SEPTEMBER 1962 / $1.00

AIR FORCE

and SPACE DIGEST

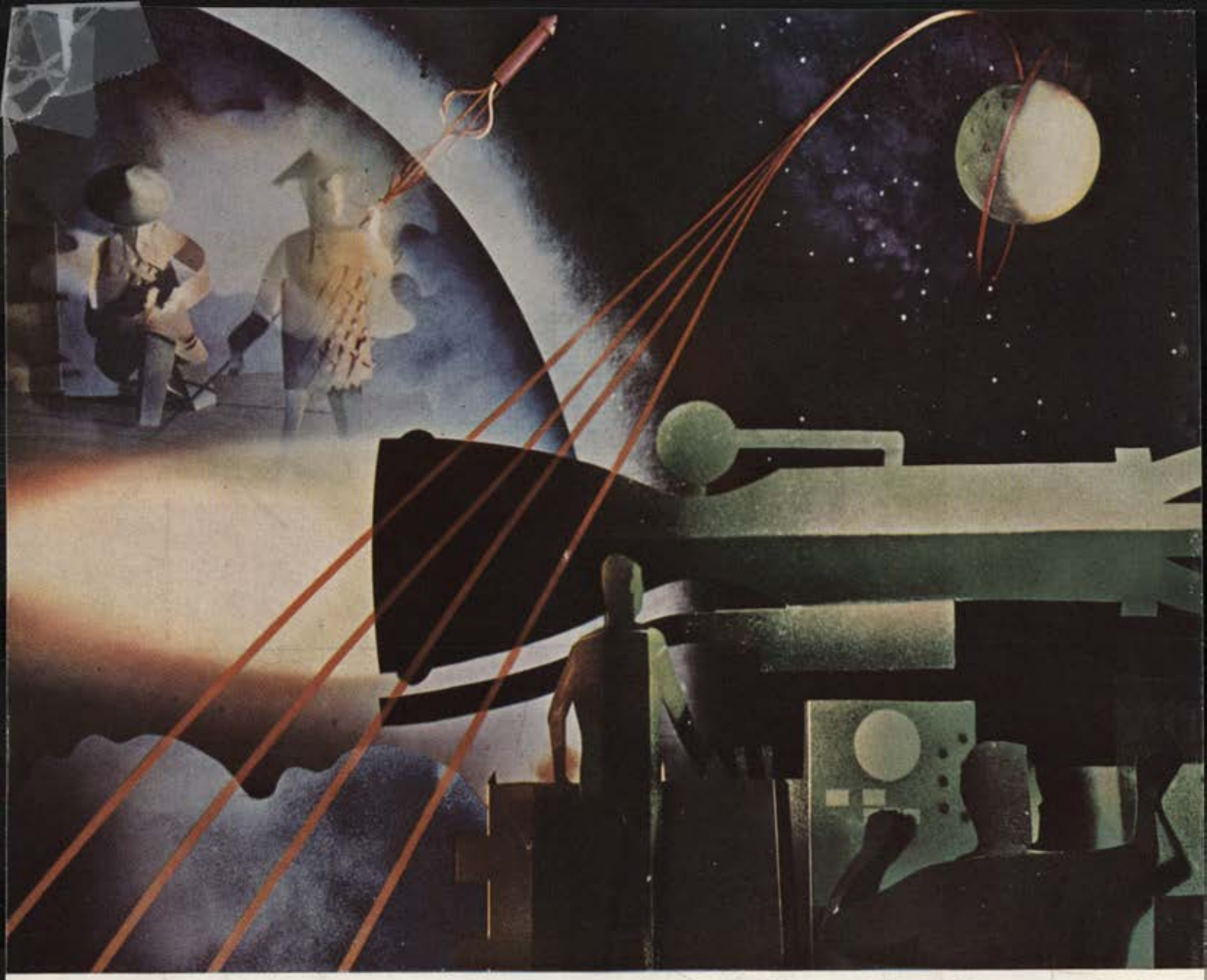
The Magazine of Aerospace Power / Published by the Air Force Association

1962

AIR FORCE ALMANAC

"BEST COLOR PHOTOGRAPH OF THE YEAR"

The Air Photographic and Charting Service has named this photo, by SSgt. Claude Holland, the best color shot of the year by one of their photographers. The picture shows a Thor-Able-Star booster on its Cape Canaveral pad before launching a Transit navigation satellite.



• *History of rocketry from 13th Century China to the present symbolized*

Bell research makes MAJOR CONTRIBUTIONS to aviation, missile and space programs

AGENA ROCKET ENGINE – Stop-and-start engine for the Air Force and NASA satellite and space probe programs. It has put in orbit more payload than any other engine.

HIPERNAS – High Performance Navigation System. Designed for the U.S. Air Force, this self-compensating, pure inertial guidance system can pinpoint a long-range missile on target, or guide a satellite or space ship to any point in the universe.

VTOL AIRCRAFT – Bell built the X14A now being used by NASA to evaluate VTOL flight characteristics. First flown six years ago, it was followed by design of the 8 engine D188A VTOL Fighter-Bomber for the U.S. Air Force and Navy. Bell currently is competing for other contracts in the VTOL field.

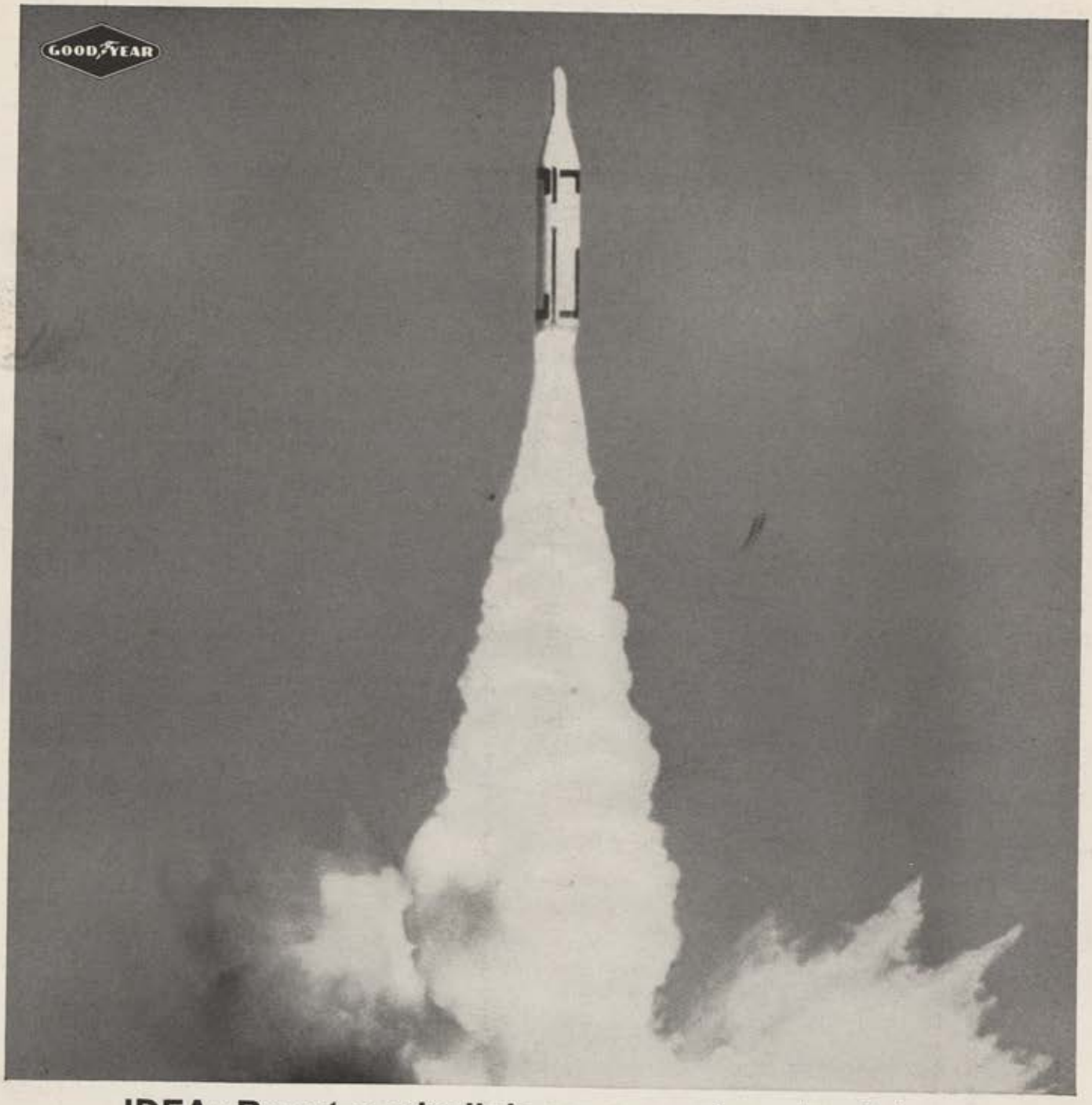
STEERING GEAR FOR MERCURY ASTRONAUTS – Jet Reaction Controls, developed by Bell, control the roll, pitch and yaw of the Mercury capsule in space.

BELL ROCKET BELT – First portable rocket device to give man free flight. Publicly demonstrated at Ft. Eustis, Va., June 8, 1961, it is now being studied by the Army for ship-to-shore landings and carrying the foot soldier over streams and rugged terrain.

ALS – All-weather, automatic Aircraft Landing System. This electronic "window in the sky" automatically guides planes to safe landings in foul weather, at night, even in heavy seas. Purchased by the Air Force and by the Navy for installation on 12 modern aircraft carriers.

BELL AEROSYSTEMS COMPANY • *Buffalo 5, N. Y.*
DIVISION OF BELL AEROSPACE CORPORATION

A textron COMPANY



IDEA: Boost a missile's range and payload, too

Cutting inert motor weight is one of the fastest ways to increase a missile's range or payload. It's not easy . . . but it can be done. And 14 years ago, GAC—Goodyear Aircraft Corporation—started working on an idea that would do it.

The idea: Filament winding—a technique brought to a fine art by GAC...a technique being used today by GAC to make Polaris first stage rocket motor cases.

Filament winding offers many advantages—strength, lightness, reliability and, most importantly, higher strength-weight ratios. Proof? The Polaris cases we make are as much as ⅓ lighter than steel cases of the same strength.

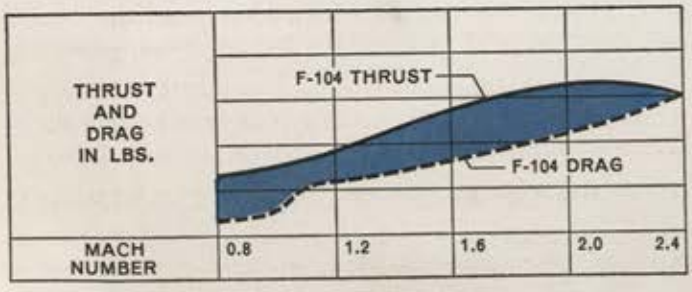
GAC can also wind nozzles, liquid propellant tanks, pressure vessels, ultra-large booster cases and similar products. If you need talent in these areas—or help with advanced systems and technology, aerospace support equipment, electronic subsystems, lightweight structures, or missile requirements—write: Goodyear Aircraft Corporation, Dept. 914VU, Akron 15, Ohio, or Litchfield Park, Arizona.

LAND, SEA, AIR OR SPACE ...TALENT THAT BUILDS BETTER DEFENSE SYSTEMS

GOODYEAR

GOODYEAR AIRCRAFT CORPORATION

Have you looked at the F-104's thrust-over-drag curve lately?



As you can see by the chart at left, the F-104's drag doesn't equal thrust until Mach 2.4. The area in blue indicates the available reserve thrust.

This reserve thrust gives the F-104 tremendous extra power for supersonic acceleration, supersonic climb, and supersonic maneuvering. The F-104 can accelerate from Mach 1 to Mach 2 in two minutes. And the F-104 can maintain Mach 2 through a 3.3G steady

state turn even when carrying wingtip Sidewinders.

But extra thrust isn't everything. Versatility is important, too: the ability to carry a variety of external stores and internal electronics, including the most advanced all-weather systems. Maintenance is also a big factor. Recently a USAF squadron in Germany flew 836 hours and 5 minutes in one month – with only 12.4 maintenance man hours per flight hour.

The F-104 is rolling off production lines at the greatest rate in its history. F-104s are being produced in 7 nations for 11 air forces, including the United States. Never before have so many nations been brought together to build one weapon for the common defense.

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A division of Lockheed Aircraft Corporation, Burbank, California

LEADERSHIP IN FLIGHT: airplanes, helicopters, aerospace planes, spacecraft

The Magazine of Aerospace Power / Published by the Air Force Association

AIR FORCE

and SPACE DIGEST

DEPARTMENTS

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SPACE DIGEST

VOLUME 45, NUMBER 9 • SEPTEMBER 1962

REPORTS FROM THE USAF COMMANDS

AN AIR FORCE ALMANAC

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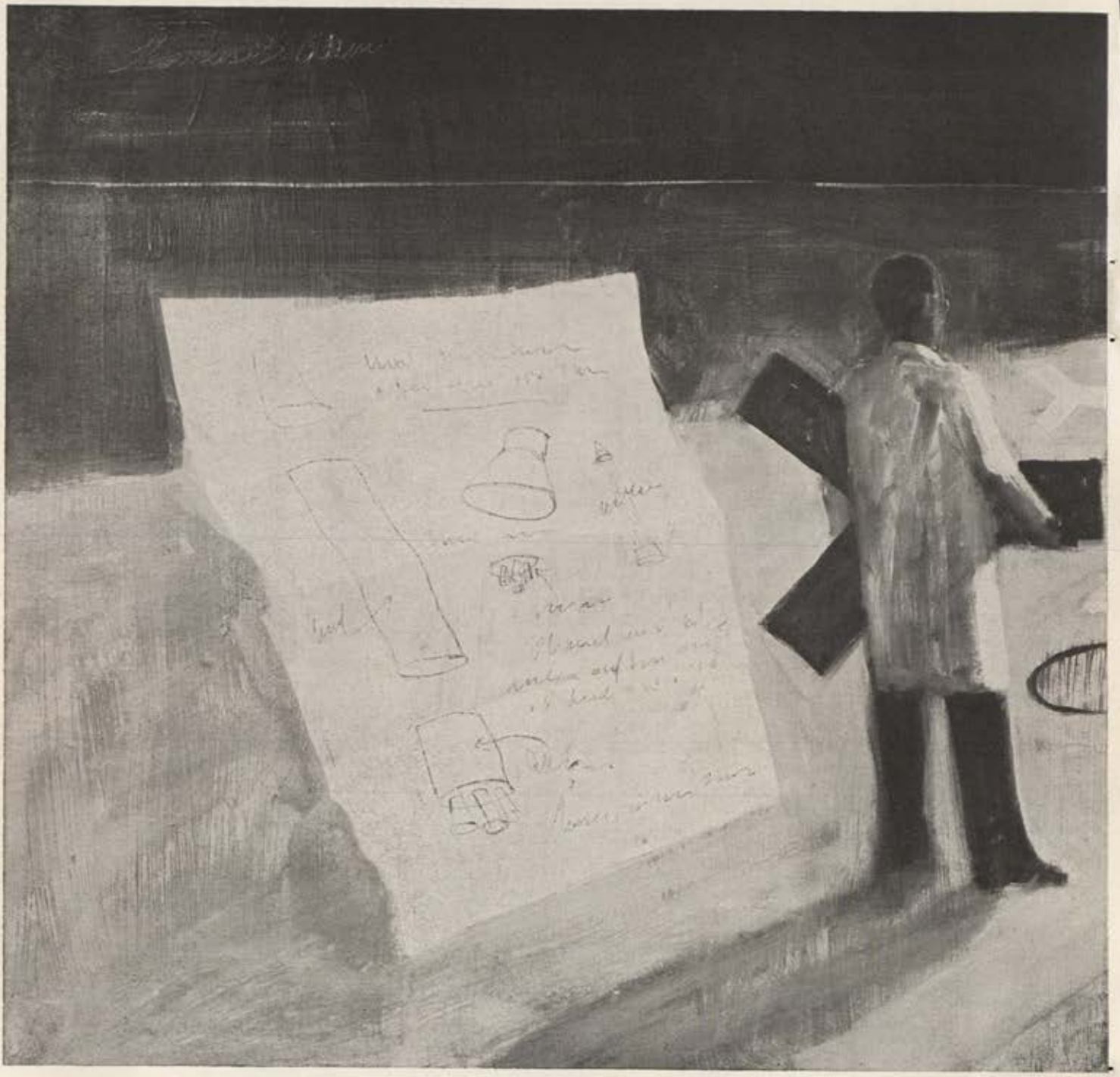


THE PRACTICAL MEN

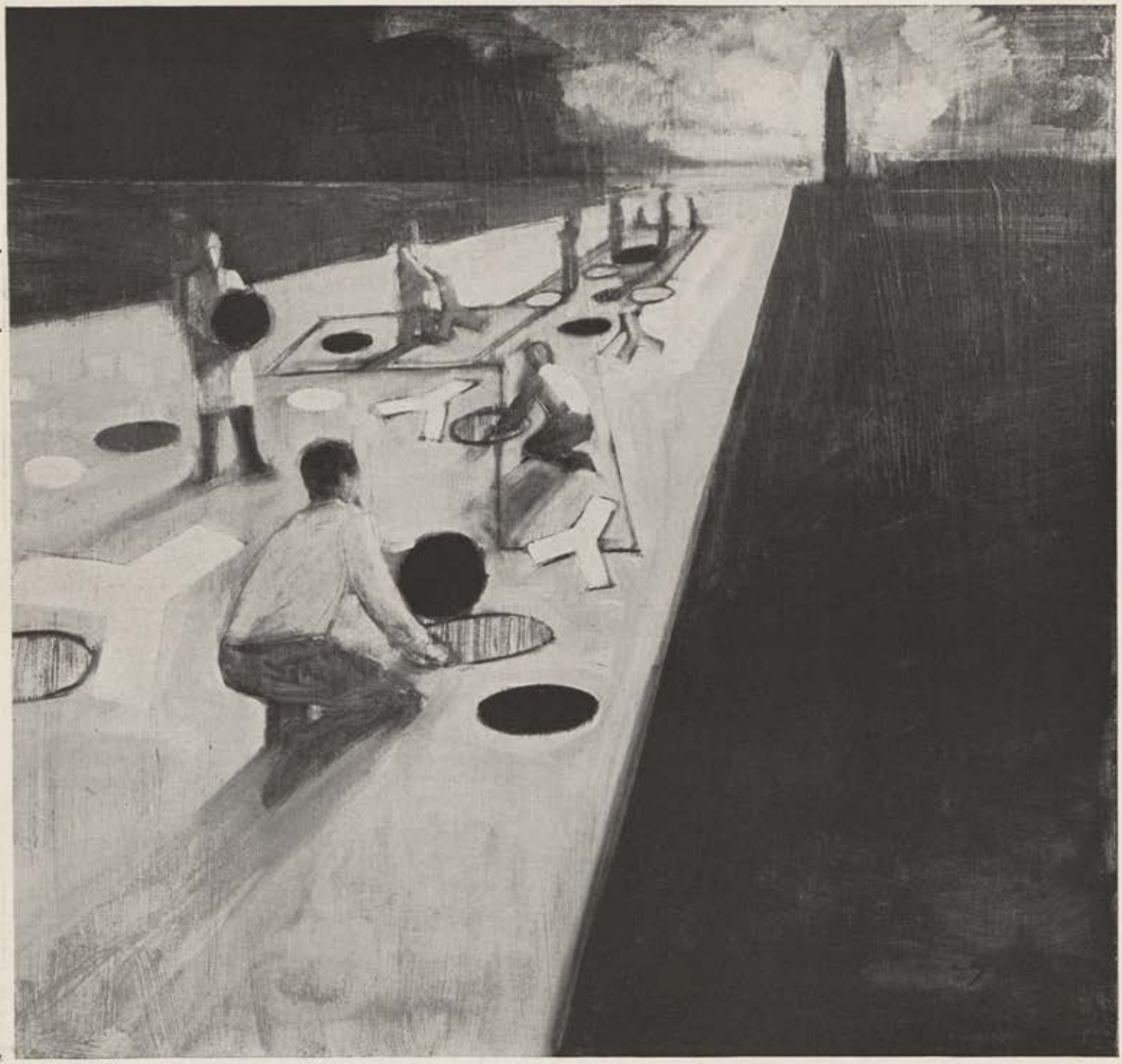
An idea is born.

It could lead to a great scientific accomplishment. It could even create a new technology.

But first it must achieve reality. To do this it must leave the theorist and go to another kind of man, a man with a more practical bent of mind.

This is the challenge for creative engineers and modern management: to turn ideas into realities. And today this work is more difficult than ever before.

For now the aerospace industry is called upon to engineer space ships that will travel thousands of miles from earth and return. It is called upon to develop rocket engines with the power of a million automobiles. It is called upon to produce electronic equipment that will last thousands of hours... to design antenna systems that can listen to stars billions of miles away... to produce electricity by nuclear power with increasing efficiency.



Even while you are reading this, the engineers of the aerospace industry are working toward these objectives. They are creating functional ideas from broad theories. They are searching out the exact materials, equipment, systems, and components to suit their needs. Often in this search they must create their own answers.

Steadily, piece by piece, part by part, the finished whole begins to emerge. The prototypes are examined. Tests run. And finally the new system is complete—tested, proved, ready to use.

This is the work of men who turn ideas into reality. This is the work of men who are creating the products of tomorrow and the industries of the future.

This is the work of the practical men.

North American Aviation is at work in the fields of the future through these six divisions: Atomics International, Autonetics, Columbus, Los Angeles, Rocketdyne, Space & Information Systems.

Editorials

Counterforce and Mr. McNamara

By John F. Loosbrock
EDITOR, AIR FORCE/SPACE DIGEST

MORE than two months have passed since Secretary of Defense Robert S. McNamara spelled out publicly, in a speech at Ann Arbor, Mich., on June 16, official acceptance by the United States of a counterforce strategy of deterrence—as opposed to a strategy of minimum deterrence and its various manifestations such as "countervalue," "countercity," "stable deterrence," "balance of terror," and the like.

An analysis shows that the response to this proposal from the highly articulate segment of the public which writes editorials and letters to editors has been largely critical of the Secretary's position. Proponents of the idea that one somehow can prevent a war from starting without possessing the ability to prevail should war begin have been vocal and persuasive over the years. Even within the Air Force, acceptance of counterforce as strategic doctrine came slowly and somewhat grudgingly. This is probably because counterforce is a highly sophisticated and complex response to an equally sophisticated and complex problem. It is easily misunderstood, especially when it conflicts with long and deeply held beliefs and prejudices. This is why the discussion and understanding of it must be broadened, a fact of which Mr. McNamara has indicated he is quite aware. Counterforce has never been popular in Army and Navy circles nor among those who see arms control and disarmament as the only, immediate, and last hope for world peace. Gen. Maxwell Taylor, the new Chairman of the Joint Chiefs, took a dim view of counterforce in the book we're sure he wishes had never been written—*The Uncertain Trumpet*—and it will be interesting to see how this one is resolved, in light of the Secretary's position.

In the Ann Arbor speech, which has been described as a watered-down version of what he had told the NATO Council in Athens the month preceding, Secretary McNamara described the Administration's strategic doctrine in these words:

"The US has come to the conclusion that, to the extent feasible, basic military strategy in a possible general nuclear war should be approached in much the same way that more conventional military operations have been regarded in the past. That is to say, principal military objectives, in the event of a nuclear war stemming from a major attack on the alliance, should be the destruction of the enemy's military forces, not of his population.

"The very strength and nature of the alliance forces make it possible for us to retain, even in the face of a massive surprise attack, sufficient reserve striking power to destroy an enemy society if driven to it. In other words, we are giving a possible opponent the strongest imaginable incentive to refrain from striking our own cities."

It is an anomaly, and at the same time illustrative of the complexity of the problem, that those military men whose services are most strongly rooted in tradition should resist a strategy that, in effect, attempts to return war to the battlefield, where it belongs, in consonance with the classic principles of war. It is likewise anomalous that counterforce doctrine is resisted so strongly by those who, for essentially moral and humanitarian reasons, abhor war as the greatest evil that can befall mankind. Premier Khrushchev doesn't like counterforce either, terming it "a monstrous proposal filled from beginning to end with a misanthropic disdain for men, for mankind, because it seeks to legalize nuclear war and thereby the murder of millions upon millions of people." Strategic debate, as does politics, makes strange bedfellows.

Our analysis of critical reaction to Mr. McNamara's speech indicates that it centers upon four major assertions which we will touch on briefly in turn.

1. **Assertion:** *that a counterforce strategy will provoke an arms race.*

This is true to some extent and in large measure must account for the violence of Premier Khrushchev's reaction to Mr. McNamara's proposal. For the economy of the USSR is ill-prepared to support this kind of military competition and the Soviets know that stabilization of nuclear weapons on a basis of arithmetical parity alone would mean that actual military superiority would pass to the USSR. Thus, when the question of comparative size of nuclear stockpiles is associated unfavorably with counterforce, the USSR stands to benefit from restrictions on nuclear weapons and fears that result in reluctance to employ them. Likewise, Western fears of engaging in an arms race redounds to the advantage of the Soviets and it is fruitful for them, from a military as well as a propaganda point of view, to put the onus for continuance of the arms race on the United States. A counterforce strategy does require a higher level of armament for the West, although improved targeting can actually reduce the required megatonnage. But in fairness and in the interest of realism, the blame for stimulating an arms race must be placed on Soviet attitudes and actions over the past seventeen years, not upon the strategy which seeks to respond sensibly to these attitudes and actions.

2. **Assertion:** *that a counterforce strategy indicates a first-strike intention on the part of the US, and thus is likely to provoke a pre-emptive attack by the Soviets.*

If this is so then the United States policy as promulgated over the years would prove to be both dishonest and wasteful. We would be dishonest because we have consistently reiterated a national policy of striking only in response to aggression and there is little question but that this policy accurately reflects the beliefs of the vast majority of Americans. We would be wasteful because we are expending enormous resources in protecting our strategic forces against surprise attack, expenditures that would be unnecessary and unwarranted if our strategy included an intention to strike first. Our early-warning systems, our elaborate SAC alert procedures, our hardening of missile sites, our quest for a protected and foolproof command and control system —all these are concrete and very expensive evidence of our second-strike intent. Counterforce then becomes the only logical strategy to employ from a second-strike posture, if we are not to make our cities and our people hostages to Soviet counterretaliation.

3. **Assertion:** *that counterforce strategy is technically infeasible.*

As the nuclear delivery forces of both sides become more sophisticated—hardened, mobile, small, dispersed, hidden, spaceborne—it will be increasingly difficult to bring

them under attack. No one claims that the execution of a counterforce strategy is easy, but it is not impossible if we exploit our technological resources. The RS-70, with its sidelooking radar and guided air-to-surface missiles, is only one way that technology can be pushed to improve our war-winning capability.

In this connection, it is often asked if we were to employ a counterforce strategy from a second-strike posture, against what military forces would we direct our attack? Would we not be hitting only empty missile launch sites and vacated airfields? This would be true only if the enemy were to act most irrationally indeed and expend his entire force salvo-style in the initial attack. But he would then have to consider how to deal with the portion of our force which had survived the first blow. If we retained only enough capability to destroy his cities, as the minimum deterrent school would have it, then the enemy could counterretaliate against our own cities with his residual capability. This kind of war is senseless indeed. Rather than compromising the validity of a counterforce strategy, technology, especially in the development of military space systems, promises to solve a good many of its problems. Space must be boldly exploited to achieve military operational capabilities in the areas of surveillance, reconnaissance, and command and control to enable us to maintain counterforce as a necessary and viable strategy for the future.

4. **Assertion:** *that a counterforce strategy is unrealistic in that it depends on enemy "cooperation" to spare our cities.*

This is what Premier Khrushchev undoubtedly had in mind when he referred to the McNamara doctrine "as a sort of proposal to the Soviet Union on 'rules' of conducting nuclear war." Indeed, it might not be illogical to conclude that Khrushchev's ridicule of counterforce as a sensible US strategy is in itself an indication of the magnitude of the problems it poses for the Soviet Union. Rather than depending on enemy cooperation in sparing cities, counterforce accomplishes the same purpose from the standpoint of national self-interest. The threat to destroy enemy cities might serve as a ploy in power-oriented diplomacy but actual execution of such a threat against a foe which retained the power to destroy one's own cities in retaliation would not be in the national self-interest of either party.

Obviously, neither Mr. McNamara nor anyone else can guarantee absolutely that our cities would be spared in a general nuclear war. But he has recognized the obligation to offer the enemy the greatest possible incentive to spare our cities. In so doing he has exhibited both strategic statesmanship and great courage.—End

The Threat Is Closer Than the Moon

By William Leavitt
ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

As this Air Force Almanac issue went to press, Soviet government and people were basking in the triumph of the latest Russian space feat—the tandem multi-day orbiting in two nearly identical paths of a pair of Cosmonauts launched within a single twenty-four-hour period and recovered safely six minutes apart.

The Soviet achievement was effected after a long hiatus in Red manned spaceflight activity that had been recently punctuated by a series of unmanned vehicle launches.

The Russian feat underscores the expanding Soviet capability, if that is what they have in mind, for close-in orbital military operations. It would seem hard to deny that they will soon have the ability to link space components in near-earth orbit, something we do not expect to accomplish before 1964 in the National Aeronautics and Space Administration's Gemini program. Indeed, it is quite possible that the Soviets actually did effect a form of rendezvous in the early phase of the double orbit. Rendezvous skill, a precondition of docking and linking of components, is but a few steps from the capability to deploy military space stations at approximate 100-mile altitudes. Nor can we pooh-pooh the Russian firing precision. It could mean a capability to interfere with our satellites, civil or military.

Yet in the face of these baleful possibilities, most of the discussion of and reaction to the Soviet achievement has been in terms of whether this means they'll beat us to the moon. And speaking for the record, NASA Administrator James E. Webb has expressed his continued confidence that the US will win that race, barring the development of additional booster power by the Soviets. In that case, Mr. Webb says he might change his mind. There is no reason to doubt that NASA will make the maximum effort to win the race. Mr. Webb is a vigorous Administrator who believes in his agency's program. The program is backed by the Executive and Congress. And the funds and personnel are being made available.

But is the race to the moon the really pertinent question?

We think not, because despite the assurances that, to the best of their knowledge, our space officials do not believe that the Soviets have the required thrust power for a manned lunar landing and safe return to earth, our opponents have demonstrated a disconcertingly swift advance toward an ability to operate militarily in near orbit. It seems to us that the possibility of Soviet aggressive activity in near space is the primary context in which comparisons of US and Soviet capabilities ought to be made. For it is not inconceivable that the Soviets, if they continue to outpace us in near-orbit capability, might be in a position to permit our expedition to the moon only on their sufferance. And it is also possible that in their obsession with secrecy, an obsession which has forced this country to undertake passive military satellite programs now under way, the Soviets might feel constrained to interfere, either openly or furtively, with such US defensive space systems. We must also consider the possibility of Soviet spaceborne strike forces. The point is that without viable and broad US military capability in near space, both our exploratory space program and our military security could be in deep peril.

As the Soviet Union, in its thinly veiled ambitions to rule our planet, approaches the capability to impose its domination with spaceborne weaponry that could irrevocably upset the international strategic balance, this country has little choice but to press forward vigorously toward military space capabilities of its own, moon program or not.

On these pages, we have frequently suggested that this potential Soviet space threat is one that must be taken seriously. After the latest Red feat, we believe so even more strongly, and we urge close Administration analysis *now* of how best to meet the threat. Time is precious and irrecoverable.—End

Missile Structures

Re-entry Materials

Plasma Research

Radio Frequency Interference Studies

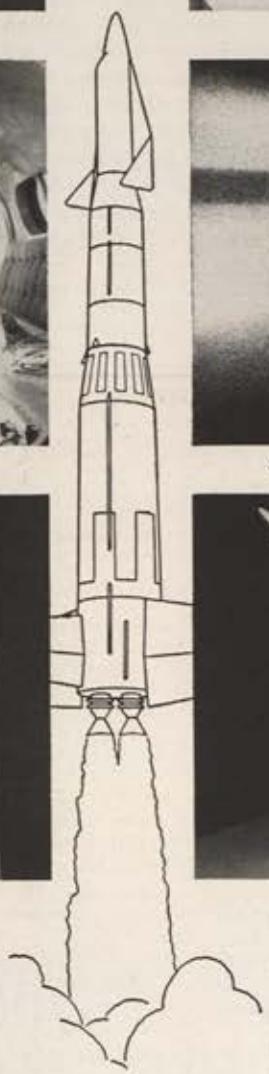
Life Sciences

Supersonic Aerodynamics

Solar Power Studies

Space Flight Paths

Guidance and Controls



Research for advanced systems—by Boeing Aero-Space Division

Research at Boeing is programmed to provide management with the technological advances needed to meet the performance and reliability requirements of today's — and tomorrow's — weapon and space systems.

These programs are devoted to advancing the state-of-the-art across a broad spectrum of fields. More than 600,000 square feet of space is devoted to Boeing laboratories. Aero-Space Division scientists and engineers carry out supersonic and hypersonic aerodynamics research in the largest privately owned wind-tunnel facilities in the world.

The Division employs advanced business management techniques, including critical-path programming methods. Aero-Space's management structure and financial procedures are designed to assure effective cost and production control.

Emphasis on quality and reliability has contributed toward the Division's outstanding record of performance in systems management. It has also assured the design and development of superior products, manufactured and delivered on schedule, at lowest cost.

BOEING

AERO-SPACE DIVISION

A Few Points Raised

Gentlemen: General LeMay's important and timely article "The Ultimate Weapon Is Foresight" (May '62) contains several inaccuracies and misleading statements, one of which was mentioned in your July "Airmail."

1. General LeMay states that "Many times during these years [implying post-1929, or more correctly, post-1926] Dr. Goddard successfully demonstrated rocket-engine performance, and technical reports . . . were published by the Smithsonian Institution," but that the Army did not officially question Goddard until 1936. Willy Ley, in *Rockets, Missiles, and Space Travel,* shows that although Goddard's first report appeared in 1919, his second report was not published until 1936.

2. The statement that "Goddard's work was recognized in Germany and Russia as early as 1920" must be qualified by Ley's statement that "by the end of 1920 there must have been . . . copies [of Goddard's 1919 report] on the shelves of European libraries. But the importance . . . of the book was not immediately noticed."

3. Evidently the first flight of a jet airplane was not that made by the Germans in 1939, but a somewhat abortive flight made by Henri Coanda in December, 1910 (*Royal Air Force Flying Review,* September 1956). . . .

4. A speed of 140 miles an hour is given for the preproduction B-17s. This would seem to be a typographical error or a low value for the cruising speed of this plane because Boeing gave a top speed of 325 miles per hour for an early model B-17, the 299-T.

Bernard Alan Biales
Dayton, Ohio

• *The following is based on information received from the Smithsonian Institution and NASA:*

1. According to the Smithsonian, a report of Goddard's early liquid-fuel work was published by the Institution in June of 1930, offering rocketeers what was called "still another" opportunity to become aware of what Goddard had been doing, the implication being that other material had been published. Goddard himself published an article in Scientific American *in 1921.*

2. Herman Oberth, a then-unknown student of mathematics, testifies to his difficulty in getting any scientific recognition of the validity of the rocket proplusion theory in Germany beyond a few enthusiasts.

3. Most authorities do not recognize the Coanda flight. The usual date for the first jet flight held by the standard reference books is August 1939, when the German Heinkel H-178 made its first flight.

4. Mr. Biales cites maximum claimed, rather than cruising speed, of the 299-T, which was an export version. Jane's *(1939) lists maximum speed at 250 mph, and a 110-mph drop for operational cruising speed would not be excessive.*—The Editors

Competition and Fair Profit

Gentlemen: Let me say first that I completely agree with the theme of Claude Witze's column in Air Force/Space Digest for June and July 1962. However, a quote in your editorial puzzles me when read in light of what Mr. Bell, Director, Bureau of the Budget, is alleged to have said in an official release . . . on the subject of Government Contracting for Research and Development.

In June ["Is Defense Industry a Public Utility?"] you quote from a Bureau of the Budget report—"The present situation . . . is one in which a large group of economically significant and technologically advanced industries depend for their existence and growth not on the open competitive market of traditional economic theory, but on sales only to the US."

In Mr. Witze's July editorial, "Defense, Competition, and Free Enterprise," you make a similar quote.

Mr. Bell, in what I assume is the official release from the Bureau of the Budget containing his statement before the House Military Operations Subcommittee, states: "In the present situation, a large group of economically significant and technologically advanced industries depend not on the competitive commercial market, but on sales to the government."

