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Technology for Tomorrow

JANUARY-FEBRUARY 1969

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the cover

General James Ferguson, Commander, Air Force Systems Command, asserts that "the world is caught up in a dynamic Scientific Revolution," and he and five of his organization heads tell of the extensive role that AFSC plays in that revolution. Although these few articles touch on only a fraction of Air Force involvement, they serve as stirring testimonial to the breadth and depth of AFSC's contribution to current aerospace technology.


SPACE
COMMUNICATIONS
engineers
& designers
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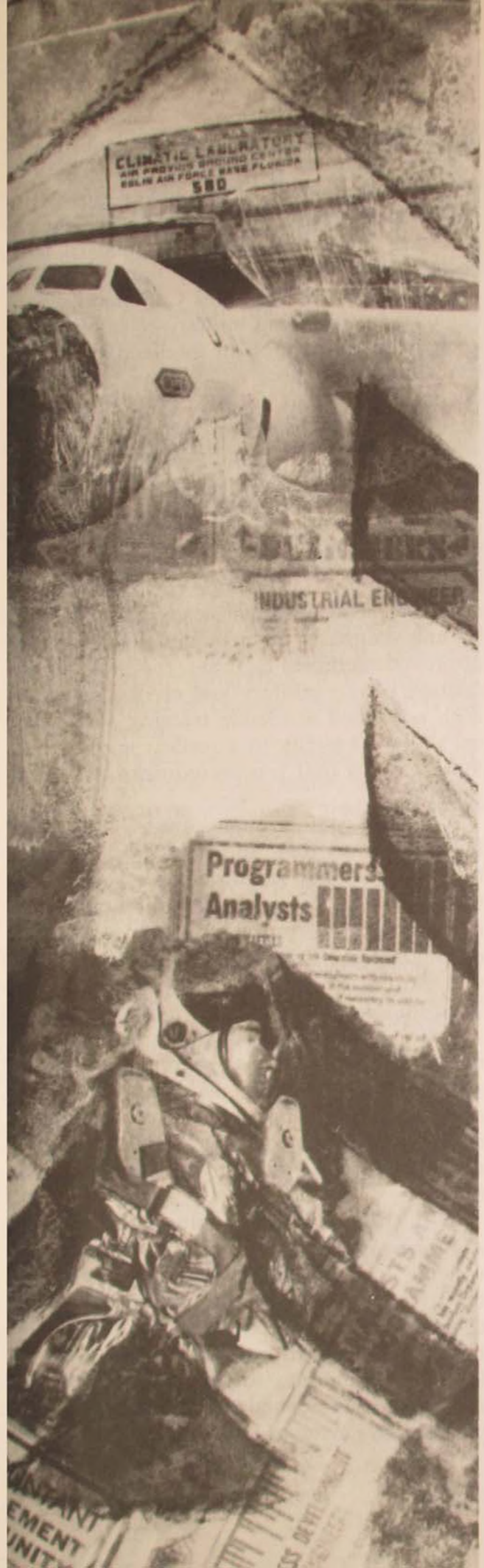


WANTED: NEW IDEAS

General James Ferguson

HUMAN activities seldom slow their advance upon mankind to give observers time to prepare mentally to receive change. It frequently takes considerable time for man to realize that new fields of action have opened up for him and much longer for him to assess meanings and reach a conclusion regarding his attitudes toward the new phenomena. For this reason the discovery of a new technology, the birth of a scientific breakthrough, the exploration of an uncharted technical frontier—such seemingly abrupt expansions of man's horizons are frequently accompanied by hesitation and at least a few false starts toward rationalizing the new situation or capitalizing on the new opportunities.

The rise of European nationalism out of the disorder of the Middle Ages, the discovery of the New World, the Industrial Revolution, the harnessing of electricity and the internal-combustion engine, and the control of atomic energy have all worked fundamental changes in the lives of great populations. Many men marked the events which signaled the dawn of the great movements which followed, and some debated their significance. But few were

wholly aware of the vast implications of what was unfolding before their eyes—the dramatic implications of a technological breakthrough or a new discovery.

Today the world is caught up in a dynamic Scientific Revolution. The atom has been identified, captured, and put to man's use. We have taken significant steps into outer space. The sciences of light and energy are finding new outlets in the laser, spectral photography, and diverse forms of radar. Electronic and computer sciences are revolutionizing business, education, communications, and engineering. A problem that only a generation ago required ten years for seventy skilled mathematicians to solve on calculators can now be performed by a computer, with greater accuracy, in less than an hour.

In terms of measuring progress, the decade has replaced the century. Whole "ages" are spanned in a single lifetime, and as a result scientific milestones are crowding closer together. Advances overlap, and the cascade effect of all this forward motion fosters still another consequence of the contemporary Scientific Revolution—the growing interdependence between the scientific and technical fraternities throughout the world.

Many Americans, living in an isolated and lethargic world of "status-quo-ism," still believe that there is nothing new in the world anymore, that all the adventure is gone, that pioneering has all been done. As the articles by personnel of the Air Force Systems Command in this issue of the *Air University Review* demonstrate, we can still dream future adventures in space, challenges in aeronautics, opportunities in engineering, and new experiences in laboratories. Yesterday's science fiction can be translated into today's scientific reality and tomorrow's scientific promise.

We in the Air Force Systems Command deal with technological accomplishment for the future, whether that future be ten seconds away, ten months away, or ten years away. In our focus on the future, we recognize no limits to the quickening march of human accomplishment and scientific adventurism. Human knowledge doubles every decade, and with this surge of knowledge comes dramatic opportunity for technological accomplishment. Just as surely as ignorance is the enemy of progress, so knowledge is power—power for good, or power for evil. Man's competence in applying the full resources of modern technology may well determine human destiny.

No one in the Systems Command who is engaged in managing military technology can accept the concept of an intellectual or creative stalemate. There will always be a crying need for new ideas, for creativity, for intellectual breakthroughs and quantum jumps in our laboratories and on our drawing boards. It is the creative mind that moves ahead, that departs from the traditional ways of doing things, that uses science as a springboard to new horizons of opportunity. For us in the Air Force Systems Command, there is no technological peace or scientific security. Our continuing emphasis on managerial competence, improved technical facilities, the growing percentage of our military and civilian personnel with advanced academic training and technical skills—all testify to a restless and forward-looking spirit that is a prerequisite to national progress.

In 1933, philosopher Alfred North Whitehead observed that "the time span of important change today is considerably shorter than that of human life, and accordingly our training must prepare individuals to face a novelty of conditions." Professor Whitehead's counsel was fair warning that a new standard had been imposed on our society. Change became a virtue, not a taboo; something to be sought, not avoided. Change has become the one constant in today's society; and the most obvious aspects of contemporary life are the rapidity of change and the power that technology gives us over our life, our environment, and our future.

In this constantly changing world, the Air Force employs the tools of continually advancing technologies to become participants, not merely observers. The exciting challenges of tomorrow's aerospace technology provide the Air Force with opportunities for our collective imaginations to look up and out into new worlds of aeronautics, electronics, space, propulsion, avionics, bioastronautics, mate-

rials, and weaponry. Our goal is an Air Force technology that moves forward in partnership with the civilian economy—not in fits and starts, but in orderly progressive fashion—always equal to any situation, always technologically responsive to any operational need or policy requirement.

In our day-to-day preoccupation with the details of funding, manpower and organization, systems management, weapons testing, and cost effectiveness, the Air Force must never lose sight of the creative process of scientific change—the need for a new, useful idea. We will always need the thinking man who asks meaningful questions and seeks the uncommon solution in his areas of interest.

Professor Henry A. Kissinger, in his book *The Necessity of Choice,* underlines this point when he writes: "Creativity invariably involves doing the unfamiliar. It requires a willingness to leave behind what is generally understood. Our generation, it is clear, will live in the midst of change. Our 'norm' is the fact of upheaval."

There are still many questions to be asked, new breakthroughs to be made, new dimensions for human progress to be achieved. From the expanding technology in Air Force laboratories, test facilities, and development centers and from our civilian associates in the nation's universities, industrial plants, and research institutes must come the ideas of tomorrow, the technological advancements to insure our nation's freedoms—freedom to grow and to be more creative—freedom to explore our universe—freedom to solve our social and economic problems and secure political understanding between the free nations of the world.

The science-industry-military-civilian team of the Air Force Systems Command has been given the prideful responsibility of providing operational Air Force commands with qualitatively superior weapons. Meaningful discharge of this responsibility can stimulate a great renascence of human creativity throughout all the known fields of technology and, indeed, can create new sciences along the way. It is a challenging opportunity for all Americans to use our democratic freedoms to plan and build a better, wiser civilization. The scientific ideas of today can determine the well-being in which man as an intelligent and conscious individual will be free to grow tomorrow, to learn and to apply new knowledge, to express himself creatively with self-respect and human dignity.

To be sure, every technical step forward opens the doors on new technological possibilities, to be used for us or against us. The discovery of gunpowder might be cited as a classic example of this observation. But there is no reason to fear an encounter with these new insecurities, to hesitate to depart from the unfamiliar. We must have confidence in the capacity of our vast natural resources to face up to problems and thereby turn stumbling blocks into stepping-stones, and convert millstones into milestones.

Ideas are the weapons with which the nation must wage its technological war in the cause of human progress. Americans have never been afraid to "dream the impossible dream" or try to "reach the unreachable stars." We have often succeeded far beyond our expectations; and we have failed only when we lacked boldness of spirit or inspired purpose.

Our national thinking need not be limited by three-dimensional natural barriers. We need not be inhibited by traditional concepts, by textbook approaches, by orthodox methods, or by conventional ways of doing things. We must accept the challenge of the unknown with the confidence gained throughout a history of meeting and overcoming technological obstacles on land, on sea, and in the air. We see new limits or even a limitlessness of man's intellectual capacity to grow.

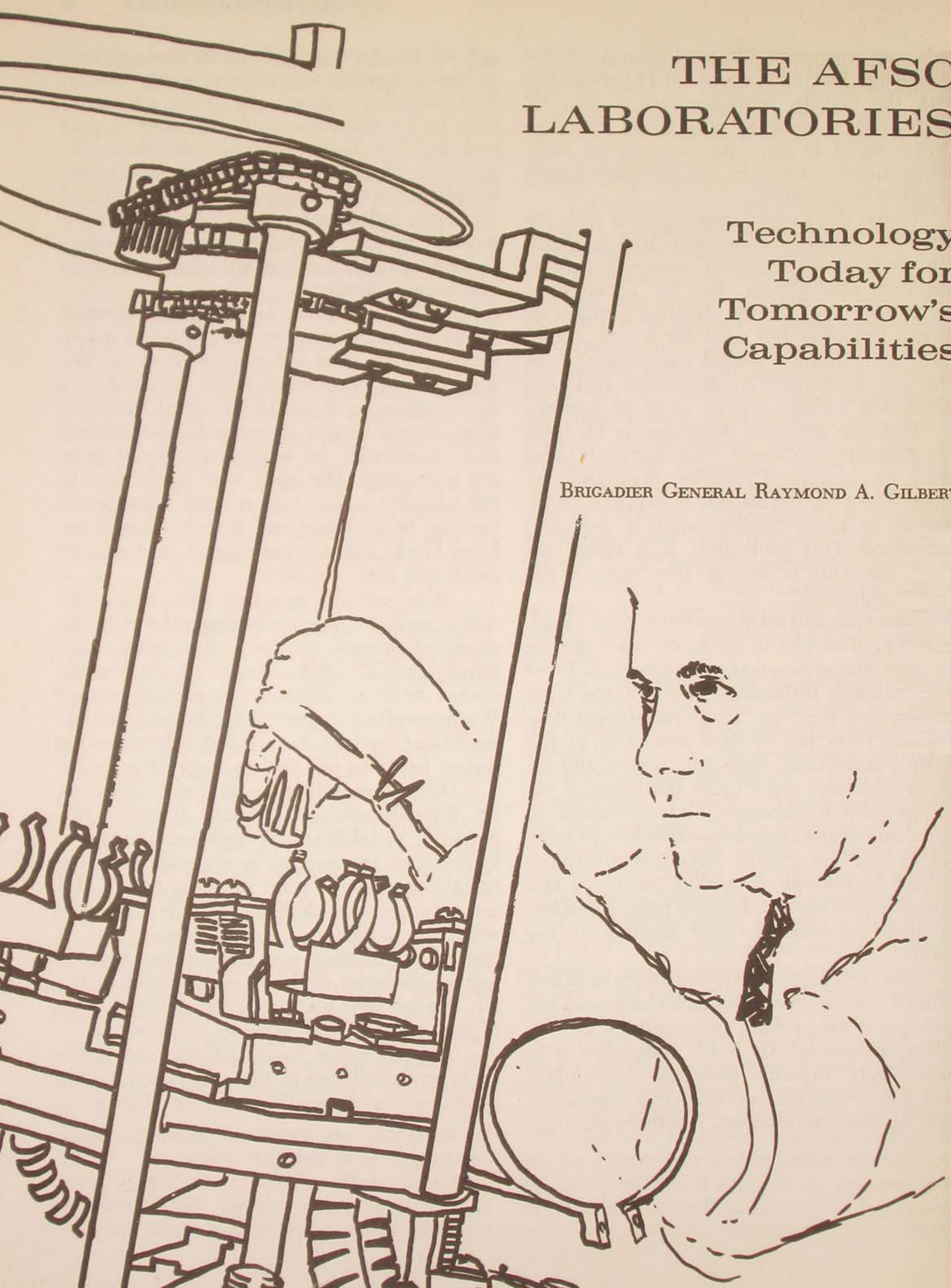
The Air Force Systems Command issues an urgent challenge to the uncommon genius of man everywhere—Wanted: New Ideas.

Hq Air Force Systems Command

THE AFSC LABORATORIES

Technology Today for Tomorrow's Capabilities

BRIGADIER GENERAL RAYMOND A. GILBERT



THE confluence of the intercontinental manned bomber and the atomic bomb in the mid-1940s was a major factor in the establishment of the United States Air Force as a separate service. The marriage of two more products of technology, the ballistic missile and the thermonuclear weapon, coupled with a national policy of strategic nuclear deterrence, was an important factor in the growth of the Air Force during the 1950s.

Also during the 1950s the administration adopted the policy of contracting out to the private sector work that it could reasonably perform. This policy was applied to research and development.

In the early 1960s it became apparent that additional effort was needed to provide within the government the necessary competence to specify and evaluate properly the goods and services produced by the private sector. A concerted effort was made, therefore, to enhance greatly the capabilities of the in-house laboratories of the federal government, particularly those in the Department of Defense. Similarly, the ever increasing costs of developing new weapon systems prompted the Department of Defense to establish a general policy that new systems approved for development would be based on technologies that had previously been adequately demonstrated.

Frequently the research, development, and testing required to provide this demonstrated technology for future systems were simply not accomplished because of the pressures of acquiring new systems which were very expensive, urgently needed by the operational commands, and always pushing the technical state of the art.

To provide this greater in-house competence and to insulate some scientists and engineers from the daily pressures of acquiring new systems, the Air Force Systems Command in 1962 established the Research and Technology Division. By the fall of 1963 seven laboratories had been established, and another, the Air Force Armament Laboratory, was added in 1966 after being a detachment since 1964.

One of the original objectives of the Research and Technology Division was to "provide effective Laboratory support to current and future systems." As the competence within the laboratories grew and became recognized, they were called upon more frequently to provide assistance to the systems organizations. By the spring of 1967 the Headquarters Research and Technology Division staff was consolidated with that of Headquarters Air Force Systems Command, eliminating one echelon of review.

On 1 July 1968 the Air Force Human Resources Laboratory became the ninth AFSC laboratory.[1]

Today the AFSC laboratories are recognized as a group of competent, dedicated people who are constantly striving to be responsive to the present and future needs of the Air Force. They are involved in a broad spectrum of activities. For example, the laboratories conduct or manage through contracts the bulk of the Air Force exploratory development program and a major portion of the advanced development program, both of which are directed toward establishing a technology base upon which to build future Air Force systems. A broad technology base that can provide the Air Force new capabilities in the future can also provide options for the next generation of systems and the basis for modifying current systems either to upgrade performance or respond to a changing threat.

With the national emphasis in the 1950s on strategic nuclear deterrence, a base for conventional and special air warfare was not fully developed. Nevertheless, the laboratories have responded vigorously to the operational requirements in Southeast Asia.

The laboratories are heavily involved in various development planning activities. They have made particularly valuable contributions to the Category C Mission Analyses conducted jointly by AFSC and the using commands over the past year and a half, to identify existing or potential operational deficiencies or needs.

To insure that new technology is applied to systems problems, the laboratories work closely with the systems acquisition organizations on many aspects of their efforts. For example, they are called upon to help write specifications for new weapon systems, to eval-

uate the feasibility and validity of contractor proposals, to manage contracts, and even to perform tests and evaluations of some hardware items. They sometimes have complete engineering development and acquisition responsibility for items such as ground-based radars.

The laboratories are frequently called on for expert consultants when a contractor is having difficulty meeting performance specifications because of a technical problem. For instance, AFSC laboratory scientists and engineers working on an Airframe Propulsion Compatibility Group helped to identify deficiencies in the F-111 and made recommendations that resulted in substantial improvement of its performance.

The laboratories sometimes provide advice and guidance to the AFSC test centers and frequently use their facilities to perform tests on items of equipment being developed in-house or under contract to the laboratories.

Scientists and engineers of the laboratories serve on many interservice, interdepartmental, and interagency committees. Because of their recognized expertise outside the Air Force, they are often called upon to manage or execute research and development projects

for ARPA, DASA, NASA, FAA, DCA, DIA, and others.

Although the Air Force grew rapidly in the 1950s, the national policy of contracting out research and development did not enhance the growth of Air Force in-house laboratories. Accordingly, today Air Force laboratories comprise approximately half as many people as the laboratories of either the Army or the Navy. Ours have therefore been forced to continue contracting out a large portion of their effort to make most effective use of the limited dollar and manpower resources. In addition to contracts with industry, not-for-profit organizations, and universities, the laboratories have sought the help of many other agencies, working closely with other AFSC and USAF organizations, with their counterparts in the other services, and with the Air Force's Federal Contract Research Centers. The AFSC laboratories have enjoyed a particularly close and rewarding relationship with laboratories of the Office of Aerospace Research.

Air Force Special Weapons Center, Kirtland Air Force Base, New Mexico, supported developmental testing of the F-111 aircraft crew escape capsule. Using a B-52 as test-bed, the Center drop-tested the boilerplate model in support of the parachute development program.

Air Force Systems Command and Air Force Logistics Command share the mission of equipping the Air Force with the best weapons that modern technology can provide at a reasonable cost. The role of the Air Force laboratories is to create the technology base and make it available, sufficiently well defined and demonstrated that it can be applied when needed to current and future Air Force problems.

Since resources will always be limited, the serious question is which areas of technology should be pushed and how strongly. These decisions must come from a firm understanding of the threat and an appreciation of Air Force operational needs and materiel deficiencies both current and projected. The understanding of the threat comes from a close relationship with the Foreign Technology Division. The appreciation of the operational needs and deficiencies comes from many sources, one of the most fruitful in recent years being the Mission Analysis studies in which the laboratories participated with the development planners' analysis studies. The DOD Five-Year Plan and formal USAF guidance and requirements documents such as USAF planning concepts help provide the broad framework, which is supplemented by advice and counsel from such groups as the Air Force Scientific Advisory Board, National Academy of Sciences, and AFSC Board of Visitors.

The laboratories have frequent meetings and almost continual communication with the acquisition organizations of AFSC. The meetings range from daily informal working sessions to formal annual coupling meetings or formal program reviews. Each laboratory has a full-time assistant for systems support, whose sole responsibility is to keep open the lines of communication between the laboratories and the systems acquisition elements in AFSC.

An extremely important source has been discussions with personnel of the operational commands in the field, both in the United States and overseas. On-site discussions in Southeast Asia and continuing discussions with those who have returned from duty there have been most helpful in providing motivation and direction for laboratory involvement in current Air Force problems.

The dialogue with the major operational commands is important also because of the impact technology must have on statements of required operational capabilities. There is a very fine line between asking for too much and asking for too little, but the impact on costs, schedules, and performance can be enormous. Better communication between those responsible for the technology base and those responsible for stating operational capabilities should lead to more credible and realistic statements of requirements.

The laboratories are having a profound effect and influence on the technology that will be available for future generations of Air Force systems through their distribution of technical objective documents, review and monitoring of independent research and development efforts of the contractors, participation in professional societies, evaluation of unsolicited proposals, and specific requests for proposals that are furnished to universities and industry.

Because it is not possible for the laboratories to perform in a meaningful way in a large number of mission analyses simultaneously, some important Air Force problems will simply not be studied by them in the next year or so. To provide a better basis for planning the exploratory and advanced development programs and guiding universities and industry, each of the laboratories has established an internal studies and analyses group that will perform mission analyses and technology applications studies directly related to that laboratory's technical responsibilities and limited to that scope.

There is one major difference between the laboratories and most other organizations within the Air Force. In most jobs, a person is rated on his performance of fairly well defined and circumscribed functions using established procedures. A Strategic Air Command crew earns the "Select Crew" accolade not by improvising or experimenting but by demonstrating an ability to execute standardized operating procedures in an outstanding manner. While much discipline and adherence to set standards and procedures are also essential in research and development, progress in science and technology is simply not achieved by practicing the same experiment over and over. Progress comes not only from developing the ability to perform new functions but also, and of equal importance, from the development and application of new and novel techniques to perform old functions more effectively. Standardized procedures are fundamental to good management, but they can also inhibit creativity.

Because of the many demands on our laboratories, perhaps the most challenging aspect of a laboratory director's job is how to allocate his resources among the many competing requests. For example, how much effort of the laboratory should be devoted to solving problems of the current fleet, providing input to the next generation of systems, or developing the technology that will be required for the generation after the next? How much effort should be devoted to problem-solving versus working on the technology? Should the work be done in-house or on contract? Should the problem-solving effort be pursued on a subsystem or component basis? What is the proper balance between developing and applying technology? What are the respective roles of man and machine and their interactions?

The technology must be well in hand before new systems are approved for development. To provide an adequate demonstration of the technology, particularly as the hardware becomes more complex and more sophisticated, requires time. Doubling or quadrupling the funds available does not insure a commensurate reduction in time. Also, it is generally far less expensive to demonstrate a piece of equipment, an idea, or a concept in an exploratory development program than it is to attempt to force the development

of a new technology while trying to maintain production schedules and initial operational capability dates. Technology is sometimes capricious, and the future is always uncertain. In view of the limitations on funds and personnel, it is especially important to select the right problems and apply resources judiciously to those technologies which have the right balance between risk and payoff.

We have come a long way in analytical techniques, but there are many areas where we simply do not have enough experimental data upon which to base analytical techniques or provide high confidence that our analytical techniques are adequate. Our knowledge of turbulence and flow separation, particularly in the transonic region, is still not founded on an adequate theoretical base. We still approach the problem of instabilities in liquid-rocket engines on a semiempirical basis. And so it is with many other areas.

There is still a need to build hardware for test and evaluation purposes even though we think we understand the performance of each of the individual components. The amount of money going into the Soviets' research and development program, plus the number of new aircraft, missiles, and spacecraft they have built in the past few years, is ample evidence that they understand this issue very well.

Although the laboratories are manned predominantly by career civilians, who provide a much-needed continuity, many of the exciting ideas and major advances come from our well-educated junior officers, many of whom have master's and Ph.D. degrees. The laboratories provide an excellent training ground for these officers, who later in their careers can be extremely effective in systems program offices or in management positions in ranges, test centers, and laboratories.

Some Past Accomplishments

A description of all the past accomplishments by the AFSC laboratories would fill many volumes, so I have selected only a few of the more representative achievements:

During the past year the laboratories have developed several riot control munitions of the tear gas sort for use in counterinsurgency (COIN) and limited-war situations. To dispense these munitions in large quantities from low altitude, the laboratory was required to develop also a dispenser that would be aerodynamically compatible with high-speed aircraft. On signal from the pilot, one such dispenser releases the munition in clusters, after which a pyrotechnic fuze is ignited. The pyrotechnic causes each of the munitions to skitter over the target area, releasing the agent as it goes, assuring effective coverage.

When the Air Force was faced with a critical deficiency in night interdiction capability in Southeast Asia (SEA), our laboratories came up with the Gunship II prototype development that enabled new night-viewing sensors and fire-control techniques to be integrated into the C-130 aircraft, which has been successfully employed in SEA.

The laboratories have developed in-house a tool that can be used as a gun harmonizer. It consists of a helium-neon laser precisely aligned with the axis of a precision mandrel inserted in the nozzle of the gun. The highly collimated red light from the laser produces a clearly defined spot on a boresight target. The results achieved to date indicate that more accurate and faster alignment can be attained than that possible with the conventional J-1 boresight tool.

Laboratory efforts have demonstrated conclusively that a system comprised of a laser illuminator, laser seeker, and flight controls can be combined to provide an accurate terminal guidance system for bombs. Further, tests demonstrated that the Air Force now has a terminal guidance system that will greatly increase bombing accuracy at greater aircraft standoff distances against targets illuminated by lasers used by either a ground or airborne forward air controller.

A quick fix to a critical Air Force problem in Vietnam was researched and successfully developed in-house by the laboratories. Identification, friend or foe (IFF) radar antennae on the F-100 were failing after about six hours of aircraft operation from acoustical vibration

generated by the plane's own cannon fire. Laboratory scientists developed a small, low-cost, easily attachable prototype viscoelastic damper as a quick fix. Field evaluation of the damper in Vietnam showed a twelvefold increase in the life of the radar antennae. A sufficient number of dampers manufactured in-house by laboratory personnel were shipped to completely equip the F-100 fleet in Vietnam.

The laboratories have done excellent work in the interpretation and processing of raw reconnaissance data. In Project Compass Eagle, a reconnaissance data-processing facility has been established in Southeast Asia which has made possible the introduction of the latest techniques, devices, and procedures directly into the theater of operations. Laboratory personnel have personally participated in this overseas extension of their work.

TALAR IV, a man-portable military landing system, provides more precise guidance than the instrument landing system (ILS). It can also be used to provide accurate guidance for weapon delivery. Headquarters USAF has recommended TALAR IV to fulfill a Southeast Asia requirement.

The laboratories have developed an automatic homing parachute system that can be controlled from the drop aircraft or from the ground or can home automatically on a ground beacon. In demonstrations in the Bavarian Alps, miss distances of 45 feet from the beacon were consistently achieved. In Vietnam, it will provide an offset release capability such that the drop aircraft is not exposed to small-arms fire. Inherent in the steerable parachute concept is the almost limitless size of the payload, which can range from small emergency supplies of war through heavy earth-moving equipment, trucks, artillery, nose cones, and satellites.

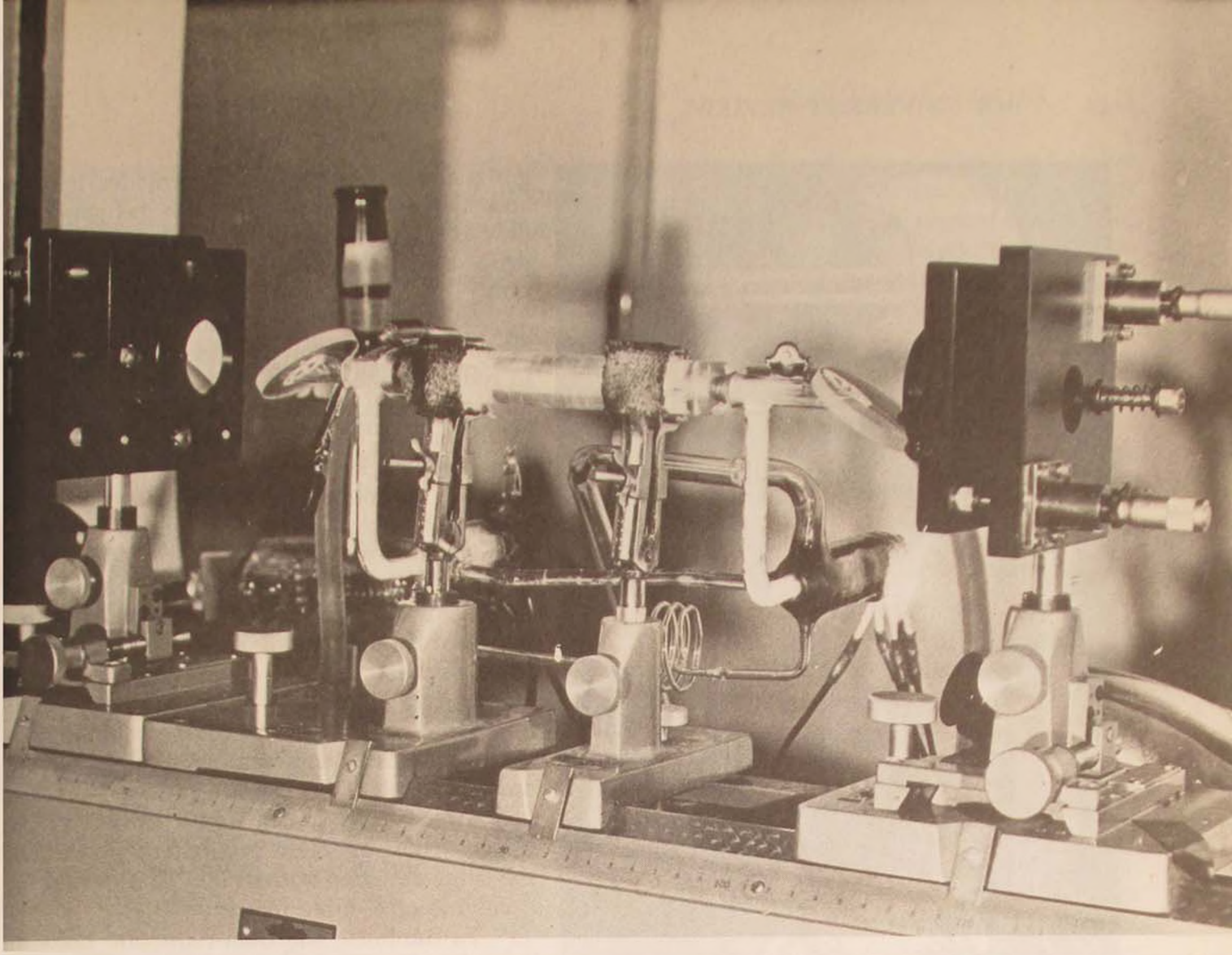
Fuel tanks of the B-52 aircraft were found to suffer from biological corrosion in which microorganisms attacked both the sealants and the substrate metal. The laboratories developed sealing materials as well as top coatings that were resistant to this kind of corrosive action. These top coats and sealing materials protected both the sealant and metal from the biological corrosion and thereby decreased the downtime and maintenance requirements of the aircraft.

A significant materials development was a glass fiber that has 40 percent higher tensile strength and 200°F greater temperature capability than the best previously available fiber. This material went from completed research to production of filament-wound plastic rocket motor cases for Minuteman and Polaris missiles in less than one year. The resulting decrease in structural weight in the Minuteman permitted a 15 percent increase in payload.

To provide high-temperature deceleration devices for Air Force aerospace systems, the laboratories have pursued a program for the development of metallic fibers suitable for weaving. This program has been highly successful, and a multifilament yarn has been woven into an extremely flexible and strong metal fabric resistant to elevated temperatures. This material is now being used in the fabrication of experimental hypersonic decelerators. The fabric was also found suitable for use as a coverall to a space suit, to provide thermal protection for astronauts during space walks. The coverall was successfully used for the first time during the Gemini IX orbital mission.

A remote laboratory detachment has developed techniques for improved imaging of orbiting objects in space, using a 48-inch telescope and a variety of imaging sensors. This was of great service in investigating and analyzing problems that developed on the Apollo mission of 4 April 1968. Malfunctions in the early rocket stages caused mechanical damage that resulted in the third stage's being left in earth orbit. It could not be determined if the payload had been ejected properly or if this too had malfunctioned. Motion-picture imagery taken at the detachment was used to establish that the payload had been ejected. It also confirmed the tumbling rate of the third stage, which had been tentatively established from other data.

A solid rocket capable of multiple start, stop, and restart has been demonstrated. The concept is called the "dual chamber" and consists of a solid-propellant gas generator, which is in constant operation, an on-off valve, and a rocket motor. The addition of flow from the



Lasers

AFSC laboratories keep in touch with the operational and acquisition elements of the Air Force, so that the technology base they create will be applicable to current or future needs. For instance, the Air Force Avionics Laboratory is working to realize all possible potentialities from the argon laser. . . . An early practical application of a laser was to "telephone" voice communication over line-of-sight to a hilltop six miles away.

The astronaut's metallic coverall is fabricated from Chromel R, developed by the Air Force Materials Laboratory. It is worn during extravehicular activity and protects him from the 1200°F gas plumes that shoot from the jet thrusters of the Astronaut Maneuvering Unit.

gas generator to the motor provides ignition and sustains combustion. If the gas generator flow is stopped, the motor chamber pressure drops below that required to sustain combustion.

As a direct result of our laboratory pioneering effort, major progress has been made in reducing the cost of moderate-performance aircraft inertial navigation systems. With the establishment of a "Low Cost Laboratory Detachment" at Holloman AFB, New Mexico, in 1964, an in-house capacity to design and develop a low-cost inertial system of moderate performance was initiated. Today, four years later, such a system has been developed in-house. Air Force interest has sparked industry, which in turn is making significant progress in cost reduction.

A lightweight one-kilowatt power amplifier has recently been developed for application to tactical troposcatter radio sets. The amplifier weighs 80 pounds and has a volume of 1.5 cubic feet and a power output of one kilowatt; current field equipment performing the same function weighs 600 pounds and has a volume of 8 cubic feet.

To minimize the data-reduction tasks involved in the production of maps and charts, an automatic stereocomparator has been developed for operational use. Precision optics provide the operator with a clear view of the image areas, permitting him to superimpose similar image points of any two of three photos to a very high level of accuracy. When this has been accomplished, the operator initiates a measurement and coordinate readout wherein the photo coordinates of each image are recorded to accuracies of two-millionths of a meter. The automatic readout process is accomplished with a general-purpose computer and electronic image-correlation equipment.

A new concept for an oxygen supply system which concentrates oxygen from air is being exploited by the laboratories for use in fighter aircraft. Feasibility has been established for this unique device, in which a highly reliable static electrolytic cell produces 100 percent pure breathing oxygen. It uses 500 watts of power to supply two men. Major advantages of its use stem from the elimination

of the present extensive ground support associated with the manufacture, storage, transportation, and servicing of liquid oxygen (LOX).

The laboratories successfully completed a program to demonstrate a flight-weight hybrid propulsion system for use in the Sandpiper target missile. This propulsion system is less expensive and provides for a greater operational envelope than the current Sandpiper propulsion system. The hybrid propulsion system used a liquid oxidizer and a solid fuel. Its thrust can be varied between 550 pounds and 60 pounds, and its burn duration is up to 7 minutes. Three flights were made with the Sandpiper having the hybrid propulsion system, and all three were successful.

The laboratories have developed a technique to simulate the airblast environment of a nuclear burst. This technique utilizes high-explosive detonating cord confined within a cavity to generate a shock wave and a resulting overpressure. They have simulated the air-induced ground motions in soil at the 1000-psi overpressure level of a 10-megaton burst.

Some Current Areas of Interest

"Higher and faster" has long been an Air Force goal, and indeed research is being carried on in the supersonic and hypersonic regimes. Specifically, major efforts are being devoted to better high-temperature, high-strength materials; new and novel structures and aerodynamic shapes; better control systems; and efficient propulsion systems. The requirement to operate at the extremes of the speed/altitude spectrum necessitates that the pilot be provided with a vehicle that is stable and controllable. This may require the complete replacement of the present complex mechanical control system by an electronic self-organizing control system invulnerable to all but the most severe battle damage. A particularly challenging problem is the development of an efficient, economical propulsion system that can cover the entire speed regime from takeoff through hypersonic flight. Such future propulsion systems may be combinations of turbojets, ramjets, and rocket propulsion. A better understanding of the lift and drag characteristics of present airfoils and lifting-body designs over this same speed regime is also needed for maneuvering re-entry vehicles that can land at a desired prepared base.

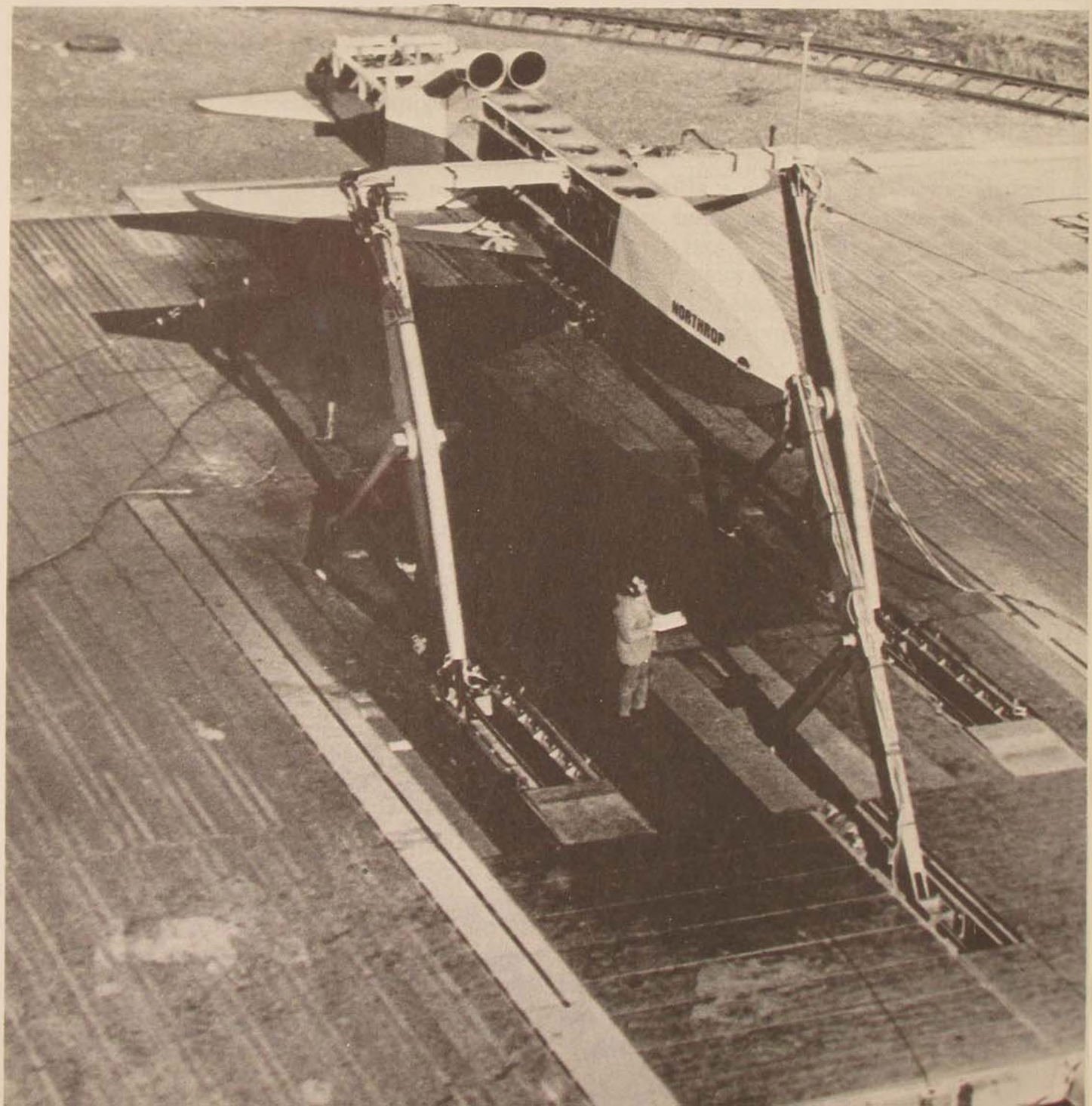
An interesting question arises with regard to hypersonic flight of manned vehicles. Have manned spacecraft obviated the necessity for manned hypersonic vehicles? Since the answer to this question is not clear, the laboratories are continuing efforts in both areas.

We need to know much more about how to design supersonic fighter aircraft that can maneuver effectively throughout the entire speed regime. A particular bothersome region is the transonic flight regime. The use of lighter-weight materials not only in the primary structure but also in the engine and all the subsystems can substantially improve performance. However, this trend to larger and relatively lighter structures operating in the projected flight environments introduces severe aeroelastic problems. New flight control techniques designed to suppress or control these structural bending modes now offer the aircraft designer a new design freedom. Trade-offs can now be made between structural weight and performance with no degradation in the service life of the aircraft. At the other end of the speed spectrum, vertical takeoff and landing (VTOL) aircraft that also have a high speed capability can provide great gains in flexibility and mobility. New materials appear to hold the key to the high thrust-to-weight-ratio propulsion devices and lightweight structures, but completely new concepts might provide the impetus for major progress in this area, which is also of such great interest to civil aviation officials. In the meantime additional work needs to be performed on high lift devices for short takeoff and landing (STOL) aircraft. High lift devices can also improve the low-speed characteristics of supersonic aircraft. These high lift devices, if used symmetrically to directly control the flight path of the aircraft, provide much more precise control during weapon delivery and other precision tracking tasks.

The mission-oriented subsystems of future

Materials Research

Technological problems yield to the skill of laboratory scientist and experimental engineer. Electronic Technology Division engineers use a Leitz microscope to evaluate silicon material to be used in developing integrated circuits. . . . Porous metal fencing was developed to deflect engine blast from VTOL aircraft so as to eliminate erosion of soil around VTOL landing pads. . . . Fast-setting concrete in its liquid state easily flows into irregularities of broken runway pavement, but an aircraft can land on the surface within an hour.



aircraft are becoming even more important. In the reconnaissance and surveillance area, we have made good progress in developing sensors for acquiring the relevant information. The big problem facing the laboratories today is how to analyze and correlate in near real time the tremendous amount of information that can be gathered in a single sortie by a modern high-speed aircraft. A second critical problem is how to present in a short time the essential information to the appropriate decision-makers so that it can be acted upon. While the location and identification of certain fixed targets is important, timeliness is more critical as to moving targets; for example, we want *immediate* information about trucks or troops moving along a certain roadway, since its value diminishes after a few days or even hours.

The laboratories also are a major contributor to the Air Force quick-reaction capability, which has been developed to meet rapidly changing tactics in electronic warfare.

The cost of a modern fighter or ground-attack aircraft dictates that we provide the

pilot something better than an iron bomb hung under the wing and a piece of chewing gum on the windshield. The laboratories have programs to make aircraft less vulnerable and to aid the pilot in finding, identifying, and hitting the target. Because the lethal radius of a conventional high-explosive free-fall bomb is small compared to the average miss distance of such a bomb, something dramatic must be done. A number of programs are under way in the laboratories to improve delivery accuracies in day, night, and all-weather conditions. Some of our improved devices are already deployed in Southeast Asia, while others will not be ready for the inventory for some time.

The laboratories are vigorously pursuing new concepts in ammunition and guns for use on future generations of fighters and ground-attack aircraft. We are continuing biological and chemical warfare programs at modest levels, with the emphasis on defensive techniques. Research on new explosives and new techniques for utilizing more effectively the energy of current explosives is also moving ahead despite the large amount of effort going into the development of current munitions and fuzes for Southeast Asia.

The laboratories are pursuing efforts to free aircraft from dependence on hard-surfaced runways and thus greatly increase their usefulness, especially in the logistics and ground support role. These efforts range from an expandable tire, which deflates to low volume when the gear is retracted and inflates to provide high flotation when the gear is lowered, to an air cushion landing gear, which operates on the ground effects principle and permits operation from any reasonably smooth surface, including mud and water.

The laboratories are developing turbojet, ramjet, and rocket propulsion systems to provide options for a wide range of air-to-air and air-to-surface missiles. Of particular interest now are the stop-start and throttling capabilities for solid and hybrid (combination liquid and solid) rocket motors. The two propulsion laboratories have joined in a single aggressive program to explore air-augmented rockets (combination of rocket and air-breathing cycle) and ramjets, using the same test vehicle. This concept is extremely important for long-range air-launched missiles that operate in the atmosphere.

In the ballistic missile and space area, the laboratories are working on new propulsion systems (liquid, solid, and hybrid) that have higher specific impulse, improved propellant mass fractions, better restart and throttling capabilities, and lower costs; new guidance systems that are more flexible and more accurate; components and facilities that are less vulnerable to nuclear attack; ground-based and airborne communication terminals that interface with satellites; and others.

In the command, control, and communications area, the laboratories are stressing wide bandwidth digital communications to enable the transmission of large quantities of secure information. An intriguing idea for future development, which evolved out of a mission analysis, is ICNI (integrated communications, navigation, and identification). The laboratories have undertaken to perform the critical "thin thread" experiments to demonstrate the feasibility of such a system. In concept, a single wide-band transmitter/receiver coupled to a computer in an aircraft and to similar compatible ground- and space-based transmitters/receivers could perform the functions of the electronic black boxes needed in aircraft today for air-to-air and air-to-ground communications, for navigation, and for precision low approaches. It would also provide for identification of friendly aircraft.

Technology-Oriented Efforts

The laboratories are well aware of the capabilities of lasers for ranging devices, test devices, communications channels, etc. Similarly, solid state technology and the new microelectronic technology being made possible by large-scale integrated circuits will be utilized to reduce the size, volume, and power requirements of electronic devices, or to increase reliability through redundancy in the same volume and weight, or to perform many more functions in the same volume and weight.

Microelectronics, coupled with new storage devices, offers some hope of dealing effectively with the data manipulation problem referred to earlier. Preprocessing of the data at the sensor offers some hope of cutting down on the amount of data that has to be handled. Here also microelectronics can play an important role.

Much of the research and development in materials is technology-oriented; boron and carbon filament composite materials and manufacturing methods are excellent examples.

A particularly interesting field is bionics. Scientists are attempting to improve their understanding of biologic sensors and information processes in hopes of applying electronic techniques to obtain similar results.

Because of the large number of components in current electronic equipment, reliability is a matter of major concern, as is the electro-magnetic compatibility of various radars and communications equipment.

Blast effects on re-entry vehicles are being examined under a rocket sled/blast simulation program, an in-house project to develop a technique and facilities for subjecting re-entry vehicles and interceptor missiles to a range of simulated atmospheric and nuclear blast loads.

While improved data-processing techniques are urgently needed for reconnaissance, surveillance, intelligence, and information handling, electronic computers can be used for processing many other kinds of data as well. For this reason, several laboratories are heavily involved in a broadly based data-processing technology program.

Modern large-scale electronic computers are also used for solving scientific problems of data. Computer and laboratory simulation and field testing play a very important role in establishing the feasibility of new techniques and components.

A specific example of successful technology development, which took place over a number of years, is the high-bypass-ratio turbofan engine that is now powering the C-5 aircraft. This advanced turbine engine gas generator program has also provided the technology upon which the engines for the next generation of Air Force aircraft will be based.

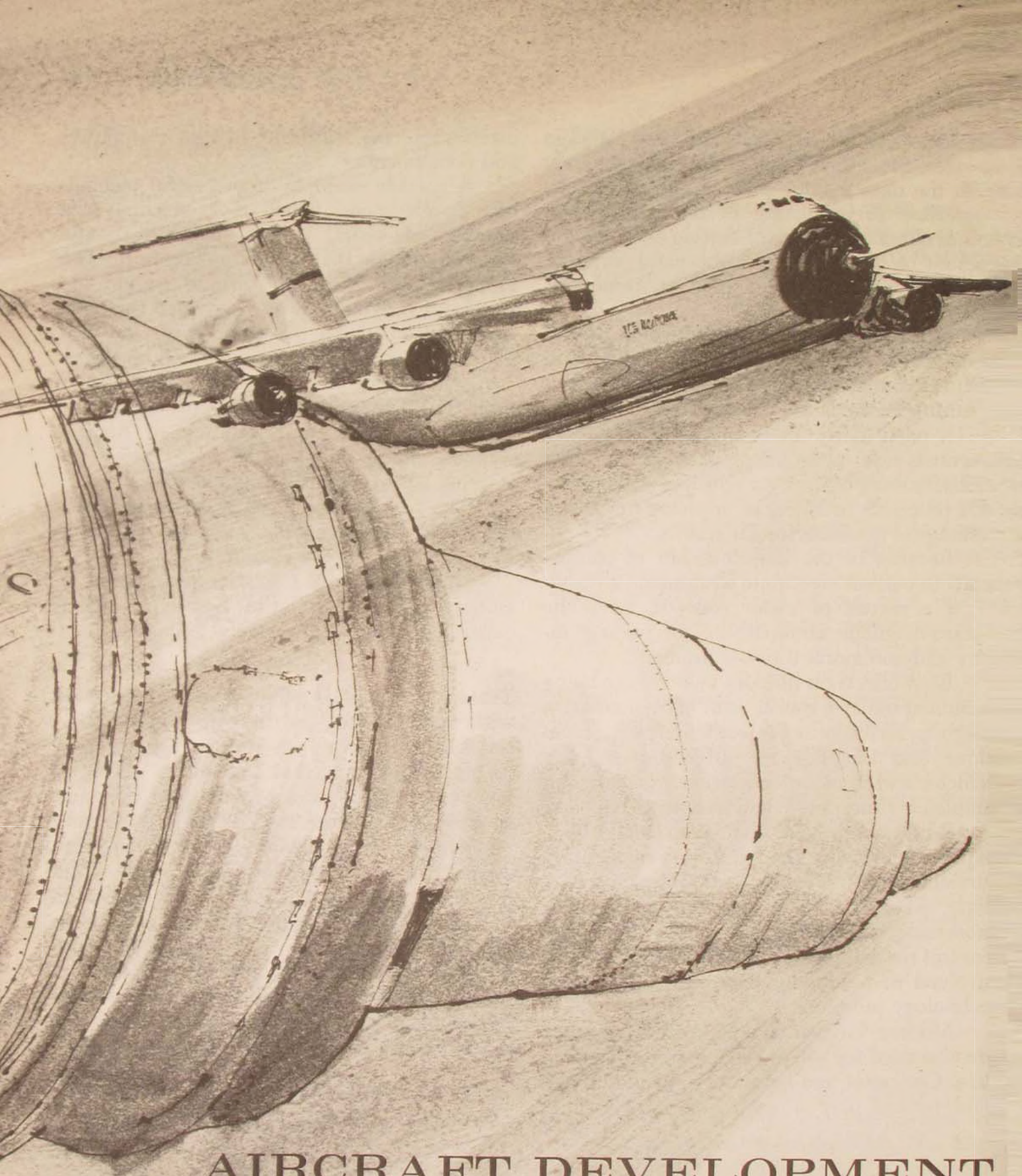
The laboratories are also working closely with the Defense Atomic Support Agency to achieve a better understanding of nuclear weapon effects and how to make Air Force systems less vulnerable to nuclear weapons.

The newest laboratory is concerned with personnel requirements, selection, classification, training, and utilization.

In all these areas the laboratories have developed excellent analytical and experimental capabilities, but much remains to be done.

THIS NATION is engaged in a technological war with the U.S.S.R., and the Air Force laboratories are in the very forefront of this struggle. As one Soviet marshal said recently, "The combat power of the armed forces now depends, as it never did in the past, on the achievement of technology. . . . Contemporary science and technology are the broad foundations of all military knowledge. . . . It is not on the battlefields but on the proving grounds and in the laboratories that competition in civilian and military technology is continuing." The achievements of the Air Force laboratories in the past indicate that with continued support they will more than meet this critical challenge.

Hq Air Force Systems Command



AIRCRAFT DEVELOPMENT

Its Role in Flexible Military Response

MAJOR GENERAL HARRY E. GOLDSWORTHY

In the approaching era of atomic plenty, with resulting mutual deterrence, the Communists will probably be inclined to expand their tactics of subversion and limited aggression. The National Military Program therefore must provide for the defeat of such aggression if deterrent measures fail.

General Maxwell D. Taylor,
The Uncertain Trumpet

Revolutionary warfare cannot be left to happy improvisation any more than can nuclear warfare.

Bernard Fall, *Street Without Joy: Indochina at War, 1946–1954*

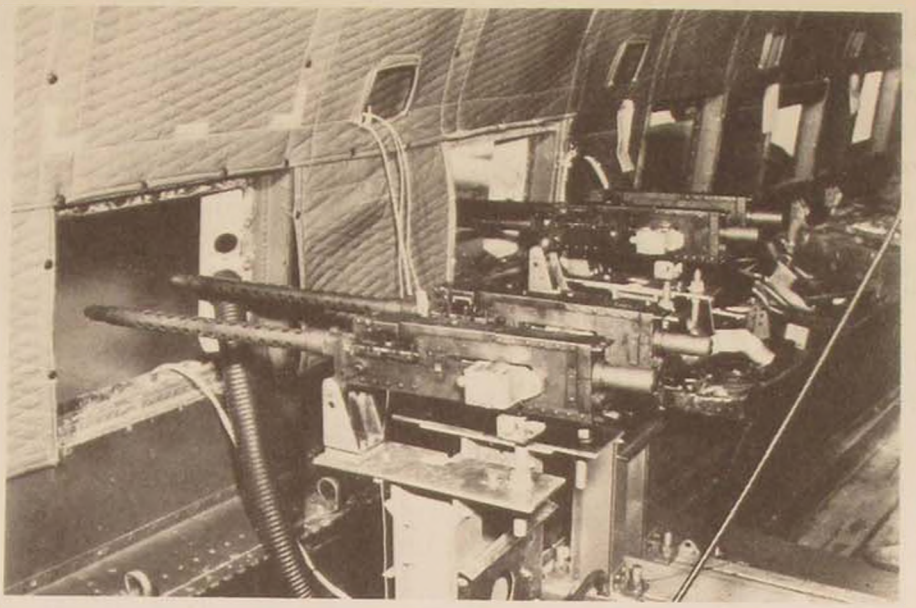
CHANGING international relations and limited wars have forced the United States to rely once again upon relatively large numbers of manned aircraft and related munitions. The current need to place men and supplies in the Southeast Asia theater and nonnuclear munitions on North Vietnamese and Viet Cong targets has pointedly emphasized the soundness of earlier decisions to update the former United States doctrine of reliance on massive nuclear retaliation. Within the context of "atomic plenty" and conflicting East-West ideologies, the cold war came to be fought largely in the realm of military technology. Both Russia and the United States continually increased the lethality of their nuclear weapons, built and deployed their fleets of manned carriers, and developed and improved their missile delivery systems. The ever enlarging nuclear arsenal has created a stand-off between Russia and the United States, with neither power willing to subject itself to atomic devastation and with both exercising restraint.

