "Réflexions sur l'Evolution des Doctrines Américaines," *Revue de Défense Nationale*, July 1964, p. 1227.
11. "A Chacun sa Guerre," *Revue de Défense Nationale*, January 1965, p. 11.
12. Ailleret, address at NATO Defense College.
13. Général André Beaufre, "Dissuasion et Stratégie," *Revue de Défense Nationale*, December 1964, p. 1877.
14. *Ibid.*, p. 1878.
15. "La Dissuasion Française," *Revue de Défense Nationale*, June 1965, p. 990.
16. Martin, p. 1508.
17. Beaufre, "Dissuasion et Stratégie," p. 1877. It is interesting to note Beaufre's conclusion that the United States has not given sufficient attention to the deterrent role of nuclear weapons but rather has concentrated on the question of employment of nuclear forces in war. Partly to this fascination with the problems of wartime operations does Beaufre attribute the American refusal to grant to her allies any meaningful sharing of nuclear responsibilities. While most Americans would deny Beaufre's allegation, it must be conceded that the problem of sharing nuclear responsibilities is a serious one and one which has exacerbated our relations with the French.
18. André Beaufre, "The Sharing of Nuclear Responsibilities: A Problem in Need of Solution," *International Affairs, a Quarterly Review*, London, July 1965, p. 415.
19. Beaufre, "Dissuasion et Stratégie," p. 1877.
20. Pierre M. Gallois, "L'Équilibre par la Terre est Stable pour l'Amérique mais Précaire pour l'Europe," *Forces Aériennes Françaises*, October 1959, p. 578.
21. Beaufre, *Dissuasion et Stratégie* (Paris: Armand Colin, 1964), p. 109.
22. *Ibid.*, p. 110.

AERONAUTICAL GERIATRICS

COLONEL I. R. PERKIN



On 29 January 1966 the following item appeared in an industrial trade journal:

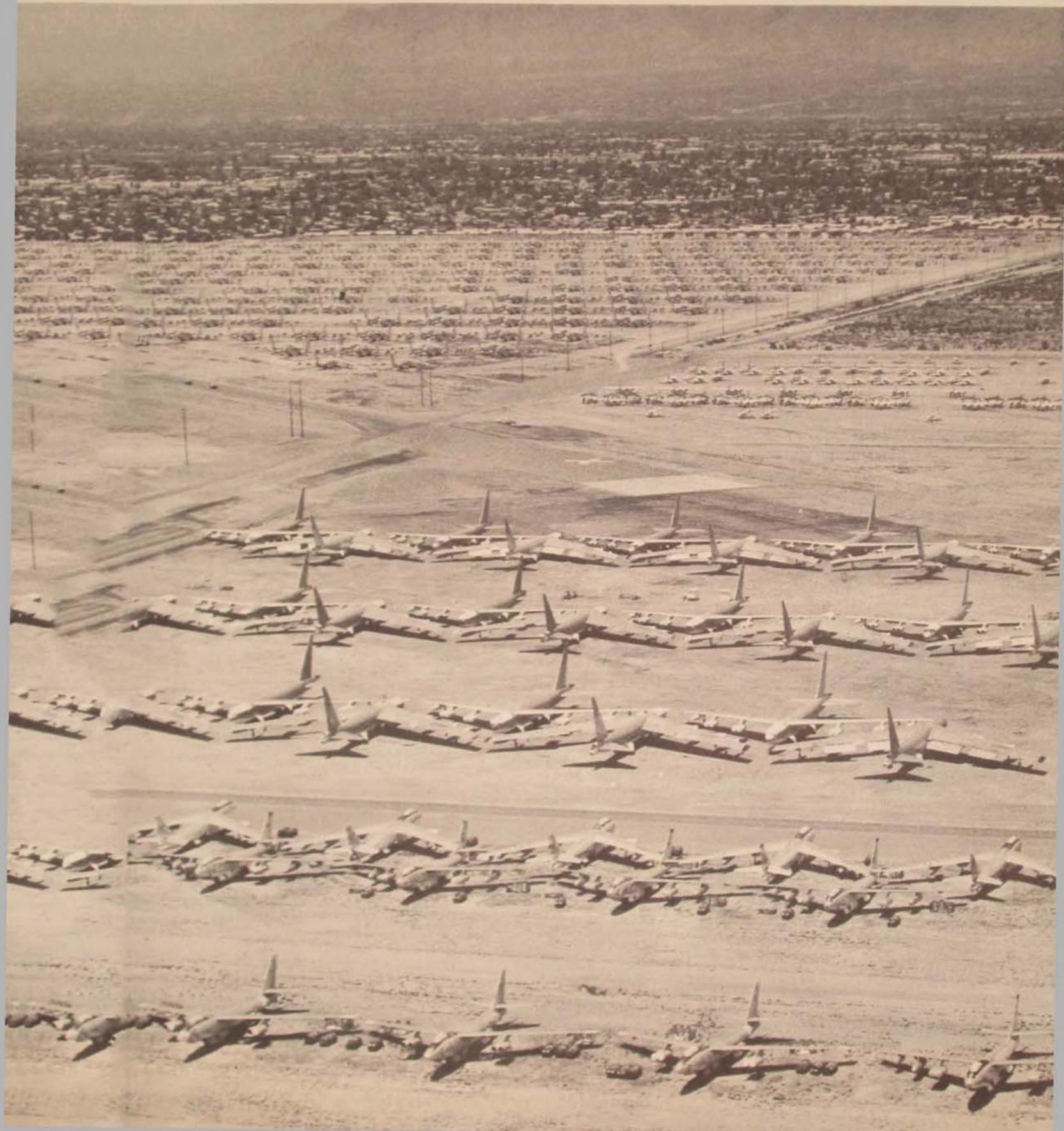
Air Force planners are conceding that the 350 B-52's and 80 B-58's which will be phased out in the next few years will serve no better purpose than a junk yard in the desert, probably at Davis-Monthan Air Force Base in Arizona. The aluminum, titanium and stainless steel airframes could go to the scrap aluminum smelters.¹

Maybe so. But there will be some raised eyebrows in southern Arizona if it actually turns out that way. In fact, if one were to ask the personnel of The Military Aircraft Storage and Disposition Center (TMASDC) about this glib story of bomber disposal, the reaction might well be: "Nothing could be further from the truth!" For they know what will happen if and when the B-52's and B-58's come to this desert storage center of the Air Force Logistics Command. They know that in all probability the aircraft will be preserved, cared for, husbanded, cycled back to operational use if needed, or utilized as parts banks. *Only* after exhaustive investigation and soul searching will they be dismantled and salvaged in such a manner as to produce a maximum dollar return. In other words, as pre-eminent practitioners of the evolving science of aeronautical geriatrics, they take sharp exception to the accusation of running a "junk yard." They know better.

To speak of their job as managing an on-the-shelf stockpile of residual aircraft—i.e., auxiliary air power—would more aptly describe their role, for in truth this is really what the USAF is accomplishing at its vast, sprawling, 3000-acre storage center near Tucson, Arizona. And it is Department of Defense air power, since storage and disposal responsibilities for Army



In the main storage area at The Military Aircraft Storage and Disposition Center (TMASDC), Davis-Monthan AFB, near Tucson, Arizona, nearly 4000 Air Force, Navy, and Army aircraft are stored. Since 1946, over 14,400 aircraft, valued at more than \$9,300,000,000, have been reclaimed, used for parts, or kept in flyable storage.



and Navy aircraft as well are now being consolidated at Davis-Monthan AFB. The Air Force is responsible for executive management of the overall centralized operation.

It is true that past events may have warranted the "junk yard" or "bone yard" image. Stacks of World War II aircraft, aluminum smelters, and piles of ingots did create the impression that consignment to Davis-Monthan was the end of the line for obsolescent, no-longer-needed aircraft. And many a veteran B-17, B-24, P-47, B-29, and B-36 met this fate. They were melted down because, after serviceable parts had been removed, there simply was no further use for the remaining carcass. The recovered metal was sold to steel mills for use as aluminum chloride in deoxidizing processes, or to the automotive industry for use in pistons, grills, engine blocks, etc., which benefit from the strength and lightness of aluminum. Beyond question, some of the material also found its way into the housewife's pots and pans.

However, bitter lessons learned since Korea, along with the remarkable "staying power" of many aircraft, dictate a new approach to managing nonactive inventory aircraft. Time and again the ability to reach into diverse stockpiles of old bombers, trainers, cargo carriers, and reclaimed usable parts has paid off. Most important, the new approach permits options which are invaluable in terms of insurance against unforeseen requirements—options in consonance with a national policy that stresses a strategy of flexible response.

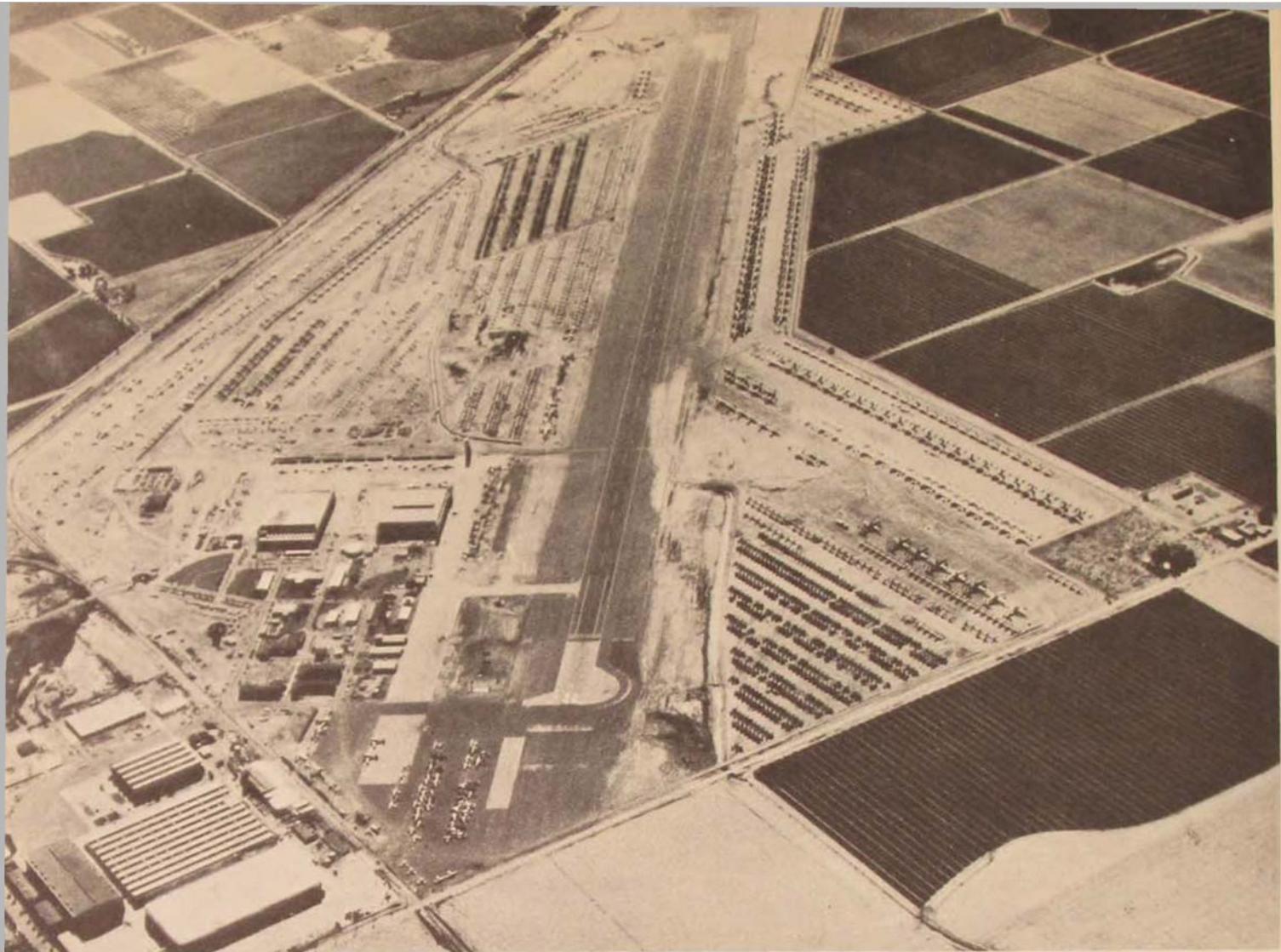
Here are some pertinent statistics. For the six-month period November 1965 to April 1966, aircraft with an original cost of over \$161,000,000 were withdrawn from storage and returned to the active inventory. In terms of *replacement* costs, this figure might be double. The overriding logistic consideration, however, is that these aircraft were on-the-shelf, readily available.

Parts are removed and made available for use. Serviceable tires are returned to supply; condemned ones are used during storage and desert movement. Low-time J-57 engines (right) removed from stored B-52 Stratofortress will replace Guam-based engines needing overhaul.



B-52 Stratofortresses declared excess to Strategic Air Command needs receive extensive processing prior to mothballing.





By July 1967 all storage operations at Litchfield Park Naval Air Station (above), near Phoenix, Arizona, will be consolidated at Davis-Monthan, where in Operation Cabbage Patch Navy and Air Force engineers (below) are testing techniques for optimum storage under desert conditions.



And, during this same six-month period, over \$26,000,000 worth of engines and parts were reclaimed for the active inventory.

If we consider the time period FY 62-66, the figures become even more meaningful. Over one billion dollars worth of aeronautical material was salvaged, returned to the inventory, or reclaimed. During this period, operating costs of TMASDC amounted to some \$25.5 million, a return of almost forty to one. And there is a good chance that the ratio will improve when consolidation of Army and Navy storage operations is completed.