In the reference attributed to Mr. Bell he uses "commercial" in his phrase "the competitive commercial market." Nowhere in your two editorials do you mention the word "commercial." My feeling is that somebody is being misquoted or someone is taking license with a direct quote and in doing so changes the context of a very important statement. . . . The statement that you quoted as being attributed to the Bureau of the Budget is bad enough, but when it is rephrased to state that a large group of economically significant and technologically advanced industries depend not on the competitive commercial market but on sales to the government, we can only conclude that there is no competition in government selling. . . .

Robert J. Maroni
Upper Montclair, N. J.

• *Mr. Maroni is an astute reader. The quote used in our magazine came from page 9 of the so-called Bell Report, properly titled* Report to the President on Government Contracting for Research and Development, 30 April 1962. *It was compiled by the Bureau of the Budget.*

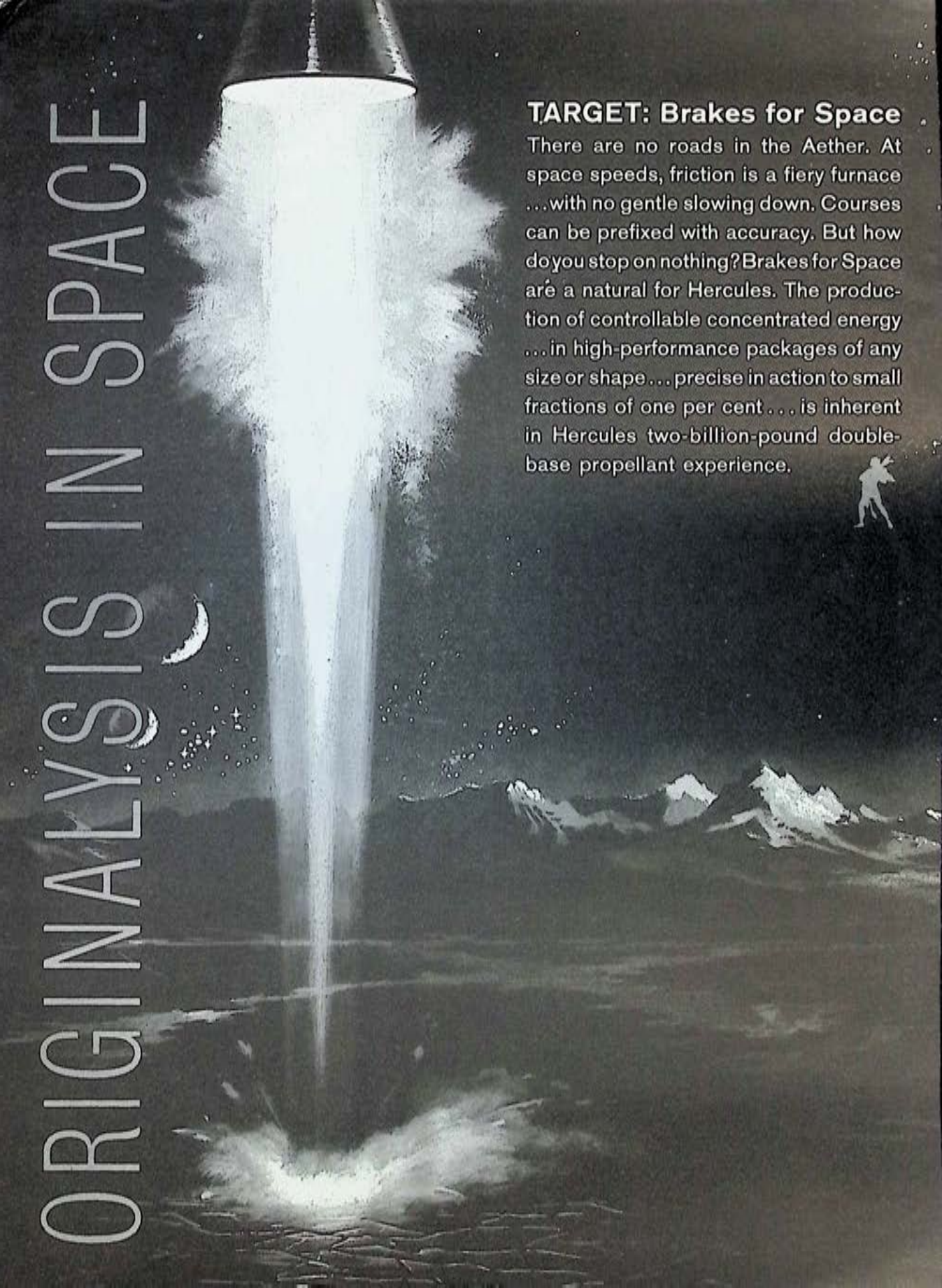
The quotation before the House Subcommittee comes from the statement given by Mr. Bell at a hearing in June. The word "commercial" was used by the witness then, but does not appear in the official report. We have no idea which gremlin was at work but feel positive it had no competition in the Bureau of the Budget.—The Editors

Gentlemen: The editorial "Defense, Competition, and Free Enterprise," by Claude Witze in the July issue is an outstanding piece of writing. . . .

Competition and fair and reasonable profit are the mainsprings of our economy. No business enterprise can remain sound and prosper without both of them. As Mr. Witze points out, there is intense competition for defense business. Even though profits on that class of business generally are lower than the industry average, there still is competition for it.

Our government appears to recog-

(Continued on page 13)


ORIGINALYSIS IN SPACE
TARGET: Brakes for Space
There are no roads in the Aether. At space speeds, friction is a fiery furnace ...with no gentle slowing down. Courses can be prefixed with accuracy. But how do you stop on nothing? Brakes for Space are a natural for Hercules. The production of controllable concentrated energy ...in high-performance packages of any size or shape...precise in action to small fractions of one per cent... is inherent in Hercules two-billion-pound double-base propellant experience.

nize a double standard where profits are concerned. The laws of supply and demand so far have been permitted to operate within limits in the open commercial market, but the tremendous power of the government is invoked to arbitrarily limit the profits of contractors (except small business) to the government.

Press reports of congressional investigations over the past decade or so indicate that there is much more concern about profits on government business than there is about cost and the quality of product delivered or service rendered. In other words, the greatest concern is focused on the smallest element of price. The remaining elements of price seem to receive little attention. . . .

An encouraging note is that the present Secretary of Defense recognizes the uses of profit, and that generous profit should be the reward for outstanding performance and severely curtailed profit the penalty for poor performance. The profit incentive has worked well commercially, and it can be made to work for the benefit of the government by fair, intelligent, and judicious administration.

I hope that Mr. Witze will continue his effort to acquaint all the readers of your magazine with the fruits of his "rudimentary" but sound economic training, and especially with the uses of profit and the consequences of too little or no profit for any business.

GEN. ORVAL R. COOK, USAF (Ret.)
Falls Church, Va.

Exchange Program

Gentlemen: I take this opportunity to comment on Mr. Gatland's letter [August issue] regarding J. S. Butz's very fine article, "The Crisis in Aeronautical Research," in your June issue.

I heartily agree with Mr. Gatland's views regarding benefits to be derived from close US/UK collaboration. It is appropriate to add, however, that there has been, since World War II, an extensive program for exchange of management and technical information on military systems between the USAF and its UK counterparts. We have a very active Joint Air Standardization Committee. RAF representatives are accredited to most of the major headquarters of both AFSC and AFLC which manage the research, development, test, and procurement of our USAF weapon/support systems.

On a recent visit to the UK, I had very fruitful talks with high aviation officials with a view to furthering existing collaboration. . . .

There are special and routine procedures for assuring that US and UK efforts in research, development, and production are complementary rather than competitive.

GEN. BERNARD A. SCHRIEVER
Commander
AF Systems Command
Andrews AFB, Md.

An Angry AFA Member

Gentlemen: I read that ex-chairman of the Joint Chiefs of Staff, Gen. Lyman L. Lemnitzer, presented our highest military decoration given any foreigner, the Legion of Merit, to a man who helped plan the attack on Pearl Harbor, Gen. Minoru Genda, in Tokyo.

Why didn't we fly him here and assemble all the people who lost loved ones that "infamous day" and have the President present the award at Arlington Cemetery?

Our political and military leaders of all branches have little, if any, patriotism, respect for our dead, or any common sense in diplomacy. Our so-called leaders expound a go-soft on the Reds theory and the President now has prepared to make concessions in A-bomb test-ban inspections.

I'm not a chauvinist or jingoist but do not believe we should grovel before everyone who asks us for aid, yells "Yankee, go home," or calls us warmongers.

MACK HARBIN
Chicago, Ill.

• *General Lemnitzer's office reports that the award to General Genda was for exceptionally meritorious conduct in the performance of outstanding service, as Chief of Staff, Japan Air Self Defense Forces, from July 18, 1959, to March 31, 1962, in furthering the mutual interests of the US and Japan. While it is reported that General Genda participated as a staff officer engaged in planning Japanese military operations in early WW II, including Pearl Harbor, his participation was limited, by virtue of his then low rank, to routine staff functions. This award is not our "highest military decoration given any foreigner." There are several higher, including a higher degree of the Legion of Merit itself.* —THE EDITORS

REUNIONS

Navy Relief Ball

The 1962 Ball will be held October 5 at the Sheraton-Park Hotel, Washington, D. C. This annual affair is for the benefit of the Navy Relief Society, which provides aid for Navy and Marine personnel and their families.

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AIRPOWER in the news

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

The Elite Are with Us

WASHINGTON, D. C.

President Eisenhower's now-oft-quoted farewell address —it was televised from the White House on January 17, 1961—has hung its claim to fame on only one of his warnings. This was the one, we have not been allowed to forget, that cautioned "against the acquisition of unwarranted influence, whether sought or unsought, by the military-industrial complex." The quote has been resounding ever since, usually in citations by people who ignore the nature of the Soviet threat and the history of how we have met it.

It happens that there were other quotable lines in that speech by the retiring Chief Executive, some of them more germane to a nation being overflown by Russians in space capsules. Mr. Eisenhower pointed out, for example, that the solitary inventor tinkering in his shop has been overshadowed by task forces of scientists. This is a truth that is distorted only by his unfortunate selection of a lone genius as the victim. The victims in this complex age are gargantuan industrial pools of talent and facilities that are frustrated in their efforts to make sound contributions to national defense. At the same time, Mr. Eisenhower must be given credit for fingering the nature of the menace. Said he in his valedictory:

"The prospect of domination of the nation's scholars by federal employment, project allocations, and the power of money is ever present and is gravely to be regarded.

"Yet, in holding scientific research and discovery in respect, as we should, we must also be alert to the equal and opposite danger that public policy could itself become the captive of a scientific-technological élite."

Somehow, the "military-industrial complex" rather than the "scientific-technological élite" has captured the typewriters and tongues of the nation as a subject for wide and serious contemplation. After all, it is older, its products can be seen and heard and used by every GI, and its accomplishments are spectacular. But the scientific élite also are with us and, more important, making decisions.

Jerome B. Wiesner, Director of the President's new Office of Science and Technology, testified recently before the Military Operations Subcommittee of the House Committee on Government Operations, headed by Rep. Chet Holifield of California.

Dr. Wiesner said that science and technology "are neutral in the affairs of men." This may be true of science but hardly of scientists. He went on to declare that science has a role in policy decision-making, which he called the "role of science in government." Here is Dr. Wiesner's declaration for his thesis:

"That scientific research and development is a major element in our most excruciating decisions must be clear from the almost daily recital of issues before the President and before the Congress. Not only is there more intimate involvement of science and engineering in many vital national decisions today than in times past, there is also an accelerating tempo of activity, an increasing complexity of issues involved—most of which are neither black nor white—increasingly numerous alternatives, a growing serious consequence of error. There is an unprecedented need for human faculties of critical judgment, a need for administrative processes that provide for flexibility, innovation, and feedback, the need for processes, including research, which amplify the role of fact as compared to that of opinion."

It must be pointed out here that there are instances in the pages of history where the errors have been made by scientists. One of the most eminent said it never would be possible to build an intercontinental ballistic missile, which

(Continued on following page)

Dr. Ivan A. Getting

Gen. Bernard A. Schriever

Dr. Jerome B. Wiesner

he considered an opinion based on fact. There are today concepts and designs in the files of major defense contractors that are kept locked in these cabinets because scientists are skeptical of their feasibility. It has been pointed out that if the modern scientist, with his propensity to feed figures into a computer and accept the answer, had been consulted at the right moment in history some ingenious character would have been stopped before he invented the wheel. There were no facts in existence at the time, to put in a computer, that would have shown that a wheel was scientifically feasible. It is a fairly safe bet that the concept of the wheel was an opinion, by Dr. Wiesner's standard, and that if the role of fact had been amplified, as he suggests it should be, we still would be moving stone on rollers.

Focus of the Holifield Subcommittee inquiry, as pointed out here last month, is the contracting of federal research and development and the recommendations of the so-called Bell Report, a study ordered from the Bureau of the Budget by the White House. Dr. Wiesner, in his testimony, supported the Bell Report recommendation that government in-house research capability should be increased. He also acknowledged that one way to reach this goal was to improve the management of scientific activities.

The witness said he is aware there are government laboratories that report "through nineteen echelons of people before a decision is made." He told of visiting a laboratory that was judged by how many coke bottles there were in the filing cabinets "because the people who had the responsibility for judging couldn't judge the technical program." When this situation appears in government, Dr. Wiesner said, it is up to the Executive Department and the Congress to change it, because otherwise "you look elsewhere for your support." Later, he commented on management as the weak link in our utilization of technical resources. He said "the nation has made the decision to go the free-enterprise route and we never will be able to manage by allocation unless there is an emergency which justifies doing it." He added that management can be improved by "giving industries incentives for doing their jobs effectively, giving them penalties for doing them poorly, providing the contracting people with more discretion. . . ."

The White House official said he was impressed with the speed with which a commercial enterprise, even then under attack on the Senate floor, had developed the Telstar communications satellite. This led Herbert Roback, staff administrator for the committee, to query Dr. Wiesner about the various communications efforts in space. He made it clear that he understands the difference between military and commercial requirements. He did not, at any point, indicate that the military requirement might be more important than the commercial one and be entitled to a higher priority as a matter of national security.

A few days later the Holifield Subcommittee witness was Gen. Bernard A. Schriever, chief of the Air Force Systems Command. He was questioned about USAF's role in the Advent communications satellite system, a Defense Department project now undergoing reorganization because it appeared doomed to failure. The General said he always felt that the Advent program was not properly managed, that he had made some recommendations which were not carried out but that USAF had not initiated a move to have the management overhauled. With Advent as a provocator, the witness then laid some facts before the committee.

General Schriever said the use of civilian satellite communications systems for military command and control missions is impossible because the system and the requirement are basically incompatible. Commercial systems must accommodate hundreds of voice channels and some television, usually on a trunk basis. They carry messages between elaborate fixed-point terminals, usually near large cities. They must operate under terms of international agreement and in a cooperative environment.

He said military command and control systems need few channels for voice, teletype, or digital data. They require many more terminal locations than a commercial system. These terminals may be remote from commercial terminals and world events may dictate where they are moved from time to time. Code security is required along with this mobility. There must be protection against jamming and physical attack. If an attack is made on the system it must have some factor of survivability.

Four days after General Schriever's appearance the hearing turned to one of his contractors, Aerospace Corporation, and heard from its President, Dr. Ivan A. Getting. By this time the committee's interest in military space missions was becoming more pronounced. Mr. Roback wanted to know whether Dr. Getting felt the military role in space is being retarded by present national policies. He asked specifically, to stimulate the witness, about the weather satellite. Is it really an important military effort?

Dr. Getting said the Administration, which has a policy of stressing the peaceful uses of space that it inherited from the Eisenhower era, has assigned the weather satellite to the National Aeronautics and Space Administration and the Weather Bureau. He said this solution is not unique and weather is, as we all know, a worldwide problem. Dr. Getting continued:

"I believe one could show that the military has a bigger requirement for knowing worldwide weather than does the Weather Bureau. The Air Force flies around the world. It is required at all times to be in a position to make a strategic strike. It is required at all times to transport military forces to all parts of the world. Similarly, our Navy operates over all the oceans. . . .

"I think it would be fruitful for the military services to operate on a continuing basis of worldwide weather systems. And I can see no reason why those aspects of the weather which are required for the US Weather Bureau could not be derived as a by-product . . . it has been a historical precedent in this country that the Coast and Geodetic Survey does charts of the US coasts and the Navy hydrographic office does charts of the world as a whole. Why this pattern was disturbed in this instance I do not know. . . .

". . . The military (unlike NASA) has a continuing military operating function. It seems to me, therefore, that one could put up a very good argument that weather satellites might be done more efficiently, more effectively and to the better over-all good of the country if they were done by the military instead of by NASA and the Weather Bureau."

Dr. Getting then was questioned about military space communication requirements. His reply amplified the stand taken earlier by General Schriever, pointing out that there are no submarine cables to such places as South Africa. He could imagine a situation where direct military communication to Cambodia or the Congo might be helpful.

Mr. Roback cited testimony from Dr. Harold Brown, Director of Research and Engineering for the Defense Department, who had taken a dim view of the possibility of utilizing space for military purposes. Dr. Getting said he can see advantages in the military exploitation of space.

(Continued on page 19)

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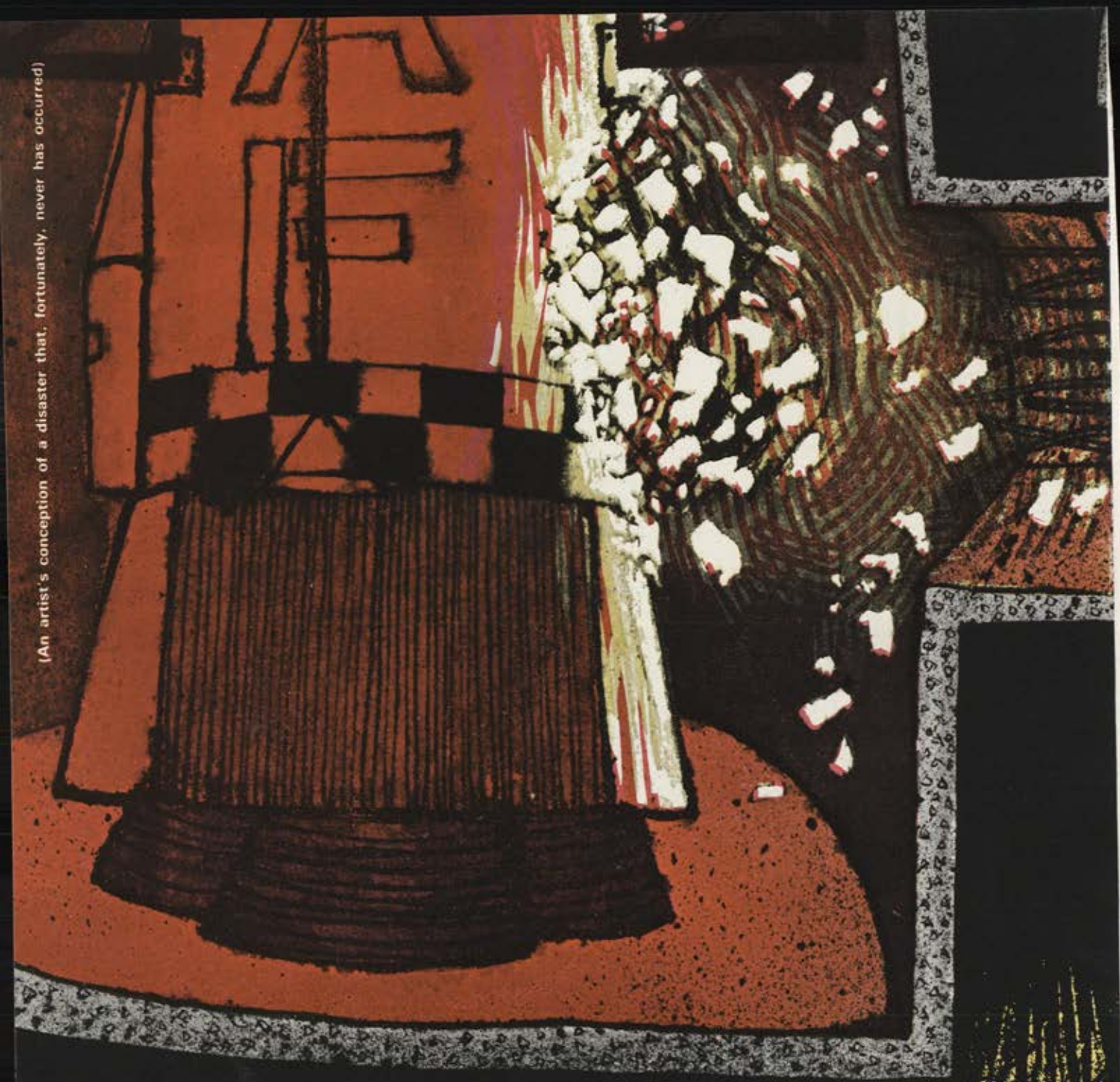

(An artist's conception of a disaster that, fortunately, never has occurred)

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He also pointed out that the airplane first was used as an artillery spotter in days before any man, military or scientist, realized it is a weapon and has utility as a transport. He implied that we know little today about the military possibilities of space, just as we once did of the airplane.

"I cannot, at this point, give you a blueprint of exactly how space and military satellites will affect military operations in the future," the witness said. "I might just say by way of comment that we have somehow as a national policy espoused space for peaceful purposes with the implication that the earth should be reserved for warlike purposes. I would much rather reverse that and save the earth for peaceful purposes and do all our warfare in space."

While the prime interest of the Holifield Subcommittee is the efficacy of research and development contracting, and the government's management of these contracts, it was almost inevitable that specifics of the military space program would be brought up. So far, there has been no suggestion that the investigation is concerned with President Eisenhower's apprehension over the threat that public policy may be dictated by a scientific-technological élite. At the same time, there are members of the military-industrial complex who fear that national security will be jeopardized if the decision-making machinery continues to grow at the top levels. And certainly the intent of the Bell Report and Dr. Wiesner himself is to make it grow and give the scientific élite a greater voice.

It was refreshing, during the Holifield hearings of early August, to see witnesses from such organizations as the RAND Corporation, MITRE, Lincoln Laboratory, System Development Corporation, and Aerospace show how the best technological talent can be mustered without menacing the democratic process or attempting to influence policy. All of these organizations are concerned with aspects of management of our technological resources, chiefly for the Air Force. All of the witnesses took care to emphasize their objectivity and their complete divorcement from policy determination.

F. R. Collbohm, President of RAND, was asked whether he thought RAND's capability could be established within a government agency. He said it is not impossible, but unlikely. And the inhibition, he said, is not the Civil Service limitation on salaries. Men want to work for RAND because of the environment, the freedom from "irritations and so on," which means the red tape and delayed decision-making of any government agency. Carl F. J. Overhage, of MIT's Lincoln Laboratory, said that he found it necessary to exceed Civil Service levels in hiring top talent, but he denied that he competes with industry pay scales. Like RAND, he said MIT has a level of prestige that makes it attractive to scientists. Dr. Getting, speaking for Aerospace, said "a good deal of our strength and attractiveness comes not only from the nature of the work that we are doing, which is fascinating, but also from the environment in which the civilian scientist likes to work. Our fellows work hard. But they work hard because they like it."

It was clear that none of these men or the people working for them harbor ambitions to belong to an élite that determines policy. Yet the Bell Report, which was signed and supported by Dr. Wiesner, says there have been instances in recent years "where we have come dangerously close to permitting contract employees to exercise functions which belong with top government officials." The report continues to say "there must be sufficient technical competence within the government so that outside technical advice does not become *de facto* technical decision-making."

If there is such a void, and it has been identified by witnesses from government, profit-making corporations and nonprofit corporations, nobody argues that it should not be filled. Nobody is more eager to deal with competent people than research and development contractors. A vice president of one major US defense industry has said in public that "research and development are supervised and controlled by government employees who couldn't possibly know as much as the contractor and at best can only impede his speed and efficiency."

There is strong evidence that this weakness is spreading and not being checked. As new layers of decision-makers are added on top the effectiveness of industry and military experts becomes more and more diluted. The recent history of the TFX dual service weapon system and the Mobile Medium Range Ballistic Missile (MMRBM) are classics of technological frustration. Even more critical perhaps, to our national survival, may be the Administration's top-level attitude—implemented by its own cadre of scientific élite—toward the military requirements in space. In the absence of positive action by the two Armed Services Committees on Capitol Hill, the emphasis on this issue that has appeared as a by-product of the Holifield Subcommittee inquiry is a public service. The interest of Congress in the military-industrial complex is traditional. The scientific-technological élite also deserve attention.—END

A major advance in multiplexing

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AEROSPACE WORLD

By Allan R. Scholin
ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

Soviet astrologers must regard August as an especially propitious month for new ventures. The past two Augusts have seen the Russians pull off both astonishing and disquieting deeds.

Last year, you may recall, the world acclaimed Russian Cosmonaut Gherman Titov for his seventeen orbits of the earth in *Vostok II*, on August 6 and 7. Five days later the free world was shocked when the Communists overnight erected a wall to separate West and East Berlin. And on August 31 last year, the USSR announced it would resume nuclear testing in a series that ran through September.

Last month the Soviets once again initiated nuclear tests, signaled by a high-altitude blast on August 5 estimated at up to forty megatons. Then, on August 11, Cosmonaut Maj. Andrian Nikolayev soared into orbit in *Vostok III*, to be accompanied in space, twenty-four hours later, by Lt. Col. Pavel R. Popovich in *Vostok IV*. In the ensuing hullabaloo, the anniversary of the infamous wall was ignored except by West Berliners who defied Vopo tear gas and fire hoses to manifest their contempt for a power which links men in global orbit, yet shuts off brother from brother on earth.

Just what the Soviets achieved by the twin orbital marathon of Nikolayev and Popovich will be evaluated and reevaluated as additional data becomes available from our resources or from the Soviets. We can assume from typical Soviet reluctance to disclose any significant data on its spaceflights that the latter will be sketchy.

The subject is sure to come in for major attention in symposiums and seminars at AFA's National Convention in Las Vegas later this month.

Certainly the flight of the Vostoks was a dramatic accomplishment. Nikolayev completed sixty-four orbits in three days, twenty-two hours, covering 1,600,000 miles. Popovich made forty-eight orbits in just about one day less, logging 1,260,000 miles. They landed—still in their capsules—at Karaganda, in Kazakhstan, about 2,000 miles east of Moscow, parachuting down only six minutes apart.

Vostoks III and *IV* apparently employed much the same capsules and boosters used in Titov's *Vostok II* flight a year ago. Thus the major success was in placing *Vostok IV* in almost the identical orbit and position of *Vostok III*. This required *Vostok IV* to meet a blastoff countdown within a tolerance of about fifteen seconds, this indicating a highly reliable booster and launch system.

It is possible that *Vostok IV's* orbital path was so planned that in an early circuit it might have crossed *Vostok III's* path within, say, twenty miles or so. Had they affected any significant convergence in their paths to the degree necessary for useful rendezvous, however, it is unlikely that subsequent orbits would have carried them steadily—and predictably—farther apart. They were at least 1,800 miles apart before reentry.

But even if they succeeded in no more sophisticated an attempt at rendezvous it is beyond what our program has so far accomplished.

The National Aeronautics and Space Administration, which manages the US space program, arranged a press conference August 15 to answer numerous press queries on the event.

(*Continued on following page*)

—United Press International Photo

Russian Cosmonauts who astounded the world in mid-August are pictured on television during their epochal double header. Maj. Andrian G. Nikolayev, left, zoomed off August 11, joined next day by Lt. Col. Pavel R. Popovich.

—United Press International Photo

Jubilant Russians in Moscow's Red Square cheer their heroic Cosmonauts. Soviet propagandists were ready with huge photos of the pair almost immediately after Popovich followed Nikolayev into their multi-orbital endurance test.

Maj. Bob White's attractive spouse helped do the honors when Gen. Curtis E. LeMay pinned Astronaut wings on the X-15 pilot, first to reach space flying a truly maneuverable vehicle.

NASA praised the Soviet accomplishment but, in the words of D. Brainerd Holmes, Chief of NASA's Office of Manned Spaceflight, thought it had "no particular significance in our race to the moon."

NASA agreed the Soviets possess bigger boosters than we do, and that we will be unable to match until we get the Saturn and the Titan III. In the meantime, they predicted the Soviets will take full advantage of their bigger boosters to stage other spectacular events beyond our present reach.

"We can expect them to beat us to multi-manned orbital flight," said Dr. Hugh Dryden, NASA Deputy Administrator, "and possibly to a circumlunar flight—since that, too, may be within the capability of their existing boosters.

"But a manned landing on the moon, and successful return, requires much more than the Soviets have so far demonstrated. In one part of the job they are ahead of us; this doesn't mean they're ahead over-all."

NASA Administrator James E. Webb asserted flatly that if the nation continues to devote all necessary resources to the moon program, "the US will make a manned lunar landing on the moon and return before they do."

Below, Gens. Paul D. Adams, left, Commander of US Strike Command, and Curtis E. LeMay, USAF Chief of Staff, watch paradrop of the 82nd Airborne Division during Swift Strike II.

All in all, the Soviet achievement seems to boil down to a spectacular demonstration which undoubtedly provided them with useful data on physiological aspects of sustained flight. But it showed no evidence of a major advance in Soviet space technology.

As President Kennedy told the nation August 13:

"I have said from the beginning that this country started [its space program] late in the 1950s. We are behind and will be behind for a period in the future. But we are making a major effort now, and this country will be heard from, in space as well as in other areas, in the coming months and years."

☆

An Army program being conducted on Kwajelein Island in the Pacific to test effectiveness of its Nike-Zeus antimissile missile produced one of the more curious aerospace episodes of the month.

A Department of Defense announcement on July 19 reported that the Nike-Zeus had "successfully intercepted" an Atlas ICBM fired that day from Vandenberg AFB, Calif.

Coming soon after Soviet Premier Khrushchev's boast that the Russians had an anti-ICBM device that could "hit a fly in space," the Atlas-Zeus test was widely hailed as evidence that the US, too, had approximately that capability.

But a statement by Secretary of Defense McNamara contained in the official DoD announcement seemed aimed more at Khrushchev than at complimenting the Zeus.

"These programs give us confidence that our missiles would be able to penetrate any such system which has been developed by anyone," Mr. McNamara said.

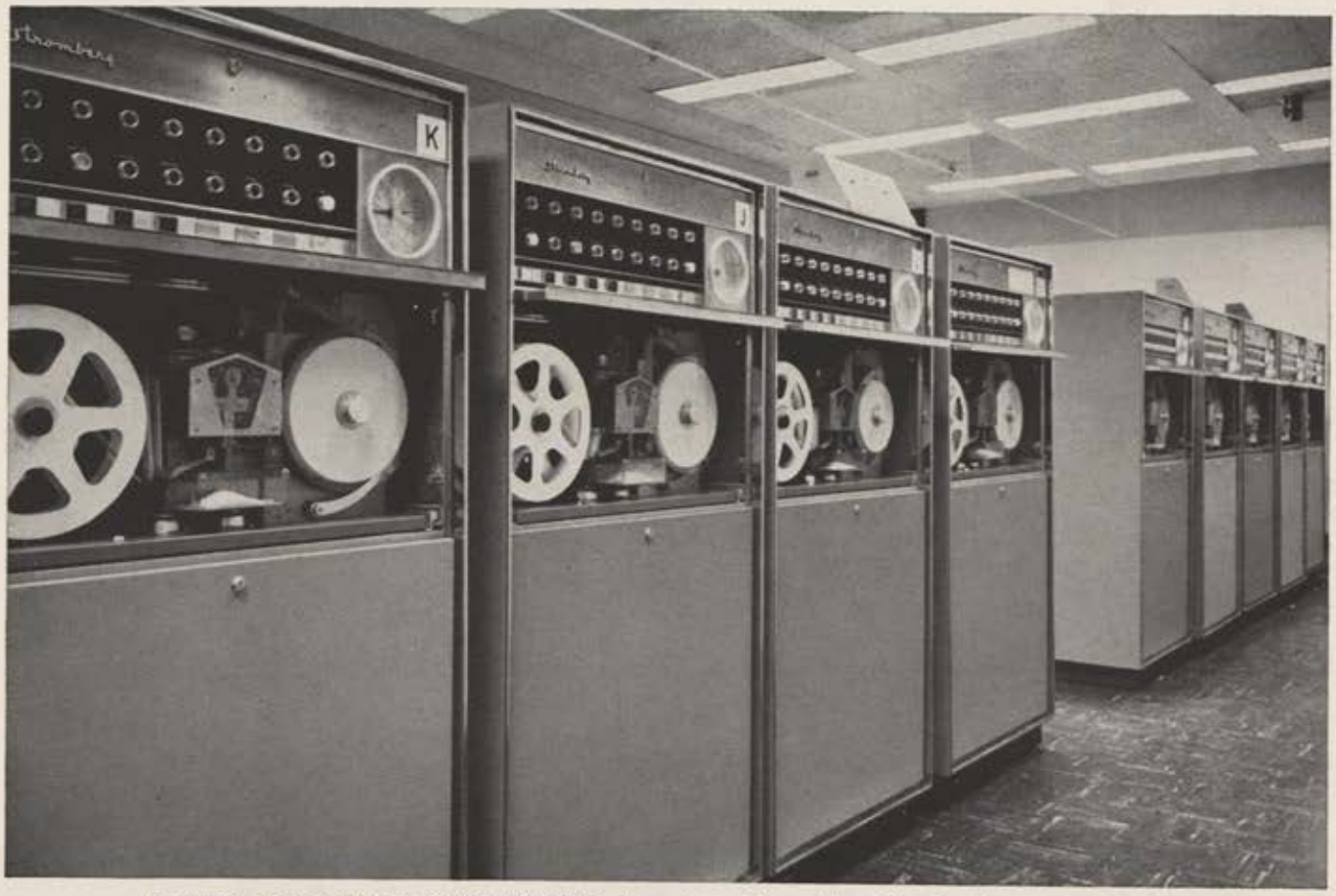
Despite numerous press queries, there were no further elaborations on the announcement.

This much is known: The Zeus had failed on a previous interception try, even though detailed information on ICBM launch time and trajectory path

(*Continued on page 25*)

—Wide World Photos

When an excursion train carrying fans to a Philadelphia baseball game hit a defective stretch of track and toppled into the Susquehanna River near Harrisburg, Pa., late in July, a Sikorsky H-19 helicopter from nearby Olmsted AFB joined in rescue operations to remove victims to waiting ambulances.



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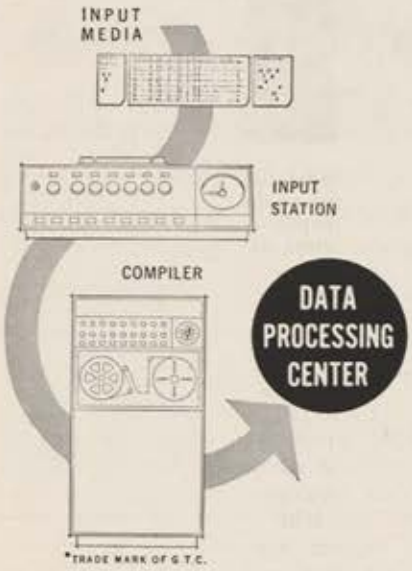

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is fed into a target intercept computer linked to the Zeus target acquisition radar on Kwajalein. The target Atlas vehicles also carry special instrumentation, including a miss-distance indicator to double-check the Zeus's own data.

☆

LAUNCHINGS – SAC missileers presented their own version of a double-header launch at Vandenberg AFB, Calif., August 9. A crew from the 389th Strategic Missile Wing, Francis E. Warren AFB, Wyo., fired two Atlas ICBMs in quick succession to demonstrate for the first time a multiple countdown and launch procedure. Both weapons impacted on target 5,000 miles downrange.

These were the ninety-eighth and ninety-ninth successful firings in the Atlas program. Next day at Cape Canaveral, Fla., an Atlas-F malfunctioned, but on August 13, another F model carrying cameras to photograph the missile's staging sequences in flight performed perfectly to become the 100th Atlas to be fired successfully. The cameras were recovered, two north of Grand Turk Island, by pararescue crews of the 3d Air Rescue Squadron from Eglin AFB, Fla., and the third in the splash zone.

The pace of classified USAF satellite launchings from Vandenberg and Point Arguello, Calif., stepped up to six during the month. From Point Arguello, USAF launched Atlas-Agena-Bs on July 18 and August 6, and a Blue Scout on July 24. From Vandenberg they sent up three Thor-Agenas, on July 20 and 27, and August 1. Since November 22, 1961, when a security clamp was placed on these launchings, USAF has fired a total of twenty-four.