The occasional eruption of localized hot war and changes in tactical and strategic doctrine from massive nuclear retaliation to a combination of conventional and reserve nuclear forces must be viewed in this context of restraint exercised under the threat of mutual destruction. Beneath the level of ideological hostility, the super-powers have made the necessary effort to control conflict. Whenever war did follow a breakdown of diplomacy and when Third World nations enlisted support from either East or West, war was not on the massive scale envisioned by strategists at the end of World War II.

The United States began to recognize the changing nature of conflict, with its new military requirements, during the late 1950s. The Lebanon crisis, for example, enabled us to reexamine airlift capabilities. Our nation's ability to deploy combat-ready troops and supporting equipment to that Near East trouble spot prevented what might have become a more serious confrontation. In the early 1960s the unfolding Vietnam struggle showed that, even in a nuclear era, war could take many forms and could be fought for specific and localized objectives. Nevertheless, U.S. ability to cope with limited war—from both the doctrinal and actual military points of view—was questionable. Such lessons had to be learned, but they were learned quickly.

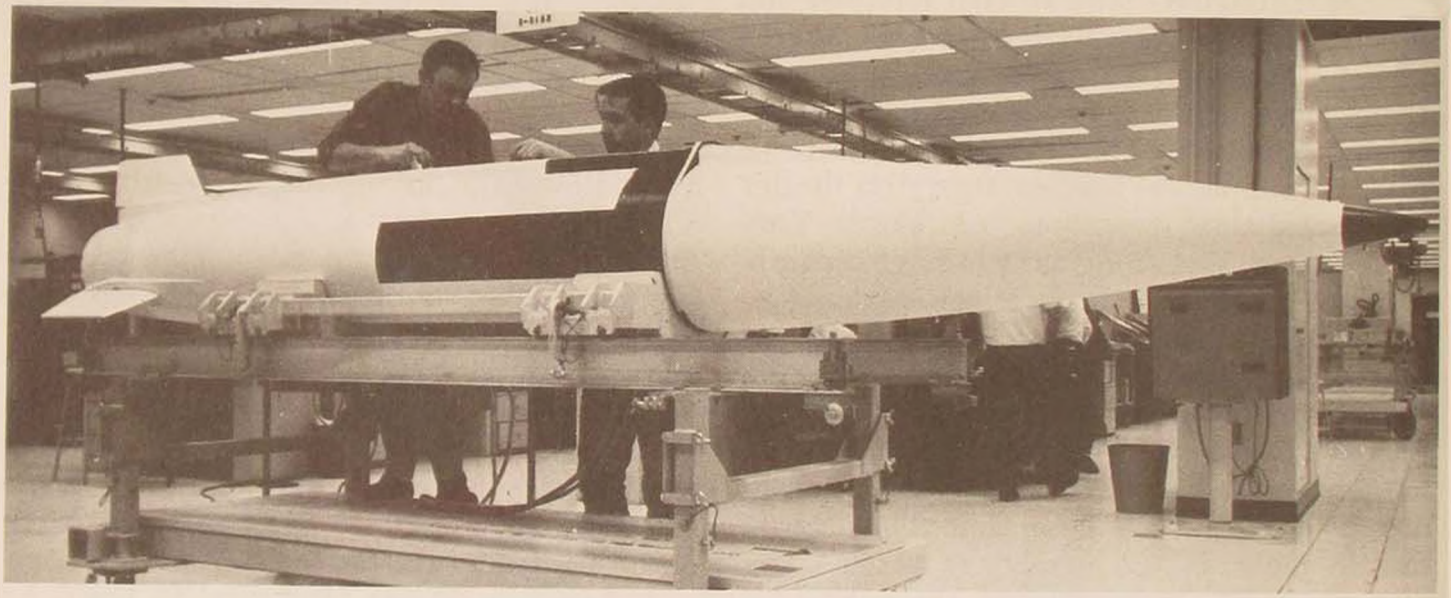
Now heavily committed in Vietnam, the United States is not fighting to destroy North Vietnam, to provoke war with China, or to fulfill any colonial ambitions. Rather, it is attempting to stabilize South Vietnam and allow that country to determine its own course of development free from coercion by the Communist North. No one can say with certainty what will ultimately persuade North Vietnamese leaders to relinquish their aims, but the United States has made every effort to apply only that force necessary to attain its limited military and political objectives. It has attempted to keep the door open to negotiate an end of combat. The goal is not one of pointless and indiscriminate destruction.

Consequently, the war in Vietnam, although on a large scale, has been carried on far below the possible nuclear level. The weaponry which the United States has employed is nevertheless modern and complex, generally possessing a flexible munitions capability. As the war has progressed, military leaders have revised strategy and tactics accordingly, to meet new threats or to gain the initiative. Still, much that has happened in Vietnam is strikingly reminiscent of previous air and ground warfare, and the process of relearning has frequently accompanied the vital process of military innovation.



Adaptation and Innovation

In its continuing role of satisfying the present and future military aeronautical needs of the nation, AFSC's Aeronautical Systems Division adapts older equipment for present roles and develops advanced systems for future needs. Thus, the C-47 has become the AC-47, used for close support of ground troops . . . the AGM-69A short-range attack missile (SRAM) will enable an aircraft to attack heavily defended targets from a distance . . . and the F-5 is a tactical fighter similar in design and construction to the T-38 trainer.



The fact that combat in Vietnam requires both relearning and innovation raises a number of questions. What does the Air Force need to fight a deadly but limited conflict? How do requirements emerge? What is the role of aircraft in the current military posture? What is the Air Force doing to prepare for current and future crises? What do these needs signify for the Aeronautical Systems Division and other military organizations charged with the day-to-day development and production of weapons?

Since the United States does not know where trouble might erupt next or the precise form a future conflict might assume, it must be prepared to contend with a broad range of threats, including that of nuclear war. The U.S. military response to any potential or actual conflict must be immediate, flexible, and believable. Although one cannot predict with certainty the nature of or the participants in a future conflict, preparations can nevertheless be based upon solid analytical work, such as that performed by the Foreign Technology Division at Wright-Patterson Air Force Base, Ohio. A struggle such as that in Vietnam cannot be resolved with Polaris-equipped submarines or intercontinental missiles. If those were the only possible weapons, Vietnam would have been written off some time ago. In other words, nuclear missiles would have exceeded the requirements and compounded the problems, which most people would like to see resolved in a rational and humane manner.

The United States, then, seeks to accomplish its objectives so as to avoid a wider war. The primary goal of our military forces is the deterrence of war at *all* levels. To attain that goal, the U.S. must possess a capability that is credible to any potential enemy and forces him to doubt that he can reach his goals through the use of military power. To control crises calls for a demonstration of resolution, the ability to execute highly specialized tasks, and the courage to function effectively during periods of extreme tension. Crisis management further demands that this nation and its forces avoid actions which might lead an enemy to misunderstand our intentions.

To function in such a world situation, the United States Air Force must be extremely versatile; it must possess not only enough aircraft and munitions for simultaneous deployment to various parts of the world but also the kinds of aircraft suitable for diverse missions and the ordnance appropriate for striking a wide range of targets. The Air Force must have multiple options to fight all levels of warfare, the ability to survive an enemy first strike and then retaliate, a first-strike and second-strike capability with ability to retarget, and the ability to strike all kinds of targets under diverse combat, weather, and terrain conditions. Weapons must be tailored for specific tasks and must be of differing magnitude for incremental applications. In addition, intelligence gathering and command and control techniques must be kept at the highest level of accuracy and reliability.

To prepare and maintain such a force, Air Force leaders must realize that requirements do not remain static, that today's weapon may not be optimum tomorrow. At the same time, today's weapon must have growth potential. The Aeronautical Systems Division has the task of meeting the aircraft and munitions needs for both today and tomorrow. While Vietnam covers most of the front pages of newspapers and in fact constitutes a substantial portion of the ASD workload, it remains only one of the division's many concerns. While many of our activities are geared to meeting daily requirements from operational units, others are concerned with the requirements that may arise ten years in the future. In the words of General James Ferguson, Commander of the Air Force Systems Command, "the mission of research and development has been futuristic. It still is. But the future is any point ahead of us in time. It can be ten seconds, ten minutes, or ten years away." The Aeronautical Systems Division's work, then, is not that of "happy improvisation." Its products are the result of imagination, meticulous planning, and much hard work.

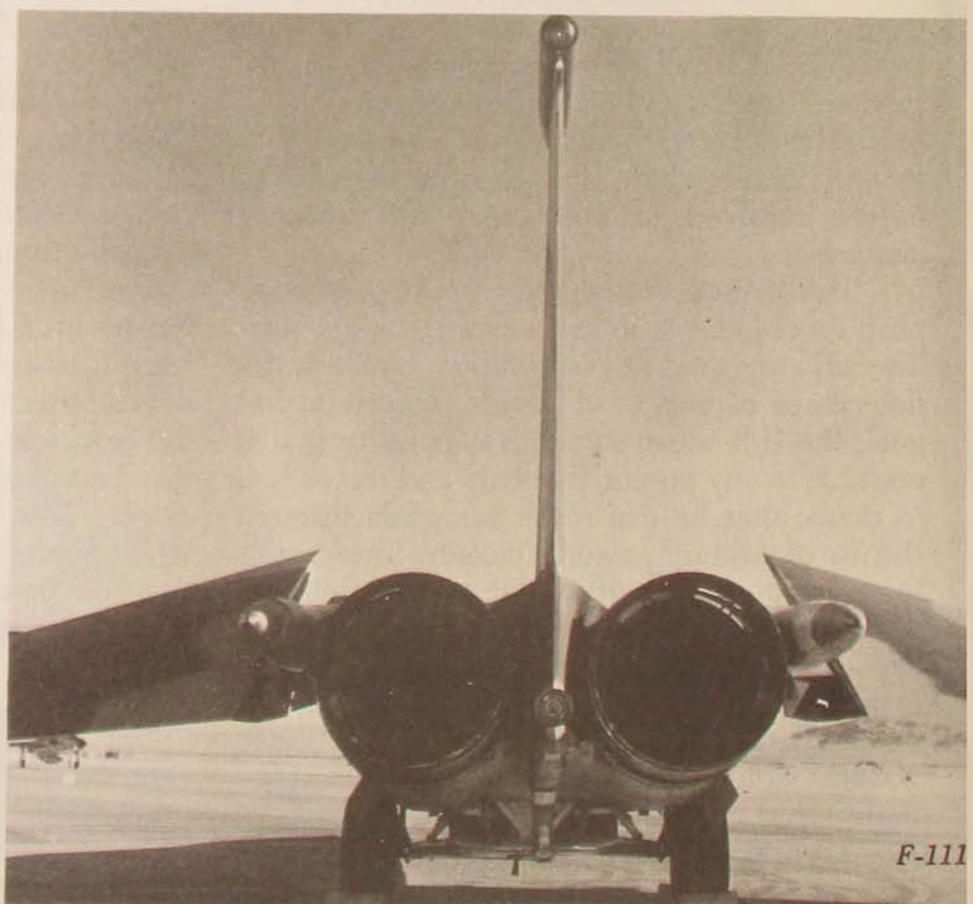
AIRCRAFT and missile systems designed for current or future military uses must employ the latest and best technology available in this country. For many years, the gen-

(Continued on page 26)

The United States Air Force must be versatile enough to fulfill its mission in any world situation that may arise. It must be ready with multiple options to deter or to win at all levels of conflict, with weaponry suited to each task. In consonance with this requirement the F-4C in its fighter and reconnaissance configurations serves a variety of roles, and the variable geometry of the F-111 extends its potential.

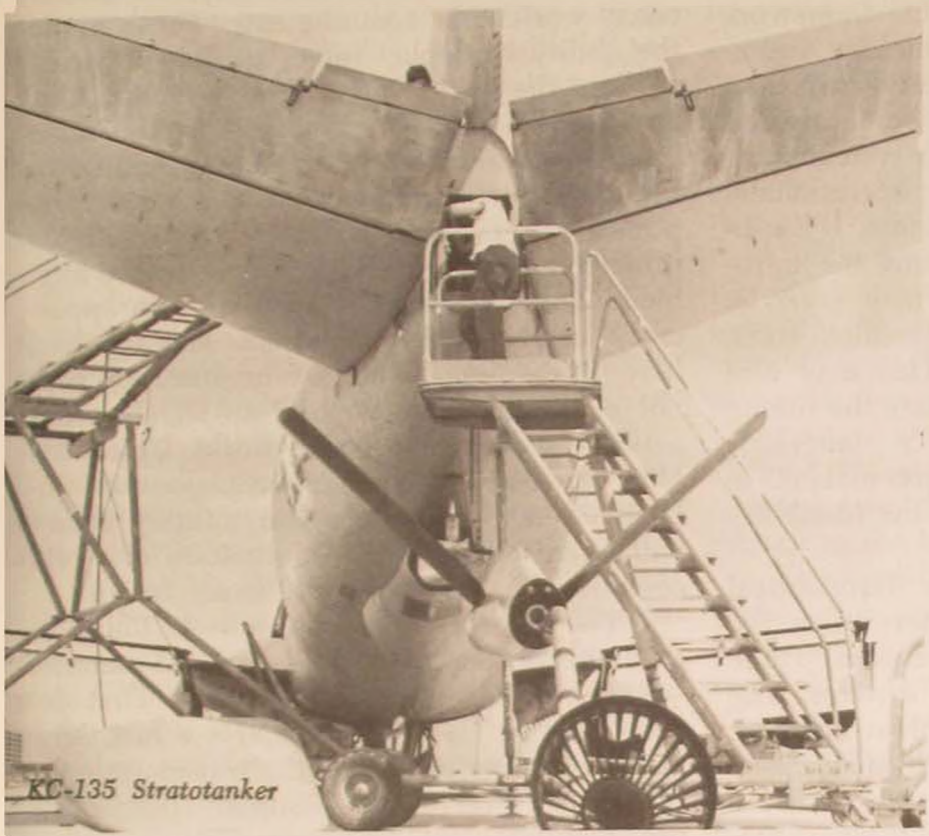
F-4C Phantoms

F-111 airborne



F-111

In the continuing effort to extend range and cargo capacity, Aeronautical Systems Division has been instrumental in improving the capability of the KC-135 tanker and developing the turbofan C-141, called "the basic workhorse of the Vietnam conflict." But in anticipation of future need for even greater scope, ASD already envisions an advanced-capability tanker and thinks beyond the C-5A to transports of even greater range and capacity.



KC-135 Stratotanker

C-141 Starlifter

eral goal in producing new weapons was to fly faster, farther, and higher.

The rapid pace of technological innovation obviously creates an enviable framework for system designers. New technology, essential as it is to weapons design, is not sufficient by itself. Any advances must be integrated into a weapon system, and the system must have every promise of becoming operationally useful within reasonable cost limits. If application of latest technology means the introduction of complexity, there may well be lower reliability, higher maintenance costs, and waste of valuable time. This may also cause a few critical items to dictate the timing of the development schedule, a dangerous situation that can lead decision-makers to question the usefulness or even the feasibility of the entire system.

An important aspect of the Aeronautical Systems Division's mission centers upon the origins of new weapons or air vehicles. Three significant factors lead to new systems. The first is that the nature of the threat changes. This may be determined by intelligence activities and analytical work such as that carried on by our Foreign Technology Division. Second, advanced technology may permit a breakthrough in our weapons design and thus allow our engineers to develop new and more effective weapons. Third, decision-makers at the national level may deliberately alter the nation's political and military policy in the light of their estimates of a changing international climate. Rather than proceed with a catalog of the division's many systems and projects, it will be useful here to review the origins of one of our major programs, the C-5A transport, and place it in the context already discussed.

When the idea of massive deterrence dominated military and political thinking, the general feeling was that no need existed for a large, long-range transport such as the C-5A. As it became clearer to policy-makers that the major powers were functioning under conditions of a nuclear stand-off, a conscious change in national policy emerged. Consideration had to be given not only to the question of what the military organizations required but also to what the country wanted and would support in terms of its military forces.

The United States obviously has undertaken worldwide commitments. These imply the ability to deploy forces quickly to many parts of the world, often in large numbers, as has been the case in Vietnam. At the same time the United States has never wished to become a garrison state; that is, it has usually preferred to maintain a relatively small, highly professional military force which can be augmented in the event of a crisis. Two apparently contradictory intentions are involved here, since a small military organization cannot ordinarily commit itself to simultaneous action in many parts of the world. Unless the U.S. retreats to an isolationist position—unlikely if not impossible—the military forces will have to respond to a situation of world commitment with relatively small forces.

The answer to the dilemma is found in an ability to deploy forces—men and materiel—rapidly to any part of the world. That demands large, fast transports. How fast, how large, and how advanced the transports must be also become major questions. There exists the possibility of using forward bases as staging areas. However, these, too, present difficulties. Our own alliance system has undergone some rapid and dramatic changes. Several years ago few people considered the possibility of losing France as our NATO ally; when France altered its diplomatic position, the U.S. had to vacate its forward areas there. This is but one example of the impact of changing international conditions on the peacetime deployment of military forces.

To some extent our military equipment dictated the need for a worldwide system of bases, but if the equipment dictates the need, the hand of the State Department is tied. Our objective must be to allow our makers of foreign policy as flexible a position as possible. If new, advanced equipment can eliminate much of the need for stationing men and materiel abroad, if the Air Force can suddenly shift troops to any trouble area, the country can freely advance or pull back at any time with no diminution of power. Arguments such as this have affected development of the C-5A.

Prior to the late 1950s, when strategists such as General Maxwell Taylor and Henry Kissinger began to attack the policy of massive retaliation, few people recognized a need for significantly expanding our airlift capability. Consequently, proposals for transports that would have allowed a more flexible policy were not approved. The XC-132, an aircraft that would have had a 5000-mile range at a gross weight of 500,000 pounds, was canceled in the 1957–58 time period. Military planners had advanced the idea of the XC-132 as a replacement for the C-124 and C-133 aircraft. Although the XC-132 was canceled, the issue of long-range, high-payload transports was not closed, and with the changing look at policy it was decided to undertake the development of an intertheater transport. Concurrently there was a new stress on tactical systems.

In the Air Force decision to push ahead with a larger, faster transport, there was general recognition of the nation's world commitment. While there had been much discussion of the problem prior to 1959–60, the hard fact was that our forces lacked speedy response time, a fact borne out in the Lebanon crisis. Early discussion centered upon the possible modification of commercial jet transports to provide the requisite speed, range, and space for troops and military cargoes. There was also some discussion of purchasing a modified version of the CL-44, a large Canadian aircraft.

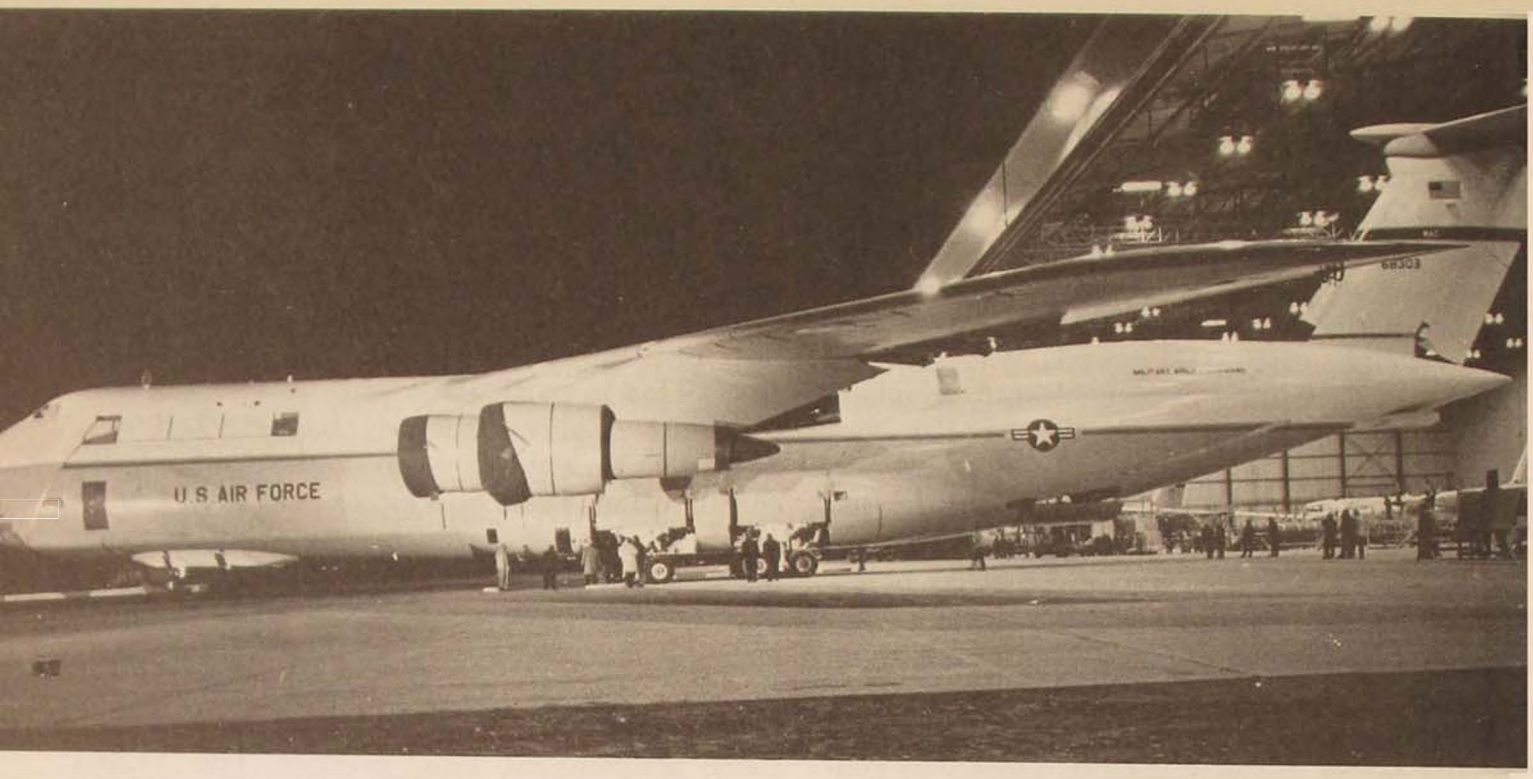
From these discussions and proposals came the turbofan C-141, also a major Aeronautical Systems Division project, which has become the basic workhorse of the Vietnam conflict. Nevertheless, this still did not settle the issue of a large intertheater transport. With no firm policy guidance in existence at the time, Aeronautical Systems Division planners looked ahead to what they thought would be a basic military need of the near future, a large, long-range transport that could carry the great majority of the items contained in the Army tables of equipment. They encouraged contractors to carry on their own research and development, stressing size, speed, and payload. Although much of the work was performed in an informal manner, contractors eventually submitted designs to the Military Airlift Command. When MAC agreed to the proposals, the specific operational requirement followed, which led to additional studies within and funded by the Aeronautical Systems Division.

The changing political or military climate in itself does not explain the advent of a new aircraft, and it is of utmost importance to emphasize the role of technological innovation and the willingness to accept calculated risks. This is particularly true in the case of the C-5A. General Electric had worked extensively on engines with low specific fuel consumption; Pratt & Whitney had conducted many studies of engines employing higher temperature materials. From the information derived from this corporation research, ASD isolated two distinct possibilities in its approach to the intertheater transport.

One possibility was to design a large airplane utilizing six TF33 engines. The TF33, an adaptation of the older J57, employed technology that was essentially 15 years old. The other route was for the Air Force to underwrite the development of new engines, utilizing both ASD's and the contractors' research, to obtain vastly better specific fuel consumption. With a new power plant, the C-5A would have four rather than six engines. The question was whether to stick with the old and somewhat less desirable turbofans or lean on advanced engine technology and introduce a calculated risk for the sake of a superior airplane.

At that time AFSC's propulsion laboratory had also performed extensive research on low specific fuel consumption engines. On the basis of in-house research, ASD planners were able to present their case for a new engine to the then Secretary of Defense Robert S. McNamara, without, however, deciding precisely which new engine to procure.

The decision was to employ a new model that incorporated principles from advanced technology. It would bleed off compressor air to cool the turbine blades. It would operate with thermodynamic temperatures in the neighborhood of 2300 degrees and metal temperatures of 1500 to 1600 degrees, attaining a bypass ratio of 6 to 8 compared to current



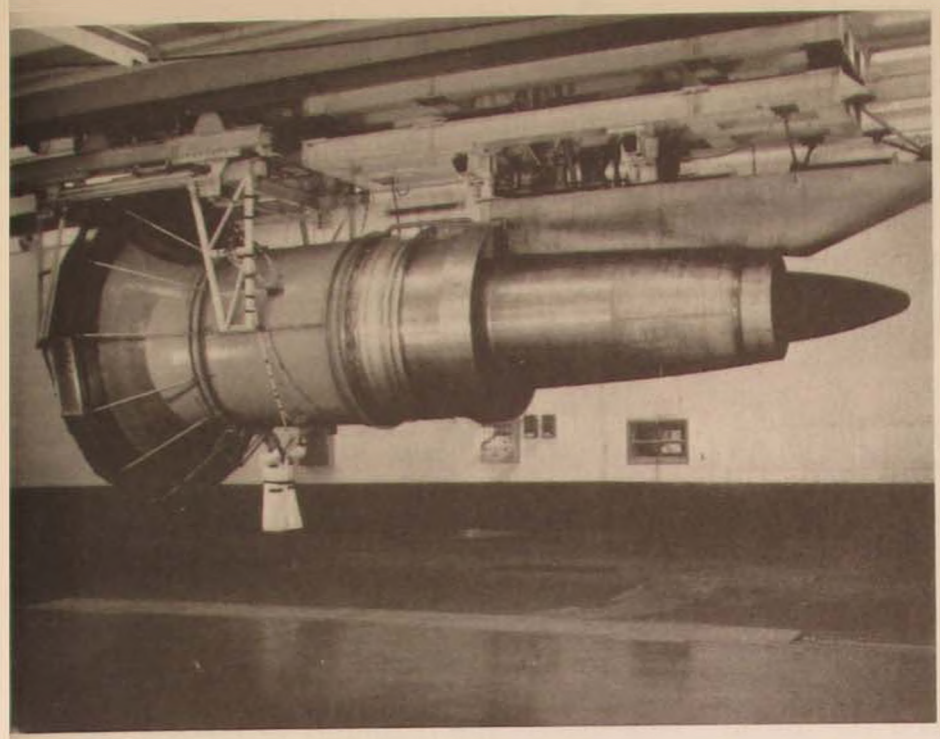
bypass ratios of approximately 2.5. By achieving the high bypass ratio and the high inlet temperatures necessary for low specific fuel consumption, C-5A designers were able to achieve the cost-effectiveness level that would make the C-5A a feasible intertheater transport. By turning to the advanced engine technology, the Air Force took a calculated risk, albeit one based solidly upon excellent research by ASD's propulsion engineers. Their efforts in advanced technology paid off directly in the establishment of the C-5A program.

The C-5 depended directly upon the exploration of advanced technology. Innovation and planning went hand in hand. At the same time, possible built-in complications were rejected or set aside for future use in still newer aircraft. For example, the C-5A does not use laminar-flow control. Again, engineers felt there was insufficient knowledge in the field of composite structures. Nevertheless, these new materials or techniques will someday play major roles in aircraft design.

Already planners at ASD are thinking beyond the C-5A, to ways of extending the range and capacity of transports so as to free them from the "island hopping" characteristic of past operations. Every stop means longer time, change of crews, new clearance for flights, and greater maintenance. For the future, designers envision an aircraft of one to one and a half million pounds' gross weight—larger than the C-5A, now the world's largest aircraft.

Every system that ultimately becomes a part of the weapons inventory undergoes an evolutionary process, beginning with the formulation of a concept, with schedules established for every step. From the concept stage it progresses through research and development, contract definition, and contract awarding; finally it is purchased in quantity and proceeds into operational use. That is the formal course of the system. It should be clear that there is far more involved than the highly formalized procedure often put on paper, that innovation, threat, and political decisions may interject themselves at any point.

When the system is no more than a concept, designers are working towards objectives in operational performance. Their commitment to and belief in the system are usually strong, and during the course of development most



Technology Applied

The capacious C-5A is the product of innovative application of principles of advanced technology. Its four TF-39 engines have a by-pass ratio four times greater than other turbofans now in use and the lowest specific fuel consumption of any AF power plant.

people concerned with the system acquire a progressively greater faith in it. During later development, when designers must pinpoint materials and components, they rely heavily upon advanced technology. If designers and system integrators have done their job well, if they employ new technology wisely as in the C-5A, the system will emerge successfully into the early operational stage.

When new system concepts are developed through studies and analyses, including system effectiveness studies, the proposed weapon need not always contain the most complex technological advances. Designers must examine the technology of a system in the light of what is actually required to counter a threat. The need, then, is for precision in sizing up the threat and in orienting the system to meet it. Neither too much nor too little will suffice.

The planners' first objective is to conceive the simplest possible design, using the most advanced technology possible, to accomplish a mission. Cost and effectiveness of the system must be related, with particular emphasis on reliability and maintainability. In new designs the Aeronautical Systems Division examines potential systems from the standpoint of meeting military needs with weapons that will fully satisfy the immediate or long-range operational demands.

THE Aeronautical Systems Division has under way many projects that will supersede or improve existing Air Force weapons. In fiscal year 1968 the division's budget was approximately $5 billion. In the previous fiscal year, ASD had 62 different systems under way, 33 of which involved nearly $4 billion in that year alone. A vast amount of the money was invested in programs such as the extremely sophisticated F-111, the C-141, C-5A, F-4, and F-5. Millions were spent on munitions and munitions research, from iron bombs of World War II vintage to a new plastic model of the BLU-26 aluminum antipersonnel fragmentation bomb, a version which produces more fragments per bomb at about one-half the cost of its predecessor.

Some of the proposed aircraft which the division may buy in the near future will be subsonic and designed for specialized employ-

ment, such as the A-X close support fighter. Another aircraft, the F-X tactical fighter, is planned to be a highly sophisticated, fast, maneuverable fighter incorporating the latest avionics, rapid fire-control system, and new engines. When the F-X joins the operational inventory, it is expected to be able to counter the greatest predicted performance threat an enemy can impose in the time period beyond 1975. Its development naturally demands the best technology available.

Although best known as the developer and procurer of aircraft for the Air Force, ASD is certainly not restricted to this role. The division has recently investigated concepts such as that of the tactical air-to-air short-range missile, a more effective air-to-air combat weapon. In early 1968, ASD was involved in studies of air-to-surface missiles for attacking ground targets in close support and interdiction missions, much needed for use in limited-war situations.

Other studies currently being made are of tactical electronic warfare systems. Electronic systems of the type envisioned are extremely complex. Many comprehensive studies are required to identify the appropriate concept and integrate the various components. Although the primary mission of the tactical electronic warfare system will be to support aircraft attacking ground targets, it will also have the capability to defend itself from air-to-air attack. In any situation where ground targets have to be struck, the Air Force must assume that the ground defense will be formidable. The tactical electronic warfare system will aid attacking aircraft by jamming radars and analyzing enemy signals to determine the depth of the penetration environment. Such weapon systems, coupled with those already in existence, are necessary adjuncts of the force structure which the Air Force requires to meet the demands of limited war in the future.

Also for limited-war use, the division is designing support aircraft such as the light intratheater transport (LIT), incorporating STOL or V/STOL capability. Such an aircraft may be needed for moving troops and supplies into or from a combat area.

The V/STOL concepts represent a very important aspect of ASD's advanced planning. There is an old military maxim that those who hold the highest ground have the advantage. Fighting forces have always attempted to gain a vertical envelopment capability, whether by putting men on a hill or in the air. In World War II this was done with limited success by using parachute and glider troops. There were many failures when troops scattered over wide areas found it difficult if not impossible to regroup in or near the drop zone. In Vietnam the Army has attained a relatively short-range vertical envelopment capability through the use of helicopters. In 1960 the division attempted to achieve a V/STOL capability by designing the tilt-wing X-18, but it was so unstable it could not be flown. More recently the division produced the XC-142, a stable tilt-wing aircraft, which has demonstrated conclusively the feasibility of the concept.

An Army is always tied to the logistics tail. During World War II soldiers in England hand-loaded five-gallon cans of gasoline into the bomb bays of B-17s to supply General Patton's rapid tank advance through the crumbling German line. Nevertheless, Patton could not obtain the necessary fuel. To supply and move troops rapidly, the Air Force needs aircraft with extensive cargo space and adequate range, as well as the capability to move quickly into, out of, and around a combat area without prepared landing pads or strips. To achieve workable V/STOL aircraft, which would be much more effective than helicopters, the Air Force must continually exploit the technological innovations emerging from the Aeronautical Systems Division.

AERONAUTICAL Systems Division plays a significant role in maintaining and strengthening the U.S. strategic posture. In spite of the current attention to limited war, the strategic role remains one of the most significant aspects of the division's work. One of the division's foremost goals is to develop a manned strategic aircraft to replace the B-52 fleet. The specific project is Advanced Manned Strategic Aircraft (AMSA). Like the B-52, AMSA

could be used for a controlled response in both general- and limited-war situations.

When the Strategic Air Command studied new aircraft concepts in the early 1960s, it became convinced of the need for a much greater low-level penetration capability. From that requirement came various AMSA concepts that would have provided for low-level supersonic flight. AMSA would take advantage of advanced technology, such as variable sweep, to achieve greater ranges and improved take-off and landing capabilities; it would certainly employ the latest technology in avionics and propulsion.

In order to establish an acceptable system concept for AMSA, planners must draw heavily upon improvements in structures and materials technology for the airframe, and they must use the most advanced propulsion system. There must be completely integrated avionics systems to enable the aircraft to penetrate enemy defenses. Whatever form AMSA ultimately takes, it will be an extremely complicated system taxing the ingenuity of designers. When it once enters a contract definition stage, it is expected to require another five or six years for development.

For use with AMSA, the B-52, or the FB-111, the division is developing stand-off missiles such as the AGM-69A. AMSA must also have various penetration aids, and ASD planners are currently considering attack missiles and decoys. At some point these missiles will be developed and coupled with AMSA or other aircraft in our inventory.

Aerial refueling remains a requirement, and this may well be true even when AMSA becomes operational. Equally vital but less glamorous is the advanced-capability tanker under consideration for the future, a very significant planning project at ASD. At present and in the near future, aircraft range extension for both limited war and strategic purposes will continue to be achieved with aerial refueling. The KC-135 tanker has been in use for many years, and while it has been improved, the Air Force still needs greater range and the ability to transfer larger amounts of fuel.

AMSA and the advanced-capability tanker would have much longer life spans than weapons designed solely for limited war, and the bomber in particular will achieve extreme flexibility in its weapon-carrying and delivery capability. AMSA, coupled with the FB-111, the new tanker, and various short- and long-range aerodynamic missiles, would help to provide the United States with a great retaliatory and deterrent force.

It would be possible to mention many of our new systems, the quantities in which they are projected or purchased, and the advanced technology they have employed. Most readers familiar with the Air Force are aware, however, that the F-111, for example, is new, has already seen combat, and utilizes the most sophisticated avionics available. Similarly, they are aware that the old C-47 and more recently the C-130 have been introduced—with added complex electronic gear and rapid-fire guns—as combat weapons in Vietnam. It would also be possible to catalog the helicopters, fighters, and munitions now in use or projected. The object, however, has not been to catalog but rather to show that a changing climate of opinion and changing military actualities have for nearly a decade placed aircraft in a new light and that aerodynamic vehicles dominate much of the thinking of planners. It is highly unlikely that in an age of nuclear weapons the airplane will relinquish either its role as a combat weapon or that of transporting military forces to various parts of the globe.

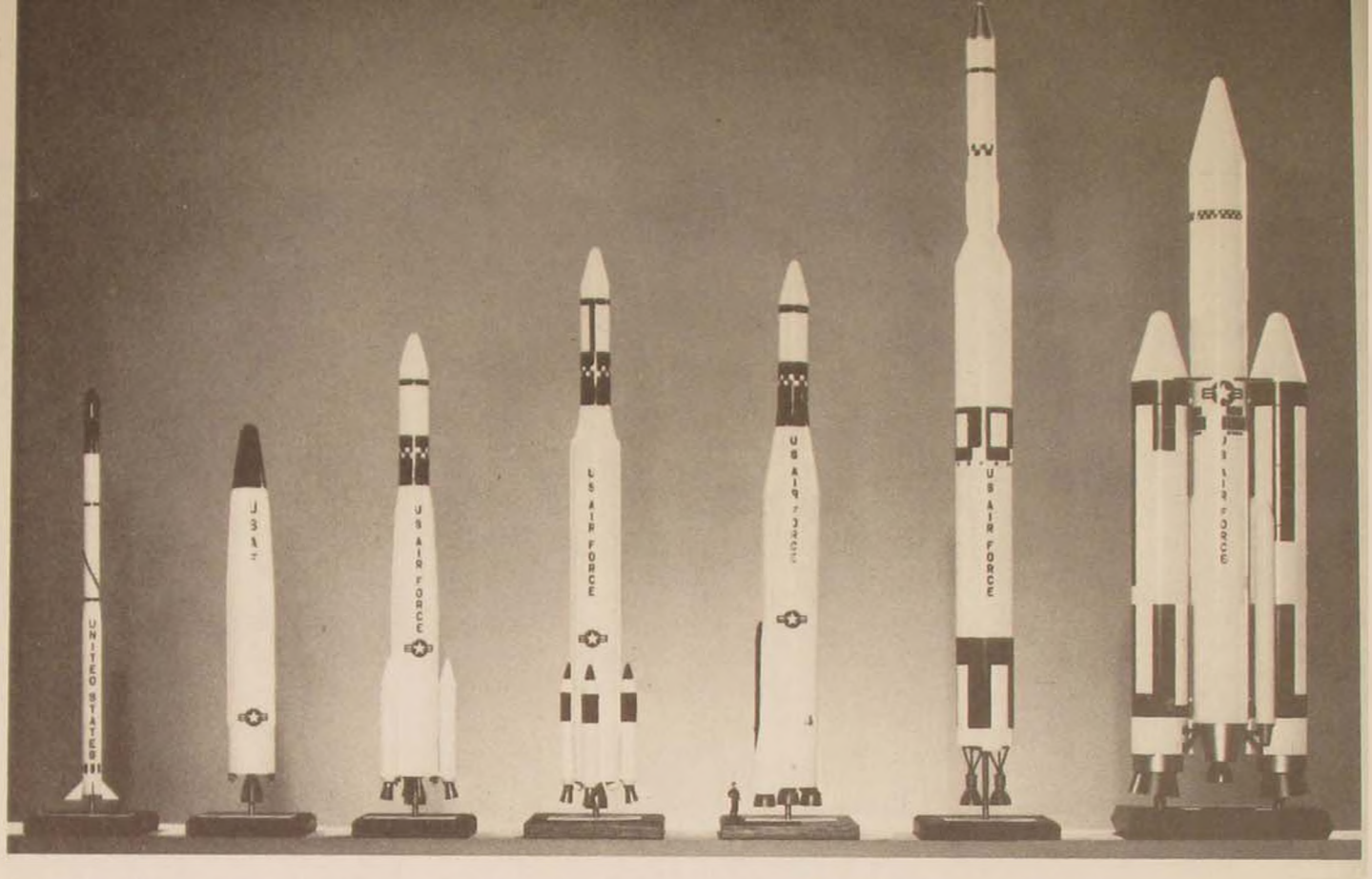
Aeronautical Systems Division, AFSC

FUTURE SPACE BOOSTER REQUIREMENTS

Major General Joseph S. Bleymaier

ONE major mission responsibility of the Air Force's Space and Missile Systems Organization (SAMSO) is the provision of launch capability for a large portion of the United States space effort. Almost three-fourths of the Free World's space launches to date have been accomplished by SAMSO-developed launch vehicles and SAMSO launch crews. Our total launch capability is, of course, a prime governing factor in the progress of our national space program as a whole. From the standpoint of both technology and economics, the launch vehicles constitute our "base for space."

The purpose of this article is to present, primarily from the Air Force vantage point, a broad, overall view of what the present United States space launch capability is, the general requirements that we in the Air Force foresee for the future, and the areas that are receiving particular emphasis in our approaches to meeting these requirements.



United States inventory of space launch vehicles includes the NASA/DOD Scout (SLV-1) . . . Air Force Thor (SLV-2) . . . Thrust-Augmented Thor/Agena D . . . Thrust-Augmented Long Tank Thor/Agena . . . Atlas/Agena D (SLV-3) . . . Titan IIIB with Agena upper stage . . . and Titan IIIC (SLV-5).

present booster inventory

Historically, the growth of our space launch capability demonstrates the healthy philosophy that there is more than one way to put our space payloads into orbit. We have managed to develop during our first decade in space an extremely versatile stable of launch vehicles. Most of them are by now reasonably well known to those who have followed the United States space program consistently, so my review will be brief.

The NASA/DOD Scout provides a launch capability for our lightest payloads of up to 350 pounds for a 100-nautical-mile circular polar orbit.

The Thor Standard Space Launch Vehicle (SLV-2), long since retired as an intermediate-range weapon system, is still giving yeoman service as a space booster. It has boosted a record number of space firsts for the United States and is especially remarkable for its exceptional adaptability, made possible by thrust augmentation and a variety of upper stages. Among its adaptations are the Thrust-Augmented Thor (TAT) with Agena upper stage, and the Thrust-Augmented Long Tank Thor/Agena. Payload capability for 100-nautical-mile polar circular orbit of all versions of this launch system ranges from 1400 to about 2800 pounds.

The SLV-3 is a booster developed from the Atlas, first of the intercontinental ballistic missiles and one of our long-time workhorse boosters. The two versions of this launcher, used with the Agena and Centaur upper stages, can place an 8000- to 12,000-pound payload in low earth orbit. The man-rated Atlas D was the booster used to launch the Mercury manned space capsules.

The Titan IIIB/Agena is a combination of the Titan II Gemini core and the Agena upper stage, with a payload capability of 7500 to 9000 pounds.

The Titan IIIC (SLV-5) is the most powerful space launch system in our present military inventory. We actually have a "family"

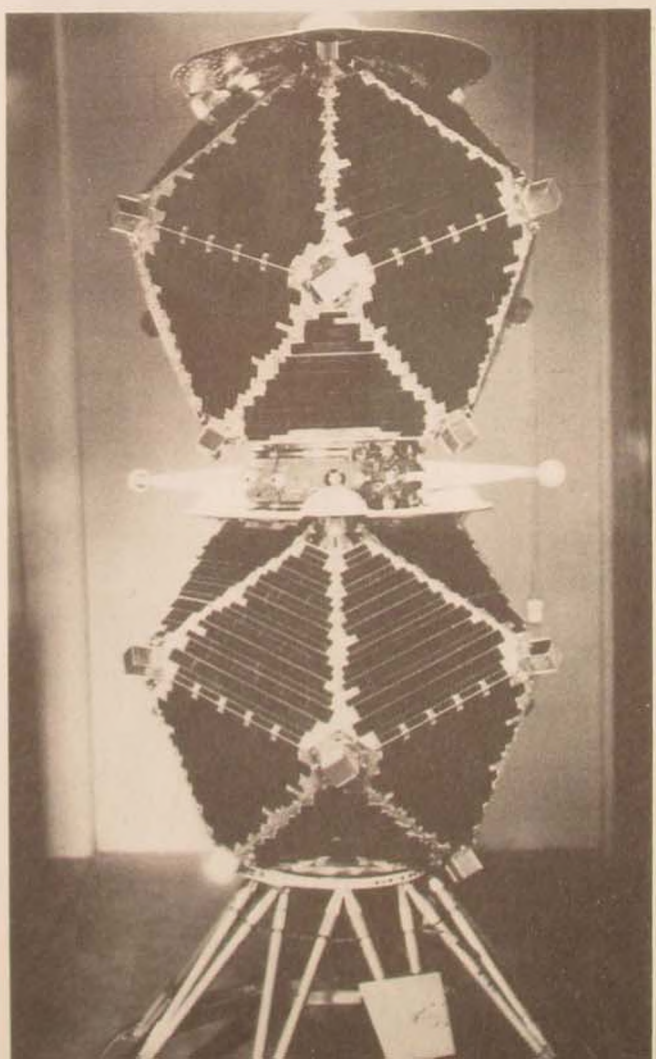
of versions of the Titan III, all of which are direct outgrowths of the Titan II ballistic missile. They are the launch systems on which we have the most active current development programs. The Titan III uses basically the same core as the Titan II, consisting of two stages, made structurally stronger to carry more payload weight. It has the same liquid-rocket engines and guidance systems. A third stage, or transtage, is added to the Titan IIIC to provide versatility in space. This stage consists of a control module housing all the guidance and attitude control equipment and a propulsion module providing 16,000 pounds of thrust. The engines have multiple restart capability, which allows change of orbit plane and other complicated space maneuvers.

The Titan IIIC consists of the core vehicle and two added 120-inch solid rocket motors. These motors provide 2.4 million pounds of thrust at lift-off, and the vehicle can place 25,000 pounds into a 100-nautical-mile circular orbit. It can also boost 5000 pounds to escape velocity for such missions as moon shots. Most important, however, is its capability for synchronous equatorial orbit. It can put 2100 pounds into synchronous orbit and provide different velocities for a number of separate satellites. During the 1967–68 period the Titan IIIC has put into orbit military communications satellites, Vela nuclear detection satellites, and a variety of scientific spacecraft. Because of its demonstrated capability, the Titan IIIC was ordered into production during the summer of 1967 to provide space boosters for high-priority payloads over the next three years.

The Titan IIIM, now being developed as the booster for the Manned Orbiting Laboratory (MOL), is, in general, an uprated version of the Titan IIIC, minus the transtage. The system is man-rated, which entails more than usual redundancy and extensive modifications to allow maximum warning time for crew escape. The payload capability is being increased about one-third over the Titan IIIC by means of larger solid motors and uprated liquid-rocket engines.

The National Aeronautics and Space Administration's Saturn V launch system is being used in NASA's Apollo program. It has the greatest payload capability of any booster now in the national inventory—between 250,000 and 280,000 pounds. From a national point of view, the Saturn V capability will undoubtedly be available to the Department of Defense should the requirement ever develop. Although it is difficult to foresee a military need for this payload capability, we must factor it into our long-range thinking as an available option. In doing so, we recognize that, short of building a Saturn V launch facility at the Western Test Range, utilization of this booster from the Eastern Test Range for polar orbit does carry a considerable penalty. With a required "dogleg" and the range safety limitations, deliverable payload

The program to develop a capability to detect nuclear tests—underground, in the atmosphere, or in space—resulted in twin detector satellites to be launched by a single booster into the same high-altitude orbit.



Air Force Blue Scout

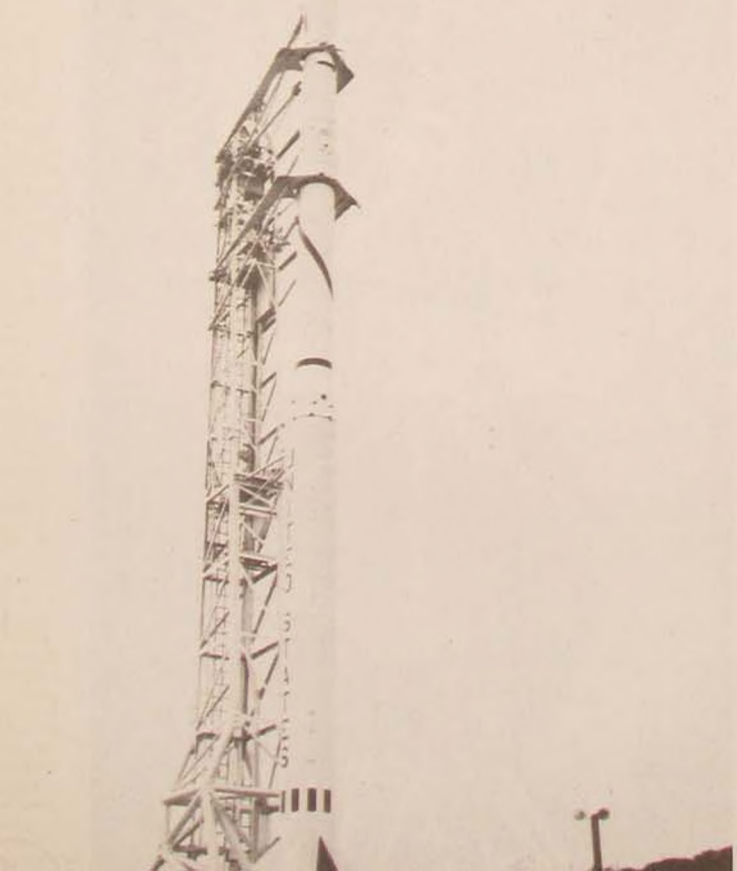
to a polar orbit from the Eastern Range may be degraded by as much as 70 percent.

reliability of boosters

As indicated in this brief overview, which has included only major versions within each of the booster families, our present inventory of space boosters represents a wide range of versatile capabilities. In the first decade of the United States space effort, 1957 through 1967, these boosters successfully launched 514 spacecraft into earth orbit and 28 spacecraft into earth escape. These included launches of British, Canadian, French, and Italian spacecraft. This compares with a total of 284 successful space launches by the Soviets during the same period.

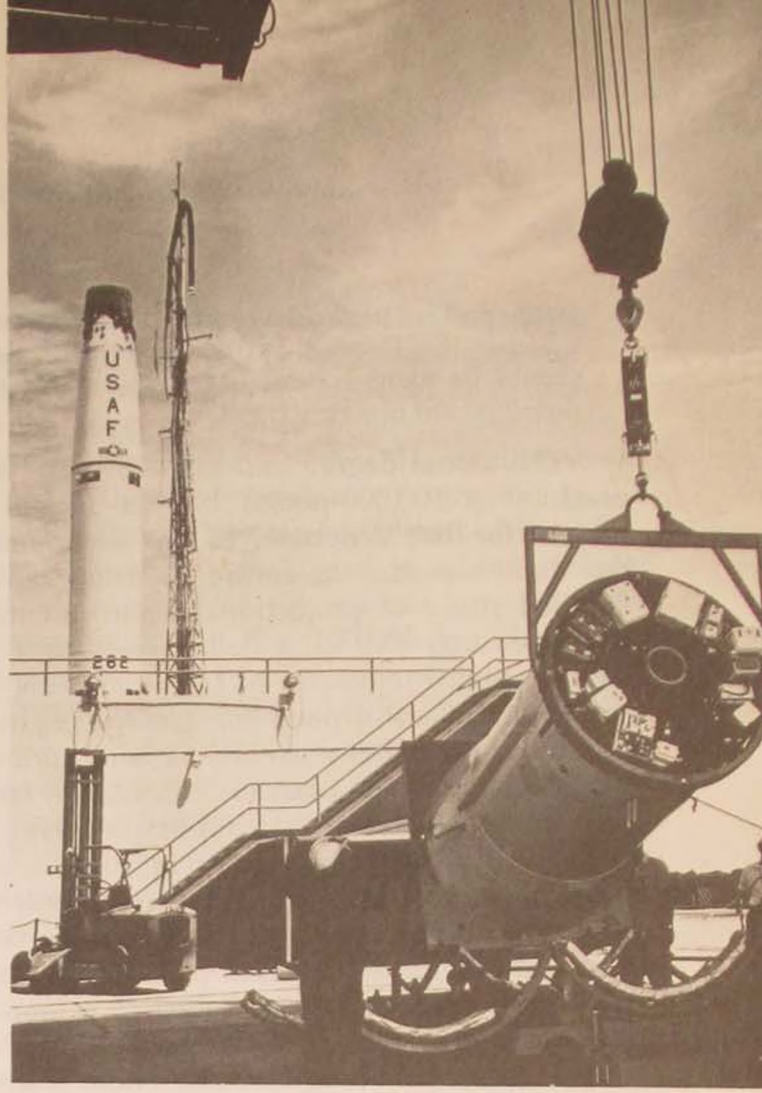
One particularly noteworthy aspect of the launch record has been the increasing reliability of our launch systems over the years. During the period 1958 through 1960, of 59 attempts to place earth satellites in orbit 29 failed. In 1967, out of 82 attempts, 77 were successful. Some of our workhorse boosters have become almost as reliable as milk trains. The Thor has achieved an unequaled record of 123 consecutive successful launches—almost four years of 100 percent reliability. Overall reliability of the Atlas SLV-3 launch system is better than 96.5 percent.

We have had 39 consecutive successful Atlas launches. Moreover, the excellent reliability record of the Titan IIIC, a relative latecomer to the booster inventory, is heartening evidence that the rising level of reliability is not simply a matter of practice making perfect in the course of a long operational experience with one or two booster types. Rather it is a direct reflection of greatly improved reliability of components and parts, the kind of integral, built-in reliability that can be passed along to future systems.