Currently, TMASDC has custody of over 3800 aircraft. Projections for the next few years will raise this figure. Of the present crop, approximately 60 percent are preserved for possible future use, 30 percent are serving as parts banks and are in various stages of dismantlement, and the remainder are shells or hulks awaiting final disposition.

The uses to which surplus aircraft and parts are being put are many and varied. The Department of Agriculture, for example, received six C-45's and one C-47, along with special-purpose equipment, for use in an experiment to halt inroads of the screwworm fly from Mexico into the southwestern states, where range cattle were being affected. Male flies are sterilized by exposure to cobalt rays and then airdropped in boxes that open on ground contact. The border area stretching from the Gulf of Mexico to the Pacific Ocean was "treated" with these sterilized male flies to arrest and curtail propagation of the species.

In another instance the Indian government asked for help in constructing the Rajasthan Canal, which is located in a desert area. A thousand two-wheel excavation carts were needed that would not sink into the sand and could be towed by camels. To support the request of the Agency for International Development, TMASDC provided wide-tread airplane tires, wheels, and axles for building simple yet effective "sand buggies."

The greatest veteran of them all—the C-47—has come out of desert retirement for a most unusual job as an attack-cargo (AC) aircraft in Vietnam. Dubbed "Puff the Magic Dragon," it has been equipped with three 7.62-mm miniguns, each with a 6000-round capability. These 18,000-round-per-minute Gatlings, mounted on their low- and slow-flying platforms, comprise a devastating firepower system when used in a ground support role.

Surplus B-47's are shedding some of their armament for Vietnam operations. Through a cross-servicing agreement, one hundred 20-mm machine guns were stripped and key components shipped to Rock Island Arsenal for use on like armament mounted in Army Chinook helicopters.

A recent reclamation program paid high dividends that may well be an augury of things to come. The first reclamation job managed by the USAF for the Army recently yielded well over a million dollars worth of aircraft parts, almost half of which went to meet Air Force and Navy requirements.

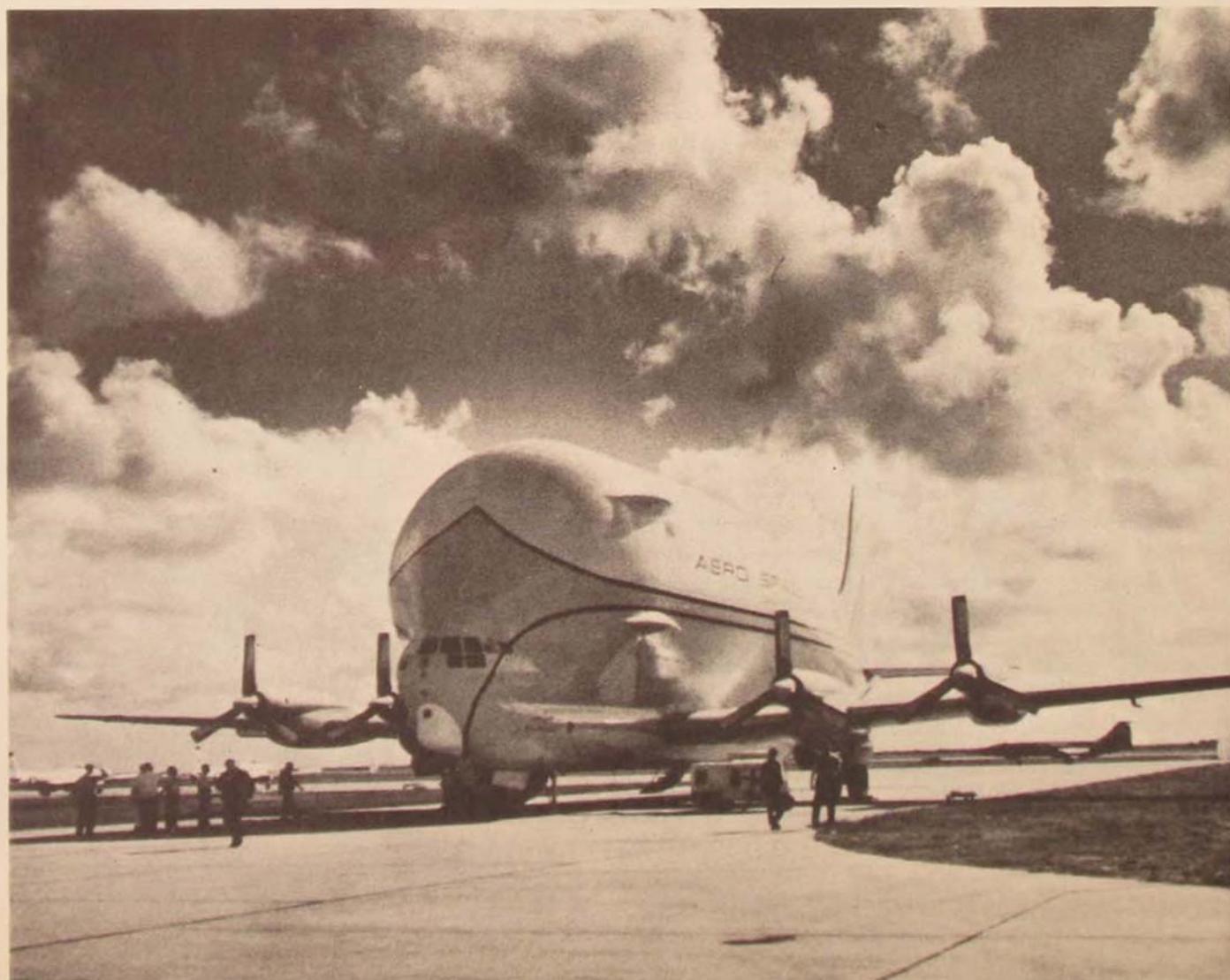
The list goes on and on: two KC-97 carcasses for use in a research project involving an orbiting space station — a C-54 to



The venerable C-47, recalled from desert retirement to a new career in Vietnam, has been redesignated the AC-47 (popularly the "Dragon-ship" or "Puff the Magic Dragon") and armed with three 7.62-mm cannons for its latest role, providing ground support against the Viet Cong.



This C-124 Globemaster has been modified for use as an aerial test bed for jet engine development. Originally costing \$1,646,406, it was consigned to the desert for reclamation and has since yielded \$1,423,864 worth of parts (acquisition cost) to keep active fleets flying.



H-43 Huskies are prepared for over-land shipment to a repair and modification center. Helicopter storage at TMASDC is on the increase as Air Force and Army inventories grow.



The "Pregnant Guppy," which was constructed from excess C-97 Strato-cruiser-type aircraft, is designed to haul large-diameter missile parts.

NASA for satellite ground-station calibration, another to the Army in support of the Nike-X program — a C-121 from storage to NASA for downrange instrumentation checking — aircraft parts to the North American Aviation Company for an experimental "hoverbuggy" — twenty-five J-73 engines to support F-86's of an Air Force Military Assistance Program. The bonanza in the desert keeps yielding returns, limited only by imagination and knowledge of resources.

In large measure, this bonanza is made possible by the favorable weather conditions. The benign desert environment, with its low moisture and low acidic soil content, is ideal for aircraft storage. Conditions in southern Arizona are not unlike those of Cyrenaica in Africa, where the B-24 *Lady Be Good* was found. This World War II bomber, which went down in 1943, remained in a remarkable state of preservation after sixteen years of exposure to the elements.

Generally, preparation for desert storage by TMASDC follows an engineered sequence involving safetying (removal of armament, initiators, etc.), removal and storage of loose equipment, and preservation of engine and fuel and oil systems. Openings and ports are sealed, and acrylic surfaces are sprayed. Under current aircraft storage procedures, complete cocooning is unnecessary—in fact it has been found to be impractical, expensive, and inefficient.

Essentially, the reverse procedure takes place when aircraft are withdrawn for active service. The airplane is depreserved, washed, and cleaned; equipment is replaced; functional checks are made of all systems; and the entire aircraft is readied for flight test. All flyaways receive a complete flight check prior to release to ferry pilots for what is usually a one-time flight to an appropriate refurbishment facility.

Many of the civilian employees at TMASDC (over a thousand) are former servicemen, and their eyes light up when they recognize an old bird on which they worked while in uniform. Their stored knowledge is invaluable; it has contributed immeasurably to the outstanding flight safety record maintained by the center since its inception in 1946. Some one hundred military personnel are also assigned. They are interspersed throughout the organization for management control and surveillance.

Consolidation with the Navy, whose like facility at Litchfield Park, Arizona, will close by 1 July 1967, is on schedule. While the merger has progressed unusually well, some problems have arisen due chiefly to differences in service technical orders dealing with preservation methods and procedures. These are honest differences, since the current Air Force methodology involving preservation and storage was arrived at independently, whereas the Navy's concern was directed primarily at salt-water and salt-air corrosion.

To reap the benefits that can be achieved by a common

approach, as well as to settle controversial issues, we set up an environmental test program, Operation Cabbage Patch, in October 1965. Ten representative aircraft are now undergoing extensive tests. Some are preserved in accordance with Navy procedures, others in accordance with Air Force directives. This comprehensive look-see (including airframes, fuel cells, engines, pumps, regulators, landing gear, propellers, etc.) is expected to yield conclusive results on the "best" way to do the job. All aspects of Operation Cabbage Patch are controlled by a joint Air Force-Navy team of qualified engineers, and expectations are high that findings will contribute significant economies and efficiencies to the state of the art of storage and preservation technology.

A dynamic, vigorous approach to this technology is strongly indicated. Sophisticated aircraft with delicate electronic guidance and control systems will require special handling. Experience indicates, however, that time, money, and effort spent on this science of aeronautical geriatrics pay substantial dividends in terms of latent air power. The growing reserve air fleet resting on the Arizona desert is truly a national resource.

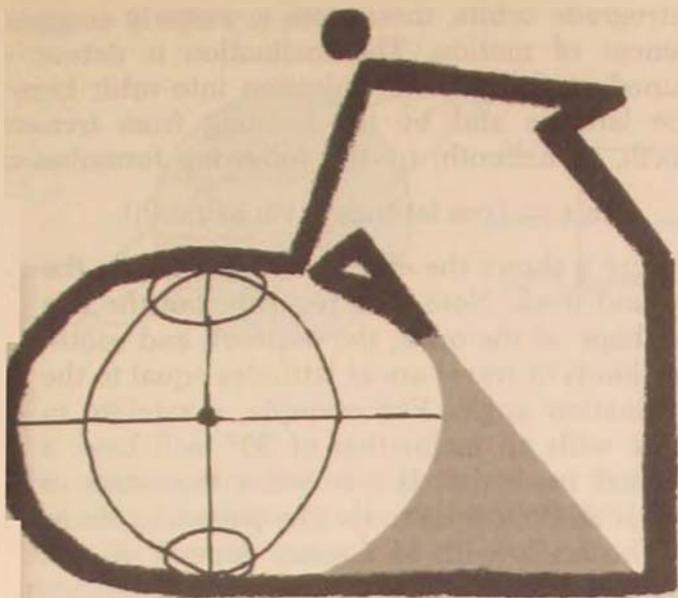
One thing is certain—not in concept, mission, or operation does The Military Aircraft Storage and Disposition Center qualify as a "junk yard." For old airplanes, like old soldiers, never die; they just fade . . . and fade . . . and fade . . .

The Military Aircraft Storage & Disposition Center

Note

1. "Disposal of 350 Old Bombers for Scrap," *Waste Trade Journal*, 29 January 1968, p. 9.





SATELLITE GROUND TRACKS

MAJOR EDWARD P. MAZAK, JR.

THERE is little doubt in the minds of most military men that space will become an increasingly vital area for military operations, even though the future scope of these operations cannot be completely defined. The present usefulness of military space systems is based predominantly on the ability to perform such essential military functions as warning, weather reporting, command and control, and communications. If these tasks are to be accomplished in the most efficient manner, a thorough knowledge of the factors that describe and limit the ground track of a satellite is required. For successful operations, the military space planner must be able to select the orbital parameters that establish the proper relationship between the satellite and the ground.

The purpose of this article is to identify the factors that influence the ground track of an earth satellite and to indicate the varieties of tracks available to space planners. The most effective use of space as an arena of military operations requires that the mission parameters be carefully selected so that the satellite ground track is the optimum path.

What is a ground track?

There is considerable difference between

the flight paths of aircraft and those of satellites. The aircraft has an infinite variety of paths available to it, limited only by the capabilities of the machine and the pilot. Needless to say, the ground track of an aircraft flight path is similarly unrestricted. The flight paths available to a satellite, in unpowered orbital flight, are much more restricted.

Bodies in orbit move in accord with the laws of Kepler and Newton. Excepting satellites that escape from the earth's gravitational influence, there are only two types of paths for a satellite—the ellipse and the circle. Further, these orbital paths are in a plane containing the center of the earth. (Figure 1) For elliptical orbits, the center of the earth is a focus of the ellipse; for circular orbits, the center of the earth is the center of the orbit. Of course there is an infinite number of planes that contain the center of the earth; therefore, an infinite number of orbits is possible, irrespective of the two-dimensional characteristics of the path. The point is that orbital paths must be examined in three dimensions: the size and shape of the orbit within the orbital plane and the location of that plane with respect to the earth.