The missile box score:

TYPE	TOTAL	SUCCESSFUL	PARTIAL	FAILURE
Atlas	142	100	26	16
Titan I	52	38	10	4
Titan II	4	2	2	0
Minuteman	18	13	2	3
Thor				
IRBM	71	49	11	11
Scientific	89	79	2	8

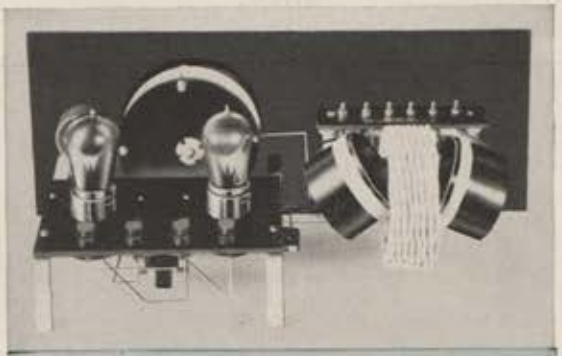
Two of Thor's "scientific" failures have been chalked up in the Pacific nuclear test program, where the nor-

(Continued on page 27)

Gen. Walter C. Sweeney, Jr., left, Commander of the Tactical Air Command, greets Senators Barry Goldwater of Arizona and Howard W. Cannon of Nevada, both Reserve pilots, after orientation rides in USAF's new F-4C fighter at Langley AFB, Va., flown by McDonnell test pilot W. C. Ross, right. Goldwater is a major general and Cannon a brigadier. Cannon is general chairman of AFA's 1962 Convention in Las Vegas; Goldwater will be a featured speaker.

Umpires and observers will follow TAC's fighter weapons meet at Nellis AFB, Nev., this month by television setup under USAF contract with Thompson Ramo Wooldridge's Dage division. Air Force cameramen will transmit over Channel 5, enabling Las Vegas residents and AFA Convention guests to see the meet too.

Harmon Trophies for 1962 were won by Jacqueline Cochran for setting eight "world class" records in a Northrop T-38 trainer over three months in 1961, and to USAF Lt. Col. William R. Payne for piloting a Convair B-58 to two concurrent records, Washington-Paris and New York-Paris, in May 1961.



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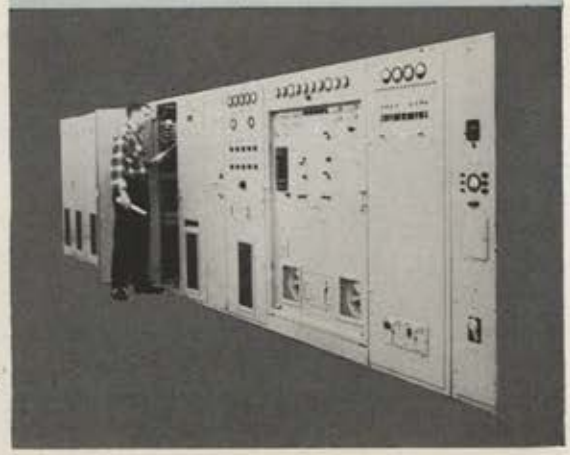


Creative careers at REL await a few exceptional engineers. Address résumés to James Kelly, Personnel Director.

mally reliable Thor is being used in high-altitude weapons tests. One failure was laid to a defect in the special gear used in carrying the weapon. There was no nuclear blast or radioactive fallout from either failure, but test schedules were delayed, particularly since the US voluntarily suspended testing while the Soviet Cosmonauts were in orbit.

Another noteworthy failure occurred in the Mariner I Venus probe July 21. The Atlas-Agena-B vehicle rose perfectly from its Cape Canaveral launch pad but soon entered an erratic flight path and was destroyed by the range safety officer. Investigation indicated a faulty equation had been fed into the direction computer. A backup vehicle, Mariner II, was scheduled to be fired toward Venus sometime between August 20 and September 10.

☆

EQUIPMENT NOTES — The Air Force expects to add seven squadrons of C-130s in the next two years. Four will go to TAC, two overseas, and one to MATS. C-123s of five TAC squadrons will be phased out to make room for the new Hercules planes.

Congress has appropriated funds for three more RS-70 Valkyrie bombers, bringing the total to six, but Secretary of Defense McNamara is still opposed to an increase in the program. Congressman Carl Vinson (D.-Ga.), who was persuaded by President Kennedy this spring not to write mandatory legislation on RS-70 procurement, spearheaded the additional fund legislation, and says firmly, "We will have the RS-70."

Changes in high command, triggered by retirement of Gen. Lauris Norstad, right, affect, from left, Gens. Maxwell D. Taylor, Lyman L. Lemnitzer, and Earle G. Wheeler. General Taylor, presidential adviser and former Army Chief of Staff, becomes Chairman of the JCS, succeeding General Lemnitzer, who takes Norstad's post as Supreme Allied Commander, Europe. General Wheeler becomes Army Chief of Staff October 1 upon the retirement of Gen. George H. Decker.

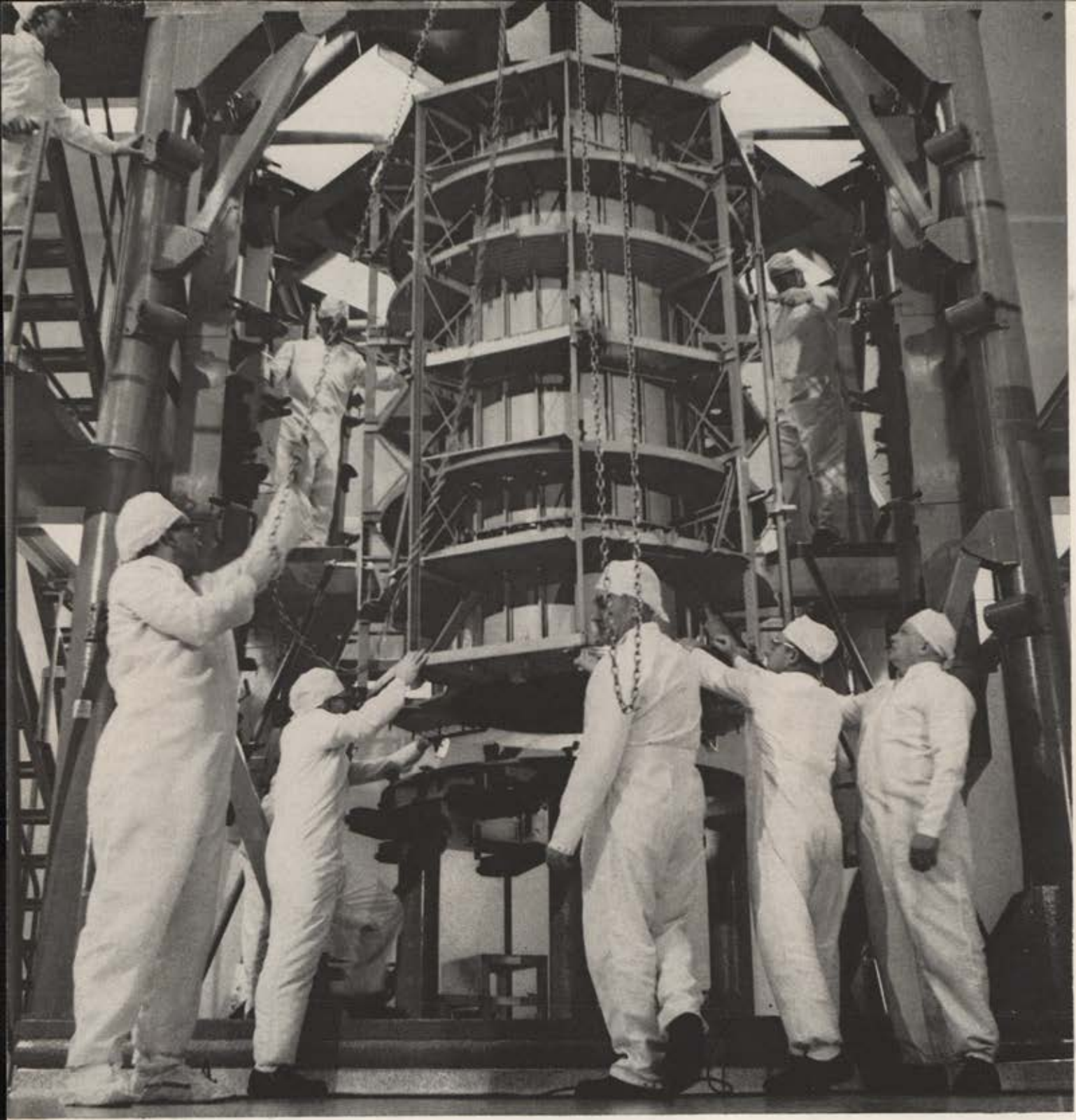
The first prototype of the Valkyrie, now nearing completion at North American's Palmdale, Calif., plant, will be rolled out to its final development area in September, and may be ready for flight-test in December.

Curtiss-Wright is building two propeller-driven X-19 vertical-takeoff-or-landing aircraft for the Air Force, to be delivered in mid-1963. They'll be used to explore aircraft performance and VTOL characteristics in recovery and survival operations. Engine nacelles are in vertical position at takeoff, tilting to horizontal for conventional flight. Speed is expected to range from zero at hovering to more than 460 mph in level flight.

Feasibility of adding two jet engines to C-123s to make them more suitable for counterinsurgency roles is being studied under a contract awarded Fairchild. The modification is expected to improve the C-123's short takeoff capability.

(*Continued on page 29*)

CMSgt. Harry C. Findley, 37, Ent AFB, Colo., won $1,500 top award in USAF 1962 suggestion program for an idea extending life of high cost electron tubes, saving $10 million each year.



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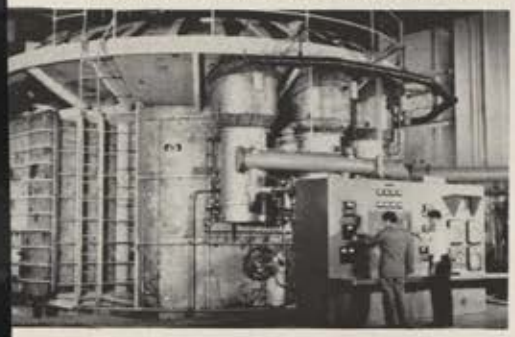


This huge centrifuge is capable of subjecting a one ton spacecraft to a stress of 40 times the force of gravity.

Drawing of new Space & Missile Center which will further expand Grumman's aerospace activities, providing accommodations for a larger scientific, engineering and support staff.

AEROSPACE WORLD — CONTINUED

Meanwhile, USAF is testing two Army aircraft for possible use by its counterinsurgency forces. They are the Grumman Mohawk and the de Havilland Caribou. At the same time, the Army is testing USAF's U-10A for possible ground support duties.

AWARDS—To Lt. Col. William R. Payne, USAF; Jacqueline Cochran; Cmdr. Malcolm D. Ross, USNR; and the late Lt. Cmdr. Victor A. Prather, USN: the **Harmon International Aviation Trophies** for outstanding and extraordinary feats of individual piloting skill during 1961. Colonel Payne's award was for piloting a Convair B-58 Hustler between Washington and Paris at an average speed of 1,048.68 mph, and between New York and Paris, along the Lindbergh route, at a speed of 1,089.36 mph in May 1961. His crew members in the B-58 were Majs. William L. Polhemus and Raymond R. Wagener. Miss Cochran won the Aviatrix award for setting eight world class records in speed, distance, and altitude in a Northrop T-38 from August 24 to October 12. Her top speed was 844 mph and peak altitude 56,072 feet. Commanders Ross and Prather received the Aeronaut's award for reaching an altitude of 113,739.9 feet in a balloon flight over the Gulf of Mexico, May 4, 1961. Prather was drowned while being picked up by helicopter after landing.

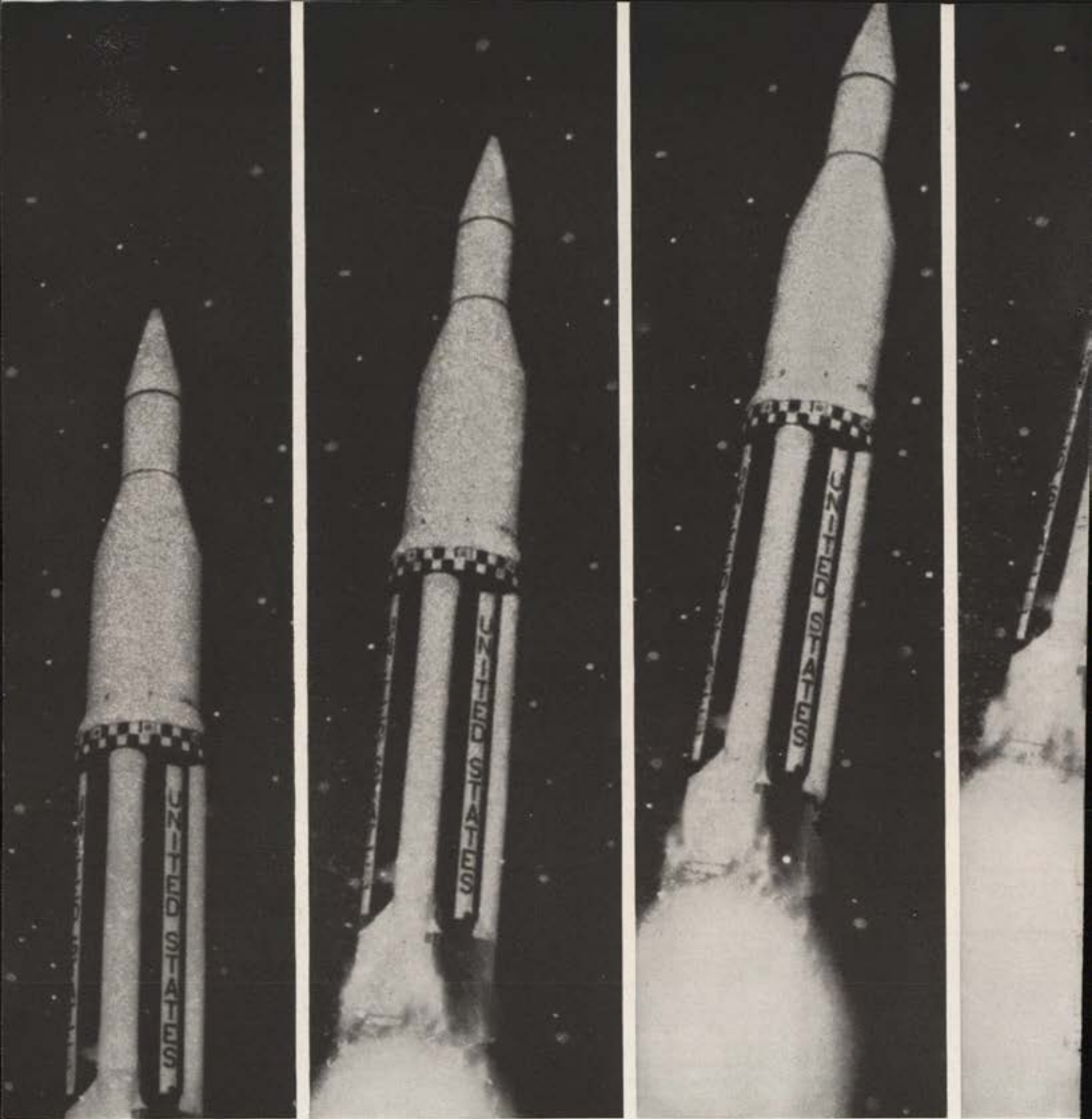
To James H. Kindelberger, posthumously, the 1962 **Daniel Guggenheim Medal** for achievement in aviation. Before his death in July, Kindelberger was board chairman of North American Aviation. John L. Atwood, NAA president, will accept the award in Los Angeles, October 10.

To CMSgt Harry C. Findley (*see cut, page 27*) Ent AFB, Colo., top award of $1,500 in **USAF's annual suggestion contest.** Air Defense Command personnel won first, second, third, fifth, and sixth places. Findley's award resulted from a suggestion to lengthen the life of high-cost radar electronic tubes, some costing as much as $51,000, which USAF estimates will save $10 million a year.

☆

STAFF CHANGES. . . . Maj. Gen. Edwin B. Broadhurst, from Commander 7th Air Division, SAC, High Wycombe, England, to Assistant DCS/O, Hq. USAF, effective October 1. . . . **Maj. Gen. Cecil H. Childre,** from Assistant DCS/P-P, to Assistant DCS/P, Hq. USAF. . . . **Brig. Gen. William E. Creer,** from Commander, 72d Bomb Wing (Heavy), SAC, to Commander, 45th Air Division, SAC, Loring AFB, Me. . . . **Brig. Gen. Roger M. Crow,** from Deputy Commander, 1st Strategic Aerospace Division, SAC, Vandenberg AFB, Calif., to Commander, 819th Strategic Aerospace Division, SAC, Dyess AFB, Tex. . . . **Brig. Gen. Allman T. Culbertson,** from Vice Commander, ASD, AFSC, Wright-Patterson AFB, Ohio, to Deputy Commander, Hq. APGC, AFSC, Eglin AFB, Fla. . . . **Maj. Gen. Charles M. Eisenhart,** from Special Assistant to Commander in Chief, Hq. SAC Offutt AFB, Neb., to Commander, 7th Air Division, SAC, High Wycombe, England, effective September 17. . . . **Brig. Gen. Harry L. Evans,** from Vice Director of Special Projects, OSAF, El Segundo, Calif., to Assistant Vice Commander, SSD, AFSC, El Segundo, Calif.

Brig. Gen. Richard O. Hunziker, from Commander, 21st Strategic Aerospace Division, SAC, Forbes AFB, Kan., to Deputy Commander, 1st Strategic Aerospace Division, SAC, Vandenberg AFB, Calif. . . . **Brig. Gen. Jamie Gough,** from Deputy Director for Operational Forces, to Deputy Director of Operations, DCS/O, Hq. USAF. . . . **Brig. Gen Loren G. McCollom,** from Chairman, Joint Command and Control Development Group, Hq. USAF, to Deputy Chief of the Joint Command and Control Development Requirements Group, DoD. . . . **Brig. Gen. John C. Meyer,** from Commander, 45th Air Division, SAC, Loring AFB, Me., to Deputy Director of Plans, Hq. SAC, Offut AFB, Neb. . . . **Brig. Gen. Harvard W. Powell,** from Assistant to Deputy Commander, AFSC for Aerospace Systems, to Vice Commander, SSD, AFSC, Los Angeles 45, Calif. . . . **Brig. Gen. Kenneth O. Sanborn,** from Commander, Air Task Force 13, Provisional, 13th AF, PACAF, with additional duty as Chief, AF Section, MAAG, Republic of China, to Chief, MAAG, Republic of China. . . . **Brig. Gen. Pinkham Smith,** from Commander, 819the Strategic Aerospace Division, SAC, Dyess AFB, Tex., to Deputy Director for Operational Forces, DCS/O, Hq. USAF. . . . **Brig. Gen. Frederick J. Sutterlin,** from Commander, 839th Air Division, TAC, Sewart AFB, Tenn., to Chief of Staff, US Taiwan Defense Command. . . . **Maj. Gen. Horace M. Wade,** from Deputy Director of Operations, DCS/O, to Assistant DCS/P-P, Hq. USAF. . . . **Maj. Gen. Charles B. Westover,** from Assistant DCS/O, Hq, USAF, to Assistant to Commander, Hq. TAC, Langley AFB, Va.—END



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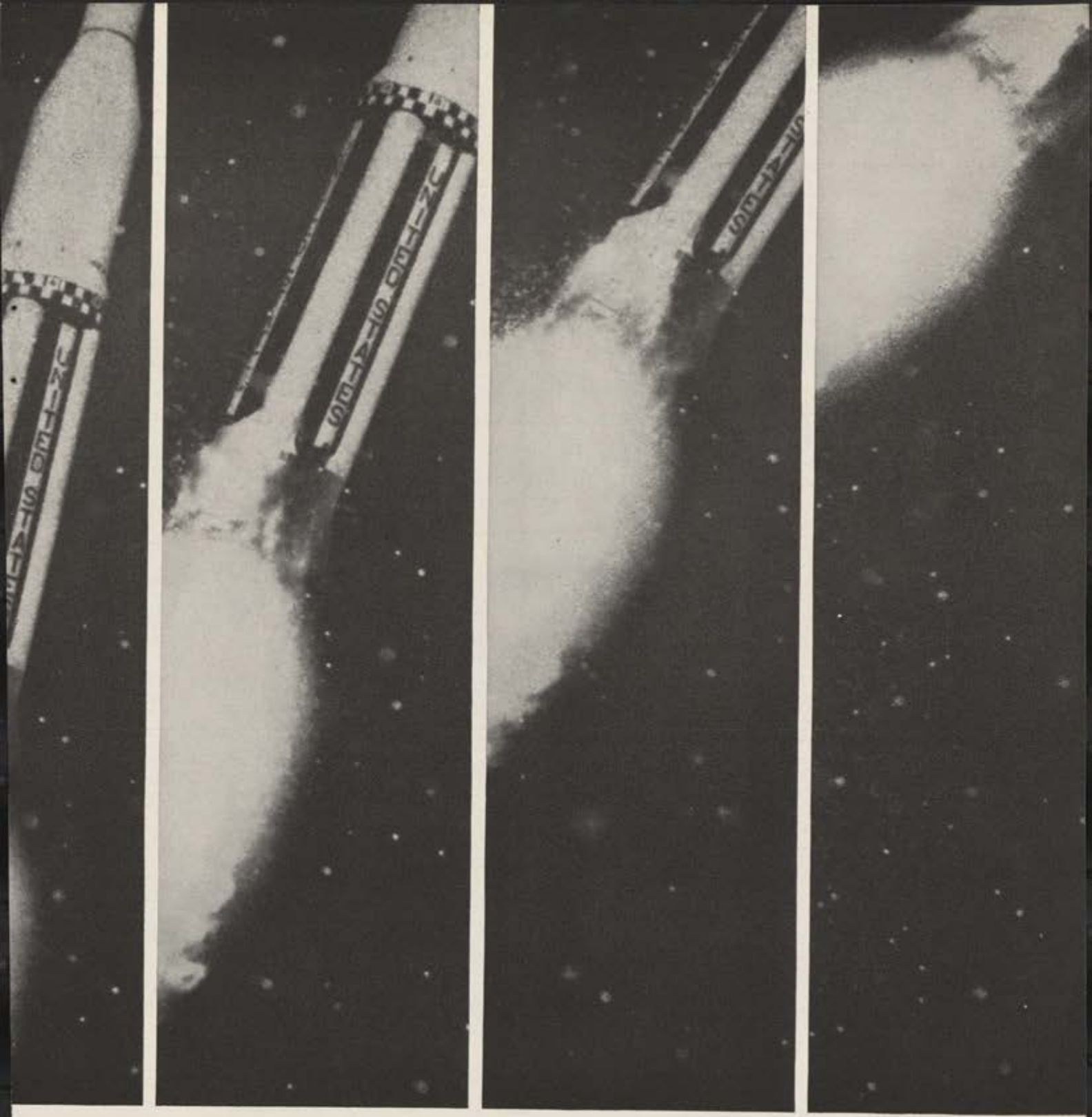

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BENCHMARKS in the

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success of the Discoverer Program and the recovery of the Mercury capsule. □ Pioneer in development of solid-fueled rockets of many performance characteristics for many systems (spherical engines to yield high mass ratios, special units for vernier control and gas generators), the Corporation has built a record which—in terms of reliable engine performance, timely delivery and economical operation—reflects the Thiokol capability required to meet present national demands for leadership in space and defense.

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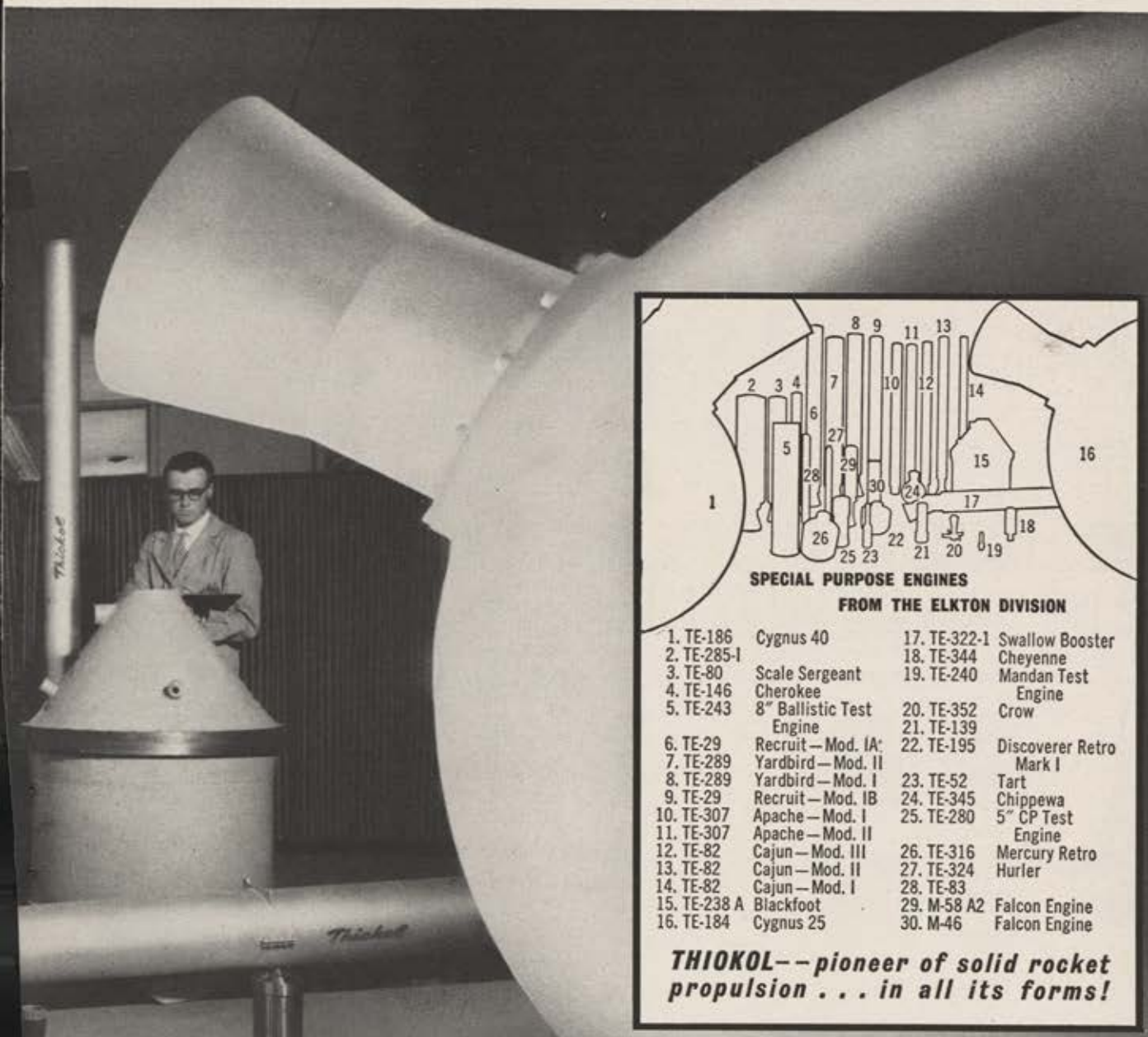

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8. TE-289	Yardbird—Mod. I	24. TE-345	Chippewa
9. TE-29	Recruit—Mod. IB	25. TE-280	5″ CP Test Engine
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11. TE-307	Apache—Mod. II	27. TE-324	Hurler
12. TE-82	Cajun—Mod. III	28. TE-83	
13. TE-82	Cajun—Mod. II	29. M-58 A2	Falcon Engine
14. TE-82	Cajun—Mod. I	30. M-46	Falcon Engine
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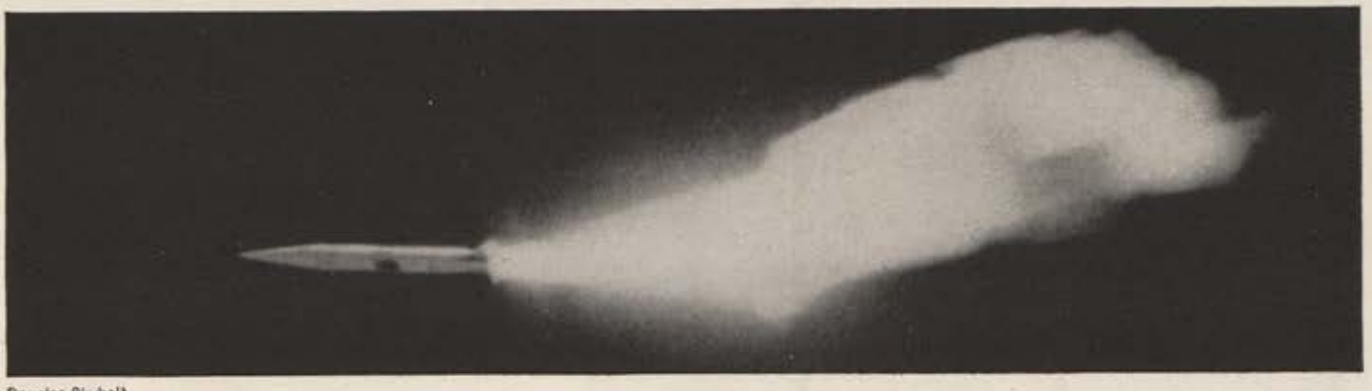

Douglas Skybolt

North American A3J

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Height Indicator

Guidance Controls

As on a multitude of other weapons systems, Transicoil subsystems are aboard both Skybolt and the A3J. ■ For Skybolt, Transicoil supplies the guidance control packages shown at left. These consist of gimbal-mounted synchro resolver transmitters; azimuth, roll and pitch repeater assemblies; and synchro computing resolvers. ■ For the A3J, Transicoil supplies the radar height indicator shown at left. This precision airborne instrument, which utilizes synchro data from the altimeter, consists of control transformer, motor generator, transistorized servo amplifier, anti-backlash gear train, and the meter indicator itself. ■ All rotating components are size 8 in both applications, and are manufactured by Transicoil. This is design excellence and reliability. This is Daystrom Transicoil. Write for booklet, "Cases in Servo Control".

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AIR FORCE
SEPTEMBER 1962

From the Secretary

My feeling as to the best way to celebrate the Fifteenth Anniversary of the United States Air Force is to mark the year with actions worthy of celebration on the Twenty-fifth—and the Fiftieth, or even the Centennial.

The Twentieth and Twenty-Fifth, at least, cannot be far off, considering the momentum of the Air Force today and the speed at which the first fifteen years have passed.

It seems only a short while since President Truman signed the National Security Act of 1947 creating a separate Air Force. Jimmy Doolittle described that day, 26 July, as "the day Billy Mitchell dreamed of."

The Air Force actually came into being on 18 September when Chief Justice Fred M. Vinson administered the Oath of Office to the first Secretary of the Air Force, Stuart Symington. Eight days later, on 26 September, Gen. Carl A. "Tooey" Spaatz was sworn in as the first Chief of Staff. Having previously served as Special Assistant to Mr. Symington and having been sworn in as Assistant Secretary (Management) on the same day with General Spaatz, I had an opportunity to see at firsthand the startup of the United States Air Force.

The accomplishments of the Air Force over the intervening span of years provide a solid basis for confidence in the future. The prologue of our past is but the promise of a future as big as space. The Air Force was created by men who looked ahead and up. They are with us today, and more. The thrust of Air Force progress is measured in their imagination, courage, competence, and integrity.

But as our future is bright, so our responsibilities are heavy. The threat to freedom today is immediate and continuing. Deterrence must be broadened, without being lessened at any point. From the strategic nuclear deterrent, which has been the principal bulwark of peace and freedom for nearly a decade, we are extending deterrent capabilities of aerospace power in two directions—toward equally threatening lower levels of warfare and higher in the aerospace.

The attendant obligations to the American people are greater in every area of our stewardship of their precious resources; the military service is more demanding, and devotion to duty is more important than ever before in the history of the Air Force and of the nation. Our observance of this anniversary must be not so much celebration as rededication to the ideals and the service of the nation which we defend.

Eugene M. Zuckert
Secretary of the Air Force

"If the military is going to make a valuable contribution to thinking through national security problems, we are going to have to place more emphasis on how we think and the organizational structure with which we think. And that thinking will have to be responsive to the existing environment."

Gen. Curtis E. LeMay

The Air Force's THINKING IN NEW

By Gen. Curtis E. LeMay
CHIEF OF STAFF, UNITED STATES AIR FORCE

A CLEAR idea of the future is the hallmark of the man who succeeds, the idea that prevails, the plan that bears fruit.

Predicting the future has never been a simple job and it is becoming more difficult. Change used to come at a leisurely pace; literally, today's ideas are outmoded by tomorrow's developments.

In this atmosphere of quick change, it is useful to try to depict the major factors that will affect the Air Force of the future, the things that will shape the environment in which we will have to work as an organization and as individuals within that organization. So, although I won't attempt here to draw a precise picture of the future, my thoughts on emerging trends may assist the reader to do so for himself.

I will discuss these emerging trends in three general categories. First I will treat the trends affecting defense organization. Then the international trends. And finally the trends affecting our concepts for developing and operating the United States Air Force.

Undoubtedly the most visible factor—and perhaps the most important in terms of long-range impact—has been the trend away from decentralized management of military problems toward concentration of problems managed in the higher levels of government. A number of causes have contributed to this trend toward centralization:

Soviet possession of the nuclear weapon has created widespread fear of the nuclear weapon and the felt need to keep it under close control.

A growing defense budget has impacted more and more strongly on political and economic affairs.

Military policy has become integrated with and is not distinguishable from diplomatic considerations.

Advancing technology has created a need to advance the scientist's role in military decisions.

And—of principal interest to us in the military—the institution we call the Joint Chiefs was originally designed to function in a decentralized system, rather then in the centralized system we have today.

So we find the need to reorient ourselves to the new requirements. We are working to change the JCS and the Joint Staff and to make them more responsive to the needs of centralized management. I hope that we will be successful in this effort.

Hand-in-hand with this centralization of management, national military strategy has become interrelated to a growing area of nonmilitary problems—the gold-flow problem is an example. So the military staffs and the JCS must extend their military considerations to an ever-broader area of affairs.

So much for organizational problems. Let's turn our attention now to some of the international factors that will shape our future military environment.

If present trends continue, the nature of our alliances could change significantly in the years ahead. This will have a distinct effect on the Air Force of the future since our military commitments change with our alliances. The growing strength of the European Community could well result in a United Europe. The

Deterrence 1962 is more than a word. It is men and machines geared to the never-ending mission of preventing aggression in a threatened world. B-52s—equipped with standoff Hound Dog missiles—are a prime factor in the deterrence equation.

Future Environment

DIMENSIONS

Common Market is, after all, the embryo of such a structure. It remains to be seen whether or not the United States takes part in that growth as a full partner in an Atlantic Community. But that, too, would have a major effect on our future.

Developments such as these could have a beneficial effect on our defense posture. Either a strengthened Europe or a strengthened Atlantic Community will add significantly to the free world's strength.

The proliferation of nuclear weapons is going to have an increasing effect on our military posture. We have to recognize the strategic consequences of widespread possession of these weapons.

Some years ago studies were made to identify the countries that could possibly develop their own nuclear weapons. These studies concluded that several countries would have the necessary resources in ten to fifteen years. And a greater number of countries—a total of ten or fifteen—might have the resources after a slightly longer period. These studies were called the Nth Country Studies, because as each new country was added to the number already possessing nuclear weapons, the possibility of conflict increased by geometrical progression. Those studies were made on the basis of the nuclear technology we knew several years ago. Since that time technology has advanced. Today a country would need far fewer and far less sophisticated resources to develop its own weapons.

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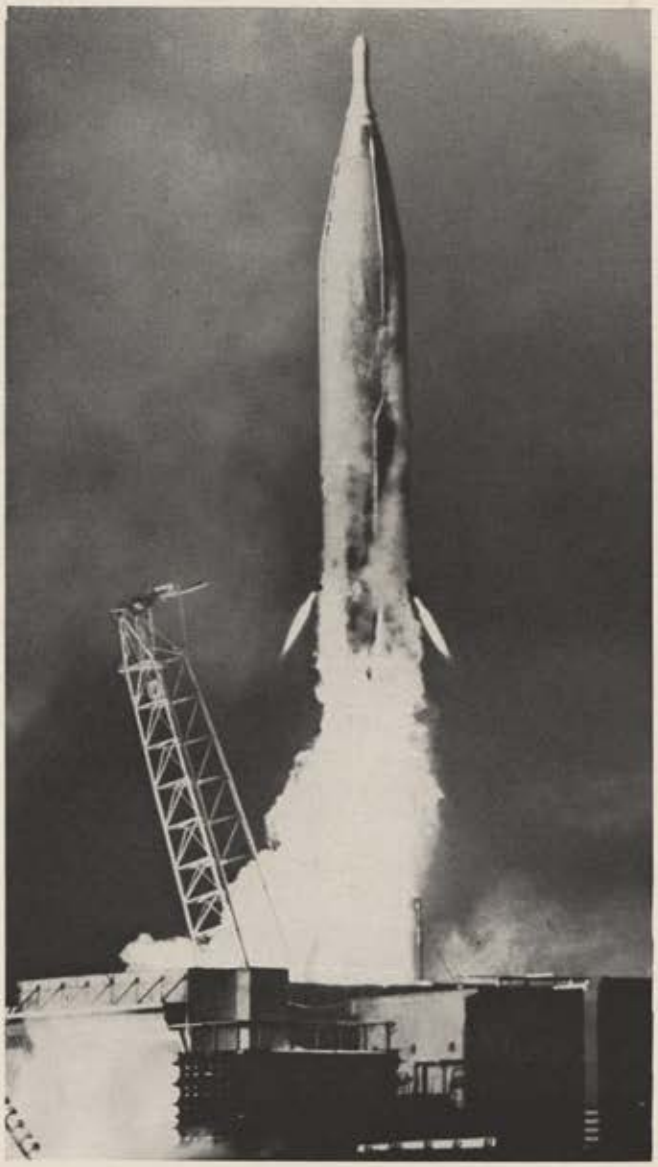


USAF and deterrence have moved into the age of missilry, as represented by this towering Atlas intercontinental ballistic missile which, when fired in retaliatory anger, would wreak devastation on the military forces of any peace-breaking aggressor.