Scout booster rocket

Air Force Thor



gaps in present capability

In spite of the basic soundness of our present launch vehicle inventory, however, gaps do still exist in our capability, and we are continually investigating the possibilities for next-generation launch vehicles. Our emphasis is on boosters to meet possible future needs that cannot be met by current launch systems and on concepts that could significantly improve the economics of space launch operations.

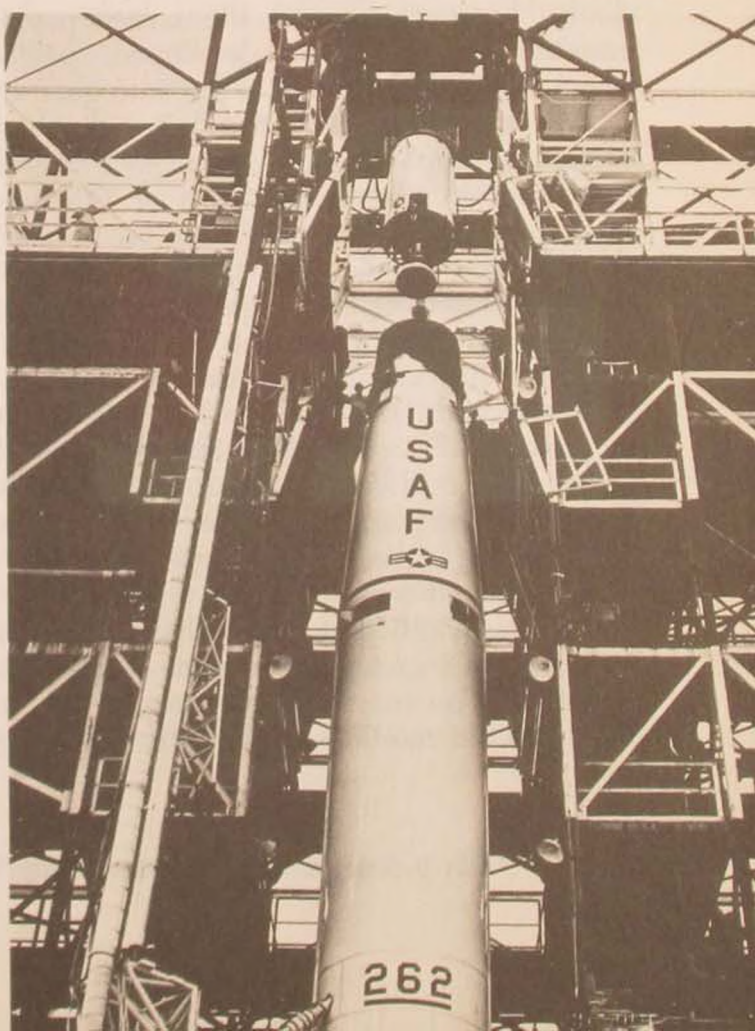
The major capability gaps in our present inventory are between the payload capability of the Titan IIIC/Saturn IB (approximately 25–30,000 pounds) and the payload capability of the Saturn V (approximately 250,000 pounds).

In addition, we are interested, of course, in all concepts in any part of the payload spectrum that could give significant lower launch costs, including partial and fully reusable systems.

the 100,000-pound booster—a requirement?

For the past several years both NASA and the Department of Defense have done a great deal of work in investigating concepts within the 35,000- to 250,000-pound range. A letter written in September 1967 by Mr. James Webb, NASA Administrator, to Secretary of Defense Robert McNamara provides a good summary of this interest:

> Perhaps of longer term importance is the question of whether either of us (NASA or DOD) or both will need a 100,000 pound payload, and the most efficient way to boost it into orbit. I believe both DOD and NASA have the possibility of focusing on a useful payload at about this level (100,000 pounds in orbit), but we believe we both will need a great deal more information, accumulated over months or years, before we can be sure that such an effort is



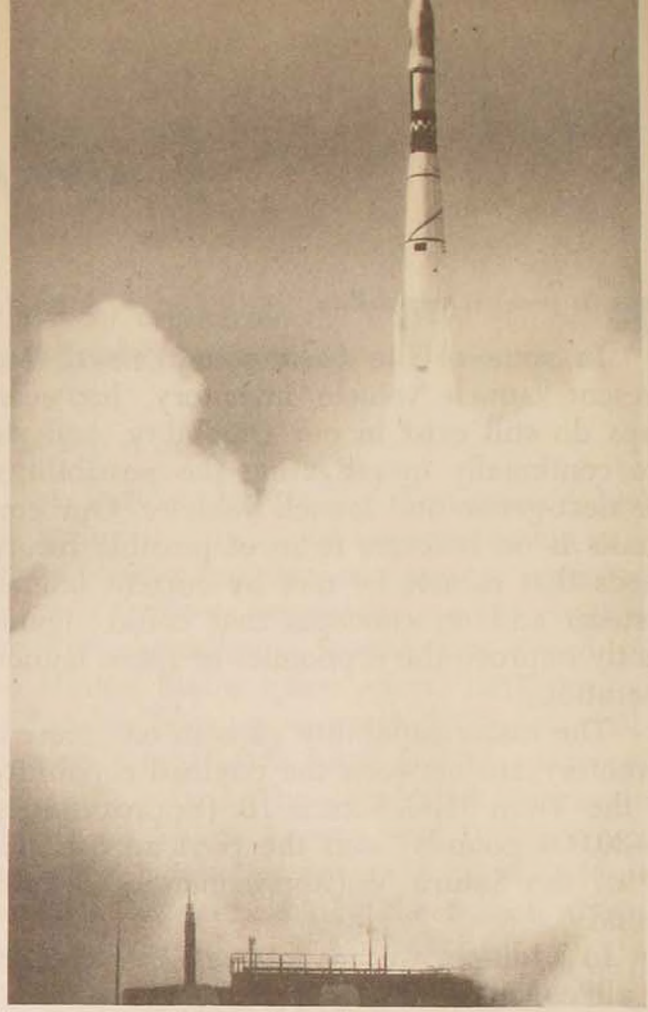
Thor second stage

justified. The payload needs probably govern whether the Department of Defense or NASA should be assigned the responsibility for the development of a new booster.

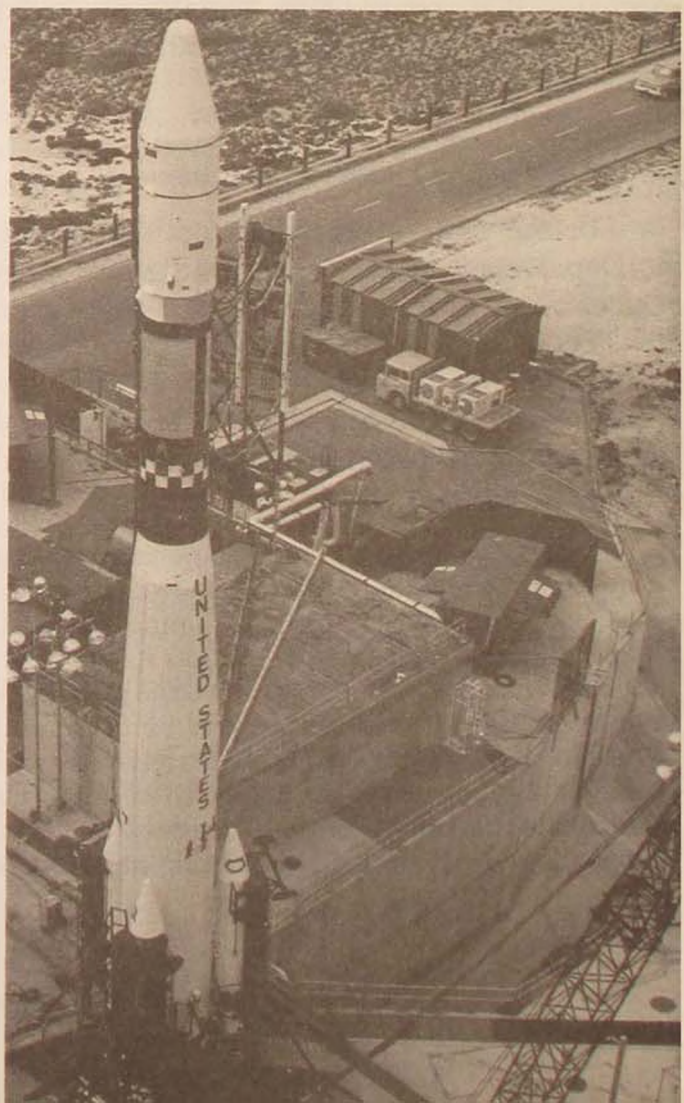
The actual degree and immediacy of our need for a 100,000-pound booster is still a subject for lively debate, as we accumulate the data essential to future decision. Even detailed study of projections of current mission does not give us a definitive answer to the question. Projections of future systems do not always show a need for greater payload capability than that currently in hand, primarily because mission planners consistently tend to plan future systems around existing launch vehicle capability. Especially in today's climate of increasingly stringent requirements for justification, review, and re-review of proposed programs, the payload planner does not want to propose a system keyed to a launch capability that does not currently exist or is not at least firmly programmed. There is little doubt, however, that if the larger payload capability were to be developed, payload planners would be quick to put it to good use.

It is undoubtedly true also that with increasing sophistication our space systems tend to grow progressively heavier. One fairly typical example of this has been the course of development of the Vela nuclear detonation detection satellites. The eight satellites orbited in pairs to date represent four progressive steps in the capabilities and sophistication of the systems. Each of the first pair, orbited in October 1963, weighed 520 pounds. The fourth pair, orbited in April 1967, had greatly improved mission capabilities and weighed 730 pounds apiece, a weight increase of roughly 40 percent.

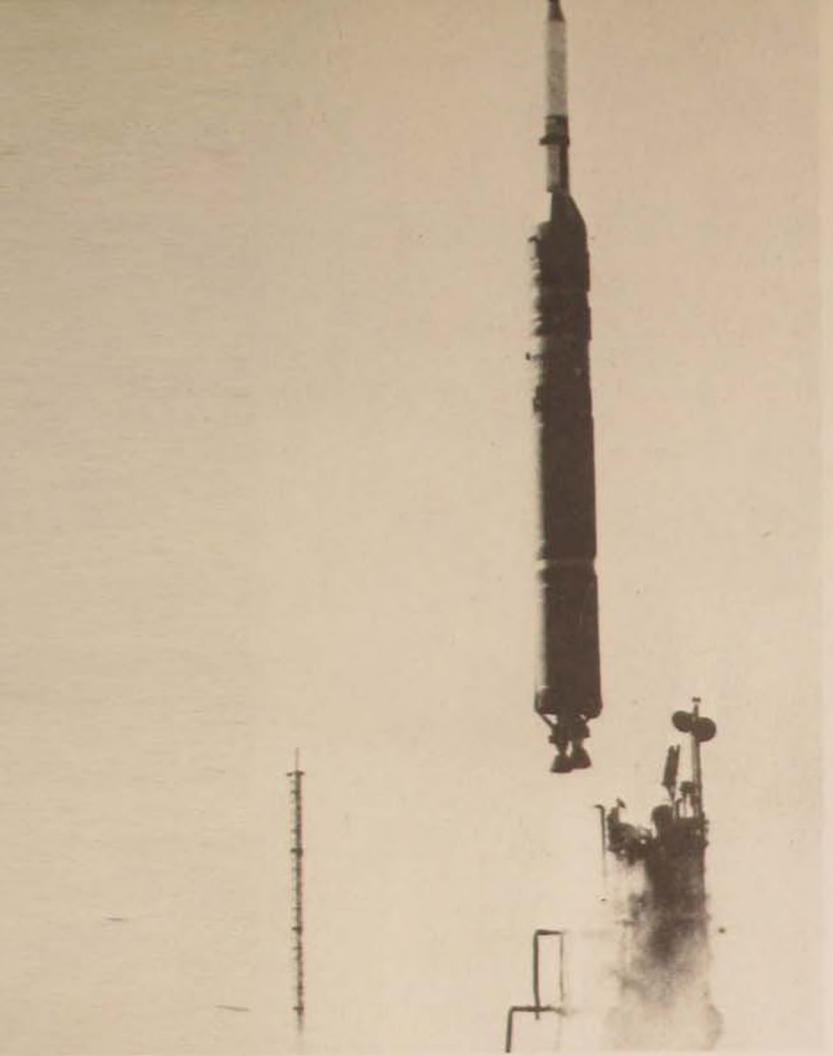
We can anticipate also other factors that will tend to increase the weight of our space payloads. The trend, for instance, is increasingly toward satellites capable of what might



Air Force Thrust-Augmented Thor



NASA Orbiting Geophysical Observatory (OGO)



Air Force Titan IIIB-Agena D

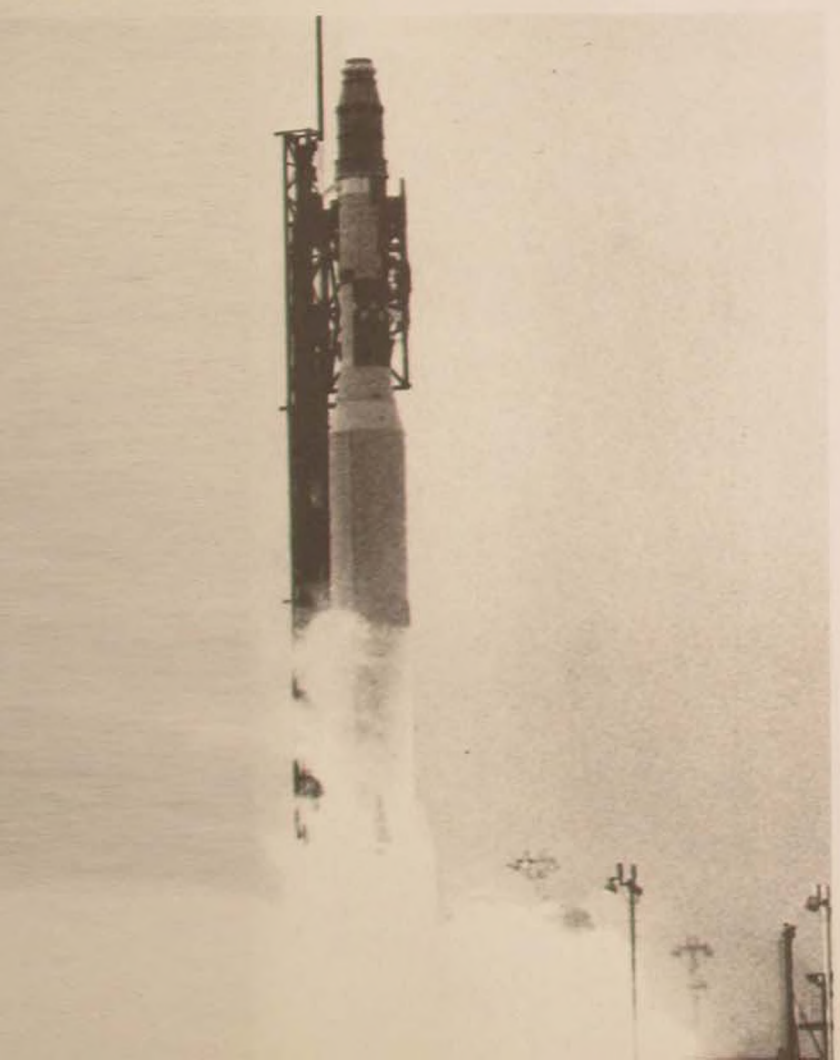
be called "predigestion" or "boiling down" of data gathered, before transmission to the surface control centers. The ideal is to have as much as possible of the preliminary data processing accomplished within the satellite itself. Even with microminiaturized components, the penalty for shifting a greater part of the processing function into space is added weight.

A number of approaches are currently being made to the 100,000-pound booster capability. The Air Force is studying the use of 156-inch-diameter solids, and NASA has done work in 260-inch-diameter solids. Studies are being made of the possibilities of down-rating the Saturn V and up-rating the Saturn IB. And we have been considering the use of current engines and stages in a variety of combinations.

Extensive feasibility studies have been made of a joint NASA-DOD intermediate launch vehicle for operation in the mid-1970s which might include as its third stage a lifting-body vehicle with variable-sweep wings for controlled landing on airfields. An alternate possibility for the third stage would be an Apollo-like space capsule. Its payload capability would be somewhere between that of the Titan III and the Saturn V. Choice of configuration would depend upon mission developments. No decision has yet been made concerning actual development of such a booster.

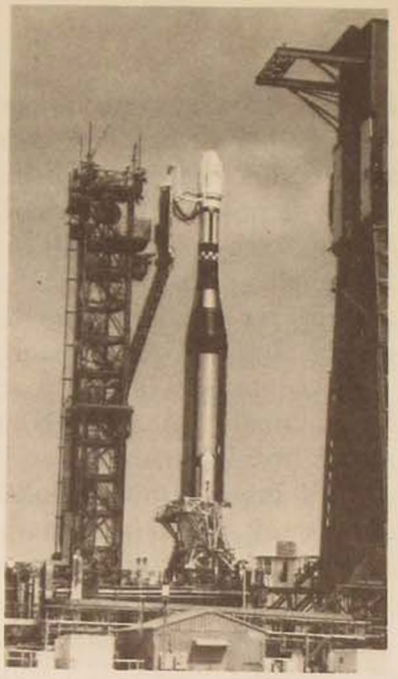
However, there are Titans with potential growth that could fill in existing gaps in our booster payload capabilities. The prime candidate among these is the Titan IIIG, which uses increased-diameter core stages one and two and 156-inch-diameter strap-on solid motors. This launch vehicle is designed to boost approximately 100,000 pounds into low earth orbit.

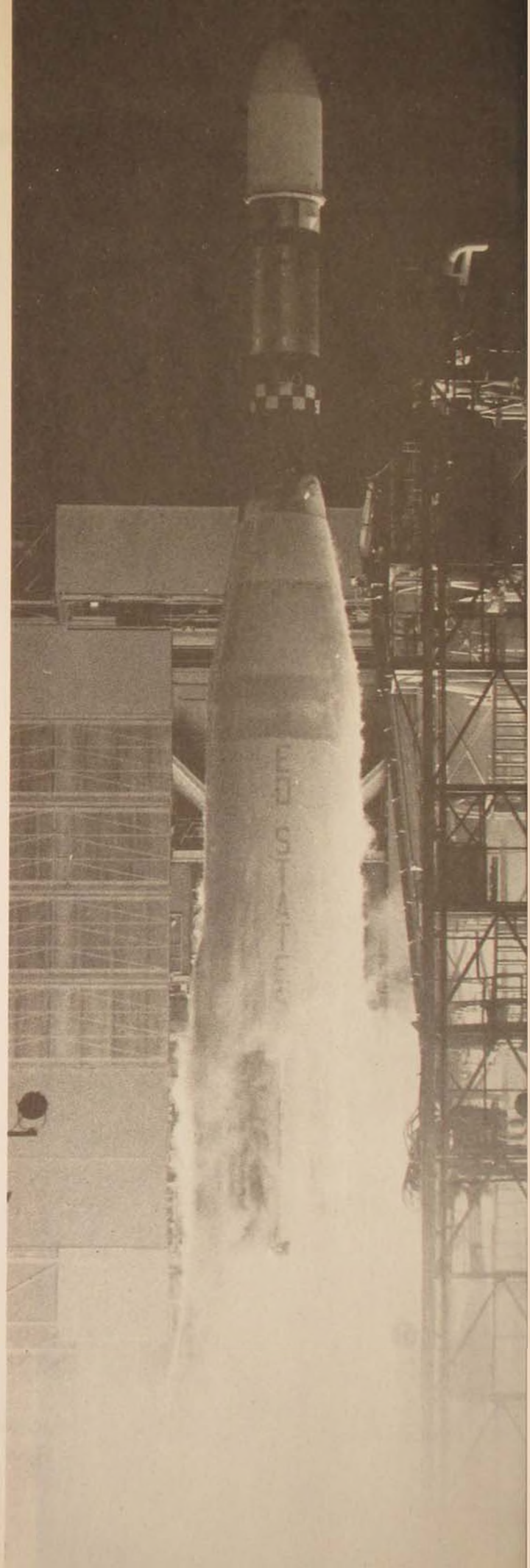
An intermediate step to the 100,000-pound-capability Titan III involves substitut-



Air Force Thrust-Augmented Long Tank Thor

NASA's Mariner spacecraft (below), atop an Atlas-Agena D, readies for its trip from Cape Kennedy to Venus. . . . Atlas-Agena D starts Lunar Orbiter "C" (right) on its photo mission preliminary to Apollo manned lunar landing.





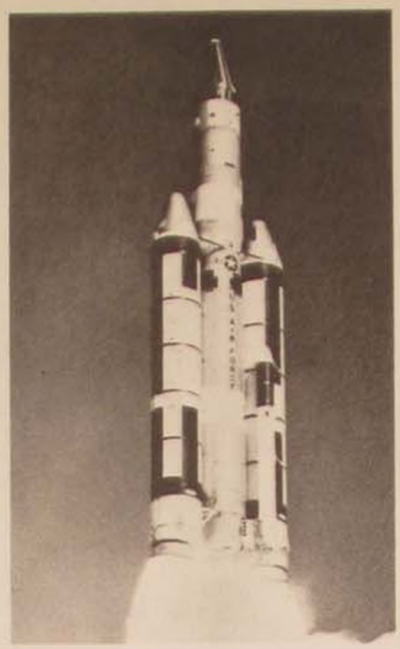
ing a first-stage large-diameter liquid core and retaining the existing stage two and the 120-inch solid rocket motors. A good deal of work has been done on this concept, and it appears to be a relatively low-cost development that could yield a payload capability on the order of 42,000 pounds.

continuing progress in applicable technology

Meanwhile, pending major programming of any next-generation booster development, work continues in supporting research and technology that can provide the basis for new booster capabilities. Among other projects, for example, the Air Force Rocket Propulsion Laboratory, under a contract from the Space and Missile Systems Organization, has completed a number of static firings of 156-inch-diameter motors configured as the first, second, and third stages of a multipurpose space or ballistic vehicle. These tests demonstrated the potential of large submerged ablative nozzles, high burn-rate propellants, and omni-axial liquid-injection thrust vector control for large solid motors. All of these offer promise for application to large boosters of the future.

Another of our recent developments is a new tungsten alloy with greatly improved

Titan IIIC (left) on a mobile launch platform, part of the integrate-transfer-launch ground facility (ITL). . . . The 2½-million-pound thrust of Titan IIIC boosts military communication satellites into 18,000-nm orbit.



strength and ductility. The alloy has a strength of over 75,000 pounds per square inch at 3500 degrees Fahrenheit. A tungsten alloy with such properties, in addition to tungsten's high melting point, has excellent potential as a structural material for space power plants and rocket engines.

the economics of space launches

The economic aspects of space launches have always been a major determinant of our booster planning and a primary consideration in our projections for space payloads themselves. Indeed, there is some evidence as we start our second decade in space, in a climate of unprecedentedly tough competition for government funds, that the high cost of space operations—much of it directly attributable to launch costs—is to some extent pricing progress out of the market.

Launch costs are subject to many variables, and the range of cost per pound of space payload is wide. Unquestionably, launch costs *are* decreasing with time, as more efficient launch vehicles are introduced and as increasing traffic volume permits a broader sharing of fixed costs. For the 1970s we anticipate a delivery cost to low altitudes of approximately

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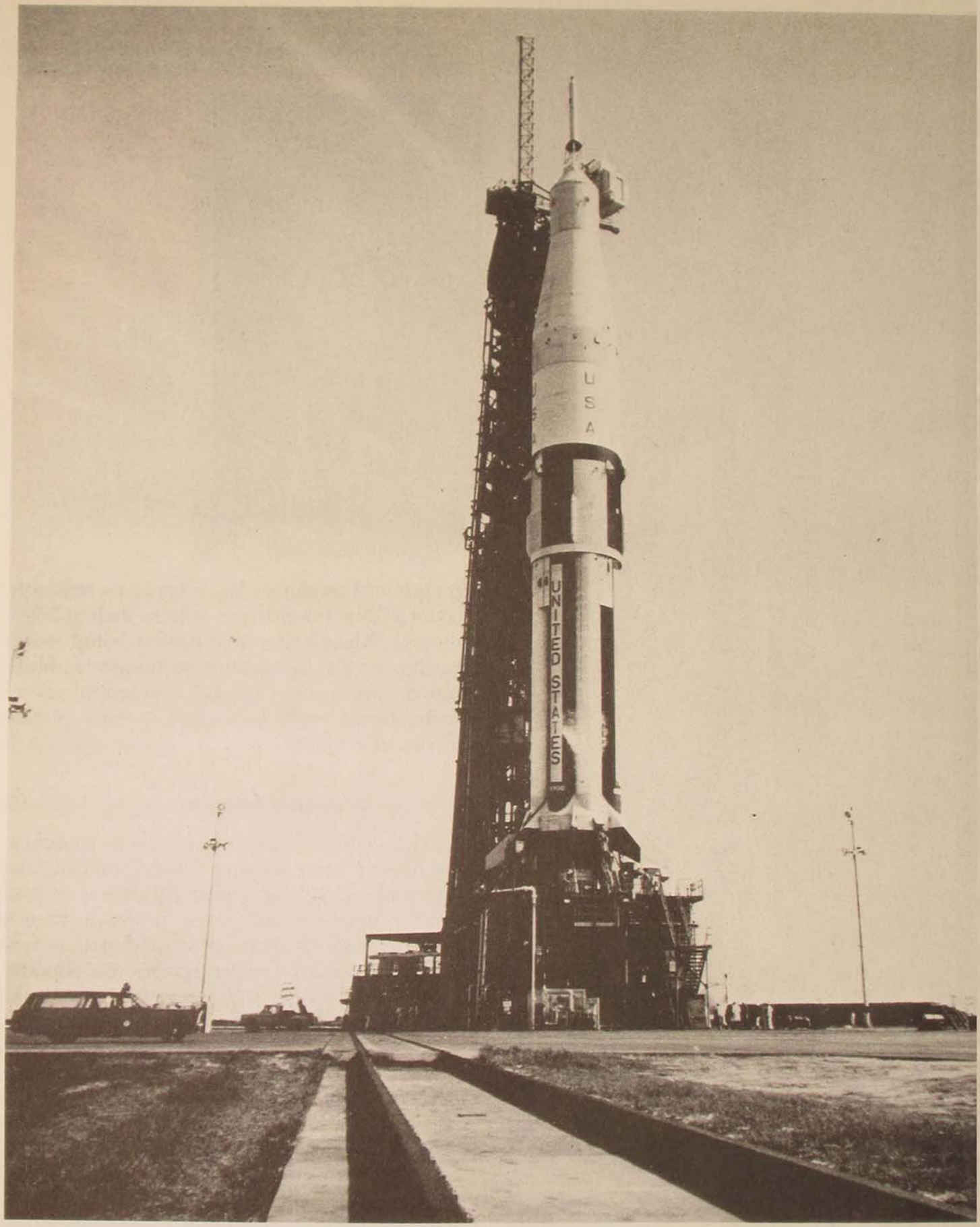
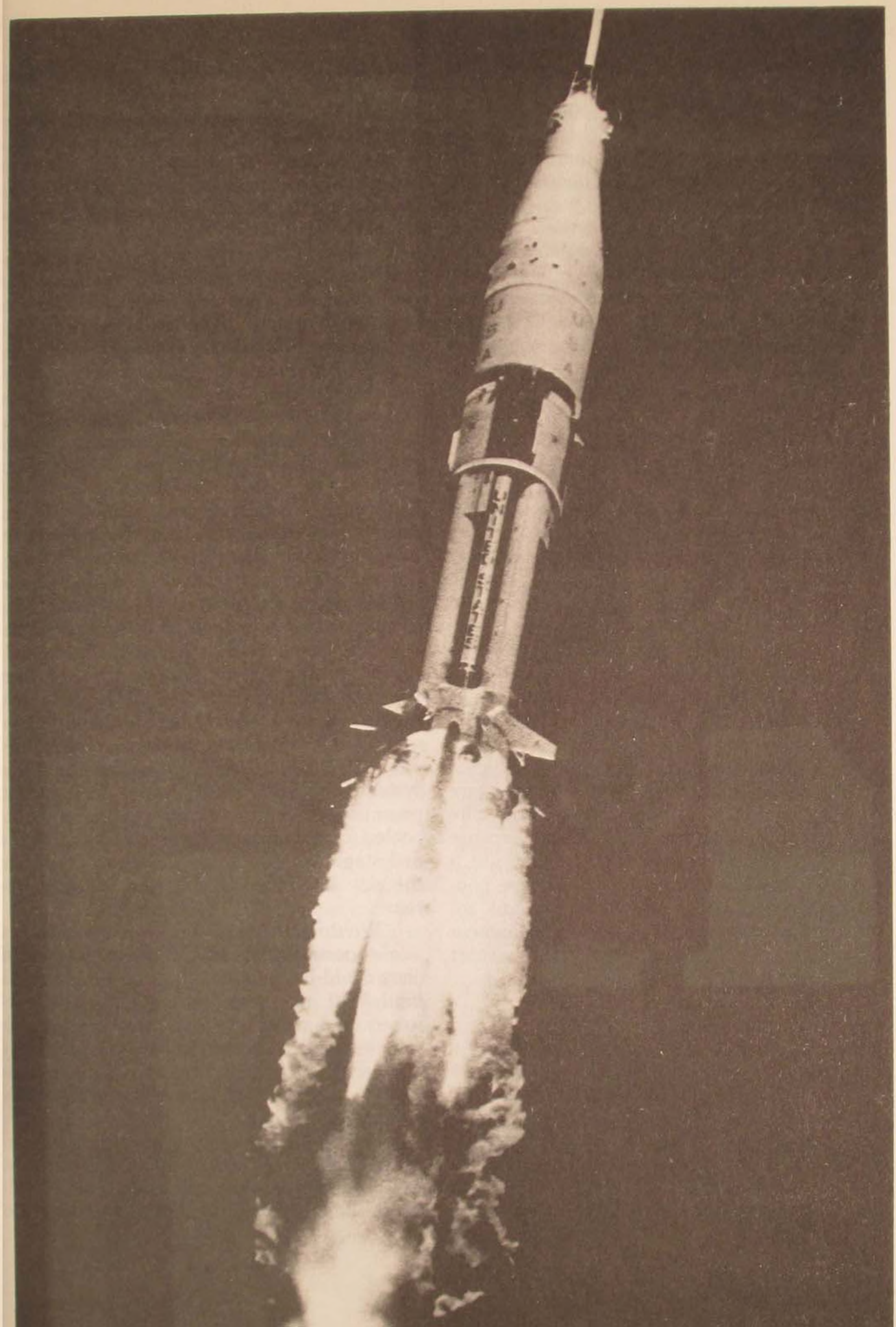


NASA's Saturn IB is groomed at Complex 34, Cape Kennedy. . . . Initial launch of the 2-stage rocket sent an Apollo command and service module on a 300-mile-high suborbital test flight down the Atlantic Test Range—precursor of manned lunar flights planned for the larger 3-stage Saturn V.



$450 to $500 per pound. Delivery to the synchronous equatorial orbit is about 10 times more costly, roughly $4000 to $5000 per pound.

Of the numerous approaches to reducing space launch costs, one is continued improvement of the reliability of our boosters to prevent failures—a route on which we are making good progress, as I noted earlier. Another means of reducing costs is major extension of the life of the spacecraft. We have found that we can feasibly increase spacecraft orbital life by a factor of two to ten. This means that we can accomplish our mission over a given time period with fewer spacecraft and fewer launch vehicles, resulting in savings of about 45 percent.

We can also reduce costs by the use of multimission spacecraft, that is, by combining the function of three to five single-mission spacecraft in one "package." This procedure is particularly attractive for the high-cost synchronous equatorial orbit, where it could reduce program costs from 25 to 50 percent.

Our studies have indicated further that multiple launches of spacecraft on a single launch vehicle could give total program savings of up to 55 percent. The Titan IIIC has this multiple-launch capability. With it we have orbited as many as eight separate payloads in one launch.

Reusable boosters and re-entry vehicles, using either present technology and hardware or more advanced concepts, do offer definite promise, but the initial development expense will be high. Such systems must provide a flexible capability, have relatively low nonrecurring costs, and provide significant recurring-cost savings, to allow development costs to be amortized over a reasonably short period of time.

designing for minimum cost—the BDB

One unusually challenging approach to the booster cost problem represents a 180-degree divergence from our traditional thinking with respect to space launch systems. Customarily we have designed for minimum weight and maximum performance. We use the finest lightweight alloys. We demand the highest order of skills in design, production, test, and retest, to get results that are the utmost in precision and sophistication. Since 1965 we have been studying the potential of a new concept of designing for minimum costs, and the result may be a new breed of launch vehicle, known unofficially in the family as the "Big Dumb Booster."

Our thinking on the BDB is dictated by the realization that, in general, minimum weight, minimum cost, and maximum reliability of subsystems cannot all be achieved simultaneously. Instead, trade-offs must be made among these requirements to produce a compromise vehicle design of minimum cost. For instance, if we use heavier hardware, of lower unit cost and inherently higher reliability, then greater simplicity of design becomes possible. Subsystems can then be substantially reduced. Tolerances can be increased optimally. A propulsion system can be selected which results in a lower propellant mass fraction but does not require structural complexity, high-speed machinery, a multitude of parts, supporting subsystems, and/or high launch service costs.

The key to such a booster is, of course, the propulsion system, and some few further low-cost developments in propulsion technology will be necessary before the minimum-cost launch vehicle can become a practical reality. As it is now shaping up, the propulsion system would utilize storable, bipropellant, pressure-fed stages having single ablation-cooled engines, the simplest of designs. The first stage may be designed for recovery from the sea after launch and refurbishment for reuse.

We think that with such a "large economy size" booster, payloads in the 40,000-pound class could be put into low polar orbit for less than $100 per pound, without first-stage recovery and with low production rates. If we can eventually accomplish first-stage recovery and certain other design-cost savings, it seems entirely possible that this cost can be cut by more than one-half.

We do have a healthy variety of opinion within our own house concerning the best approaches to minimum cost. The Big Dumb Booster, as a frankly revolutionary about-face

from the deeply ingrained perfectionism of traditional aerospace design, generates both great enthusiasm and some uneasiness among Air Force engineers and those of the aerospace industry. There is little doubt, however, that the concept of which the BDB is a principal example today—*design for minimum cost*—must be a main current of our thinking on future space boosters.

The economic factor is particularly important with respect to the development of vehicles with new payload capabilities that will fill the existing gaps in our inventory, most notably within the 40,000- to 250,000-pound range. Because we have been designing space payloads within the restrictions of the launch capability actually in-being, the annual number of payloads in this class will be relatively small at first. If a new booster is to survive the stringent cost-effectiveness evaluation that will precede its approval, it must indeed be designed from the outset for rock-bottom minimum cost.

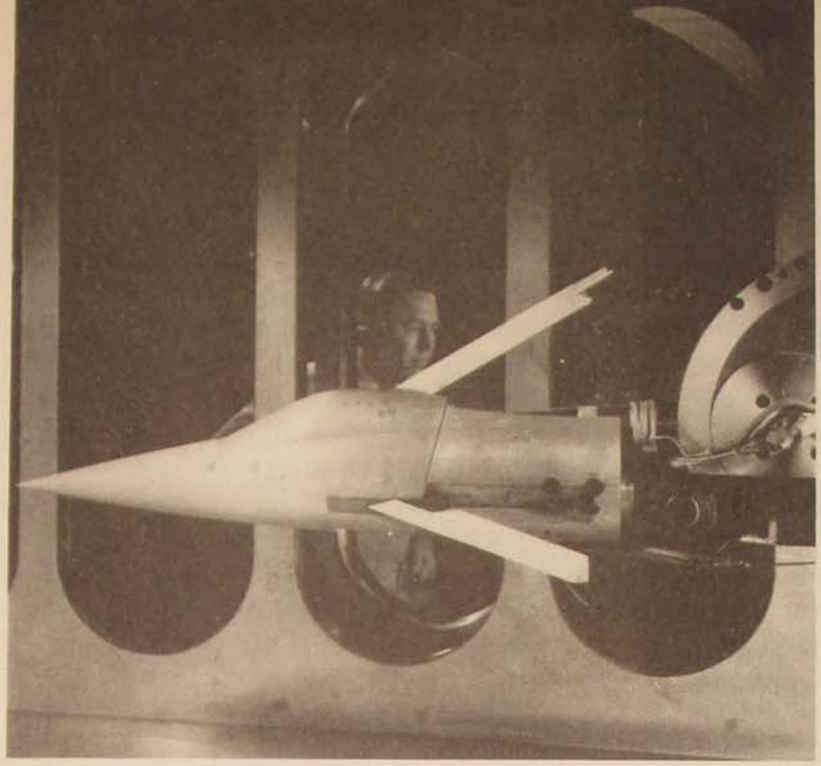
There can be no doubt, however, that the 100,000-pound booster, or something in the general neighborhood of that capability, is our next logical major step in booster development. How long it will be in coming depends upon many factors. Not the least of these are the tightening squeeze on space funds—especially evident in the lowered 1969 civilian space budget—and the unfortunate loss of momentum in advance space programming. The pacing factor is not, as it was in the early days, the state of the art; it is the state of the budget and the resultant necessarily cautious slowdown of the complex machinery of program decision and approval. Even existing booster designs are feeling the pinch. Production of the Saturn IB and Saturn V, at the upper range of our present payload capability, has been slowed down in an attempt to prevent an abrupt falloff in the production facilities, from feast to famine, when existing contracts are completed.

potential advantages of mid-range boosters

Development of some new mid-range booster capability, without undue delay, could definitely contribute to the improvement of our military space posture. It could open the way for more ambitious, more cost-effective space endeavors; more sophisticated and reliable mission equipment; more manned capability; longer orbital life of our space systems, manned and unmanned; greater mission versatility and flexibility, including the capability to maneuver systems in space; more multimission spacecraft and multiple-payload launching of space systems; and reusable spacecraft which, instead of being expended in one mission, could be used over and over again.

IN CONCLUSION, we have in-being at the present time an exceptionally flexible booster inventory with an excellent record of accomplishment in the first decade of the space age. We have made steady gains in the reliability and the cost effectiveness of our space launch systems and have marked the trail for continued improvements in the future. Gaps do exist in our launch capabilities. We are giving particular emphasis and study to the possibilities of highly cost-effective boosters with payload capabilities in the mid-range from approximately 40,000 to 100,000 pounds. This capability is important to the optimum development of space systems of the immediate future. No program has as yet been specifically approved and funded for the development of such a booster; certain growth models of the Titan III could provide the most immediate solution. In the present economic atmosphere, establishment of any such program depends primarily upon our ability to design a system of provable exceptional cost effectiveness. We are investigating all concepts that appear to offer promise for future launch systems of this nature. And we are pushing forward with the advanced technology that can make such systems, when their development does become feasible, very significant additions to our capability for the exploration and utilization of space.

Space and Missile Systems Organization, AFSC



TESTING AT THE ARNOLD ENGINEERING DEVELOPMENT CENTER

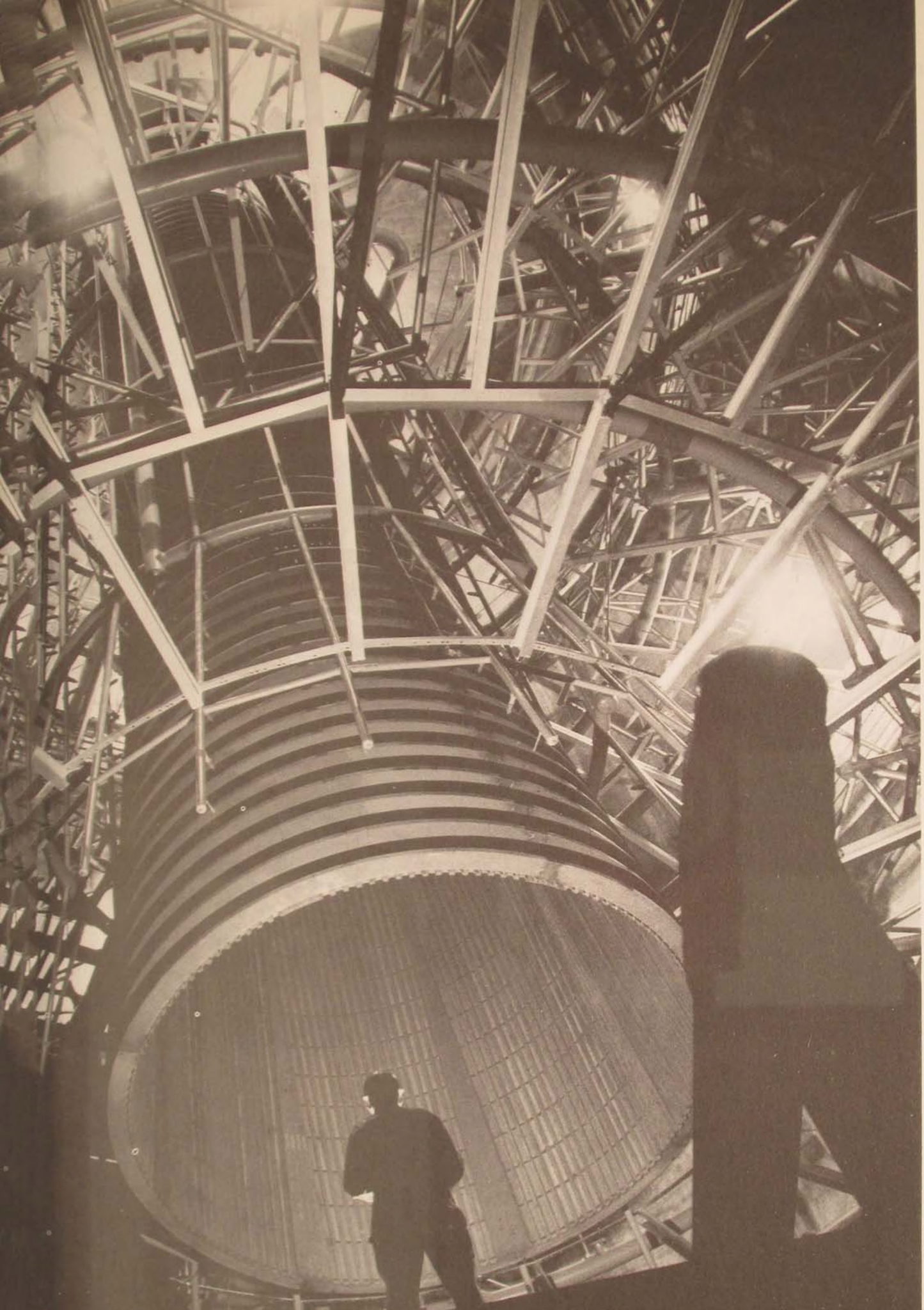
Brigadier General Gustav E. Lundquist

Recent investigations by the AAF Scientific Advisory Group of German engineering and research facilities have revealed that their long-range planning of research facilities was more ambitious and forward-looking than our own. . . .

Dr. Frank Wattendorf, June 1945

THE appearance of German jet- and rocket-propelled aircraft and missiles over Europe as World War II drew to an end made it clear that the United States was running a poor second to Germany in flight research and development. Although the Germans came up with too little too late, their apparent technological lead so concerned General Henry H. Arnold about the future of American air power that as soon as the war ended he asked Dr. Theodore von Kármán to head a group to investigate German development facilities. These are the investigations referred to by Dr. Wattendorf, a member of that group, in the quote from a memorandum to Dr. von Kármán which he drafted aboard an aircraft on his way home from Germany after the initial investigation.

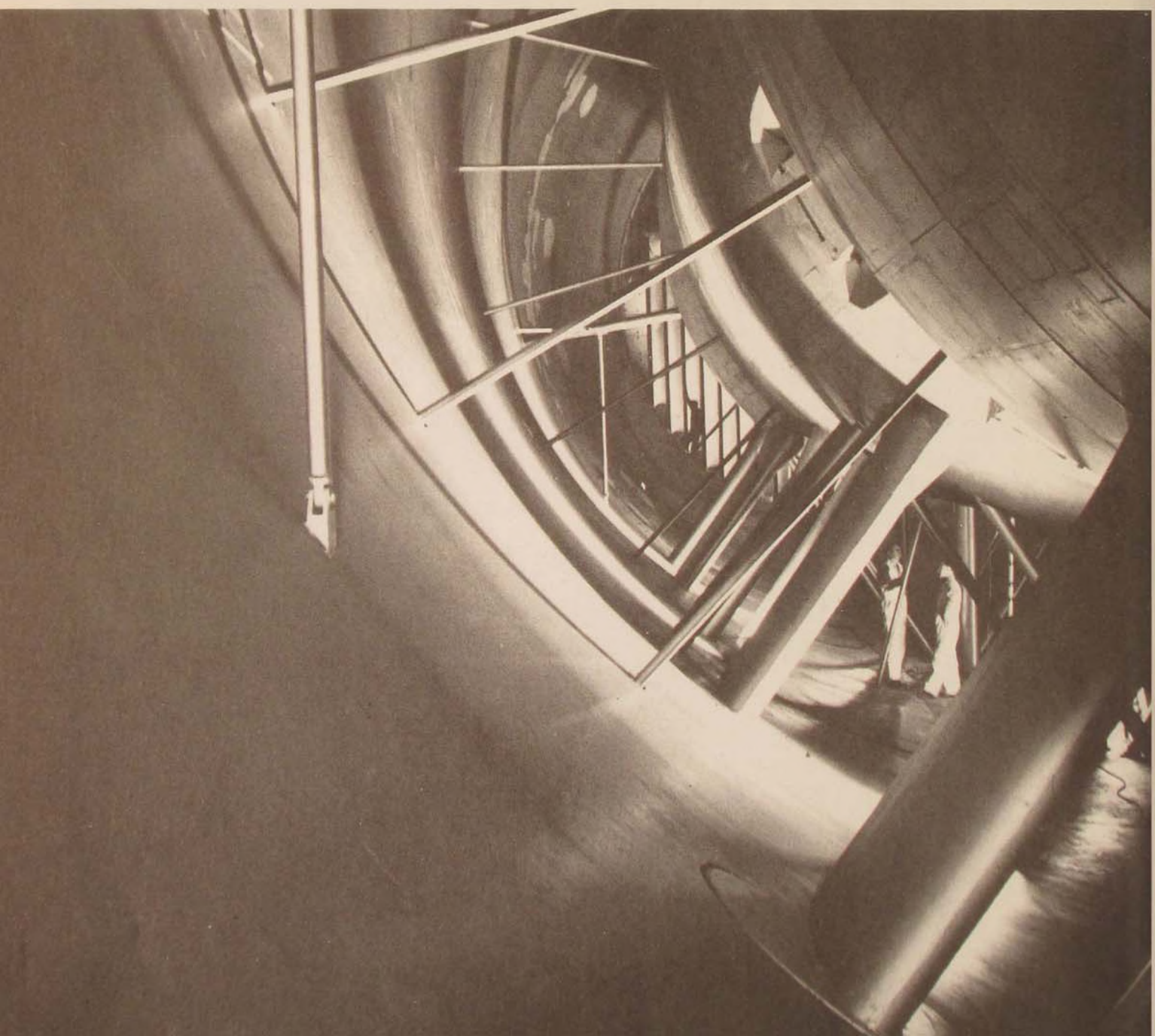
Some five months later, Dr. von Kármán delivered his report, the famous "Toward New Horizons," to General Arnold.



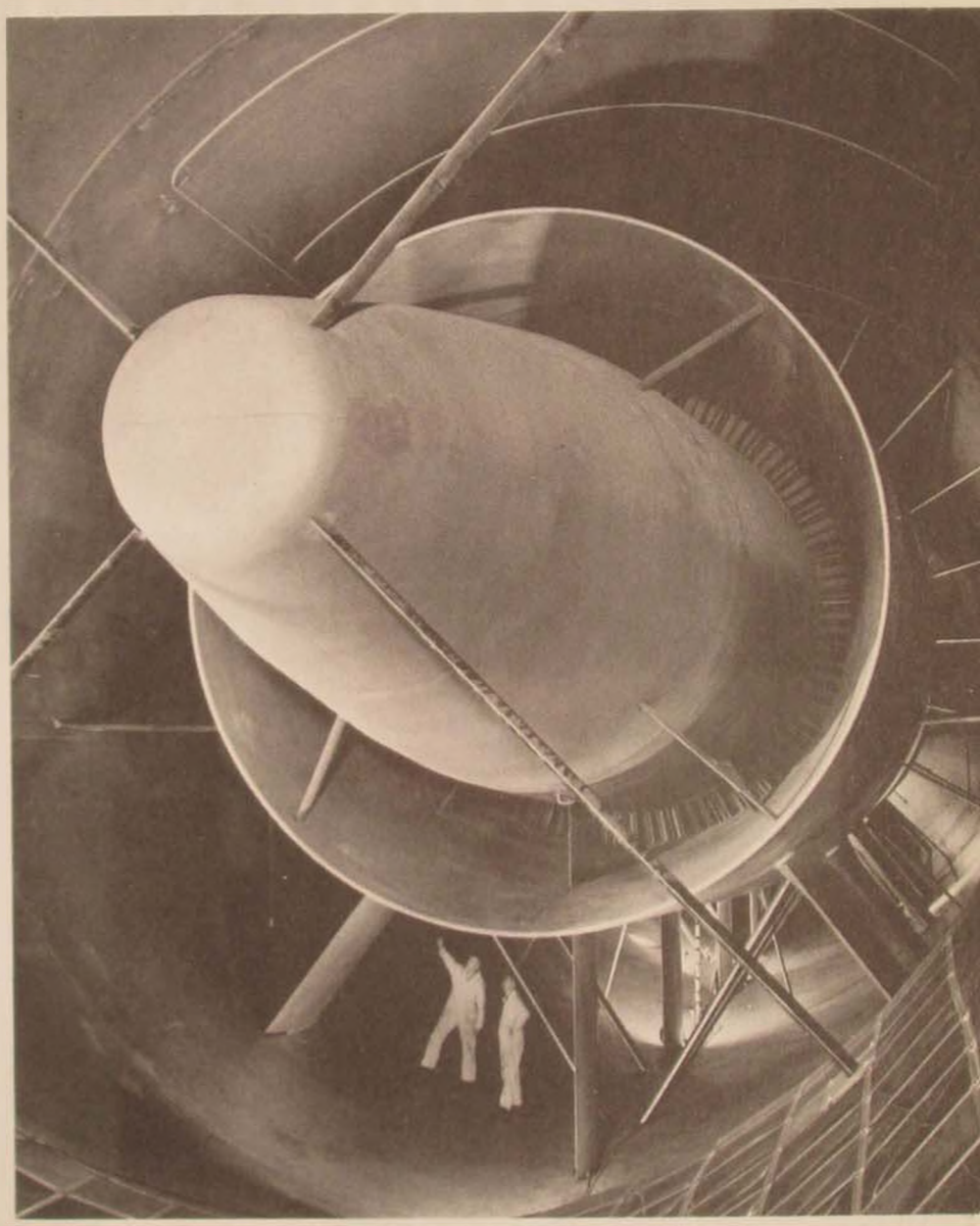
The rocket exhaust diffuser and water spray cooling bars help cool and remove exhaust gases from a 250-foot-deep, 100-foot-wide exhaust spray chamber at Arnold Engineering Development Center.

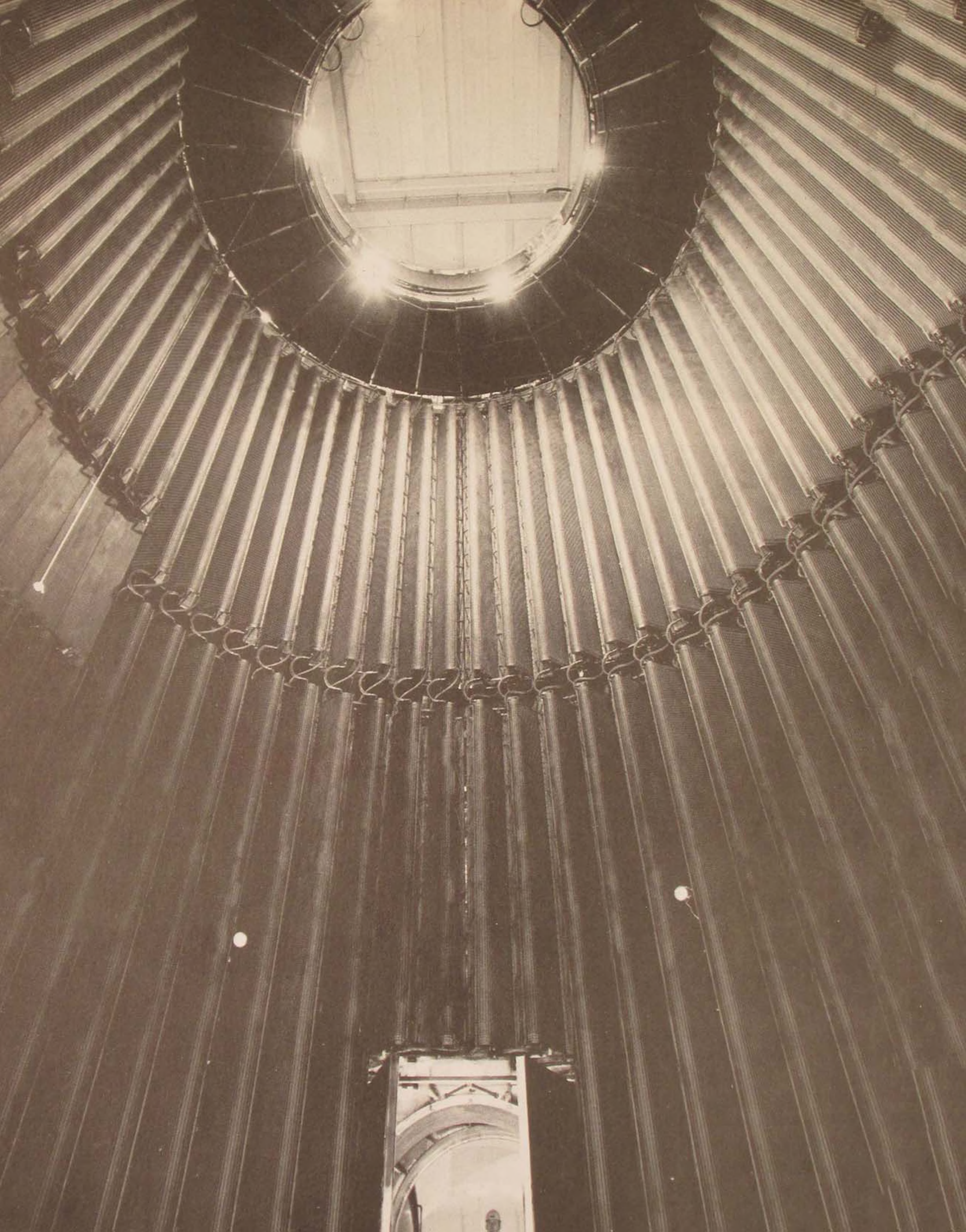
A significant statement in the report was that the substantial German technical progress was "not the result of any superiority in their personnel or engineering competence, but rather was due to the very substantial support enjoyed by their research institutions in obtaining expensive research equipment, such as large supersonic wind tunnels, many years before such facilities were even planned in this country."