The ground track of a satellite can be most readily visualized if it is assumed that a line, called the radius vector, exists between

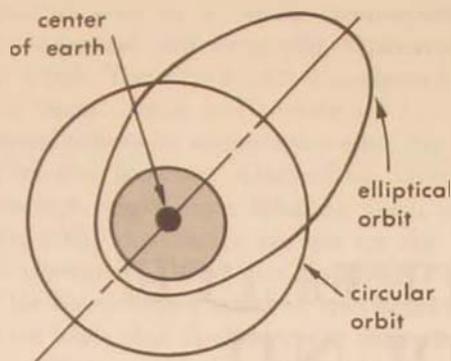


Figure 1. Orbital paths

the satellite and the center of the earth. As the satellite moves in its orbit, the intersection of the radius vector with the surface of the earth will trace the ground track for that particular orbit. To ascertain the exact shape of the ground track involves the instantaneous comparison of the speed of the satellite with the speed of the point on the earth directly below. This comparison is not always obvious or intuitive. Fortunately, the general characteristics of the ground track can be determined by examining the parameters that affect the relationship between the speed of the satellite and earth below.

parameters that influence ground tracks

There are five parameters that must be controlled to define the ground track of a satellite: inclination, period, eccentricity, argument of perigee, and injection point. Their combined effects must always be considered by the space mission planner if the optimum path is to be achieved.

Inclination. The plane containing the orbit is referenced to the earth's equatorial plane. The angle between these planes is defined as the inclination angle of the orbit, i . When $i = 0^\circ$ the orbit is in the equatorial plane; when $i = 90^\circ$, a polar orbit exists. Inclinations between 0° and 90° refer to prograde orbits, those with an easterly component of motion; inclinations between 90° and 180° refer to

retrograde orbits, those with a westerly component of motion. The inclination is determined at the point of injection into orbit by the latitude and by the heading from true north, or azimuth, by the following formula:

$$\cos i = (\cos \text{latitude}) (\sin \text{azimuth}).$$

Figure 2 shows the effect of inclination on the ground track. Note that, regardless of the size or shape of the orbit, the northern and southern limits of travel are at latitudes equal to the inclination angle. For example, a satellite in orbit with an inclination of 30° will have a ground track that lies between the limits of 30° N and 30° S latitude. The particular shape of the track will, of course, depend on the other factors involved.

Period. The period of a satellite, P , is defined as the time it takes to complete one orbit in inertial space. As deduced by Kepler in the seventeenth century, the period is a function of the semimajor axis of the orbit, a , or, more simply, one-half the distance between apogee and perigee.

$$P = k(a^{\frac{3}{2}})$$

where k is a constant.

If the earth did not rotate, it would be a simple matter to sketch any ground track. In the general case, except for orbits in polar or equatorial planes, they could be represented by a sinusoid, with successive orbits reproducing the exact same ground track. The depiction of ground tracks is complicated by

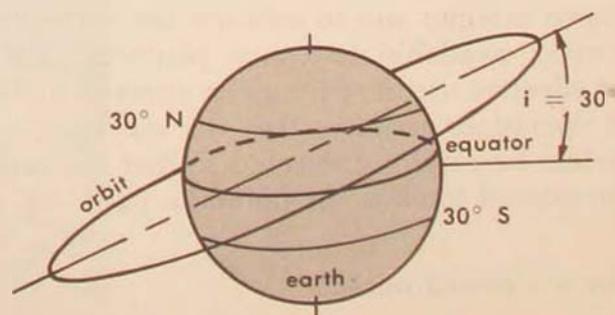
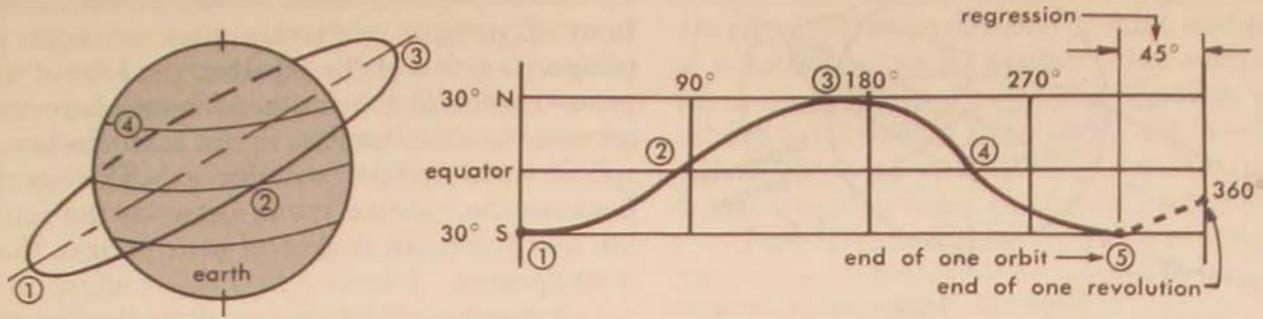


Figure 2. Effect of inclination

Figure 3. Effect of period



the obvious fact that the earth rotates to the east at a constant angular velocity of 15° per hour. Further, as a result of this rotation, the instantaneous easterly speed of a point on the surface of the earth varies with latitude. Maximum speed occurs at the equator, and the speed decreases to zero at the poles.

Thus the effect of period on the ground track is to reduce the easterly travel over the earth (for posigrade orbits) during each orbit by the amount of earth rotation occurring in the same time span. If a satellite is in a circular orbit with an inclination of 30° and has a period of 3 hours, it will complete one orbit at an earth longitude 45° west of its injection point. (Figure 3) This 45° is the amount of earth rotation to the east in the 3 hours it took to complete the first orbit. Ground tracks of each successive orbit would also regress 45° to the west. Only when the satellite crosses the

original line of longitude has it actually circled the earth or completed a "revolution"; thus a revolution is longer than the period for posigrade orbits.

As the period of the satellite increases, the loops of the sinusoid curve are further compressed to the west. If the period is 23 hours, the regression to the west is $23 \text{ hrs} \times 15^\circ/\text{hr}$ or 345° . (Figure 4) Thus the ground track progresses through only 15° of earth longitude during each 23-hour orbit. If the period of the satellite is equal to the earth's rotational period, ≈ 24 hours, the ground track is a closed curve which is repeated on successive orbits. For circular 24-hour orbits (Figure 5), which occur at an altitude of 19,360 nautical miles, the closed curves resemble a figure eight, the size of the loops determined by the inclination of the orbital plane. If the orbit is in the equatorial plane, a true earth synchronous orbit exists, and

Figure 4. Twenty-three-hour-period orbit

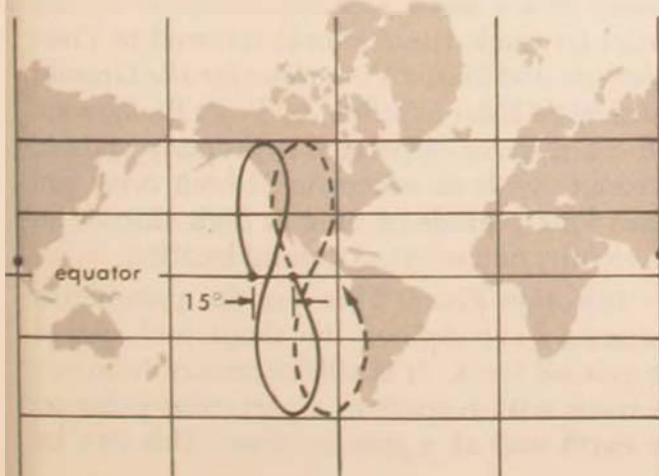
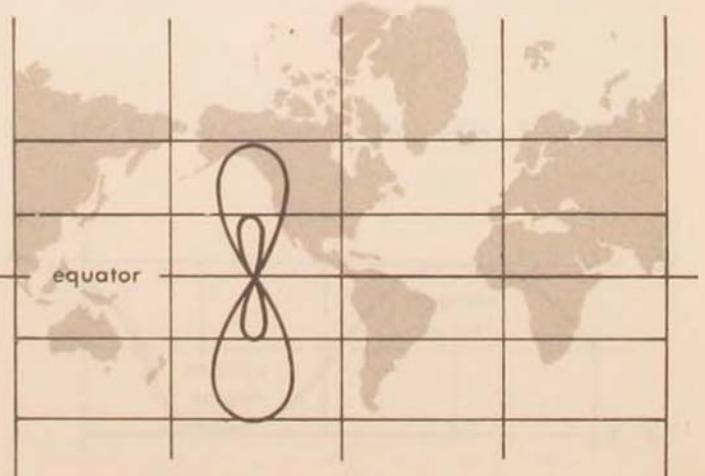


Figure 5. Twenty-four-hour-period circular orbits



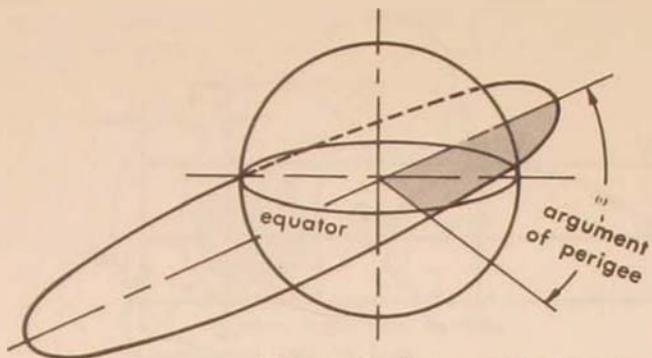


Figure 6. Argument of perigee

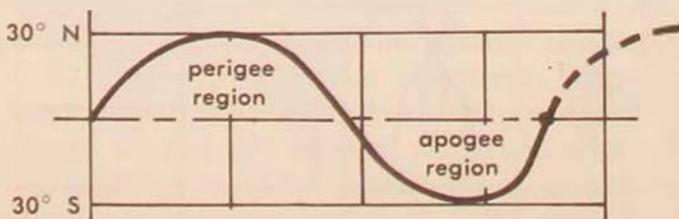
the ground track will be a "spot" on the equator.

Eccentricity and Argument of Perigee.

The eccentricity, ϵ , of an orbit is descriptive of its shape and indicates variance from a circle. Values of eccentricity range from 0, for a circle, to numbers approaching 1, for highly elliptical orbits. The greater the value of ϵ , the more eccentric is the ellipse. When the orbit is elliptical, another factor must be considered, the location of perigee. The point of perigee is specified by measuring an angle, ω , the *argument of perigee*, in the orbital plane from the intersection of the orbital plane and the equatorial plane to the point of perigee. (Figure 6) The values of ω range from 0° to 360° .

The combined effect of these two parameters, ω and ϵ , results from the changing speed of the satellite in elliptical orbit and the relation of that speed to the earth below. As satellites have higher speeds at perigee and lower speeds at apogee, the shape of the basic ground track, sinusoid or figure eight, is modified. If perigee is located on the equator, i.e., if $\omega = 0^\circ$

Figure 7. Elliptical 3-hour orbit: $i = 30^\circ$



or 180° , the paths above and below the equator are symmetrical. (Figure 7) But for other locations of perigee, symmetry does not exist. If perigee is north of the equator, the lobe of the ground track in the northern hemisphere will increase in size; the lobe in the southern hemisphere (near apogee) will decrease. This occurs because the relative speed between the satellite and the earth is greater near perigee than near apogee.

A similar effect occurs with the ground track of 24-hour-period satellites. In general, an eccentric 24-hour orbit with perigee *not* on the equator will produce an unsymmetrical closed track of the figure eight type, with the smaller loop in the hemisphere containing apogee. (Figure 8) Certain combinations of eccentricity, ϵ , and argument of perigee, ω , produce ground tracks that do not exhibit characteristics of the figure eight but are simple closed curves

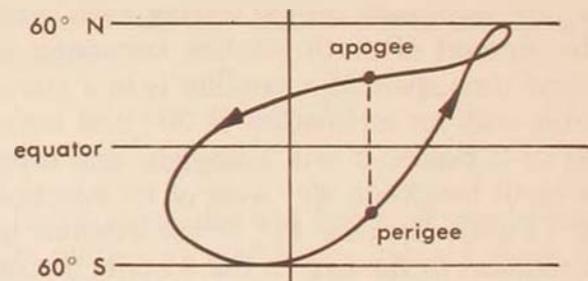


Figure 8. Elliptical 24-hour orbit: $i = 60^\circ$, $\omega = 315^\circ$

in which the small loop near apogee has disappeared. For a more detailed treatment of this particular track, the reader is referred to *Time Relations and Shape Variations for the Ground Track of 24 Hour Satellite*, by Peter Bielkowitz. If the argument of perigee is properly chosen, a satellite with an eccentric 24-hour orbit can spend long periods of time at high altitude in the vicinity of a selected ground location.

Injection Point. Thus far the parameters discussed have defined the shape and size of the ground track. It is still necessary to locate the track with respect to a particular point on the earth and at a specific time. This can be

accomplished by careful selection of the point and time of injection of the satellite into orbit. At injection (or burnout), the characteristics of the orbit are completely determined (unless, of course, in-space maneuvers are later to be executed), and the exact ground track can be plotted by many different techniques.

THE GROUND TRACK of a satellite is completely determined at the time of injection into orbit by the speed, altitude, location, and heading of the vehicle. However, visualization of the ground track by examining these complex parameters is difficult. Consideration of the five factors presented in this article—inclination, period, eccentricity, argument of perigee, and injection point—provide the space planner with an approach that will permit a rapid estimation

of the shape of the ground track and its relation to the surface of the earth. If exact ground paths are required, more detailed graphic and analytic techniques can be applied. One such method is included in *The Space Planners Guide* recently distributed throughout the Air Force. All methods of determining satellite ground tracks must consider the factors listed herein.

For the near future, the value of most military space systems will be related to their carefully selected paths over the surface of the earth. It is important that military planners recognize that, although the orbital paths of satellites are limited to circles and ellipses, the ground tracks resulting from these orbits are endless in variety and are selectable by the planner. An appreciation of the factors that influence ground tracks will assist in achieving the most effective use of our space systems.