The dedication of the men who man USAF's deterrent weapon systems has ensured peace since the end of World War II. These are just some of them, Strategic Air Command crews, at briefing. Their job, today and tomorrow, is keeping the peace.

Realistic and workable arms-control agreements are stated aims of the US, and patience is a prime requirement for American and allied negotiators who must cope with Soviet bargainers at Geneva. Military policy must be geared to national policy in this vital field.

So the Nth Country problem is a serious one. And it is one we are going to have to deal with. In my view, there are three things we can do about this problem:

One, we can live with it by adapting to the changed environment as new nations join the nuclear club.

Two, we can rely on technological advances to offset the effect of growing nuclear capabilities. I'll return to this point later in this article.

And three, we can enter into international treaties to control and prevent the growth of nuclear capabilities. This brings me to my next point.

Our government is seeking general and complete disarmament under effective international control. We have recently created a federal agency whose mission is to develop the ways and means to reach that goal. The Arms Control and Disarmament Agency is now staffed with about 100 people, and they plan to reach a strength of 200 in the near future. These are dedicated people. They are intelligent people. And they bend their efforts to their assignment. I sometimes think we in the military don't pay adequate attention to those efforts.

No nation can properly refuse to go to an international conference table to discuss arms-control proposals that appear to have been offered in good faith. But think for a moment about the bases on which we can make or accept disarmament proposals.

Generally speaking, we can't place in jeopardy such military superiorities as we might have. Nor can an enemy. We have to find the basis for an appropriate trade-off of these superiorities if both sides are seeking stability. Consider the difficulties in this case:

On first blush, it appears that an agreement for each of us to scrap 200 missiles of similar size would be an even trade. Yet such a trade might in fact be grossly uneven. It would depend on the value each nation places on its missiles, how they will be used, and their relative importance to over-all strength. That determination involves an assessment of the impact that the loss of those missiles would have on the entire defense structure of the nations in question. The same problem applies to any disarmament proposal. So each participant at such a conference is looking for agreements that won't cause his side to be put at a disadvantage.

We recently tabled a draft disarmament treaty at Geneva. The Armed Forces considered this proposal, participated in its drafting, and made inputs to it. Yet how much does the average military person really know about that proposal and how much does he really know about the effect its adoption would have on our military posture? For that matter, how much do we really know about just the effect of making the proposal?

Arms control and disarmament proposals and counterproposals are going to be a permanent feature of the defense environment. More and more of us are going to have to contribute to these proposals and to be aware of their impact. More importantly, we are going to have to develop our recommendations in this area in response to the broad considerations of national strategy and not in the limited consideration of military strategy.

I would like to turn now to a discussion of some of our purely military problems and the environment that will affect our concepts for solving them.

In the strategic field, the heavy stress on making war calculable and predictable has led us to concentrate on a strategic force that can ride out an enemy attack and still strike back effectively. This philosophy—if accepted as a total strategy—would force us to be inflexible by our own choice of weapons.

I have no quarrel with the thought that our strategic forces have to be secure. But if the high cost of that kind of survivability should ever entice us to abandon our ability to destroy opposing strategic forces and to adopt instead the cheaper strategy of retaliating against an enemy's cities and people, our defensive posture would be seriously affected. Because, in the final analysis, such a single-moded force

Arrayed against US and allied negotiators at the Geneva disarmament talks are the skills, forensic and propagandistic, of the representatives of the Soviet Union. Neutralist powers' positions vary. Yet the talks go on, because seemingly impossible agreement might occur.

would create a situation that deters *us* more strongly than it deters an enemy.

If we were deterred by our own incomplete weaponry, we would have lost superiority at the ultimate level of warfare. In this situation, we would be unable to exercise choice or flexibility in any lesser forms of warfare against this enemy. We would have lost control and flexibility because our enemy could have the ability to outraise us in this vital "table stakes—no limit" game.

For these reasons, all of us were heartened to hear Secretary McNamara come out forcefully on this point in June at the University of Michigan. He said that our principal military objective in war should be the destruction of the enemy's military forces, not his civilian population. That statement went far to clear the air both here at home and abroad. I feel that it has made our deterrent posture much more believable.

Returning to my point about the desire to make nuclear war calculable and predictable, a second problem this kind of thinking causes is that when we overstress our efforts to end nonpredictable nuclear war we are cautious about doing anything that might provoke an adversary. By definition, the building of an offensive weapon system amounts to provocation. Carried to its extremes, some people even consider shelters provocative. In this environment, the development of new strategic systems meets strong moral and emotional, as well as economic, opposition.

Third—and perhaps the most dangerous effect of all—this thinking makes us shortsighted about space. I'll return to this subject when I discuss the strategic problem in space, but now let's look at the future environment that will affect our limited-war posture.

A great part of the limited-war problem is political in nature. The ground rules for fighting, the use of bases, overflight rights—all these and many more play a large part. Therefore, political considerations are always going to dominate our preparations to fight such wars. The fear of nuclear weapons has a marked effect on this problem and will probably continue to have an effect for some years to come.

It is often charged that we in the Air Force expedited a rush to place almost sole reliance on the nuclear weapon for limited wars. This is a distorted view. The Air Force has always recognized that there are many possible situations in which a purely nuclear capability would be inappropriate. We support wholeheartedly the need to improve conventional capabilities, and we are working to develop those enhanced capabilities as quickly as possible.

A fairer statement of the Air Force position on limited war would be that we feel that the alternative to early use of nuclear armaments in limited wars against forces large in manpower is to maintain exceedingly large forces in-being. If a decision were made to develop and maintain that magnitude of forces, we of course would support it.

Most of the confusion surrounding limited war seems to me to spring from confusion as to how we would fight such wars. Perhaps it would be more accurate to say that there is confusion on how we would fight such wars against forces that would employ nuclear weapons and against forces that have no recourse to nuclear weapons. These are separate problems, and they are being treated separately. Certainly there is a vast difference between capabilities here.

We can expect nuclear-capable forces to be sophisticated and to have modern weapons. Forces without recourse to nuclear weapons, on the other hand, can be expected to have conventional weapons and less sophisticated tactics.

So to my mind the first problem in limited-war planing is to have a clear understanding of what weapons and what tactics are to be used against which opponents.

The use or nonuse of nuclear weapons is a governing factor in the size and composition of limited-war forces. And it is a major factor in planning limited-

(Continued on following page)

war tactics. It seems clear that you need more forces to fight without nuclear weapons than with them, because it is patent that you can deliver more firepower with nuclear weapons than with nonnuclear ones.

It is also obvious that you must plan tactics differently for nuclear and for nonnuclear war. The principle of mass is applied on the nuclear battlefield with weapons. Mass is applied on the nonnuclear battlefield with forces. If you intend to fight with nonnuclear weapons, you must assemble a great many forces. Yet if you plan to retain the option to use nuclear weapons, those concentrated forces would be a handicap because they themselves would present an enemy with a critical nuclear target.

There is still another major problem presented by the consideration of whether or not to use nuclear weapons in a limited war.

In war, each side tries to achieve military dominance. When two nuclear-capable military forces are in combat, even with high-explosive weapons, the overriding priority for destruction is the opponent's nuclear-capable forces. This is true because nuclear weapons are far more effective than high explosives, and, until the enemy is disarmed of his nuclear weapons, he may decide to use them preemptively to gain an irreversible military dominance. So, in limited nonnuclear war, each opponent risks losing his nuclear capability all at once by preemptive nuclear attack. Or he risks losing it over a period of time by attrition. In nonnuclear war the side with the fewer forces suffers the effects of attrition first.

If you had quantitative superiority, it would be to your advantage to fight a nonnuclear war and let your opponent lose his tactical nuclear capability by attrition.

When both forces are nuclear capable and one side enjoys an overwhelming quantitative superiority, the smaller force in a nonnuclear contest will eventually lose its tactical nuclear capability *for the simple but often overlooked reason that nonnuclear war is essentially a contest between production and attrition.* And a fact of life that we must live with is that modern tactical air forces—land-based or sea-based—are simply too expensive to stockpile or to mass produce in advance in quantities sufficient for a World War II scale of operation.

We have to appreciate the economic and political difficulties facing the President as he addresses the twin problems of nuclear and conventional war. Both he and the Secretary of Defense have stated publicly that we would retain the option to use nuclear weapons in a limited-war situation. And it is important that we continue to understand this point in our planning.

We are working hard to solve these problems that must be solved if we are to field the flexible and effective limited-war capability the President requires. Yet at the same time I feel that there is a growing awareness here at home and among our allies that these points I have mentioned are urgent and must be dealt with.

Our ability and determination to resist aggression with whatever force is necessary have all but closed the limited-war avenue to the Communist. They have forced him to select a lesser form of violence as his ploy. I think it is important to remember, however, that he could always return to large-scale limited wars if that kind of war ever again presented him acceptable risks.

I want to taik now about a lower form of violence — counterinsurgency. I think it's a fair guess that we will be involved in this business for some years to come. Unless, of course, ways can be developed to close this avenue of aggression by means of an international constabulary. This is always a possibility. And it is one I don't think we should overlook, even though there there are many problems to be overcome.

Nevertheless, our forces are still charged with this national mission and we are getting on with the job. I look for the traditionally superior US capabilities to develop rapidly.

Here again we have a problem that has political, cultural, and economic overtones. When a friendly country asks for our help late in the second or guerrilla phase of a Communist takeover operation, we go in at a severe handicap. The Communist has been at work perhaps as long as ten or twenty years in the first phase alone, infiltrating the population and becoming a part of it. Our job at this late time is to prevent the take-

The US Air Force can look back on two decades of counterinsurgency know-how, but is sharpening up skills and designing them specifically for the foreseeable cold-war future, to contribute significantly to the spectrum of military capabilities ranging from general war-winability to successful handling of Communist guerrilla efforts in distant areas. The Air Force Special Air Warfare Center at Eglin AFB, Fla., is USAF's prime locus for such training, as represented by the C-47 jungle air evac exercise above.

over from entering the third, or formal military operation, phase.

This is no simple job. It can't be done by traditional means. We in the Air Force are very much immersed in this job and with the other military services we have a responsibility and a capability for doing it that is second to none.

When we organized the Special Air Warfare Center at Eglin AFB, Fla., recently, we took stock of the Air Force people and talents available for counterinsurgency. I assure you our supply is adequate. After all, we have been conducting air-ground operations now for more than twenty years in World War II, the Philippines, and in Korea. And we are assisting in the training of South Vietnam forces. During that time many of our people learned how to live and to fight a fleeting and concealed enemy under the most primitive conditions, improvising as they went along. We have a veteran corps of air commandos who operated all over China, Burma, and Southeast Asia during World War II. For years we have been training crews in the hide-and-seek tactics of escape, evasion, and survival in the jungle or desert or in the heart of enemy territory. We have learned communications and intelligence-gathering techniques, and tactical intelligence is the controlling factor in counterinsurgency operations. And we have an unsurpassed wealth of experience in coordinated air-ground action all over the world. All of these talents and the people who own them are priceless resources for the counterinsurgency effort.

So as long as the United States stays in the counterinsurgency business, you can be certain that the Air Force will play an important role in that effort. This, too, will be part of our future environment.

I stated that I would return to the strategic and the Nth Country problems and the environments in which we would have to solve these problems. I mean to do that under the general heading of military space capabilities. Certainly space is a strategic factor, and certainly technological developments in space have the potential of rendering Nth Country problems obsolete.

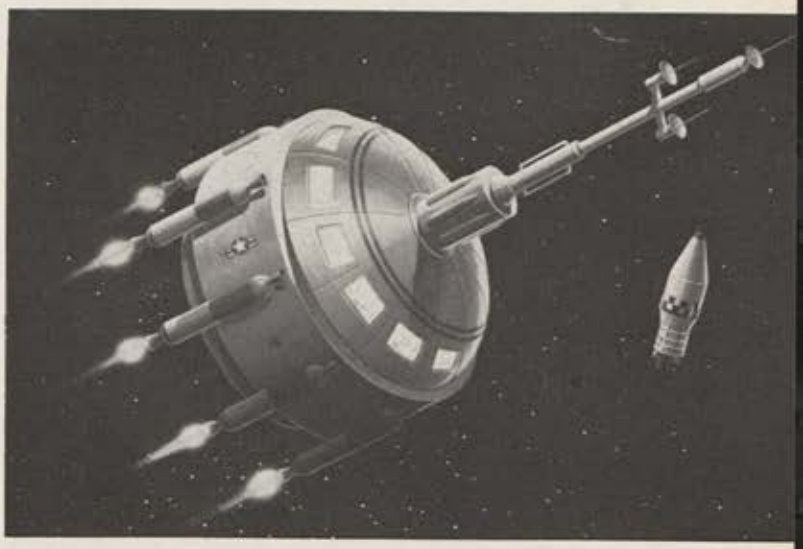
An idea that is impeding military space progress is one to which I have spoken publicly on several occasions. This is the idea that nuclear weapons are the ultimate weapons. This concept assumes that no weapon can ever displace the nuclear weapon — except a more powerful or different form of the same weapon.

People who believe this say that there are already enough nuclear weapons to destroy the world and they say that this abundance of weapons is intolerable. Most of the arguments for arms control, the stalemate theories, and the minimum-deterrent theories derive from this basic idea.

Most important to us, the development of military capabilities in space is viewed as a way to widen the area where nuclear weapons can be used. This idea, perhaps more than any other, causes some people to worry about and to question the need for the development of military space capabilities.

Now I don't think the nuclear weapon is the ultimate weapon man will ever devise. And I don't think the one that replaces the nuclear weapon will be the ultimate either.

Tomorrow's weapons may employ entirely new and nonnuclear principles of operation. For example, we are still acquiring greater understanding of the principles governing focused energy. And, eventually, we may see these developments lead to focused-energy weapons.



The strategic importance of space is assured, if military history is any guide. The US will need military operational capabilities in the medium that is an extension of the air envelope, as symbolized by sketch of USAF crew effecting rendezvous.

The energy directed by such weapons could travel across space essentially with the speed of light. This would be an invaluable characteristic for the interception of ICBM warheads and their decoys. And, if a new generation of armaments operating in space could neutralize an aggressor's ICBMs, warfare as we have known it would be outmoded by the advance of technology.

The neutralization of ICBMs by a system deployed aboard a maneuvering space vehicle is no irresponsible escalation of an arms race.

People who say that we have an unstable military environment say that because they feel the offense has overwhelmed the defense. A weapon such as I have described would return that offensive-defensive balance. And it would move the world into a new era of warfare. More importantly, it would move the world into a new era of *preventing war*. Assuming, of course, that it was in the proper hands.

In the environment I have described, one big question looms in my mind: Who is going to think through security problems in the years ahead?

History writes clearly. Victory does *not* always go to the strongest and the bravest. Victory—since the time of David and Goliath—often goes to the nation that is best able to think.

That is the challenge that lies ahead for us.

If the military is going to make a valuable contribution to thinking through national security problems of the future, we are going to have to place more emphasis on how we think and the organizational structure with which we think. And that thinking will have to be responsive to the existing environment.

If we fail in this task, we will be reduced to functioning as custodians of military resources. And the national strength will be reduced proportionately.—End

"In a tribe of hunters or shepherds, a particular person makes bows and arrows, for example, with more readiness and dexterity than any other. He frequently exchanges them for cattle or for venison, with his companions; and he finds at last that he can, in this manner, get more cattle and venison, than if he himself went to the field to catch them. From a regard to his own interest, therefore, the making of bows and arrows grows to be his chief business, and he becomes a sort of armorer."

—Adam Smith, The Wealth of Nations. *(1776)*

Any objective analysis of the history of the development of American air—and now aerospace—power, in terms of the approaches used to get the technology moving and the systems built, proves that a resounding YES is the answer to the question: Can free enterprise do the defense job best?

What's the Best Combination?

PRIVATE and the PUBLIC

WHEN Adam Smith wrote *The Wealth of Nations* he did not contemplate that the task of the armorer would become as complex as it is in 1962, or even that weapons would be vital to the very survival of free men. He did recognize the essentiality of "readiness and dexterity," a pair of talents that have come to be known as "know-how" or "capability." Indeed, readiness and dexterity are attributes sought out today in the source selection phase of weapon-system procurement.

Adam Smith's basic economic philosophy was that of the Free Enterprise system, as every college freshman has learned. His maker of bows and arrows pursued this specialty "from a regard to his own interest," which meant that he did it for profit. That the profit was in the form of venison, rather than dividends, is beside the point. He got his venison and filled his belly. The rest of the tribe got better bows and arrows. If they were not better, the hunters would have gone back to "do-it-yourself" and the armorer would have had an empty belly.

More than a hundred and thirty years separates Adam Smith from Wilbur and Orville Wright, yet his economics were understood and applied by the two bicycle repairmen from Dayton, Ohio. They invented the airplane in 1903, and the next six decades have not uncovered two government contractors who were more jealous of their proprietary rights and more determined to realize a fair profit for their work. The diaries and papers of the Wright brothers are heavily burdened with detail that betrays an almost picayune sensitivity in this regard.

In 1910, a New York newspaper published an interview with Octave Chanute in which this friend and counsel of the Wright brothers was quoted as saying the inventors did not have a clear title to the idea of the warped wing, a device that achieved lateral balance for their airplane and made it controllable. Wilbur Wright protested loudly in correspondence with Chanute, who indicated that the interview was not an accurate reporting job. Chanute also said that the mechanism used by the Wrights to warp the wing was original with them, but held that the warping idea was not.

"I told [Wilbur Wright] I was sorry to see they were suing other experimenters and abstaining from entering the contests and competitions in which other men are brilliantly winning laurels," Chanute was reported as saying. "I told him that in my opinion they are wasting valuable time over lawsuits which they ought to concentrate in their work. Personally, I do not think that the courts will hold that the principle underlying the warping tips can be patented. They may win on the application of their particular mechanism."

There is no denying that the touchiness of the Wright brothers was centered on their pocketbook. Wilbur reacted almost apoplectically when it was suggusted that he and his brother Orville were greedy. In the course of his 1910 clash with Octave Chanute he wrote:

"We believed that the physical and financial risks which we took, and the value of the service to the world, justified sufficient compensation to enable us to live modestly with enough surplus income to permit the devotion of our future time to scientific experimenting instead of business. We spent several years of valuable time trying to work out plans which would have made us independent without hampering the invention by the commercial exploitation of the

ENTERPRISE INTEREST

By Claude Witze
SENIOR EDITOR, AIR FORCE/SPACE DIGEST

patents. These efforts would have succeeded but for jealousy and envy."

Then Wilbur betrayed a touch of bitterness:

"It was only when we found that the sale of the patents offered the only way to obtain compensation for our labors of 1900-1906 that we finally permitted the chance of making the invention free to the world to pass from our hands.

"You apparently concede to us no right to compensation for the solution of a problem ages old except such as is granted to persons who had no part in producing the invention. That is to say, we may compete with mountebanks for a chance to earn money in the mountebank business, but we are entitled to nothing whatever for past work as inventors.

"If holding a different view constitutes us almost criminals, as some seem to think, we are not ashamed. We honestly think that our work of 1900-1906 has been and will be of value to the world, and that the world owes us something as inventors, regardless of whether we personally make Roman holidays for accident-loving crowds."

Wilbur Wright's apprehension that he was being viewed almost as either criminal or mountebank is only one more thing he had in common with today's defense contractors. The Wright brothers first offered their airplane to the US War Department in 1905. It is timely to recall that when Wilbur and Orville made their first approach they were handicapped because they chose to go through political channels.

The Army's Bureau of Ordnance and Fortification already had invested $50,000—of the taxpayer's money—in Samuel P. Langley's airplane, which splashed into the Potomac River on its first takeoff. Langley was

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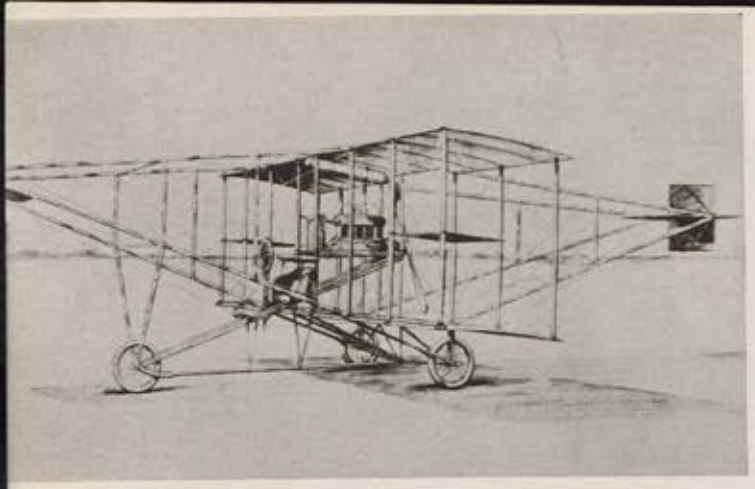
The Wright brothers operated this Dayton, Ohio, factory.

Boeing Company invested $16 million in KC-135 tanker and later applied know-how to commercial 707, in foreground.

History of Atlas ICBM starts with USAF contract of 1946. Funds were cut off in 1948, but Convair continued with own money until 1951, when military interest was resumed.



Glenn Martin, typical aviation entrepreneur, built his first plane in abandoned church in Santa Ana, Calif., in 1909.

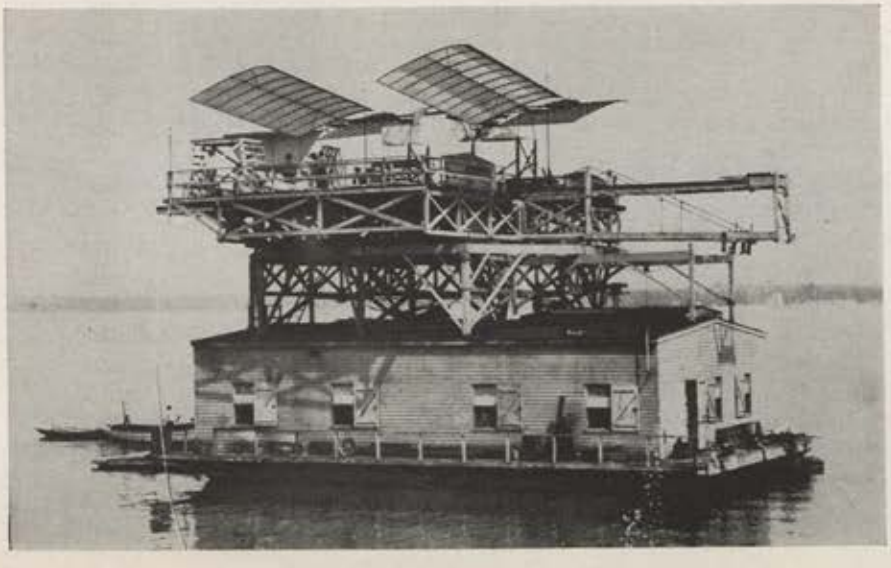
Lawrence Bell, Eric Springer, Glenn Martin, Donald Douglas with MB-1, only American-designed combat airplane of 1918.

Martin Company, with plants in three states, has long history illustrating foresight of private US industry in defense areas. It manufactured planes from 1909 until 1960, then turned to concentrate on missiles, space, atomic power. Research Institute for Advanced Studies (RIAS) is division of firm devoted to basic research, none of it directed to products, on assumption that this work is vital to survival for both the nation and the company.

Martin B-26 of World War II was unflatteringly christened "Flying Prostitute" by AAF pilots. But Uncle Sam bought 5,631 of them for $935.4 million. The plane was designed by Martin, chosen from its drawing boards as war loomed.

Secretary of the Smithsonian Institution, a position that he held because of his high qualifications as a scientist. The Smithsonian was privately endowed and supported by government grants, which makes it a precursor of the modern nonprofit corporation. Even in those days the War Department, as always, was aware that Congress provides the money for such ventures and that the solons are hypersensitive to technological failure. On top of the $50,000 put in by the Army, it is estimated that the Smithsonian contributed an almost equal amount to the Langley machine in the form of facilities and the time of its own personnel. Yet, had the machine been successful, there was no restriction on what Langley and the Smithsonian could do with the patent rights. While they probably would have stepped aside to permit exploitation of the invention for the nation's good, they still were free to profit from it, if they chose to do so.

On their first try to sell their machine to the government, the Wright brothers made the mistake of



Langley's airplane, product of public effort, enriched Potomac River with about $100,000 of public money. He was an astronomer and physicist who held Smithsonian position because of his eminence as a scientist. Wright brothers were contemporary with him, expected profit for their inventiveness.

Martin Pershing *(left)* is Army surface-to-surface weapon with wide variable range. Contract in 1958 marked firm departure from arsenal system for Ordnance Corps. USAF's Titan ICBM *(right)* was first two-stage weapon of this type. Newest version will provide important booster power for US space-age effort. In background, Boeing B-52 bomber.

Looking to the future, Martin-designed guidance device can read star patterns, establish a pointing axis in space and thereby orient a vehicle in orbit. Instrument was designed to stress simplicity and high reliability.

writing to a local congressman and thereby aroused suspicion in the Army. They were brushed off as if they were a couple of small businessmen appealing for a handout. Actually, they did not want any money until they delivered their product. By 1908, after much flirting with interested parties in Europe, they signed a contract with the new Aviation Division in the Office of the Chief Signal Officer.

For all practical purposes, this document marked the start of our aircraft industry and the establishment of private industry as the source for modern weapon systems. In the first place, there was competition. The Wright brothers' bid was one of twenty-four, of which two led to contracts—a pattern that is common to this day. Further, the contract signed by the Wrights contained an incentive clause. It called for an airplane with a speed of forty miles an hour, range of 125 miles, and a payload of 350 pounds. The Army said its men must be able to disassemble the aircraft, carry it in an Army wagon, and reassemble it ready to fly in not more than one hour.

Then, said Signal Corps Specification No. 486:

"The flying machine should be designed to have a speed of at least forty miles per hour in still air, but bidders must submit quotations in their proposals for cost depending upon the speed attained during the trial flight, according to the following scale:

40 miles per hour, 100 percent.
39 miles per hour, 90 percent.
38 miles per hour, 80 percent.
37 miles per hour, 70 percent.
36 miles per hour, 60 percent.
Less than 36 miles per hour rejected.
41 miles per hour, 110 percent.
42 miles per hour, 120 percent.
43 miles per hour, 130 percent.
44 miles per hour, 140 percent.

"The speed accomplished during the trial flight will be determined by an average of the time over a measured course of more than five miles, against and with the wind. The time will be taken by a flying start, passing the starting point at full speed at both ends of the course. The test subject to such additional details as the Chief Signal Officer of the Army may prescribe at the time."

The agreed price for the airplane if it met basic specifications was $25,000. But the Wrights exceeded the forty-mph speed requirement and won a bonus. They were paid $30,000. The incentive brought them a twenty percent reward. This $5,000 was considered earned profit. It was not subject to renegotiation, and there is no record that any congressional committee was incensed by the possibility that the Wrights might have made more than this twenty percent profit. There is, in fact, no way of knowing what their total profit was on that machine or how close it came to covering their investment since 1896.

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Technological progress made between that first contract and the eve of World War I was insignificant in aviation as well as other fields of military preparedness. Guns and ammunition were the basic war materiel, both designed and produced for the most part in government arsenals. In fiscal year 1913 the US aeronautical appropriation was only $125,000. Mexico appropriated $400,000 that year, which was more than we spent in six years. The French were the most air-minded, with an outlay of $7.4 million. In 1914 the Chief of the Signal Corps told a House Committee that "as a fighting machine the airplane has not justified its existence."

There were at least two good reasons for this. One was that the military were not trying to use the airplane as a fighting machine. They considered it a reconnaissance vehicle, little better than the balloons used in the Civil War. The other reason was that the airplane already was too complex, too specialized, and too fast changing to be nailed down as a production-line item in government arsenals. Both the French and British aircraft industries, as well as those in other countries, had proven more aggressive and inventive than our own. Stimulated, probably by the competitive spirit, continental unrest, and a much higher level of government interest, they made major advances while US industry lagged.

I. B. Holley, Jr., has recorded, in *Ideas and Weapons:*

"Before the end of 1914 Rudolf Boehm in Germany had flown a Rumpler for twenty-four hours nonstop, Igor Sikorsky in Russia had completed a four-engine aircraft [the first so built], and in England Short Brothers, Ltd., mounted an experimental two-pounder naval gun in an airplane even before war came. Of still greater importance, the Royal Flying Corps, established with a military and naval wing in 1912, formed an Experimental Branch in 1913. By the end of another year more than a dozen English manufacturers were turning out aircraft at the rate of a hundred a year."

The fiscal 1913 aeronautical appropriation in Great Britain was $3 million, and it was $5 million in both Russia and Germany. With only $125,000 available in the US, the incentive for America's infant aviation industry was minuscule. A 1914 competition for a reconnaissance biplane brought in twelve bids, but the critical fact of life was that there was no reliable engine available to any aircraft designer that could perform to the standard set by the airframes. This may be the point at which the American industry first started to define a weapon system, without even knowing that it had. The Signal Corps had to set up a separate competition for development of a power unit, and, according to Professor Holley, the aircraft bidders began to maintain company representatives at the Aviation Center in San Diego "to keep in touch with the needs of the new section." Industry was beginning to learn about concurrency and to realize their own efforts might be fruitless if they did not closely monitor subsystem development. Lacing up their ties with the military, in the first steps toward a "complex," the pioneer manufacturers, like those of today, were solving a technological problem.

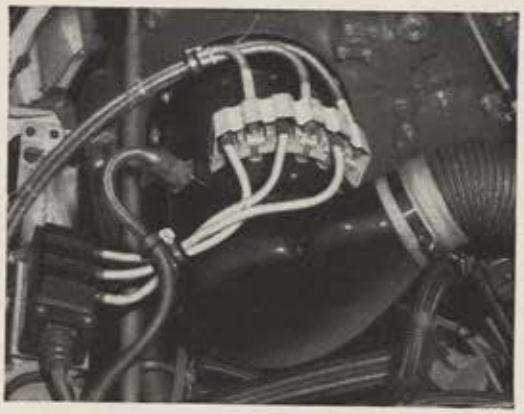
So far as the first World War is concerned, the story of the American aviation effort is one of too little and too late. The reasons have been indicated, and they persisted until 1917, when the Premier of France asked the US—his new ally—to send to the front, within a year, 4,500 airplanes, 5,000 pilots, and 50,000 mechanics. General Hap Arnold has written that Billy Mitchell, who was the first American to fly over the lines in Europe, was in Paris when the Premier's cablegram was written. He detects Mitchell's fine hand in the message, which constituted an early example of "pressure" applied to encourage a military expenditure.

Actually, the US Airplane Division in the War Department was working under impossible handicaps and needed the help. The bosses, General Arnold recalls, were Signal Corps officers who would not listen to the pleas of US airmen. They did hearken to the complaints of air missions from Britain, France, and Italy, whose members disagreed on everything except the judgment that American airmen, who never had fought a war, didn't know anything. With this kind of support it is not surprising that the first wartime aviation appropriation bill, passed by Congress in the summer of 1917, went through without ever being approved by the General Staff of the Army. It provided about $640 million for aircraft procurement

(*Continued on page 51*)

McCook Field, near Dayton, Ohio, was early predecessor of Wright-Patterson AFB. It was one of two major efforts to establish an aviation arsenal, at least to provide airplane designs. Neither effort could match industry.

This airplane detects, early warns, controls intercepts, and has a heart.



This is the heart.

The airplane belongs to the U. S. Navy. It is a Grumman W2F-1 Hawkeye. It is one of the largest carrier-based aircraft, is manned by a crew of five and was designed to perform airborne early-warning missions. Technically, for long range radar detection and control of intercepts with minimum reaction time.

The heart of the W2F-1 is its avionic-electrical system: two Bendix® Type 28B95-3, 60 KVA AC brushless generating systems direct-driven by the airplane's turboprop engines. These brushless systems—along with companion Bendix solid-state regulation and protection components—supply reliable, efficient electrical power to help the Hawkeye do its job. Which is a big one.

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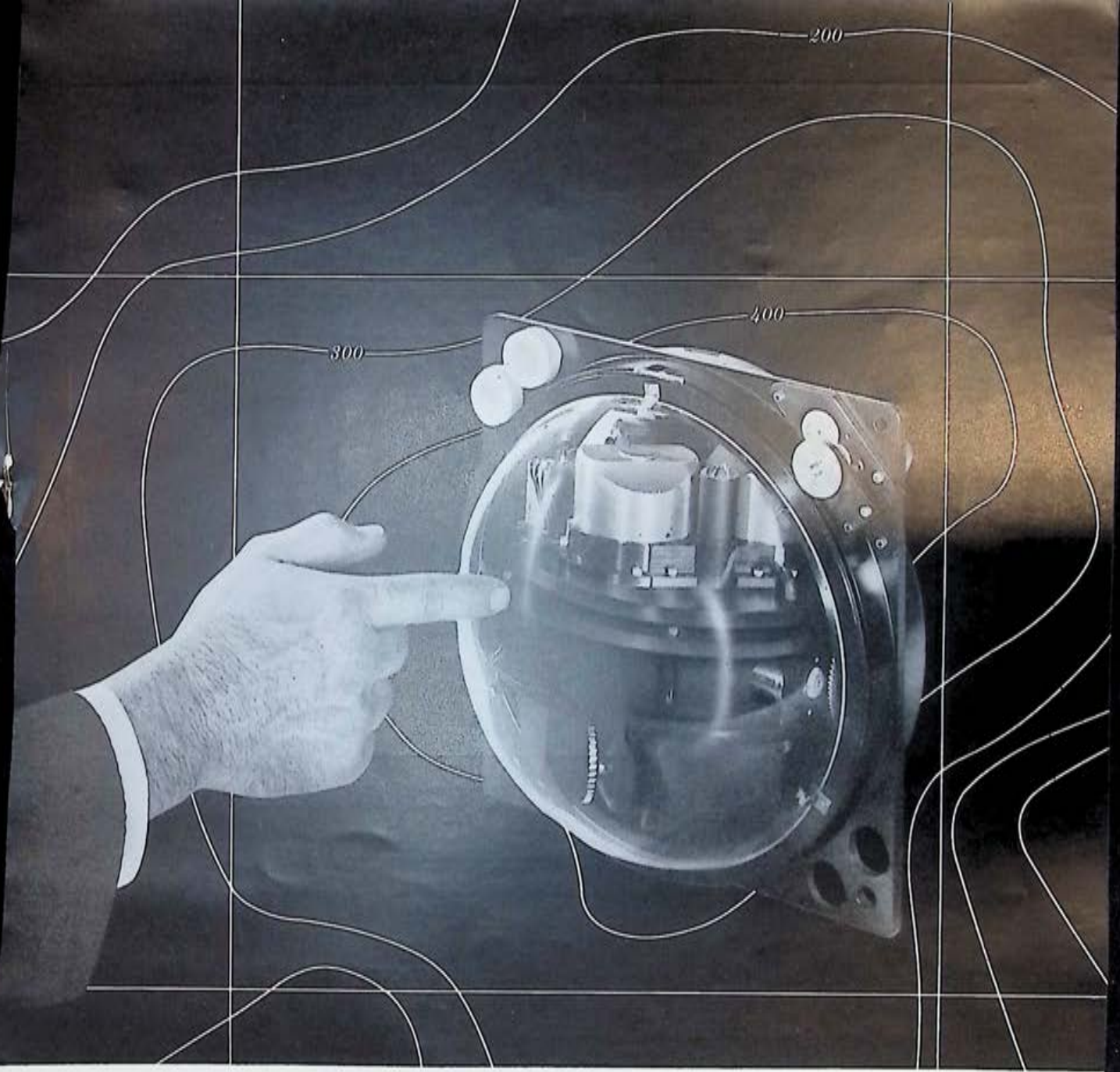
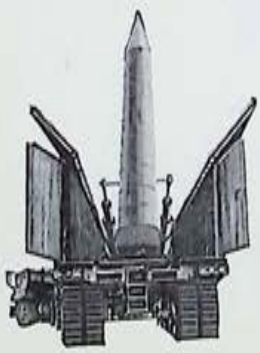


How to put your finger on precise location



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and maintenance. Until this time, the Army had lagged far behind the Navy, which had received an appropriation of $3.5 million in the summer of the previous year. Yet the Navy did not have an impressive force in the early months of 1917. There were six flying boats, forty-five seaplane trainers, three landplanes, two balloons, and a badly floundering dirigible.