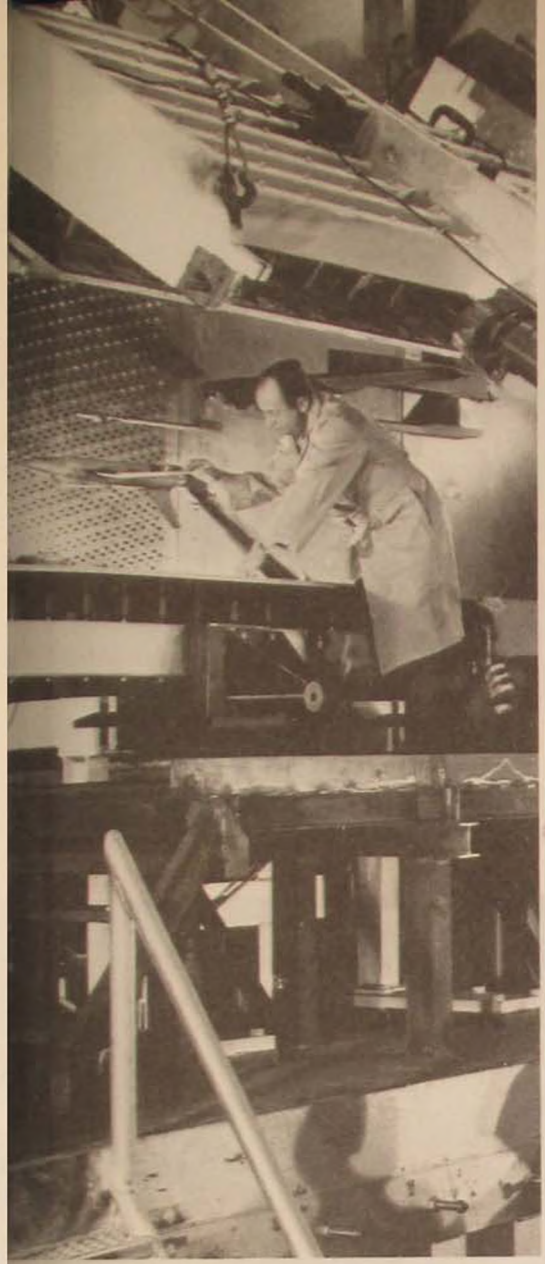
Recommendations in the report included development of wind tunnels capable of generating airflows "up to three times the speed of sound" with test sections large enough to accommodate models of "reasonably large size," including jet propulsion units, and an ultrasonic wind tunnel "for exploration of the upper frontier of the supersonic speed range." It also called for ample facilities "for the study of combustion and other characteristics of propulsion systems at very high altitudes."



Common control room and data acquisition system are used in operation of the transonic wind tunnel and large supersonic tunnel. . . . Compressor and iris valve struts (left) for the four-barrel, 18-stage compressor system of the Propulsion Wind Tunnel are contained in the 38-foot-diameter first leg of the supersonic circuit. . . . Located in south central Tennessee, Arnold Engineering Development Center includes the Aerospace Environmental Facility, Propulsion Wind Tunnel Facility, Rocket Test Facility, Large Rocket Facility, and the Von Kármán Gas Dynamics Facility. . . . The Aerodynamic tip of the supersonic compressor directs high-pressure, 650-degree airflow through the supersonic circuit of the Propulsion Wind Tunnel.





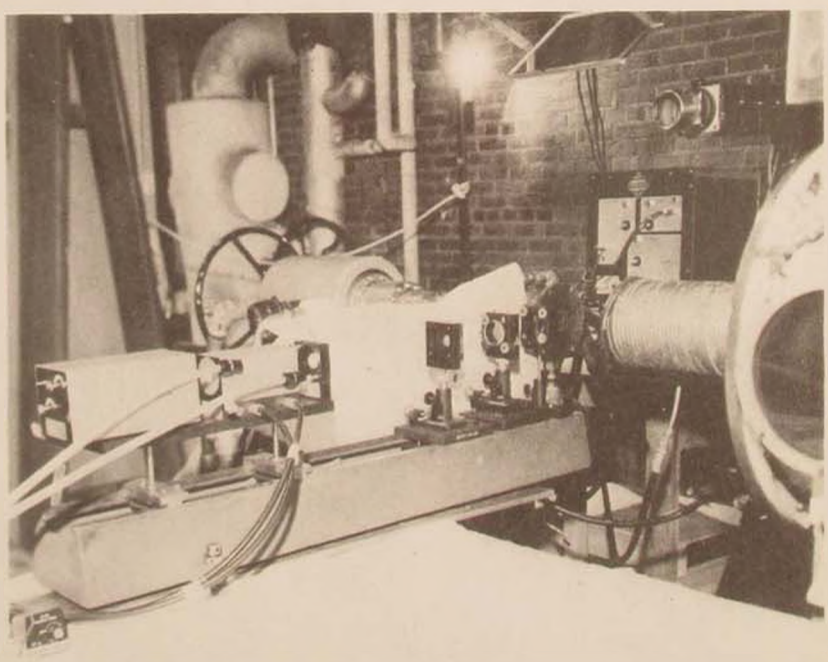


The louvered cryogenic walls of the Mark I aerospace environmental chamber use liquid nitrogen and gaseous helium to attain a vacuum of 10^{-8} Torr (approximately 300 miles altitude) and temperature of 72°K (–340°F). . . . The transonic wind tunnel is used primarily for stores separation tests. Models are mounted upside down to aid in equipment-handling problems. . . . Velocity measurements in high-speed, high-temperature gas flows are made with a pulsed ruby laser and image converter camera.

For 1945, when many knowledgeable people remained sincerely convinced that flight beyond the speed of sound was impossible, these were indeed ambitious—even visionary—goals. Nevertheless, plans were drawn up according to the recommendations, and construction of what is now the Arnold Engineering Development Center (AEDC) was started in 1950. The first test unit, a small supersonic wind tunnel, went into operation in 1953. Since then, test equipment has been designed to accelerate the development of rocket, turbojet, and ramjet engines, along with aircraft, missiles, satellites, and space systems. The results of this effort have produced test conditions far beyond those envisioned by Dr. von Kármán.

The Center is located at Tullahoma in south central Tennessee, a site selected because of the availability of the large amounts of electrical power and cooling water required to operate test units. Although the Center is an Air Force installation, it also serves the Army, Navy, and National Aeronautics and Space Administration and their contractors, other federal agencies, and educational institutions involved in aerospace research and development. Capital investment in the Center is currently more than $415,000,000, most of which went into the five major test facilities.

The main space chamber of the Aerospace Environmental Facility contains a test area 65.5 feet high and 34 feet in diameter. Its capabilities include real-time trajectory simulation from sea level to a pressure altitude of 15 miles in 82 seconds. Various series of pumps can further reduce pressure to simulate an altitude of 200 miles. Equipment for thermal balance tests includes an energy source to simulate sunshine and the heat radiated by the earth, a cryogenic system for simulating the cold black of space, and a handling system to support and maneuver the test vehicle. Tests of smaller systems and components are run in three other space simulation chambers, one of which

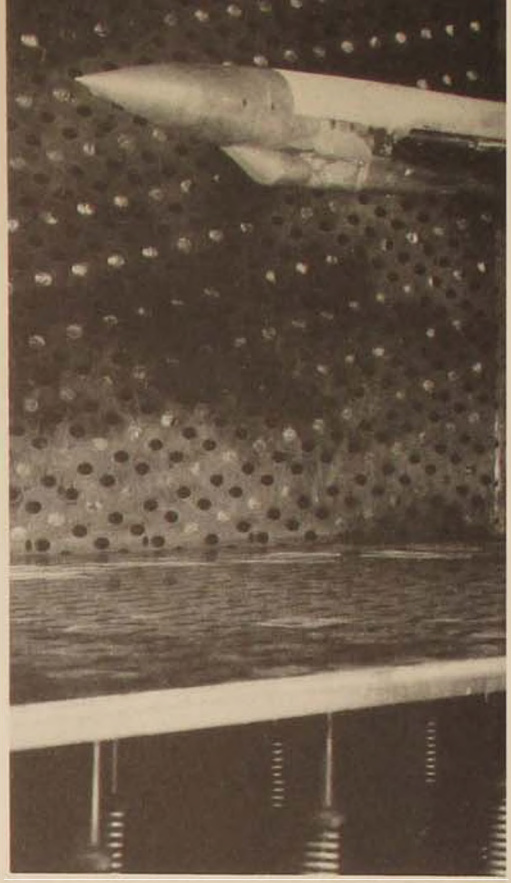


can be pumped to a pressure altitude of 1000 miles.

Within the Propulsion Wind Tunnel Facility, the two main tunnels have test sections 40 feet long and 16 by 16 feet in cross section. The transonic tunnel is capable of simulating speeds of mach 0.20 to 1.6 at pressure altitudes from sea level to 103,000 feet. Supersonic tunnel capability runs from mach 1.5 to 6.0 at pressure altitudes between 45,000 and 180,000 feet. Another transonic tunnel has recently been added with a test section 12.5 feet long and four feet square. Its capability is mach 0.20 to 1.5 at pressure altitudes from sea level to 45,000 feet.

The Propulsion Wind Tunnel Facility also has a 5-megawatt heater for tests of re-entry ablative materials. The flow ranges from mach 1.6 to 2.3 at temperatures up to about 11,000°F and total pressures between 10 and 100 atmospheres.

The two large tunnels are used for tests involving missile base heating, aerodynamics, and combined aerodynamic inlet and propulsion systems. The supersonic tunnel is also used for aerothermodynamic tests. The smaller transonic tunnel is used primarily for aircraft stores separation tests. Two model tunnels, originally built to obtain data required in the design of the large

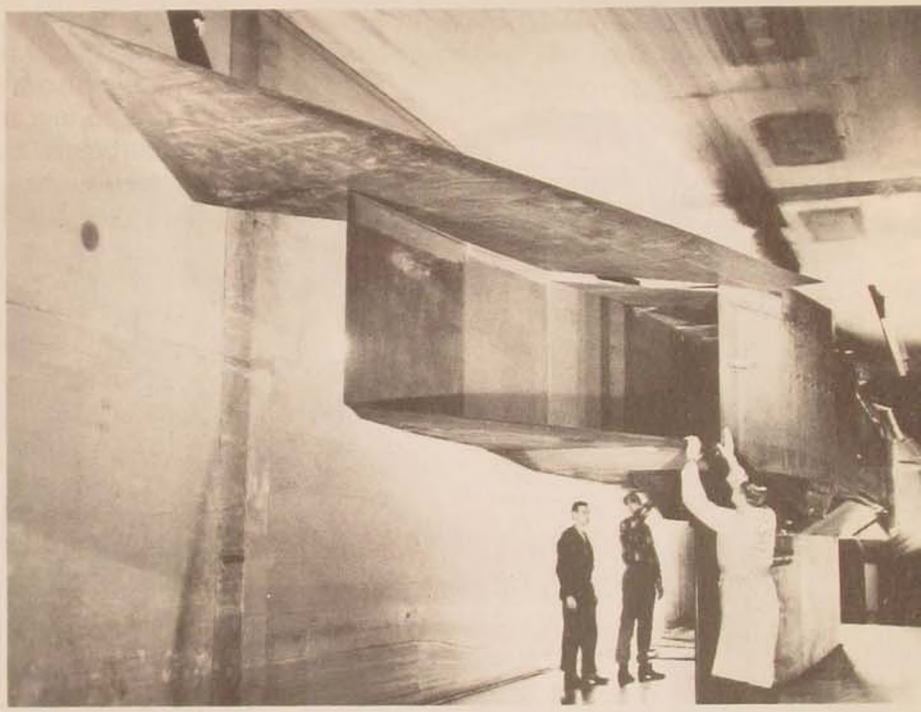


tunnels, are still used for aerodynamic tests of small models.

The Von Kármán Gas Dynamics Facility contains three conventional, continuous-flow wind tunnels. One has a flexible nozzle permitting mach variation between 1.5 and 6.0 while the tunnel is running. Pressure altitudes in the 50-inch-square test section range from 20,000 to 160,000 feet. The other two tunnels have 50-inch-diameter test sections. One operates at mach 6 and 8 at pressure altitudes between 98,000 and 180,000 feet; the other at mach 8 and 10 and pressure altitudes between 132,000 and 188,000 feet.

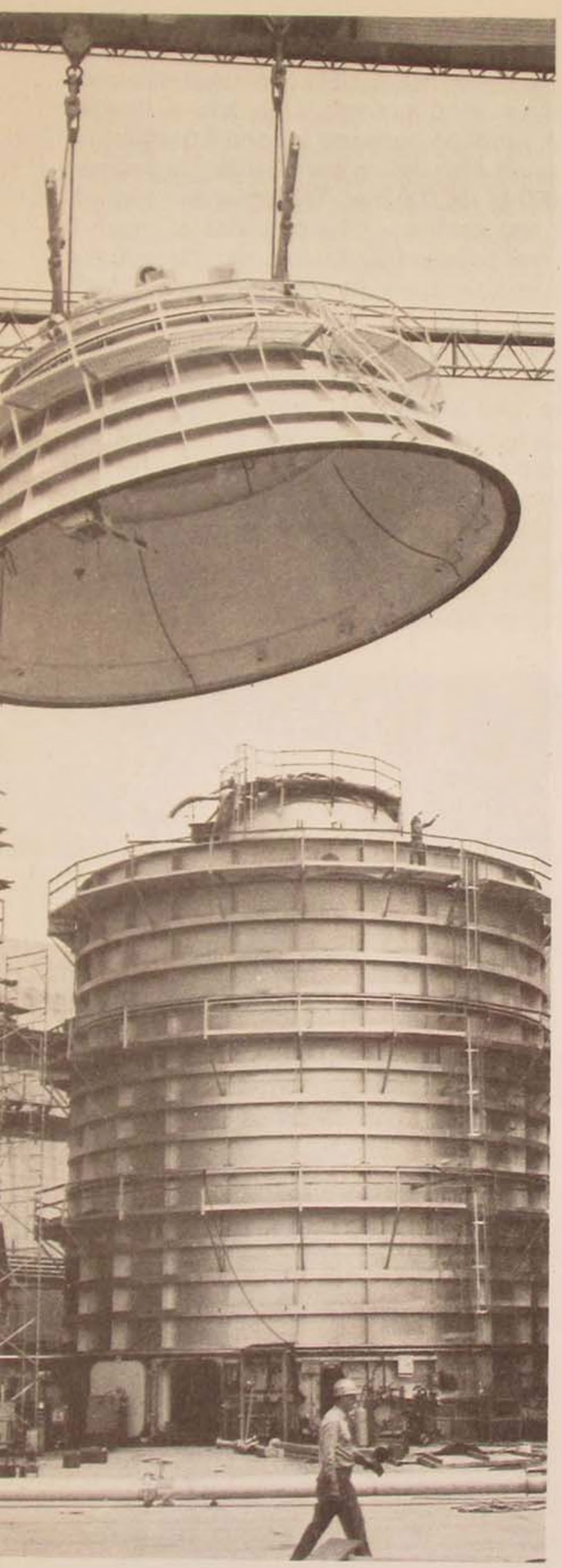
One of the two smaller intermittent tunnels operates between mach 1.5 and 5.0; the other at mach 8 at pressure altitudes between sea level and 160,000 feet, and between 100,000 and 170,000 feet, respectively. Flow is generated by releasing air from a pressure bottle, which can be charged up to 4000 pounds per square inch, through the test section and into a vacuum sphere. Run times of up to five minutes are possible, depending on test requirements.

An intermittent tunnel, driven by electric arc, has two test sections—one 54 inches in diameter, the other 108 inches in



Tunnel Testing

A scale model of the modified Athena missile is made ready for a high-speed environmental test in the Von Kármán Gas Dynamics Facility. . . . Trajectory characteristics of airborne armament are found by mounting a model of the parent aircraft in the wind tunnel test section. Position of the model is manually set, while the captive trajectory system is controlled by a computer. . . . The engine/inlet scale model for the XB-70 in the supersonic wind tunnel is the largest model of its type tested in such a tunnel. . . . The transonic wind tunnel was used for more than 150 hours of tests supporting development of the USAF/Navy F-111 aircraft.



The lid is placed on a test capsule after installing full-scale boilerplate tankage for the S-IVB stage of Saturn V.

diameter farther downstream. Flow is generated by discharging a powerful electric arc in a pressure chamber. The sudden increase in temperature and pressure ruptures a diaphragm in the nozzle throat, from which the flow expands and accelerates through the nozzle into the test sections. Test capability is mach 11 to 22 at pressure altitudes from 80,000 to 250,000 feet.

Two closed ranges, one 100 feet long and the other 1000 feet long, are used to test gun-launched, free-flying models at velocities up to 30,000 feet per second at pressure altitudes to 299,000 feet. Finally, there are two impact ranges used to study the effects of meteoroid strikes on spacecraft materials at pressure altitudes up to 325,000 feet.

Four of the test cells in the Rocket Test Facility are 12 feet in diameter and range from 16 to 75 feet long. Test conditions for rocket motors generating up to 20,000 pounds of thrust are mach 0 to 3.0 at pressure altitudes to 170,000 feet. There are three other rocket test cells. One is 20 feet in diameter and 69 feet long for testing engines generating up to 60,000 pounds of thrust at a pressure altitude of 120,000 feet. Another is 18 feet in diameter and 32 feet long for testing engines generating up to 20,000 pounds of thrust at a pressure altitude of 350,000 feet. The third cell is 18 feet in diameter and 40 feet high for testing engines generating up to 200,000 pounds of thrust at a pressure altitude of 125,000 feet.

There is also a high-altitude test cell for air-breathing engines. It is 16 feet in diameter and 72 feet long and is used for testing turbojets and ramjets in airflows to mach 3.3 and at pressure altitudes up to 80,000 feet.

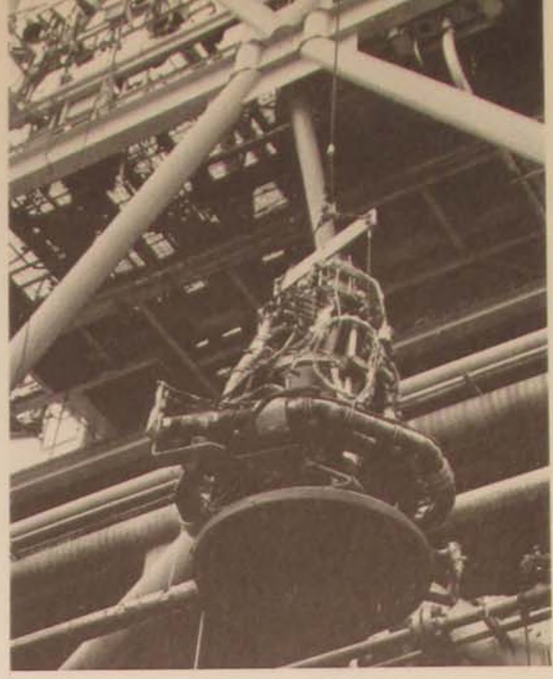
There are only two test cells in the Large Rocket Facility, but they are the largest at AEDC. One is for testing liquid-propellant rocket engines rated to 500,000 pounds of thrust, at pressure altitude of 100,000 feet. The liquid-propellant test engine is mounted in the 48-foot-diameter capsule at ground level, and it exhausts into a below-grade flame chamber 100 feet in diameter and 250 feet deep, where the gases are cooled in a water spray before being returned to the atmosphere. The other test cell, for solid-propellant engines rated to 100,000 pounds of thrust, is 16 feet in diameter and 50 feet long and tests at pressure altitude of 120,000 feet.

Over the years, tests in these facilities have produced vast amounts of data, all of it vital to aerospace programs. For example, chuffing, or unwanted bursts of low-level thrust after scheduled burnout in solid-propellant rocket motors, was discovered in a high-altitude simulation cell. The phenomenon, which had not occurred in sea-level tests, dictated new staging techniques to prevent possible collision after separation. — In-flight failure of a turbojet engine for operational aircraft led to an intensive test program by AEDC. The engine failed during the tests, and a fix was made in the field, based on the test data and results of examination of the failed parts. — Movies of failure in early Atlas E launches indicated the trouble was in the base region, but the precise location could not be determined. Tests at AEDC showed the exhaust gases were recirculating between the clustered nozzles and impinging on the missile base, which led to overheating and failure. The phenomenon was found to

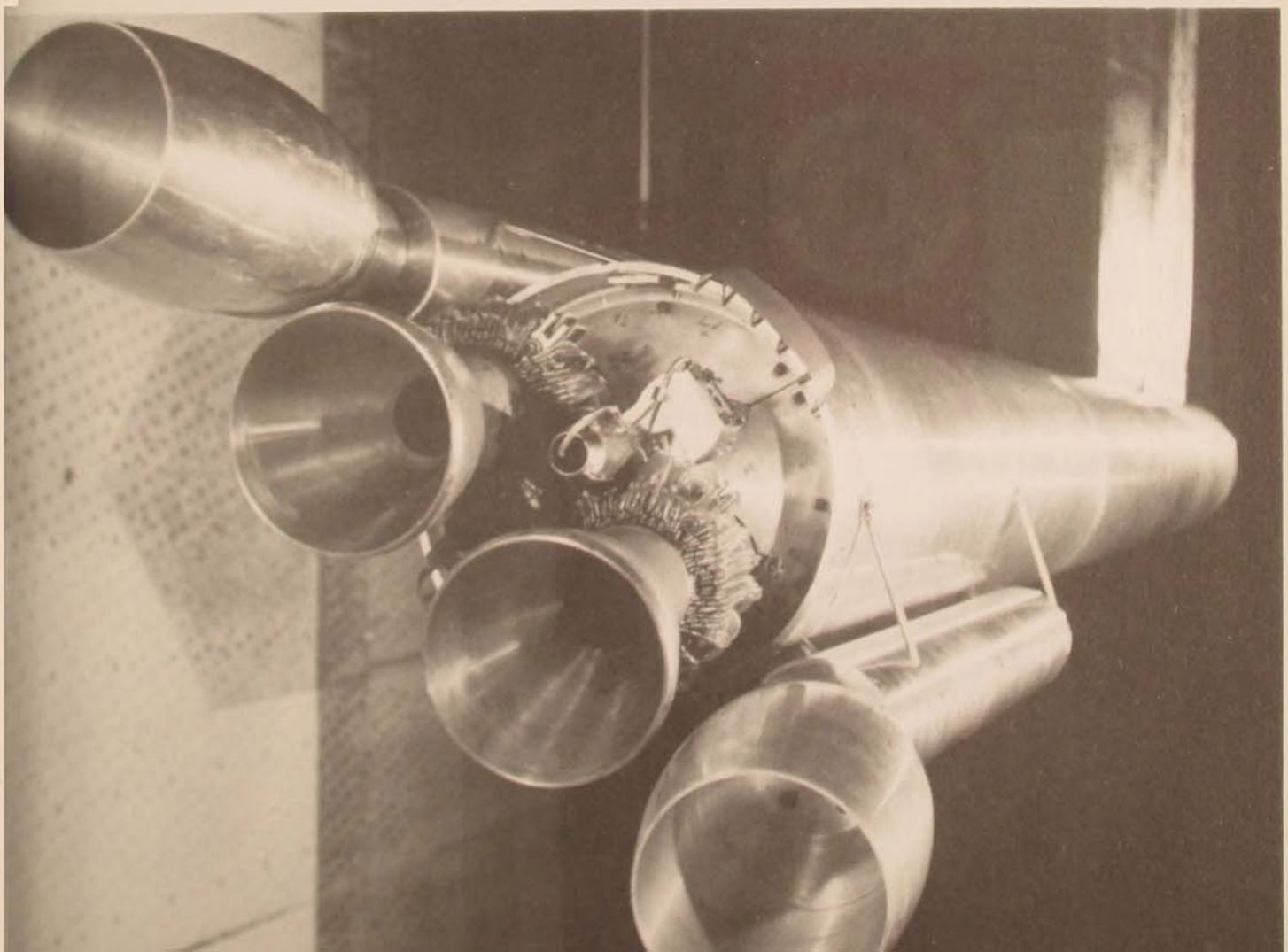
be common to all clustered-nozzle configurations.

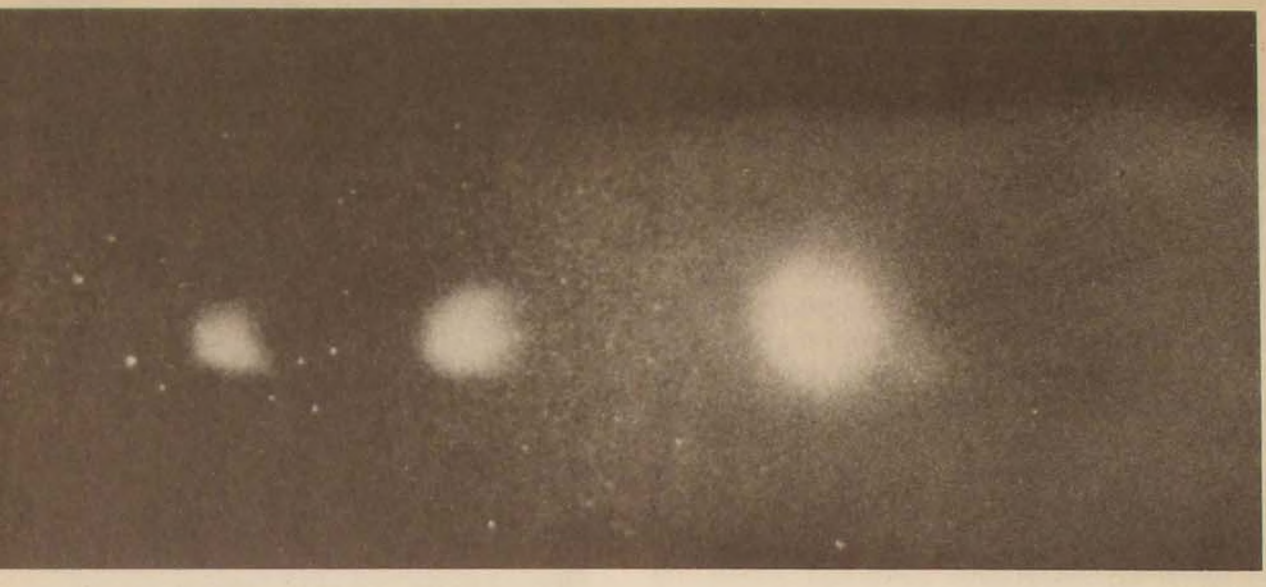
While these are some of the most dramatic examples of the work done at Arnold Center, there are more recent ones: Scale-model tests in support of the C-5A program led to a reduction in drag by 30 counts, each drag point representing 940 pounds in payload. — In simulated high-altitude tests, AEDC found the cause and recommended a fix for the random decreases in the Agena turbopump speed and performance during flights since 1964. Subsequent tests involved 37 successful firings of durations between 75 and 660 seconds and simulated coast times of up to 15 minutes between some pump starts and stops. — Hypervelocity impact tests on materials that could be used for the walls of a spacecraft show that when a simulated meteoroid penetrates the wall, the hot particle and the wall material fragments produce an extremely hazardous condition inside the spacecraft.

Designs for protecting manned spacecraft from damage by meteoroids are being evaluated by AEDC in two test programs in support of the National Aeronautics and Space Administration's Apollo Applications Program. One is to determine the protection required to make the empty liquid-hydrogen tank of the Saturn IB booster second stage acceptable for use by astronauts as an orbiting workshop for long periods of time. The second is to determine what materials have suitable penetration



The Apollo service module engine (minus nozzle extension) is hoisted into the J-3 rocket test cell for final bipropellant valve qualification tests. . . . The scale model of the Titan IIIB, standard launch vehicle for a number of Air Force satellites, is one of several configurations tested in the transonic wind tunnel to determine effects of high-speed flight on the core engine nozzles.





resistance for construction of an airlock to be used by astronauts in transferring from one space vehicle to another. The tests are being run in an impact range that employs a special launcher to fire projectiles that simulate meteoroids at speeds up to 20,000 miles an hour through a 100-foot long range tube into a chamber containing test material. Air can be pumped out of the 21-foot-long, 6-foot-diameter chamber to simulate altitudes as high as 130 miles.

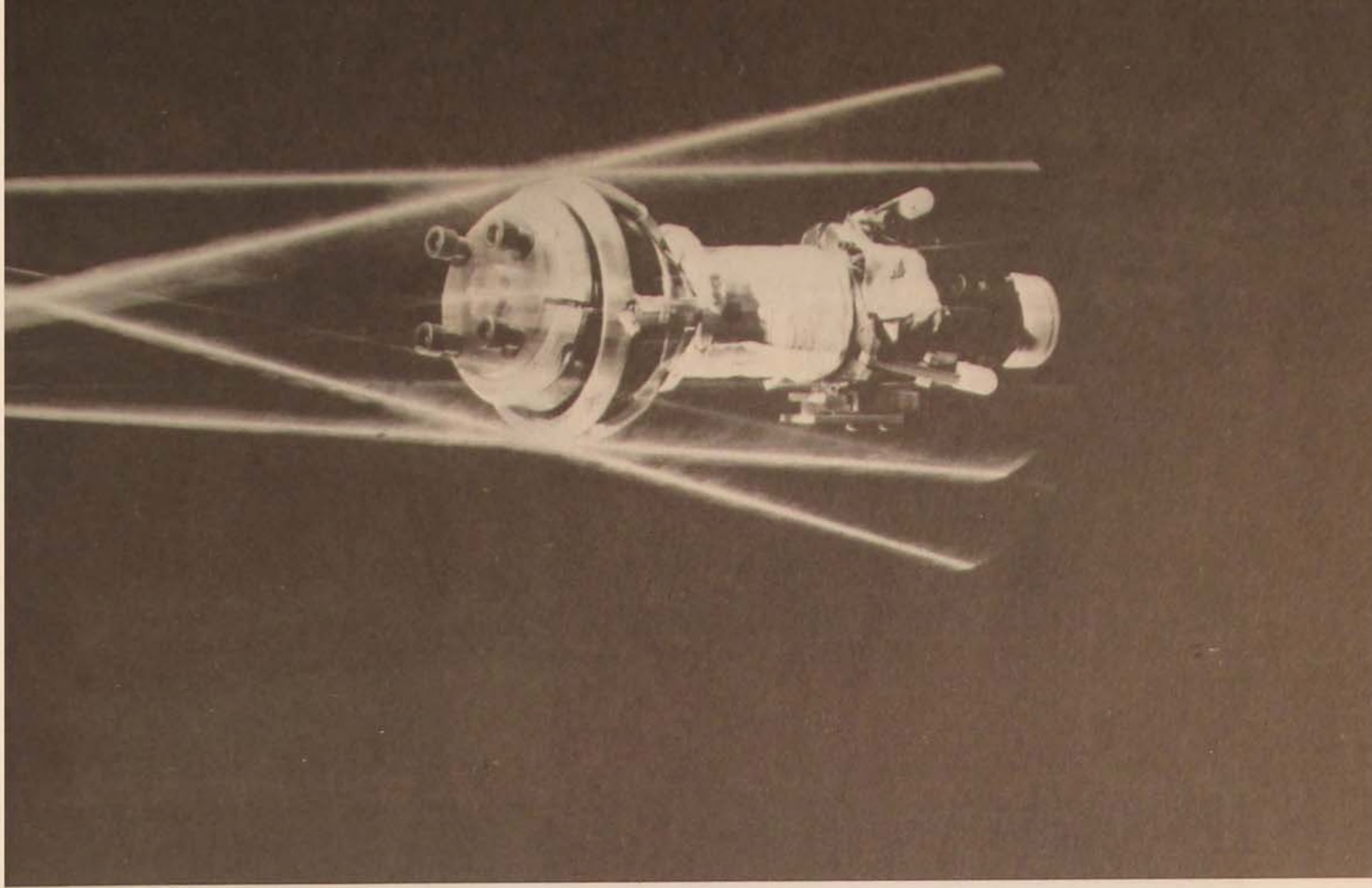
The ability of the F-105 and F-4 fighter-bombers to launch or jettison various payloads of rockets, bombs, or pods under combat conditions is being investigated by AEDC. The first test series matched the F-4 with a missile being developed for use against fortified structures, the second paired the F-105 with an air-to-ground guided missile, and the third combined the F-105 with an airborne pod used to dispense a variety of munitions. The studies were conducted with the wind tunnel's captive trajectory system composed of an aircraft model support in the floor of the four-foot-square test section and equipment suspended from the ceiling that controls movement of the payload model. This arrangement of equipment was arrived at because of the dual use of the tunnel—for study of trajectories followed by payloads upon separation from the parent aircraft, and for the more normal aerodynamic testing. Suspension of the trajectory system from the ceiling simplifies its removal when the tunnel is being used for aerodynamic studies. The model of the parent aircraft is mounted upside down in the tunnel, and the payload, moving along its delivery trajectory, "falls" toward the ceiling of the test section.

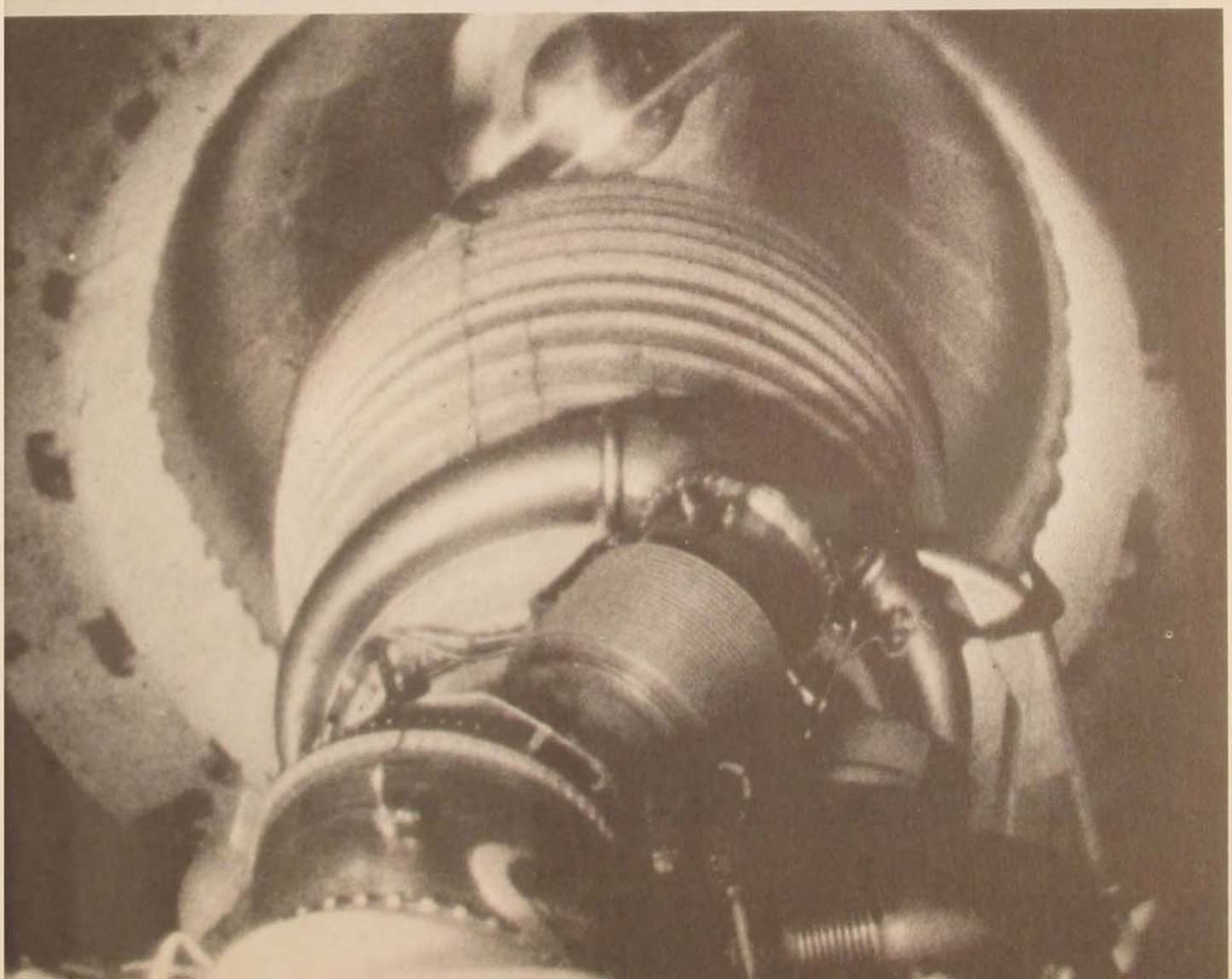
Through refinement in testing techniques, research personnel have been able to reduce the time required to plot a trajectory from 45 minutes in their first efforts to as little as 15 minutes in later tests. The two F-105 series averaged a trajectory every 19 minutes of operating time, which included short delays for corrections in tunnel conditions or changes in computer programs.

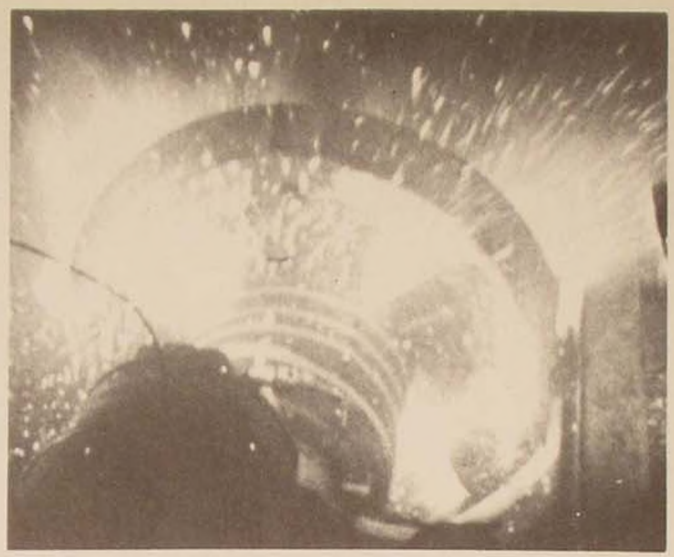
Key to the rapid operation is closed-loop computer prediction and control system. A plotting operation is started by bring-

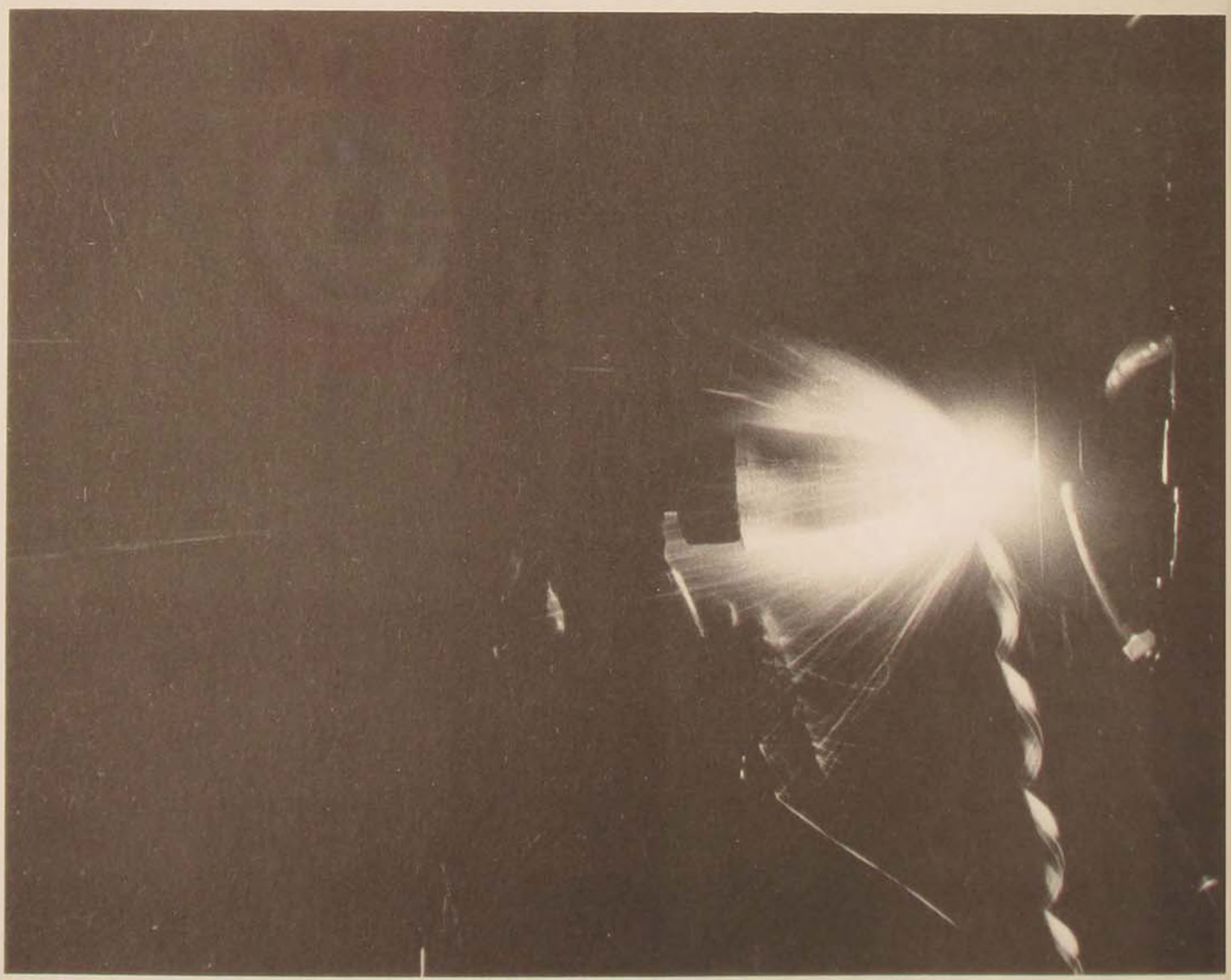
Testing Procedures

A multiple-exposure photograph (above) sho a new approach to the measurement of velo ties in high-temperature gas flows. The th spots are of a single spark created in flow by a laser and recorded by image c verter camera. . . . Freedom of motion is p vided by a new wind tunnel model suppo which is basically a ball-and-socket pivot t permits the model to react simultaneously the pitch, yaw, and roll motions. . . . T full-scale J-2 engine for the S-IVB stage Saturn V undergoes tests in the Center's la est cell testing liquid-propellant motors (rig









Glow of Testing

An Apollo spacecraft model glows white-hot on its leading face (about 1000 degrees Fahrenheit) during simulated re-entry tests. . . . A sample of ablative material (left) gives off a shower of glowing particles while subjected to the jet of a five-megawatt arc heater, during testing of materials used to protect re-entry vehicles from extreme temperatures and pressures. . . . Burnthrough of the rocket motor case for a spin-stabilized system occurred during simulated altitude test (above) in a special spin rig rotating at the prescribed revolutions per minute.

ing the payload into contact with the pylon on which it is carried by the aircraft. The forces acting upon the store model are then measured through instruments in the model support. These measurements are examined by the computer and a calculation is made as to the payload's position after a given time interval. The computer also makes a prediction of what the loads will be at the new position and activates the control system to place the payload in the next predicted position. A new set of measurements is then made, and if these figures agree with the prediction, the computer proceeds to predict a third position on the trajectory. If the figures disagree, the support system is automatically returned half the distance to the payload's last position for additional measurements. In making its predictions, the computer must take into consideration the speed and attitude of the parent aircraft, the mass and moments of inertia of the payload, and, in the case of powered missiles, the forces generated by the missile motor. The computer can also simulate mathematically a variety of flight conditions not actually created in the tunnel.

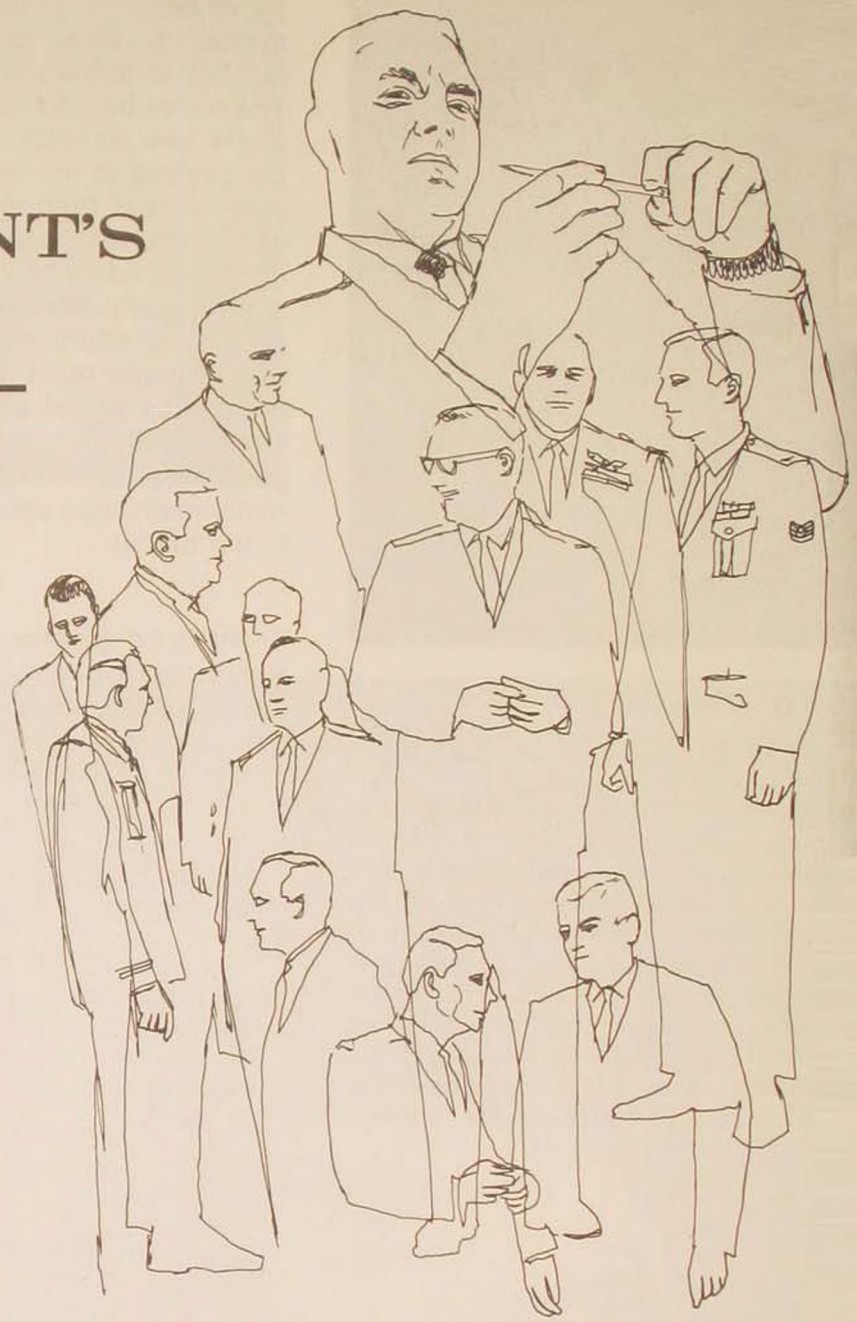
THERE is no question that the AEDC facilities have proven their worth, and they will continue to be valuable in the years ahead. Test facilities needed today and tomorrow to test future systems will be expensive and complex—even more so than some of the systems that will be tested in them. Test facilities must be identified, programmed, and built far enough in advance to serve future needs.

General James Ferguson, Commander, Air Force Systems Command, sums it up:

> The problem of timely acquisition is becoming critical. The resources so useful to the nation today must be assured for tomorrow. We need to recapture the spirit of Arnold and the foresight of von Kármán if we are again to reach far out into the future in our facilities planning.

Arnold Engineering Development Center

MANAGEMENT'S CRITICAL CHALLENGE—PEOPLE



BRIGADIER GENERAL JOHN B. HUDSON

THE military challenge to the United States and her allies makes it clear that technological superiority is a key factor to our national survival. Essential to this superiority in today's increasingly complex world are the quality and quantity of skilled technical people.

The national defense program is a major user of scientific and engineering talent. Within the Air Force, the management of research, development, test, evaluation, and acquisition programs is the responsibility of the Air Force Systems Command. Performing these functions requires some 62,500 military and civilian personnel with talents for the management, scientific, engineering, flying, and supporting roles. The Systems Command team includes some 9800 officers, 19,500 airmen, and 33,200 civilians.

It is important to remember that our most

important resource is not hardware or facilities or systems but the *people* who create and operate them. We cannot take for granted that systems and hardware will operate themselves or that there will always be someone around who can do the job. People are the lifeblood of our operations. If we want the best possible defense posture for our country, we must continue to get the very best people to carry out the nation's defense policies.

First, a few observations about the people in Systems Command:

—Of the 9800 officers, about 5000 are scientists/engineers, 98 percent of whom have at least a bachelor's degree, 35 percent a master's, and 2 percent a doctoral.

—Of the 33,200 civilians, some 6000 are scientists/engineers, 13 percent of whom are at the master's level and 4 percent at the doctoral.

—In terms of active military service, the distribution curve of our scientific and engineering officers is characterized by the large numbers in the junior officer ranks. There is a sharp drop in the middle service ranks, but another hump appears in the higher field-grade ranks, resulting from World War II and Korea inputs. The latter group is rapidly disappearing through retirements, so that over 3100 (60 percent) of our 5000 scientific and engineering officers are lieutenants and captains.

—By contrast, insufficient input of young scientists and engineers has resulted in an undue "aging" of our civilian technical force. In May 1960, 41 percent of this force was over 40; by June 1968 the percentage had increased to 51. Thus, on the military side our officers are young, and on the civilian side our force is getting too old. Because of increasing national needs for scientists and engineers, at a time when the supply is not keeping pace, the critical challenge of management is brought into sharp focus: To develop policies and programs designed to attract, motivate, effectively use, educate, recognize, and retain the highly qualified people we must have. It is within this framework that I shall discuss the Systems Command personnel programs.

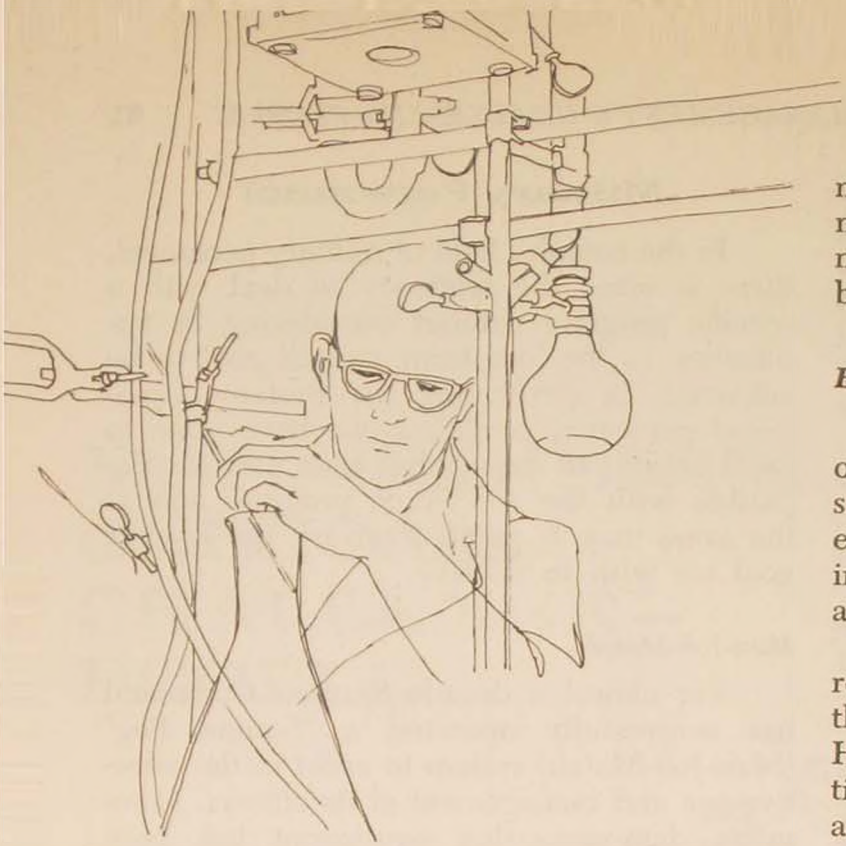
Military Personnel

In the complex field of military personnel, there is often the tendency to deal with a specific program without considering its application to the long-term, overall goal to be achieved. In developing the Systems Command personnel programs, we have gone to great lengths to ensure that each part is compatible with the Air Force program and at the same time is pointed toward the specific goal we wish to achieve.