Warfare Systems School, AU

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Air Operations in Viet Nam



THE AIR FORCE ENGINEER'S PROBLEMS IN SOUTHEAST ASIA

MAJOR GENERAL R. H. CURTIN

WE SOMETIMES fail to realize that the major Air Force missions in Southeast Asia are largely supported by a base structure that was substantially developed by, or at least initiated under, early Military Assistance Programs. The tremendous expansion of our force structure overnight has forced us to crowd as many missions as possible onto the existing bases. We have resorted to crash programs of all types to realize the needed basic facilities at as early a date as feasible. Key installations have all felt the impact of the rapid expansion.

A close relationship exists in the Air Force between base facilities and mission accomplishment. This is clearly demonstrated in Southeast Asia (SEA), where our Civil Engineers face the tasks of keeping what they have going at maximum effectiveness; doing all they can "in-house" to meet urgent unforeseen facility needs by modification, improvisation, and new construction; and working with construction agents (Navy ORCC's, Corps of Engineers divisions and districts, and Army Engineer Construction units) to site, design, and build major new facilities for the Air Force. Special consideration will be given here to the first two tasks, since the major construction program

has already been widely noted elsewhere.

Manpower resources providing complete Civil Engineer support to the Air Force include:

- (a) the Base Civil Engineer (BCE) as the key or focal point;
- (b) the Base Civil Engineer work force of PCS personnel, supplemented by local hire;
- (c) a *Base Engineer Emergency Force*, designated "Prime BEEF," under which small, select, highly qualified teams are deployed to SEA on temporary duty; and
- (d) Heavy Repair Squadrons organized under the code name "Red Horse."

The Prime BEEF teams are manned and equipped to do specific preselected tasks at identified bases. To the extent possible, design and procurement of materials are completed in advance of the team's arrival so it can hit the job running and get the most out of the 120 days TDY.

The first two Red Horse squadrons of 400 men each, capable of horizontal and vertical construction and repair work, were recently deployed to the Republic of Vietnam (RVN).

A major element of the total force, often overlooked, is the Air Force Civil Engineer's fire protection and crash rescue activity. In SEA,

this task takes on expanded significance. The density of facilities, the tempo of wartime operations, and recovery of battle-damaged aircraft make this facet of the engineer's job challenging and hazardous. The 500 Civil Engineer firefighters on the job in SEA man some 115 pieces of heavy firefighting equipment as well as augment the crews of the H-43B helicopters used for crash rescue. The courage and professionalism of this group of men have repeatedly paid off in lives and materiel saved.

BCE general problems

The great and rapid expansion of the existing bases has saturated our facilities and overloaded the utilities. There has been little chance to really master-plan. In general, numerous tenants, often unexpected, have simply entered into a kind of "dog eat dog" competition for allocation of the limited land and facilities available. From the start, the expansion of the mission has outpaced plant growth. Therefore today the Base Civil Engineer still has the major problems of power, housing, water and waste, dust and foreign-object control, and petroleum, oil, and lubricants (POL) and ammo storage. Let us consider each of these problems briefly.

Power. In the initial period, we felt that our prime and backup electrical power needs could be met by units of 200 kilowatts and smaller. The resultant shipment of a multitude of makes and models included high-speed units designed only for a backup power role. The mushrooming power requirements necessitated a more flexible approach to the problem. In July 1964 we had 255 units in the 5- to 150-kw range in SEA; by January 1966 the number had grown to over 900. More will be required—possibly a doubling of this number—because major power plants simply cannot be programmed and constructed overnight. In the large generator area, we initially relied on some 30 to 35 200-kw units to meet our needs. Today we have 45 of the 200-kw size, 140 of the 500-kw size, and 44 of the 1000-kw units. It is now evident that we must plan to continue filling a considerable gap with small units after these major plants are in operation.

The power problem is and will continue to be a nightmare until our large central power plant construction is much further advanced. Meantime the Base Civil Engineer must rely on the multitude of smaller units, with their attendant operation and maintenance problems. He is often forced to ration power and restrict new uses as much as possible. A related problem is that of the distribution system, where overloaded lines and transformers are a reality of everyday business. Our present construction program will do much to ease this situation, mostly through the installation of major power plants.

Housing. As added operational and support units have been placed "in-country" and adjustments made in deployments, a major problem facing the BCE has been the job of "bedding down" personnel. Generally there has been very little reaction time, and tents are still the principal recourse. For the longer pull we resort to the "hootch," a light-frame one- or two-story structure that goes up fast and is relatively cheap. Our BCE and Prime BEEF teams have become very proficient at this sort of construction work. At Tan Son Nhut the BCE has erected the equivalent of over 125 hootches (each 20' x 100') in the past year. Recently a Prime BEEF team on TDY to SEA, headed by a Civil Engineer second lieutenant, set quite a record: Manned by 29 airmen and employing some 240 local nationals, this team built a 1250-man single-story frame camp—a turn-key job, including roads, walks, light, water, latrines, and sewer—in less than four months. This project involved about 95 separate buildings of some 160,000 square feet.

The upgrading of quarters presents a continuing problem. Lumber of marginal quality and the need for speed dictate attention to longer-term maintenance, repair, and possible replacement problems. Progress is being made, and this year should see a substantial improvement in our position.

Water and Waste. The vast increase in the need for potable water has also produced problems. Locating sources, which frequently means drilling a well, is difficult. Pumping equipment, treatment plant, and storage facili-

Prime BEEF

Thirty-man Base Engineer Emergency Force (Prime BEEF) crews, deployed to Vietnam on 120-day duty tours, have done a notable job of constructing steel revetments at Tan Son Nhut, Bien Hoa, Da Nang, filling them with sand from old revetments.



ties have not kept pace with growing requirements. Thus over half our bases in RVN still have a major water problem, though our Red Horse well-drilling units are bringing it under control. Soon water will no longer be the serious concern it has been.

Coupled with the problem of water supply is waste disposal. Without adequate water, the BCE has had to resort to pit latrines and burning. In the tropics at fixed installations with crowded conditions this constitutes a serious sanitation problem requiring close attention. Waterborne sewage is the only effective answer, but this will be possible only with the development of adequate water systems and completion of major sewage-disposal construction projects.

Dust and Foreign-Object Control. Many bases have unpaved roads and open areas that have been cleared of vegetation. During the dry weather there is a serious dust problem, which is aggravated by heavy traffic. This is a considerable annoyance to personnel and a real problem in the maintenance of aircraft and other sensitive equipment, virtually in the open. Paving and dust palliatives have reduced

the problem somewhat, but the real answer lies in more extensive paving and planting. The paving of roads and other areas has, to date, taken a backseat to airfield construction, however, and this order of priority will remain for some time to come. At sandy locations, wind-blown sand creates an even more severe problem, again requiring paving and planting. Cover planting is receiving more attention as BCE management takes hold.

Congestion and activity have made the control of foreign objects on airfield pavements a pressing one for the BCE. Rotary and vacuum sweepers had to be pressed into early service to cover all aircraft-movement areas, and they are now working at full capacity to minimize jet-engine damage from foreign objects. The loss of combat capability resulting from foreign-object damage has to be reduced. The Base Civil Engineer has a key role in this program of relentless preventive measures.

POL and Ammo Storage. We are still relying heavily on the "bladder" systems for on-base POL storage, with aircraft generally being refueled by trucks. The bladder system was designed as an air-transportable hydrant fueling system to furnish refueling support to Air Force strike units in forward areas. The entire system can be transported in one C-124 aircraft and placed in full operation within eight hours by an experienced crew.

As presently used in SEA, a system consists basically of eight 50,000-gallon bladders, two 600-gallons-per-minute turbine pumps, and two water-separator dispensing carts with connecting hardware. The system weighs approximately 35,000 pounds. The 50,000-gallon bladder is of two-ply nylon fabric impregnated with synthetic rubber and measures 62'6" long by 24' wide. When filled, it is approximately 5½' high.

At new bases, this system is the main on-base storage as well as the only dispensing system for servicing aircraft. A bladder system of this type can be supplied by pipeline, truck, or drums, and additional bladder tanks can be added as required. These field systems, intended for short-term use, pose heavy operation and maintenance problems for the BCE, but they have been "lifesavers." We are using

10,000-barrel bolted-steel tanks and some welded tankage for early backup storage in our follow-on replacement of the bladders. As this program advances, we will be in an improved position and able to provide better service with less operations and maintenance effort.

One of the first impacts of our current operations in SEA was an urgent requirement for facilities to store bombs and ammunition. The difficulties in finding convenient sites that would meet the stringent explosives-safety considerations and then in getting access for construction have been serious bottlenecks. We have had to improvise in many cases, and to date operations have been supported mainly with interim facilities. We look forward to completion of more permanent facilities before 1967.

BCE technical problems

Until now, the BCE in SEA has really had to scramble to keep up. In doing so, his major effort has gone into improvised utilities and new construction. Capability has just not been available for tackling the day-to-day maintenance problems, which have grown more and more critical. Moreover, management has not kept pace with the growth of the BCE organization and is a serious problem today.

Operational tempo has, for the most part, precluded any but the most essential repairs to airfield pavements. Three of the airfields in RVN are among the world's busiest airports in daily aircraft movements. High volume and essentially round-the-clock operations hardly permit inspection, let alone preventive and routine maintenance as we know it at home bases. This means that extensive maintenance/repair capability must be in-being, on site, to take full advantage of the limited time when pavements can revert to the BCE for work.

The list of Civil Engineer problems in SEA would not be complete without mentioning several others:

(a) The large quantities of refrigeration and air-conditioning equipment introduced to support critical materials and processes have brought significant maintenance and repair problems, plus increased power requirements.

(b) Corrosion as a problem is primarily associated with exposed metals—pipes, tanks, buildings, etc. An extensive program of protective-coating application must be incorporated as part of day-to-day maintenance. Here, again, time is an impacting factor: what is good enough for a short haul is not necessarily suitable for the longer pull.

(c) Many of the major drainage structures in SEA were hastily conceived and built. A high water table, coupled with fairly level airfield terrain, makes surface drainage a real problem. The rapid buildup of bases, with attendant expansion of impermeable surfaces, compounds this problem. Maintenance, repair, and rebuilding of drainage structures, preferably prior to monsoon or other wet weather, are high-priority BCE tasks. Here, again, management is a critical factor, for if the problems are not recorded during the monsoons the next BCE will face them again and without prior planning.

Prime BEEF

One can readily appreciate that the BCE, on a base with 75 to 150 USAF aircraft and some 3000 to 5000 USAF personnel, plus a like number of VNAF and U.S. Army aircraft and personnel, is a busy man. The scope of his responsibilities is vast, as is the importance of his job to accomplishment of the Air Force mission. No wonder, then, in SEA when one encounters a base or wing commander his BCE is usually with him!

As an indication of its magnitude, from January 1965 to January 1966 our BCE force in SEA expanded six- to sevenfold in terms of people as well as items of heavy equipment. Despite this growth, there were many essential tasks the force could not meet, especially in the light construction area.

The Air Force thus resorted to its previously established Prime BEEF forces. Under this concept, we have had 34 teams totaling about 1000 men on TDY in Vietnam over the past 9 to 10 months. (The one headed by the second lieutenant is more typical than not.) The projects generally assigned these teams have included revetment construction, troop camp construction, utilities work, light structure

work, erection of inflatable structures, and other vertical construction, but only very limited horizontal work.

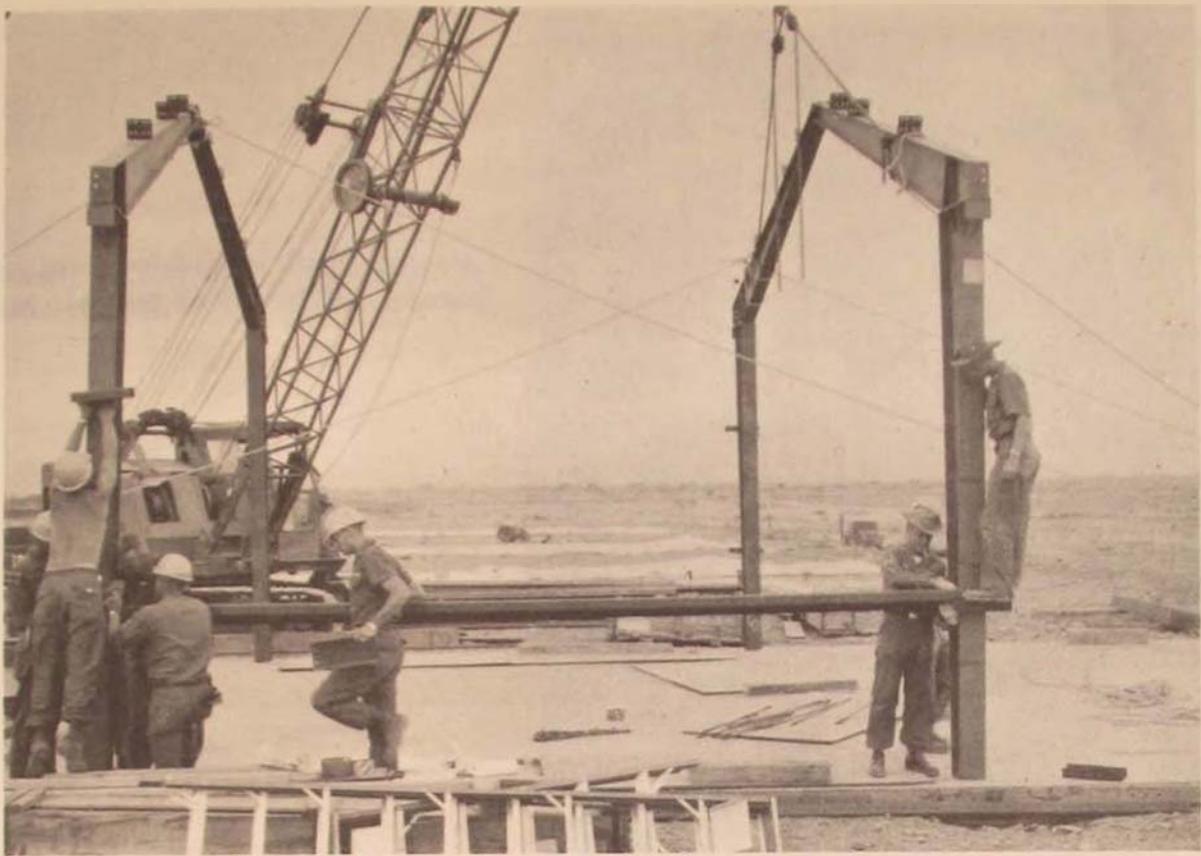
A good example of team capability is seen in the fact that, with experience, a 30-man team can erect a Type "A" (fighter) revetment in less than three days, 285 linear feet (lf). This involves the fabrication of 22 tons of steel (almost 1800 pieces, with 11,000 bolts), sealing, and backfilling with 630 cubic yards of fill. These revetments were improvised by the Air Force, with the help of industry, from off-the-shelf components, and they have already proven their value. In section, the wall is 5½' wide by 12' high and extends 80' to 90' on each side and 105' across the rear, a total of some 285 lf for a typical installation. In RVN, the teams have to date erected over seven miles of this revetment wall in various configurations.