With their history of adherence to the arsenal concept in the provisioning of munitions, it was no surprise that both the Army and Navy thought first of in-house capability when it looked as if airplanes had become weapons. Offsetting this was their early experience with private enterprise, starting with the Wright brothers and their incentive contract. There were many other manufacturers in the field by this time, of widely varying capabilities, and nobody denied that the armed forces needed competent people to judge and select and buy airborne weapons.

But the arsenal approach had a foothold in long years of history. McCook Field was established in Dayton by the Army in 1917, and the Naval Aircraft Factory at Philadelphia produced its first aircraft in April of 1918. It is interesting that the Navy justified the factory partly on the basis that the Army's requirements were so enormous that private manufacturers were cool to the Navy's smaller contracts. On the other hand, in 1925 C. M. Keys, President of the Curtiss Airplane and Motor Co., told the Lampert Committee —during a congressional inquiry into the air services— that he favored the Navy heavily as a customer during the war because McCook Field was "destructive to the industry." He explained that this was because McCook, as the customer, insisted that the designs and drawings had to originate with the McCook Field staff. He said that in 1918 he contracted to build a large number of planes for the Army, but McCook was unable to provide proper designs, drawings, or specifications. What he built for the Navy was designed from the bottom up by the Curtiss Company.

The Naval Aircraft Factory was expanded during the war, but it never was able to keep up with the early demand. It built airplanes designed by private companies—the Curtiss H-16 was the first—but had personnel and skills problems. At the peak it had 900 employees, many of them women, and all had to be trained. Still, the Curtiss Company drawings, fully satisfactory for their own foremen and workers in the home plant, were inadequate for the Navy factory.

A Bureau of Aeronautics technical publication of 1930 says that for the Philadelphia operation " the men and women of the Victor Talking Machine Company had to make parts whose use to them was a mystery and, furthermore, must make them to fit with parts from some furniture maker in Philadelphia who had never seen a flying boat." The report later says that because the Navy wanted to encourage private enterprise in the aviation field, "the work of the factory has been restricted to experimental work, repair, and overhaul for the service, and the general storehouse for naval aviation activities."

The Lampert Committee hearings of 1925 provided a critical review of the nation's aviation effort in World War I. The study uncovered a good many precepts, both from military and industry witnesses, that helped steer the United States farther away from the arsenal concept and into a reliance on private business for its airborne systems. It may be the point at which the aerospace industry was separated from the "munitions makers," who were to be put under a glaring spotlight a few years later by the famous Nye Committee. Principles enunciated before the Lampert Committee have held their validity through all the years while airborne systems advanced from the clumsy to the complex.

Charles L. Lawrance, Vice President and General Manager of the Wright Aeronautical Corporation, which had built a large number of engines for the Navy, told the committee he could not recall a single contract that involved competitive bidding. He said his company did not make a lot of money and that the Navy got a good product at a fair price. If there had been competitive bidding, he testified, he would expect to win because he had the know-how and equipment to build the engines.

The witness conceded that the Army and Navy needed competent engineering officers to provide sufficient in-house capability to cooperate at an efficient level with the manufacturer and to provide essential inspection services. He favored subcontracting as a prerogative of the prime contractor, who should be allowed freedom to enlist other firms rather than expand his own capacity. He pointed out that this system was widely used in England.

Lawrance was not right about everything. He lamented the few dollars spent on helicopter development and said he did not believe rotary wings ever would provide a means of air transport. Another exponent of private enterprise, Igor Sikorsky, was busy with flying boats at this time. He had experimented with the helicopter in 1909 and 1910, then put the idea aside for twenty-nine years before he flew the VS-300—designed, developed, and proven with private funds. The US Army bought its first experimental rotary-wing aircraft in 1942—from the Sikorsky Division of United Aircraft Corporation.

Between World War I and World War II military aviation suffered from the traditionally lean peacetime funding. There was a long list of investigations by congressional committees and boards set up by the executive branch. Probably the most important was the Morrow Board, headed by Dwight W. Morrow, later to become the father-in-law of Charles Lindbergh. The Secretaries of the War and Navy Departments had urged President Coolidge to start a study of the role of aviation in national defense. He did it promptly after the crash of the Navy dirigible *Shenandoah* in 1925.

The Morrow Board again confirmed the dependence of the United States on private enterprise. Profiting, at least in part, from the experiences of the Naval Aircraft Factory and McCook Field, both of which had indicated that the designing and manufacture of aircraft should not be separated, the board spoke up

(Continued on following page)

USAF Generals Power and Schriever at congressional inquiry face grilling, usually by critics. Not all witnesses wear stars. Many are dedicated, fully competent officers of lower rank who must defend decisions made years ago in face of pressures and unknowns.

for competent and well staffed aircraft manufacturers. It studied their resources and decided that, in an emergency, the country could produce at a rate of 15,000 planes a year within twelve months. The figure would be higher after eighteen months. The board suggested that designs be standardized for three-year periods. Proprietary rights should be protected, the board said, and the companies encouraged to press research. The board is credited by historians with putting an end to many dissensions and laying the foundation for a sound industry. It may be that without the Morrow Board's counsel and what came of it, this country would have been pathetically unready for the test of World War II. Technologically, the Army—working with the Engineering Division of the Signal Corps—was almost helpless. It retained little of the experience gained in World War I. The lessons that were carried over were those learned, for the most part, by engineers and scientists employed by the aircraft industry and in the laboratories of the National Advisory Committee for Aeronautics. The great lesson of World War I had been that *better* weapons are more important than *more* weapons and that the way to meet this demand is to rely on the incentives offered private enterprise, not on the routine procedures of government-operated arsenals.

For all of the Morrow Board's sage advice, the money available did not permit exploitation of its recommendations. Before 1940 airplanes for the most part were handmade, and the real transition to mass production did not take place until we were already in World War II. Franklin Roosevelt's call for 50,000 planes a year could not be met by government factories, by a subcontracting network, or by converting the talking machine and furniture industries. As in World War I, Europe helped to point the way. The history of the *Army Air Forces in World War II* records:

"In 1939, some use was made of so-called 'educational orders' as a means of encouraging and measuring the possibility of expansion of munitions factories, but the sums allocated for Air Corps use were insignificant. The real incentive to expand came from foreign orders, a type of business which had been under severe criticism in those years when all the makers of arms were attacked as 'merchants of death.' Under the impetus of war in Europe, however, public opinion and government policy changed; the Neutrality Act was modified to allow sale of munitions by the 'cash-and-carry' method, and France and England began ordering US aircraft."

In view of the present atmosphere, in 1962, it is essential to recall that the evil "merchants-of-death" label and the Neutrality Act itself, which had to be changed, came out of the Nye Committee investigations of the mid-1930s. In full, heated cry after industry as a possible source of international irritation, designed to provoke war, this inquiry later was described by Harry Truman as irresponsible demagoguery and blamed for a large part of our unpreparedness. The inquiry drove a number of major industries—not in the aviation field—off the list of defense suppliers, at least until crisis was again with us and there could be no demagogic challenge to their patriotism. It also must go in the record that the Vinson-Trammell Act of 1934, amended in 1939, placed a ceiling of twelve percent on aircraft profits. This was cut to eight percent by Congress in 1940. The industry, which had suffered from overexpansion a decade earlier, was reluctant to invest in new facilities for a wartime boom and bust, and they found sound support from their bankers. This marked the start of the fast tax amortization program and, finally, the provision of government-owned facilities.

It is not necessary to review the role played by the aircraft and related industries in World War II. The gargantuan expansion was successful despite all the problems that arose when technology first started to move swiftly. The peak month was March of 1944, when 9,113 military planes were built. At that rate we could make 110,000 a year. On December 7, 1941, the day Pearl Harbor was attacked, the rate was about 29,000 a year. Cost of the aircraft program for World War II has been estimated at $45 billion. The expenditure of this money was accompanied by new procurement regulations, constant supervision, and renegotiation of contracts, all designed to regulate the flow of profit and to protect the interests of the government. There was little apprehension expressed by the industry over trends to control anything except profit. Uncle Sam was out to buy the best product for the best price possible, and he depended on private corporations to do the job. The minority of suppliers guilty of transgressions did not seriously mar this record, and few of them were able to survive the competition.

The sharp cutback after the war, the reinstitution of

(Continued on page 55)

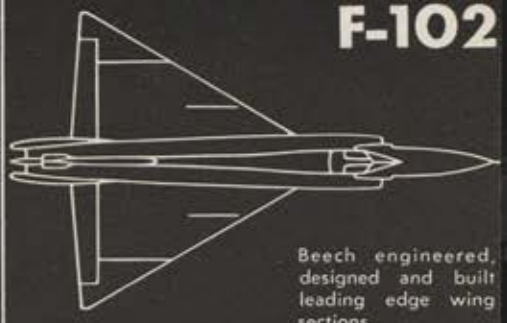
F-101

McDonnell F-101 has Beech nose, canopy, stabilator, windshield, rudder.

F-106

Convair F-106 has Beech aft section, tail, canopy, nose, windshield, wing sections, elevons, missile bay doors.

F-102



Beech engineered, designed and built leading edge wing sections.

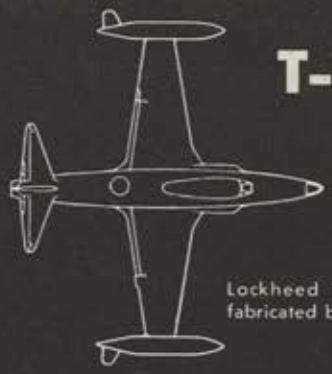
F-94C

Lockheed F-94C uses Beech-built wings.

MISSILES

Beech contributions include fuel tankage and fuel management and component testing for ATLAS, TITAN, SATURN, and CENTAUR.

T-33A



Lockheed T-33A wings fabricated by Beech.

T2V-1

Lockheed T2V-1 wings are Beech-built.

F-105

Republic F-105 ailerons and aft fuselage are Beech-made.

F-104

Lockheed F-104 aft fuselage and pylon tanks are by Beech.

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reliance on industry in the Korean War, and the subsequent necessity for maintaining an industry-in-being also are familiar chapters of the history. The Soviet menace had made itself felt and America accepted the decision that only a deterrent force, ready and technologically superior, could maintain the peace.

Probably the most important thing about our experience in World War II and the application of that experience to military procurement programs in the years since has been the revolution brought about in management. For a starting point, take the organization set up by the Air Force when it became a separate branch of the armed forces in 1947. The location of World War I's McCook Field at Dayton, Ohio, long since had determined the site of what became, in the last big war, the Air Technical Service Command of the Army Air Forces. The site, greatly expanded, became the Wright-Patterson Field complex, and in March of 1946, about a year before USAF was born, the command was rechristened as the Air Materiel Command.

Here was a centralization of procurement authority that was set up with the deliberate intent of avoiding the complicated old War Department pattern, with its multiple customers in Ordnance, Signal Corps, Quartermaster, Chemical Corps, and the like. There had, indeed, been a parallel pattern in the Navy, where history has recorded a Bureau of Steam Engineering, a Bureau of Construction and Repair, a Bureau of Ships, a Bureau of Aeronautics, a Bureau of Ordnance.

USAF, starting with AMC, has been forced by advancing technology to revise its own pattern, and it has shown the way for its sister services. In 1950, following an Air University study headed by Dr. Louis Ridenour, the Air Research and Development Command was created. In 1954, after another committee headed by Dr. John von Neumann argued for acceleration of the ICBM program, ARDC set up the Western Development Division and put it under the command of then Brig. Gen. Bernard A. Schriever. General Schriever, reviewing this history for the Symington airpower investigation in 1956, put it clearly in the record that WDD "assumed complete responsibility over the [ballistic missile] program." He said ". . . I have a channel, a direct channel, into the air staff. Secondly, the ARDC staff in Baltimore is at my disposal and I have directive authority over all the centers in the program. . . . Gen. [Thomas S.] Power [ARDC Commander] . . . permits me to run with the ball, and I do run with it."

WDD later was renamed the Ballistic Missile Division, and it produced successful missiles in record time, both in IRBM and ICBM configurations. It had the kind of over-all authority and responsibility, centered in one office, that later was adopted by the Navy for administration of its Polaris submarine program with equal success. These experiences, following USAF's initial effort, have led the Navy to reorganize, setting up a Bureau of Weapons in 1959, so that the approach can be utilized across the board. USAF made a further change in 1961, when AMC and ARDC were replaced by a Systems Command and a Logistics Command. This will meet the challenge offered by the nature of new aerospace systems, which in reality never get out of the development stage and require more custom construction, almost eliminating production-line assembly techniques.

Most recently, within the past month, the Army has stepped into the pattern pioneered by USAF and used by the Navy with the establishment of a new Army Materiel Command under Lt. Gen. Frank S. Besson, Jr. It was announced at the time that there are about thirty Army projects tagged for "exceptional treatment," and General Besson elaborated that this is about half of the Army's burden in the research-and-development field. The Nike-Zeus antimissile missile is high on the list.

For an interpretation of what this means to the military interface with defense industry, a succinct account was given to the Subcommittee for Special Investigations of the House Committee on Armed Services in 1959, by Maj. Gen. W. Austin Davis, then attached to the Air Materiel Command. General Davis said:

"It became quite apparent that the complex equipment required for a modern Air Force would require such a high degree of scientific and technical skill and so much specialized training, tools, resources, facilities, and so forth, that the Air Force, by itself, would not have the manpower or skill required to do the total job, but would of necessity have to look to industry for greater technical support.

"[A] second factor was the need to closely harmonize the development-and-production effort. During World War II the airplane manufacturer designed and built only the airframe on which he installed the equipment furnished by the government. This resulted in considerable incompatibility of systems and subsystems, leading to impaired performance, operational delays, and reduced combat effectiveness. It was obvious that a method had to be devised wherein all elements of a particular weapon could be developed and produced as one integral unit.

"Factor number three was the realization that functional performance alone was not enough. Although the Air Force is organized and managed on a functional basis, we measure the Air Force's effectiveness in terms of the capabilities of its weapon systems. To ensure that optimum performance is obtained in a weapon system, there must be centralized control of the design, development, and production of the system. This is best accomplished, we believe, by making the weapon-system contractor the responsible focal point for consolidation of all such effort into a unified and capable entity. The weapon-system concept of management performs this function.

"Under it, the Air Force retains control of a weapon-system program while at the same time giving the prime or associate contractor sufficient latitude to accomplish his job. In this role, the Air Force must time-phase and integrate all actions of Air Force agencies as well as those of industry. Because of the magnitude of the job and the limited technical resources within

(Continued on following page)

the Air Force, there was no alternative but to turn to industry for assistance in performing a portion of our task. The Air Force has retained over-all decision-making management prerogatives. . . ."

Since General Davis gave this outline, the space age has enveloped his command and USAF, starting with the Minuteman ICBM system, has taken an increasing role in the integration effort. To meet this challenge it has needed more help. At first this aid was provided by private consultants organized into profit-making corporations, such as Ramo-Wooldridge. Since then, in the hunt for unchallenged objectivity, it has turned increasingly to self-created nonprofit organizations. This is an élite corps, of which MITRE and Aerospace Corporation are examples, to provide the kind of technical excellence dictated by still-increasing complexity, the demand for 100 percent reliability, and the time and cost factors. The basic dependence for design, development, and production still rests with private enterprise.

This consistent decentralized management system utilized by the three branches of the armed forces stands in contrast to the increasingly centralized overhead control wielded by the Department of Defense. If there is a turning point for reorganization in this area, it is the National Security Act of 1947, as clarified by Congress in 1949.

The new law made possible the 1950 appointment of a Director of Guided Missiles and, later, the choice of new Assistant Secretaries of Defense for Supply and Logistics and for Research and Development. The next step was in 1958, by which time it was clear that research and development was becoming more critical and large-quantity procurement was fading fast from the scene. Then there was created a Defense Department Director of Research and Engineering. In the same year, the Advanced Research Projects Agency was set up. It was described as an "up-stream" operation, an office that would concentrate on the state of the art and on possibilities, turning projects over to the armed forces only when feasibility was fairly well proven. The military forces were apprehensive that ARPA would get into operational aspects, but these fears have declined. USAF, the Army, and Navy still originate their own weapon system requirements and depend on industry to meet them, as do the Atomic Energy Commission and the National Aeronautics and Space Administration.

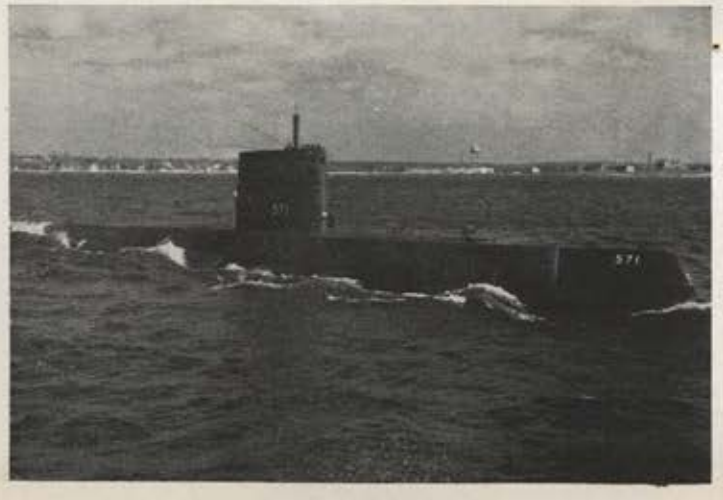
Today, the Defense Department can flash a red or green light at some points in the history of a weapon system. It can be halted on the road by signals which originate with the Director of Research and Engineering, or the Comptroller or even certain national strategy considerations. But, once the light is green, it is the decentralized office of one of the military services that picks the contractor and works with him.

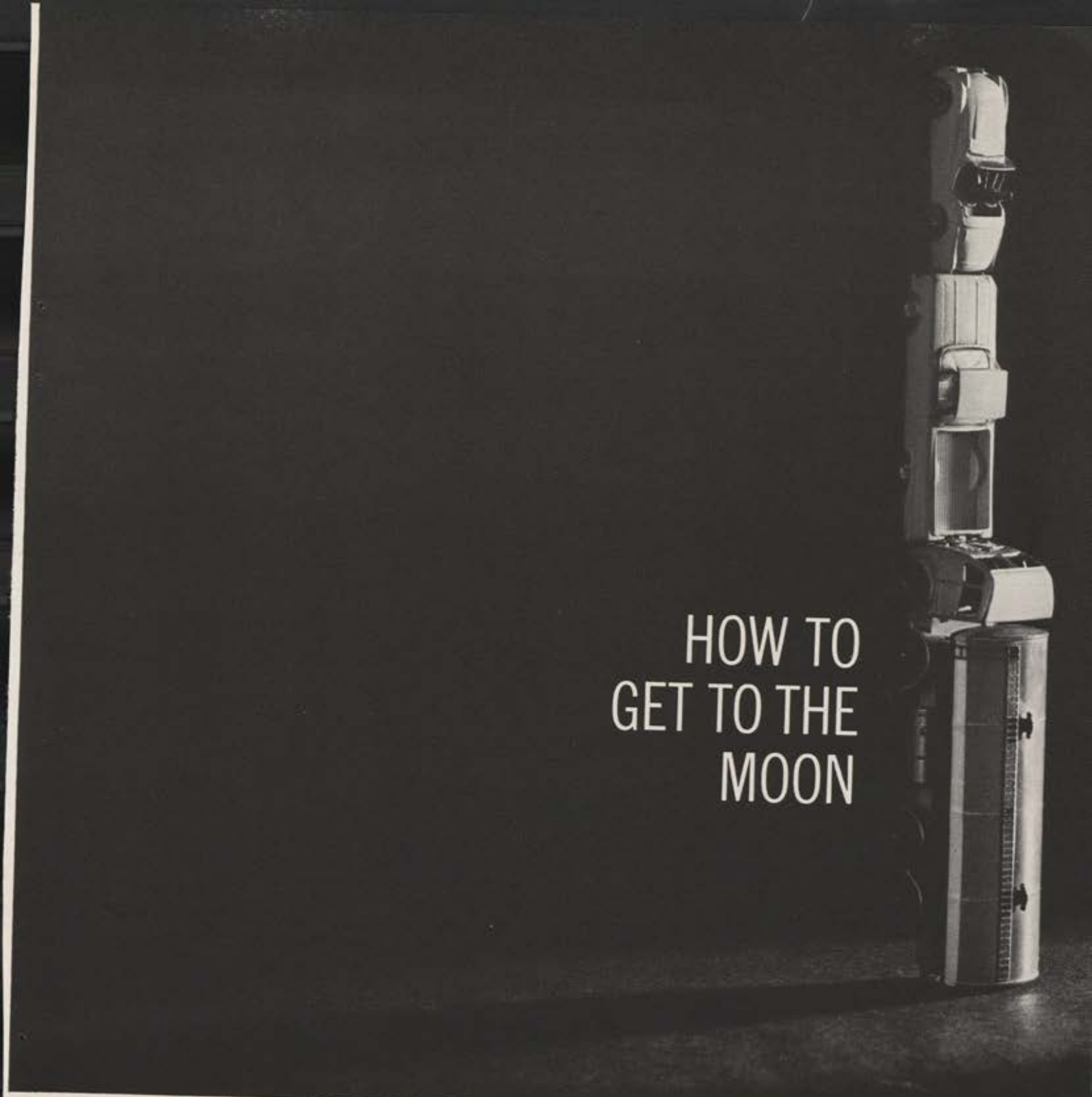
Here it becomes evident that there are some truths, accepted by industry and its military customers, which still lack public understanding and acceptance. It is a lack that appears to spill over into Congress and the executive departments.

First of these is that the arsenal is dead in the area of aerospace weapons, and, in America, we rely on private industry to meet the challenge. This is the system. The second is that it is not enough for industry to stand by ready to fill orders as soon as the military has outlined the requirement. Industry must

(Continued on page 59)

Army's Nike-Zeus antimissile missile system is the third generation of this family. Major contractors are Western Electric, Douglas Aircraft, and Bell Laboratories. Navy's proud *Nautilus*, atomic-powered submarine *(right)* came out of Electric Boat yards in Connecticut. Westinghouse made the power plant. *Nautilus* first went to sea in 1953.





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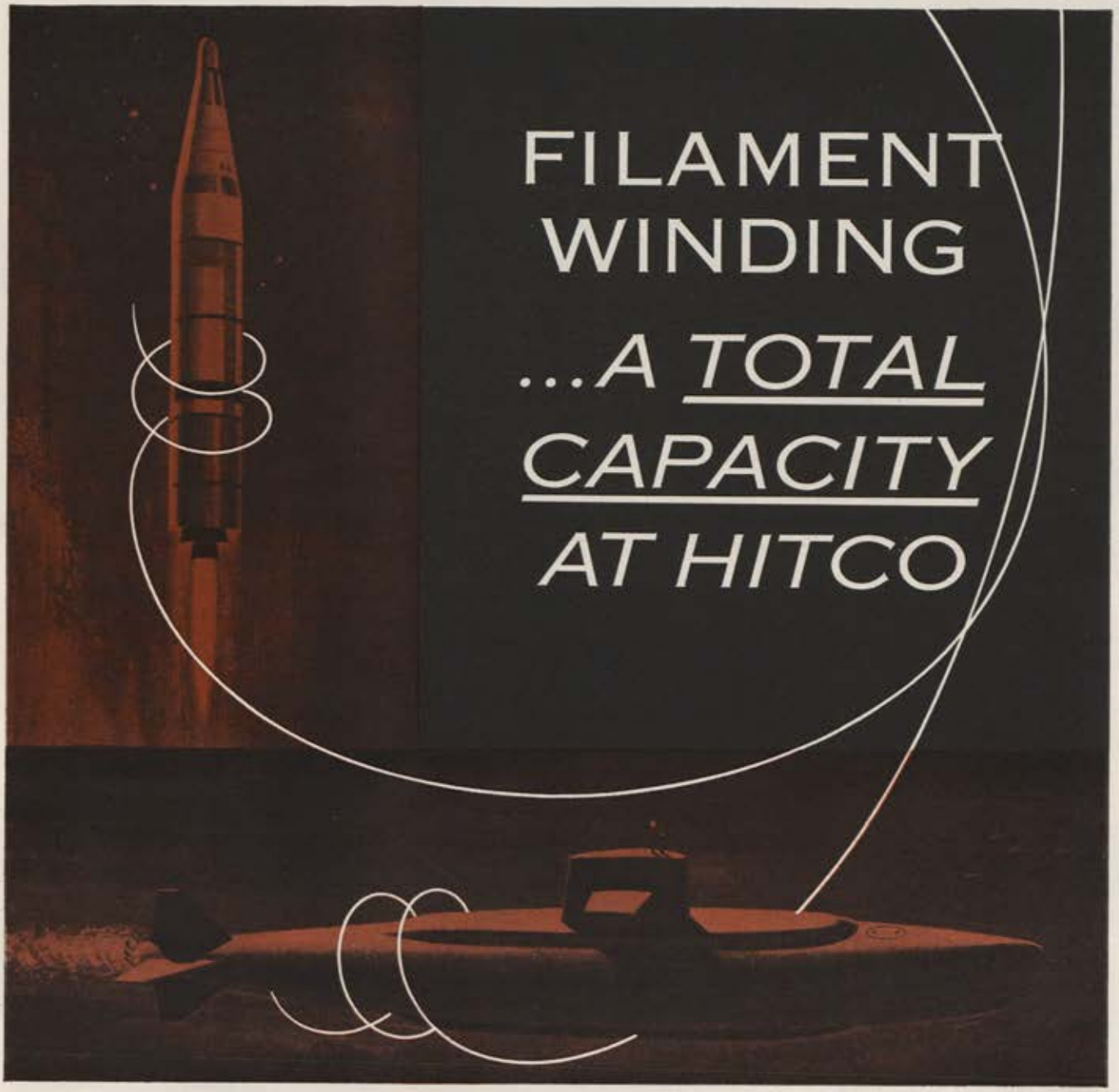

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take part in the planning program. It must be a reservoir of expertise. In many cases the military cannot fix a requirement until industry points out what can be done. All of the forces, AEC, NASA, and ARPA itself do this of necessity and to ensure full use of industry talent.

There are today weapon systems defending the free world that are based on concepts that originated on the drawing boards of private corporations. It is small wonder, then, that the military and industrial worlds are so close that President Eisenhower spoke of them as a "complex." To some, it is a wonder that they are not closer. There have been serious discussions, some of them on paper, of the plausibility of having the contractor go a step beyond the design, development, and production of weapon systems. His support already is essential to maintenance—he has technical representatives at every major air base and missile-launching site, including those under the sea—and the only phase of the life of a system where he has no mission is in the actual destructive use of weapons. Indeed, in the Soviet state, there is a single pivot around which the entire project turns until it is fired at an enemy. The extreme, in our democracy, is so remote as to be ridiculous; it would entail a contract between the government and a private corporation or consortium providing for expert operation of the weapon system under the direction of a military command.

When a defense contractor works on a weapon system, be it an aircraft, a space vehicle, or a submarine, the talent employs basic and applied research, not only in weapons technology but across the whole spectrum of military operations. The designer and builder of a modern system must be familiar with enemy capabilities, he must know what future wars will be like, and how to fight them. In addition to advanced knowledge in the fields of propulsion, electronics, and aerodynamics, the contractor needs the help of medical experts and a full understanding of the human factors that will be present in a cockpit or a capsule.

In applying such talents to today's systems and those that lie ahead, it is already clear that industry has outpaced government in-house capability by a wide margin. Dr. Jerome B. Wiesner, first Director of the new Office of Science and Technology, has pointed out that our annual expenditure for government-sponsored research and development today—more than $12 billion—is more than was spent from 1776 through World War II. One of his major concerns is that industry has so much talent rewarded with cash incentives that the government finds it hard to keep competent people to carry out the new responsibilities assumed in the past few years.

There is no accepted and responsible spokesman for private industry who denies that Uncle Sam needs a high level of competence, both military and civilian, to make the tough decisions that lie ahead. The point at issue is the degree of expanse of that in-house capability. There are some 800,000 US engineers and scientists who contribute to the nation's total research and development capability, military and otherwise. Of these, competent observers list only 200 or 300 men who can be called truly creative. This means that even fewer than 300 are contributing in a creative sense to our military, atomic, and space age effort.

Industry cannot and does not claim that all of these near-geniuses are on corporate payrolls. Nor that they should be. The Office of Naval Research, the laboratories of NASA (formerly NACA), Wright Field, more than a score of leading universities, and privately endowed laboratories are essential, particularly in the field of basic research. All are part of the way we do things in the free-enterprise system. The managers of our leading defense contracting firms were as aghast as other alert citizens in the era when Charles E. Wilson, as Secretary of Defense, scorned basic research and said it was the activity of people who don't know what they are doing.

Industry has not argued in a loud voice for any sort of special status for defense contractors. Competition flourishes, despite some assertions to the contrary, and there is a whole cemetery of coffins filled with unsuccessful defense-contracting ventures. So far as the talent in industry is concerned, the courting of this capability is almost violent, with the result that a competent scientist or engineer who has the misfortune to be aboard a sinking ship will be quickly rescued by some more successful bidder. Mediocrity, in the free-enterprise system, cannot be hidden for long, and the incentives will seek out superior talent.

It is interesting that the Soviets now appreciate this. They, too, have special rewards for competence, and relatively speaking, they are even higher than those permitted in this country. Their view of profit, which is what we are talking about, is becoming clearer every day. O. K. Antonov, the Soviet plane designer, has written in *Izvestia*, of all places, that the search for profit in a capitalist system has the great advantage of forcing us "to make things better, sturdier, and cheaper." This holds for defense as well as civilian goods.

Of course, there is constant reiteration that there are vast differences between the civilian and defense markets. Dr. Harold Brown, present Defense Department Director of Research and Engineering and possibly the most important man in America so far as defense development trends are concerned, makes a strong point of these differences. He says he recognizes the necessity for close government relations with a profit-making industry. He also has pointed out that defense-oriented industries have a capitalization of about a quarter of their annual sales. Other industries report a figure nearer two-thirds of their annual sales. The ratio of profit to sales in defense industries, largely reflecting that capitalization, is only about three percent. For others, it is eight percent. He acknowledges that the ratio of profit to invested capital is about the same for both.

Dr. Brown is also impressed by the fact that defense industries, for the most part, have grown faster than civilian-oriented industries, which can be explained easily by a glance at the defense budget. He

(Continued on following page)

Near-forgotten name of Huff-Daland, an early team, was credited with the design of the Keystone Bomber. From 1927 to 1932 the Army bought 210 of their aircraft in nineteen different models. Company had two plants but succumbed to skillful competition.

also finds it significant that there is what he calls only one customer, or family of customers, for defense industry but quickly acknowledges that there is competition among the producers.

"However," he told an industry group, "in the civilian economy the product is produced first and the customer decides to buy the product or not. With all the decisions as to what is to be bought, and most of the initiative of what to produce resting ultimately with the government in the area of defense-oriented industry, it is hard for the usual adjustments of the producers to the free market place to occur. Furthermore, survival of the United States depends upon the high quality of the military weapons which are produced and on the correct choice of which weapons should be produced and in what numbers.

"This is not the case for vacuum cleaners or washing machines. It thus is clear that a much closer partnership between the government, particularly the Defense Department, and defense contractors—almost a symbiotic relationship—is needed, a relationship very different from that which can prevail between the producers and consumers of automobiles. What we both need is a much clearer understanding of what you in industry are trying to do and what we in the Defense Department are trying to do to accomplish the common aim."

Then he made a deep bow to the success of the system:

"Equipment by itself won't win wars; the people are very important too. But equipment has a great impact on people and on military doctrine, and the three taken together do prevent, or that failing, win or lose wars.

"What we must do is to use the free-enterprise system maximally to help make sure that in the choices to be taken by the government among various optional developments, we have the best possible options to choose among, and that the best advice both from within and without is available in making the choice."

With these words Dr. Brown refuted, in the name of the New Frontier, the Eisenhower implication that there is something sinister and potentially disastrous in the "military-industrial complex." He went so far, in fact, as to say cooperation must be strengthened and become more intimate. This will be in the best interests of national security.

It is this intimacy, almost as much as the profit factor, that disturbs Congress. A contributing situation is that the growing centralization of basic management power in the Defense Department has been accompanied by a gradual surrender of congressional prerogatives. Between 1945 and 1960 there were vast changes in US military policy and procedures. There is nothing more clear than the constitutional provision that Congress, and not the Executive Branch of the government, has the whole power of raising armies and keeping them supplied in the field. The President can command only the forces placed at his disposal by Congress. Yet, this legislative power has been fading as more and more critical decisions are made by the Executive Branch of the government, in this case the Defense Department.

Professor Samuel Huntington has pointed out that it has been true since World War II.

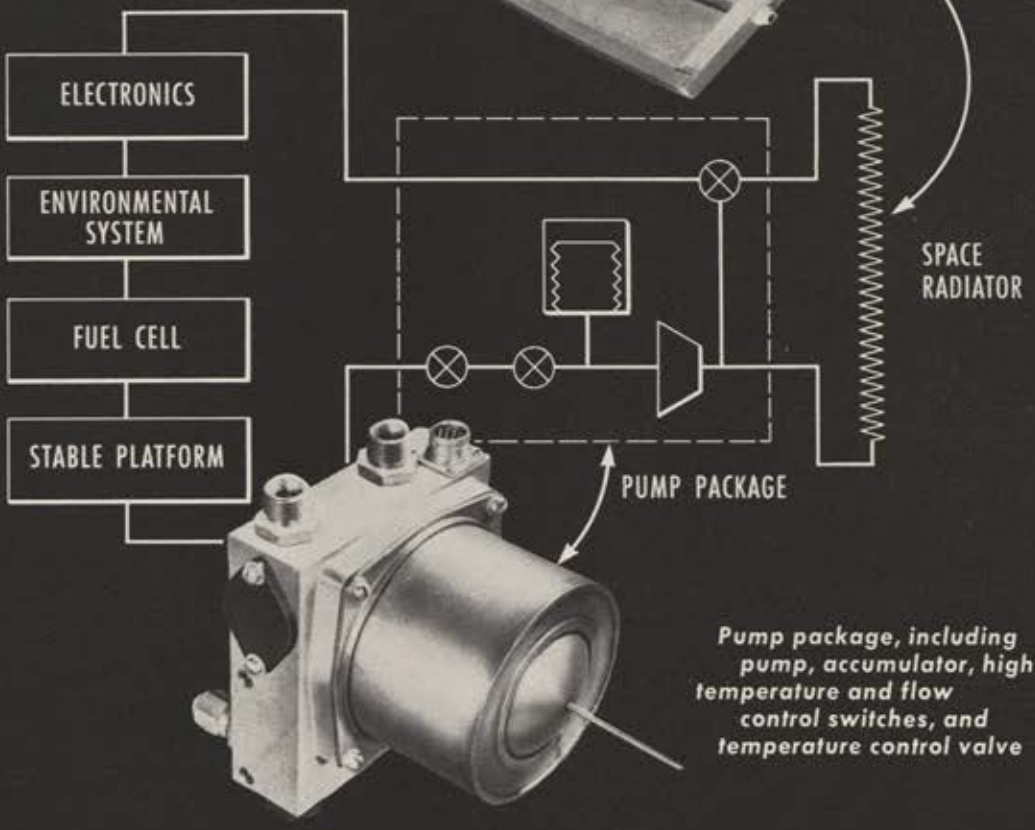
"The executive decided whether the Air Force should have ninety-five or 137 wings, the Army fourteen or twenty-four divisions, the Navy 200 or 400 warships," Huntington wrote last year. "The fundamental decisions to maintain a massive nuclear retaliatory force, to construct a continental defense system, and to develop or not to develop forces for conventional limited wars were all made in the Executive Branch. The decisions on whether to build hydrogen bombs, supercarriers, long-range jet bombers, intermediate-range and intercontinental ballistic missiles, nuclear-powered submarines and planes also were executive decisions. This is not to say that congressional groups played no role in these decisions. In a variety of ways they could influence them, and in some cases compel the Administration to pay a high price to get what it wanted. But they could not make the decisions. The effective, final 'yes' or 'no' rested with the Executive Branch."

Professor Huntington went on to assert that under these conditions Congress has become a lobbyist. To this, the military and industry observers would add that the congressional lobby also is a watchdog, frequently lacking discrimination in selecting which legs are to be bitten. The point is that Congress no longer can impose its will, so it tries to cajole and persuade. It makes its preferences known, it uses the exposé technique in inquiries, it voices its preferences in the annual authorization and appropriation bills. In very recent years it has appropriated money, for example, to support the manned-bomber program, that the Executive Department has refused to spend. There are cases where the judgment of Congress has been superior to that of the Executive Department.