Man-Job-Match

For almost a decade Systems Command has successfully operated a "Square Peg" (Man-Job-Match) system to assist in the effective use and management of its officers. Automatic data-processing equipment has been used to report, process, and store the descriptive job requirements information, and the personnel data system has been used for ascertaining the individual's qualifications. The final matching of an individual against a job has been accomplished through evaluation by the assignment officer personally. This method is time-consuming, and the evaluations tend to be somewhat subjective; thus inconsistencies could occur in the final determination of assignments.

To overcome these limitations, efforts were recently initiated, in conjunction with Headquarters USAF under the provisions of AFL 36-1, to develop a computerized Man-Job-Match system utilizing the major command computer to compare the attributes of the available individuals with the requirements of the available jobs. The basic objectives of the new Man-Job-Match system are (1) to ensure that technical and senior managerial officers are identified and considered for assignment to positions that will make the utmost use of their skills; (2) to optimize the assignment and utilization of critical-resource officers; and (3) to provide a current statement of the advanced education requirements of the command. Normal job requirements such as authorized grade and Air Force Specialty Code (AFSC) have been expanded to



include information that describes the precise requirements of specific jobs, e.g., essential and desirable education, technical training, previous experience, and rated specialty. Through the command position numbering system, the unique identification of each manpower authorization provides the capability to control the assignment of an individual to a specific position (desk) within an organizational element (office). The computerized Man-Job-Match system quickly and accurately considers a large number of people for possible assignment to a large number of vacant positions. The system objectively evaluates and scores the attributes of individuals compared to the requirements of positions. It presents an optimized recommendation to the assignment officer in the form of a mathematical matrix for his evaluation and final decision. The system provides flexibility to vary the priority or weighted factor being used to adjust or limit the resources to be considered.

Although the computerized Man-Job-Match system is still in the development and testing phase, results thus far have proven extremely promising. The initial effort has been directed specifically toward the assignment and utilization of scientific and development engineering (S&DE) officers and our senior managers. The system has the potential to be applied to the entire USAF officer force.

Expanded Assignment Preference

One of the most often expressed desires on the part of an officer has been for some say in his assignment. For the scientist and engineer particularly, duty location is far less important than the basic job content or work activities.

Most technical people, early in their career, prefer to work directly in the area of their expertise, at the "bench" so to speak. However, many do not fit this generalization and feel dissatisfied and demotivated if assigned to "bench" work. There are as many individual career paths and assignment preferences as there are officers. When assignment generalizations are made, officers not so typified are demotivated by what they feel to be a disregard of their opinions regarding the work area in which they believe they can make their greatest contribution.

One essential key to effective management is to involve the individual in the process of making decisions about his career. Studies have shown that the more the individual is involved in his career planning and job selection/placement, the better satisfied and motivated and more productive he will be. We in the Systems Command have been particularly concerned about the need for ways to provide greater insight into the individual officer's preference for work activities and assignments.

As a result of this concern, AFSC has instituted a program to give our officers a greater voice in determining their next assignment. The new program is called the Expanded Assignment Preference system. It supplements the career objective and assignment preference procedures now in use throughout the Air Force. Through the expanded program the officer can identify the particular type of work he wants to do in a specific kind of Systems Command organization. Aimed initially at lieutenants and captains in the Scien-

tific, Development Engineering, and Systems Program Management utilization fields, the program was launched at Wright-Patterson AFB in March 1968. In the months following, it was progressively extended throughout the command and to include other specialties. To augment the assignment preferences previously recorded, primarily geographic, the individual officer can define the functional area and precise work experience he desires. He is aided in preparing his Expanded Assignment Preference Statement by a comprehensive manual, which tells him what to consider in regard to a new assignment and where the requirements are for people doing the kind of work in which he is interested.

The Expanded Assignment Preference system gives the officer a chance to indicate specific things he wants considered by the officer who makes his assignment, to specify alternatives, and to indicate special desires regarding his next move—even as to when it should or should not occur. Response to the program by the officers so far involved has been enthusiastic.

Some assignment selection methods and allied personnel practices had to be tailored to enable full realization of the program's potential. However, the changes involved were easily accommodated by the assignment officers and assignment process. An additional benefit of the program appears to be the ease with which it can be accommodated into the Man-Job-Match computer-aided assignment process. The rationale of the approach and the computer data elements employed lend themselves readily to the logic process of the Man-Job-Match program.

Analyses of the Expanded Assignment Preference program's effectiveness to date lead us to believe it may be a personnel breakthrough in helping an officer to get the kind of assignment he wants. These analyses further imply that the program can be expanded to include all specialties. It had been our intention to continue the program on a test basis through calendar year 1968. The success of the program, its acceptance by our people, and its application to our needs have caused us to incorporate it as a regular, ongoing Systems Command program.

Project OPEX

In the fall of 1965, the Chief of Staff, USAF, emphasized the need for major air commands to provide career broadening experiences for officers. Also at that time a high-level subcommittee of the Defense Science Board published a report entitled "Technical Military Personnel" which emphasized career broadening for "technical" officers. The report stressed that it should be a standard practice for each new officer to serve a tour of duty where the real problems of military activity clearly show.

The assignment of large numbers of rated scientists and engineers to flying duties in Southeast Asia (SEA) provided this operational

broadening to an extent not often possible under peacetime conditions. The same situation, however, did not apply to our young, nonrated scientists and engineers. Scientists and engineers are in critical national shortage. The loss of rated ones not only put more responsibility on those remaining but also reduced the operational experience level represented in Air Force research and development activities. Therefore, even the requirement that young officers be used to the maximum of their technical skills does not obviate the need for them to become familiar with the operational aspects of the Air Force. Only through operational exposure can the nonrated officer better understand the "real life" problems in the use of equipment now in the operational commands and thus improve his ability to design better and more useful R&D products.

To attain this goal and not impair the responsiveness of development activities to operational requirements, a concept was developed whereby R&D officers are rotated on TDY to operationally oriented assignments and back to R&D duties. The basic tenet of this concept was the placement of an officer in an operational position where he would be widely exposed to the unit's operational mission while providing the unit a unique and useful capability in keeping with his R&D specialty.

The first seven officers selected for implementation of the rotation program served from July to December 1967, three in units of the Military Airlift Command, two in Strategic Air Command, and two in Tactical Air Command. The response to the program, informally dubbed "Project OPEX," was overwhelmingly favorable. Local commanders, supervisors, and scientific and development engineering officer participants were unanimous in their approval and support of the program.

Project OPEX continues to be highly successful. Presently, ten officers are participating in the program: four at strategic missile wings in SAC; two engineers at military airlift wings and a computer mathematician with Air Weather Service, MAC; two S&DE officers with TAC; and an electrical engineer with ADC. Each of these assignments was given individual consideration to ensure maximum benefit from the TDY. Thus the R&D potential of the officers selected will be substantially enhanced upon return to their original job or planned reassignment.

Our present plan for Project OPEX includes expanding the number of officer participants to thirty per year and developing a broader spectrum of opportunities for operational experience. The program has paid off in more knowledgeable officers and improved relationships with the operational commands.

career motivation

We in the Systems Command recognize the need to motivate our young officers and airmen to seek a career in the Air Force. As we look to the future, the long-term continued technical competence of the Air Force is directly related to our ability to retain these young people.

The Systems Command career motivation program got its impetus several years ago when we were able to forecast that officers who served in World War II and those recalled for Korea would retire and that sufficient numbers of young officers were not staying in the Air Force to take over the leadership functions. Something had to be done, and Systems Command established the first formal Air Force career motivation program, which has three principal functions:

—to provide information to the young officers and airmen so they can make intelligent career decisions,

—to initiate action to improve the attractiveness of an Air Force career,

—to support other staff agencies in their efforts to provide better management and administration for our people.

Surprisingly enough, our most difficult job is to ensure that our young officers and airmen have the kind and amount of information necessary to make their career decisions. In the officer area, we start with presentations at colleges and universities before the individual is commissioned. This is the job of our Junior Officer Speakers Bureau, started about five years ago. Its original purpose was to send a few young lieutenants back to the AFROTC unit

at their alma mater to talk about the R&D work being done in AFSC. The success of the program has resulted in its expansion to include the majority of ROTC detachments. The objective of the program has also been enlarged to include a presentation on the role of the young officer in the Air Force.

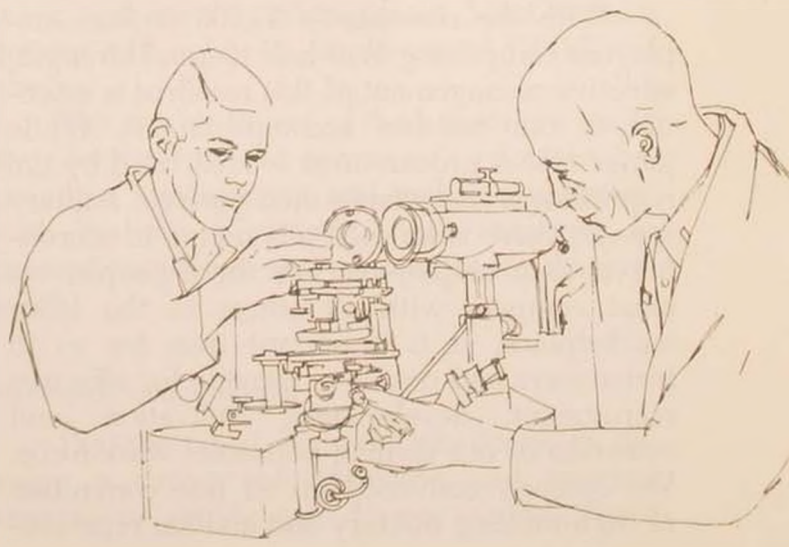
The key to its success has been young officers talking to potential young officers about the work and life of other young officers in the real world environment. It has been this initial motivation that plants a seed of interest in the cadet's mind. He starts to picture himself with new gold bars, working as a part of the Air Force team, living the life of a young officer, and meeting the challenge of today's problems.

The enthusiasm generated by these presentations has been excellent. The young lieutenants coming on board today are ambitious and ready to go to work. They know more about what is being done in the Air Force, and they report to their first commander with a positive attitude. This initial attitude makes the retention job somewhat easier and, more important, results in the young officer's becoming effective earlier in carrying out his responsibilities. It is much easier to train and supervise a young officer who has a positive attitude.

In both the officer and airman areas we rely on personal counseling to get the word down. We must keep the supervisors informed of the new things the young people need to know and continually interested in responding to the questions asked. We have a program of visits and direct contacts with our subcommands. To supplement these contacts, we instituted in the officer area a new program called "Dear Captain," tailored after a well-known newspaper column. Its purpose is to provide personal advice on career matters to the young officers trying to make their career decisions.

The program was started last year when over 200 officers, all with about 2 years' service, received a personal letter from the AFSC Career Advisor soliciting their questions or problems. The program has been expanded to "action line" type of service, providing the officers with another course of appeal on problems associated with their careers. In many cases a solution does exist—it is just a matter of finding the responsible man and explaining the problem to him. The young officer who has not had much exposure to the personnel system and has a difficult time finding the right man to talk to now has an avenue to get a quick reaction and a response to his problem.

Recognizing the value of the NCO and airman in performing the command's mission, we are trying to do more and better things for this group. To put the airman career motivation program in its proper context, we convened an ad hoc council to develop the program generally along the same lines as the officer program. As in so many of our other programs, the interest and support of our Commander gave us the impetus to come up with an imaginative array of realistic, viable things to do. Recommendations of the ad hoc group have already been put into effect, including inauguration of NCO Advisory Councils and Airman Councils. The NCO Council plans and organizes programs to improve conditions affecting the morale and welfare of all airmen. The Airman Council identifies problem areas and recommends actions to improve career attractiveness for young airmen. These councils give airmen entree to commanders. It is encouraging to know that these councils are being used and their recommendations given serious consideration. Many improvements have been suggested and implemented by our commanders.



recognition

We all know the importance of an imaginative awards and decorations program in recognizing the achievements of our people. In order to have a system of awards and decorations which is responsive to the kinds of activities in which we are engaged, a number of new Systems Command awards have been established, which of course are in addition to the military, civilian, and special awards authorized by the Air Force and the Department of Defense. These include the Officer Career Motivation Award, awarded annually to the Systems Command organization adjudged to have the best career motivation results during the previous year; Captain and Lieutenant Noteworthy Accomplishment Awards, to recognize the contribution of young officers to the success of the command mission; Junior Officer of the Year, to recognize the achievements, duty performance, and contributions of the command's outstanding junior officer; and the Aerospace Primus Club, to honor individuals whose achievements represent significant and historic firsts in aerospace.

The growth of the overall program from about 400 military awards in 1960 to over 2000 in 1967 and the establishment of Systems Command awards attest to a strong and continuing interest in recognizing outstanding service and achievement.

civilian personnel

With the command's 33,200 civilian employees comprising over half its total strength, effective management of this resource is essential to our mission accomplishment. While junior officer procurement is facilitated by the requirement that young men perform military service, there is no such advantage in recruiting civilian employees. For these people, we must compete with all others in the labor marketplace. It is important then for us to foster ways and means to provide for effective recruitment, development, utilization, and retention of our civilian personnel work force. We recently convened an ad hoc committee of high-ranking military and civilian representatives from throughout the command to study the civilian employee situation and make recommendations as to how it could be improved. The result of the committee's recommendations has been a restructured program with emphasis on quality and youth.

Recruiting plans. A specific recommendation of the ad hoc committee was the establishment of a command-managed professional recruiting program. Authorizations have been provided, and a Systems Command Professional Employment Program (SCOPE) initiated. Under this concept, Headquarters AFSC is providing each subcommand with a nationwide civilian recruiting capability for scarce skills, such as engineers, scientists, management trainees, and high-level administrators. Formerly no such commandwide capability existed. The program provides for full-time, highly qualified recruitment coordinators, geographically dispersed at subcommands throughout the country, to plan, coordinate, and participate in all activities that go into the making of a professional recruitment program. It enlists support by managers and supervisors at all levels of the command and requires participation by all subcommands in a formalized program of college relations and recruitment. The college relations activities will be a continuing effort to build cooperative relationships with faculties, placement officers, and other staff members. Recruiters will establish and maintain year-round campus contacts through regular visits.

With this new program we are attempting to overcome the steady increase in the age level of the civilian work force by replacing about 5 percent of the scientists and engineers each year with recent college graduates. With the current loss rate of scientists and engineers at about 7½ percent annually, some room is left to bring in experienced professionals in high-level positions. In addition, our program sought out young college graduates to come into support areas such as comptroller, procurement, and personnel. To do all this, our recruiting teams visited 200 colleges and universities during the 1967-68 school year. More than 500 offers were made in the face of stiff competition from industry and other govern-

ment agencies. Results for the recruiting season show that 230 S&DE and 78 non-S&DE college graduates were employed. This represents a substantial increase over the previous year, when 188 were hired, and stands as our best recruiting season since 1961.

A college cooperative program, whereby the student works full time with us during part of the year and attends school the remainder, is being expanded to include every major subcommand in AFSC. A limited program has existed for several years, dependent almost entirely on utilization of momentarily unoccupied spaces and reprogrammed funds, with the result that a steady input of new graduates could not be relied upon. A total of 100 spaces is now invested in this program, which enables 200 co-op students to alternate work and study. A five-year plan calls for expansion to a level of 460 co-op students.

Trial retirement. Retirement laws in the Civil Service system are such that an employee cannot normally retire until he is 55 years old and is not required to retire until he reaches 70. Many employees who are eligible to retire tend to hang on, apparently reluctant to take the risk of starting a new way of life. This has led to a top-heavy structure of older employees, some of whom are not as vigorous as they once were but who are effectively blocking promotion opportunities for a younger group.

In March 1968 the Systems Command offered all eligibles a chance to take a one-year trial retirement with assurance that they could return to a position of similar grade and salary level if they desired. Almost 6 percent of the civilian work force is eligible to retire. Since the program started only recently, it is too early to determine how effective it will be. Much will depend on how many elect to return, but estimates are that no more than 10 percent will do so. The program has been received with enthusiasm by both management and employees. The Director of Civilian Personnel, Headquarters USAF, has indicated that the plan will be extended Air Force-wide if the trial period proves successful in Systems Command.

Civilian Policy Boards. A final recommendation of the ad hoc committee related to the establishment of Civilian Policy Boards to ensure top management review, evaluation, and input on important civilian management matters. Civilian Policy Boards, composed of high-level civilian and military members, have been established at each subcommand and at Headquarters AFSC to advise commanders on civilian management affairs; to review and make recommendations on civilian policies, programs, and procedures; to advise and aid in the solution of civilian personnel problems; and to recommend actions in these areas to their commanders. The boards have specified review and advisory functions in the areas of classification, placement, promotion, employee recognition, employee and career development, and position management. Most of these actions will apply to employees at GS-13 and above.

The establishment of the boards is a major step forward in the command's effort to improve its management and make employment with Systems Command more attractive to present employees and candidates for employment.

education and training

We are faced with the challenge to develop a variety of education and training courses to satisfy our diverse needs. These

courses range from those required to keep our scientists and engineers current with the state of the art to those required for the maintenance and operation of Air Force equipment. Much of our people's competence level today is attributable to the imagination and effective management in the field of education and training over the years.

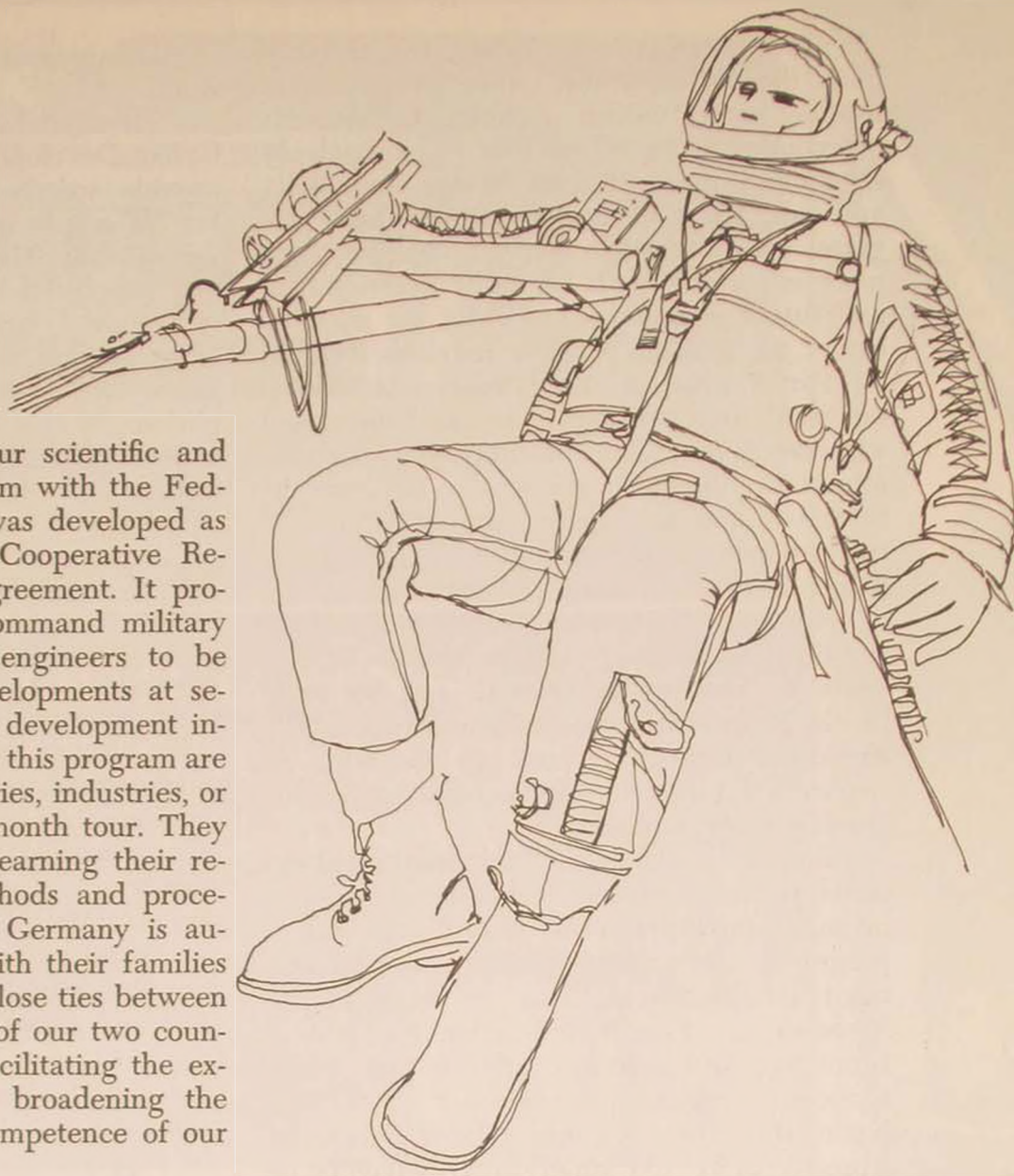
Proficiency education and training. Systems Command's most unusual short-range effort is its Proficiency Education and Training Program, designed to increase the technical competence of military personnel in management, scientific, engineering, and technical areas without loss of time from the job. Under this program individuals enroll in specialized education courses directly related to their assigned duties. Study time is limited to off-duty hours, but as much as six hours' duty time per week is allowed for scheduled academic or laboratory sessions. Thus the program is not considered as off-duty training: It is a duty assignment in which enrollees are required to complete the courses as a part of their job responsibilities. All costs, tuition, books, and fees associated with the program are paid by the command.

Ph.D. Sponsorship Program. In conjunction with Air University, AFSC developed a program, called the Ph.D. Sponsorship Program, for officers pursuing the doctoral degree at civilian institutions. A sponsor is selected for Air Force Institute of Technology doctoral candidates in science and engineering who are programmed to be assigned to Systems Command upon graduation. The sponsor is a Ph.D. engaged in scientific or engineering projects in AFSC laboratories. The aim of the program is to assist in the selection of research projects, to provide opportunities for research in areas of more direct application to Air Force requirements, and to provide laboratory facilities and equipment to the Ph.D. candidate while he is still in the university. A collateral benefit will be to familiarize him with current AFSC research and development activities.

Research Associates. Since 1963 there has been at the Lawrence Radiation Laboratory (LRL) a Research Associate Program for AFSC scientists and engineers. It provides a significant tie for us with the people, engineering projects, and operations at the Lawrence Radiation Laboratory. This laboratory, operated under contract by the University of California, is located at Livermore, California, just east of San Francisco. Founded in 1952, it was one of the first laboratories to use research teams and large, complex new research tools to make coordinated assaults on the unknown. It is devoted basically to applied research in virtually all phases of nuclear energy. The interchange of information between personnel of the University of California laboratory, the Atomic Energy Commission, and our Research Associates provides a unique opportunity to obtain experience in nuclear weapons research and development in a working laboratory environment with some of the Free World's finest nuclear scientists. This greatly improves the Associates' competence and contributes to projects of long-range interest to the Air Force.

The Los Alamos Scientific Laboratory (LASL), at Los Alamos, New Mexico, also has a Research Associates Program. A principal laboratory of the Atomic Energy Commission, LASL is also operated under contract by the University of California. The laboratory was founded in wartime with a single mission: to create the world's first nuclear fission bomb. Since those early days, its scope has been broadened so that it now devotes a large part of its effort to exploration of peaceful uses of nuclear energy. Qualified officers are assigned for 24 to 36 months as members of a working team in the Weapons Division of LASL. This division carries out detailed investigations in the design of nuclear weapons and their components. The scope of work ranges from detailed theoretical calculations to laboratory and field experiments. In addition to actual weapon design, extensive work is carried on pertaining to selective weapons' effects and the vulnerability of weapon systems to these effects. As with the LRL, our program with LASL greatly improves our Research Associates' competence and provides the background and experience for significant contributions to projects of interest to the Air Force.

German Exchange Program for Junior



Scientists and Engineers. Our scientific and engineering exchange program with the Federal Republic of Germany was developed as a part of the U.S.–F.R.G. Cooperative Research and Development Agreement. It provides for young Systems Command military and civilian scientists and engineers to be trained in the technical developments at selected German research and development installations. Those selected for this program are assigned to German laboratories, industries, or universities for a 12- to 18-month tour. They work for local supervisors, learning their research and engineering methods and procedures. Concurrent travel to Germany is authorized, so our assignees with their families live on the local economy. Close ties between the scientists and engineers of our two countries are established, thus facilitating the exchange of information and broadening the perspective and technical competence of our people.

Employee and Career Development. All civilian employees in the command have the opportunity to keep pace with change and update knowledge and skill to meet their career goals and our mission requirements.

A formalized and systematic career planning/appraisal/development process plays a key role in determining individual requirements. This process includes self-analysis, career planning and goal setting, an appraisal discussion with the supervisor, and the mutual design of an individual development plan. The individual pursues the plan, accomplishes the training, and applies the learning on the job, while the organization provides financial and other support and encouragement. At the entrance level, for example, a Cooperative program student working temporarily in one of our subcommands and going to school for an equal period of time can be trained technically to the point where he can be effective upon entering a full-time permanent position at the GS-5 to -7 level.

Other entrance-level training programs include full-time employees who come to work under a training agreement approved by the Civil Service Commission. These agreements, normally for scientists and engineers, contain planned and systematic on-and-off-the-job training aimed at building technical expertise and knowledge of the organization.

As one progresses beyond the entrance level, there is an almost unlimited number of training opportunities available to assist in overcoming technical and/or managerial obsolescence, increasing knowledge and skills, and cultivating inherent potential. These programs are designed to help an employee cope more effectively with his present assignment and future challenges and meet his personal career goals. Some of these activities include:

—Participation in college courses conducted on base, after working hours, at government expense. About 1500 AFSC employees per year attend these specialized scientific, engineering, technical, and managerial courses, which are the companion to our Military Proficiency Education and Training program.

—Another 150 employees per year attend full-time academic programs of one or two years' duration at the master's and doctorate levels. These individualized programs are fully supported by management in the form of spaces and funds, in addition to encouraging employee participation.

—Employees at all levels of management can develop competence in technical and general management through on- and off-base college programs, other nongovernment and government activities, e.g., American Management Association, Executive Seminar Centers, Brookings Institution, residence and correspondence courses in senior service schools, National Institute of Public Affairs, and others. Approximately 750 supervisors/managers receive training yearly in this manner.

—Active participation in professional society meetings, symposiums, and conferences is encouraged and recognized as a means of keeping abreast of one's occupational field and broadening one's expertise.

—We have another program, similar to the one with F.R.G., directed toward recognition and cultivation of independent creative research. This is the Systems Command's Research and Study Fellowships program, intended to permit selected individuals to perform self-designed scientific, engineering, or management research anywhere in the world.

The Systems Command's Employee and Career Development program is integrated to provide orderly and sequential opportunities for all employees, managerial and nonmanagerial alike. These opportunities are provided and supported to meet individual needs for self-renewal, updating, and growth and the organization's needs for talent. These programs are consistent with the command's philosophy that our qualitative mission results depend primarily on the quality of our work force.

WE SEE no lessening of the need for capable career military and civilian personnel with high professional and technical competence. As we look to the future, it is very clear that our need, and that of the Air Force, for these kinds of people will increase as dictated by more complex jobs, continued pressures to upgrade our in-house capability, and the discernment necessary to decide between possible avenues of investigation in light of the fact that the Air Force will have more expensive and complex systems.

The available national resource of technical manpower will continue to be in short supply to meet the needs of government, industry, and educational institutions. Since the national need is expected to increase while the supply remains relatively static, we must continue our efforts to make the most effective use and provide for the best development of the people available to us.

We in Air Force Systems Command have made significant advances in building programs to meet our specialized needs and to advance our people. We cannot rest on our laurels, though; we must continue to press for innovative and imaginative personnel policies, plans, and programs that will make further contributions befitting the urgency of our mission.

Hq Air Force Systems Command

OUR GAINS FROM SUCCESS IN VIETNAM

Brigadier General Henry C. Huglin, usaf (Ret)

THE TIDE of battle seems to have been turned fully in our favor in Vietnam. The political, social, and economic situations all really look better—even though we clearly have a long way to go. Accepting for the time being the tragedy of the war and putting aside the arguments over the details of the manner and scope of our involvement over the years, what of the positive side for our long-term interests? What are the gains which our sacrifices, persistence, and skills have given and will give us? Are there gains which will be significant to the Free World in general, to us in our role as the leader and protector of the Free World, and even to the slow progress of mankind toward an enduring peace?

We cannot now clearly foresee when or how the Vietnam conflict will cease, nor how complete our success will be. Neither can we foresee what further demands on our strengths and tests of our will may be involved before the conflict is over. The insurgency is being defeated militarily, psychologically, and politically and, in time, will likely wither away without negotiations—as happened with other guerrilla insurgencies in Greece, Malaya, and the Philippines. But the North Vietnamese and Viet Cong may agree to genuine negotiations; this they seem to be considering, now that they have apparently been finally convinced that dissent in America will not really force our withdrawal, that they are losing decisively militarily, that they are failing to capitalize on the occasional turmoil from the political growing pains in the South, and that they were uselessly taking the punishment being inflicted by our air strikes on North Vietnam.

We may have the chance of greater success if the insurgency just withers away. Our experience in Korea is a worrisome precedent for a similar development in Vietnam. In Korea the negotiations dragged on for about two years while the Communists flagrantly violated the terms of the cease-fire by building up and reinforcing their forces; they inflicted tens of thousands of casualties on our troops meanwhile, and we finally had to threaten to reopen the conflict and use nuclear weapons to bring the Red Chinese to serious negotiations.

But it is clear now that success to some degree will be ours in achieving our basic objective in Vietnam: defeating the attempt by North Vietnam to convert South Vietnam to Communism by force. Our decisions in early 1965 were the crucial ones. South Vietnam was then on the verge of being overwhelmed by the stepped-up guerrilla actions. We decided to launch sustained air strikes against North Vietnam, to participate actively in the defense of South Vietnam, and to build up our forces to the necessary degree. These decisions were considered to be politically, psychologically, and morally necessary. They almost came too late. It took a long time for their effect to turn the tide noticeably.

HOW DOES our involvement in Vietnam fit into the world environment and relate to our pre-eminent role in the world?

We became involved in Vietnam not by any grand design or long-term plan but by rising reluctantly step by step to the progressive challenge to the freedom of the people of South Vietnam collectively to determine their own future. Because we did not foresee correctly, we sometimes have had to choose a belated course of action which, far from being ideal, was the least bad of the alternatives we then faced. Yet, have not our basic purposes and actions in Vietnam been consistent with our basic purposes and actions during the past twenty years—most notably in Western Europe, Greece, and Korea? Were we not then, as now, faced with an unavoidable choice of either using our strength responsibly to protect the weak and the threatened or of letting the Free World be eroded step by step until our own security would be in direct danger?

In fulfilling our pre-eminent role in the world, our strategic superiority in nuclear weapons and the aircraft and missiles to deliver them has had major influence on Vietnam, as it has had on most international crises in the last twenty years. In Vietnam, that superiority is of major importance in insuring that Soviet Russia's and Red China's support of the indirect aggression by North Vietnam is

kept at such a low level as not to provoke a nuclear response from us on their homelands. Our strategic superiority also is of major importance in giving our leaders the confidence to take the actions they have taken and accept the low risks involved, despite the blustering threats of the Soviets and Red Chinese and the hand-wringing of those who do not understand the importance of this superiority and are frightened by the threats.

The Soviets are believed to have been deterred by our strategic nuclear monopoly in the late 1940s from expansion through open aggression. In 1950 they turned to limited open aggression through their pawns, the North Koreans. When that aggression was defeated, they persuaded the Red Chinese to become their "cat's-paw" and enter the Korean conflict. Our unexpected but successful responses, under the aegis of the United Nations, to the open aggression of both the North Koreans and the Red Chinese upset this expansion tactic. This display of our capabilities and will—along with our subsequent development of incredibly powerful and broad-based strategic and tactical nuclear weapons capability and our expanded alliance system—has deterred Soviet Russia and Red China from sponsoring a further open aggression, which would now carry a clear risk that their homelands would no longer be sanctuaries from counterattack.

In the various aspects of the postwar confrontation between the Soviets and us, the Cuban missile crisis in October 1962 was the most crucial turning point. Prior to this the Soviets had been striving mightily for many years to gain a strategic advantage over us in nuclear delivery capability. They had failed in numbers of weapons and in sophistication of technology. Their sneak move of medium-range missiles into Cuba was a desperate gamble. With these missiles in Cuba they obviously felt they would be able to coerce us into making major political concessions. The boldness of our response and the success of our showdown with them were primarily due to the marked superiority in strategic nuclear capability we had developed and made credible to them, thus avoiding nuclear blackmail.

Having been taught by us that open aggression and nuclear blackmail would not succeed, the Soviets and the Red Chinese turned to indirect aggression. They strongly supported Ho Chi Minh in trying out in South Vietnam their so-called "wars of national liberation." Such wars are simply Communist-instigated guerrilla insurgencies to overthrow whatever regimes are in charge in weak nations and to install Communist ones; and they try to exploit social and economic problems and the people's aspirations for a better life in order to gain control.

Are we not showing in Vietnam, as we have shown in Berlin, in Greece, in Korea, and in the Cuban missile crisis, that we have learned through bitter experience in this century that aggression appeased or unopposed enlarges its appetite and boldness? Have we not decided that unless we help the people who want to resist Communism—or any other totalitarianism of left or right—being forced upon them, the chance for peace with freedom and justice under law in the world will ultimately be lost for us as well as for the weak? Is this not really what has been the crux of our role in the world for twenty years? Is it not the crux of our cause in Vietnam and why our basic policy there is right? And is it not the basic rightness of our policy, backed with our strength, skills, and determination, that is leading to our success and the direct and indirect gains therefrom?

JUST what are these gains? First, what have we gained in the political, psychological, and moral fields?

Our greatest gain has been the avoidance of the calamitous consequences which our failure would have brought about, including the risk of greater war.

Had we failed in Vietnam, our prestige and trustworthiness as a nation would have been seriously eroded. The nations of the Free World, both allies and neutrals, would not have felt able to depend so much on our shield of strength for their protection against aggression, subversion, and nuclear blackmail—as

they now do, consciously or unconsciously, despite carping by some at our role in Vietnam. Some of these nations would have felt impelled to move toward accommodation with Soviet Russia and Red China or to seek tenuous security in building their own nuclear weapons.

Meanwhile, we would most surely have been challenged again and again, more boldly and crucially. Domestically, we might have suffered an agonizing political and psychological upheaval—far greater than the agonizing we have already gone through—over what would have been considered our greatest failure in foreign affairs in our history. And, to try to recoup as much as possible of our standing in the world, we might have overreacted and risked a general nuclear war in a major, perhaps fatal, showdown over the increased challenges we would have had.

Beyond this greatest gain in the avoidance of these calamities should be the reinforcement of our reliability, willingness, and determination to use our strengths responsibly to help the weak and threatened. Thus, a major gain will be that our prestige and trustworthiness will, in the long run, be strengthened with our allies and the neutrals in the Free World, and we will be even more respected in the Communist World.

Other political and psychological gains seem already to have developed in Asia since we have apparently convinced our allies and the neutrals—if not yet our enemies—that we truly are going to see our cause in Vietnam through to success.

Most notable has been the suppression of the Communist grab for power in Indonesia. This development reversed a ten-year disintegration during which President Sukarno led his teeming, potentially rich nation into economic chaos and toward Communism. Sukarno obviously had been impressed with the way the Red Chinese achieved domination in China and appeared to be the tide of the future in Asia. Had we let Vietnam go down the drain, would the anti-Communist forces in Indonesia have resisted the Communist takeover? It is highly doubtful. Their will to do so and to set Indonesia on the long road back to stability and progress can be considered a salutary gain deriving from the climate of confidence we have created by our determination and performance in Vietnam.

The June 1966 meeting in Seoul, Korea, of Foreign Ministers from nine Asian and Pacific nations—Japan, South Korea, Australia, Nationalist China, New Zealand, the Philippines, South Vietnam, Thailand, and Malaysia—can be considered another major political gain. This meeting resulted in the establishment of the Asian and Pacific Council to promote cooperation among the non-Communist nations in those areas. Although we did not participate in the conference, is it conceivable that these relatively weak nations would have had the will or interest to take these steps to broaden their economic and political activities as independent nations if they had not been confident that our strength and determination would shield them from the threats, coercion, or actual aggression of Red China?

In addition to the gains from proof of our reliability, we will derive further gains from the corresponding appearance of severely limited reliability of the Soviets and Red Chinese. They have encouraged North Vietnam in the effort to subvert South Vietnam. They both have furnished North Vietnam with advice and military equipment. They both have made tough-sounding but ambiguous promises of support—but never firm commitments of direct participation, because of their justified fear that their open involvement would risk our retaliation. Therefore, as our cause succeeds, Soviet Russia and Red China are being exposed as provokers and encouragers but not active partners. Will not this exposure have a demoralizing effect on the morale and determination of any but the most fanatical Communist revolutionaries elsewhere in the world?

Most important, through our success and their failure the Communists should be taught a further vital lesson: that we will not allow them to get away with their tactics of subversive indirect aggression. This lesson should constitute another major gain for the evolution of the world toward peace in freedom and diversity and ultimately for our security.

YET THE WORLD will not be free from turmoil and danger after the Vietnam conflict is over. Unfortunately not. Most of the age-old troubles of excessive nationalism, greed for other nations' territories, and racial and ethnic animosities fester in trouble spots in many areas of the world. And, on top of these potential causes of conflict, there will still be mounting the social and economic problems of the poor nations, stemming from the combination of their political immaturity, their economic backwardness, their burgeoning populations, and their greater aspirations for a better life.

Nevertheless, if we blunt completely the expansionist drive of the major Communist nations, which has been the chief threat plaguing the world for two decades, then the United Nations hopefully can, with our strong support, deal with the lesser threats and conflicts. Further, we and the other relatively rich nations can collectively help the poor nations with aid and know-how to deal with their multitudinous problems without great despair and violence. We Americans also can then concentrate more effectively on our own serious problem of how to control our internal evolution in such a way that we can still cherish our human values in a rapidly changing social and technological environment. And we can try to deal further with mankind's common problem of constructing a world community based on law and the recognition of our interdependence, not just in preserving this relatively small spaceship Earth on which we exist, but in keeping life really worth living.

An eventual strengthening of the United Nations can be an indirect gain, too, from our success in Vietnam. The U.N. has been unable to play a significant role in Vietnam because it became an arena of confrontation between the Communist World and the Free World, with the former, led by Soviet Russia, firmly against any role of the United Nations that would interfere in the Communists' subversion in South Vietnam. But the failure of this type of expansionism should further dissuade the Communists or any other group from using aggression, direct or indirect, to expand, to redress old grievances, or to gratify new greeds. Thus mankind, hopefully, will turn more to international cooperation and settlement of disputes by peaceful means through the United Nations.

Other important gains for us should stem from the experience we have acquired in the complex problems of nation-building, of dealing effectively with the interrelated social, economic, and political problems so as to bring stability and progress to new nations. One of our greatest problems in Vietnam has been to evolve the techniques, procedures, organization, and training of people—to learn how ourselves and to help the South Vietnamese to manage this difficult nation-building task. It is, of course, far easier to tear down, terrorize, or subvert with promises of future correction of all dissatisfactions—as the Viet Cong and the Communists in general do—than it is to deal responsibly with correcting, adjusting, and following up on the building of social, economic, and political stability which will permanently benefit the people concerned. It is most difficult to achieve progress while guerrilla operations, terrorism, and open combat are under way. But, with our help, the South Vietnamese are making significant progress in this complex field, and this experience will prove to be a valuable testing and learning ground for us.

We sometimes find a difficult and annoying aspect of the nation-building process in the political turmoil and in our relations with the people in power. We find that leaders like Diem or Ky or Thieu are subject to foibles, to the pressures of diverse and frequently unstable factions in their country, and sometimes they feel a need to dramatically show some independence of us. These problems with the leaders, as well as political turmoil, often seem to be the unavoidable accompaniment of success in promoting political awareness and of growing internal confidence and security in new nations. We should learn to regard the demonstrations, the turmoil, and even the coups in perspective. We may take some heart in Vietnam from the contrast between the turmoil in the South, which reflects in part political growth and confidence in the future, and the lack of any political activity in the North,

which reflects the stultifying pall of totalitarianism. We, as the external ally of South Vietnam, have had to follow a careful course of persuading but not dictating to the regime, and withal not being dragged into policies and actions contrary to our interests and objectives. In this process we are surely gaining by learning how to suffer through the growing pains of our inexperienced allies and still get effective results in the long term.

As a nation, we have had little firsthand experience to draw on in this complex nation-building process in conditions such as those existing in South Vietnam. Yet we have many skills, techniques, and technologies to help analyze and solve problems. And, in the nation-building aspect of our cause in Vietnam, we are progressively learning how to adapt our talents in helping the Vietnamese to mitigate the ravages of the war and to reconstruct and improve their social and economic life. This new experience should, in significant measure, be translatable to helping other countries in Asia, the Middle East, Africa, and Latin America, where we most surely will be involved to some degree. Hopefully, we can translate this experience into programs and actions that will help other poor nations help themselves in bringing about the changes and progress the people want and need and that will avoid or correct conditions conducive to insurgency.

In many fields and many aspects of military operations, great gains should come from our military involvement in Vietnam. Above all, we shall have learned better than ever before the interaction of the military with the political, social, and economic fields. Also, at the highest level of national strategy and action we have had further lessons in applying our enormous power selectively and effectively. Mankind has obviously not yet progressed to a point where the existence and sometimes the use of military force are not major factors in international affairs; certainly they are a part of our current role in the world. In Vietnam we are learning invaluable lessons which so often can only be learned by experience in the application of military strength.

Vietnam has been a testing ground for our soldiers, sailors, and airmen—testing their leadership, training, adaptability, skill, courage, and determination. Irrespective of the light in which our involvement in Vietnam is regarded, all Americans should be gratified by the superb performance of our men fighting there. Never before have Americans gone into combat so well prepared, proven themselves so adaptable, and acquitted themselves so outstandingly. Yet it is obvious that some doctrine, tactics, procedures, and equipment were found wanting and have been discarded or adapted. Other needs have cropped up and have been met by improvisation or by quick development and procurement of new equipment. From these lessons and changes we should gain greatly in the increased competence and flexibility of our armed forces.

Our military strength and skill, along with our technology, have been applied dramatically, imaginatively, and effectively—especially in the field of air power—to counterbalance the advantages of deception, concealment, surprise, and ruthlessness that operations of fanatically indoctrinated guerrillas have previously had. Thus, we have upset the calculations of foe and friend alike. Instead of fighting on the guerrillas' terms, we are using our skills and technology to swing the balance in our favor without having to use overwhelming numbers of men. This should prove to be a lesson and, ultimately, a major gain politically and psychologically, as well as militarily, around the world.

In many fields we have used our advanced technology in our military operations to overcome the guerrillas in combat, to apply pressure on them and North Vietnam in the political and psychological fields, to enhance the effectiveness of all of our forces, and to minimize the cost in lives of our soldiers, sailors, and airmen. But our greatest military achievement in Vietnam is in the development of tremendous effectiveness of air power in both traditional uses and in new or extended uses to meet both the challenges and opportunities there. Our air power played a crucial role in World War II and in Korea, but the

vast scope of its effectiveness in countering guerrilla operations was neither fully recognized nor explored until we really started applying it in the last few years in Vietnam in imaginative, flexible, effective ways. Beyond the basic courage, skill, and dedication of all our fighting men, our use of the air power of all our military services has proved to be our principal advantage over the guerrillas in Vietnam, as well as the effective means of interdicting the supply sources and applying pressure on the directors of the insurgency in North Vietnam. The tremendous propaganda campaign against our use of air power—particularly the strikes on North Vietnam—is testimony to its effectiveness and importance.

Some people who deplore our extensive use of air power apparently do not deplore the death and destruction caused by guerrilla attacks with mortars, rockets, or Molotov cocktails and their atrocities against civilians and military alike. May we hope that our success in Vietnam will help overcome this discrepancy of values? Should we not be truly grateful that we have developed the equipment, techniques, skills, and trained, dedicated men who can protect us and promote our cause and the cause of those dependent upon us—with such restraint and humaneness as are possible—without having to fight on equal, ill-equipped terms with our foes? If Vietnam helps more people see our military operations in this light, will this too not be a significant gain for us?

DOMESTICALLY in our politics and psychology—in the long term—our perseverance and success in Vietnam also should result in significant gains. At least, success there should represent another major step in our maturing process as the most powerful nation in the world.

Reluctantly, we as a people have risen during the last twenty years to fulfill responsibly our role as a great world power. Until we were dragged into World War II by the Japanese attack on Pearl Harbor, we had lived for nearly a century and a half—except briefly during World War I—under first the reality and later the illusion that we could be safe in isolation behind our ocean moats. Now circumstances and the tide of time and events have projected us into the role of the leading power in the world. As such, we are now basically responsible for our own security and freedom. Furthermore, in the face of the greedy expansionism of a number of nations and in the absence of effectiveness in the United Nations, we must prudently insure—to the limit of our great capabilities—the security and freedom of our allies and most of the neutrals in the world, because erosion of the Free World would ultimately jeopardize our own security and freedom. With much debate and soul searching, we are fulfilling this role which history has thrust upon us. Just as we had to decide with the Marshall Plan, the Truman Doctrine of aid to Greece and Turkey, the Berlin Airlift, the NATO, Korea, and the Cuban missile crisis, we have had to make crucial decisions in regard to Vietnam. In the process, we have again agonized over our role in the world. But, by having risen effectively to the challenges in Vietnam and successfully met them, we shall have gained greater strength and unity.

We should gain also in learning how better to take in stride some of the news media aspects of such conflicts. We should learn to put in proper perspective the reports of small military engagements or an individual monk's exhibitionism, despite their being magnified into seemingly major events by large newspaper headlines and dramatic TV newsreels. A balanced perspective may often be hard to achieve or preserve in face of the daily pounding of sensational stories from the scene, officials' optimistic statements, commentators' doom-and-gloom opinions, and our adversaries' propaganda claims or threats. But part of our necessary maturity as the leading power in the world may be our ability to put the confused situations in which we become involved in proper perspective and withstand the mental buffeting we are subjected to by sight and sound, from friend and foe alike.

Further, we should gain from our Vietnam experience in better governmental organization and effectiveness for dealing with nation-

building problems and in anticipating and taking early action in potential areas of turmoil and conflict. In the past, there seem to have been inadequate coordinated planning and joint action among the Departments of State and Defense, the Central Intelligence Agency, and the other agencies that need to be involved in supporting our nation in anticipating and dealing with trouble spots like Vietnam. Surely we will gain from these lessons learned in Vietnam in attitude and in organizational adjustments for the future trials we may well face.

OUR EXPERIENCE and our success in Vietnam are certainly not coming without heavy cost in resources and in the lives of thousands of our men, with the sorrow and loss to their families and the loss of the further contributions they could have made to our society. As with many trials and achievements in one's personal life or in the life of a nation, Vietnam is taking its toll.

But we might well look at this toll in some perspective. The financial cost of Vietnam will be huge, but it will probably be less than our affluent people will have spent on extra luxuries in the same period. The cost in lives will be tragic, yet in numbers they will be but a small fraction of those killed during the same period on our nation's highways—and these latter are lost to our society without sense, purpose, or significant notice or protest.

So, we ought not only keep the actual costs of Vietnam—heavy though they are—in proper perspective but also measure against them the gains outlined above and the most important prospect of all: that by the success which is stemming from our actions in Vietnam we should help mankind take another major, vital step in the slow, tortuous evolution toward a world of freedom and justice under law—steps which are vital to our future security. The sacrifice of our men and the effort and agony of our nation thus should not be in vain.

We have no reason to gloat, and we have much to be sad about. Yet should we not be proud as a people for the success we will have achieved and what this success should mean to us and to weaker peoples in the world who want to be free to determine their own future?

We are the nation that has gained preeminent political, economic, and military power through our unique political and economic system, combined with the vigor of our people and the natural wealth of our land. We have gained this position at a time in the course of history when the world is in the process of unprecedented challenge, turmoil, and change. Therefore, much of the kind of future mankind will have now hangs in the balance of our successes or failures. Will we continue to deter general nuclear war, and will mankind survive in increasing richness and meaning of life, or will we fail, and mankind—what is left—descend into a long dark age? Will we successfully champion the right of people to self-determination in an interdependent world of freedom and diversity, or will we fail and see the world slip into totalitarian inhumanity? Have we really any sound alternative to continuing to rise effectively to the challenges in the world and to use our great strengths responsibly?

Some of us seem not yet to appreciate the cruciality of our role in the struggles going on in the world—a role that we did not seek, a role in which we are often resented or vilified, but a role which no other nation can fulfill and which we morally and prudently cannot shirk. We have so far met most of the challenges responsibly, even though sometimes barely. Vietnam has been a vital challenge in a long series. Our success in Vietnam should make our future tasks significantly easier and should bring the world somewhat closer to an enduring peace that is meaningful in the values that we share with most of mankind.

Santa Barbara, California

THOUGHTS ON THE LIMITATION OF WAR

LIEUTENANT COLONEL T. C. PINCKNEY

THE limitation of war has been a key concern of U.S. defense policy for many years, and a sizable literature has grown up dealing primarily with the dilemma of how to achieve a national objective in the face of an armed challenge without allowing the conflict to escalate into general nuclear war. The result has been a more or less generally accepted set of types of limitations designed to facilitate control of war.

Within this literature one cannot do better than to use Robert E. Osgood's formulation.[1] He establishes five prerequisites for a policy of limited war: limited, well-defined objectives (not necessarily made explicit to the enemy); willingness to limit the means employed; appropriate military policies, weapons, techniques, and tactics; adequate economic resources; and a resolute national will. Within the construct of these prerequisites he suggests seven categories of possible limitation: geographical area, weapons (types and numbers), targets, manpower, number of belligerents, duration, and intensity. The first three — geography, weaponry, and targets — have received by far the greatest amount of attention.[2] These may be, as Osgood maintains, ". . . the decisive limitations upon military operations that are within the power of the belligerents to control . . . Without these three kinds of limitations it is difficult to imagine a war remaining limited. With them, the other limitations would probably follow, and wars might remain limited even if they did not follow."[3] Another factor in the disproportionate attention devoted to these limitations, however, may be that area, weapons, and targets offer tangible, easily determined distinctions of quality and/or quantity which lend themselves readily to both theoretical discussion and practical application. On the other hand, the results of variations in manpower, number of belligerents, duration, and intensity of conflicts are much less clear. This is not to deny the importance of the first trio —they are and will remain vital considerations;[4] but if we disregard the interactions of other types of limitations, we may fail to achieve our national objectives in a limited war, or, even more serious, the war may escalate beyond control. It is my purpose to discuss manpower, number of belligerents, intensity, and duration, with particular attention to the last.

• Manpower admits of so many possible gradations in both quantity and type, and the intent behind each blurs so indistinctly in the light of political and military dynamics, that manpower becomes a difficult and gross way of conveying one's meaning to the enemy. To be sure, there are significant and easily discernible distinctions between engaging a force of, say, 20,000 men and one of 500,000; but it is most doubtful that a clear message can be successfully conveyed to the opponent by an increase from 500,000 to 525,000 men. Specific circumstances may, however, enable even as unwieldy a tool as mere numbers of men engaged to clarify our intent. A series of increases followed by even a token decrease would certainly catch the enemy's attention. Whether a decrease would be interpreted as indicating a sincere desire to negotiate or a faltering of determination is conjectural. Given the Communist conception of the capitalist mentality and the utility of force, the latter interpretation seems more likely to be the one received, regardless of what we might have wished to convey. The types of troops and, especially, the way they are used are more important than numbers, but the significance of these aspects is so dependent upon the political/military circumstances that no worthwhile theoretical discussion seems possible.

The question remains: Can manpower restrictions effectively contribute to preventing escalation of a war to uncontrolled proportions? The answer seems to be that such restrictions can be helpful, but only in very crude terms. A large nation is not apt to become firmly committed to military victory in the minds of its own citizens if it has only a few thousand troops engaged—assuming an absence of dramatic elements such as a surprise attack or use of "unfair" weapons or tactics by the enemy. Yet the psychological commitment level need not be high; and conversely, in the absence of national commitment, increases in the numbers of men involved may increase pressures for ending the

conflict, not escalating it. Thus the role of mere numbers is hazy. Other things being equal, it is probably true that the more men are engaged, the more likely the war is to expand. Yet it is certainly true that other things are never equal. It is through those other factors that we must seek to control the war, with only secondary aid from the manipulation of manpower.

• The number of belligerents is also ambiguous in its effect on the war. If each belligerent were fully and passionately committed to complete victory, then the swelling chorus of demands for absolute success would work to expand the war; but history belies this picture. Rather, each participant's interests only partially coincide with those of its allies. Therefore, counsels differ, discussion causes delay, and the addition of each partially committed belligerent acts as a brake on hostilities and presents another policy to be reconciled. Were the new belligerent fully committed to military victory, its participation would, of course, act to expand the war. But in the case of Western nations, the effect is normally the reverse, limitation rather than expansion. Therefore, varying the number of belligerents should be based upon diplomatic considerations, including the supposed impact upon limiting or expanding the war.