We are extremely pleased with Prime BEEF results. To quote one base commander: "If I need it now, I give it to Prime BEEF. I have never heard the team at my base use the phrase 'We can't do it!'" Or to quote the BCE of a large SEA base: "Without Prime BEEF, I couldn't have existed." We have learned a lot about manning, equipping, deploying, and using these teams. This experience will go a long way toward giving us a real credible capability to provide needed CE support to Air Force needs anywhere and anytime. It has been said that "nothing great or substantial was ever achieved without enthusiasm." In Prime BEEF everybody has been enthusiastic—airmen, officers, commanders.

Red Horse

Notwithstanding the fine results, Prime BEEF as a TDY concept was intended and designed to meet needs of relatively short duration. To fill the gap on a longer-term basis, the Air Force now has in the field its first Red Horse or Civil Engineering Heavy Repair Squadrons. The first two of these units were organized, trained, equipped, and deployed to SEA in less than four months. Additional units are now in training.

These 400-man units give the Air Force field commander organic Civil Engineer capability short of that we would hope to have



Red Horse squadrons construct, install, or repair structures on a longer-term basis than Prime BEEF forces. With the help of Army and Navy, the Air Force got its first two 400-man Red Horse units to Vietnam within four months. There, typical jobs include erecting the steel for a 30 x 60-foot prefabricated building and bolting POL tank lid in place.





A Prime BEEF team on TDY from Air Training Command pours the cement floor for a building at Da Nang.

provided by Army construction battalions. Typical construction or installation projects assigned the initial squadrons have included cantonment areas (including hootches, latrines, mess facilities, personnel and medical facilities, with utilities); supply areas; ammo supply areas; motor pool areas; base drainage systems; bolted-steel POL tanks; runway barriers; engine test cell pads; runway lighting; liquid oxygen pads and shelters; aerial port facilities; vehicle maintenance shops; utility systems; inflatable shelters; and revetments. Some of these are military construction program projects which are assigned to Red Horse, by theater construction authorities, as being in our overall best interest. We know that there will be some "shakedown" in manning and equipping of these units based on our experience. We are getting this feedback and cranking it into follow-on units.

At this point we in the Air Force publicly thank the Army and Navy, not only the engineers of these services but others also who

gave the Air Force a real helping hand in getting Red Horse units trained, equipped, and moved out in such a short period of time. This attitude of helpful assistance was wonderful and certainly appreciated. It reflected what we all know: there's plenty of work out there to go around, and we can use all the help we can get.

lessons learned

The most important lessons for engineers that have come out of SEA are not startling. Many of them we had learned before and somehow let slip by.

Time. Regardless of how we might wish otherwise, it just takes a certain amount of time to get things done. For this reason, the more we can improve anticipatory engineer planning and contingency planning, the better off we will be. The more we can preselect alternate sites or prestock kits for airfield matting, lighting, power generation, water supply,

*awing lumber for new buildings at Da Nang consti-
tes another phase of Prime BEEF construction work.*

pre-engineered buildings, etc., the fewer our headaches and the more rapid our reaction in time of need.

Saving time by better planning is well illustrated by the rather widespread problems encountered in SEA in the determination of aggregate sources and their production. In many cases wider and earlier source selection would have insured much earlier high-volume delivery to the job site. In a like manner the earlier installation of heavier high-volume aggregate crushing, screening, and handling equipment would have significantly aided in providing the tremendous volumes of sound aggregates and suitable fill materials generally so badly needed in the very early days of on-site construction. More and more-timely source exploration and higher-volume equipment are essentials and must be planned for.

Design. In the main, in SEA, we are concerned with relatively simple structures. Reflecting this, our design must be kept simple. More important, our design must be keyed to



the materials on hand or those known to be reliably available. Designs must be flexible and must permit easy and quick substitution of materials. There is considerable merit in having a designer/contractor unity rather than design by one element and construction by another.

Research and Development. It is clear that if we had not had AM-2 airfield matting for use in SEA, we would have been in deep trouble. The mat is not a substitute for a good base, as we know. The better the base, the less maintenance and the longer the mat life. We have not learned all we need to know about the placing and maintenance of mat, but we will.

We have improvised airfield lighting kits; the same for revetments. We have used POL bladder tank systems and "invasion" pipelines. We have tried inflatable as well as relocatable shelters, and we can make more progress here. We are depending greatly on pre-engineered buildings, a wide open field.

We suggest that there are innumerable

engineering matters that can certainly stand more research and development effort. We in the Air Force are working on this and have a comprehensive program moving. Within the military engineering community, we sense the need for a medium by which we can exchange ideas and keep each other informed of our efforts, so that we can speed progress and avoid duplication.

EXPERIENCE is a great teacher, and we have learned a lot in SEA. We have a lot yet to digest as well as to learn. The Air Force Civil Engineers recognize this, but we face the future with confidence. We are a small part of the total military engineer effort in SEA. We are, however, proud of being a part of the "team" out there and appreciate all the assistance given us by our sister services. By continuing to work together, we will all give the military effort the outstanding engineer support it must and will have.

Hq United States Air Force

USAF HOSPITAL CLARK AND THE VIETNAM CASUALTIES



COLONEL ARTHUR B. TARROW, USAF (MC)

AT THE FOOT of the Zambales Mountains, near Manila in the Philippines, stands a new multimillion-dollar medical facility, the USAF Hospital Clark. This beautifully designed building, set among cocoanut palms and flowering bushes, is a welcome sight to the weary Vietnam casualties as they arrive in ambulances from the nearby flight line. The USAF Hospital Clark is one of the Air Force's best equipped and staffed medical centers. It is ideally situated to render medical service in the Southeast Asia conflict.

Casualties received from the medical units located in the zone of hostilities are routed by the Medical Regulating Officer in Saigon to the various hospitals in and outside the Pacific theater where specialized treatment is available. The USAF Hospital Clark, only 3 to 4 hours' flying time from the zone of hostilities, has become the center for care of many of the seriously wounded casualties. Here, also after re-examination by fully qualified specialists, some casualties destined for further transportation to other hospitals may be admitted to the hos-

pital for further stabilization. The others are sent on their way in as little as six hours, but usually in about 24 hours.

Air evacuation casualties from Southeast Asia are normally transported into Clark Air Base by C-118 or C-130 aircraft specially configured to provide maximum comfort as well as space economy. In early 1965 only one flight was scheduled per week from Southeast Asia. Now there are fifteen scheduled flights, with an average of five additional special flights per week. The aircraft arrive daily, manned by experienced flight nurses and aeromedical flight technicians. Selected medical specialists or flight surgeons, from either USAF Hospital Clark or RVN hospitals, are on board when patients are known to be very seriously injured.

The Thirteenth Air Force band salutes the sick and wounded as each flight arrives. This added welcoming touch has a profoundly moving effect on many of the combat evacuees and their attendants. Immediately upon landing, each patient is checked by a physician while still in the aircraft. At this point a patient's

evacuation schedule may be changed because of a reverse in his condition. He may be sent direct to the USAF Hospital Clark instead of the 19th Casualty Staging Unit transient wards.

Ambulances meet each flight at the airfield and immediately take the more critical cases to the main hospital. Dome lights flashing, the ambulances—the larger ones are air-conditioned—make the two-mile trip carefully. The less critical patients, who will be evacuated still further, are sent to the nearby 19th Casualty Staging Flight transient wards. Administrative matters are quickly completed by liaison officers and enlisted men of the Air Force, Army, Navy, Marine, and Republic of Korea forces. The 19th Casualty Staging Flight with 250 beds is responsible for processing all casualties upon arrival. Its wards and administrative buildings, next to the main hospital, were the hospital until 1965.

On arrival, the casualties are separated into three categories: those who will remain overnight and be air-evacuated to another facility the next day, those who are too ill to travel and must either be fully treated at Clark or stabilized before further movement, and those Air Force patients who can be treated and returned to duty within 120 days. It is the task of the 19th Casualty Staging Flight to see that these casualties receive necessary care and comforts, to double-check each patient for any change in condition, to take care of orders and other administrative necessities, and to properly direct their further movement.

Roughly about 35 percent of the casualties brought into USAF Hospital Clark are the result of hostile action. Of these, more than half require the attention of an orthopedist, for fractures, amputations, etc. About one-fourth of the hostile-action casualties have head and chest wounds requiring the care of the thoracic and neurosurgeons, or facial injuries requiring the maxillofacial team (otorhinolaryngologists and dental surgeons). The remaining hostile-action casualties are usually general surgery cases.

Approximately 55 to 60 percent of the casualties from Southeast Asia have diseases rather than wounds. Malaria, amoebic dysentery, and

hepatitis are frequently encountered because of the living conditions in the zone of conflict. Most of these patients are treated and returned to duty.

About six percent of the air evacuation patients are psychiatric cases. These range from extreme psychiatric disturbances to characterological disorders, brought on by the stresses of combat or from being in isolated areas. Character disorders are dealt with administratively. Psychosomatic illnesses are treated jointly by the Psychiatric and Internal Medicine Departments, and these patients are usually returned to duty. Very few flyers are admitted for psychiatric illness, attesting to the effectiveness of the Air Force selection process. Fewer battle-fatigue cases have appeared than had been anticipated, perhaps because of the elite regular troops present for duty.

management of USAF Hospital Clark

For those casualties needing immediate surgical care, USAF Hospital Clark has available the latest in anesthesiology and operating equipment. Its laboratory not only provides sophisticated clinical testing but maintains, through volunteer donations by Clark personnel, a complete blood bank. Patients with cardiac arrhythmia (abnormal heartbeat) can be treated with the hospital's cardioverter, a remarkable piece of electronic equipment that first stops the heart and then restarts it in a normal beating pattern.

An artificial-kidney team is functioning at Clark for patients with disease or injuries disrupting kidney function. Most such patients have been wounded, but some suffer from severe "black water fever malaria," with precipitation of blood constituents in the kidneys. The artificial kidney cleans out accumulating waste in the blood, supplying kidney function until the "sick" kidney can heal. This unit has performed in the first three months of its operation three times as many dialyses as a similar unit did in its entire eighteen months of operation during the Korean conflict. Time is so important a factor when kidney function is disrupted that this unit often means the difference between life and death.