(Continued on page 63)

Reliable space radiators for satellite cooling

AiResearch tube-and-fin space radiator



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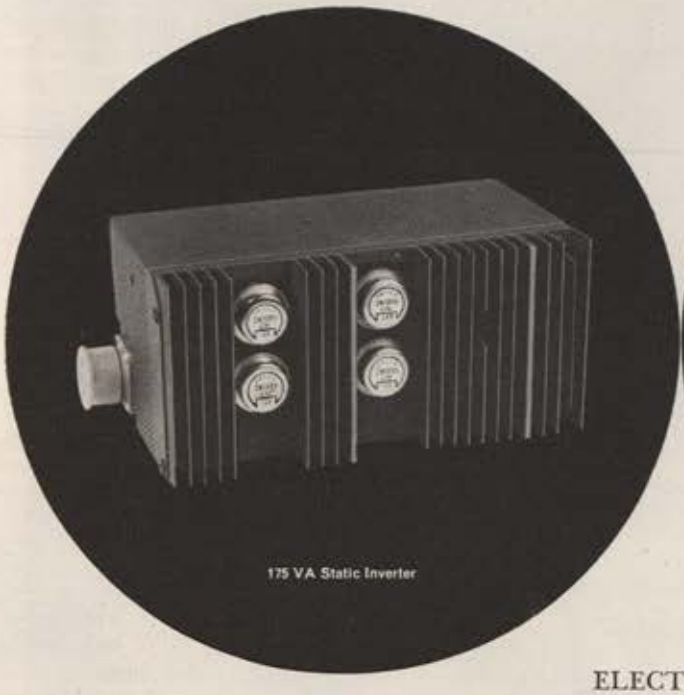

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Output

Power:	175 VA single phase 0.5 lag to 1.0 power factor
Voltage:	115 V adjustable from 110 to 120 volts
Regulation:	1-volt change for any variation of load between zero and 110% of full load, and input voltage between 25 VDC and 30 VDC
Frequency:	400 ± 1 cps. Frequency changes less than 1.0 cps. for all environment, load and input voltage variation
Distortion:	Less than 5% total harmonic
Efficiency:	80% at full load

250 VA STATIC INVERTER

Input
Voltage: 27.5 VDC ± 10% per MIL-STD-704

Output

Power:	250 VA single phase 0.6 lag to 1.0 power factor
Voltage:	115 V adjustable from 110 to 120 volts
Regulation:	0.7 volt for any variation of load between zero and 110% of full load, and input voltage between 25 VDC and 30 VDC
Frequency:	400 ± .5 cps. Frequency changes less than 1.0 cps. for all environment, load and input voltage variation
Distortion:	Less than 5% total harmonic
Efficiency:	80% at full load

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On the other hand this lobbying function of Congress, as Professor Huntington has called it, leads to the introduction of a great many extraneous standards in the choice of a weapon system. It is a basic precept of the military-industry complex, founded as it is on the practice of the free-enterprise system, that the government should buy solely on the basis of what is best for the national interest. The price is important, but secondary to the results in terms of national survival. A prime example here, and one that has Congress in an almost constant uproar, grows out of the procurement regulation that requires contracts to be awarded on the basis of competitive sealed bids in response to agency advertising. Yet the trend, until recently, has been away from this kind of business until, in fiscal 1959, advertised bidding preceded the award of only 13.6 percent of the total dollar value of defense contracts.

There are a number of reasons for this. One is that the private financing of weapon-system development is impossible. Development costs can run easily beyond a billion dollars. The last big system developed with substantial sums of private funds was the Boeing KC-135 jet tanker, into which the company put $165 million of its own money. Compared with space systems, that price was cheap. Raising private capital for weapon system development is handicapped by the known low rate of return and high risk involved. Obsolescence, changes in government policy and planning, the uncertainties of the market, discourage speculative investment. Finally the government is the sole customer, as the Executive Branch points out so frequently. This creates a buyer's market and gives the government a vast bargaining advantage. These are the factors which lead so many people to say that defense contracting does not and cannot operate under the free-enterprise system. What they should say, and what Congress should acknowledge—possibly by revising the procurement legislation—is that the characteristics of the customer and the product and the requirement for infallible technical capability narrows the source selection to a point where open competitive bidding is neither realistic nor practical.

Congress also has passed statutory profit rate limits and the renegotiation law. These grew out of abuses and profiteering which existed when defense merchandise was primarily in the form of simple munitions and long before monitorship and auditing forces of the military moved into production plants. The effort to control profiteers is at least as old as the French and Indian War and will always be with us, it is hoped.

Then there is small business, for which Congress also lobbies. Congress has defined small business, keeps an open ear for its complaints and, by legislation, insists that it get a share of the defense dollar. Sophisticated small businessmen know that their sensible role is that of working for large prime and associate contractors. The General Electric Company says that fifty-three cents of every defense dollar it receives are passed on to small business. The figure is even higher for some other major contractors. But the fact remains that it is not always true that the government can get the best product for its money from small business.

Congress also lobbies for geographical areas, usually each man speaking out for his own bailiwick. Only a month ago, on the floor of the US Senate, there was a heated argument between two gentlemen from California and New York, touched off by the shifting pattern of defense spending. New York demands a bigger cut and cites the existence of high unemployment areas. California brags of its capability and challenges other states to stand up to the competition in quality and price. A Senator from Minnesota also has been heard on the floor. Minnesota charges that its fine technological capabilities for research and development are ignored, while Massachusetts and California get all the favors. It is here that the economic impact of defense spending is turned into political impact and thereby impedes the military and the defense industry in performing their jobs. The same kind of "sharing the wealth" emanates from the Executive Department as well.

That these factors are worked into the spending pattern is best illustrated by the short history of the National Aeronautics and Space Administration, an aerospace industry customer. It is no secret that NASA installations and effort have been scattered. The states of Florida, Louisiana, and Texas have been favored although none of them stood high on the aerospace contracting list before NASA. The Vice President of the United States at one point expressed his pleasure that Houston, Tex., in his home state, would be the home of the new Manned Spacecraft Center. "Just because a man can afford to send his son to an Ivy League college," he declared, "that's no reason for that area to get all the benefits." This, clearly, was a reference to the Northeast and particularly the Boston area, home of the Massachusetts Institute of Technology and its institutional and business satellites.

For 1959 and 1960 Massachusetts was ranked in fourth position among the states in distribution of Defense Department contracts, with 5.3 percent of total contract awards. In fiscal 1961, on the list of NASA contractors, Massachusetts ranked in tenth place with only two percent of the awards. Alabama was ranked fourth on the NASA list, a position equal to that held by the Bay State with the Defense Department. There are a number of other striking contrasts if we compare the geographic placement of defense contracts with those of the newer and more politically oriented NASA. If NASA and the Defense Department are seeking the same kind of capability with the same standards—flawless quality at the best price—it would appear that their judgment in finding the talent has wide variance. On the other hand,

(Continued on following page)

California, major home of the aerospace industry, appears to have a firm grip on top place in any competition. It ranks number one on both NASA and Defense Department listings.

The role of the congressional investigations has been turned largely into another pressure operation in which representatives and senators try to alter policy, strategy, and procurement. These hearings are not entirely evil, although many of them are in the class of petty witch hunts, set off by misinformation or malice in one degree or another. The Symington airpower hearing of 1956 was an example of a major study that did not produce any legislation but did force the Administration to defend its policies in a sophisticated atmosphere. It contributed to public education, and the transcript of the sessions remains today one of the best textbooks on the subject. Close to the other extreme are such spectacles as the 1959 sessions of the Hébert Subcommittee of the House Armed Services Committee. Here defense industry executives were harassed, presumably in an unsuccessful effort to uncover scandal in the employment of retired military officers. For the most part, the witnesses who made accusations—New York's Rep. Alfred E. Santangelo and newspaper columnist Drew Pearson—were discredited before the sessions were over. The committee could not find anything calling for congressional action.

There is an almost continuous parade of probes into defense procurement. In many cases these result in sensational headlines, few of which have any basis in sound analysis, or result in procurement regulation changes. The most important result, unfortunately, is that they make military procurement officers overtimid and thereby interfere with sound decisions. An officer with contracting responsibilities gets to the point where he senses Congress and its General Accounting Office looking over his shoulder at every transaction. The atmosphere also contributes to the constantly growing procurement bureaucracy as layer is piled on layer and the papers are pushed ever higher for decision-making.

Most of the congressional interest and intimidation of procurement personnel grows out of the question of profit, which always can be publicized as coming from the taxpayer, making the man who curbs it more worthy of the taxpayer's vote. There is no doubt that the threat of investigation leads to conservatism in the discharge of duties. "Play it safe" becomes the watchword. Mobilization planning, before World War II, was inhibited by this profiteering specter, and it handicapped our readiness. Also, in 1955, the Hoover Commission staff found that forty-six percent of the military buyers and seventy-three percent of the contractors questioned were so fearful of GAO and congressional critics that they placed more emphasis on the contractor's profit than they did on the ultimate price.

The Defense Department is fully aware that profit is one of the smallest elements going into the ultimate price paid for a weapon system. So are the contractors. This accounts in large degree for the current emphasis on costs as the use of the cost-plus-fixed-fee (CPFF) contract has increased in recent years. There is today a definite effort on the part of the Defense Department to utilize more fixed price and incentive contracts, but the complexity of the new systems and the vast unknowns yet to be explored make this a difficult job.

The cost reimbursement type contract was originated for situations where it is nearly impossible to estimate costs. A contractor can hardly be expected to fix a price for his services and product if he does not know at the outset exactly what he is going to make, how long it will take, and what unpredictable complications may arise. Frequently overlooked in discussions of the cost-reimbursement contract, is the simple fact that it brings the contractor and the customer closer together—closer to Dr. Brown's "symbiotic relationship"—than any other type of agreement. The contractor does not have to "sell" his product. He and the customer jointly administer its creation, once he has convinced the customer of his capability. Then there is a fee for his services, fixed in advance.

Despite the unknowns, each contractor is required to submit an estimate of costs when he bids for a CPFF contract. Thus, to start with, there is an incentive to underestimate the costs. The reason is that procurement officers, always conscious of their GAO and congressional critics, are looking for the low price, frequently at the expense of what the end product will be and the soundness of the estimates. For example, costs are broken down into components, such as overhead, facilities, equipment, and the general expenses of doing business. These are internal matters, separate from the cost of raw materials, labor assigned to the project, etc. There is a tendency for procurement officials to weigh the overhead of one company against that of another and favor the firm with lower overhead. Actually, the end price from this firm may well be higher than that of a competitor with a higher overhead figure. These differences can result from varied approaches in bookkeeping, or they can come from deliberate efforts to underestimate with the view to winning the contract and then making up for the lag with an overrun on the costs. Thus it is total cost that is vital and the contractor should be judged by that figure in relation to results. In a great number of cases overruns are built into contracts from the start and the task of detecting and controlling them is almost insurmountable, particularly while the military service and the contractor wait for decisions to come from higher authority.

At a recent USAF conference with major contractors, held by the Systems Command at Monterey, Calif., the case was recalled of a program for which the Air Force estimated an expenditure of $37.2 million. The contract was awarded for $25.2 million. The final costs will be about $38 million. It is not difficult to imagine that if USAF had given this contract to a firm that made a bid of $37.2—which was reasonably accurate—in the face of several bids with estimates

(Continued on page 67)

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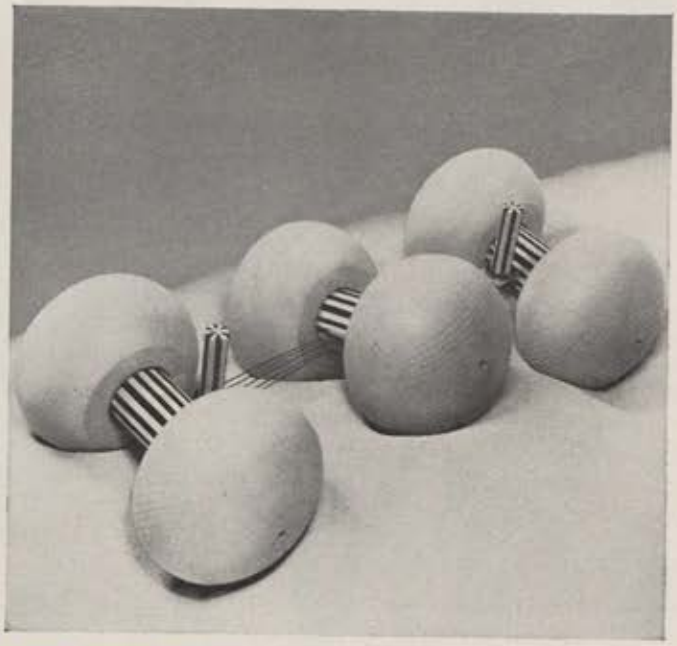

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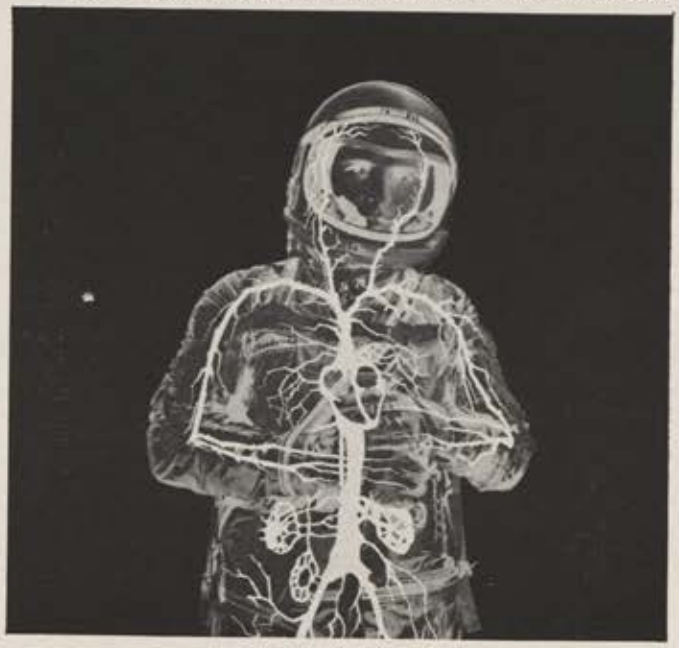

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in the $25 million range, the GAO and Congress would have found a new bone to chew in the public prints, and the Defense Department, as well as USAF, would be forced to explain the choice. Yet, USAF is convinced, all of the low proposals were knowingly made low by the contractors. And the procurement officers knowingly accepted one of them. And, when the overruns were announced and money sought to meet them, some other USAF project was bled to meet the requirement. Congress is convinced it is forcing economy. "We have an obligation," a prominent senator declared on the floor recently, "to the American taxpayer to see that the money is spent as economically as possible." It is difficult for industry to understand how this obligation is carried out by literally forcing a branch of the armed forces to accept a $25 million bid for a job that should have cost more than $37 million. And which eventually did.

The Defense Department today is determined to correct the overrun situation, according to Deputy Secretary Roswell Gilpatric. Mr. Gilpatric has denied there is a working "military-industrial complex" that exerts pressure on decision-makers. He also says he is more interested in controlling costs than in controlling profits, partly because profits take such a tiny percentage of the defense procurement dollar. At the same time there is an evident proclivity in the Executive Department to view overruns as an evil that is generated, perhaps deliberately, by defense contractors. On the contrary, there is evidence that deliberate underbidding is discouraged by responsible corporations. An industry spokesman at the Monterey conference acknowledged the manufacturer's responsibility in this regard.

"Contractors should generally take the attitude," he said, "that it is better to risk unpleasantries with the customer in initial negotiations and clearly establish reasonable cost levels, rather than let the contracting officer beat the price down, and then be faced with the embarrassment at a later date of having to secure additional appropriated funds to pay for the program."

Later, he declared that contracting officers are increasingly insistent on seeing data and figures relating to costs that can be expected only after the job is done. When the support is not provided, because it does not exist, the tendency is to disallow the cost. Later it can be validated and contributes to the overrun. The principal reason why the contracting officers do this is that, if they accept the cost and the estimate is wrong, they may find themselves on the witness stand trying to convince some congressman from Pennsylvania that they did not deliberately waste a taxpayer's dollar.

This situation is only one small irritant in a huge sea of complexity surrounding the weapon-system procurement arena. It is a sample of the problems that have led the Defense Department, to reiterate that it will depend on private industry just as strongly as James Forrestal, first Secretary of Defense. It has, recently, formed a new Defense Advisory Council, made up of the presidents of leading defense firms, to carry out the "symbiotic relationship." So far as the Air Force is concerned, it has pioneered with its dependence on private enterprise and never has sponsored an arsenal. Gen. Bernard A. Schriever, Chief of the Systems Command, continues to say, "Management is our theme, because management is our need. . . . In systems acquisition today, management is the pacing factor."

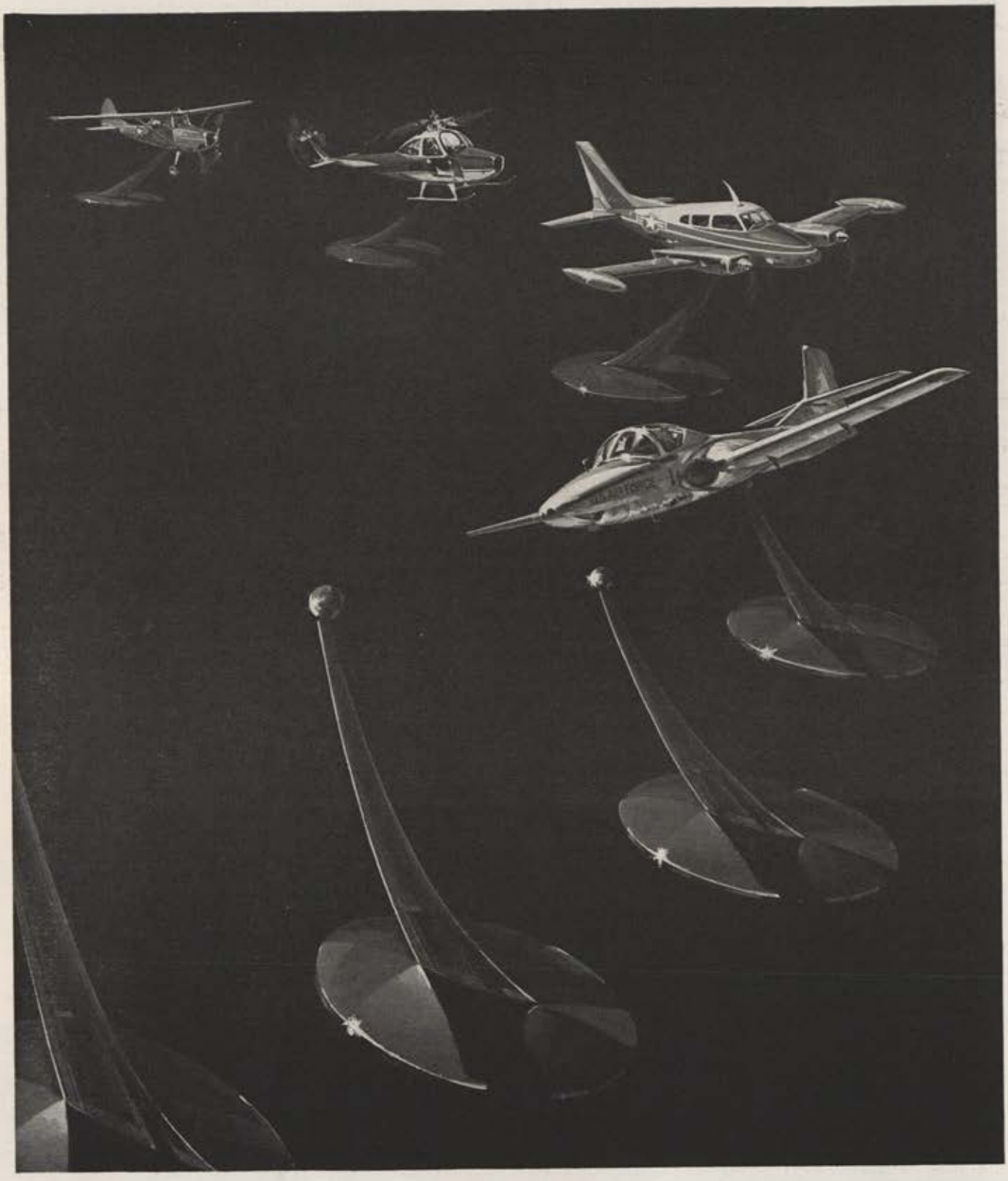
Thus it appears that free enterprise is accepted as a partner and that it carries a heavy responsibility for the free world. At the same time, there is apprehension on every industrial front, in defense industry and outside of it among the factories that produce for the civilian market. Regardless of the merits or shame of the steel industry's effort to raise prices, it is an acknowledged economic fact that "the squeeze is on" so far as profits are concerned. Major business publications express serious concern about the ability of the nation's industry to invest fast enough to employ America's resources.

In the defense field, profit controls are an old story, and the industry has learned to live with them. But it is a constant struggle. On top of this there is serious discussion about salary controls in the defense business, there are ever-increasing regulations, inspections, and checks imposed from ever-higher echelons in the Pentagon. A book could be written about patents and proprietary rights, an area in which most aggressive contractors feel the government takes a greedy and unreasonable attitude, failing to protect their interests.

There is increasing interest by the Defense Department in building up its own capabilities. Both Dr. Brown and David Bell, Director of the Budget Bureau, have endorsed programs calling for increased in-house research capabilities. Captive corporations, many of them organized for service, not for profit, are more and more popular. The most recent is the Logistics Management Institute, which is going to help the Defense Department manage its relations with profit-making industry. These trends have led to speculation that we are headed back toward an arsenal system, that private defense industry is becoming more and more a captive of the state.

If anything is needed it is a reaffirmation that we will depend on private enterprise to provide the tools needed for national security. It is the way we have proven it can be done, and it is the only way we can do it. In addition the private-enterprise system is one of the things we have fought for in hot wars and for which we are fighting the cold one.

A couple of years ago one congressman put it in the record that he believed we were spending defense dollars for things other than defense. There was nobody there to point out that this was not a policy endorsed by private defense industries and favored by them. Ever since the Wright brothers delivered that first Army airplane the industry view has been that Uncle Sam should get the best product at the best possible price, on which industry is entitled to a fair profit. Adam Smith's maker of bows and arrows was no different.—END



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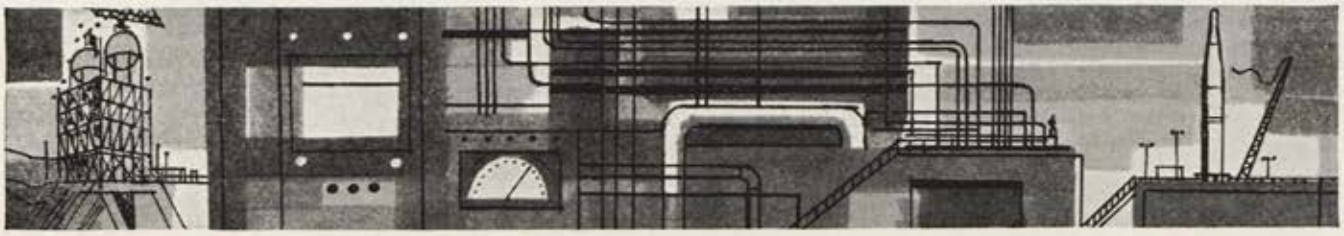

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and

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NASA-USAF Interface —*Will It Be a Two-Way Street?*

By WILLIAM LEAVITT
Associate Editor, AIR FORCE/SPACE DIGEST

Interface (noun). A surface, especially a plane surface, forming a common boundary of two bodies or spaces.
—Webster's New Collegiate Dictionary

TO THE mass of jargon that is an unnerving semantic feature of our harried times and includes such governmentese as "finalize" . . . "reorient" . . . "capability" . . . "building block" . . . and "deemphasize" must now be added the space-age watchword "interface."

Interface is another way of saying: trying to work together on difficult enterprises under complicated circumstances. It is what a patient company of Air Force and National Aeronautics and Space Administration specialists are attempting to do in the national space effort. Interface is not an easy way of life; there are differing views in the space community on both technical and policy questions. There is the specific problem that NASA, as an agency created by Congress on the same level as the Department of Defense, can and does deal laterally on basic policy questions with DoD, while the Air Force, which is the prime agency for *operational* cooperation with NASA, is an element of and subject to well known and firm control by DoD.

Yet, if candor and a true spirit of cooperation and mutual respect prevail, the Air Force-NASA interface can go a long way toward helping the country meet space deadlines ranging from the Apollo moon-landing program to the potentially far more significant requirement for viable military space operational skills and hardware. This latter and less glamorous aspect of the national space effort is where the real test of interface will come. The crucial question is whether USAF-NASA interface will be a "two-way street." There is little doubt USAF is heavily supporting NASA goals. But will NASA support Air Force space defense aims? And will the White House and Department of Defense give their imprimaturs?

The process of USAF-NASA interface has been under way for much longer than the word itself has been popular in space-planning circles. Interface has not been devoid of acrimony, especially in early post-Sputnik days. Those were times when the zealous advocates of space "purely for peaceful purposes" went to rather incredible lengths to suppress military contributions to such efforts as the Mercury program after it was renamed and transferred from the Air Force to the embryonic NASA. Those were frustrating and morale-shaking days for blue-suiters who found themselves, for policy reasons, asking visitors to such installations as the Air Force's animal laboratory at Holloman AFB, N.M.—where chimpanzees got their schooling for spaceflight—to please not make too much of the Air Force role in the train-

USAF's MAJ. GEN. OSMOND J. RITLAND

As Deputy to the Commander, AFSC, for Manned Spaceflight, he is prime focus of cooperation.

NASA's D. BRAINERD HOLMES

In his post as Director, NASA's Office of Manned Spaceflight, he heads the American push to the moon.

ing of animals for space missions as a prelude to manned orbital flight. Air Force people either on direct loan to the space agency or working at support roles from their regular service billets—in research and development, booster procurement, and launch operations—have from the start beefed up the civilian agency's efforts. What is now ancient history is the tale of today and tomorrow too. All the way to the moon and back and in earth-orbital operations, military men and machines will make significant contributions.

As Air Force Secretary Eugene M. Zuckert put it in a recent issue of the General Electric *Forum*:

"The Air Force and NASA have already established the broad basis for cooperation and a concerted effort is made to maintain it to the fullest possible extent at all levels of Air Force and NASA management. We are in agreement with NASA officials that our programs must be mutually supporting—rather than competitive. NASA-Air Force management cooperation will keep pace with the expanding NASA program. Ninety-three Air Force research and development officers are now assigned to duty with NASA. NASA and Air Force efforts together form the major part of the national space program."

But in the same article, the Secretary also said:

"Despite the broad common ground between civilian and military needs, the Air Force has a big job in building the technology on which the military applications [of space] are based. Within such technological areas, there are unique military requirements that will not be attended to by civilian developments."

As examples, the Secretary lists: inspection of uncooperative satellites; survivability in combat environments as represented by high-thrust in-space propulsion systems; rapid turnaround, reuse, and recovery of spacecraft.

The most important recent step in formalizing what had mostly been an *ad hoc* NASA-USAF interface was the designation of Maj. Gen. Osmond J. Ritland, USAF, as Deputy to the Commander, Air Force Systems Command, for Manned Spaceflight, with special USAF-NASA liaison responsibility. A former commander of the Space Systems Division of AFSC, General Ritland succeeded Gen. Bernard A. Schriever at Space Systems when General Schriever was named Commander, AFSC.

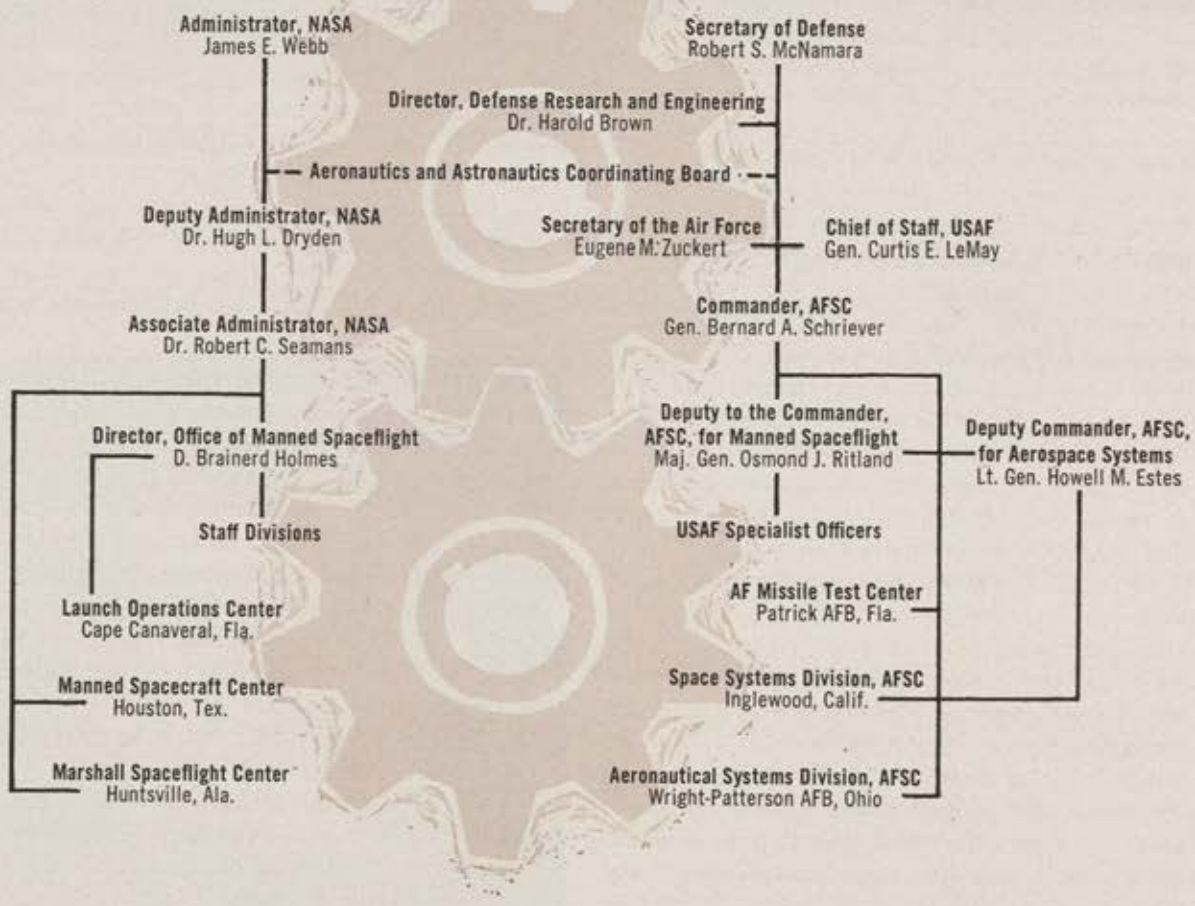
General Ritland's assignment divides him between his two offices, one at AFSC headquarters at Andrews AFB, Md., the other down the hall from the suite of D. Brainerd Holmes, Director of NASA's Office of Manned Spaceflight and chief of the NASA Apollo moonlanding program, in downtown Washington, three blocks from the White House. His job is to serve as focal point within Systems Command for all USAF support of the NASA programs, as arranged through

NASA-DoD agreements. All such support must be in terms of prior NASA-DoD agreements. And wearing his military hat at AFSC, he is also to direct booster and other development programs in support of military space systems efforts.

To implement his interface with NASA, General Ritland is gathering a staff of six USAF specialists in space technology who will correspond generally in function with the six staff divisions of NASA's Office of Manned Spaceflight. The General's staff, as he puts it, will match Mr. Holmes's staff on a point-to-point contact basis. The hope is that this point-to-point contact will minimize red tape and also provide a day-to-day exchange on the planning of joint efforts as well as provide a feed into NASA of possible ways defense space capabilities might be studied in cooperative efforts.

The establishment of General Ritland's new office came after discussions involving top USAF, NASA, and DoD planners out of the office of Dr. Harold Brown, Director of Defense Research and Engineering, with General Schriever and D. Brainerd Holmes contributing. In the exchanges that led to the planning and setting up of General Ritland's shop, there was acknowledgement

DoD-USAF-NASA MANNED SPACEFLIGHT INTERFACE



Above, schematically presented, is how the gears of military-civilian space effort cooperation are supposed to mesh in the three-way relationship between the Department of Defense, the National Aeronautics and Space Administration, and the Air Force. Top gear may be considered policymaking, the bottom operational. Not shown but significant in over-all policymaking picture is the National Aeronautics and Space Council, whose Executive Secretary is Dr. Edward C. Welsh. The council is chaired by the Vice President; the Defense Secretary and NASA Administrator are members. Space limits the representation on this chart of every echelon of DoD, NASA, USAF, involved in cooperative interface.

DoD's DR. HAROLD BROWN

As Director of Defense Research and Engineering, his nay- or yea-saying on future projects is significant.

of antagonisms between NASA and USAF over policy and priorities. One of the principal rationales of formalizing the interface was the expectation that closer coordination would dissipate some of the differences.

As noted, USAF's interface with NASA is no easy business. From the point of view of money and broadness of charter, NASA, understandably excited by its moon mission, has a natural tendency to think in terms of accomplishing *its* assignments as fast as possible. And it runs its own show. The Air Force, on the other hand, has to cope with much tighter money and policy controls, so far as military space programs are concerned. It is the White House and DoD that call the tune on what the Air Force is to do in cooperating with NASA *as well as* what the Air Force can go ahead with in the field of military space research and development.

Yet it is a plus that high NASA officials have increasingly expressed their acceptance of the concept that the space effort ought to be broad enough to meet *national* needs, including defense needs.

For example, Dr. Joseph F. Shea, the thirty-six-year-old deputy to NASA moon project chief Holmes, says he thinks of Air Force-NASA interface in two contexts. The first is the direct Air Force support of NASA programs, the provision of personnel, range, launch support, and booster development. These include such items, for example, as the Air Force responsibility for development of Titan II as the booster for the NASA two-man Gemini orbital program, the Agena development which will make the Gemini rendezvous effort possible, and the Titan III booster development which will not only bring the X-20 (formerly Dyna-Soar) manned orbital glider project to fruition but also gain some needed answers on the future of solid fuels.

The second interface context, as Dr. Shea sees it—and here, hopefully, General Ritland's office will be especially significant—is in the area of over-all consultation and planning as to "what the national space program ought to be, how it should be shared, and how missions can be planned to serve defense needs."

The latter interface is, of course, the most difficult, because of the Air Force's need for DoD (Office of the Director of Defense Research and Engineering) approval of military space projects. No matter how close people's offices are and how personally cordial the relationships are between those who directly interface in USAF and NASA, up the co-ordination ladder must go the ideas for cooperation.

As the chart on page 73 suggests, the money and priority decisions that affect NASA and USAF jointly are worked out at such cosmic levels as the Aeronautics and Astronautics Co-

USAF's GEN. BERNARD A. SCHRIEVER

The Commander, Air Force Systems Command, manages the sizable USAF aerospace R&D complex.

The great paradox of our time, perhaps of all time, is that peace depends on our capacity to fight a war. Thus the person who contributes to our military strength, contributes to the cause of world peace.

MITRE's contribution is the design of command and control systems to give our military commanders the means to detect attack and retaliate.