• Intensity is another potential area of limitation with problematical results. There is a good case to be made that in an area such as Europe the more intensely a limited conventional war may be waged, the more likely each side is to conclude that escalation is inevitable and decide to pre-empt its opponent. But in Europe such a limited war would, presumably, have important characteristics not likely to be present in other areas of the world. A European conflict would probably be a relatively overt, transborder application of regular military units, although major efforts might well be made to camouflage the purpose of the conflict. Any likely European limited war would take place in industrialized, highly integrated territories of immediate and vital significance to both the Soviet Union and the United States. This significance has been sanctified by usage and declamation ever since World War II, and both sides witness their interests by the forward deployment of large and powerful military elements. It seems unlikely, indeed, that a European conventional conflict could occur at any except the smallest levels without directly involving Soviet and U.S. forces. In such a case intensity might prove a vital aspect of limitation.

In other than European areas, none of these characteristics are apt to be present. Borders might well be undemarcated and sparsely populated, or they may divide unsophisticated peoples of common cultural and racial backgrounds, thus facilitating claims of civil insurrection and hindering attempts to clarify events. Though important to both powers, such areas admittedly do not possess the same degree of significance as does Europe, and East-West areas of mutual interest are still being determined, rather than having long-standing sanction. In a few of these areas the United States has significant forces stationed, but the two largest contingents both result from Communist aggression. In none of these areas has the Soviet Union stationed significant forces.[5] Thus with interests less immediate, with lines less definitely drawn, and with little likelihood of a direct U.S./Soviet military confrontation, the intensity with which non-European wars are waged is not a significant factor tending to escalate or limit the conflict. This is borne out in Vietnam, where fluctuations in bombing sorties or numbers of allied and enemy killed in action by factors of 3, 4, or 5 are not considered particularly significant. Such changes may, in combination with other factors, help get a point across to the enemy; but their utility is marginal at best, and their effectiveness in maintaining limitation of the conflict is low.

• Duration is a key consideration in limiting conventional wars, although its impact is much less distinguishable than other factors because it is entirely psychological and not measurable. As a war continues, two contrasting trends become evident: the desire to win at any cost—proescalation; and a willingness to accept defeat in order to end the carnage and expense. Both attitudes are un-

desirable: the first because of the attendant danger of general nuclear war, the second because it sacrifices the national interest being defended.

Militarily a long war is disadvantageous. If we can end a war quickly, presumably we possess a capability to apply force rapidly and massively (massively in relation to the opposition, not in absolute terms). Having such an alternative available, if we allow the war to continue over a more extended period, it is due to self-imposed restrictions on the forces we employ. From the military point of view such restrictions produce numerous disadvantages. The enemy is given time to study, adjust to, and counteract our strategy, tactics, and weapons. Time is allowed for him to deploy new weapon systems or perfect and expand existing ones (witness the formidable North Vietnamese air defenses built up within the last three years), to create different routes of supply (the jungle highways through Laos and sea-fed routes through Cambodia), to train large numbers of peasants to be effective troops, to redistribute his population, to disperse his vital industries, to duplicate and build bypasses to critical communications links, to develop and employ successful propaganda themes. In short, we surrender or seriously compromise the initiative and so make the war much more expensive and difficult to win.

From the political standpoint, a long war is similarly disadvantageous, and for the same basic reason—sacrifice of the initiative. The other side is allowed time: time to rally all the heterogeneous elements which may oppose our participation in the war, time to appeal to domestic opposition, to encourage it to organize, and for it to express itself during elections, time for the tireless repetition on which his propaganda depends to take effect, time to mask aggression behind a façade of liberation, and time to orchestrate his diplomatic offensive. Moreover, the picture we present to the world during a long war lends much more credence to his charges of U.S. militarism than does a short war, even though the total military effort might be comparable. For example, hypothesize two alternatives: in the first we engage two million men for a year; in the second we engage 500,000 men for four years. The number of man-years is the same, but the longer war gives the enemy much more propaganda and diplomatic advantage. During the hostilities news headlines, photos, articles, and radio and television coverage are apt to be at nearly the same high level regardless of whether a half million or two million men are engaged. The longer war enables the enemy to substantiate his image of the United States as a militaristic nation over a longer period of time.

From the humane point of view also (certainly an appropriate criterion for U.S. policy), the short war is more desirable—perhaps we should say less undesirable. Although we have expended the same number of man-years, the enemy is overwhelmed before having had time to mobilize and deploy all the forces of which he is capable. Moreover, a long war permits several new year-groups of boys to mature enough to be drafted, and thus more soldiers become available to the enemy, our task increases, and more total casualties result. In our hypothesis, civilian casualties and destruction would probably be greater during the longer war because of the increased numbers of enemy forces brought to bear. However, even if we assume in both cases the same number of direct combat-related civilian casualties, the cumulative effects of longer hostilities will include the partial destruction of four years' crops (especially significant in the agrarian societies where such wars are apt to occur); will cause the long-term debilitation of the population, thus increasing deaths from disease; will delay the process of reconstruction and rehabilitation; and will contribute to psychological defeat—a feeling of futility throughout the afflicted people, a feeling more fatal to freedom than bullets.

NOW TO RECAPITULATE the effects of the seven areas of possible limitation of war. The geographical area must, at a minimum, exclude the territory of the major nuclear powers and Europe, else the probability of escalation will be unacceptably high. Without this geographi-

cal restriction—that is, in a limited war involving Europe and/or U.S. and Soviet territory—careful control of weapons, targets, intensity, duration, and to a lesser extent manpower becomes essential to prevent escalation to nuclear war. However, outside the critical geographical area, weapons, targets, manpower, and intensity appear to be of much less significance to limitation of war than they are generally assumed to be. Increasing the number of belligerents may actually help limit the war by introducing conflicting interests into the council chamber. Finally, in noncore areas, brevity closely follows geographical limitation in importance as a means of preventing escalation. Therefore, shortening the war should be given pre-eminence in national consideration over the secondary elements of weapons, targets, manpower, and intensity.

480th Tactical Fighter Squadron

Notes

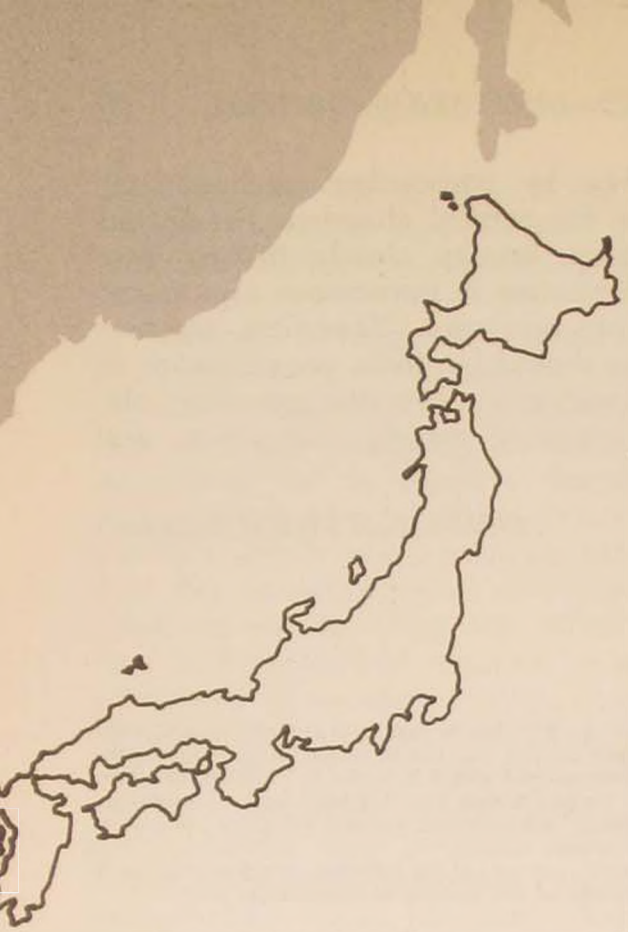
1. Robert E. Osgood, *Limited War: The Challenge to American Strategy* (Chicago: University of Chicago Press, 1957), pp. 234–84.

2. It is true that intensity, number of belligerents, and duration have been discussed at length, but within the context of a nuclear war, usually a U.S.–Soviet nuclear war.

3. Osgood, p. 243.

4. I would qualify this in regard to targets. In my judgment, in a limited nuclear war targets are a primary consideration; but in a conventional war, à la Korea or Vietnam, too great a sensitivity to targets within the "agreed" area of hostilities will reduce military effectiveness without adequate returns in the nonmilitary sphere.

5. We may be witnessing the initiation of a Soviet forward policy in the growth of the Russian Mediterranean fleet.



JAPAN'S SEARCH FOR SECURITY

WILLIAM J. SEBALD

BEFORE attempting to assess Japan and its position in the world today, it would be advantageous to review briefly some of the highlights in Japan's history since it emerged in the middle of the nineteenth century from a long period of self-imposed seclusion.

More than a hundred years ago, on March 24, 1860, Lord Ii Kamon-no-Kami, who was what today would be the Prime Minister of Japan and the then Regent of the twelve-year-old Shogun, was about to cross the bridge over the moat surrounding the Shogun's palace in Edo, as Tokyo was then called. Carried in a palanquin, he was surrounded by his officers and guards. On the bridge were a number of idlers, wearing oil-paper cloaks as protection against the snow and rain. Suddenly one of these men flung himself across the line of march of Lord Ii's group, causing the escort to rush at the intruder. The escort in turn was attacked by some eighteen armed men, who seemed to spring from nowhere. When the melee ended, the survivors looked to their Lord in the palanquin. There they found the headless trunk of their master.

It was this Lord Ii who had signed the first formal commercial treaty with the United States in 1858, following the advent of Commodore Matthew Calbraith Perry and the Treaty of Kanagawa some four years earlier, whereby Japan was opened to trade and the foreigner. Moreover, Lord Ii had dealt strongly with opponents of these treaties among the palace party in Kyoto, where the Emperor resided, as well as with similar elements in other parts of Japan that were demanding the expulsion of the foreign barbarians as a threat to Japan's security. He was, therefore, a marked man.

The fifteen years following Commodore Perry's arrival in 1853 saw much unrest, discontent, and struggle throughout Japan. Harassment of foreigners in Japan was one method of embarrassing the Shogunate, and many foreigners were attacked and a number killed,

especially by unemployed samurai known as *ronin*. These attacks resulted in reprisal bombardments by British, French, Dutch, and American warships. Finally the Shogunate, for centuries the real government of Japan, toppled, and in early 1868 the whole country submitted to the Emperor.

Not until 1877 did it become illegal for samurai to carry swords. In the words of a contemporary observer, "The curio shops displayed heaps of swords which a few months before the owners would less willingly have parted with than life itself."

In 1910, fifty years after the death of Lord Ii, a ceremony under very distinguished patronage was held in Tokyo at the Yasukuni Shrine, to honor the spirits of the men who had assassinated Lord Ii. This was in keeping with the sacred purpose of the shrine, to honor those who died in the cause of their Emperor, whether in the war with China (1894–95) or the Russo-Japanese War (1904–05) or, later, in World War I, in the incursions into China and Manchuria during the 1920s and 1930s, or in the Pacific war of 1941 to 1945.

I mention these events as a backdrop for Japan's modernization and Westernization and some of the consequences flowing therefrom, with which I shall deal. This year 1968 marks the centennial of the restoration of the Emperor polity in the person of the Emperor Meiji, ending nearly 700 years of power exercised by successive Shoguns. It is a century which witnessed the rise of Japan to the status of a great power, its fall to the depths of total defeat, and its subsequent renascence to new heights of prosperity, responsibility, and self-reliance. Its people have a background different from ours; they are a proud, sensitive, and highly disciplined people with a long history and indigenous culture that must be studied and understood if their contemporary conduct is to be explicable and if we are to appreciate the strengths and weaknesses of this our most important ally in the western Pacific.

In 1868 Japan was a feudal state, seemingly unprepared to take its place within the comity of nations. But the new leaders who displaced the Shogunate were men of great prescience and courage who had the foresight to begin at the beginning and do what had to be done over the years to recast Japan and its people into the mold of a modern state.

The Emperor became the symbol of Japan's unity. It was in his name that reforms were undertaken. Western experts and teachers were brought to Japan in great numbers, and Japanese were sent abroad to acquaint themselves with Western ways and the mechanics of Western civilization, for adaptation to Japan's needs. There was also the recognition that only by being strong in a military sense could Japan survive the predatory policies of Western powers so evident at that time in Asia, particularly in China. To this end and to insure Japan's security, a modern army and navy were established, based upon conscription and taught by German, French, and British officers and instructors.

In its newly found integrity as a state—well governed, stable, and economically capable of supporting its military forces—Japan was not long in taking advantage of favorable opportunities to annex neighboring territories that could pose serious threats to Japan if occupied by foreign powers. Thus, in 1875 a treaty with Russia resulted in the Kurile Islands becoming Japanese territory, and in the following year the Bonin Islands were annexed. In 1879 Japan formally annexed the Ryukyu Islands, despite China's protests of prior claim. Formosa and Korea were gained through long diplomatic and political processes, sealed by the Sino-Japanese War and the Russo-Japanese War, respectively. These wars also resulted in Japan's preferred positions in China and Manchuria and in the

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cession of southern Sakhalin Island to Japan. The German Pacific islands north of the Equator were given to Japan under a League of Nations mandate as a result of World War I.

Manchuria, North China, Inner Mongolia, and vast portions of China proper were progressively occupied by Japanese military forces, beginning with the seizure of Manchuria by the Kwantung army in 1931.

Japan's entry into World War II in the Pacific began with a succession of victories. Her power reached its zenith when she conquered all of East Asia, from the borders of Siberia to those of India, and Japanese forces roamed at will over vast stretches of the western Pacific and the Indian Ocean.

Yet, with the growing power and determination of the United States, eventual defeat of Japan was inevitable. Japan accepted the terms of the Potsdam Declaration, which had been announced on July 26, 1945, and for all practical purposes its surrender was unconditional, the only alternative being "prompt and utter destruction."

For a Japan which had prided itself in the knowledge that throughout its long history it had never known defeat, this finale was the ultimate in bitterness and humiliation. But it was not a total or permanent eclipse, as I have noted previously:

> Although Japan was ultimately to suffer crushing defeat, the brilliant exploits of its arms in 1942 have left a lingering legacy of pride, self-respect, and gratification. It would be unrealistic to assume that the final victory of the Allies over Japan extinguished national recognition of the achievements of its fighting men . . .
>
> It is not surprising, therefore, that those who fell in battle are enshrined in Yasukuni Shrine, the national pantheon in Tokyo. While Japanese pacifists and iconoclastic leftists may hold such traditions in contempt today, deep in the national psyche is a continuing veneration of valor and loyalty. . . .[1]

On balance, the Occupation of Japan under General of the Army Douglas MacArthur, later under General Matthew B. Ridgway, was benevolent, constructive, and humane. Its success, however, was in large degree the consequence of the Japanese people's adaptability, discipline, and sense of responsibility in the difficult situation of a defeated people. Some of the policies carried out by the occupation forces were harsh. Of these, the most far-reaching was the provision of the Potsdam Declaration that Japanese sovereignty was to be limited to the four main islands of Japan and such minor islands as would be determined by the Allies, later given effect by the San Francisco peace treaty. The United States occupied the Ryukyu Islands, though Japan's residual sovereignty over them was recognized. Territorially, with the recent return of the Bonin and Volcano island groups, this is the Japan of today.

Early in the Occupation, Japan was completely disarmed and demilitarized, and once again, as in 1877, "the curio shops displayed heaps of swords," which had been prized possessions of their owners but the possession of which had become illegal.

Democracy was not unknown in Japan prior to World War II—a constitution had been adopted in 1889. It was a friendly, democratic Japan in which I lived when I first came to that country as a naval language officer in 1925. But this democratic interlude lasted only until the early thirties, when extreme rightists and the military managed between them to strangle the political parties and established a single national party, which was nothing more than a rubber stamp for the Japanese General Staff.

The Occupation therefore launched a vast democratization program, which included widespread purges from office of many thousands from the upper levels and leadership of Japanese society. Ironically, Communists who had been imprisoned by the Japanese were released and allowed to form their own political party, the Japan Communist Party, under the leadership of Moscow-trained Communists. This was one of the consequences of the hasty implantation of American democracy in an Oriental country that was to cause untold troubles for the future.

One important adjunct of the democratiza-

tion program was the promulgation of a new constitution along Western lines, initially formulated in the General Headquarters, Allied Powers. It came into force on May 3, 1947, after having been publicized, discussed, and passed by the Diet. Article 9 of the new constitution renounced war "as a sovereign right of the nation and the threat or use of force as a means of settling international disputes." It also denied Japan the right to maintain land, sea, and air forces as well as other war potential. This was an important departure in the constitutional process, and I will refer to it again. However, despite this self-denying article, no provision was made for Japan's security, and seemingly it was assumed by the General Headquarters and Washington as well that the question of security for Japan was moot and would not arise.

But an undertaking of such magnitude and political potential as the Occupation of Japan could not be carried on in isolation and without response to the impact of world events. This was the period of the cold war, which also impinged in full force upon Japan and the Japanese people. General MacArthur, while technically inhibited by the Allied trappings of the occupation terms of reference, was able to exercise sufficient flexibility to change the thrust of policy from that of a conqueror towards a defeated enemy to a paternalistic approach towards a valued ally of the United States. The realities of the Korean War, which began in June 1950, with its need for a firm base from which United Nations forces could operate and obtain needed support, greatly assisted in crystallizing this significant change of direction in American policy.

Another important consequence of the outbreak of the Korean War and removal of occupation forces from Japan was the formation, under General MacArthur's instructions, of a so-called police reserve to deal with possible serious internal subversion or other difficulties. The formation of this reserve was the first step in an effort to remedy the previous failure to provide for Japan's security. It later became the Japan Self-Defense Force, now comprising a Ground Self-Defense Force of about 160,000 men; an Air Self-Defense Force of about 1200 planes; and a Maritime Self-Defense Force of some 500 vessels, aggregating about 150,000 tons. These forces were developed despite the provisions of Article 9 of the constitution, on the theory that self-defense, recognized in 1959 by the Supreme Court of Japan, is a fundamental right of the state and that the constitutional prohibition should not be interpreted as conflicting with that right.

Among the Japanese people there is considerable discussion concerning Article 9. One view asserts that world events have overtaken the great principle espoused in that article, which should therefore be amended to allow rearmament. The opposite view maintains that the self-defense forces are illegal and that Article 9 should be construed literally and the forces abolished.

It is argued by those favoring rearmament that Japan should not be caught unarmed in the event that the Vietnam war should be further escalated. The nuclear explosions in Communist China and continuing progress in the nuclear field by that country also give serious concern to the Japanese government and people, causing some elements to opt for nuclear armaments in keeping with Japan's capabilities. Others insist that Japan's prosperity, in contrast with the increased burdens and presence of the United States in Asia, is a good reason why Japan should at this time carry a greater share of responsibility in maintaining Asia's security.

Under present conditions in Japan, however, as I shall point out later, it seems clear that any use of Japanese forces—assuming that they might at some future time be used in support of Japan's foreign policy, either alone or in combination with others—must have the support of the "home front," to which General Maxwell Taylor so cogently referred in his lecture given here last February. No Japanese government, either now or in the foreseeable future, would dare commit Japanese forces for use abroad without firm support of the people.

TO THE SURPRISE of the world, and perhaps even to the Japanese themselves, it was

a new Japan that emerged from the Occupation when the peace treaty became effective on April 28, 1952. Japan was remembered as an aggressive and warlike country, given to a philosophy that envisaged world leadership through integrated national mobilization, superb development in the arts of war, and the strength of the Japanese spirit. But with the advent of peace following upon a disastrous war and a lengthy occupation, Japan seemed to have all the attributes of a democratic country, given to the peaceful expansion of its economy, to which it was devoting its strength and attention. Its pacifism and opposition to war were attested to by the prohibition of war and armaments written into its constitution, as I have noted.

The new posture of Japan, however, was not entirely appreciated or understood elsewhere, particularly among the east Asian and western Pacific countries that had felt the sting of Japanese military action and occupation. It therefore became an important objective of successive postwar Japanese governments to overcome the bitterness and skepticism that remained in these countries and to establish friendly relations by demonstrating Japan's acceptability as a helpful, peaceful, and democratic nation. In these efforts they were highly successful.

Paradoxically, the security treaty between Japan and the United States, signed at San Francisco on September 8, 1951, raised some doubts in Asian countries as to Japan's peaceful intentions. And in Japan, as we shall see, the Opposition maintains that the security treaty violates the spirit if not the letter of the constitution. The treaty, however, corrected the oversight regarding Japan's security, and it made Japan a partner of the United States, which shared with it the ultimate security of nuclear power. At the request of the Japanese a revised treaty was negotiated and ratified by the Diet in 1960, despite serious riots and massive demonstrations sponsored by opposition Communists and left-wing Socialists. Under the revised treaty, a one-year notice of termination may be given by either party when the treaty has been in force for ten years. The year 1970 will therefore be a highly important year insofar as United States–Japan relations are concerned.

There is also the difficult problem of the return of Okinawa by the United States to Japanese administration. Both governments have taken a number of steps to minimize the impact of this situation, but the United States apparently has been unable to go beyond its position of maintaining that it is impractical under present conditions in the Far East to turn over administrative control of the island to Japan. And even though many Japanese understand that the American occupation of Okinawa contributes to their own security, the question is one on which all political parties are unanimous in desiring a speedy return of the island to Japan.

The problem is complex, and feelings are exacerbated by political and emotional considerations both in Japan and among the Okinawans. As one who in the past has struggled with this problem, it is my view that the difficulties are not insoluble and the wit of man should be able to devise a satisfactory and workable arrangement without too much delay. Certainly there is danger of serious friction arising unless this issue is solved.

Close to home, Soviet Russia presents a difficult security problem for Japan. Aside from the Free World–Communist World relationship, the issue of territorial adjustment arising out of Soviet Russia's occupation of several adjacent islands, which Japan claims are *not* part of the Kurile chain, has made the normalization of relations between the two countries difficult. This situation continues despite the resumption of diplomatic relations between Japan and the U.S.S.R. in 1956.

The question of China has serious and continuing domestic overtones in Japan. Although Japan is clearly aligned with the West, in part out of deference to the United States' desires it chose the Republic of China on Taiwan as the China with which to establish formal diplomatic relations in 1952. Yet it was soon felt in Japan that the problem of China was outside the framework of Japan's foreign policy position with the West and could therefore be treated as an exception. In due course and as an ad hoc measure, private trade

relations, separated from politics, were established with mainland China. This worked well for a time, aided by Communist China's wooing of the Japanese people while simultaneously lambasting the Japanese government's policies. But notwithstanding a growing trade relationship, China's intransigence, its nuclear tests, unfriendly posture, and the shock waves of the Great Cultural Revolution have raised the question in Japan whether, perhaps, the *real* security threat does not in fact arise from this gigantic and seemingly irresponsible neighbor.

Despite these considerations, it does not make much sense to many Japanese to consider the exiled Chinese government on the former Japanese colony of Taiwan as the government of China. This arises out of a number of factors. Mainland China has for centuries had great fascination for the Japanese people, and Chinese culture is deeply embedded in Japan. The pull of China upon the Japanese persists—a relationship always "characterized by a strange mixture of affinity and antagonism."[2] Their long and close association with China, in peace and war, has convinced them that they, more than any other people, can be the bridge between China and the West.

On the other hand, the United States, with which Japan is allied by its only security treaty, has little meaningful contact with Communist China. This, together with the dangerous situations brought on by the Korean and Vietnamese wars, has placed the Japanese government in a position of being pressured by its own people to establish closer relations with mainland China, while at the same time desiring to coordinate its policies with those of the United States. The Japanese government, however, has somehow managed to follow a sensible China policy, and its dilemma is also tempered by close trading relations with Taiwan, with which Japan's favorable trade balance amounted to almost $200 million in 1967.

THE PHENOMENAL rise of Japan's economy since 1952 has rightly been called the "economic miracle" of Asia. At the end of World War II, Japan's economy had collapsed, and, as General MacArthur once told me, output at the time of the surrender was approaching zero. All principal cities (except Kyoto) had been burned out by our B-29 raids; the people were on the verge of starvation; raw materials, including oil and gasoline, were almost nonexistent. Six million Japanese were repatriated from overseas, and the millions of men who were hastily demobilized from the armed forces within a matter of months added to the confusion. Japan was stripped of all overseas territory and assets. Total defeat had brought the economy to a standstill.

From this chaotic state of affairs in late 1945, Japan has now become the second economic power in the Free World, with a gross national product of $115 billion in 1967, a figure expected to increase considerably in 1968. This rapid progress is a continuation of the advances made during the past century and has its roots in the feudal Tokugawa period. The miracle is also the result of many other factors, among which I would suggest: native industry and frugality; the peculiarly Japanese paternalism that exists between employer and employee; the wise and effective guidance of business by governmental agencies concerned with trade, commerce, and industry; a restructuring of the economy by the formation of larger units on an industry-wide basis, to eliminate the wasteful processes of intense competition; and finally, freedom from the need to incur the heavy defense expenditures with which other major powers, particularly the United States, have been saddled. In this connection, Japan chose butter without the guns. Much-needed capital thus became available for economic growth and social security programs that resulted in the creation of a huge and expanding domestic market in consequence of higher living standards and rising expectations on the part of the Japanese people.

Less obvious contributions to the miracle were such important factors as the land reform program enacted by the Supreme Commander, Allied Powers (SCAP); free access to raw materials in world markets; the rebuilding of war-destroyed factories and the rise of

spanking new plants of the latest design; improvement of internal communications—roads, railroads, airfields, and telephones; the establishment, with considerable selectivity, of joint undertakings with foreign companies bringing technological knowledge and processes; and the accumulation of capital through domestic savings (18.5 percent in 1966) and availability of needed funds in world money markets.

A very few illustrations in concrete terms will assist in demonstrating what an economic giant Japan has become and how it now stands out among the countries of Asia.

• In 1967 the total value of Japan's foreign trade (imports and exports) amounted to more than $22 billion; and Japan's growth rate prospect for 1968 is forecast as 12.1 percent in nominal terms and 7.6 percent in real terms, one of the highest in the world.

• Japan is second in the world in steel production, despite its need to import 91 percent of its iron ore over an average per-ton transportation distance of 5800 miles, the longest of any major steel-producing country.

• In shipbuilding, Japan builds nearly half of the world's tonnage, or fifteen times the volume produced by American shipbuilders. It ranks first in the world and in 1967 launched 7½ million tons of ships.

• Japan is second in the manufacture of automobiles. In 1967 it turned out 3.1 million cars and trucks, of which 359,000 vehicles were exported.

• The Japanese chemical industry is making giant strides, having increased its output 2.8 times between 1960 and 1967.

• More than 20 million TV sets are registered in Japan; in TV set ownership it now ranks second after the United States by a wide margin.

But enough of these statistics. I might sum up by noting that the production and export of high-quality goods have changed the image of Japan from the purveyor of shoddy merchandise before the war to the guarantee of quality which the label "Made in Japan" now connotes.

Japan's trade patterns have changed considerably during the past twenty years. In 1967 the United States accounted for almost one-third of Japan's total foreign trade (27.5 percent of imports, 28.8 percent of exports).

A new departure is Japan's rapidly increasing trade with Australia, which bids fair to become highly significant, especially in much-needed imports. As an example, it is estimated that by 1971 almost 40 percent of all iron ore used in Japan will be imported from Australia as a result of long-term contracts involving several billion dollars.

In comparison with these figures, in 1967 imports from *all* Communist countries, including the Chinese mainland, amounted to only 7.6 percent of total imports into Japan, and exports to these countries aggregated only 5.1 percent of total exports (including Cuba in both categories).

In keeping with the enormous progress of her economy, Japan is among the most advanced nations in the peaceful uses of atomic energy. Moreover, the Japanese have for many years been experimenting on a sophisticated scale in the use of long-range rockets. Hence Japan has the economic capability of converting to atomic weapons should the security situation be such as to warrant the huge costs involved.

One final word regarding Japan's economy. Questions arise as to whether Japan will be able to maintain its fantastic growth rate. Some economists, including Japanese, think not and estimate that the average postwar rate of 10 percent growth will be reduced to about 6 percent by 1971 because of four fundamental factors which I will merely mention in passing: a gradually decreasing labor supply, accompanied by rising labor costs and greater unionization; a reduction in domestic savings; a growing technological gap in contrast with the West; and balance-of-payments difficulties.[3]

LET US now consider some of the facets of the American-Japanese relationship and the interaction upon Japan's security which the alliance seems to bring forth.

Aside from Japan's dependence upon the United States for its security under our nuclear umbrella, there is a considerable linkage to the United States in the financial field. Thus, from 1950 through March 1967, 64 percent of all foreign capital inducted into Japan, including loans, was American, amounting to about $2 billion. Seventy percent of all foreign money paid for the acquisition of Japanese stock in connection with management participation was American. And of all technical assistance agreements concluded during this period, 60 percent were with American partners.

Of the 500 largest American corporations, some 120 are already operating in Japan, and the weight of American capital is considerable. Moreover, as we have seen, one-third of all Japanese trade is dependent upon the United States. Of the remainder, roughly one-third is with Asia and one-third with the rest of the world.

To many Japanese, this apparent overwhelming dependence upon the United States —the Americanization of Japan—is a disquieting state of affairs. They feel that, as a minimum, greater efforts must be made further to diversify Japan's trade and thus, in this sector, make the economy less dependent upon what might happen in or to the United States. The argument runs to the effect that the American economic tail wags the Japanese political dog; that only by diversification of trade into other areas—such as Europe with its 300 million people, mainland China with 700 million, and Soviet Siberia with its need for development—can some measure of political independence from, and equality with, the United States be achieved.

This uneasiness about American predominance in Japanese affairs is given voice principally by the Opposition, mainly the Japan Socialist Party, which has consistently over the years opposed alignment with the United States through the security treaty, American bases in Japan, rearmament, and any amendment of the constitution that would make rearmament possible. But even the foreign policy of Japan gives some indication of efforts to obtain greater flexibility through closer relationships with countries other than the United States. Thus, Japan has become an influential member of the nine-nation Asian and Pacific Council (ASPAC), which now seems to be developing after an uncertain beginning. There have also been various soundings and initiatives looking to the formation of organizations concerned with the area, with Southeast Asia, and with regional projects of a technical nature.

There are other influences and forces that cannot be ignored by any Japanese government that aims to strengthen, or even simply to maintain, security ties with the United States or, as an alternative, to increase Japan's military strength and thus lessen the dependence upon the United States for security.

One of these forces is pacifism. In Japan today a surprisingly broad sector of the population totally rejects everything military. This pacifism largely derives from the Japanese people's experience during World War II, when they were utterly helpless during air bombardments by fire bombs, and the fact that only Japan has ever been on the receiving end of atomic bombs. A Japanese writer summed up this type of pacifism by saying: "Indeed, one of the most conspicuous characteristics of postwar Japanese life and thought is the virtual nonexistence of military considerations."[4]

Second, an important irritant and nuisance factor is the student unrest, usually led by the Zengakuren, a highly disciplined, leftist-controlled student organization. The Zengakuren can be counted on to bring out thousands of students for riots and demonstrations against the Japanese government and the United States. These *demos,* as they are called in Japan, are often aided and abetted by nonstudent left-wingers and Communists. They are, to say the least, unsettling, and their effect upon public opinion should not be minimized.

A third element, somewhat more subjective and elusive, is the emphasis which many Japanese now place upon the need to better their own personal security and situation. This is in contrast to the prewar group discipline that resulted in the support of the policies of

aggression, aggrandizement, and force adopted by the military leaders as the proper precepts of Japanese nationalism. Perhaps this new attitude is best illustrated by the themes adopted for EXPO '70 to be held in Osaka in 1970, the first world exposition to be held in Asia. The principal theme is

Progress and Harmony for Mankind

and the four subthemes are

Toward Fuller Enjoyment of Life
Toward More Bountiful Fruits from Nature
Toward Fuller Engineering of our Living Environment
Toward Better Understanding of Each Other.

In the Spartan atmosphere of Japan prior to World War II such themes would have been unthinkable.

Finally, with the steady rise in industrialism, there has been a rapid shift of population from farms and villages to the great cities. These trends—industrialization and urbanization—have brought the curse of industrial pollution of air and water, critical overcrowding of cities, vast traffic problems, and gross housing shortages. The problems in Japan's cities are in many respects worse than ours, with inadequate sewerage facilities, water, public transportation, hospitals, schools, and, above all else, space. Moreover there is the problem of security for the aged, for no longer in many instances can the family live as a unit as it had in Japan for centuries.

The disparateness of Japanese thought on security problems, the polarized divisions that have developed between successive conservative governments and the Socialist and left-wing opposition, the enormous power of the politically oriented labor unions, the problems of the cities, and the not entirely new tactic of taking to the streets to indicate opposition, all tend to complicate governmental difficulties —political, economic, social, and military—and thus affect attitudes and capabilities towards the problem of national security.

The exercise of the option to continue the close political alignment with the United States, based upon the present or perhaps a revised security treaty, could well give rise to great difficulties. The paradox of the present arrangement—the partnership of two nations, one of which has overwhelming nuclear power, the other having nuclear capability through economic strength but no power—arises in part out of Article 9 of the constitution and certainly some of the other factors that I have mentioned. In any event, the amendment of Article 9 would be well-nigh impossible under present circumstances. And the "big brother" relationship which has resulted is in itself a psychological handicap that has already taken some toll in goodwill and understanding.

Regardless of whether the security treaty is continued, revised, or abrogated, it seems to me that it is patently in the interests of both countries to maintain the economic interdependence that has developed during the past two decades. But in our own country, there are growing protectionist and isolationist tendencies which have arisen out of the enormous amount of highly competitive imports from exporting countries, such as Japan, and out of our Vietnam experience that suggest a need for reappraisal of our own security requirements. In my view, protectionism and isolationism would both be inimical to the best interests of the United States and could seriously undermine our friendly and, on the whole, satisfactory relations with Japan.

Also on our part there has been a certain amount of taking Japan for granted, despite great differences between us in outlook, responsibilities, geographical considerations, history, culture, and national aspirations. As the world's greatest power, we are on occasion somewhat prone to consider our own policies and actions as sacrosanct. A case in point, already touched upon, and concerning which I am fully aware of the depth of conviction and feeling with which it is held, is our policy towards Communist China. Large segments of opinion in Japan consider this unrealistic, despite the many provocations that may be laid at China's door. And no single problem gives so many Japanese in all walks of life so much concern as the possibility that Japan, as an ally of the United States, might somehow be drawn into a war with mainland China.

Having said all this, it should be evident that the security needs of Japan go much beyond the political and military aspects of the security treaty with the United States. These needs additionally involve the security problems of the economic sphere so basic to Japan's efforts to support its population with ever rising living standards and expectations and the security of a well-maintained and preserved environment. Some of these hopes and aspirations, as we have seen, are pithily expressed in the EXPO '70 themes about fuller enjoyment of life, more bountiful fruits of nature, and fuller engineering of living environment.

All this should, I suggest, be considered a part of the security picture of Japan—a synchronization of the political, military, economic, social, and environmental aspects of atomic-age security of mass populations, with their pressures of improving living standards, urbanization, and the host of new economic, societal, and environmental requirements. But in this context, Japan must face the dilemma of its military security problem: Can Japan develop and preserve a great new society and yet remain virtually defenseless—more defenseless should it cut its security tie with the United States?

No doubt there are many Japanese who will contend that this can and should be done and that the security relationship with the United States (or an independent rearmed Japan as an alternative) in fact makes the achievement of these goals impossible. I think that the reasoning of these Japanese is wrong and is based upon a false premise. The problem, however, is somewhat similar to our dilemma in choosing between the divisive issues of our own security requirements as exemplified by our commitments in Vietnam, Korea, and elsewhere, and the domestic needs of the Great Society with its overtones of racial difficulties.

I hope that I have not given the impression that all is not well in our relations with Japan. The strong showing made by the Liberal-Democratic Party in the July elections for the House of Councillors, and the declining popularity of the Japan Socialist Party, seem to indicate that Prime Minister Eisaku Sato's policies continue to have the backing of the majority of the electorate. Moreover, we may take heart in the similarity of outlook of Japan and our own country. What we both want, in the words of Secretary of State Dean Rusk at Kyoto in 1966, is "freedom, security, and peace." I venture the thought that there are no problems or irritations between the two countries, serious though they may or could be, which would not be susceptible of solution through the give and take of the normal channels of diplomacy. There is, fortunately, a broad range of interchange between us. And in consequence, in my view, the increasing ferment of cultural, educational, technical, and informational exchange which is constantly taking place between Americans on all levels and their Japanese counterparts bodes well for the future.

Naples, Florida

Notes

1. William J. Sebald and C. Nelson Spinks, *Japan: Prospects, Options, and Opportunities* (Washington: American Enterprise Institute for Public Policy Research, 1967), p. 13.
2. Noriyuki Tokuda in *Journal of Social and Political Ideas in Japan*, Tokyo, Vol. IV, No. 3, 1966, Introduction, p. 6.
3. Dick Wilson, "Fat, But Fighting Fit," *Far Eastern Economic Review*, Vol. LXI, No. 29, July 18, 1968, p. 151.
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THE THEOLOGY OF COMMUNISM

DR. MARTIN H. SCHARLEMANN
CHAPLAIN (BRIGADIER GENERAL), AFRES

IN 1964 the Chicago University Press published a volume of essays entitled, *What Can a Man Do?* The chapters of this book were written by one of our most distinguished Jewish journalists, Milton Mayer. One of his essays goes under the title, "Christ Under Communism."[1] It concludes with the observation that there are, at this time, only two serious contenders for the hearts and minds of men, namely, the Church and Communism.

At the moment, as the author points out, the Marxist movement looks strong and victorious, while the Church appears to be in retreat. Yet the Church has known right along that this contest would be long and bruising. She has entered the arena, therefore, prepared to endure. Communism has only recently discovered that this struggle is not an easy one. In the meantime, both address themselves to man's capacity for basic loyalties. Both work with an interpretation of reality which proposes to deal with the ultimate issues in depth.

That is to say, both have a theology, as Nikolai Berdyaev was quick to point out when he went into exile from Russia almost fifty years ago.[2]

It is a paradox, of course, to describe Communism in terms of theology. After all, do not its prophets insist that "religion is the opiate of the people"? Yet Communism itself may be spoken of as a religion. It certainly insists on dealing with men at the same level. Hence the World Council of Churches, in its Evanston Assembly of 1954, took special note of the structural correspondence between Christianity and the Marxist system of thought.[3]

We shall most certainly not understand the full dimensions of the worldwide conflict in which we are engaged if we do not reckon with those aspects of Communism which reveal it to be a product of that dark despair which overtakes men when they abandon the substance of the Christian faith but want to preserve its forms. Communism is nothing less than a theological caricature. It is a child of the Church, in the sense that it is a product of the Christian West and not of the thought of the East.

Karl Marx and Friedrich Engels both worked in the West. The system of thought they put together could not have been created had there not been a Christian tradition from which they could and did borrow some major features

of their ideology. Bishop Fulton Sheen, therefore, has properly entitled his work on Marxism, *Communism and the Conscience of the West.*[4]

Marxist theory is a caricature of Christian doctrine, rationalized and secularized by men who grew up within the Church and who at times insisted they were speaking for the Church. Communism is religion turned inside out, so to speak. The theology it contains we can discuss under five general headings: its doctrine of God, its view of sin, its belief in salvation, its teaching on man, and its concept of last things. We shall try to spell out each of these elements as we go along.

Its Doctrine of God

We must always keep in mind that Communism has a doctrine of God despite the fact that it is officially atheistic. If what we put our trust in is our god—and that is a good working definition—then the god of Communism is history itself. The followers of Marx think of the historical process as a cosmic endocrine gland that secretes its own solutions as it goes along. This god is good, Marx held, since history is moving toward a noble end; namely, the creation of a classless utopia and a stateless society. The Communist is sure that he has a road map into an open future, and so he is basically optimistic. He is convinced that he is riding the wave of the future.

On the basis of this conviction he will go to an emerging nation and try to persuade its leaders that he has the key to history and that he can show people who are caught in the revolution of rising expectations how to do a shortcut past the evils of capitalism. Pointing to Russia as exhibit "A" for this kind of revolution, he offers to show backward peoples how to move directly from feudalism into socialism as the last step before full Communism.

We must observe at this point that Communists think of the historical process as moving along a line. This is a concept of history which Karl Marx borrowed from the Scriptures. In the ancient world it was the prophets of the Old Testament who alone among the religious exponents of that time rejected the notion that history moved in a circle. Israel's prophets spoke of a God who had given certain promises at one time in history, which He would fulfill at some time in the future. They proclaimed a God, therefore, who had given His people both "a future and a hope." (Jeremiah 29:11, RSV) Communism has taken over this view of what is going on in the world, thoroughly secularizing the concept in the process of adapting it to the needs of revolutionary activity.

The prophets of old spoke of history as having a goal, the establishment of the kingdom of God. In much the same way, Communism speaks of man's future in terms of a classless society. To be sure, it denies the existence of God as the Lord of history, displacing God with its own autonomous notion of history as that process by which men will be redeemed as they are carried forward toward the Communist order of things. The degree to which such a view of history serves as a compelling idol may be gauged from the title of a book written by André Gide and a number of other disillusioned Marxists. It is entitled *The God That Failed.*[5]

Its View of Sin

Communism also has a view of sin. The disciple of Marx knows that there is something wrong with the human situation. He does not, however, think of this contradiction between what is and what ought to be in the same way that Christians do. Yet he has caught something of the idea.

He is convinced that the difficulties which beset mankind have their source in that moment of history when someone invented the instruments of production, which enabled him to exploit others. This is what is wrong with society, says the Communist. Evil is not within the human heart; it is to be found in economic maldistribution. The invention of the means of industrial production drove men from their primordial paradise. These means of production made possible the accumulation of private property, enabling some men to become

wealthy and reducing others to slavery. It is this development which created the destructive struggle of classes within society; and the presence of this contest is the most rampant evil in man's existence.

At this point we must remind ourselves that the Communist applies to all of life a law from the laboratory known as the principle of conflict and tension. Everywhere there is conflict and tension. Electricity operates in units of opposites. A positive proton is always balanced by a negative electron. These two are held in tension within a single unit of reality.

Marxist ideology works on the assumption that there is nothing in the universe except matter in movement.[6] Hence it is not only permissible but necessary to take this law from the laboratory and apply it to man and to society. Reality comes in units of opposites; and the Communist is happy to help this process along. He causes difficulties and stirs up trouble as an act of faith and not just for the sake of harassment.

This is one reason why it is very difficult for a man from the West and another from the East ever to have a meeting of minds. Each thinks of reality in quite different terms. We in the West believe that the world was created as a place for order and harmony, and we are quite willing to work at this kind of design under a national policy devoted to security, stability, and development. The Communist, however, enjoys conflict, because he believes that tension is the motor of the historical process. In all these tensions, though, we must keep in mind that, to him, there is one artificial conflict, and that is the class struggle. This conflict, the Communist holds, must be eliminated; it is destructive. "All past history is the history of class struggles," says the *Communist Manifesto*.[7] The goal of history will be achieved when this class struggle has been eradicated.

Its Concept of Salvation

If men are to be saved, therefore, something must be done about the class struggle, so as to eradicate evil from the social order. Here we touch on the Communist teaching as it relates to salvation.

The Communist has something of the same kind of passion for social justice that is found among the prophets in ancient Israel. He is concerned with the redemption of mankind and often thinks of his movement in terms of Biblical Messianism. To him, the proletariat, rather than a single savior, is the anointed instrument of liberation.

One concept which Marxism has borrowed from the Scriptures in this connection is that of a center of time. In the Old Testament the Exodus constituted such a focus. There the liberating forces of God's redemptive purpose manifested themselves in concentrated form. In the Christian Church we think of the events in the ministry of our Lord, specifically of His crucifixion and resurrection, as occurring in the fullness of time. That is to say, we look back upon these events as a way of evaluating all the rest of history. We see a principle at work in the life of our Lord, the principle of the Kingdom of God: the lowly shall be exalted, and the proud brought low. (Luke 14:11) The Communist also has such a center of time: it is the October Revolution of 1917. If mankind is to be saved, if there are to be successful revolutions against the bourgeoisie and against imperialism, men must follow the program and the methods of Lenin in bringing the socialist revolution to Russia and converting that land into the model for mankind's liberation and an outpost of revolutionary activity. History will never be the same again, the Communist believes; Lenin introduced into the historical process those forces which will and must set all men free.[8]

In this connection it may be useful to point out the fact that the Communist Party functions something like the Christian clergy. The job of Party members is to interpret the particular historical context in which people live and then prescribe what needs to be done. As clergymen have the job of proclaiming the will of God, so the members of the Communist Party have the assigned task of prescribing what needs to be done at a given moment. Here, by the way, we are dealing with one of the most deadly weapons in the Communist

arsenal. It changes the rules whenever the historical context seems to require it. For example, in the 1930s the Party believed that it would be good for the Communist movement to make it possible to get easy divorces in the Soviet Union. That time is past. Now the historical context requires rather stringent rules on marriage.

Karl Marx began this process of changing the rules. Way back in 1848 he reworked the Ten Commandments to suit his own needs.[9] The Ten Commandments say, "Thou shalt not steal." Karl Marx wrote, "Thou shalt steal; because the property your neighbor has does not belong to him in the first place; he got it by exploiting the poor wage earner." The Ten Commandments say, "Thou shalt not kill." Karl Marx wrote, "Thou shalt kill, if the needs of the movement require it." Ever since that time, Communists have been making up their own moral rules as life goes along. In fact, Lenin specifically denied the existence of anything like absolute moral principles. To the Young Communist League, assembled at Moscow in 1920, he boasted, "We deny that there is a moral law which comes to men from outside of history, outside of society. It is a fraud. We devise our own moral rules according to the needs of the class struggle."[10]

Still speaking of a doctrine of salvation, we must point out that in this area Communists apply to man and society another law from the laboratory, namely, the principle of negation. This is basically a very simple proposition. If you want to grow a crop of barley, you have to sow seed in the ground, and that seed must die before there can be new life. Our Lord Himself, by the way, once used this example to depict the necessity of His death and the consequences of His resurrection. (John 12:24)

This idea has been taken over by Communism, which insists that there has to be wholesale death before there can be a general reconstruction of society. Stalin did not worry, therefore, about the death of a million kulaks. In fact, he was sure that this was a major contribution to his revolutionary movement. Today the Red Chinese generals sometimes talk about unleashing a nuclear holocaust. When Russian experts used to remind them that this would cost China at least 300 million lives, their response was simply this: "That is good; there can be new life only where there is this kind of wholesale death." Here the Christian doctrine of the death of One, Christ, to save many, has been transposed by Communism into the idea of the death of many as a means of saving generations yet unborn.

Its Teaching on Man

Communism also has a doctrine of man. This follows from its basic principle that there is nothing in the universe except matter in movement. Man, as a consequence, is just another glob of matter. In essence he differs in no way from a tree, from a concrete block, from the stuff that has gone into the making of a car. Man is a set of chemicals put together in a certain way to create a unit of energy able to work. And so the individual is reduced to being "the quotient of one million divided by one million," to borrow a phrase from Arthur Koestler's *Darkness at Noon*.[11]

No one will deny that physically we are constituted of certain chemicals. About thirty years ago the price for the chemicals in one man was listed at $1.98. The price has now gone up to $34.54 because of inflationary trends and a rise in the price of phosphorus. Certainly, man consists of chemicals; in fact, 90 percent of each one of us is water. But when we have said this, we have not given a complete description of man. We have not taken into account what the Communist specifically denies: the transcendental in man's existence.

Communist insistence on this point was never more clearly brought to light than when Mrs. Eleanor Roosevelt, in 1948, introduced into the United Nations Assembly what is known as "The Universal Declaration of Human Rights." This document contains the statement that men are "endowed with reason and conscience" and are therefore entitled to certain rights. Every last Communist representative in the Assembly rose to object.[12] He had to do so in order to be true to his beliefs, for he sees man as just another configuration of

matter. In his view man's superiors are human engineers who manipulate numbers. Since the number one is of less value than ten, a single individual may properly be eliminated or liquidated in the interest of ten. This is just a matter of mathematics.

Its Doctrine of Last Things

Finally, we come to the Communist's teaching on last things. It is this element in his creed that gives him something of the same driving power and sacrificial spirit manifested by the early Christians. In the development of this doctrine, the Communist makes use of a third law from the laboratory, known as the principle of transformation. If you take water, reduce the temperature to 32° Fahrenheit, suddenly—not gradually—a new substance comes into being: ice. Since there is nothing in the universe except matter in movement, the Communist is persuaded that it is quite proper to apply the laboratory principle to man and society. The Communist leader, therefore, insists that he is busy regulating the human environment in such a way as to produce the equivalent of the 32° Fahrenheit tranformation, so that by a "leap"—that is his expression! —a new order of things may come into being.

Obviously it is difficult for one of us to get into the frame of mind of a Communist. We believe that things are changed gradually. So we accommodate, we modify, we compromise. The Communist rarely does. He moves along the total spectrum of life in the hope of producing the equivalent of 32° Fahrenheit. He is convinced that only in this way will he be able to create the conditions that will in time produce the "leap."

This is recognizable as a secular version of Christian hope. We believe that our Lord will return suddenly, "in the twinkling of an eye," to quote Saint Paul. At that moment history will come to an end and there will begin what we call the kingdom of glory. Christians have looked forward to this moment through all the centuries as the time of their full redemption. The Communist imitates us in this respect. In the second verse of the Internationale he sings:

> 'Tis the final conflict, let each stand in his place:
> The International Soviet shall be the human race.[13]

TOWARD that prospect every Communist looks in faith and hope. He is persuaded that he can hurry the process along by his own devotion to the right side of present struggles in the world, just as we hold to the conviction that we can hasten the day of the Lord by our prayers and our service.

Communist ideology, then, consists of a caricature of Christian doctrine. If the Communist conspiracy is to be combatted successfully, it will have to be understood and fought on this level also.

St. Louis, Missouri

Notes

1. Milton Mayer, *What Can a Man Do?* ed. W. Eric Gustafson (Chicago: University of Chicago Press, 1964), p. 59.

2. Nikolai Berdyaev was himself a Marxist for a time and was converted to the faith of the Orthodox Church. With a rather large number of other members of the Russian intelligentsia he attempted to bring the Church of Russia into the twentieth century. These efforts were cut short by the October Revolution of 1917. Cf. Nikita Struve, *Christians in Contemporary Russia*, trans. Lancelot Sheppard and A. Manson (New York: Charles Scribner's Sons, 1963), p. 21. Berdyaev's views may be found in his book, *The Origin of Russian Communism* (London: Centenary Press, 1937).

3. The official report of that Assembly, unhappily, does not include this observation contained in the second report (p. 18) of the Advisory Committee on the theme of the Second Assembly, which reads: "Thus in Marxism men have often noticed a kind of structural correspondence to Christianity. . . . This correspondence is, of course, counterfeit. But it would be a mistake for the Christian to treat this correspondence as if it were merely counterfeit." The final report of the Committee is given in *The Christian Hope and the Task of the Church* (New York: Harper, 1954), pp. 33–35. It is dilutions of this kind which prompted one sensitive soul to observe, "The Second Assembly of the World Council of Churches in Evanston may be cited as an additional symptom of this mood of lethargy." Cf. Arthur Voobus, *The Communist Menace, the Present Chaos and Our Christian Responsibility* (New York: Estonian Theological Society in Exile, 1955), p. 40.

4. Fulton J. Sheen, *Communism and the Conscience of the West* (Indianapolis: Bobbs-Merrill Co., 1948).

5. Richard Crossman, ed., *The God That Failed* (New York: Harper, 1950).

6. Gustav A. Vetter, *Sowjetideologie Heute* (Frankfurt am Main: Fischar Buecherei, 1962), I, pp. 15 ff.

7. *The Communist Manifesto* of Marx and Engels is available in a Government Printing Office book known as *Marxist Classics* (Part I, Section A).

8. Cf. William Ebenstein, *Two Ways of Life* (New York: Holt, Rhinehart and Winston, 1962), p. 119; also Wolfgang Leonhard, *Sowjetideologie Heute* (Frankfurt: Fischar Buecherei, 1962), II, pp. 139 ff.

9. The full text of this revision is given in the *Franzoesische Jahrbuecher* of 1848.

10. V. I. Lenin, *Aufgaben Jugendverbaende*, in Socinenija (Werke), fourth edition, Volume 31, p. 266. Whitaker Chambers, who served the Communist Party for twelve years before breaking with it to bring Alger Hiss to trial, once observed: "I can no longer retrace with certainty the stages of my inner earthquake or distinguish its successive shocks. I did not know what had happened to me. I denied the very existence of the soul. But I said, 'This is evil, absolute evil. Of this evil I am a part.' " From that moment he broke with the system. Cf. DOD Pamphlet 4-6, 8 December 1955 (Washington: Government Printing Office, 1955).

11. Arthur Koestler, *Darkness at Noon*, trans. Daphne Hardy (New York: Macmillan, Modern Library, 1941), p. 155.

12. Much of the story behind the Communist maneuverings in the United Nations Assembly, when this Declaration was before it, is given by Maurice Cranston in *What Are Human Rights?* (New York: Basic Books, Inc., 1962), pp. 29–42. Article One of the Declaration reads: "All human beings are born free and equal in dignity and rights. They are endowed with reason and conscience and should act towards one another in a spirit of brotherhood."