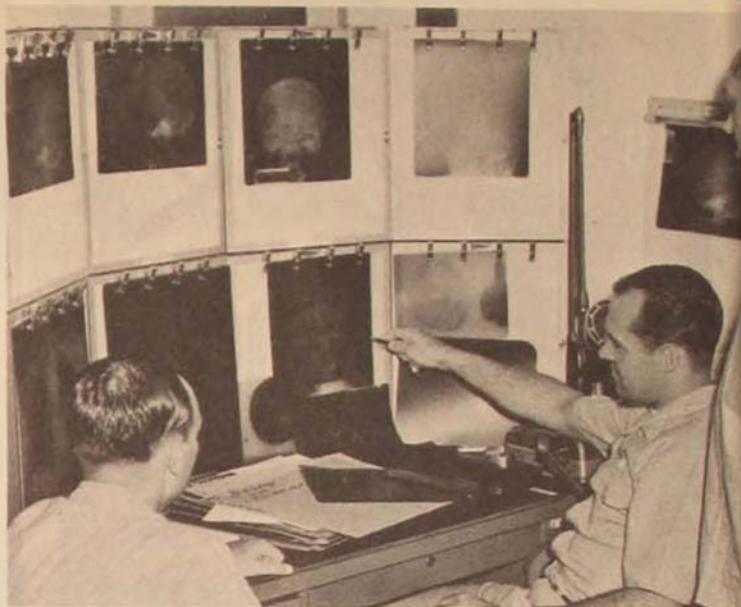
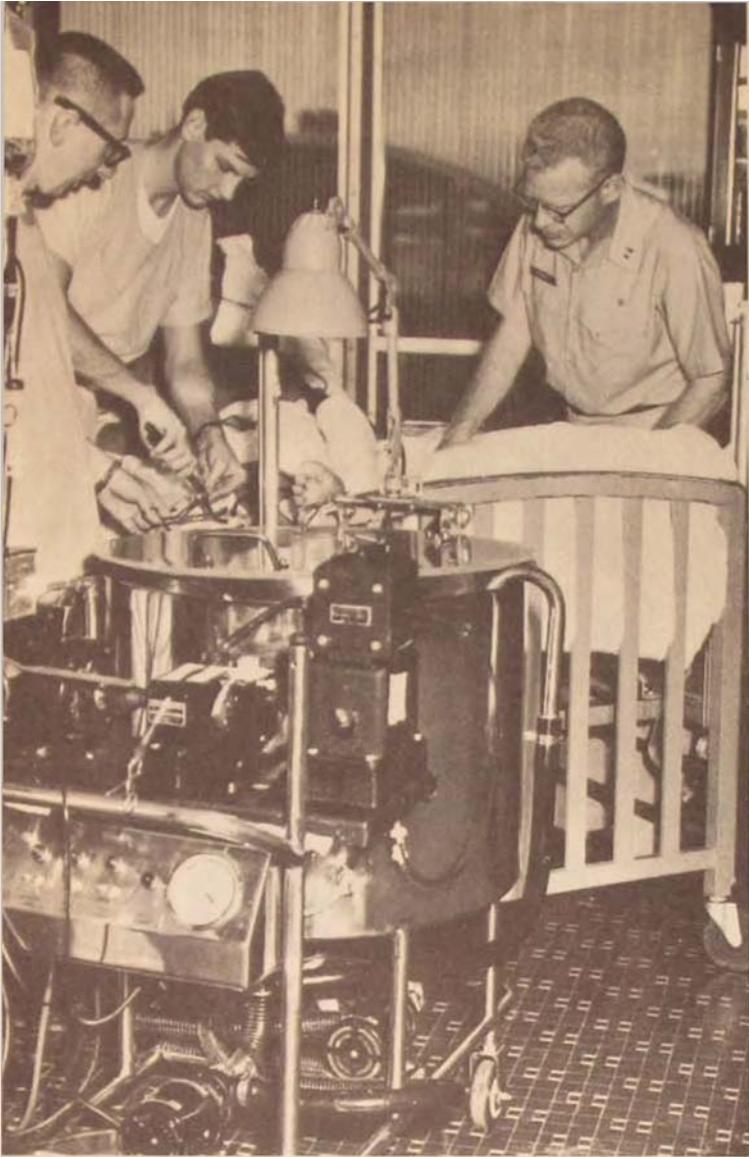
Screening Vietnam casualties on inbound C-130



Flight nurse attends casualties en route to Clark.

Ambulances and ambulance buses at Clark Air Base receive the offloading sick and wounded.



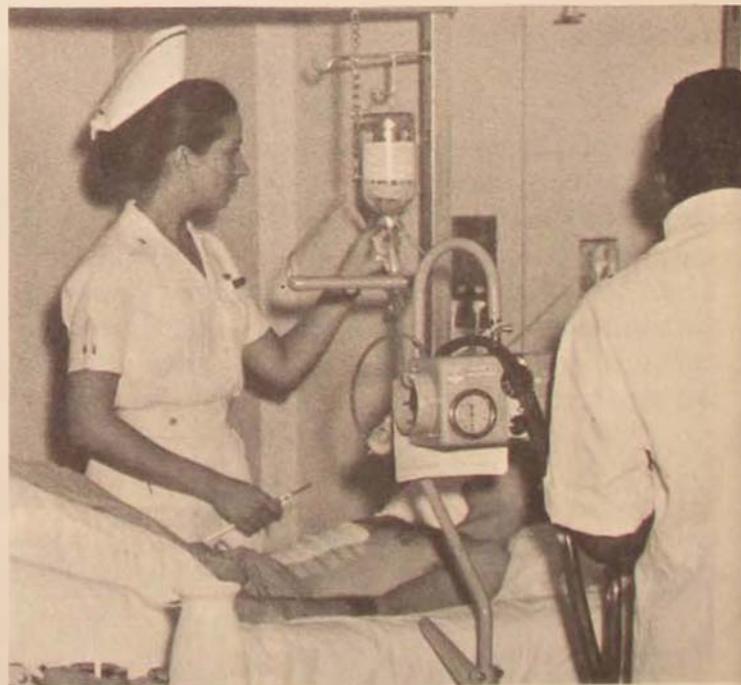


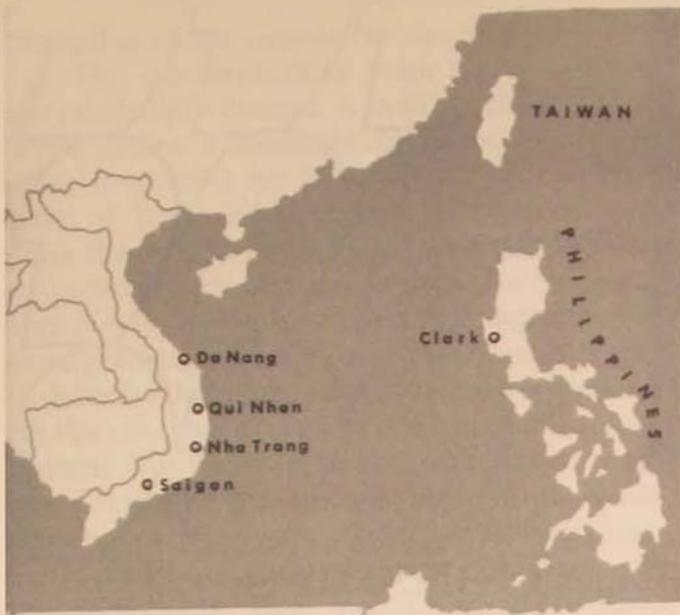
Radiologists scan X-ray for skull-embedded shrapnel.

The artificial kidney team treats patient with machine that substitutes for body kidney functions.



Night or day, skill and selfless devotion typify the care given Vietnam casualties at USAF Hospital Clark.





From the battle zones of Vietnam to USAF Hospital Clark in the Philippines is often a matter of as little as six hours. The distance from Saigon to Clark is 898 miles; Da Nang to Clark, 799 miles.

The Radiology Department plays a significant role in the treatment of Southeast Asian casualties. Along with its usual function of X-raying for fractures, ulcers, tuberculosis, etc., the Radiology Department is concerned with the location and identification of shrapnel fragments imbedded in the various body areas.

Casualties who are severely injured and retained in the hospital receive physical therapy in the main clinic or on the wards. This section also assists in cleaning infected wounds. A program of whirlpool and sonic therapy speeds maximum rehabilitation of joints and muscles for patients scheduled to return to duty.

other hospital responsibilities

USAF Hospital Clark, while concentrating on its primary mission of caring for the war casualties, carries on other normal functions. Its research program assists in controlling and conquering tropical diseases such as malaria, tropical sprue, and Japanese encephalitis. Its Medical Depot provides an average of over half a million dollars' worth of supplies monthly to 37 accounts, including all Air Force units in Southeast Asia as well as American em-

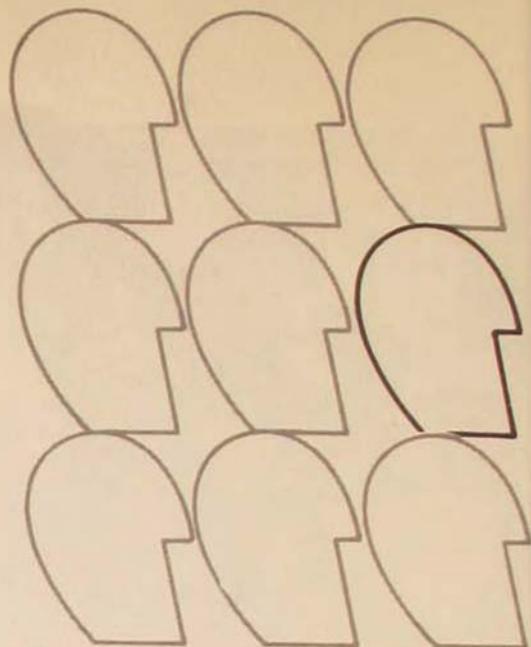
bassies, the Peace Corps, and Military Assistance Groups as far west as New Delhi, India, and as far south as Inkarta, Indonesia. It helps keep two 75-bed tactical hospitals and three squadron medical elements trained and ready to deploy to any area in the theater. It takes care of food inspection. It offers education and training to Filipino interns and residents and to medical officers from other countries under the Military Assistance Program. During manned space flights, the hospital keeps ten "walking" blood donors in readiness to meet its responsibility for care of any injured astronaut. Meanwhile, construction proceeds on an expansion of the facility to add 100 hospital beds, a 300-bed casualty staging unit, and larger clinics, laboratory, X-ray and administrative space.

A NEW CHAPTER was written in Air Force history when Hospital Clark was called upon to furnish general hospital care to all branches of the armed forces during wartime. Everyone can rest assured that the care given is the best possible with this superb medical facility and the wholehearted dedication of its professional and ancillary staffs.

USAF Hospital Clark, PACAF



In My Opinion



MANAGER-SPECIALIST RELATIONSHIPS: A THEORY

MAJOR LAWRENCE B. TATUM

MILITARY organizations today have grown to gargantuan proportions. It is the thesis of this article that neither military commanders nor their subordinates have understood adequately how to ensure the effective functioning of their organizations because they have not seen that current organizations succeed or fail on the basis of how well they marry discipline and creativity. While corporations and other units operative in the modern civilian world also have this problem, many characteristics of military service make the necessary coupling of discipline and creativity much harder for the military than for most professions.

Eighteenth and nineteenth century social thought was dominated largely by the relationship between propertied and nonpropertied classes. In our century the place of property has been taken by *knowledge* because our political, economic, and social well-being depends to an ever increasing degree on our understanding of science, technology, the social sciences, and administrative technique. Being industrialized and urbanized, twentieth-century man bands together in large-scale organizations so that he may bring *knowledge* to bear on problems that

concern the entire society, or at least large segments of it.*

The requirement for meshing knowledge and large-scale organization tends to produce two groups which our contemporary literature labels bureaucrats (managers) and intellectuals (specialists). These are the repositories of knowledge. Members of these two groups acquire society's leadership positions. The relation between the bureaucrat and the intellectual is, essentially, the relationship between discipline and creativity.** This relationship is one of the most critical problems of our time and can be neither wished away nor ignored.

By presenting a thesis regarding the proper relationship between modern-day managers and specialists, perhaps I can illustrate how difficult the marrying of discipline and creativity really is—especially in the military, where tradition and the necessity for control in combat have led frequently to an emphasis on

*Many of these ideas are expressed by Richard Pipes in *The Russian Intelligentsia* (New York: Columbia University Press, 1961), Foreword.

**For the purposes of this article, I use "creativity" to mean advancing specialty knowledge within the organization rather than increasing knowledge of management techniques.

discipline at the expense of creativity.*

The generalizations I am about to make are admittedly inexact. A man is seldom exclusively either a manager or a specialist. Far more frequently his job calls for him to be a little of both. Furthermore, whether a man plays the role of manager or specialist is often a function of his personality as well as his position. Nevertheless, I believe the designations of manager and specialist are meaningful terms to describe different types of persons necessary for the effective operation of large-scale organizations. For instance, in the military organization, "manager" most nearly refers to the commander—or to anyone higher in the organizational command chain than the actual user of skill. "Specialist," then, would refer to the operator—the pilot, the instructor, or anyone whose primary task is to perform a skillful function deemed necessary to his service.

The following observations seek to adapt organizational practice to the realities of organizational existence.

First, the manager should remember that he is a manager of specialists. His primary responsibility is to create the environment in which his specialists can successfully apply their skills. He must understand their needs and provide for them to the greatest practicable degree. He must explain the whys and wherefores of environmental factors imposed by higher levels so that the specialists (1) understand organizational goals and bring their expertise to bear in the most efficient manner and (2) can tell the manager when (and why) those imposed environmental factors inhibit the specialist's ability to aid in the accomplishment of objectives. In this latter instance, the manager has the duty to ensure that higher headquarters understands that its directives are impairing the accomplishment of organizational objectives.

Second, the manager must understand that he is a manager and not a specialist. In today's complex world, where the boundaries of knowl-

edge expand exponentially, the manager cannot possibly be the best specialist in the organization. Even if he was chosen to be the manager because he was the best of the specialists (and this becomes daily more unlikely), the press of his managerial duties ensures that he will not long be the best specialist. Therefore, he must *manage*, not dictate. He *must* be receptive to ideas from below—and not only to problems concerning specialty methods. He must be receptive also to specialists who offer *management* judgments, because the operational institutional environment always affects the specialists' ability to exercise their expertise. In this area, the success of the manager is a function of his willingness and ability to get his specialists to maximize their capabilities.

Third, the manager, especially the military manager, must remember that the description of his job as a "manager of specialists" is different from traditional formulations. Therefore, many of the tried and true leadership "principles" may no longer be applicable, particularly those based on the assumption that the manager knows best (because of experience factors) and does not need the advice of lower-ranking specialists.

Fourth, the manager must guard against excessive centralization and standardization. The specialist needs guidelines regarding objectives and information concerning the operations of organizations whose specialties complement his own—but he does *not* need point-by-point instructions concerning job methods because he knows best how to apply his specialty to a given task. Also, his success as a specialist is directly proportional to the extent he is free to apply his specialized abilities. Furthermore, he will feel a greater responsibility and loyalty to his organization if he is allowed to *participate* actively in creative as well as mechanical endeavors.