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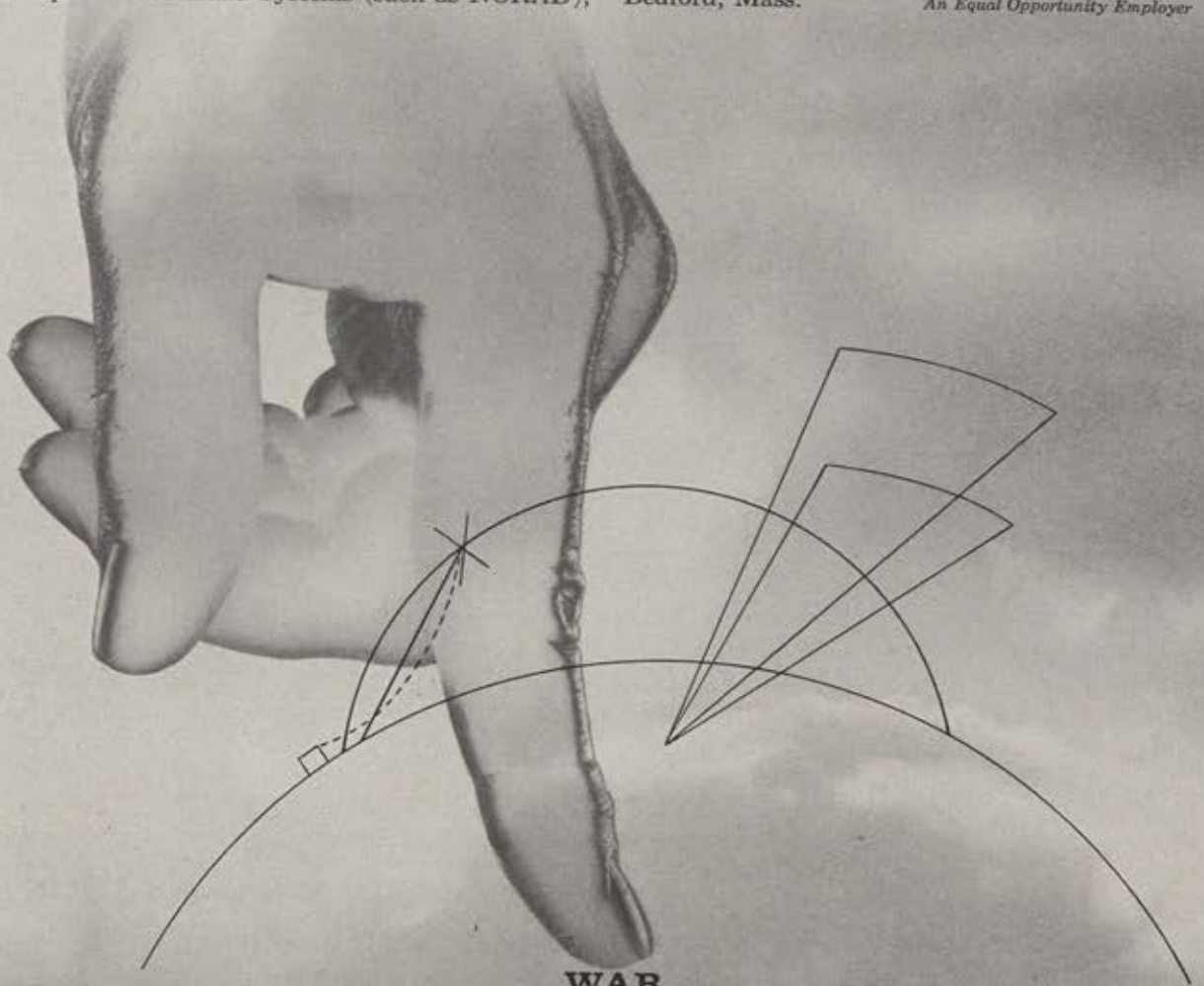

WAR

How would it be fought?

What would this nation's strategy be?

What kind of decisions would have to be made?

How would the commander command?

Who and what would survive?

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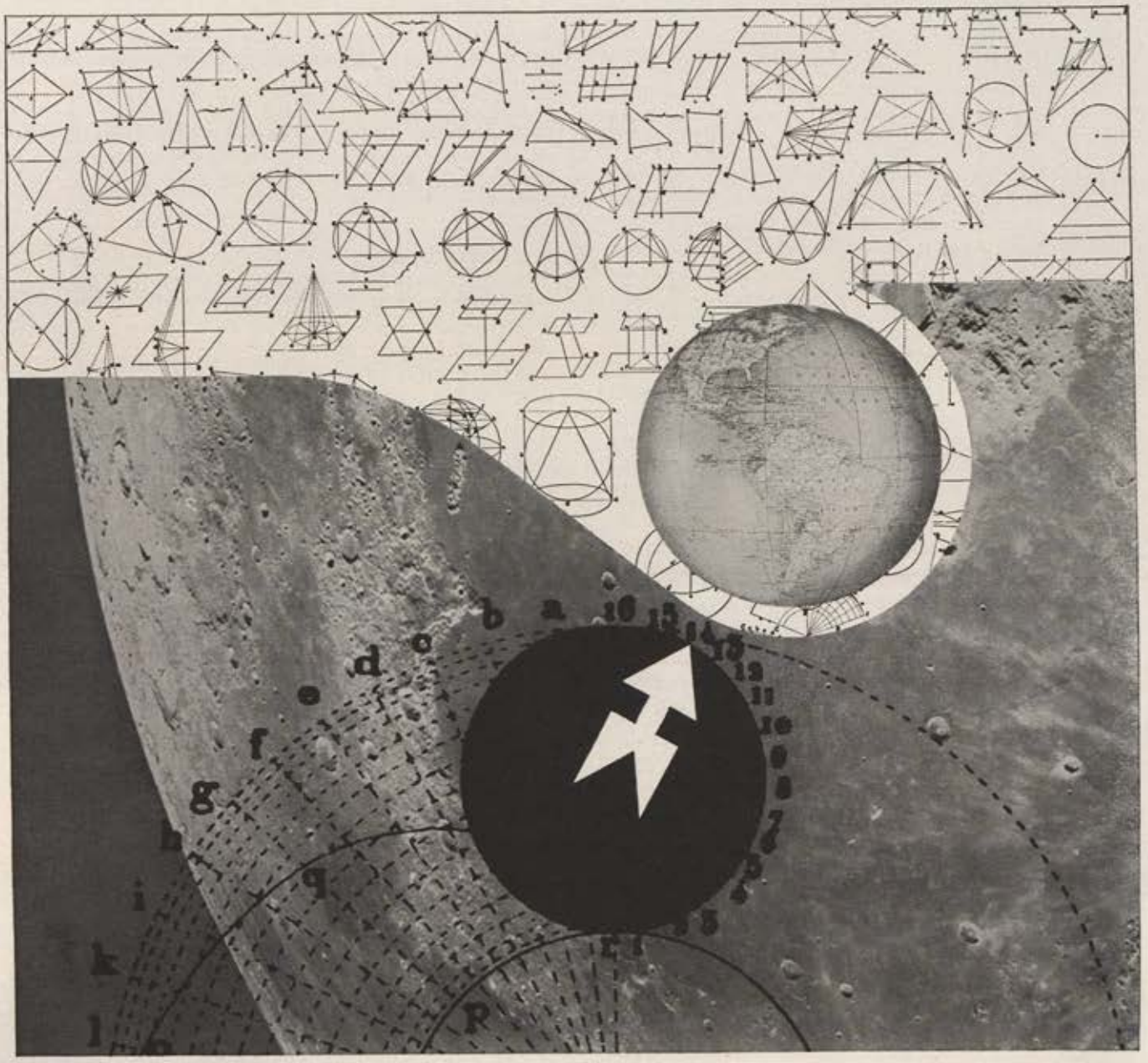

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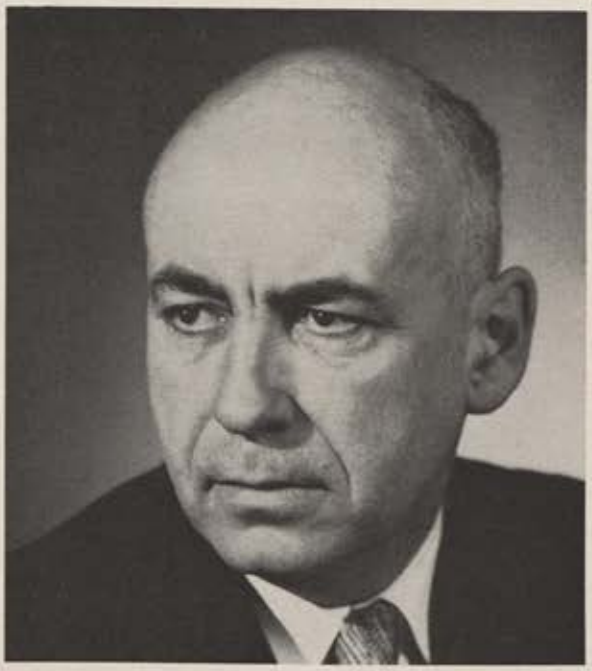
AEROSPACE CORPORATION

ordinating Board, cochaired by NASA Deputy Administrator Dr. Hugh L. Dryden and Assistant Secretary of Defense for Research and Engineering John H. Rubel. Most decisions involve action by Director of Defense Research and Engineering Dr. Harold Brown, and NASA Associate Administrator Dr. Robert C. Seamans, who is frequently described as "our general manager" by NASA Administrator James E. Webb. The Defense Secretary and Mr. Webb also make contact in person or on paper. Also involved are the Deputy Defense Secretary, Roswell L. Gilpatric, and the Air Force Secretary, Eugene M. Zuckert. The path over the Potomac between NASA on the Washington side and the Pentagon on the Virginia side is well trod these days. Add to that the important policy-advisory function of the National Aeronautics and Space Council, chaired by Vice President Johnson. The Council's Executive Secretary, Dr. Edward C. Welsh, one of the most experienced government officials in the capital, has played a significant role in coordinating Administration policy on space goals, and has addressed himself candidly to the military potential of space technology.

Since the August Red tandem-Cosmonaut feat, there have been renewed reports that the Council has been circulating a policy paper raising questions on the military significance of the Red action and suggesting US response.

NASA's DR. JOSEPH F. SHEA

The deputy to D. Brainerd Holmes and technical chief of moon program hopes for mutual benefit.



NASA's ROBERT R. GILRUTH

Would NASA's Manned Spacecraft Center, which Mr. Gilruth directs, "buy" closer interface with AF?

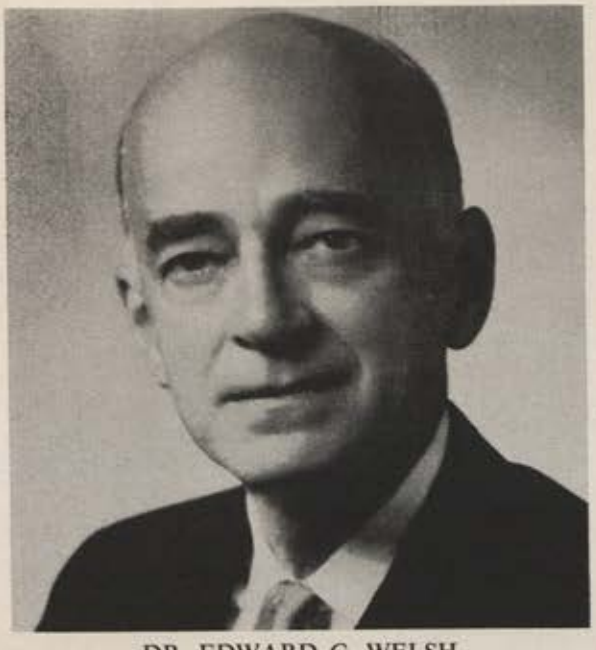
Aside from the support—both personnel and development of hardware—that USAF is providing NASA, what is the outlook for a real two-way street operation between the Air Force and the civil agency? The answer to that question is out of Air Force hands. USAF can only propose, while the White House, DoD, and the highest levels of NASA dispose.

There are a number of obvious areas where viable contributions to military space capability can be made by the Air Force in joint development efforts with NASA. The Gemini program, which from the NASA point of view is a tightly scheduled prove-out of rendezvous principle and a crucial element in the agency's race to the moon, offers clear potential for the development of military capabilities. A properly time-phased "blue suit" direct or separate-mission Air Force program would give Air Force personnel the experience they will need for extended near-space orbital military operations. There is some significant support in NASA for such Air Force participation. But at the same time, no one can say at this writing whether DoD would approve such a plan, not to mention the possibility of fairly strong resistance to the idea by the burgeoning Manned Spacecraft Center operation of NASA at Houston, Tex., which in the organizational nature of things, could probably be expected to resist any encroachment on what it considers to be *its* mis-

sion. Yet there is talk lately of expanding Gemini to a five-year program. Certainly this approach could allow for extraction of really valuable military orbital experience. Last month's new Soviet manned spaceflight achievements ought to underscore the need for such USAF capabilities.

Another increasingly important concept is the Air Force interest in orbiting, in association with the Gemini program, a military research-and-development laboratory, where vital long-term data on men and materials in the space environment might be obtained. Such a test satellite program could provide answers to questions that from a military as well as NASA point of view have to be gotten sooner or later, the sooner the better.

It is important, and not carping, to note that, having been assigned the job of going to the moon, NASA is under a new kind of pressure. The time is short if it is to meet the President's deadline, and NASA can be expected to divert people and money from its other efforts. This is a classical occurrence in research and development, and NASA is conscious that its sizable budgets will raise questions in Congress as the years of this decade fly by. In NASA, there is bound to develop the practice of feeding Apollo at the expense of other programs. The Air Force, with its considerable space technology capability, must be allowed to fill the breaches bound to develop, especially in the vital-to-defense near-earth orbital areas which may soon be crucial.



DR. EDWARD C. WELSH

The Executive Secretary of the Space Council, he has made notable contributions in the policymaking area.

Another obvious area of potential NASA-USAF cooperation in terms of Gemini is the manned Satellite-Inspector program. There is much overlap in the techniques involved in rendezvousing with either friendly or unfriendly satellites, yet there are enough obvious differences in procedure to more than justify intensive efforts in the Air Force Inspector effort. If DoD will approve, and if such an effort could be mounted in conjunction with the NASA Gemini program, then all the better for the country.

Other possibilities come to mind, such as the concept of manned ballistic missile interception from orbit—doubtless a difficult technique to master—an idea that might turn out to be without merit. . . . We just don't know. The main point is that money has to be spent and personnel invested in finding out.

The onus is on DoD—and finally on the White House. And the accurate determination of DoD's current philosophy on the development of a broad spectrum of military capabilities in space is extremely difficult, because, depending on whom you talk to and what public statements you examine, you can come to either of two conclusions: Either—

- DoD is unconvinced as yet of the military significance of astronautics beyond the relatively well accepted passive roles of unmanned strategic reconnaissance and early-warning vehicles—hence is concentrating on its "today" problems, the piling up of sufficient missiles to ensure continuing nuclear deterrence, and concurrently upgrading conventional, nonatomic, military capabilities. It is sticking to the low-cost (for DoD) philosophy of relying on NASA to come up with capabilities that the military can use *if* they are needed.

OR

- DoD is truly cognizant of the need for the country to develop the broad spectrum of military space skills as an extension of deterrent power, but, for political reasons, will not acknowledge this fact, preferring to work quietly toward those capabilities through Air Force classified programs and through an earnest effort to negotiate a "two-way" NASA-USAF interface.

There is evidence for both possibilities.

In view of the latest Soviet feats, it can only be hoped that the latter is the true case.

Yet, the publicly announced view of the Secretary of Defense that he is not concerned over the security significance of the latest Russian feats and sees no need for changes in the nation's space programs is less than heartening.—END

INSIDE GROUND STATION "RADOME" AT ANDOVER, MAINE. Giant antenna (note man near rim of horn) concentrates signals to Telstar in a narrow, powerful beam. The same antenna also receives extremely weak signals coming from Telstar and amplifies them billions of times.

New "TELSTAR" relays phone calls and TV pictures for first time

Bell System microwave-in-sky satellite is latest communications triumph for America arising from telephone research

The world's first private enterprise communications satellite is now being used for dramatic experiments in relaying telephone calls, television and data messages internationally.

Its name: Telstar. It was launched from Cape Canaveral at Bell System expense by the National Aeronautics and Space Administration.

The ground stations in the U.S. now being used for Telstar were built by the Bell System at Andover, Maine, and Holmdel, New Jersey. Organizations abroad have built stations in England and France. The latter, a near replica of the station in Maine, was assembled with Bell System cooperation. A receiving station in Italy will be ready late this year, and another in West Germany next year.

Telstar is a major experimental step toward a world-wide satellite communications system that was first proposed as a practical venture at Bell Telephone Laboratories. Progress toward such a system has depended on many contributions by the private communications industry, including six basic components—the transistor, the solar battery, the traveling wave tube, ruby masers, the waveguide, and new antennas for the ground stations with innovations in circuitry—direct outgrowths of Bell System research and development.

Above all else, Telstar is the latest achievement in an unending Bell System quest to develop ever better communications for both civilian and military applications.

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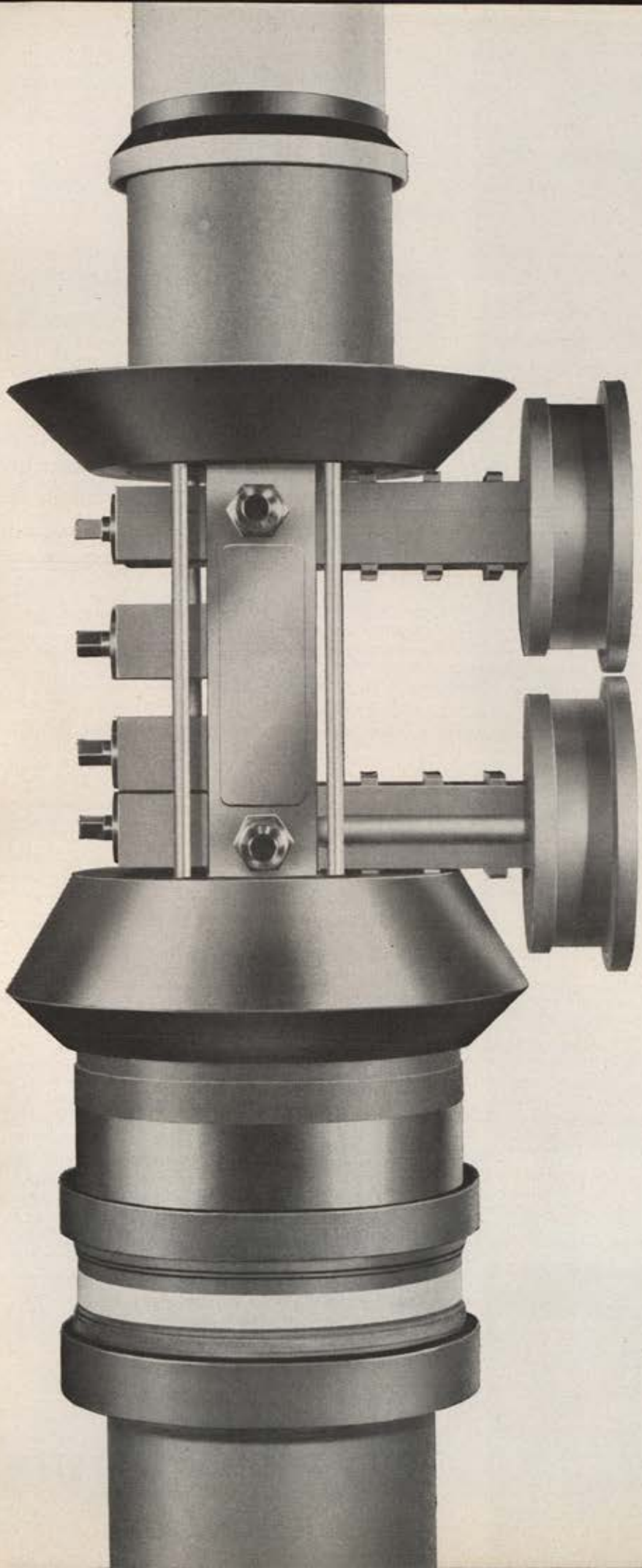

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G-E Breakthrough in Electron Beam Welding Simplifies Fabrication

CINCINNATI, Ohio—General Electric engineers at the Flight Propulsion Division here have developed a method of electron beam welding in the atmosphere which can be applied to large, heat-resistant aircraft and rocket parts.

The new G-E method involves using a continuing flow of inert gas which completely surrounds the weld metal—a shielding technique that eliminates the vacuum needed in conventional electron beam welding. Until now, the biggest single disadvantage of EBW has been enclosing and maintaining the workpiece in a high vacuum.

G.E.'s new method, besides cutting costs by eliminating the vacuum, extends the use of EBW to parts larger than could previously be welded.

Electron beam welding is a recent advancement in metals technology which provides many advantages over ordinary welding processes. It is particularly attractive for welding critical space age metals resistant to ordinary high-temperature welding techniques.

Development work on the new electron beam inert gas welding is continuing at General Electric's Large Jet Engine Department under U.S. Air Force sponsorship. Meanwhile the technique is being incorporated into applicable fabrication phases in G.E.-built propulsion systems and rocket cases.

The 90-ton H.S. Denison skimmed over Long Island Sound at a top speed of 57 knots recently during her first sea trials. The developmental hydrofoil vessel was built for the U.S. Maritime Administration by Grumman Aircraft Engineering Corporation and is powered by a 14,000-shp-class General Electric LM1500 turboshaft engine. A smaller 1000-shp turboshaft, the G-E LM100, is used for low-speed harbor maneuvering when the craft is not foilborne. First commercial application is planned for 1963 when the Denison will carry tourists between Florida and the Bahamas.

Harmon Trophies Awarded B-58, T-38 Pilots

NEW YORK—Two American aviators were awarded 1962 Harmon International Aviation Trophies on August 12 for outstanding feats performed in General Electric-powered jet aircraft.

They were USAF Lt. Col. William R. Payne, responsible last year for flying the General Dynamics-built USAF B-58 bomber to two transatlantic records, and world renowned aviatrix Jacqueline Cochran. Miss Cochran's recognition was for having established eight "world class" flight records while flying the Northrop T-38 supersonic trainer.

A third award, the Harmon Aeronaut Trophy, was won by USNR CDR. M. D. Ross and the late USN LCDR. V. A. Prather for their record-breaking 1961 balloon flight that reached 113,740 feet over the Gulf of Mexico.

The three Harmon Trophies, presented annually since 1926 by the President of the United States, are perpetual "American Awards for outstanding international achievements in aeronautics."

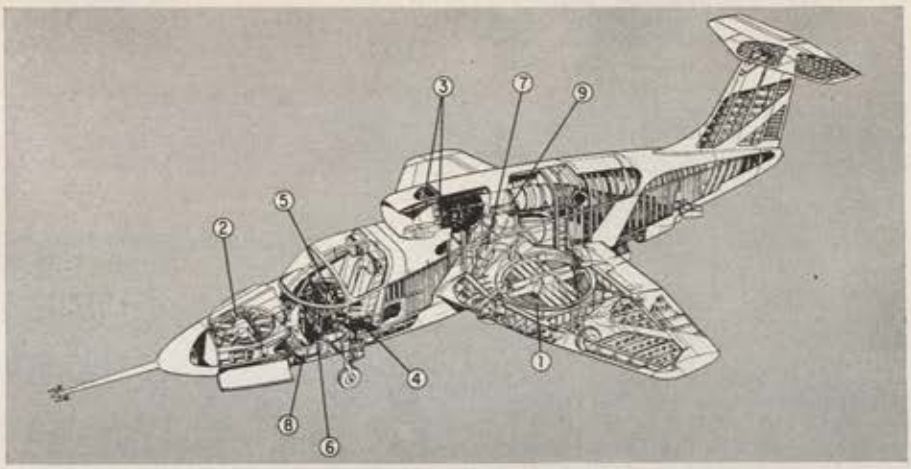
Colonel Payne, winner of the Harmon Aviator's Award, was responsible for two international speed records set in May, 1961. One flight covered the 3833 statute miles between Washington and Paris in 3 hrs., 39 min., 49 sec. for an average speed of 1048.68 mph; the other coursed between New York and Paris (3626 statute miles) in 3 hrs., 20 min. to average 1089.36 mph.

The B-58 Hustler, which is powered by four G-E J79 engines, also holds several international closed course speed records.

Famed woman aviator Jacqueline Cochran was named winner of the 1962 Harmon Aviatrix Trophy for compiling four speed, two distance, and two altitude records while flying the G-E J85-powered Northrop T-38 jet trainer.

According to the National Aeronautic Association, Miss Cochran's eight record flights, flown last year between August 24 and October 12, constituted "the largest number of individual record flights made by any pilot in the world in so short a time."

Significant among Miss Cochran's records were a straight line distance mark of 1492.39 miles, a 15/25 kilometer straight-away speed of 844.20 mph, and a sustained altitude record of 55,253 feet.



FINALIZED FLIGHT CONFIGURATION OF THE ARMY'S VTOL VZ-11 is shown in this newly released cutaway drawing. The flight-test aircraft, already under way at Ryan Aeronautical Company, is due for flight test in mid 1963. General Electric's lift-fan propulsion system will power the VZ-11. Shown in the drawing are the X353-5 lift fans (1), and the X376 pitch fan (2), which supply power for VTOL and attitude control. Two G-E J85 engines (3) drive the lift fans and also supply thrust for level flight. Lift control stick (4) positions lift fan exit doors and pitch fan flow modulators. Conventional control stick (5) controls pitch, roll and yaw. Rudder pedals (6) handle both VTOL and conventional control. Crossover ducts (7) are a safety feature furnishing both lift fans with power in case of an engine-out situation. Nose fan supply duct (8) delivers engine power to the pitch fan. At desired altitude after lift-off, diverter valves (9) shut off the fans, and the VZ-11 transitions to normal horizontal jet flight.

NEWS

A report about progress in research and products from the Flight Propulsion Division of the General Electric Company

G-E CJ610's to Power West German HFB-320 Business Jet Aircraft

LYNN, Mass.—Twin General Electric CJ610 turbojets have been selected to power Hamburger-Flugzeugbau's recently announced HFB-320 executive jet.

Described as a 7- to 12-place aircraft, the HFB-320 is expected to have military and feeder-line potential in addition to its executive transport role. Its cruising speed is specified at 391 to 495 mph, with a range of 1465 to 752 miles, depending on passenger capacity.

Making the third new international application for G.E.'s J85/CJ610 engine family in the last four months, the West German jet will use twin, fuselage-mounted CJ610's, each developing 2850 pounds thrust.

Late in April the Canadian Department of Defense Production selected the CJ610 to power Canadair's single engine CL-41 trainer.

A few weeks later, the U.S. Department of Defense named the J85-powered Northrop F-5A "Freedom Fighter" as the aircraft to be supplied to allied nations under this country's Military Assistance Program.

Besides international applications, twin J85's are used to power the U.S. Air Force's Northrop supersonic T-38 trainers, and to provide boost for the Fairchild C-123 transport.

CJ610's will also power three other executive aircraft scheduled for international as well as U.S. service—Aero Commander's Model 1121 Jet Commander, SAAC Lear-Jet, and the Piaggio-Douglas Vespa-Jet.

Other versions of the J85 family have been developed, including a lift fan design scheduled for flight-testing next year in the Ryan VZ-11, an Army V/STOL research aircraft.

USAF's Mach 3 North American XB-70 'Valkyrie' will be powered by six YJ93 engines. A prototype aircraft is scheduled for flight tests before the end of the year.

YJ93 Deliveries Completed for First XB-70

CINCINNATI, Ohio—Last of the six YJ93 jet engines which will power the U.S. Air Force's first XB-70 aircraft has been shipped from General Electric's Large Jet Engine Department here.

Maiden flight of the giant Mach 3 XB-70 is scheduled for late this year, according to North American Aviation, builders of the aircraft. G.E. began engine deliveries to North American last April.

First tests on a YJ93 were conducted in September, 1958. Ten months later the engine demonstrated its ability to operate under conditions simulating those it would encounter in flight at 2000 mph (Mach 3).

Following completion of the YJ93's Preflight Rating Test in September, 1961, the Air Force accepted the first engine on schedule last December.

In addition to the engines shipped to North American for installation in the aircraft, two YJ93's were delivered to Tullahoma, Tennessee for XB-70 inlet compatibility tests in the Air Force Arnold Engineering Development Center propulsion wind tunnel. A third engine began ground tests at North American's Santa Susanna facility in May, 1962.

Design principles of the YJ93 are based largely on those of the proven General Electric J79. These include advanced compressor design, lightweight construction, single spool, and converging-diverging exhaust nozzle.

The jump in speed capability from Mach 2 to Mach 3, however, created for General Electric a number of new challenges, particularly in the approach to high-temperatures. To solve these problems, G.E. cooperated with the USAF and U.S. industry to make greater use of new high-temperature alloys and honeycomb structures.

TWA CJ-805's BOOSTED TO 2200 HOURS TBO

CINCINNATI, Ohio—Trans World Airlines recently received 2200-hour Time Between Overhaul approval for the General Electric CJ-805-3 engines which power their fleet of Convair 880's.

The new extension to 2200 hours by the Federal Aviation Agency is the highest allowable TBO for the CJ-805 announced to date. The boost continues the CJ-805-3's record of having attained the fastest advancement in TBO allowed under present FAA regulations.

TWA's 2200-hour TBO came several months earlier than G.E.'s original forecast for reaching that mark. Delta and Northeast Airlines are expected to pass the 2000-hour mark soon.

Unusual forward-sweeping wings make Hamburger-Flugzeugbau's new HFB-320 executive jet easily recognizable. The 7- to 12-place craft will be powered by twin fuselage-mounted General Electric CJ610's, each developing 2850 pounds thrust

FOR MORE INFORMATION

If you would like additional information on these G-E flight propulsion programs, write on your company letterhead to: General Electric Company, Section A206-51, Schenectady 5, N. Y., USA.

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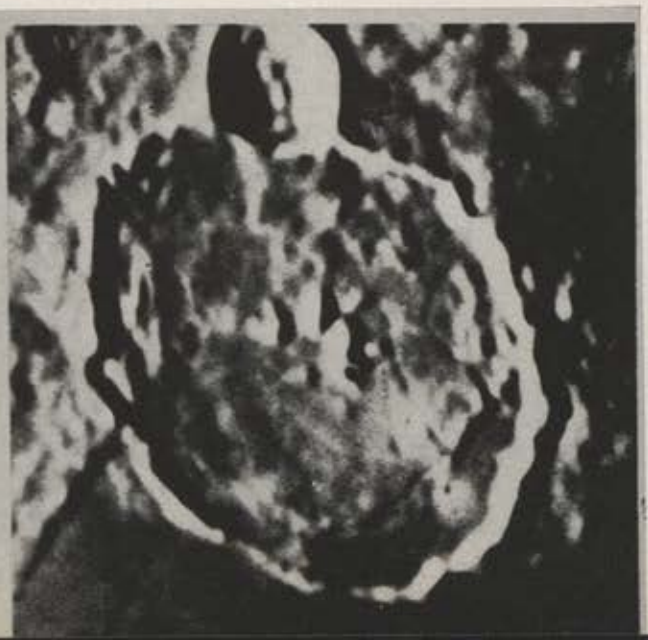
In cooperation with leading astronomers, USAF mapmakers are busily charting our lunar neighbor, against the day in the late '60s when—if all schedules are met—American explorers will touch down on the pocked surface of the moon . . .

HOW USAF MAPS THE MOON

Above, lunar photo taken at Pic du Midi Observatory France, using a USAF K-22 aerial camera. Below, left, a shaded relief drawing of the lunar crater "Gassendi" by ACIC cartographers. Below, right, the McDonald Observatory actual photo of the same area on the lunar surface, illustrating the comparison.



ACIC cartographic specialists analyzing observatory photographs being used for USAF moon mosaic. Photos from many observatories go into mosaic.

ACIC scientific illustrator, using airbrush, builds up relief features of the moon. Here she is developing third-dimensionally the moon crater Copernicus.

THE wild *black* yonder beckons Air Force mapmakers who have long applied their expertise to charting the ups and downs of our planet's surface.

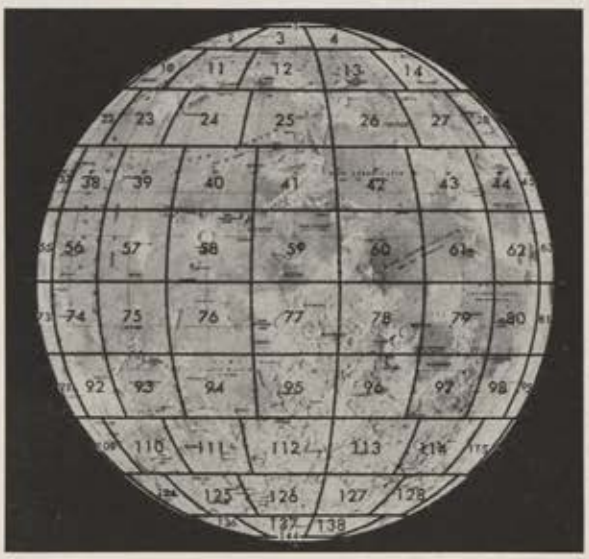
Under a program jointly sponsored by the Air Force Cambridge Research Laboratory, Air Force Systems Command, Laurence G. Hanscom Field, Mass., and the Aeronautical Chart and Information Center, St. Louis, Mo., aerial photo, lunar, and scientific illustrator specialists—working with noted astronomers at famous observatories in this country and abroad—are helping create lunar atlases, mosaics, and relief maps in support of the US effort to land an expedition on the moon.

It's a delicate job. Thousands of lunar plates are examined, selections made, careful composites created, measurements and remeasurements performed for maximum accuracy. For the relief maps, skillful illustrators (see photo, opposite page) make drawings and use airbrush techniques to create the third dimensional effect.

Already completed are the USAF *Lunar Atlas,* a project sparked in 1958 by an Air Force contract with the noted lunar expert, Dr. Gerard Kuiper, and the *Orthographic Atlas,* a photographic atlas using map projection. Due out soon is the *Rectified Lunar Atlas* being edited by Dr. Kuiper. Rectification involves projecting normal lunar photos onto hemispheric easels, then in turn photographing the images with the camera aimed at the center of the hemisphere—providing the observer a view of the lunar surface as it would appear from a point directly overhead. The rectification process aids study of craters and fissures.

Distributions of these charts and maps of the moon for government use is by ACIC, while non-governmental editions are available on a nonprofit sale basis from the University of Chicago Press (*Lunar Atlas*) and the University of Arizona Press (*Orthographic Atlas*), which will also distribute the *Rectified Atlas.*—END

USAF Lunar Reference Mosaic, reduced in size but showing quality and accuracy of composite lunar photograph based on plates from three observatories.



The Air Force Luna Aeronautical Chart, on scale of one inch equalling sixteen miles, follows pattern of the widely-used USAF World Aeronautical Charts.

Speaking of SPACE

BY WILLIAM LEAVITT
Associate Editor, AIR FORCE/SPACE DIGEST

How Scientific Is A Moon Trip?

"The American program for exploration of extraterrestrial space serves two distinct purposes. On the one hand, it contributes to defense, to international political purposes, and to our national prestige. On the other hand, it advances scientific knowledge."

So opens a brief commentary on the US moon expedition plan by Dr. Warren Weaver, Vice President of the Alfred P. Sloan Foundation, in the August 4 issue of the *Saturday Review*.

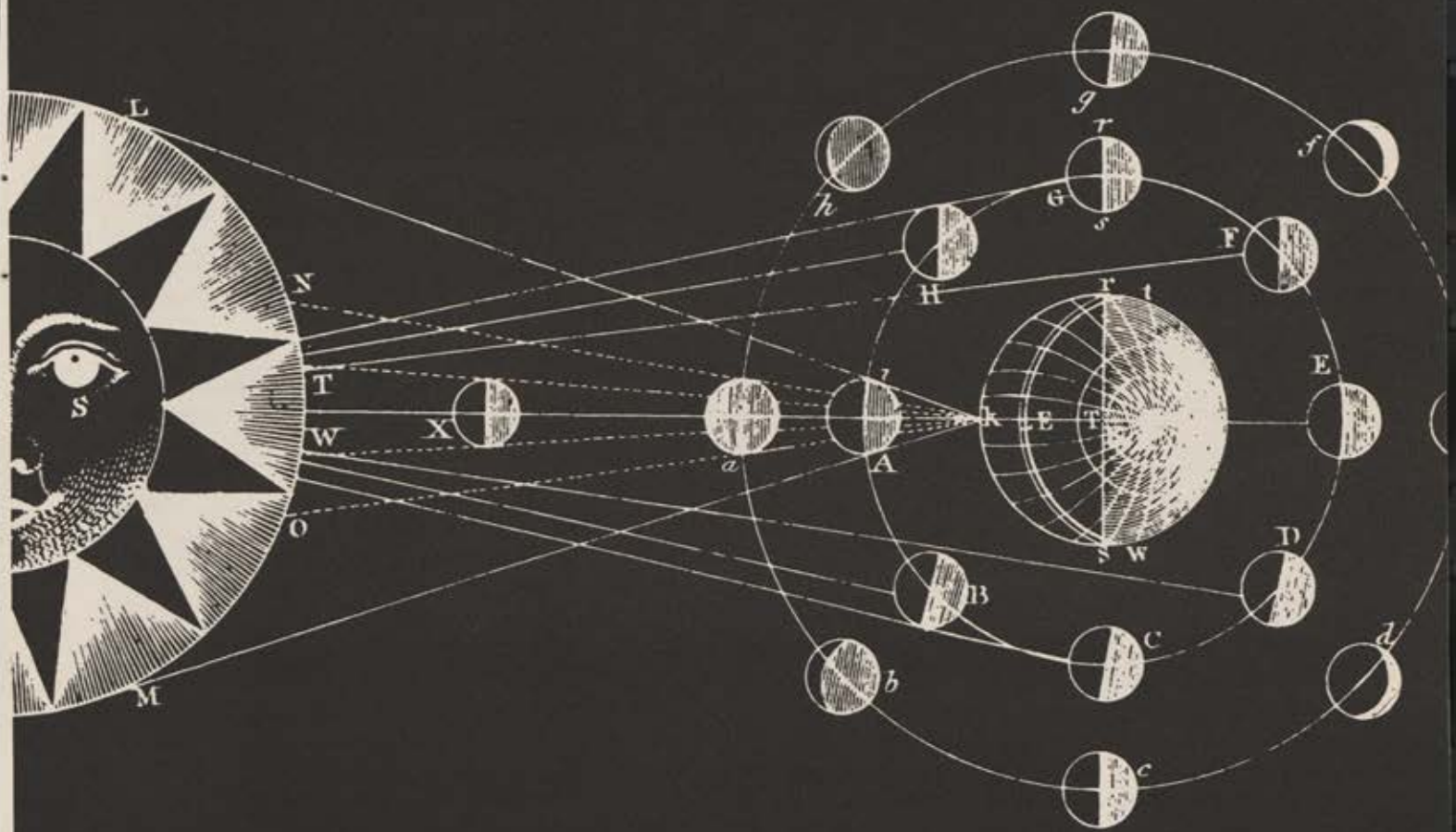
Dr. Weaver goes on: "Certainly few scientists have the professional competence or the practical experience [to] enable them to make responsible judgments [on] the nonscientific aspects of space research. I . . . am not prepared to oppose any level of expenditure which has been thoughtfully evaluated by leaders competent in the military and political fields, and . . . deemed by them, in careful review of alternative uses of the money and manpower, to be necessary for nonscientific reasons.