13. The whole verse reads as follows:

> We want no condescending savior
> To rule us from a judgment hall;
> We workers ask not for their favors,
> Let us consult for all.
> To make the thief disgorge his booty,
> To free the spirit from the cell
> We must ourselves decide our duty;
> We must decide and do it well.
> 'Tis the final conflict, let each stand in his place:
> The International Soviet shall be the human race.

Military Affairs Abroad

YEMEN: DISENGAGEMENT IN PROTRACTED WAR

Dr. Joseph Churba

ALTHOUGH altered in character through Soviet intervention, the continuing Yemen conflict manifests the difficulties inherent in the quest for containment and disengagement of regional powers engaged in protracted war. What began as a civil war escalated rapidly into a war by proxy between the United Arab Republic (U.A.R.) and Saudi Arabia and threatened to escalate further into open confrontation between these regional powers notwithstanding the attendant risk of an East-West confrontation.

A unique feature of this conflict is its sharp contrast to the Communist-inspired "war of national liberation" characteristic of the revolutionary process in Africa, Asia, and Latin America. For in the Yemen the newly emergent forces representing republicanism and social progress are concentrated in the major cities, while the monarchist, reactionary, and theocratic royalists have launched a successful counterrevolution from the countryside with the support of the rural population. Thus, we observe a "war of national liberation" in reverse but which nevertheless contains escalatory dangers inherent in all protracted wars. The object of this article, therefore, is to evaluate the major political and diplomatic efforts made to arrest the escalatory potential of this conflict and to determine their relevance to Egyptian military withdrawal from the Yemen.

Throughout the course of the conflict the continually shifting diplomatic positions of the protagonists reflected approximate battlefield conditions, and while diplomacy failed to effect disengagement it succeeded in restricting hostilities to the geographic confines of the Yemen. Accordingly, disengagement was the consequence not so much of political negotiations but rather the effect of strategic, military, and economic factors external to the dispute. In short, disengagement in this protracted war was a by-product in part of the six-day war in June 1967 between the Arab states and Israel.

The proximate cause of the Yemen–U.A.R. conflict was the arrival of Egyptian troops in the Yemen to support a palace coup by republican revolutionists on the night of 26 September 1962. Saudi Arabia, fearing the revolutionary upsurge on its borders, reacted by sending supplies and money to the pro-royalist forces behind the deposed Imam Muhammad al-Badr, who led the royalist counterrevolutionists. From the republican standpoint, Saudi assistance (never in the form of troops) constituted interference in the affairs of the Yemen. From the Saudi standpoint, the U.A.R. military presence on the Arabian peninsula constituted a threat to its monarchy and its oil fields.

From the standpoint of interested parties external to the conflict (the United States, the United Kingdom), a solution lay in the creation of some understanding whereby the U.A.R. and Saudi Arabia would disengage from the civil war. Although this understanding was accomplished on 15 December 1967, the Soviet Union has carried out a massive emergency military airlift to the Yemen, including for the first time the use of Soviet Air Force pilots for combat missions. The effect of this has been to deny a royalist victory and motivate Saudi Arabia's resumption of military aid to the royalist tribesmen.

That the conflict threatened to escalate beyond its geographic confines and transform itself from a war by proxy between the U.A.R. and Saudi Arabia to one of direct confrontation was perceptible only after it was recognized that enough outside aid was going to the royalists to make it impossible for the U.A.R. to withdraw and for the Russians to regularize the situation. The Yemen appeared attractive to Soviet plans because of its location on the Red Sea opposite east Africa, about a thousand miles south of Cairo.[1] The Soviet construction of a modern jet airport for the Yemen was viewed by the U.S. with natural concern, for the U.S.S.R. could use it to develop access to east Africa, improve air connections with India, and open shorter routes across Africa to Latin America. The importance to the Soviet Union of an African air route was understood during the Cuban missile crisis.[2]

To the British, Egypt's goal in the Yemen went beyond settlement of the civil war. This interest was evident late in the struggle from the attention Egypt was giving to the activities of the National Front for the Liberation of

Occupied South Yemen. The belief was that the U.A.R. sought to extend the Yemeni revolution to all of southern Arabia and bring about the collapse of the Federation of South Arabia, as it was then called. Moreover, as was subsequently proven in the spring of 1964, the U.A.R. military presence in the peninsula posed a serious threat of extension of the conflict into Aden.[3] The Aden base was regarded as necessary for the protection of British oil interests in the Persian Gulf and as a staging post for the Middle East, east Africa, and the Far East. British troops in Aden were considered necessary to meet treaty obligations to protect Muscat, Oman, the seven states of the Trucial Coast, Qatar, Bahrein, Kuwait, and the South Arabian Federation. In the British view, Gamal Abdel Nasser, Egyptian President of the U.A.R., sought to eliminate the British hold on Aden, which controlled the southern outlet to the Red Sea. If he could accomplish that aim, the whole British-protectoral Federation of South Arabia would collapse, opening his way to Oman and Kuwait. Such success would cement Nasser's hold on the Yemen and force Saudi Arabia to come to terms with him. This would also constitute a giant step toward Arab unity and a step toward actual confrontation with Israel, for which Nasser claims Arab unification to be the primary condition.

From the outset the U.S. and Great Britain were in fundamental disagreement as to the scope and nature of the problem, and therefore they disagreed over the means by which to preserve Western influence in the Arabian Peninsula. Nevertheless, the two Western powers understood that the Yemeni civil war provided the Soviet Union with the unprecedented opportunity to pose as the champion of social change and progress at the relatively cheap price of supplying all the military hardware for the republicans. While all of this aid was channeled through the U.A.R., the U.S. declined to reduce its aid program to Egypt and decided not to intervene actively unless its primary interests in the Saudi oil fields were directly threatened. The internal stability of both Saudi Arabia and Jordan was considered tenuous, and the Kennedy Administration feared any move that might either jeopardize its access to oil or increase the risk of a pro-U.A.R. coup in Jordan, which in turn would trigger a clash with Israel. Therefore, the primary aim of the U.S. was to seek containment of the conflict and do everything possible to avert an open confrontation between the U.A.R. and Saudi Arabia.

The U.S. hoped to avert escalation by exchanging recognition of the republican regime for a withdrawal of Egyptian forces. In effect, it sought to condone the Egyptian intervention as the price for achieving a peaceful settlement that would result in a U.A.R military withdrawal.

This policy was foreshadowed by President Kennedy's personal messages in November 1962 to the leaders involved: Prince Faisal of Saudi Arabia, King Hussein of Jordan, Nasser of Egypt, and Abdullah al-Salal of the Yemen. The texts of these messages were never released, but according to the *New York Times* they "proposed as a first step that Egyptian troops withdraw from the republican side in Yemen and that Saudi Arabia and Jordan halt their material support of the royalist cause." The implication was that U.S. recognition of the republican regime would then be in order.

Subsequently, in defending the recognition policy, Phillips Talbot, Assistant Secretary of State for Near East and South Asian affairs, stated:

> We realize that only by recognizing the regime could we play a useful role in preventing an escalation of the Yemen conflict causing even more foreign interference and placing in jeopardy major U.S. economic and security interests in the Arabian Peninsula.[4]

But the proposed solution, U.S. recognition, was contingent not on an accomplished and verified withdrawal but rather on a promise to withdraw.[5] Prince Faisal increased aid to the royalists immediately, and it is left to further investigation whether Saudi Arabia and Jordan were consulted or were bound to cease their aid upon U.S. recognition of the republican regime. In the circumstances, the U.S. decision eliminated the possibility of any official U.S. negotiations with the royalist government to seek a compromise between the two factions.

The decision also sharply reduced any leverage Washington might otherwise have exercised through its aid program to Egypt.

While recognition was accorded by the U.S. on 19 December 1962, for three days beginning 30 December Soviet Ilyushin-28 bombers carried out heavy raids into Saudi territory directed against Najran, the major transit area for Saudi arms and supplies for the Yemeni royalist forces. Sharp protests from the Saudi Arabian capital, Riyadh, and from Washington had no effect, and a week later Najran suffered another bomber attack that lasted throughout the day. It was obvious that the U.A.R. sought a military settlement before the actual withdrawal of its troops. Heavy attacks continued on Yemeni villages suspected of harboring royalist tribesmen or troops. Most probably, the bombing of Najran (in addition to interdicting traffic along the main road to the Yemen border) was calculated to test President Kennedy's reflexes and the so-called "*Pax Americana*" in the Red Sea and South Arabia. The U.S. was told in Cairo and Washington that the U.A.R. wanted some sort of verification that Jordan and Saudi Arabia had ceased their aid to the royalists. This, of course, was impossible, for it assumed the full collaboration of both sides to the dispute. The Egyptians went further: their press and spokesmen stated that withdrawal would be undertaken only when it had been requested by the republican government.

Thus in the months following U.S. recognition the conflict was intensified on all fronts. The total Egyptian forces rose from 12,000 to an estimated 28,000, with a sharp increase of Russian and Soviet bloc personnel. Significantly, U.S. recognition of the republican regime was widely interpreted in Middle East countries, Arab and non-Arab alike, as a U.S. acknowledgment of Nasser's right to send a large expeditionary force into a neighboring country.

THE UNITED NATIONS entered the Yemeni picture only after both sides recognized that the war had reached a stalemate. The U.S. proposal for disengagement, as originally put forward in President Kennedy's letters of November, called for the U.N. to play a supporting role if and when necessary. It was not until late February of 1963, however, that Dr. Ralph Bunche, Under Secretary for Special Political Affairs in the U.N. Secretariat, was dispatched to the Middle East on a "fact-finding" mission. Interestingly enough, the Bunche mission was looked upon by U.N. officials more as an attempt to alleviate tensions than as an effort to prevent escalation.

At about the same time, Washington mounted a parallel drive to expedite U.N. intervention. After two or three weeks of secret and separate talks with Nasser, Faisal, and Salal (but not with the Yemeni royalists), special envoy Ellsworth Bunker obtained their agreement to a plan for a phased Egyptian withdrawal tied to cessation of Saudi aid to the royalists. Accordingly, on 8 April 1963 a draft of the agreement was initialed at the U.N. However, it was not until 10 June that the U.N. Security Council met to consider Secretary-General U Thant's announced decision to send a U.N. observer mission to the Yemen. The Council adopted, by a vote of 10 to 0 (with the Soviet Union abstaining), a compromise solution, sponsored by Ghana and Morocco, which noted "with satisfaction" Thant's initiative and the agreement of Saudi Arabia and the U.A.R. to share equally the costs of the observer mission. The resolution urged the two countries to observe the disengagement agreement and requested the Secretary-General to report to the Security Council on implementation. On 13 June the U.N. mission, led by Major General Carl Carlsson von Horn of Sweden, arrived in the Yemen to supervise the disengagement operation. It should be noted, however, that U Thant stated that he considered the operation to have officially begun only when observers were placed in Jizan on 4 July, almost three months after the parties signed the disengagement agreement.[6]

While it is true that the U.A.R. started to withdraw its forces in the early days of May 1963, the ships and planes that ferried troops to Egypt invariably returned with replacements in systematic rotation. Consequently, there was no net reduction of Egyptian forces in the Yemen, nor did Saudi Arabia fully

terminate its aid to the royalists. During this time Yemeni republican President Salal sought to broaden Arab support for his cause by seeking admission into the newly proposed United Arab Republic. In June Salal, on an official visit to Cairo, reiterated his desire to join the U.A.R., but the Yemen was excluded from the Cairo unity talks between Egypt, Syria, and Iraq. Nasser was thought to be disinclined to involve Egypt in the Yemen's vast economic difficulties. It was not until after Salal had secured Syrian and Iraqi endorsement for union that the U.A.R. on 17 June acceded to the Yemen request to join the proposed Arab Federal Union, and even then the Egyptian president specified that there would be no constitutional union until after Egyptian troops had been withdrawn from the Yemen.

Thus, both the royalists and republicans were using the interim period to shore up their respective military and political positions. Therefore, the hesitancy of the U.N. to act decisively to effect a disengagement at this juncture is indeed a factor to be considered in light of future evidence. While it cannot be stated at this time that the delay necessarily contributed to protraction of the conflict, it certainly did not enhance the prospect for peaceful settlement.

As events unfolded from July 1963 onward, the major weakness of the "Bunker agreement" appeared to be that it did not include any deadline for the withdrawal of U.A.R. forces or Saudi aid. This omission, coupled with U Thant's emphasis in a later report to the Security Council that "fulfillment by one side is contingent on fulfillment by the other," provided a self-renewing invitation to delay and evasion.

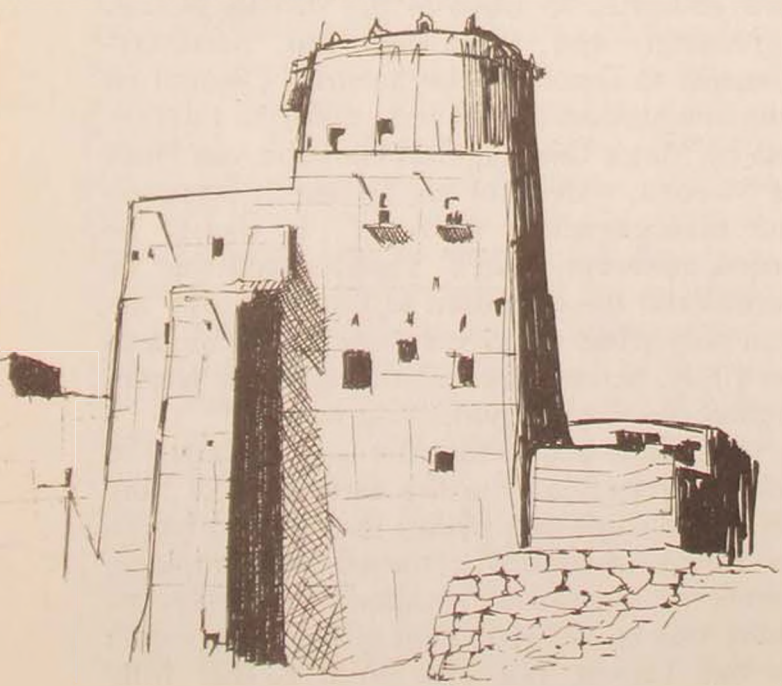
Another serious deficiency in the Bunker agreement was that it had never been agreed to or signed by the royalists. Thus the second-largest fighting force in the Yemen remained free to operate as it pleased. Its nonparticipation in the agreement provided the U.A.R. with the necessary excuse to remain in the Yemen: the right of self-defense against attacking forces that were not bound by the disengagement agreement.

At no time during the fourteen-month existence of the U.N. Yemen Observer Mission (UNYOM) did the Secretary-General express satisfaction with the terms of the mandate under which the mission operated. Quite the contrary, the mandate restricted UNYOM to observing, certifying, and reporting. In U Thant's second report to the Security Council he stated:

> . . . that UNYOM, because of its limited size and function, can observe and certify only certain indications of the implementation of the disengagement agreement . . . as an intermediary and as an endorser of good faith on behalf of the parties concerned. I believe that within its severe limitations it has fulfilled this role very well and that certain improvements in the situation have been the result. I do not, however, believe that the solution of the problem, or even the fundamental steps which must be taken to resolve it, can ever be within the potential of UNYOM alone—and most certainly not under its existing mandate.[7]

This view, reiterated in subsequent reports, appears to substantiate, to a limited

Desert fortress near Ketaf, stark reminder of fierce tribal warfare of an earlier day



degree at least, the sweeping charge of gross incompetence and moral cowardice of U.N. headquarters by General von Horn, who resigned in late August 1963. He charged that U.N. observer teams were undermanned, discouraged, and short of rations and lacked sufficient aircraft to supply their remote outposts in the deserts and mountains. Important sectors of the proposed U.N. buffer zone along the Saudi-Yemen border, from which all military forces and equipment were to be excluded, had been under royalist control from the earliest days of the fighting. The Swedish chief of the U.N. mission could not send his men into these areas. He declared to a correspondent of the London *Observer* that he had been "expressly forbidden to make contact with the Royalists or even to acknowledge receipt of their letters . . ." From his first report addressed to the Security Council (4 September 1963), the Secretary-General freely admitted the failure of the U.N. mission to effect a disengagement. "It cannot be said at this stage that encouraging progress has been made toward effective implementation of the disengagement agreement. . . . No plan for phased withdrawal of U.A.R. troops has been received." Nevertheless, he asked for and received permission to continue the observer mission for an additional twelve months, the U.A.R. and Saudi Arabia agreeing to pay the operating costs of the mission.

It is important to stress that the observation operation undertaken was not financed as part of the regular United Nations budget. The Secretary-General arranged in advance that the costs were to be paid by Egypt and Saudi Arabia, and it was on that basis that the Security Council passed resolution S. 5331 on 11 June 1963, with the Soviet Union abstaining. Had the U.N. been called upon to finance the operation, the Soviet Union would have vetoed the draft resolution. Inasmuch as the mission was totally dependent upon the mutual consent and the finances of the disputants, the mandate under which it operated was restricted. It was virtually impossible under those circumstances for the U.N. to achieve any degree of independence in relation to the national policies of the three governments directly concerned. Consequently, UNYOM had no authority to issue orders or directives. The parties themselves were solely responsible for fulfilling the terms of disengagement on which they had agreed.

The second Egyptian and Saudi agreement to disengage from the Yemen was concluded in direct negotiations between President Nasser and Prince Faisal in Alexandria on 5 September 1964, the same day that UNYOM began its withdrawal marking the end of its unsuccessful 14-month effort. The well-launched U.A.R. summer offensive against Muhammad al-Badr's mountain stronghold had failed, and the momentum of the Egyptian summer offensive was spent. Five days before the Arab "summit conference" in Alexandria and four days before UNYOM was to wind up, Prince Faisal threatened to escalate the conflict by implying that he would send Saudi troops to help the royalists unless the U.A.R. agreed to withdraw. Following private talks on 12-13 September between Nasser, Faisal, Iraqi President Arif, and Algerian President Ben Bella, a joint Egyptian-Saudi communiqué announced an agreement "to fully co-operate in mediation with the concerned parties in order to reach a peaceful solution of all problems in Yemen" and to continue these efforts "until conditions stabilize there." The first result of the agreement was a cease-fire which took effect 16 September 1964.[8]

While the details of the agreement were withheld, diplomatic sources with contacts in both delegations said the agreement provided for a seven-month armistice in the civil war and that simultaneous with the beginning of Egyptian withdrawal all Saudi support to the royalist tribesmen would cease. It was also understood that the agreement called for both of the opposing Yemeni factions to replace their leaders and that the Egyptians agreed to the formation of a new Yemen government which would include some royalists but no member of the Imam's family. In addition, President Nasser and Prince Faisal were reported to have agreed on a joint force to police the borders between Saudi Arabia and Yemen.

The joint communiqué issued after the

talks said that the U.A.R. and Saudi Arabia would "undertake necessary contacts with the parties involved for a peaceful settlement." This statement implied that each side was willing to accept peace without unconditional victory.

Nevertheless, this agreement, concluded in the shadow of the second summit conference of Arab kings and presidents, was not a settlement. It was an agreement to seek a settlement. What existed at this stage of the conflict was an armed truce brought about by the pressures of the summit conference, by the U.S., and by the fatigue of the disputants. The agreement therefore was convenient to both sides. It provided an opportunity for the U.A.R. to consolidate its military and political position and for the royalists to force the U.A.R. into spending more of its dwindling financial reserves in the Yemen.

THE FIRST direct peace talks between Yemeni republican and royalist delegations were subsequently held at Erkhawit in the eastern Sudan on 1–3 November 1964. The preparatory committee agreed on the following terms:

(1) A cease-fire would come into force at 1:00 P.M. on 8 November 1964.

(2) A national congress would meet in a Yemeni town on 23 November to lay down the principles for settling existing differences through peaceful channels in order to maintain stability in the Yemen.

(3) The congress would consist of a chairman, 63 Ulema (Muslim religious teachers), 63 tribal leaders, and 42 military leaders and "men of experience," in addition to 18 members of the preparatory committee.

(4) The congress would implement the preparatory committee's decisions and would request the U.A.R. and Saudi Arabia, jointly or separately, to help carry out the agreement.

The cease-fire came into effect on 8 November as arranged. This was considered a Faisal triumph, since it meant that Nasser was required to give de facto recognition to the Yemeni royalists and to acknowledge that the Egyptian Army could not subdue them. The proposed national congress, however, was indefinitely postponed when statements made by both sides demonstrated that the disputants were unable to agree on where the congress should meet and on the choice of delegates.

The Jidda Agreement of 24 August 1965 represented the third Saudi-Egyptian attempt at disengagement from the Yemen civil war. Between January and July 1965 the royalists had taken the offensive on all fronts, occupying large areas previously held by the republicans. The royalists' successes were no doubt due to the increased military and financial aid which they received from Saudi Arabia, Iran, and the principalities in the South Arabian Federation. A new factor was added to the struggle with the reports of large-scale Iranian aid to the royalists from February onward. On 30 July *Le Monde* reported that Iran had supplied the royalists with several light bombers and that they also had spent unlimited credits from non-Arab sources.[9] To a considerable degree, the Algerian coup of June 1965 had sharpened the U.A.R. sense of isolation in the Arab world. Moreover, the virtual disintegration of the republican regime from within and the impetus given by the royalist issuance of a "national charter" designed to rally dissident republican support were added factors that prompted the U.A.R. to sign the agreement.[10]

More decisive perhaps were the pressures of dissatisfaction within Egypt which unexpectedly burst forth with the resurgence of the Muslim Brotherhood and the establishment of the "Free Egypt" movement headquartered in Switzerland.[11] Most probably it was the new Soviet Ambassador Dimitri Pogdiaev who impressed upon Nasser the need to come to terms with King Faisal and also the desire to avoid strengthening the U.S. position in Saudi Arabia.[12] In the face of an increased danger of armed uprising, an immediate relief from the Yemen problem appeared necessary. To the Russians, preservation of the existing U.A.R. regime was a pressing matter in light of their decline in Iraq and Syria. If for their own sake alone they had to save Nasser and the Yemen, peace was the first step.

In these circumstances, Faisal informed Nasser of the terms he would exact, publicly and privately, prior to the latter's arrival at Jidda. The terms of the Agreement were as follows:

(1) The people of the Yemen would decide the form of government they desired through a plebescite, to be held not later than 23 November 1966.

(2) The period until the plebescite would be considered a transitional period.

(3) With the cooperation of Saudi Arabia and the U.A.R., a conference of 50 representatives of all the national forces and leading personalities of Yemen would meet at Harad on 23 November 1965, to decide the system of government during the transitional period, form a provisional government, and determine the form and nature of the plebescite.

(4) Saudi Arabia and the U.A.R. undertook to respect the decisions of the Harad conference and to cooperate to ensure their successful implementation. They agreed to form a joint committee to organize the plebescite if the conference considered it necessary.

(5) Saudi Arabia would immediately stop military aid of all kinds and forbid the use of her territory for operations against the Yemen.

(6) The U.A.R. would withdraw all her forces from the Yemen within ten months beginning on 23 November 1965.

(7) Fighting in the Yemen would end immediately, and Saudi Arabia and the U.A.R. would form a joint peace commission to supervise the cease-fire and control the frontiers and posts. Food aid would continue under the commission's supervision. The commission would be entitled to use all transport facilities within the Yemen and to move through Saudi territory if necessary.

(8) Saudi Arabia and the U.A.R. would form a joint force to be used by the commission where necessary to prevent any violation of the agreement or any action intended to obstruct it or provoke disorders.

(9) President Nasser and King Faisal would remain in direct contact to overcome any difficulties in carrying out the agreement.

The Egyptian President won time to cushion the shock of defeat: there was to be no fundamental change in the Yemen for three months. Withdrawal of U.A.R. military forces would begin as of 23 November 1965 and be completed by 23 September 1966, two months prior to the Yemeni plebescite. Thus the inherently dangerous humiliation of a quick withdrawal was avoided. The agreement also offered a face-saving device for Salal to give up his office.

The accord was a shattering military and diplomatic setback to the U.A.R. Nasser had given far-reaching undertakings about nonintervention in Saudi Arabia and the Persian Gulf states. His long-declared demand that the royalists be excluded from any power was dropped in acknowledgment that the U.A.R. could neither kill the monarchy nor guarantee the republic.

The royalist regime announced on 25 August that it had ordered its forces to stop fighting but to maintain their positions pending the outcome of the Harad conference. While the U.A.R. pulled back its forces from the Saudi frontier, the Cairo press reported on 5 September that the U.A.R. had agreed to a joint Saudi-Egyptian force which would man the observation posts no later than 25 September. This force was to consist of an infantry brigade from each side and a fighter-bomber squadron, to be commanded by Saudi and Egyptian officers in alternate months.

In accordance with the Jidda Agreement, 25 Yemeni republicans and 25 royalists met at Harad on 23 November 1965, to discuss the nature of the plebescite on the future form of government and the formation of a provisional government. The U.A.R. and Saudi Arabia were each represented by two observers, while a Yemeni liaison committee comprising two republicans and two royalists acted as a link between the conference and the joint Saudi-Egyptian peace commission. However, the Harad conference collapsed in a dispute over the name of the Yemeni state in which moderate royalists and republicans might combine. The royalists wanted a plain state of Yemen (not an imamate), but the republicans stood for a republic. The second main disagreement arose over the royalist demand for the immediate withdrawal of all U.A.R. forces

from the Yemen, to be followed by a plebescite as quickly as possible. The republicans raised no objection to a plebescite but argued that time was needed to arrange the evacuation of Egyptian troops.

Notwithstanding *Al-Ahram's* statement on 30 October that 10,000 troops would be withdrawn each month beginning 1 December and other indications that the Egyptian President was interested in a settlement, the royalists insisted on immediate U.A.R. withdrawal. The conference broke up 24 December, and while both sides agreed to reconvene on 20 February 1966 the meeting never took place.

Nevertheless, Egyptian forces regrouped and evacuated the northern and eastern Yemen in the early months of 1966, concentrating their force in the area between San'a, Hodeida, and Ta'izz. Adoption of this "enclave" strategy, designed to reduce both the size and cost of the expeditionary force, was subsequently confirmed by the Egyptian President in an address on 22 March.

Throughout this continued military and political stalemate, the split between the pro-Egyptian and moderate republicans had widened and intensified. Notwithstanding his earlier Egyptian orientation, the republican prime minister, General Hassan al-Amri, was brought into alliance with the moderate republicans headed by Ahmed Muhammad Noman, a former prime minister who had been ousted but a year earlier for pursuing a policy independent of U.A.R. direction.[13]

The main cause of friction had been U.A.R. insistence on controlling the Yemen's foreign relations and finances, including all foreign aid to the Yemen. During Premier Kosygin's visit to Cairo in May 1966 the U.A.R. government was said to have had to prevent General al-Amri from meeting with the Soviet leader, until the latter insisted on meeting with the general. Offers by the Soviet Union to arm and equip a republican army of 18,000 men and by East Germany to supply military equipment to the Yemen had been vetoed by the U.A.R. Similarly, a request by the Yemeni government for the release of Yemeni foreign exchange deposits retained in the Central Bank of the U.A.R. had been refused. Moreover, the moderate republicans had put forward in July 1966 a plan for peaceful settlement through direct negotiations between the royalists and republicans acting independently of the U.A.R. and Saudi Arabia. It was proposed that a Supreme State Council and Consultative Assembly of 99 members should rule the country for a transitional period of one year, at the end of which the Assembly would determine the future form of government.

This plan was superseded by yet a fourth agreement for a peaceful settlement, reached between representatives of the U.A.R. and Saudi Arabia at Kuwait on 19 August 1966. Although no details of the plan were published, unofficial reports indicated that it envisaged the formation of a transitional government, drawn from all Yemeni factions but with a republican majority, from which members of the former royal family would be excluded. For an interim period of ten months, the country would be known as the "State of Yemen," thus avoiding use of the term "republic" or "imamate." The Egyptian forces would be withdrawn during this period and replaced by a joint Arab force, which would supervise a plebescite on the final form of government. The agreement was never implemented, however, partly (it was reported) because both the republicans and the royalists resented the fact that they had not been consulted on it but mainly because the U.A.R. refused to withdraw its troops from the Yemen.

Thus, the moderate republican faction felt that the Yemen's true interests were being subordinated to Egypt's ambition in South Arabia, for the Egyptian-Saudi power confrontation loomed larger as the British confirmed their intention to withdraw from Aden. It was in these circumstances that President Salal's return to San'a on 12 August from Cairo, where he had been living for almost a year, precipitated a crisis between the two factions. The crisis came to a head with the arrest on 16 September by the Egyptian Security Police of General al-Amri and Noman, along with other leading members of a 40-man delegation that had arrived in Cairo on 12 September to demand that Salal be permanently exiled. On that same day San'a radio an-

nounced that President Salal had accepted the "resignation" of General al-Amri and assumed the premiership. He violently denounced the "professional politicians, deviationists, hypocrites, and traitors who had attempted to sow dissension between Yemen and the U.A.R." Through his foreign ministry, Salal announced his wholehearted support for the Egyptian-backed National Front for the Liberation of Occupied South Yemen. This was the first time that the republican government openly supported this front.

The change of government was followed by a sweeping and bloody purge of the Yemeni armed forces and the administration.

As a result of these repressive measures, many republicans fled to the mountainous country and others into Saudi Arabia, where they organized the Union of Popular Forces under the leadership of Ibrahim al-Wazir, a member of a powerful family opposed to the imamic dynasty. On 31 December he claimed that fighting was now virtually between Egyptians and Yemenis regardless of their former loyalty.

The Yemen conflict reached its decisive turning point with the outbreak of war between Israel and the U.A.R. on 5 June 1967. Egypt was reported to have withdrawn 15,000 men, 150 tanks, and all its heavy artillery from the Yemen during the week of 5–12 June. (Estimates of the number of Egyptian troops in Yemen before this withdrawal varied between 40,000 and 70,000.) Egyptian garrisons were withdrawn from the towns of Haja, Harad, and the port of Maidi in the northwest (70 miles from San'a) and from Harib. While the royalists subsequently occupied these areas, an Egyptian counteroffensive regained much of this lost ground in July.

Confronted with the massive and humiliating defeat by the Israelis and their occupation of Egyptian soil, the U.A.R. delegation to the Khartoum conference of Arab foreign ministers, 1–6 August 1967, proposed the reactivation of the Jidda Agreement as the basis for a peaceful settlement of the Yemen conflict.[14]

In a personal meeting between President Nasser and King Faisal resulting from Sudanese mediation in Khartoum, the Saudi leader agreed to pay $120 million a year to Egypt (as part of a $378-million subvention provided also by Libya and Kuwait), to continue as long as the Suez Canal remained closed.[15] This arrangement was naturally contingent on U.A.R. withdrawal from the Yemen. Significantly, the Jidda proposal for a plebescite had been dropped. The withdrawal was supervised by Morocco, Iraq, and the Sudan and was completed on 15 December 1967.

The arrangement was vigorously denounced by President Salal, who shortly thereafter was ousted in a republican coup,[16] which has yet to come to terms with the royalists. Russia has since assumed a paramount position with its direct involvement in the affairs of the Yemen.

THE YEMEN conflict demonstrates that, notwithstanding the relaxation of cold war tensions in Europe, there is no Soviet accommodative spirit in this region. On the contrary, despite its lack of strategic mobility and amphibious capability, the Soviet Union has directly intervened in the civil war in order at least to guarantee the survival of the republican regime. This decision undoubtedly is related to the increased deployment of Soviet naval power in the Mediterranean, the decision to reactivate the Soviet marine corps, and the effort to develop an "amphibious" capability as part of the development of a strategy of "flexible response" designed to create an environment in which wars of "national liberation" can be more actively encouraged. In effect, the Soviets have gained ascendancy within the republican camp and seek to fulfill the role Egypt has abandoned. In doing so, they have abandoned a tacit refrainment from superpower intervention and have discounted fears of American counter-intervention and possible escalation. Thus, in the absence of coordination, the ability of the two superpowers to coerce their client states (the U.A.R. and Saudi Arabia) was extremely limited. Moreover, the U.S. and Great Britain failed decisively to coordinate their policies except on the minimum objective of nonintervention.

While the U.S. extended recognition to the republicans, the British steadfastly refused to do so. When its recognition failed to achieve the intended purpose of disengagement, the U.S. strove for containment through a policy of inaction on the assumption that inasmuch as Egypt lacked the physical resources for protracted war, it would sooner or later, of its own accord, disengage.

At no time did the Western powers seek to attempt a sea blockade, arms embargo, or economic sanctions as a means to prevent escalation or force disengagement. Thus, given the U.A.R.–Saudi stalemate and the absence of superpower and Western coordination, the circumstances permitted the dissident protagonists on both sides to acquire a degree of political flexibility in their relations with their respective sponsors. The republicans were weakened by dissension between the supporters of Salal, who was backed by the U.A.R., and his opponents, who advocated the ending of foreign aid for both sides and a negotiated peace settlement. The dissident republicans enjoyed wide support among the tribal leaders, the trading class, and the intellectuals. Undoubtedly, an awareness that the revolution had been lost to great power and regional rivalry had prompted the moderate republicans to put forward in July 1966 a plan for a

No longer merely a remote imamate on the borders of Saudi Arabia, Yemen occupies a strategic corner between East and West, on sea lanes connecting Europe, Africa, and Asia, and is a potential air link from the Soviet Union to India, Africa, and Latin America.

peace settlement through direct negotiations between republicans and royalists acting independently of the U.A.R. and Saudi Arabia. Although contact had not yet been established with the royalists, the growing support which the plan had received among republicans was reported to have been responsible for the U.A.R. decision to allow President Salal to return, despite General al-Amri's vigorous opposition.

While this dissent had reflected and weakened the overall republican position, it was insufficient in itself to overcome the necessity for deference to Egyptian prestige that a disengagement presupposed. From the moment Egyptian troops first landed in the Yemen, any republican-royalist understanding at the expense of Egyptian prestige was prohibitive. For the U.A.R. as the vanguard of Arab republicanism had, after all, expended substantial human and financial resources in a war that was never popular at home. Any Egyptian withdrawal without having accomplished the minimum objective of guaranteeing the republican form of government was bound to have severe adverse consequences. The credibility of Egyptian leadership would have been challenged, giving added impetus to the forces of conservatism led by Arab monarchs and also to the more radical if not volatile Syrian Baathists. How the U.A.R. fared in the Yemen therefore was considered central to its position as the leading revisionist power in the Arab world.

The Egyptians, however, had badly miscalculated in their intelligence estimates prior to their intervention. They failed to evaluate correctly the time, the possible fields of battle, and the attitude of the local population.[17] Their unawareness of the pitfalls of protracted conflict was underlined by the speed of their intervention, which assumed a quick and decisive victory. Even after it was clear that enough outside aid was going to the royalists to at least guarantee the possibility of a protracted war, the Egyptians failed to revise their goals or broaden their options for disengagement. The fighting thus followed the classic pattern of a large, well-equipped force attempting to subdue a mountain-based guerrilla force working in small units with primitive weapons. As it developed, the fighting centered in the unfamiliar terrain, and the Egyptian army was unable to force a decision before the first winter as had been expected. Moreover, resorting to dropping bombs indiscriminately on civilian targets in the hope of breaking the royalists' will to resist had the opposite effect. Certainly the intensity of the conflict was dramatized with the issuance of a statement by the International Committee of the Red Cross confirming that poison gas had been used in U.A.R. bombing operations against civilians in the Yemen. Thus, as time progressed, the conflict increased in intensity, for no agreement was concluded between the combatants restricting the use by type of military weapons, demilitarization, sanctuaries, target restrictions, or zonal disengagements.

The conflict has demonstrated the limits of Egyptian power and the dangers of miscalculation and overextension. It has confirmed the basic principle that foreign policy objectives must be adjusted to the harsh realities of limited resources and that failure to do so invites hazardous consequences. Equally important, the conflict has shown that, unlike Cairo and Damascus, the towns in the Yemen were not the focal points of political power. From another standpoint, the results affirm that the unconventional war doctrines of Mao Tse-tung are not the exclusive option of the left.

In the final analysis, the U.A.R. decision to disengage was due to military, economic, and strategic factors external to the conflict. Each political arrangement to disengage reflected the different stages of the conflict, the net effect of which was no more than to serve as an expedient pause before resumption of hostilities. The U.A.R. military withdrawal from the Yemen should therefore be understood in light of the more catastrophic defeat suffered in its conflict with Israel. This extreme circumstance provided U.A.R. the necessary condition for disengagement without realizing the minimum objective. The Jidda Agreement was thus nothing more than a convenient face-saving device for withdrawal. Had it not existed, a similar arrangement

would have been concluded to effect disengagement. Thus, while diplomacy has succeeded in arresting the escalatory potential of this conflict, even if temporarily (for the U.S. has not challenged the recent direct Soviet intervention), diplomacy has proven of limited value in effecting a solution through disengagement.

Aerospace Studies Institute

Notes

1. On 10 June 1962 *Izvestia* published a map showing a proposed air route from India to Madagascar via the Yemen.

2. Guinea refused permission to land planes en route to Cuba with personnel and supplies. This action helped the U.S. naval quarantine of Cuba. Guinea, Algeria, and Morocco were pressured to let the Soviet commercial airline *Aeroflot* land on flights to Havana. Ethiopia and Somalia had been urged to permit Soviet planes to land and proceed along the east coast of Africa. Sudan, which permits Soviet planes to land and fly westward, had been asked to let planes fly south from Khartoum. None of these states has acceded to the Soviet request.

3. Oil and strategic real estate in South Arabia brought Great Britain and the Yemen and the U.A.R. to a confrontation in the spring of 1964. A long series of incidents on the frontier between the Yemen and the South Arabian Federation, characterized by frequent Yemeni incursions into Federal territory, led to a British air attack on Harib fort (28 March 1964) just inside the Yemen frontier in retaliation for a series of raids on Beihan State, a member of the South Arabian Federation. Similarly, throughout 1964 and 1965 military operations continued at intervals against dissident tribesmen in Jebel Radfan area of Dhala State, who were alleged by the Federal authorities to be receiving arms and support from the Yemeni republican authorities. British military operations succeeded in securing the main 90-mile Dhala-Aden trade route, but at the same time diplomatic and political efforts were made to speed measures to advance South Arabia's independence.

4. Letter to Senator Bourke Hickenlooper, *Congressional Record, Senate*, July 30, 1965, p. 12902.

5. Philip Horton, "Our Yemen Policy: Pursuit of a Mirage," *The Reporter*, October 24, 1963, pp. 29–34.

6. Successful Baathist Socialist coups in Iraq (8 February) and Syria (8 March), both of which countries appeared favorably disposed to unity with U.A.R., were of considerable importance and required a settlement of the Yemen crisis. The coups in Baghdad and Damascus were the first successful seizures of power by the Baath party in the Arab world, and that party was Nasser's first ally outside Egypt. In addition, on 28 March 1963 the Jordanian premier Wasfi al-Tal submitted his resignation to King Hussein; this was considered Jordan's first step toward disengagement from the royalist cause. On 17 April, Iraq, Syria, and the U.A.R. signed an agreement in Cairo which provided for the establishment of a new tripartite federation to be known as the United Arab Republic, which other "independent Arab republics" would be able to join. Three days later, in the wake of violent pro-Nasser rioting throughout Jordan demanding union with U.A.R., Premier Samir al-Rifai, failing to win a vote of confidence, resigned. The Israeli position (stated earlier on 30 November 1962) that a pro-Nasser regime in Amman would be considered a *casus belli* no doubt restrained Nasser, who, with 28,000 troops in Yemen, did not press the Jordan insurrection to its successful conclusion. Thus by April, when the disengagement agreement was initiated and the Soviet Union had given its tacit consent to the U Thant formula, the republican cause in the Yemen appeared to be favored.

7. *Official Records of the Security Council*, Eighteenth Year, Document S. 5447.

8. *New York Times*, September 15, 1964; *The Economist*, London, September 19, 1964.

9. The ex-Imam's family and the Zaidi tribes of northern Yemen, like the Iranians, are Shi'ite Muslims, whereas the Shafi'is of southern Yemen are Sunni Muslims like the Egyptians.

10. The "national charter" demanded withdrawal of U.A.R. forces and promised to establish a constitutional monarch. After the death of the present Imam, future Imams would be elected, and there would be a Council of Ministers with executive powers and a nominated Consultative Assembly. The charter also promised a general amnesty, equality before the law, and freedom of speech within the limits of the law and Islamic belief.

11. Resurgence of the Muslim Brotherhood and the "Free Egypt" movement headquartered in Switzerland were of serious concern in the summer and fall of 1965. Armed attacks against police stations took place simultaneously in widely spaced districts. On the night of 1 September Brotherhood units attacked the Cairo Broadcasting Station, the headquarters of the Egyptian High Command, the Central Telegraph Office, and the Helwan Experimental Workshops—the center for Egypt's missile construction since January 1965. Some 2867 Egyptians belonging to the Brotherhood, the Free officers, and members of the Liberation Movement had been arrested. This figure includes 417 officers arrested in the Yemen for meeting and brought to the U.A.R. for trial.

12. *Jewish Observer and Middle East Review*, September 3 and October 27, 1965.

13. In the spring of 1965, the newly formed Noman cabinet moved quickly to assert its independence from the U.A.R. by making peace overtures with Arabia and the British in South Arabia. Without checking with Cairo, the Noman government sent a delegation to Kuwait, Jordan, Syria, and Lebanon to make indirect contact with the Saudi government. In a gesture of conciliation with Great Britain, it dropped the portfolio of "Minister for the Occupied South Yemen Affairs," and U.A.R. advisors no longer attended cabinet meetings. In seeking a reconciliation with Arabia and Great Britain, the Noman government obviously sought an independent course from the U.A.R. In a showdown with the U.A.R. and President Salal, the Noman government resigned on 1 July. *The Guardian* (Manchester), April 19 and May 31, 1965. *New York Times*, June 1, 1965.

14. *Al-Ahram*, August 2, 1967.

15. *New York Times*, August 24, 1967.

16. Interview with *Agence France Presse*, August 16, 1967.

17. "Egypt's Problems in the Yemen," *New Outlook*, Vol. 6, No. 6 (52), pp. 12–14.

In My Opinion

WHERE IS HE?

MAJOR GENERAL MILTON B. ADAMS

ARE WE putting the right kinds of resources on the line to locate the enemy? Are we forced too many times to use a steamroller to kill an ant? Acknowledgment of a simple truth may help us make the answers to both questions more logical.

Our commanders in Southeast Asia, particularly in South Vietnam, continue to encounter relatively severe gaps in tactical information and targeting. Any apologist for the U.S. reconnaissance-intelligence system who denies this assertion—be he Air Force, Navy, Marine, or Army—tends to be kidding himself. This gap continues despite many spectacular improvements of the last year or two. The gap also hurts the rest of us in the pocketbook every time our strike forces exercise the steamroller to get the ant. Finally, in far too many instances, our forces, ground and air, become aware of the enemy forces only with the shock and fury of a fatal ambush or a surprise attack.

During the past two years substantially increased technical and fiscal resources have been committed to enhance the Air Force's ability to ferret out, measure, and track enemy forces operating in the Southeast Asia (SEA) environment. But are our abilities to precisely identify and define aiming points that are meaningful to our fire-control systems keeping up with target intelligence gathering systems?

The Air Force's TACRISE (Tactical Reconnaissance-Intelligence System Enhancement) conference at Shaw AFB, South Carolina, in the spring of 1966 gave the USAF program a big boost. The other services too have applied greatly increased intellectual and material effort to these same problems. The Army's TARS 1970–75 study now in progress at Fort Leavenworth, Kansas, and associated hardware efforts define and respond to the Army's information needs. The Navy's TRIM program is backed up by intensive study and definition of means to acquire land warfare intelligence and aiming points.

Today airborne sensing and reporting devices are relied upon to respond to an ever increasing share of U.S. combat forces' information and targeting needs in SEA. However, the haunting question remains: Are we putting enough into the effort? It may well be that we can and should do more in the Air Force in the context of the cost of the alternatives.

I would like to dust off an old equation. Its logic is often overshadowed by massive statistics on missions, sorties, tonnages, and kills. It is that the ratio of the weight of military effort required to destroy two similar surface targets with conventional weapons is about inversely proportional to the square of the ratio of the accuracy with which aiming points for the two targets can be acquired by attacking forces. In other words, in its simplest form:

$$\frac{W_a}{W_b} = \left(\frac{K_b A_b}{K_a A_a} \right)^2$$

where W is the weight of attack required for equivalent levels of destruction of targets a and b;

A is the linear accuracy or distance between the location of the ideal aiming point for each target and the location of the actually designated aiming point; and

K is a constant which applies to target characteristics.

For example, if we can mark and/or acquire the location of the center of gravity of point target a within 100 yards and if we can mark or designate the location of target b with an accuracy of 200 yards for high-explosive weapons, it will take roughly four times the effort to achieve the same degree or certainty of destruction on target b as it will for target a.

The principle may also be stated: "The relative weights of effort required to destroy each of two like targets is inversely proportional to the square of the ratio of the distances from the actual targets to the designated aiming points." Again, if target a's aiming point is accurate to 100 yards and b's to 1000 yards and the two targets are equivalent, it takes about 100 times as much effort to kill b as it does to kill a!

This straightforward formula for point targets is modified somewhat when applied

to linear and area targets; however, the principle still governs.

How often and for how long must we continue to use a case of dynamite to kill a cottontail in the brier patch when the state of the art could soon permit us to use a .22 ever more frequently?

Headquarters Command, USAF

THE AIR FORCE SHOULD REPLACE THE OER

MAJOR ALBERT H. THELANDER

THE SYSTEM by which the Air Force evaluates its officers for promotion, special assignments, and other personnel actions is based mainly on the Officer Effectiveness Report (OER). Few officers, however, appear to have much confidence in the validity and reliability of the OER system. It is charged by many with being a dishonest, unfair system that has injured many and ruined the careers of others. To some extent these complaints may be dismissed as defensive maneuvers by individuals who have failed at promotion or in some other way. However, not all of the complaints can be so dismissed.

the flaws

What are the shortcomings of the present OER system? They can be considered under four headings:

(1) *Subjectivity.* The reports as presently written are highly subjective. They probably reflect as much about the author of each report as they do about the officer being rated—or perhaps even more. The personal likes or dislikes, the prejudices, even the writing abilities of the authors determine to a large extent how effectively an OER is prepared. What the rating officer considers most important, even though it may be incidental to the assigned job, is what he will base his rating on.

For example: An officer is assigned primary duty as an AFROTC instructor, additional duty as commandant of cadets, plus other minor administrative duties. The rating officer never visits his classroom and never observes his performance as commandant. He does, however, criticize him on a few *minor* administrative and social matters. Because of these observed lapses in areas that the supervisor personally takes more interest in, the officer does not receive the high rating needed to compete with his contemporaries.

Most officers quickly realize that the way to succeed is to impress the boss by doing a good job on those matters he is interested in.

If this means giving little time to subordinates or cadets, that is unfortunately the way the game is played.

This system also tends to stifle initiative and independent thinking on the part of junior officers. Most officers soon learn that it pays to agree with the chief, even though he may be wrong. The officer who speaks frankly on a matter is too rare. This climate of conformity tends to reduce our efficiency and also our professionalism. One of the qualities of a true professional is that he can be trusted to apply his knowledge and judgment to a problem without fear or distortion.

(2) *Varied interpretations of ratings.* Theoretically the Air Force desires a distribution of ratings approximating that of the normal or "bell" curve. Adjectives are applied to the various boxes on the rating scale in such a way that only paragons of military performance should receive the higher ratings. Yet these official distinctions are ignored by almost all rating officers. The entire distribution of ratings is skewed considerably to the right. All rating officers are somewhat aware of this skewing. Most (but unfortunately not all) know that to describe an officer as "Effective and Competent" is really to say that he is marginal and should probably be let go. To get across the idea that he is a very fine officer and is doing an excellent job, the rater must label him as "Outstanding" or even "Absolutely Superior" (which in our inflated system is the step above outstanding). This leads to an unfortunate degree of dishonesty in official reports and personnel records.

More damaging, however, is the fact that different rating officers vary greatly in their interpretations of the ratings. Some officers conscientiously try to stay as close as they can to the officially defined ratings. They tend to rate most of their subordinates only one or two blocks above the middle and feel that they are giving honest ratings. On the other hand, many officers take the position that any rating less than the highest block or two is a downgrading and should be resorted to only in special cases.

For example, one officer has reported the following rather contradictory and disturbing experiences:

—sitting in an Officers Call at the Air Force Academy among a select group of officers and hearing the Superintendent state that rigid controls would be used to limit the number of top OER's;

—sitting in Officers Call at a tactical wing among average officers and hearing the commander exhort his supervisors to "be generous" on OER's;

—being told by one lieutenant colonel that he, as a matter of principle, rates all of his subordinates "Outstanding" in order to give them a fair chance for promotion;

—hearing another lieutenant colonel tell a hard-working officer that it is doubtful that he can truthfully give him a "Very Fine" rating.

(3) *Unfairness to individual officers.* As a result of the subjectivity of the ratings and the varied standards of different rating officers, many officers have been hurt badly—promotions missed, relieved from active duty as a result of passovers, special assignments denied, and so forth. The old saying that "one or two low OER's won't hurt anybody" obviously does not apply during times of limited promotion quotas or when some headquarters is looking for the best qualified officer for a special position.

It becomes largely a matter of luck whether an officer receives an assignment under a high-rating supervisor or under a lower-rating one. In some cases the command of assignment or the indorsing official may exert a predominant influence. An officer may find himself for years in assignments where he is able to garner a series of outstanding reports. As a result he will win early promotions, special schooling, and choice positions and be on the road to success in the Air Force.

Another officer, equally qualified and as hard-working, may find himself in an organization where OER's are kept conservative or under a supervisor who has certain prejudices or very strict standards of performance. This officer may find that after a year of long hours, sweat, and suffering he receives a "Very Fine" or lower rating. He may find himself in this predicament for two or three years in a row.

The OER's from those years will remain in his record unless he can document a case to have them removed—an extremely difficult procedure. It will take him years of further endeavor to build up a file of better reports. Probably the lower reports will bar his way to positions where he could best demonstrate his ability. In either case, during the first year or two after receiving the comparatively low reports, he may be subject to passover, selection out, or other damaging action. He may be as good an officer, as hard-working, and as full of initiative as the officer who has the string of outstanding reports. Nevertheless, he is branded as a failure and is going to be embittered. He may bounce back or he may not.

(4) *Failure to meet Air Force objectives.* The most serious charge against the OER system is that it is not meeting the objectives of the Air Force. What are the objectives on which an officer evaluation system should be focused? Air Force Manual 36-10 says only that OER's are "to be used with other information as a basis for personnel actions such as promotion, elimination, school selection, and Regular appointment." How well is this objective being met? Obviously it cannot be met unless the Air Force has sound, fair, consistent information on the officers it must select for these various personnel actions. With the built-in subjectivity and varied interpretations of ratings, the OER system cannot provide reliable data for such actions. Each officer can probably name from his own experience at least one truly excellent officer who failed to be selected and one other who should have failed but didn't.

Another objective of a good rating system is that the majority of officers should consider it a fair and honest system. Unless officers believe the Air Force is being fair with them and their careers, they are not going to be motivated to give long years of their lives to the Air Force. From such indications as personal conversations and letters to the editor of *Air Force Times*, it appears that very few have a good word to say for the present OER setup, and many have some rather bitter comments on it.

In the last analysis, the real objective of an officer evaluation program is to enable the Air Force to operate more effectively by having well-motivated, well-qualified officers in the jobs where they are needed. The system should encourage officers to perform their duties at a high level of professionalism.

Motivation is a complex thing; it is tied to human needs, which are many and varied. At a fairly low level there is the need for security. An officer who feels insecure is going to devote his efforts toward gaining security and will have little energy for moving higher. He will conform and fawn upon others and be incapable of coming up with a new idea. Unfortunately much of the motivation of the OER system is based on this need for security. An officer works to avoid an unfavorable OER because it would jeopardize his career.

At a higher level is the need for recognition. A man will perform better if he expects that his work and his abilities will be given proper recognition. Unfortunately, under the OER system the correlation between work done and recognition received is very imperfect. Consequently this motivation is weak.

The highest level of need is termed by some psychologists as the need for self-actualization. A man, once he has satisfied his lower needs, wants to go further. He wants to see what he can do, how high he can go. He feels a need to develop his skills to the fullest. This need for self-actualization calls forth the best in a man and leads to the highest achievements. In a military situation this drive can produce new ideas and a vigorous approach to problems. It can produce true professionalism.

Unfortunately, there is a priority system in our satisfying of needs. A man cannot work at self-actualization until his lower needs for security and recognition have been met. As long as the OER system threatens an officer's career by the subjectivity and unfairness of its ratings and does not consistently give recognition where it is due, few officers will be able to rise to the level of fulfilling their higher potentialities. The loss to the Air Force from this failure to motivate officers to achieve their best cannot be calculated.

The present officer evaluation system based on the OER is not, therefore, achieving Air Force objectives. Whether these objectives can be met by revising the OER is doubtful. A number of revisions have been made since 1947, and the improvements achieved have been minor and temporary in nature. Perhaps the time has now arrived to consider seriously some drastic changes in the officer evaluation system.

The root of the problem lies in the rating of each officer by another very fallible person, his immediate supervisor. It is these supervisors who inject the subjectivity and varied interpretations of ratings into the situation. They are human beings who often develop feelings and emotional reactions toward their subordinates. A system standing on such subjective and shifting foundations can never provide valid, objective evaluations of officers.