Of all the requirements placed upon the manager, the dictum not to overcentralize and overstandardize is the most difficult. Perhaps this is so because the tendency in large-scale organizations is to hold the manager responsible for *all* the errors (including sins of omission as well as commission) of his subordinates. While one must hope that the higher-level man-

*The management theory outlined herein must be altered radically for combat and other crisis situations. Most situations in the military, as in other large-scale organizations, are not crisis situations.

agers will come to understand how destructive the "responsibility" principle can be, the lower-level manager should, I think, have the courage, wisdom, and integrity to err on the side of giving *too much* initiative to subordinates (if he must err at all). Ironically, in the final analysis, a manager who is afraid to let his organization be judged on its overall long-term performance probably will be fired—because his specialists will be operating normally at substandard levels.

Fifth, the top-level manager must be constantly on guard against growing bureaucracy at his level and at all levels between him and the line specialist. Perhaps this requirement is no more than complementary to our fourth requirement, because centralization requires large staffs. Staffs tend to isolate the manager from his specialists, precluding the interaction necessary for effective operation of contemporary large-scale organizations. Managers' jobs must be kept few and must be justified as being vitally necessary. As Parkinson says, energetic managers are bound to create enough work (imposed on specialists) to justify the existence of their own jobs. Under bureaucracy gone wild, the poor specialist has little time to operate because he is too busy fulfilling other requirements laid on him by managers. Furthermore, promotion, prestige, and monetary rewards must not be so aligned that the ambitious will seek only (and always) to be managers. Good managers are invaluable; but there must be excellent specialists to manage or the mission itself will be prostituted.

If these five requirements hold, the military manager's principal task can be reduced to this: He must inculcate in his specialists a *motivation* to the missions of the organization, the service, and the country, and he must do his part to ensure that the missions of all three are complementary. If he does not, the specialists will have loyalty problems that are inherently demotivating. Finally, the manager must be impeccably honest and his example must be of the highest order, because the specialists he manages are intelligent and simply will not be motivated by men whose arguments and persuasions are unrelated to the specialists' conception of reality.

THESE, then, are the difficult requirements placed upon the manager by the necessity of marrying discipline and creativity. But what responsibilities does the specialist have?

First, the specialist working in a large organization must understand that he is not a specialist for the specialty's sake. The specialist is trained because his organization (e.g., the military) has established a need for expertise in a certain specialty field (e.g., operations, research and development, political science, administration) to accomplish its overall objectives. The specialist must identify with those objectives and believe that *his* performance of the specialty can contribute to the accomplishment of the objectives. He must not identify with the specialty *per se*, as he may then pursue specialty interests unrelated to the objectives of his organization. For instance, a rocket scientist told to build an ICBM must not work on space platform technology simply because he *likes* working on space platforms. However, if the scientist believes that his organization's objectives can be better fulfilled by work on space platforms, he has the duty to present that argument to the manager.

Second, the specialist must believe that he has the *duty* (not just the option) to communicate specialty views to his manager, who cannot be effective otherwise. These views not only update the manager's knowledge of the specialties he manages but enable him to understand how the environment he creates affects the specialist's ability to operate. Loyalty *demand*s—not prohibits—such upward communication, regardless of its critical nature. Of course, human nature being what it is, the specialist must be tactful and use good judgment regarding communication timing and method.

Third, the military specialist must realize that he *is* a specialist and, in the final analysis, cannot possibly know all the factors that influence ultimate decisions on preferred missions and methods at country, service, or organization level. He has a duty to find out as much as he can about preferred missions and methods—and the manager has a duty so to inform him. Still, it is inevitable that he will be uninformed on many occasions. It is also inevitable that

intelligent, responsible people will differ sometimes in the selection of alternatives. This means that the specialist must exercise humility and tolerance concerning the views of others and must recognize that the manager, not he, will be held responsible by higher levels for mission accomplishment. He must be willing to do his best on personally undesirable as well as desirable tasks. However, the specialist can hardly be expected to react in a "do or die" manner if managers do not observe the realities of modern complex organizations which we have discussed.

Finally, assuming that proper motivations are existent (and this, I believe, is usually the case), *communication* is the oil that smooths a proper manager-specialist relationship. While fault for blocking or impeding communication lines may well be shared, it is the manager who has the greater responsibility. The manager who says (or indicates by his actions) that he will not listen to ideas from below is

slamming the door shut. Although the specialist may realize that loyalty demands his upward projection of ideas and criticism, few are likely to continue their efforts to the point they risk either punishment within or ouster from the organization.

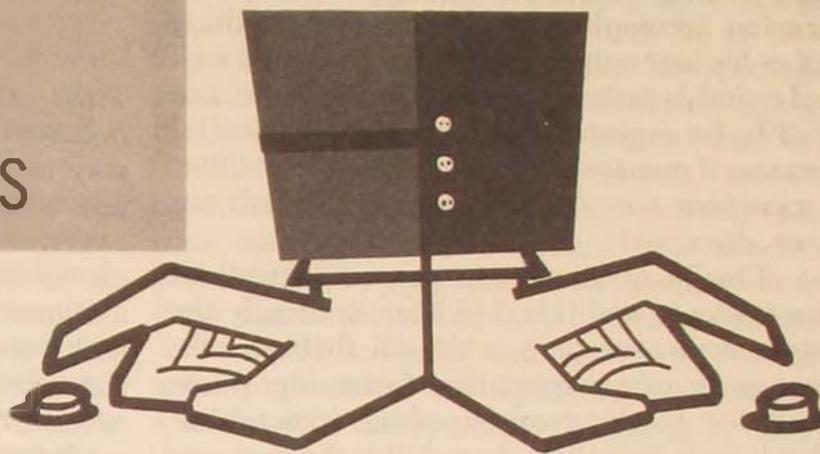
THIS ANALYSIS of manager-specialist, commander-operator problems is, I believe, one way to demonstrate how difficult is the business of establishing the proper relationship between discipline and creativity. The problem cannot be wished away. It requires good will and understanding on the part of all managers and specialists or combinations thereof. We in the military especially need to understand the manager's requirements because seldom will we be purely specialists. We deceive ourselves if we believe that the specialists below are inherently creative, regardless of the impediments we place in their way.

Vietnam

Books and Ideas

OUR STRATEGIC DILEMMAS

DR. DAVID W. TARR



CHARLES BURTON MARSHALL has recently observed that the application of the term "strategy" as a "synonym of higher policy" is very much in vogue, not only because it "sounds big" but because

strategy suggests the idea of discriminating choices. More dimensions are implicit in it than in any other word. Any response or purpose might qualify to be called a policy, but a strategy seems to suggest deliberateness, scope, and complex calculation. So probably the prevalence of the term reflects a sense of our having gone beyond the simplicities characteristic of earlier times in world affairs.¹

Not only is "strategy" ubiquitous but the "strategist" also. This is, of course, a sign of the times. Books on strategy abound, as do centers for the study of strategy and the scholars who populate them. Universities now recognize it as a "field" of study, enhancing the collaboration of academic and military professionals' efforts to elaborate and analyze the subject. Even the annual professional meetings of the American Political Science Association now in-

clude Strategic Studies as a major subject area, on a par with American Government, Comparative Politics, and International Relations.

If the military profession sometimes feels that civilian scholars are encroaching upon its domain, that sentiment is profoundly misplaced. It is not that strategy is too important to be left to the generals; the point is that strategy is too complex to be left to one profession.

The strategists of our society have contributed measurably to the advancement of strategic thought over the past decade and more. It is becoming increasingly difficult to keep up with the proliferating literature of the field. Fortunately in recent years a number of "readers" on national strategy have been published, collections of the more significant articles on a wide variety of topics subsumed under the subject of national strategy. Professor Henry A. Kissinger, a prominent "strategist" in his own right, has produced one of the best collections of readings currently available.†

In the Kissinger reader the main problems

†Henry A. Kissinger (ed.), *Problems of National Strategy: A Book of Readings* (New York: Frederick A. Praeger, 1965, \$8.50), 477 pp.

of American strategy are explored, analyzed, and argued by academic and government defense analysts. The authors (and in many cases the selections) are already well known. Among them are the expected members of the strategy "establishment," including Herman Kahn, Albert Wohlstetter, Thomas C. Schelling, and Malcom Hoag; some notable critics of the main course of U.S. strategic doctrine, such as Arthur Waskow, Leo Szilard, and Pierre Galois; and a few official spokesmen, including Dean Rusk and Robert S. McNamara.

The book is divided into five groups of readings: U.S. strategic doctrine and defense policy, alliances, insurgency, arms control, and national security organizations. In the real world, of course, such security problems are so intertwined as to defy separate treatment. As a consequence, most of the selections in fact treat more than one category.

Greatest emphasis is on strategic issues that relate to the use and control of nuclear weapons. This is perhaps justified because nuclear weapons in themselves constitute a grave danger to mankind and also because the United States has come to rely heavily upon their deterring functions.

Although the emphasis on nuclear-related strategic problems is appropriate, it is regrettable that only a few of the selections concern the dilemmas that arise from the successes of nuclear deterrence. I have two salient ones in mind. The first arises out of the obvious fact that as a strategy of deterrence succeeds over a period of time, the argument is strengthened that the adversary never had any intention of attacking in the first place. This paradox is mentioned briefly by the editor in his introduction, where he notes that "an effective deterrent strategy may thus have built-in pressures to strengthen the arguments of those who argue that a defense effort is unnecessary."² Unfortunately, none of the selections treats this point, important as it is to the policy process in the United States. It seems fairly clear, at least from this reviewer's perspective, that many of the political problems currently plaguing American policy-makers—particularly domestic and foreign dissent over the course of U.S. security policies in Europe and Asia—

have arisen because the deterrent enterprise has on the whole been so successful that, in the minds of many, the fear of aggression from Communist sources has been supplanted by a fear of undue provocation by the United States.

The second and related dilemma arising out of the success of deterrence pertains to the tactical and strategic alterations of the adversaries' approach to the West: there is a perceptible tendency to avoid the dangers of direct confrontation and to explore indirect, ambiguous, and by and large more subtle ways of exploiting military power for aggressive purposes. This development raises at least two political problems: First, critics of American deterrence policies tend to assert that this trend demonstrates that nuclear weapons are no longer politically or militarily relevant to the contingencies most likely to arise. This point of view ignores the contribution of nuclear deterrence to the avoidance of direct confrontation; yet it is politically significant that many critics are beginning to think along these lines. Second, the more subtle and indirect methods of aggression of themselves constitute a grave problem for American security because, quite obviously, ambiguous and low-level violence is the most difficult to deter and—as experience in Vietnam suggests—the most difficult to defend against.

It is somewhat disappointing, therefore, to find that Professor Kissinger has included only two selections explicitly concerned with unconventional (guerrilla) warfare and only a few others in which the relationship between nuclear deterrence and the challenge of insurgency warfare are discussed in any detail. The rather sparse attention paid to the wider ramifications of insurgency warfare does not, however, seriously detract from the general worth of the readings. The major strategic issues are discussed with considerable skill and from a variety of viewpoints.³ Some critics of American defense policy are likely to find Kissinger's selections "unbalanced" because insufficient challenge is made to the basic purposes of U.S. security policies. But for those who are interested in the debate over the best combination of means (and doctrinal guidance for their employment) for adequate deterrent

and defensive effects, the Kissinger reader is likely to be regarded as an instructive, thought-provoking collection.

This point, the probable difference in reaction of the fundamental dissenter on the one hand and the moderate critic and supporter on the other hand, brings me back to an earlier point: the paradox of successful deterrence. In whatever troubles the United States currently finds itself involved, from the policies of De Gaulle to the challenge of the Viet Cong, there is a significant and growing number of critics who regard U.S. security objectives themselves to be dangerously out of date. A rising chorus of voices contends that the Communist states should not be treated as a single, undifferentiated adversary or "bloc," that few if any of the Communist governments seek extensive territorial expansion, and that, in any case, excessive intransigence on the part of the United States stands in the way of political accommodations and a more "natural" set of relationships between the Communist nations and the West. For many of them *détente*, rather than deterrence, should be the main object of American strategy.

The point is, of course, that *détente* is quite probably more likely to be accomplished through deterrence than without it. In dealing with a group of nations dedicated to objectives explicitly at odds with our own—indeed a group which, whatever its internal disagreements might be, has shown itself both in ideological commitment and in action to be inclined to resort to force and the threat of force to achieve its goals—the U.S. is more likely to reach accommodation when they perceive that their objectives cannot be reached by military means. It is certainly highly probable, although not beyond the realm of argument, that the Soviet Union has adopted a course of peaceful or competitive "coexistence" in prudent reaction to the overwhelming strength of the Western coalition. The United States obviously seeks to persuade the Communists in Asia that similar caution on their part is required in that region of the world.

Are the deterrent doctrines that have largely succeeded in providing a firm foundation for security in Europe applicable to Asia

as well? This question is not often faced directly in the book of readings under review. The "schools" of strategy are, however, well represented, and the reader would do well, after reading the arguments which the authors have generally developed in the context of NATO and deterrence of the Soviet Union, to apply them to Asia and the prospects for deterring China and North Vietnam.

The two contexts, Europe and Asia, are of course fundamentally different. Whatever the differences among the NATO allies, they do have basic shared political values, prospering economies, and deepening self-confidence arising out of a sense of relative security from external threats. The United States is deeply committed to the defense of Europe, as manifested in its long-term major deployment of American military power on the Continent, backed by enormous strategic retaliatory power. The United States may differ with France over future doctrines and military arrangements for maintaining an adequate security system for Europe, but the very fact that France feels secure enough to advocate a course that is partly independent of the United States is itself an indication of the success of the Atlantic security system.