The system of rating by supervisors is so deeply engrained in our military structure that it appears idiotic to question it. Yet we know that the OER as a formal report dates back only to World War I. Although we have fragments of commanders' reports dating far back in history, they appear to be highly impressionistic in tone. It is doubtful that they could have been used as the principal means for selecting and promoting officers.

the alternatives

Let us face the question then: Do we *need* ratings by supervisors of officer personnel? The present system is not effective in meeting Air Force objectives. Could these objectives be met without some kind of ratings by supervisors? Are there other means for evaluating officers that might be more effective?

But wait, someone may say, doesn't the OER system also serve some other purposes indirectly? Maybe we would be endangering something basic to eliminate it. Doesn't the OER help the supervisor to maintain the loyalty and discipline of his subordinates? Doesn't the ability to give a high OER to a deserving officer give his chief a good means of promoting morale and job performance? These questions can be answered very simply by going back to some of the basic principles of leadership. A supervisor who needs the OER to maintain his authority and the loyalty of subordinates is an inadequate leader. He is using the OER as a crutch. Perhaps, if the OER were abolished, some of our supervisors could relearn the basic lessons on how to motivate their troops. This would be a tremendous gain, not only for morale but also for the operational effectiveness of the Air Force. And, of course, operational effectiveness is the ultimate goal of any officer rating system.

Suppose we were to eliminate the OER system. What alternative methods could be used for officer evaluation purposes? A complete answer to this question would require a research project designed to investigate the types of executive and professional evaluation systems used throughout a wide variety of organizations. It would also require some imaginative engineering to develop a new system designed especially for Air Force needs.

The following suggestions indicate some of the areas in which a solution may be found:

- The *self-report*, covering accomplishments, self-improvement efforts, and related items, could be a useful tool. This would be similar to the yearly report which a professor makes to his university president. An annual Achievement Report would provide each officer the opportunity for describing what he has accomplished on his job in terms of missions flown or other workload, important projects completed, improvements initiated, ratings given by inspectors, special accomplishments or recognition (speeches, articles, awards, and decorations), civic activities, educational achievements, and similar items. The report would be factual in tone, with no evaluative language allowed—except of course for quoting an inspection report or citation.

A benefit of the self-report would be an increased sense of professionalism on the part of individual officers. An OER type of report is simply not compatible with the dignity of a true professional man. In what other profession are such annual report cards required? When the officer realizes that the Air Force trusts him to report upon his own activities, he will

feel the added dignity necessary to become a mature professional.

• *Appraisal by committee* is a method used by some corporations to overcome the inherent subjectivity of ratings by immediate superiors. A group of two to five officers at the management level just above the man being rated is formed to prepare an appraisal. They will look at his performance and prepare a balanced appraisal, which must be agreed upon unanimously. Companies which use this method of reporting executive performance claim that it provides a more valid appraisal and is worth the time and effort required.

• The Air Force presently uses a number of comparatively *objective measures of performance*. Outstanding base personnel offices are selected on the basis of error ratings in mechanized programs, OJT success rates, retention rates, reports of audits, and other inspection and staff visit reports. Outstanding base-level supply organizations and finance offices are selected on the basis of quantitative data reflecting the accuracy and effectiveness of their operations. Select aircrews are recognized on the basis of grades on standardization/evaluation and tactical evaluation checks, flying safety records, bombing or gunnery accuracy, and related factors. Tactical Air Command in TAC Manual 900-1 provides an award for outstanding accomplishment in almost every operational and support function.

• *Specialty knowledge tests* are used to upgrade airmen in almost all specialties. Test results are also looked at by selection boards. Why can't tests be developed to measure the professional and technical knowledge of officers? Although it is true that knowledge is useless unless it is translated into effective duty performance, still the officer with the greater knowledge has a higher potential.

Carrying this idea of testing somewhat further, perhaps psychologists could devise special tests for officer evaluation and selection. Tests to measure problem-solving ability, creativity, initiative, imagination, understanding of human relations, and similar personal qualities would be very useful evaluative tools.

THESE recommendations are not put forth as final solutions to the problem of officer evaluation. They are proposals for further research in this important area. Perhaps the answer will lie in a combination of two or three of these approaches. For example, self-reports, objective measures of performance, and test scores could be combined to give a more valid picture of each officer.

A more objective officer evaluation system is urgently needed, both to meet Air Force requirements and to provide fair treatment for all officers. A more mature approach to this problem could do much toward increasing professionalism in the Air Force.

Hq Tactical Air Command

Books and Ideas

THE PROMISE OF SPACE

COLONEL PAUL E. WORTHMAN

ONE NIGHT in the sixth year of the space age, as Kingsley Amis and Brian Aldis were conversing informally in C. S. Lewis's rooms at Magdalene College, Cambridge, their thoughts turned to a common interest, science fiction, and a tape recorder caught this exchange:

> **Amis:** The purely technical and the purely imaginative overlap, don't they?
> **Aldis:** These are certainly the two streams, and they often overlap—for instance, in Arthur Clarke's writings. It can be a rich mixture.

In Mr. Clarke's new book, *The Promise of Space*,† we have the rich overlapping of the technical and the imaginative. He begins with the tale of a second-century astronaut, Lucian of Samosata, whose ship was caught up by a waterspout and swept to the moon; and he moves through the centuries to a time when our descendants will build citadels "beneath the blistering sun of Mercury." En route, he fills his pages with the story of recent achievements in space technology and the promise they bring for the near-term future.

As always, Mr. Clarke writes with a clarity and assurance that develop understanding in the mind of the interested layman. Rocket mass ratios? Engine designs? Low-inclination orbits? Most readers will come away from this book convinced—and quite properly so—that the fundamentals of space science are well within their grasp.

What Amis calls the "purely technical" in Mr. Clarke's work deserves admiration and respect. The "purely imaginative" is more complex in its evocations. A portion of this book is inventive (one would expect this from the man credited with creating the concept of communication satellites). Much of it is visionary ("two hundred years from now there will be committees of earnest citizens fighting tooth and nail to save the last unspoiled vestiges of the lunar wilderness"). Some is mystical ("space-warps" are suggested as high-dimensional short cuts across interstellar distances). And sometimes it is poetic ("Often, one of these brightly orbiting stars will suddenly explode in a silent concussion of light and a fierce, tiny sun will draw slowly away. . . ").

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†Arthur C. Clarke, *The Promise of Space* (New York: Harper & Row, 1968, $8.95), xxi and 325 pp.

Perhaps the most instructive reaction to the imaginative would be to extend one's own thoughts regarding the promise of space. The book jacket refers to the "enormous promise of the 1970's." Is that promise "enormous?" Is it enormous for the Air Force? For NASA? What is the likely nature of space activity during the '70s?

A glimpse into the future is often enhanced by an examination of the past. Until recently, military space history has been restricted necessarily to a shallow perspective, with few recognizable vantage points for a long view. Even today, with two decades of data, there are serious hazards in forcing too much meaning from what is available. On the other hand, it is noteworthy that the history we have, however brief, is densely packed with events. A world which has launched over 800 spacecraft can feel that it has passed its novitiate and that a few trends and signs must be emerging from the record of that achievement.

In looking at the space story from 1957 to 1960, one is struck by chaotic excitement within a nation struggling to recover from technological ambush. In military space history, 1961, 1962, and 1963 stand in contrast as years of retrenchment, introspection, and thoughtful evaluation. For the Air Force, in particular, these years are an indicative past containing important clues to the decade ahead and a history well worth reviewing for suggestions of the promise of the '70s.

During the decade preceding the Kennedy Administration the United States had made good progress in observing and studying the space environment. Space probe experiments had been under way for almost fourteen years, and the launching record was impressive, totaling over 700 flights. But probes had serious limitations as data gatherers: their observations were made at one location, one altitude, on a particular day. An ideal space technology program should produce knowledge of the effects of latitude, altitude, and season, a combination which would produce a "map" of environmental effect plotted against time. Needed were vehicles that could remain in space; clearly, those vehicles would be satellites.

The Air Force began building a space technology satellite in 1958, using a Thor-Agena combination. This space system reached its full productivity during the Kennedy Administration; by December 1963 it had made 53 successful flights. It flew dozens of sensors and experiments, but its basic contribution lay not so much in the variety of its experiments as in the continuous, repetitive coverage it provided. An important side benefit of this satellite was the introduction of new engineering knowledge and techniques. It tested the Agena stage, for example, and exercised the Air Force's global Satellite Control Facility, Sunnyvale, California, for the first time.

Of course, the space technology satellite was not operating alone in its field. The Mercury program of the National Aeronautics and Space Administration, in which the Air Force shared heavily, was gathering a mass of data on man in space as Shepard, Grissom, Glenn, Carpenter, and Cooper brought back the record of their pioneering flights. The X-15, although not a satellite, served as a bridge between space probes and satellites, collecting data over a substantial time duration and helping develop engineering answers to a special class of aerodynamic problems.

In 1961, American engineers were using space data from these systems to outline critical technology required by future space systems. Lists of needs appeared in a number of Air Force studies—chief among which was the Gardner Committee Report—calling for new achievements in propulsion, guidance and navigation, auxiliary power, sensors, materials, environmental knowledge, and bioastronautics. These needs were reflected in key hardware requirements: low cost, standard building-block boosters; standardized modular stages; attitude control subsystems; auxiliary power subsystems; and command and control equipment.

The Wiesner Report of 10 January 1961, which examined the national space program for the President-elect, shared a majority of common viewpoints with the Gardner Committee Report. In addition, it pressed hard for certain specifics: setting up an improved management environment for space development;

developing larger (much larger) boosters; developing a nuclear rocket engine; developing a manned space station; moving swiftly toward manned lunar landings; and developing an interceptor satellite.

At the same time these studies were under preparation, the Air Force was working on a comparison analysis of what it was doing and should be doing in space to meet the needs essential to carrying out its functions.

First, the Air Force reviewed its space facilities. It had an operational space detection and tracking capability in SPADATS at its Air Defense Command headquarters, Colorado. In the Air Force Systems Command, it had electronic centers at the Electronic Systems Division, Massachusetts, and at Rome Air Development Center, New York; excellent propulsion research facilities were in-being at Air Force Flight Test Center, Edwards Air Force Base, California, at Wright Air Development Center, Ohio, and at Arnold Engineering Development Center, Tennessee; and at the Air Force Missile Development Center, New Mexico, a seven-mile sled track stood ready to test guidance subsystems.

Cape Canaveral, Florida, a $1-billion capital investment, was available as an excellent near-equatorial space launching center. An 80,000-acre site at Vandenberg AFB, California, could be used for launchings into polar orbit.

The Air Force had the boosters for the space job. The Thor, which was to make its 100th space launching in December 1962, was boosting Air Force space technology satellites into orbit, as well as the Army's communication satellite experiments, the Navy's navigational satellite, and NASA's Explorer (scientific), Tiros (meteorological), and Echo (communications). The Atlas booster was available for heavier space loads. The Agena was showing excellent reliability as a second stage with either booster.

The Air Force had the industrial base for space. The ballistic missile program had created a new industrial complex across the face of America. Twenty prime contractors and 1700 subcontractors were looking forward to assuming imaginative roles in space work.

The Air Force's Satellite Control Facility was a unique organization and fundamental to space operations: the tracking, controlling, and commanding of satellites, some of which would require scores of separate commands on a single orbital pass.

Finally, the Air Force had organized the Space Systems Division at Los Angeles in April 1961 as a special management team to handle its space programs.

These unique assets implied extensive obligations, going beyond the Air Force itself to all military agencies and to the nation at large. In 1959, the Air Force had been made responsible for furnishing space booster support to all the military services. In March 1961, Secretary of Defense Robert S. McNamara assigned "research, development, test, and engineering of Department of Defense space development programs or projects, which are approved hereafter" to the Air Force. Again, during the same month, he assigned all DOD reconnaissance, mapping, and geodetic programs to the Air Force. These responsibilities aggregated into an Air Force space mission of great scope and potential:

(a) To conduct applied research and advanced technology to further the state of the space art.

(b) To manage the development and procurement of Department of Defense space systems.

(c) To launch, control, and recover DOD space vehicles.

(d) To support other federal agencies as required in attaining national space objectives.

What was the Air Force's space program at this time? How was it meeting its mission? The military applications of space have been thoroughly studied, and answers as to how the Department of Defense can use space fall into three categories: as an observation post, as a communication center, and as an arena for deterrence. The Air Force had arrived at these conclusions well before 1961 and was developing space systems of each species. The nuclear detection satellite and the attack alarm satellite, for example, were designed to search space and earth for possible covert nuclear testing and ballistic missile launchings. By

1962 the Air Force was building a communication satellite, using mid-level repeater communicators as well as synchronously orbiting spacecraft, to furnish truly global information channels for military users. If space were to be kept peaceful, it was necessary to know what was in space and, specifically, to be able to obtain information on "unknown" orbiting spacecraft. To this end, the Air Force had begun work on a simple inspector satellite.

But the Air Force program of activities extended far beyond its own needs. Time and again, when reading a news account of a Navy, Army, or NASA space flight, one saw the expression "the Air Force furnished the booster." This terse phrase came into perspective in the Wiesner Report: "The USAF provides 90% or more of the resources and physical support required by the space programs of other agencies." Booster services were indeed extensive, covering a wide range of activity that might include the first booster stage (usually a Thor or an Atlas), the second stage (an Agena or Able-Star), the final stage vehicle, total system engineering, procurement services for the system, a launching pad, launching services, injection into orbit, on-orbit command and control, and capsule recovery. The record of these services was impressive:

Year	Total Launchings	Air Force Boosted	Other
1960	29	21	8
1961	52	42	10
1963	46	37	9

For the Navy, the Air Force's booster services were devoted to two very successful programs: a navigational satellite and a geodetic satellite. For the Army, booster support centered on communication satellite tests.

For NASA, the cooperative services were continuous and extensive, Mercury and Gemini being the best-known examples. Others were Ranger, the lunar exploration satellite; Mariner, the Venusian exploration satellite; Topside Sounder, which looked at the ionosphere from above for the first time; Echo, for communications; Nimbus, the advanced version of Tiros; the Geophysical Observatory, for space technology studies; Rebound for passive communications research; the Orbiting Astronomical Observatory, for obtaining astronomical data above the interfering atmosphere; Fire, for very high-speed re-entry tests; and Gemini/Target, the docking partner for Gemini. Each of these projects derived its major support from the Air Force—support which NASA officials described as enthusiastic, continuing, and effective in achieving positive results.

In furnishing booster services, the Air Force became convinced of the need for standardized, reliable, "building-block" boosters. The first of these was the solid-propellant Blue Scout, developed in collaboration with NASA and made up of modular units that could be assembled for a variety of payloads and operations. The Agena D, built on a remarkably short 6-months schedule, reduced the variety of Agenas from nine to one. The Standard Atlas brought a ballistic missile design closer to the needs of space systems. Most important of all, the Titan III family of solid-propellant boosters promised to give the United States capability for lifting as much as 25,000 pounds into a 100-nautical-mile circular orbit.

The Air Force program, coming into flower during the second and third years of President Kennedy's term of office, generated dozens of firsts in space. Internationally, the United States was regaining much of its prestige, as witness the September 1962 international box score:

	Earth Satellites	Lunar Probes	Inter-planetary Probes	Total
U.S. spacecraft orbited	71	1	4	76
Soviet spacecraft orbited	21	1	2	24

As the Air Force reviewed its assets and resources for space work, its broad mission assignment, and its wide-ranging program, it was tempting to assume that events were combining to make the promise of space a reality for military spacemen. Yet, even as it stood in the midst of apparent bounty, the Air Force began to note signs that the headlong rush of military space activity was to be challenged.

In May 1961, for example, the Secretary of Defense and the Administrator of NASA jointly requested the Vice President of the United States to add $626 million to the FY 1962 national space program. These recommendations included a manned lunar spacecraft with a launching vehicle development, a solid-propellant development, an unmanned lunar exploration program, a satellite communications system, a meteorological satellite, a nuclear rocket development, and supporting research and technology. Of this massive work list, only the solid-propellant development was to be done by the DOD, and of the $626-million price tag only $77 million was to go to the DOD. NASA was chosen to carry out the President's decision to commit the U.S. to landing a man on the moon.

Two months before, in March 1961, the Office of the Secretary of Defense had assigned to the Air Force "research, development, test, and engineering of Department of Defense space development programs or projects, which are approved hereafter." Although this action was welcomed widely within the Air Force, Secretary of the Air Force Eugene Zuckert, who had a great gift for seeing the defense scene steadily and seeing it whole, remarked that although he, too, welcomed the assignment, it could turn out to be "like getting a franchise to run a bus line across the Sahara Desert." His observation was validated immediately as the OSD began to place existing space programs under a most detailed scrutiny (which often appeared to the Air Force to be hostile). This critical examination went on for months and was very difficult for the Air Force to understand, let alone accept.

Why did the review occur at this particular time, 1961? It could hardly be attributed to impact or backlash from the Soviet space program. During 1961 the Soviet space drama was centering on manned space flights—Vostoks 1 and 2 (Gagarin and Titov); any pressure resulting from these spectaculars would have impacted on NASA, rather than the Air Force. And the examination could not be attributed to a bow wave of NASA activity, since NASA had no space spectaculars during 1961.

We can see today that the basic conflict did not derive from Soviet or NASA influences; rather, it was a product of a fundamental difference in functional and managerial outlook between the OSD and the Air Force. The differences could be summarized, though perhaps oversimplified, as follows:

The 1961 Air Force Spacemen	The 1961 OSD Spacemen
Enthusiastic and zealous for space	Sober, cautious, conservative
Long experience in military space work	New in military space work
Eager to sponsor multiple solutions to a single space problem	Determined to select a single best solution, in advance
Advocates of a total space systems concept	Believers in an R&D demonstration concept

These differences in attitude and belief created a fundamental schism regarding the best way to get a space job begun or done. Communication between the two agencies was frequently strained, and relations were complex. Following its own convictions rigorously, the OSD began to cancel or slow down a number of Air Force "pre-Kennedy" programs. The cases took on a dreary similarity, with a regular pattern of review, revision, de-emphasis, or elimination. In January-February 1961, the OSD canceled practically all funding for a spaceborne defense system. In July 1961 it organized a review task group to study the attack alarm system, stating in advance of the review, "It is not anticipated that the results of this study will result in a termination of the program; however . . . ." In August 1961 it reduced the satellite inspector to a back-burner research and development program. In April 1961 it had set a $200,000-limit on individual Air Force space studies, and in the summer of 1962 it took one of its most drastic actions: cancelation of the entire space system study program. Most of these actions clustered in 1961; some parallel actions extended into 1962; the Dyna-Soar cancelation took place in December 1963.

Air Force–OSD space relationships reached their nadir on 9 October 1962, when Assistant

Secretary of Defense John Rubel, appearing before the Aerospace Luncheon Club, made a militant speech containing four points that struck the Air Force very hard: (1) in spite of all the studies undertaken over the past five years, no really new ideas for space had evolved; (2) manned military missions in space simply did not make sense; (3) all OSD space systems had to meet clear-cut military requirements; and (4) systems decisions would not be made in response to doctrinal concepts.

At this point it seemed to the Air Force as if Secretary Zuckert's bus franchise would indeed begin and end in the Sahara. Looking back now, however, one notes that the space prospects of the Air Force were beginning to take an upturn, even in the midst of tribulation. By late 1961 the new OSD space team had essentially completed its review of the existing Air Force program, had purged or slowed down what it found questionable, was planning to sponsor replacement programs that met its new ground rules, and was becoming personally identified as the creator of an approved OSD space program, which, as before, would be largely under the stewardship of the Air Force. In effect, the OSD space team was about to accept its own space program, which happened to be in the Air Force. And, as it gained experience with the OSD, the Air Force was beginning to accept new principles for evaluating and managing a space program. This acceptance had developed early at the Air Force Secretarial level. At other levels acceptance was grudging, limited at first, but inevitable. Regardless of how one felt about them, the new ground rules were becoming facts of life that could not be set aside. Henceforth, Air Force space programs, like other expensive military programs, would be disciplined in concept and scope by an external evaluation of OSD or national (rather than service) need, by system analysis considerations, cost-effectiveness studies, trade-offs, and deliberately conservative extensions of the technological state of the art. New authorizations would be limited, initially, to a research and development phase, followed (perhaps) by an extended precommitment period, and would require continuous, exhaustive justification of all technical, managerial, and procurement aspects to the OSD.

The first step toward reconstructive action came late in 1961, when an Air Force study for a Titan III standardized space booster was accepted. In May 1962 OSD's DDR&E issued a White Paper sponsoring the development of a communication satellite by the Air Force. In the spring-summer of 1962, cooperative Air Force–NASA Gemini tests were approved. In March 1963 the OSD agreed to finance a new Air Force satellite inspector. In December 1963 the beginnings of a Manned Orbiting Laboratory were assigned to the Air Force.

The years 1961-63 represented a period of introspection on the part of the Air Force, a period of adjustment to a demanding external management and reorientation of goals in conformity with broadened national space objectives. These events have made 1961-63 a unique source of clues to the military space program of the decade to come. We know, for example, that the space management innovations of 1961-63 remained with the Air Force, have become well-formulated and strongly developed in the OSD, and are even beginning to take root in other government agencies.

Will this close external interest and supervision continue? The answer is "Yes," or perhaps "Yes, as long as space systems are expensive." For space systems are not just expensive, they are shockingly expensive. A modest R&D program approved in 1969 can easily become an operational budget-devouring monster in 1972. Spacemen (and Clarke follows the custom) like to quote Tennyson's vision of

> . . . argosies of magic sails,
> Pilots of the purple twilight . . .

But the next phrase, "dropping down with costly bales," is usually glossed over or omitted. Space "bales" are indeed costly, unusually costly, because they are handcrafted, custom-built, and discarded after one use. Until some way is found to reduce these costs by at least an order of magnitude, military space activities will continue to receive very close attention at the top levels of the OSD—and above.

What do the lessons of the early '60s tell

us about space activities of the '70s? One may generalize, with reasonable confidence, on the military spacecraft of the '70s. They will be designed to provide, as now, observation, communication, and deterrent capabilities. The Manned Orbiting Laboratory will be flying during the '70s, getting answers to a multitude of questions about the space environment, somewhat like the space technology satellite of the early '60s. The very successful nuclear detection satellite will undoubtedly have follow-on counterparts in orbit. Attack alarm satellites will be patrolling the skies, alert to missile launchings over the entire globe. Communication satellites will continue to be useful for both strategic and tactical purposes and will show longer active lifetimes and an increase in available channels. Improved navigation satellites will certainly continue to serve an important defense function. Inspector satellites will probably be available for rendezvous with, and observation of, noncooperative objects in space.

The military man of this generation may roam personally or vicariously through near-earth orbit, but the planets and stars are not for him. He will be a space traveler but not a space explorer, for to enter the realms of cislunar or planetary space he would need to establish, in advance, an explicit, cost-effective need serving national objectives. This doctrine of the early '60s will echo throughout the '70s.

Working within a franchise that is constrained by money and motive (but still extending far beyond the Sahara), it is likely that the main "new" effort will go into advanced space technology, with the emphasis on "smaller," "lighter," "tougher," "cheaper," and "different," in the conviction that this is the route to changing the cost of proposed space systems from "prohibitively" expensive to "very" expensive.

Under these circumstances, it might appear to the military space enthusiast that the grass on the NASA side of the fence is very green. He should take a closer look. In 1969 NASA is hearing, and will continue to hear, the sobering phraseology so familiar to the DOD: "cost effectiveness," "options," "trade-offs," "national goals." NASA has also been hearing other ominous words, such as "Vietnam," "urban renewal," "disadvantaged," "surtax." The impetus of the 1961 Presidential announcement will carry NASA astronauts to the moon, but not far beyond, according to recent fiscal decisions. What happens to the moon program after a few successful landings will depend, in large measure, on Congressional and popular reaction to what is found on the moon. For, as Mr. Clarke points out, NASA bales are even more costly than DOD bales, with "the price of the first ticket to the Moon . . . approximately $10 billion, though in later Apollo flights, as development costs are written off, it should come to something like $1 billion." Since, as he goes on to say, "we cannot continue indefinitely to carpet the Atlantic seabed with Saturn V's," NASA's space program, like that of the DOD, must turn to a relentless pursuit of the "smaller," "lighter," "tougher," "cheaper," and "different."

The lack of approval for a postlunar manned program has led NASA to an introspection and self-analysis strongly reminiscent of the Air Force situation of 1961-62. Looking at the fiscal parabola which contrasts NASA's affluence of 1961-66 with the comparative frugality of the present, its planners have been working hard to find answers to the question, "How do we fill the gap?" Pessimists, stung by the prospect of retrenchment, have suggested drastic alternatives that would involute NASA back into the old National Advisory Committee for Aeronautics (NACA) or capitalize on new "growth stocks" such as oceanography or urban renewal. It is unlikely that NASA's choices will follow these avenues. Rather, it appears that, like the Air Force of 1961-62, NASA will emerge from its self-analysis with new concepts of management and a program more closely aligned to shifting national goals. For one example, NASA is in a preferred position, historically and by inclination, to assume national leadership in the basic research, development, and advanced technology required to produce smaller, lighter, tougher, cheaper, and different spacecraft. Second, NASA's strong interest in using spacecraft for the direct economic benefit of man could lead to extensions of already-useful programs typified by mete-

orological, geodetic, communication, and navigational satellites. Here the rules of cost effectiveness will certainly prevail as the costs of candidate space programs are compared to benefits to the United States. It seems clear, even now, that in some instances NASA will find itself in a position to use aircraft to excellent advantage as a complement to its space program. Third, it seems reasonable to conjecture that NASA will give increasing consideration to aeronautics. This could lead to an appropriate renewal of a pre-eminence which it had demonstrated for years and to which it still pays homage in the second word of its name. It would be anomalous, for example, if future advanced civil aircraft were developed and tested elsewhere than in the nation's aeronautics agency. Finally, if the '70s bring a serious international movement toward disarmament, it is possible that NASA would find a rewarding mission in developing and operating an arms control satellite—internationally, bilaterally, unilaterally.

Mr. Clarke writes:

> Every age has its dreams, its symbols of romance. Past generations were moved by the graceful power of the great windjammer, by the distant whistle of locomotives pounding through the night, by the caravans leaving on the Golden Road to Samarkand, and by the quinquiremes of Nineveh from distant Ophir . . . Our grandchildren will likewise have their inspiration—among the equatorial stars.

This "purely imaginative" view reflects a great inspirational influence in the early history of the United States military and civilian space programs. As these programs advance, a "purely technical" counterpoint is heard: inspiration is being forced to harmonize value with cost. Yet, of this nation's many visions, all costly, the inspiration of the stars will continue strong, and each decade will mark a giant stride toward fulfilling the promise that awaits us.

Washington, D.C.

CRISIS MANAGEMENT MADE MODERN

DR. RICHARD T. LOOMIS

IN A WORLD beset by conflict and the threat of conflict, the phrase "crisis diplomacy" has acquired a new significance in the organization and operation of U.S. national security. At first obscure and unique, the characteristics of crisis diplomacy have appeared with increasing regularity since the Cuban missile crisis in 1962, making possible today the identification and description of a new and critical dimension of the foreign policy process. The theme of this new development is the rising importance of the operational roles played by the national command authorities and the general decline of the policy-making functions. The more apparent manifestations include the growth of "crisis centers" in Washington, from which the President and his advisers manage emergencies at home and abroad; the centralization of decision-making in the nation's capital; the trend toward shorter and shorter decision times; and a mounting volume of conflict situations requiring Presidential action.

Concern over the impact of these develop-

ments on the institution and operation of U.S. public policy has frequently been voiced both in and out of government. However, the documentation and evaluation of these changes have been somewhat slow to emerge, mainly because the key policy-makers—the President, Secretary of State, and Secretary of Defense—have been preoccupied with fighting diplomatic fires and thus have had little time to act on the long-term implications.

The first major effort to study in detail the nature and extent of recent changes in foreign relations was initiated in July 1959 by the Senate Subcommittee on National Security and International Operations under the chairmanship of Senator Henry M. Jackson.[1] Now in its tenth year, the Jackson subcommittee has set a high standard for scholarly yet practical research into a complex subject over a wide range of topics. The literature it has developed now runs into the thousands of pages and is a prime source for data on national security policy, organization, and operations.

The basic charter of the committee was to investigate how well the government was organized to plan and implement national security policies in the nuclear age. Drawing upon the knowledge and experience of present and former government officials and students of foreign policy, the Jackson subcommittee explored at length such topics as policy-making at the Presidential level; the roles played in foreign policy by the Secretary of State and American ambassadors, the National Security Council, and the Bureau of the Budget; and the interdependence of foreign policy, nuclear strategy, and military technology. Changes wrought in the structure and procedure of foreign policy decision-making, in part the result of the findings and recommendations of this subcommittee, include initiation of the exchange program for State Department and Defense Department officers (1960), establishment of the Deputy Assistant Secretary of State for Politico-Military Affairs and the State Department crisis operation center (1961), and formation of the National Communications System (1963). The central purpose of such changes was to improve the quality and effectiveness of decision-making, particularly at times when the United States had to respond swiftly to crisis situations.

A second source of literature and insight on crisis diplomacy developed as the President's role as the nation's chief crisis manager began to make more and more headlines. The Cuban missile crisis, the Tonkin Gulf incident, the Vietnam war, domestic disturbances, the Kennedy assassination, and the Alaskan earthquake all underscored the prominence of the White House as the nation's command and control center for domestic as well as diplomatic emergencies. One result of this movement of power to the center was the publication of a number of "inside" accounts on Presidential crisis management, written by journalists and former government officials, who presented move-by-move descriptions of how decisions were made by the national command authorities in the midst of fast-moving and often confusing circumstances. Among the more successful studies in this category are the Schlesinger, Sorensen, and White books on the Kennedy years and the Hilsman volume on both the Kennedy and Johnson Administrations.[2]

Under this category of "history as it happened" is a book by Weintal and Bartlett, experienced Washington observers, who bring to their study a high level of knowledge and interest in the machinery of government.† Their goal, as stated in the Foreword, is to give the reader "an intimate glimpse of history in the making." Their approach is to present case studies of a number of crises, including Cyprus, Yemen, Cuba, and Vietnam, and to analyze in detail the manner, quality, and effectiveness of the foreign policy decision-making associated with each. The result is a valuable, well-informed study which highlights some of the more significant developments in the con-

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†Edward Weintal and Charles Bartlett, *Facing the Brink: An Intimate Study of Crisis Diplomacy* (New York: Charles Scribner's Sons, 1967, $5.95), vii and 248 pp.

duct of foreign policy during the 1960s. Much new information is included, particularly on Cyprus and Vietnam and the roles played by the negotiators and decision-makers both within and without the United States during these emergencies. A brisk, sophisticated style keeps the story moving at a rapid pace.

The authors rely on interviews with key members of the foreign affairs community for much of the insight and information they present. The focus is on the key participants in each drama and on the decision-making machinery of the United States government. Throughout, the authors compare the Eisenhower, Kennedy, and Johnson Administrations in terms of style and results. Eisenhower is depicted as a President who wanted each major foreign policy problem fully staffed. Thus he was attracted to the formalized use of the National Security Council (NSC) machinery to study and debate such issues as Quemoy and Matsu and the Nasser question. Toward the end of his term of office, as the pace of events accelerated, Eisenhower was obliged at times to set aside this procedure, one instance being the Lebanon crisis of 1958, which, according to Weintal and Bartlett, "was not even discussed in the NSC."

The advent of the Kennedy-Johnson Administration, according to the authors, introduced a significant shift in the method of handling foreign affairs issues as the need for quicker response and Presidential involvement became more urgent. Instead of the more formalized structure, as symbolized by the NSC, the emphasis turned to a more pragmatic, informal mode of operation. "Kennedy . . . distrusted large meetings as a forum for honest exchanges." His creation of the Executive Committee during the Cuban missile crisis, which turned out to be a condensed version of the NSC, is an example of how Kennedy improvised and personalized the foreign policy organization to meet the exigencies of changed circumstances.

President Johnson is pictured as entering office with neither a penchant nor a background for foreign relations. Eventually his instinct for decision-making in domestic matters applied also to foreign relations, which meant he utilized key advisers and the advice of friends (such as Abe Fortas and Clark Clifford) to supply him with the information and judgments needed for making decisions. This attitude and mode of operation are seen by Weintal and Bartlett as accelerating the trend toward a "highly personal, informal and frequently secretive procedure" in which traditional foreign policy planning is minimized.

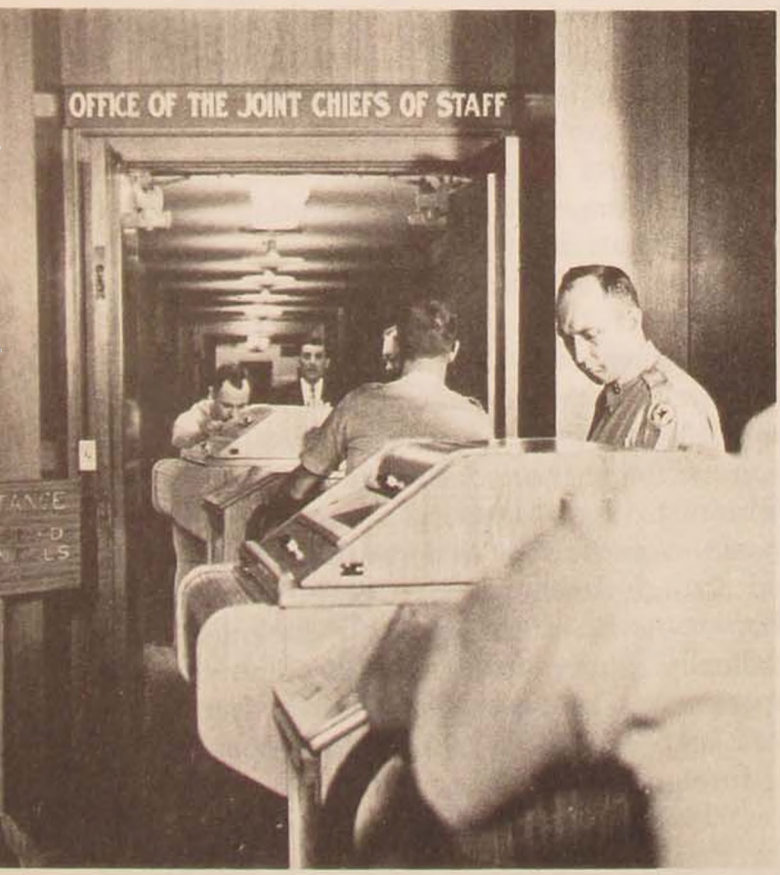
The conclusion by the authors that the 1960s witnessed a disintegration of the more institutionalized approach to the foreign relations process provided them with the thesis that the current U.S. foreign policy process needs urgent transfusions of precrisis planning to avoid future entanglements of high risk. "The crisis-ridden history of the Kennedy and Johnson administrations described in this book provides conclusive proof that impatience with a crisis situation coupled with the natural American tendency to 'do it now' has involved the United States in crises where, with some preplanning, involvement could have been avoided."' The pragmatic, ad hoc, hit-or-miss approach to decision-making during the last eight years has, according to the authors, led to an over-emphasis on the operational aspects of foreign affairs and a dangerous underemphasis on long-range planning. The President, they say, needs to return to the use of some "formal machinery" that will restore a sense of balance to the foreign affairs process, in which national goals, policies, and priorities will receive as much attention as day-to-day operations.

The argument by the authors for a return to some "formal machinery," perhaps modeled after the National Security Council organization as it functioned during the Eisenhower Administration, is generally unconvincing, primarily because it is oversimplified. The political change during the last eight years, which *Facing the Brink* convincingly documents, has radically altered foreign policy planning and operations. Fundamental national security factors such as total war and the response time of foreign nations, factors which formerly had long lead times, must now be structured into the President's operational role in addition to their inclusion in long-range forecasts. The

decisions of the Kennedy and Johnson Administrations to scrap some of the national security machinery of their predecessors (e.g., the Operations Coordinating Board of the NSC) are more a reflection of changes in the world environment than of differing Presidential styles. The presence of instant global communications, 30-minute rockets, and fractional orbit bombardment systems with a five-minute warning time is transforming the Presidential decision-making process, necessitating new solutions, new emphases.

This is not to argue that basic policy planning is no longer a primary concern. Rather, the machinery and the agenda for foreign relations planning in the future must be redrawn, and the planners must tailor their tasks and their solutions to the demands of nuclear diplomacy, in which the President's operational role will be a primary consideration.

Russian teletype equipment goes into the Pentagon terminal of the U.S.–U.S.S.R. direct communication system.



In examining the manner and method of decision-making during the Kennedy and Johnson Administrations, Weintal and Bartlett also allude to some of the technological forces that have contributed to the shift in emphasis from long-range planning to day-to-day operations. Although these factors—such as strategic nuclear weapons. jet travel, and modern communications—are not analyzed in depth in this study, it is quite apparent that they figure in a major way in the shaping of crisis diplomacy in the 1960s. The influence of technology on the organization and operation of national security has yet to be adequately documented and analyzed.

The flights and appointments of Undersecretary of State George Ball in Geneva, Athens, Ankara, Washington, and New York during the 1964 Cyprus crisis were dramatic examples of how jet travel has altered the format of classic diplomacy. In this episode one man negotiated a highly sensitive international crisis by moving between the major decision centers on a timely basis.

Perhaps the least heralded development of the technological revolution, however, has been the movement of modern communications to the center of the foreign policy process. George Ball's 90-minute trans-Atlantic teleprinter conference with Secretary Rusk during a crucial point in the Cyprus affair and the extensive use of cables between the State Department and American embassies are examples which can be cited from this book.

The most significant communication application, however, is the use made of the telephone and telegraphy in recent years by the President during emergencies. One example from *Facing the Brink*, involving President Johnson during the Dominican crisis, provides some insight into the impact of communications on the foreign policy process:

> Once, during the crisis in the Dominican Republic, the UPI reported that 12,000 rebels were poised to overwhelm the first contingent of American troops then being landed by helicopter on the island. Tearing the item from his ticker, Johnson placed an urgent call to McNamara, who happened to be testifying be-

The Presidential desk affords instant worldwide contact with commanders, diplomats, and allies.

fore a Congressional committee. McNamara had not heard of this menacing rebel force but he called General Earle Wheeler, chairman of the Joint Chiefs of Staff. One of Wheeler's subordinates, a colonel, was directed to call General Bruce Palmer, the commander on the scene, to learn what the report was all about. Not aware that the President had initiated the inquiry, the colonel balked, saying it was ridiculous to clutter up the communications channel with such garbage. By the time the query reached Palmer, the President had already telephoned him directly and been advised that the report was totally untrue.

The casual reference to President Johnson's telephone call to General Palmer in the Dominican Republic in the heat of crisis gives some hint of the great strides made in Presidential communications since that day in May 1878 when the first telephone set was installed in the White House. For the first fifty years, the telephone was used mainly by the White House staff. Then in March 1929, reflecting a trend toward the increased use of the phone by Presidents Coolidge and Harding, President Hoover ordered a handset installed on his desk, putting him in arm's reach of a communication network that provided immediate contact with the nerve centers of the nation.

Some eleven years later, in May 1940, President Roosevelt ordered a private line between the White House and Prime Minister Churchill's official residence in London. This link enabled the two Allied leaders to discuss and decide critical wartime issues virtually in

real time, bypassing the time-consuming diplomatic practices and procedures. After World War II, advances in telephony, such as submarine telephone cables, communication satellites, and electronic switching, came with amazing speed, and with them came a further projection of Presidential power both nationwide and overseas. Today, through worldwide communication networks, President Johnson can talk instantly with his military commanders at home and abroad, as well as with his diplomatic representatives and America's allies. He has a direct line to the British Prime Minister. He can and does talk directly with the top U.S. commander in Vietnam. "If knowledge is power," conclude Weintal and Bartlett, "up to the minute knowledge yields special power to a crisis operator like Johnson." And key instruments in this power leadership are the telephone and the broad array of telecommunications now available to the President.

One feature of *Facing the Brink* that will be distracting to many is the overpursuit of personality analysis, in which the authors seek to penetrate the subtleties of leadership behavior. For example, the in-depth and critical comparisons of Presidential styles (Kennedy versus Johnson) in the chapter "Diplomat in Chief" do not contribute significantly to an understanding of the foreign affairs process but do add measurably to the partisan discord. Much the same can be said for the chapter on the Secretary of State, in which the authors trace the career of Dean Rusk under two Presidents, a career which they roundly criticize for its lack of imaginative leadership. In the instance of Rusk, Weintal and Bartlett overanalyze to the point of contradicting themselves. After a deep criticism of his career, the authors end by praising Rusk (along with Ball, McNamara, and Rostow) as a member of "a team which any government in the world would be proud to call its own."

This journalistic prerogative, however, does not overshadow the intrinsic importance of this book as a valuable contribution to the anatomy of foreign policy decision-making in the nuclear age. Testifying before the Jackson subcommittee on the organization for national security, General Maxwell D. Taylor called for a system of "politico-military bookkeeping" by which the President and his advisers could keep close tabs on major and minor shifts in the world environment affecting national security. *Facing the Brink* is a welcome contribution to such a system of politico-military bookkeeping, in which changes in the foreign policy process precipitated by the crisis diplomacy of the 1960s are identified and evaluated.

Annandale, Virginia

Notes

1. Since 1959 the Jackson subcommittee of the Senate Committee on Government Operations has functioned under three names: Subcommittee on National Policy Machinery, 1959–62; Subcommittee on National Security Staffing and Operations, 1962–65; and Subcommittee on National Security and International Operations, 1965 to date.

2. The studies referred to include: Arthur M. Schlesinger, Jr., *A Thousand Days* (Boston: Houghton Mifflin, 1965); Theodore Sorensen, *Kennedy* (New York: Harper & Row, 1965); Theodore H. White, *The Making of the President, 1964* (New York: Atheneum Publishers, 1965); and Roger Hilsman, *To Move a Nation* (New York: Doubleday & Co., 1967).

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THE EDITOR

The Contributors

General James Ferguson is Commander, Air Force Systems Command, and Director, Manned Orbiting Laboratory (MOL) program. Commissioned from flying cadet in 1937, he organized the 405th Fighter-Bomber Group in 1943 and took it to the European Theater. He was Assistant Chief of Staff, 9th Fighter Command, during the Normandy invasion and its Chief of Staff when the war ended in Europe. He then served briefly with the 5th Fighter Command in the Philippines and Okinawa. Other assignments have been as instructor in tactical air operations, Air Command and Staff School; Chief of Staff, American Mission for Aid to Turkey; Assistant Deputy for Operations, Far East Air Forces; Vice Commander, Fifth Air Force; Deputy Commander, Ninth Air Force, TAC; Director of Requirements, DCS/D, Hq USAF; Vice Commander, Air Research and Development Command; and Deputy Chief of Staff, Research and Development, Hq USAF, from 1961 until his present assignment in 1966.

Brigadier General Raymond A. Gilbert (M.S., Ohio State University) is Director of Laboratories, Air Force Systems Command. After flying training in 1941, he served in Air Training Command and in research planning during the war. Postwar assignments have been at Air Proving Ground; in USAFE in airline management and intelligence assignments; as nuclear research officer, Air Force Special Weapons Center; theoretical physicist, Lawrence Radiation Laboratory; Chief, Analysis Division, and Director of Research, Special Weapons Center; Deputy Commander, Sciences, AF Office of Scientific Research; DCS/P&O and C/S, Research Division, Air Research and Development Command; C/S, Office of Aerospace Research; military assistant to the Deputy Director of Defense Research and Engineering, OSD; Commander, Air Force Weapons Laboratory; and Vice Commander, Headquarters Research and Technology Division, Bolling AFB, D.C.

Major General Harry E. Goldsworthy (B.S., Washington State College) is Commander, Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio. Commissioned in 1940, he commanded the 10th Bombardment Squadron in Puerto Rico and Trinidad; the 377th Bombardment Squadron and 329th AAF Base Unit at Columbia AAB, South Carolina; and the 42d Bombardment Group (M), Pacific Theater. Postwar assignments have been as Tactical Inspector and Commander, 7th Bombardment Group and Wing, Carswell AFB, Texas; member, Weapons Systems Evaluation Group, Hq USAF; DCS/O, Hq Air Proving Ground Command, Eglin AFB, Florida; Inspector General and C/S, Seventeenth Air Force, Morocco; Vice Commander, 4061st Air Refueling Wing, SAC, and Commander, Det. 18, Ballistic Missiles Center, Los Angeles, duty at Site Activation Task Force, Malmstrom AFB, Montana; and at Hq USAF as Director of Production and Programming, DCS/Systems and Logistics, from 1963 until his present assignment in 1967.

Major General Joseph S. Bleymaier (B.A., University of Texas) is Deputy Director, Manned Orbiting Laboratory (MOL) program, and heads the MOL Systems Office at AFSC's Space and Missile Systems Organization (SAMSO), Los Angeles. He enlisted in 1941, was commissioned in 1942, and served as aerial gunnery officer on 25 combat missions with 11th Bomb Group (H), Seventh Air Force, Pacific Theater, 1943–45. Postwar assignments have been as Deputy for Test Operations, Air Proving Ground, 1946–50; Assistant Director, Command Support Division, Deputy for Development, Hq USAF; at Hq Air Research and Development Command, 1952–58, became Assistant Director of Astronautics; with AF Ballistic Missile Division, later Space Systems Division; and as Commander, AF Western Test Range, from 1965 until his present assignment in 1967. General Bleymaier is a graduate of Air Command and Staff College and Air War College.

Brigadier General Gustav E. Lundquist (M.S., North Carolina State College) is Commander, Arnold Engineering Development Center, AFSC, Arnold AFS, Tennessee. He enlisted as a flying cadet in 1940 and was an experimental test pilot 1942–48, testing many of the aircraft used in World War II and later the research aircraft X-1. Other assignments have been with the Atomic Energy Commission, 1952–55; as Professor and Head of the Physics Department, Air Force Academy, 1961–63; Deputy for Engineering and Technology, Electronic Systems Division, AFSC, Hanscom Field, Massachusetts, 1963–65;

Deputy Commander, Rome Air Development Center, Griffiss AFB, New York; and Commander, Systems Engineering Group, Wright-Patterson AFB, Ohio, from 1966 until his current assignment in 1967. General Lundquist is a graduate of Army Command and General Staff School and the National War College.

BRIGADIER GENERAL JOHN B. HUDSON (USMA) is Deputy Chief of Staff, Personnel, Hq Air Force Systems Command. After commissioning and flying training in 1943, he flew 82 combat missions over Europe in P-47s as flight commander and operations officer, 404th Fighter Squadron. During 1944–45 he served in the Directorate of Post Hostilities Plans, Hq USAAF Europe. Postwar assignments have been as test pilot and squadron commander, Air Proving Ground; Inspection Team Captain, Hq USAF IG unit, Langley AFB, Virginia; Deputy Base Commander and Assistant Inspector General, Hq 5th Air Division (SAC), Morocco; student, Air Command and Staff College; Deputy Commander, Western Development Division, ARDC; student, National War College; Chief, Colonels Assignment Group, DCS/P, Hq USAF; and Assistant Deputy for Engineering, later Deputy for Launch Vehicles, Hq Space Systems Division, AFSC, from 1963 until his current assignment in 1966.

BRIGADIER GENERAL HENRY C. HUGLIN, USAF (Ret), is a Senior Military Scientist with TEMPO, General Electric's Center for Advanced Studies, Santa Barbara, California. After graduating from the U.S. Military Academy in 1938, he took flying training and during World War II commanded a B-29 group, Twentieth Air Force, based on Tinian. Postwar assignments were in the Far East and Europe. He served eleven years with the North Atlantic Treaty Organization, ultimately as Deputy U.S. Representative to the NATO Military Committee and Standing Group, 1959–63. General Huglin is a graduate of the National War College and a member of the Council on Foreign Relations, New York, and the Institute for Strategic Studies, London. He has previously contributed to the *Review*.

LIEUTENANT COLONEL THOMAS C. PINCKNEY (M.A., Syracuse University) is Assistant Operations Officer and F-4 Aircraft Commander, Da Nang Air Base, Republic of Vietnam. After graduation from the Citadel and completion of flying training in 1952, he served in flying assignments on Okinawa and at Travis AFB, California. As Assistant Professor, Department of Political Science, USAF Academy, for four years, he was responsible for publication of the 4-volume USAFA *Readings in Defense Policy*. Other assignments have been as Action Officer, Arms Policy Branch, Deputy Directorate of Plans for Policy, Hq USAF, 1964–66; as an exchange officer, Special Assistant to the Deputy Undersecretary of State for Political Affairs; and in F-4 replacement training and survival schools until his present assignment in June 1968.

AMBASSADOR WILLIAM JOSEPH SEBALD (USNA; LL.D., University of Maryland) served in the Navy 1922–30, including three years as Language Officer, American Embassy, Tokyo. After finishing law school in 1933, he practiced in Japan, 1933–39, and in Washington until Pearl Harbor, when he was assigned to the Office of Naval Intelligence. Reverting to inactive status in 1945 with rank of Captain, USNR, he was appointed Special Assistant, Auxiliary Foreign Service, on staff of Political Advisor to Supreme Commander, Allied Powers. His career in the Foreign Service, Department of State, began in 1947 and included assignments as Foreign Service Officer, Tokyo; Ambassador to Burma; Deputy Assistant Secretary of State for Far Eastern Affairs; and Ambassador to Australia from 1957 until his retirement in 1960. Ambassador Sebald's writings about Japan include *With MacArthur in Japan* (1965) and, with C. Nelson Spinks, *Japan: Prospects, Options, and Opportunities* (1967).

MARTIN H. SCHARLEMANN (Ph.D., Washington University; Th.D., Union Theological Seminary), Chaplain (Brigadier General), AFRes, is Graduate Professor of Exegetical Theology, Concordia Seminary, St. Louis, Missouri. Commissioned as First Lieutenant, AUS, in 1941, he served on active duty until 1952, notably overseas with 43d Air Service Group (1942–45) and as instructor, The Chaplain School (1946–51). His Reserve assignment is as Assistant to the Chief of Chaplains. Materials he wrote on moral leadership and character guidance in 1946–51 are still used by the U.S. armed forces. He graduated from Air War College by correspondence and is a regular guest lecturer at Air University. Chaplain Scharlemann is author of numerous books and articles.

DR. JOSEPH CHURBA (Ph.D., Columbia University) is a member of the Documentary Research Division, Aerospace Studies Institute, and of the faculty, Air University. He was formerly Senior Middle East Specialist for the Office of National Security Studies and has served as Professor of Government at both the University of Winnipeg, Canada, and Adelphi University. Dr. Churba has contributed articles to *Military Review* and *Ideas* and is coauthor of *The Jewish Stake in Vietnam* (1967). His book entitled *Egypt and Israel in Africa* will be published in 1969.

MAJOR GENERAL MILTON B. ADAMS (USMA) is Chief of Staff, Pacific Air Forces. After flying training in 1940, he served with the 22d Pursuit Squadron and commanded the 328th Fighter Group; in the Pacific Theater 1943–45 he commanded the 18th Fighter Group and flew 275 combat missions. Other assignments have been as Advisor to the Iranian Air Force; faculty member, Air University; Commander, Basic Jet Flying School and Advanced School for Tactical Fighter Pilots; at Hq USAF, 1959–62, including 18 months as Director of Systems Acquisitions, DCS/S&L; as ACS/Plans, Military Assistance Command, Vietnam, 1962–65; Commander, USAF Tactical Air Reconnaissance Center; Deputy Director for Forces, Defense Communications Planning Group; and Commander, Headquarters Command. He is a graduate of Air War College and National War College.

MAJOR ALBERT H. THELANDER (A.B., Harvard University; M.A., University of Colorado) is Assistant for Housing Policy, DCS/P, Hq Tactical Air Command. Previous assignments have been in the Air Materiel Command, 1952–53; with Far East Air Forces, Tokyo, 1953–56; as instructor in history and philosophy, United States Air Force Academy, 1956–60; Personnel Officer, Hahn AB, Germany, 1960–63; with AFROTC, University of Michigan, 1963–66; and as Training Officer, Shaw AFB, South Carolina, 1966–67. Major Thelander is a graduate of the Personnel Officer Course and Academic Instructor Course (AC&SS) and has contributed an article to the *USAF Instructors Journal.*

COLONEL PAUL WORTHMAN (M.A., Miami University) is Deputy Director of the Space Systems Office, Office of the Secretary of the Air Force. After completing aviation cadet training in 1942, he served as a meteorologist throughout World War II in the Pacific Theater. Postwar assignments have been as Chief, Atmospheric Sciences Section, Hq USAF; as head of the Atmospheric Devices Laboratory, AF Cambridge Research Center, 1953–56; as Chief, AF Ballistic Missile Division Office, Hq Air Research and Development Command; as Director of Space Systems, AFBMD, and Chief, Plans and Programs Office in the newly formed Space Systems Division, from 1960 until his present assignment in 1962.

DR. RICHARD T. LOOMIS (Ph.D., Stanford University) is a member of the technical staff of the MITRE Corporation at Tyson's Corner, Virginia. He served as a historian for the U.S. Air Force, 1955–57, and was with Lockheed Missiles and Space Company, 1957–62, performing foreign policy studies relating to the Polaris deterrent system. At Stanford Research Institute, Menlo Park, California, 1962–68, he was a senior politico-military historian, specializing in analysis of the crisis management process at the national level. Dr. Loomis has taught history at Carleton College and San Jose State College.

AWARD

The Air University Review Awards Committee has selected "Khe Sanh: Keeping an Outpost Alive" by Major General Burl W. McLaughlin, USAF, as the outstanding article in the November-December 1968 issue of *Air University Review.*

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