But whereas in Europe the American commitment has been firm, continental, and based on mutual interests, in Asia U.S. involvement has been largely peripheral, hesitant, and plagued by diverging interests. The Korean War was preceded by decisions by the Joint Chiefs of Staff and an explicit statement by the Secretary of State that America's defense perimeter extended along the island chain from Japan to the Philippines—i.e., that no part of the Asian mainland was included. American commitment to Taiwan and the Pescadores has been a matter of continual domestic political dispute, leading mainland China to test this policy on occasion. American determination in Southeast Asia has at most been uncertain over the past two decades and despite the creation of a paper alliance (SEATO) did not involve a significant display of power until American combat forces were sent to South Vietnam. In the light of these considerations, America's commitment to defend the nations along the

south and southeast Asian arc has been nowhere near as plausible as its commitment to defend Europe. In Asia the problem has not been to maintain credibility but to establish credibility.

The "agony of power" that the United States is now experiencing in Asia arises from another dilemma of deterrence: the effort to establish a credible commitment, now manifest in the war in Vietnam, is inherently escalatory. It is not in the interest of the Communist powers for that credibility to be established. These escalatory risks, which the United States appears to be willing to accept, frighten allies and neutrals who are largely helpless in the face of the power struggle. They fear the immediate consequences of escalation more than they do the long-term and less demonstrable consequences of the failure of American security objectives in Asia. Many domestic critics of American foreign policy share these fears.

If there emerges a consensus among the strategists who have contributed to the Kissinger reader, it is this: whatever the character of the military posture necessary for deterrence and defense, the United States must exhibit a clear willingness to meet and defeat aggression. Conveying the will to act and the determination to see the action through to a successful conclusion requires a psychological operation involving an orchestration of military power, in relevant varieties and strategic locales, in concert with sets of policy statements from American and allied government officials that carry

a plausible message of capacity and determination to potential adversaries. Yet (and here is where the largest vacuum exists in the American literature of deterrence) how is it possible to convey such clear commitment when, both within our own domestic political framework and in the international political coalitions we have constructed, public dissent and dispute are an inherent, indeed an essential, aspect of the political process? The enforcement of political solidarity endangers democracy and undermines voluntary alliance. Since free associations require persuasion rather than coercion for long-term effectiveness, the elegant logic of particular deterrence doctrines is likely to be compromised at every stage by the requisites of politics.

America's role and responsibilities in world affairs are subject to perennial review. That is not too heavy a price to pay for democracy. One might wish, at times, that the review was more thorough, more informed, and less biased by preconceived conclusions, but politics is hardly ever that tame or rational. The strategic doctrines and defense policies of the United States must be publicly debated so that the problems of national strategy are widely understood. Then the executive branch can base its policies upon a broad and supportive political consensus. Kissinger's *Problems of National Strategy* contributes substantially to that objective by providing both the professional and the layman an informed and provocative collection of readings on national security affairs.

Madison, Wisconsin

Notes

1. Charles Burton Marshall, "Strategy and Purposes in United States Foreign Policy," in Robert A. Goldwin (ed.), *Beyond the Cold War* (Chicago: Rand McNally & Company, 1965), pp. 2-3.
2. Kissinger, p. 6.
3. For those who may need some guidance in placing

authors in appropriate "schools" of thought, I suggest reference to the following: Robert A. Levine, "The Arms Debate," in *The Politics of Military Policy* (Security Studies Project, University of California, Los Angeles, 1965), pp. 9-13; and William R. Van Cleave, "The Nuclear Weapons Debate," *United States Naval Institute Proceedings*, Vol. 92, No. 5 (May 1966), pp. 26-38.

HISTORY AND THE LONG-RANGE PLANNER

MAJOR JOHN SCHLIGHT

AS A HISTORIAN I am periodically brought up short by rebuffs to my craft on the part of long-range military strategists and others who have made a concern for the future their principal occupation. You historians have nothing to offer, they imply. Part of the blame for this attitude rests, I am sure, on historians themselves, who too often imply that history repeats itself. When history fails to perform the second time, the entire profession seems to be discredited. This is unfortunate because history's main contribution to planners for the future lies elsewhere—in the realm of perspective. The future is anchored in the past, and history is the story of the past. It is my conviction that when the moment for immediate decision concerning the future arrives, the planner's greatest ally is sound perspective on the past. A good example of the type of book that can help in the building of such a perspective is a recently published volume entitled *The Theory and Practice of War*.† A fruitful discussion of this work itself requires a bit of perspective.

Twenty-five years ago, on the eve of our entrance into the Second World War, a volume of essays by leading contemporary historians appeared which traced the evolution of military theory from the time of Machiavelli to

that of Hitler. The book was born in a seminar on military affairs held at the Institute for Advanced Studies, Princeton, New Jersey. Edited by Edward Mead Earle, it bore the title *The Makers of Modern Strategy*. Contributors to this volume trained their historical acuity on the question of continuity and diversity in the military thinking of the preceding four and a half centuries. Although the book contained essays by twenty different authors, it was held together by certain well-defined themes. Among the more prominent of these were the relationship between war on the one hand and society, politics, economics, and technology on the other; the militia versus the professional army; the role of discipline in military forces; limited versus unlimited warfare; whether war is primarily an art or a science; and the relative value of the offensive and the defensive. Each of these topics, plus a host of subsidiary ones, was handled with the scholarly depth that one would expect from such a galaxy of contributors.

The book's subsequent tenacity is witness to its value. Despite its age it continues to form the basis for many, if not most, undergraduate courses in military history. It has been used with success at the Air Force Academy in the basic Military History course, as well as in the

†Michael Howard (ed.), *The Theory and Practice of War: Essays Presented to Captain B. H. Liddell Hart* (New York: Frederick A. Praeger, 1965, \$10.00), x and 376 pp.

advanced course in Military Theory. Extensive references to it are found among the footnotes of articles on military theory appearing in professional journals. Its appearance earlier this year in paperback gives promise of even more widespread dissemination of its contents.

Yet *The Makers of Modern Strategy* suffers from one serious defect—it is dated. While this is true to some degree of everything published, it is particularly serious in this instance. For in 1941 the world was on the threshold of the atomic revolution—a development which has proved important enough to force a rethinking of much previous strategic doctrine. The implications of the nuclear age have challenged many of the conclusions found in Earle's work and have demanded, as a minimum, the publication of an updated volume to carry forward the story of military theory into the atomic period. It is my opinion that this new volume, *The Theory and Practice of War*, serves this purpose. Like its predecessor, this is a volume of essays by military historians. Edited by Michael Howard, it was dedicated and presented to Captain Sir Basil Liddell Hart on the occasion of his seventieth birthday in the fall of 1965.

Although each of the fifteen essays in this volume comes from the pen of a different author, I was able to detect three elements that knit them together. The first is Liddell Hart himself, whose imaginative and penetrating spirit, if not always his name, is recognizable on almost every page.

The book's chronological arrangement also makes for unity. Each of its three parts contains five essays dealing with a specific time period. Part One discusses the evolution of military theory in the nineteenth century by detailing the relationship between society and military theory on the one hand and between military theory and military practice on the other. Jomini and Clausewitz are sympathetically and delicately placed in their context by Michael Howard and Peter Paret. Professor Gordon Craig comes up with a new explanation for Austria's surprising military defeats in 1859 and 1866—command and staff problems in the Imperial Army. General European military thought and doctrine are examined for the en-

tire period 1870–1914 by Jay Luvaas. Brian Bond of the University of Liverpool highlights the conservatism of the British cavalry and the resistance of human nature to change. Each of the essays in this section is brief and concise while lacking nothing in thoroughness. Together they provide an intellectual journey from theory to practice and present a panoramic view of the application (or misapplication) of the theories of Jomini and Clausewitz by the major actors in the First World War.

The middle third of the volume concentrates on the two interwar decades, 1919–1939. The essays in this part display a less even quality than those of the earlier section. While the overall objective of showing the influence of the theories of Liddell Hart and others on the armies of the period is attained, several of the chapters lack the historical approach and remain mere memoirs. The best of the lot is Maurice Matloff's story of the quiet revolution in strategic thinking that prepared the United States for its role of moulding allied strategy during the Second World War. Military developments in France, Germany, and England are the subjects of essays by General André Beaufre, Captain Robert O'Neill, Sir Frederick Pile, and Norman Gibbs.

The final section focuses on the fate of military theory and practice in the nuclear age. Since this fate has yet to be determined, this part of the book remains inconclusive. As one would expect, the United States and Russia share the majority of these pages. Three of the five essays, those by J. M. Mackintosh, Henry Kissinger, and Alastair Buchan, recreate the tortuous attempts by both East and West to construct a strategy for the cold war. Two final chapters illustrate the revival of limited-war concepts and practices in the face of nuclear stalemate.

Less mechanical, and on that account less obvious, is the third ingredient which binds these essays together. This takes the form of a set of themes to which many of the chapters contribute. Most of these topics are the same as those dealt with in *The Makers of Modern Strategy*, and by continuing the story of their evolution past 1941 and into the nuclear period *The Theory and Practice of War* forms a

perfect complement to the earlier volume. It is the historian's analysis of these themes that represents his strongest contribution to those who must plan for the future.

Take, for example, the question of the relationship between war and society. Former Secretary of the Air Force Eugene Zuckert wrote in the pages of the *Air University Review*: "It [the military mind] should recognize not only military considerations but also the sociological, political, economic, and technical forces that influence this complicated world." (November-December 1965, p. 9) But how does one recognize such considerations? Certainly one way is to study the close interaction of these areas in the past. The point here is not simply that military strategy and practice *should* reflect these other areas of society; it is that theory and organization always have been determined largely by society and social change.

It is one of the values of *The Theory and Practice of War* that it emphasizes the dependence of military progress upon "civilian" advances throughout the nineteenth and twentieth centuries. The French social revolution introduced the citizen into Western society and the nation-in-arms into the military arena. The industrial revolution brought advances in the areas of armament, transportation, and communication which were, after much trial and error, to revolutionize warfare. Jomini's principles of war originated less in their author's experience as chief of staff in Marshal Ney's headquarters than in the composite intellectual atmosphere of the eighteenth century, usually summed up in the term "rationalism." The theories of Clausewitz, as well, sprang from predominantly "civilian" developments—the destruction of the absolutist political system and the intensely empirical attitude of his own times. The controlling theory and practices which led to the defeats of the Austrian army in 1859 and 1866 were likewise outgrowths of forces outside the military sphere—the rulers' continuing tradition of suspicion and jealousy toward outstanding field commanders and the sad state in which the general staff found itself as the result of a "deliberate flight from intelligence." Between the two World Wars military

theory and practice continued to be influenced by extramilitary evolution. Much of the military history of Russia and Germany, for instance, can be explained in terms of the political ostracism of those nations from Europe. The technological breakthrough in the twentieth century has had profound repercussions on the military. All these relationships, plus many more, are treated at length in the Howard volume. I can think of no better way to illustrate Zuckert's words than to read it.

There is a corollary to the view that war and policy (to include economics, technology, and society) merge at every point. There are understandable reasons why military strategists have often in the past tended to operate without the aid of historical perspective. As lifelong professional soldiers, their education and experience outside their chosen field have often been limited. But there is no excuse for the future. Military academies and war colleges are equipped to fill the gaps and are busy impressing on their students the importance to military strategy of such apparently "nonmilitary" areas.

Craig's chapter on the Austrian army adds perspective to this question of military education. Austria's tradition of military prowess was undermined in the nineteenth century by two factors: a mortal degree of misunderstanding and distrust between the civil and military segments of the society; and a basic divergence of opinion regarding the nature of war. Although the first of these was not entirely the fault of the military, it does emphasize the responsibility of professional military men to understand national policy. The second destructive tendency is more to our point. Craig attributes the corrosion of the Austrian General Staff to "intellectual slackness" and a "deliberate flight from intelligence." The most important element contributing to this failure was a widespread disregard of the importance of learning as a military virtue, which led after 1848 to a general feeling of positive distrust of the intellectual. Our own society must be continually on guard against such a tendency.

The development of the theme of vital relationship between war and society, begun in the Earle volume, is continued by its succes-

sor. The same is true of the concepts of limited and unlimited war. In our generation this has become a topic of the greatest immediacy. Long-range strategic planning is predicated upon a particular view of the nature of future wars—whether they will be limited or total. Neither of these volumes, of course, makes a pretense of predicting the future. This is outside the province of the historian. What these books do, however, is provide perspective to those charged with supplying a view of things to come. They contribute to the “educated” part of the “educated guess.”

By 1941 the topic of limited warfare was a museum piece. Today, after a whole generation has sat in the shadow of the mushroom cloud, the subject has been revived. Limited-war concepts have been revitalized in two forms, nuclear and nonnuclear. Limited nuclear war in this context refers not so much to the employment of tactical nuclear weapons as to such concepts as graduated response and

the British trip-wire concept. Nonnuclear limited war includes guerrilla warfare and conventional war for limited aims. Both are covered in the Howard book. A serious omission, in my estimation, is the absence of an essay on Vietnam. A chapter on this subject would illustrate even more forcibly the shift in thinking that has taken place from unlimited to limited military thinking. Perhaps had this volume been under American editorship such a chapter would have been included.

There are other threads of continuity in *The Theory and Practice of War*, such as war as an art or science, the value of offense and defense, the professional army versus the militia in history. As with the two cases cited, each of these topics has modern application. If you approach this volume looking for tailor-made answers as to the future, you will be disappointed. If you seek perspective on the past and present course of military thinking, you will find it rewarding.

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AWARD

The Air University Review Awards Committee has selected "Trends in Military Thought" by Colonel Francis X. Kane, USAF, as the outstanding article in the September-October 1966 issue of the *Review*.

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