"Apart from the military and political purposes . . . I believe that most scientists consider the proposed expenditures quite unjustified on the grounds of scientific considerations; and also consider the frantic pace of the program to be wasteful. . . . It is sobering to think of an alternative set of projects that might be financed with this sum."

Dr. Weaver then lists other ways the moon billions might be spent: a ten-percent pay rise over ten years for every teacher in the US; $10 million grants to 200 of the best smaller colleges in the US; the financing of seven-year freshmen-through-Ph.D. courses for some 50,000 new scientists and engineers; creation of ten new medical schools; the building and endowment of complete universities for the fifty-three additional nations that

Scheduled for next US Mercury orbital flight, Astronaut Walter M. Schirra, US Navy commander (above). *His backup pilot for what is expected to be a multiorbital flight is Astronaut Leroy G. Cooper, Jr.* (right), *a major in the USAF. Reds beat US to fifth-man (and sixth) into-orbit honors last month.* (See "Aerospace World.")

The Sun, Earth, and phases of the Moon
— from a 17th century engraving



NEW DIMENSIONS IN SPACE

From early theories on space geometry, man's knowledge progressed to a finer appreciation of the universe and the challenging problems in its exploration.

Texas Instruments is applying its capabilities to an important part of the challenge — the problems of data acquisition, transmission, recovery, and display.

One of the newest technologies being brought to maturity in the Apparatus division is the expanded application of semiconductor network circuitry to space exploration equipment. TI's approach improves reliability and simplifies circuitry — effectively extending equipment capability without increasing volume.

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Here is one example: This seven-ounce PCM digital data signal conditioner has the semiconductor network equivalent of 2,215 components. Logic is performed by *Solid Circuit*® semiconductor networks — 102 of them. This equipment has already been delivered to the Department of Physics and Astronomy at the State University of Iowa for an EGO satellite experiment.

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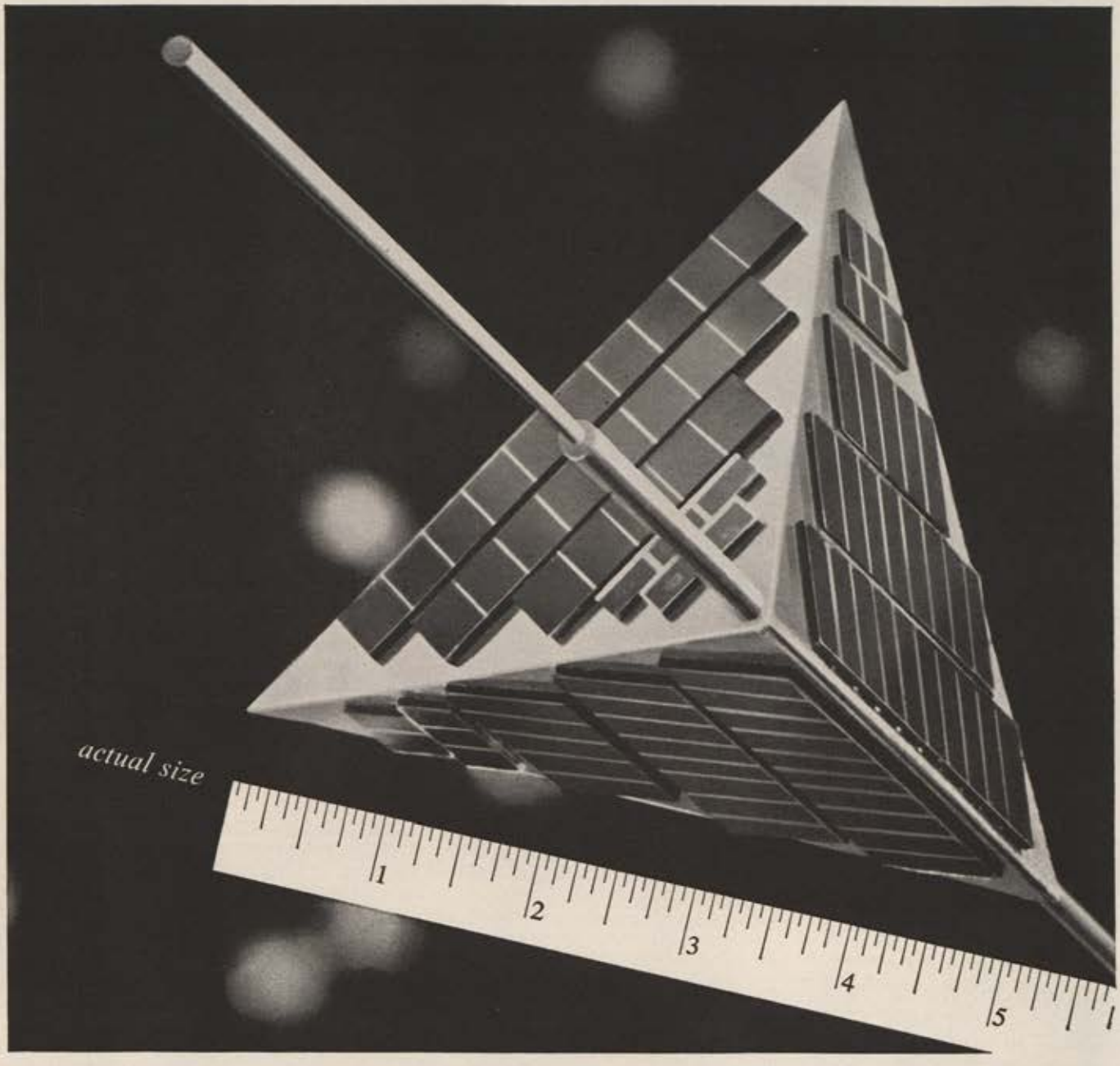

The world's smallest satellite has been developed by Space Technology Laboratories. Its shape will be different from all other satellites before it. STL engineers and scientists have used a tetrahedral configuration to bring about some remarkable characteristics in a space vehicle. There will be no need for batteries nor regulators in flight. The satellite will have no hot side, no cold side. It will require no attitude control devices. No matter how it tumbles in space it will always turn one side toward the sun to absorb energy, and three sides away from the sun to cool instrumentation and telemetry equipment inside. It can perform isolated experiments in conjunction with other projects. Or it can be put into orbit by a small rocket to make studies of its own, up to five or more separate experiments on each mission it makes.

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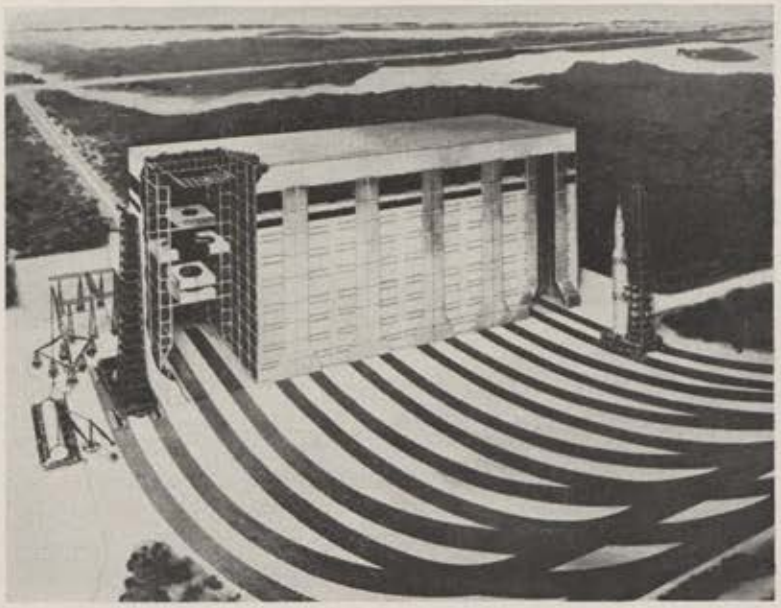


Artist's sketch of giant planned NASA vertical assembly building to be built northwest of Cape Canaveral, Fla. Forty-eight stories high, two blocks long, building will house six 350-foot Saturn C-5 moon rockets, allowing sheltered mating and checkout. Huge crawler vehicle, at right, then will carry launch-ready rocket two miles to launch sites for moonshots.

have joined the United Nations since its inception; the financing of another three Rockefeller Foundations. Totaling all these costs, Dr. Weaver suggests we'd "still have $100 million left over to popularize science."

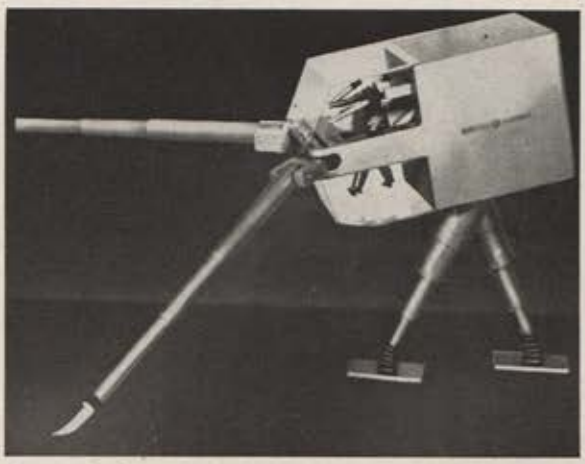
Dr. Weaver concludes his commentary with the admonition: "Whether you are primarily concerned with national welfare, international prestige, or science, weigh these alternatives against a man on the moon."

How widespread is agreement in the scientific community with Dr. Weaver's dubious view of the national moon effort would be difficult to put down with any accuracy. The commitment to the moon program has already been publicly made anyway, it can be argued, therefore the question is academic. Yet the views of so distinguished a scholar cannot be—nor should they be—brushed aside lightly. His doubts do reflect the feelings of at least some prominent members of the scientific fraternity. And, although Dr. Weaver singles out the moon program for criticism as a possible diversion of resources that might better be used for social improvement, he is implicitly criticizing the idea of expending large sums on space programs in general, even though he grants the defense and prestige significance of the space effort. He is not alone in his conservative philosophy. Indeed, it was the dominant philosophy, re space, civilian or military, during the Eisenhower Administration, although Dr. Weaver's anxiousness to expend funds for social improvement was not a particular feature of the philosophy of that Administration. Indeed, the former President, concerned as ever with budgets, labeled the moon effort as a "crash" program and "stunt," profligate of the taxpayers' money, in a recent *Saturday Evening Post* article. Dr. Weaver, at least, recognizes the defense significance of space technology.

It is certain that many scientists—and this is a particular legacy of Hiroshima, to use Dr. Edward Teller's phrase—have developed a strong sense of social conscience and responsibility and consequent desire to see large-scale advanced planning that would enable the technological transformation for social betterment of our country and those portions of the world that we can influence. This post-World War II attitude of the scientific community is truly, in the words of Robert Gilpin, author of the recent study, *American Scientists and Nuclear Weapons Policy,* a "novel phenomenon in American political life."

Hence it is not surprising to hear earnest voices raised against the expenditure of billions to mount a flight to the moon and back. It can hardly be argued that twenty or thirty billion would not be well, if not perfectly, spent for all the worthy enterprises Dr. Weaver lists in his dissent. But Dr. Weaver's approach is really too simplistic. Would the money be spent in the various valuable ways that he enumerates? And if it were, would vast progress on all fronts attacked necessarily result? For example, in a federalized society such as ours with varying local standards, would a nationwide pay hike for teachers necessarily raise the quality of education across the country?

Many educators would argue that raising the pay of the *gifted* teachers and driving out the *poor* teachers might be far more effective. Blanket approaches don't really solve multifaceted problems,



General Electric is studying feasibility of "walking" machine concept, as shown above. The machine, which might be used on difficult earthly or extra-terrestrial terrain, would follow with its "legs" the natural movements of the operator sitting inside while protecting the operator from environment.

not even in the regimented states we deplore. And surely, from a political point of view, the defeats of social legislation as mild as Medicare or aid-to-education since the advent of the Kennedy Administration are strong evidence of the sizable, earnest, and potent opposition to social planning on a national scale, regardless of the merits of the arguments on either side. There is a certain academic naïveté in the expectation that the multi-billions Congress is willing to appropriate for special activities such as the moon program or defense would be as easily invested in the enterprises that Dr. Weaver and others suggest.

This is not particularly sinister. It is merely a fact of national life, especially during Democratic Administrations, which—again, regardless of the political pros and cons—are less budget-oriented and more of the persuasion that large-scale dramatic enterprises have national impact politically, economically, and, in this new age, technologically, too. Of such stuff was the moon decision of May 25, 1961, made. It was a decision fraught with several kinds of risks. Not only is it possible that the Soviets might enter the moon race in earnest, but it is also possible that our effort might be a catastrophic failure, for reasons not foreseeable now. Such a tragic failure could hobble astronautics for decades, perhaps forever. But the gamble has been decided on, and in the main, it is an honest and worthwhile gamble, clearly typical of the pragmatic society that twentieth-century America represents. For ours is not a philosophical society, although it contains distinguished philosophers. As Dr. Weaver points out, the moon expedition contributes to defense (the more it does, the better, we say), international political purposes and national prestige. It can be added that it will also contribute to the national economy through its demands for special skills and services, and to technology through its operational requirements.

As to its potential contribution to the store of scientific knowledge, it is surprising to note doubt in the scientific community. How can astronomers, physicists, medical scientists, and all the rest not be excited by quantum jumps possible in their various disciplines? To sample the lunar surface, to view the blue earth from afar, to gain inevitable new understanding of creation: How can these achievements be anything but contributions to the sum of science? Even irreversible failure would serve a scientific purpose, for it would tell us that we are bound to our planet and its near confines, and perhaps would turn us inward toward a greater willingness to achieve some of the aims Dr. Weaver lists in his demurrer.

That the National Aeronautics and Space Administration is conscious of questions such as those raised by Dr. Weaver is evidenced by such current NASA enterprises as a summer seminar at the State University of Iowa, Iowa City, where a number of scholars are mulling over possible scientific problems that might be studied in the moon-exploration programs. This is doubtless a worthy effort, but it would be regrettable if it were expanded by NASA into a program designed to "sell" the moon effort to the scientific community. The lunar mission will fly on its own power. Its impact on science—and industry—is obvious.

Aside from questions of scientific worth, NASA people admit a certain nervousness over the

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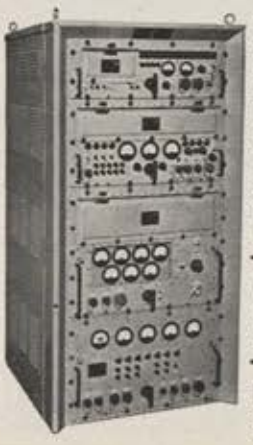

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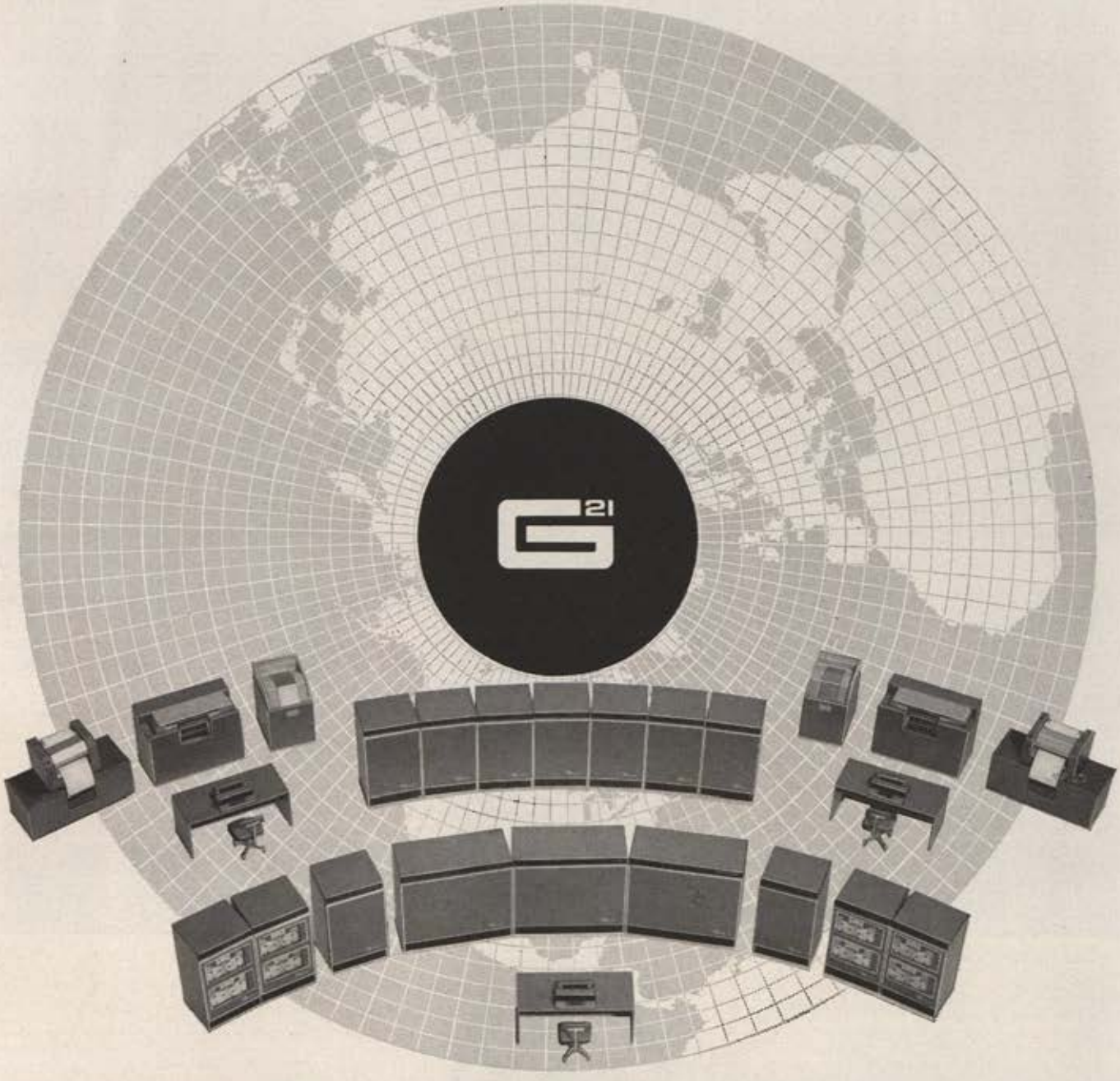

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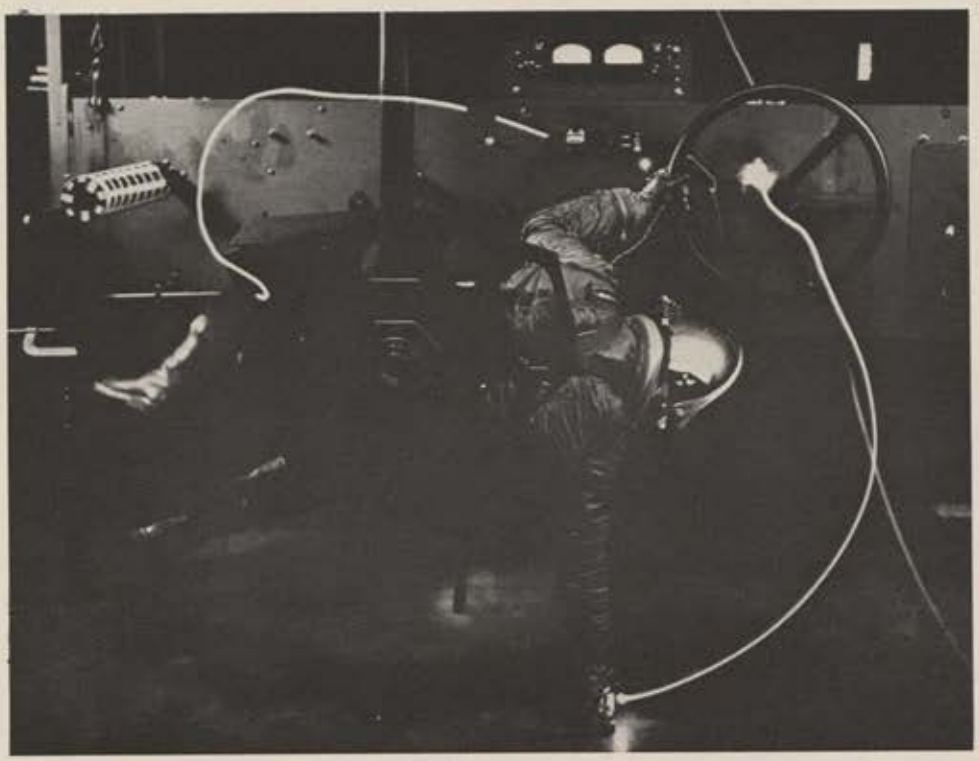


This is Boeing's "anthropometric-ergometric facility"—a work-measurement machine which simulates work conditions in the weightless state by seating the subject in a balanced ball-bearing-mounted chair, unable to brace himself, and pushing a variety of levers, cranks, and wheels. Scientists then analyze amount of and nature of physical forces he can exert without the aid of gravity. Data gained is expected to help in design of controls and tools for use in zero-G.

question of how long the virtually unanimous congressional support the agency and its programs have been getting will last. They know hoopla is not substance. They wonder what the reactions to significant failures and slippages will be. These are important political questions with no pat answers. Surely in Congress there will be, indeed there already have been, sharp criticisms of the "fallout" theory by which military space capabilities were to be largely filled as by-products of the moon effort. The pressure for Administration attention to military space capabilities is increasingly evident. Senator Barry Goldwater, on the Republican side, and Senator Thomas Dodd, on the Democratic side, have both been critical of soft-pedaling on this point. There are other congressmen on Capitol Hill who confide that the prime reason they have voted for space expenditures is their assumption that the new technology achieved will have military significance, and that the military will be encouraged to cooperate with NASA and contribute to space capabilities.

All in all, there seems to be a growing maturity in the space agency, represented by its current increased willingness to think in terms of the broad spectrum of national—particularly defense—needs that can be served by its moon and other programs. The depth of this conviction will have to be demonstrated, of course, in the coming years, because despite the demonstrability of its scientific worth, there is little doubt that the decision to shoot for the moon was a political decision. The effect will be monumental and it will use up people, skills, and money at a prodigious rate. There is the danger—and it has to be recognized—that in the rush to the moon, the development of important capabilities for defense operations in near space may be bypassed, with serious strategic consequences. Positive steps to prevent such military-technological surprise in space are the responsibility of the Administration and the Department of Defense. The Air Force is anxious to press forward with projects designed to ensure the logical extension of deterrent power into space.

Space Capsules

The LOVELACE FOUNDATION, Albuquerque, N. M., which earned national fame through its contributions to the selection of the seven Mercury Astronauts, will attack the problem of premature aging, under a grant from the National Institutes of Health. The Foundation will study 500 human "guinea" pigs, their heart action, kidney function, respiration, blood flow, and other physical and psychological parameters, with the aim of determining why some persons get "old" faster than others. Many of the subjects will be airline pilots considered an "élite physical group,"

according to Lovelace spokesmen. Others will include middle-aged executives. Some of the findings will be fed into Lovelace's work with the AF, NASA, and other special project people.

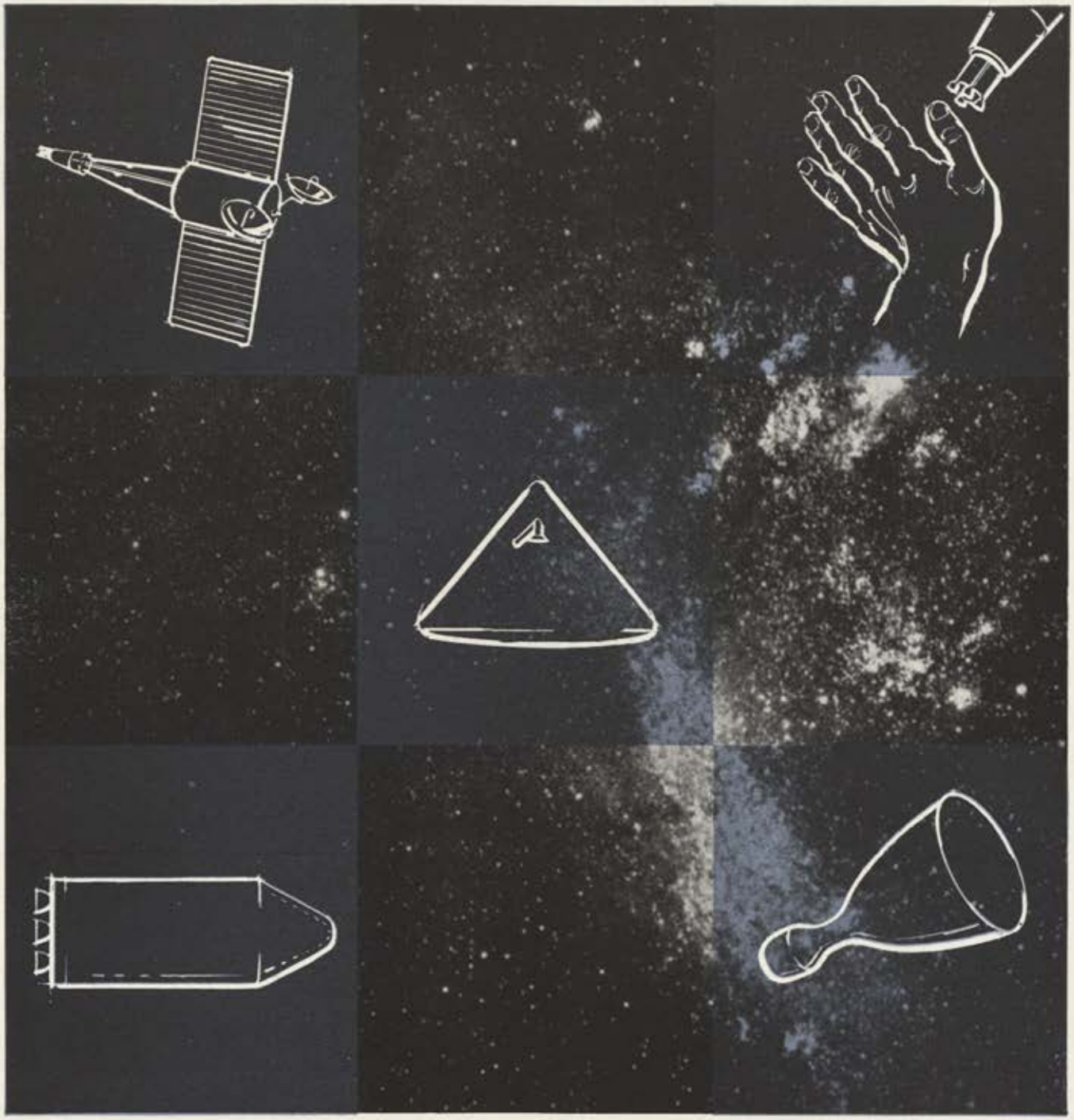
More Down to Earth Footnotes on the Space Age, featuring cartoons and light-hearted text on Astronautics by PETE BENTOVOJA and DON BAILER, and released by the AEROJET-GENERAL CORP., is now available. Write to Don Bailer, Public Relations Department, Aerojet-General, Azusa, Calif. . . . That close-up look at the United Nations building relayed live to European television viewers from New York via the TELSTAR satellite July 23 was made possible by a USAF helicopter crew out of Otis AFB, Mass., flying a Sikorsky S-61, and carrying an American Broadcasting Company crew. The shots were made through the helicopter's door and transmitted via microwave transmitter from the S-61 to the Telstar control station.

Industrial Research Magazine for July-August has some fun with an old science-fiction theme, the study of human culture by an extraterrestrial expedition. From the piece, entitled, THE DISCOVERY OF MANHATTAN MAN: "Being more or less familiar with all higher forms of life inhabiting the terresphere, our primary concern was answering the question: Is there a living native population in the region known as the Manhattan site? How these beings could exist in such a hostile environment has been, until now, an enigma to scientific investigators. But, undeniable evidence of a large native population had been monitored previous to the International Year. Our job, then, was to confirm these suspicions, and if true, to study the population from an eco-social standpoint. . . . Despite the crowding of many thousands of individuals into the inner city, a great deal of social freedom could be observed. And only during what appeared to be mealtimes did the activity reach the fever pitch, during which some natives struck and trampled others in a frantic scramble for the sparse food supply. . . . On one occasion we witnessed a ceremonial sacrifice, which took place as an integral part of an otherwise typical morning ceremony. After a distressing period of near-contact, two natives apparently deliberately demolished their conveyances, sacrificing both individuals. A tribal official, who apparently was late for the ceremony, arrived in time to superintend the final incantation. After flashing a red light for a moment, and waving frantically, the official sounded an odd wind instrument. The two deceased combatants were carefully wrapped in sheeting and removed. The balance of the ceremony was quite normal. Clearly the population of the region has reached a semicivilized state and warrants much further study. . . ."

—Wide World Photos

NASA Project Mercury chief, Manned Spacecraft Center Director Robert R. Gilruth, received Distinguished Civilian Service medal from President August 7. On hand, Astronauts Shepard and Glenn.

Reporters who have sweated through those Mercury launches at Cape Canaveral will be amused at the account by FRANK MCGUIRE in the current issue of the *Columbia Journalism Review*. Mr. McGuire recounts the semantic struggles that have been features of some of those prelaunch press conferences.—END



Pattern of systems capability: Structures for the Air Force System 621A ■ Design, development, and production of ICBM re-entry vehicle systems ■ Electrically propelled space vehicles for 24-hour communication satellites and other missions ■ Thermal-protection system for Project Apollo ■ Studies on neutralizing accidental re-entry of nuclear reactors ■ Advanced rocket-nozzle and combustion-chamber development ■ These, along with management-technical integration and outstanding research-and-development facilities, are indicative of Avco/RAD capabilities for systems design and management.

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The two striking photos on this page earned joint runner-up honors in the color category in the Air Photographic and Charting Service annual competition. Best color photo of the year is shown on the cover of this issue of AIR FORCE/SPACE DIGEST. It was taken by SSgt. Claude Holland at Cape Canaveral and shows the booster for Transit IV-A being readied for launch. The photo above of an Atlas ICBM in its gantry against a Pacific sunset was made at Vandenberg AFB, Calif., by A3C Richard Filakousky, using Anscochrome film in a C-6 camera at 1/5th second and f11. Its companion winner, at left, shows a crewman on a boom painting an American flag on the tail of one of the presidential VC-137A transports during servicing at Andrews AFB, Md. The picture was made by A1C Derek C. Scoble, formerly stationed at Andrews, now in England. He used a C-6 camera with Ektacolor Type-S film and shot at 1/100th of a second at f8. In earlier competition, Airman Scoble's photo was "Photo of the Month" for July 1961, while Airman Filakousky's dramatic shot of the Atlas at Vandenberg was December 1961's "Photo of the Month."

The Air Photographic and Charting Service covers the world of USAF operations with striking results. Here are the year's best . . .

USAF IN FOCUS

THE JOB of making a film record of day-to-day USAF operations around the world falls to the Air Photographic and Charting Service, one of the subcommands of the Military Air Transport Service (MATS). This film coverage ranges from simple documentation through aerial photographs to complex sequential engineering photography.

Commanded by Brig. Gen. Robert W. Hall, APCS has its headquarters at Orlando AFB, Fla. The 5,000 military and civilian personnel of APCS operate from twenty-four permanent locations and dozens of other temporary sites throughout the world.

One of the agreeable by-products of the unit's many activities is an annual selection of the "Best Photos of the Year," in both color and black-and-white categories. Winners and runners-up in both classes are shown on these pages and on the front cover of this issue of AIR FORCE/SPACE DIGEST.

On Cover I, depicting the space-age wonder of a Thor-Able-Star booster being readied to launch Transit IV-A in the predawn hours at Cape Canaveral, Fla., is APCS's "Color Photo of the Year," a shot taken by SSgt. Claude Holland, who used a C-6 camera and Kodacolor Type-S film. The setting was f11, and the film was exposed for twelve seconds, with the moving gantry causing the interesting set of color streaks. This photo was earlier chosen "Photo of the Month" for September 1961.

On the page at the left are the two runner-up color photos, while the black-and-white winner and runner-up appear at the right. Airman Haas's black-and-white "Photo of the Year" is a stern portrait of A2C Brattin, a member of the 815th Combat Defense Squadron at Forbes AFB, Kan. This photo was named "Photo of the Month" for December 1961.

The runner-up shot of the Thunderbirds jet demonstration team was "Photo of the Month" for June 1962. The second "sun" in the photo is a result of refraction by the canopy of the aircraft from which the picture was taken.

During the year just past a special honor came to the Air Photographic and Charting Service when the APCS film "Breaking the Language Barrier" was nominated for an Academy of Motion Pictures Arts and Sciences "Oscar" award. Though the film did not win the Oscar for its category, APCS is justifiably proud of this singular achievement.

As we publish these prize-winning photos, AIR FORCE/SPACE DIGEST salutes the continuing contributions of APCS and its far-flung personnel to photographic art and the Air Force mission.—END

Black-and-white photo of the year, "Deterrent Posture," shot at Forbes AFB, Kan., by A1C Shirl Haas, who used a C-6 camera, Plus-X film at 1/100th at f16, G-15 filter.

B&W runner-up shows Thunderbirds near Nellis AFB, Nev. Picture taken by APCS civilian employee Ken Hackman using a C-6 camera with Plus-X film at 1/200th and f22.

"As managers in the Air Force, we must keep continuously in focus that we work with imprecise safeguards against inflexibility or carelessness. In contrast to private industry, we have not the finite measuring stick of profit nor the last resort of bankruptcy as a way out" . . .

No Alternative to Success

The Air Force's Management Revolution

By John J. McLaughlin

ADMINISTRATIVE ASSISTANT TO THE SECRETARY OF THE AIR FORCE

REVOLUTION usually implies political and social upheaval. In the physical sense of the word, a wheel makes a revolution and returns to a beginning point. It appears that management of the United States Air Force has returned to a strongly centralized control, which existed before USAF became autonomous fifteen years ago.

During World War II the Army Air Forces had been largely directed by its professional military leadership. In the following decade civilian influences dominated the entire military establishment, reaching their highest point during the first Eisenhower Administration.

H. Struve Hensel was counsel for the Nelson Rockefeller Committee which in 1953 authored many of these changes. He became General Counsel for the Defense Department to implement them, and in 1954 wrote an article for the *Harvard Business Review* describing the decentralization of operations which gave greater prestige and power to the civilian Secretaries of the Army, Navy, and Air Force. "Modern business practices, as distinguished from government formalism and bureaucracy," he wrote, "are in the ascendancy."

This civilian-oriented decentralized control was in turn overtaken during the late 1950s by technology, principally the ICBM and the race into space. To come to terms with these advances, we have recently entered a new and unusual phase of military organization. The burden of power is moving away from middle management in two opposite directions: on one hand, to the highest civilian levels centered around the Secretary of Defense; on the other hand, to the soldier-scientists in the field. Last year, for example, the Air Force Systems Command was given managerial control of new weapons from initial development to their delivery to operational commands. Also, the new Air Force Logistics Command received sweeping authority to procure all common-usage items and to provide logistical support for each weapon system throughout its operational life. Thus in the Defense Department today we now have a centralized-civilian control exercised by the Office of the Secretary of Defense (OSD) and a decentralized-military management within the Air Force commands.

Within the AAF in 1946 everyone wanted a separate Air Force, but there was decidedly less agreement as to just what place should be found for the Air Staff in relation to the top civilian authority. Assistant Secretary of War for Air Stuart Symington assigned the job of finding the answer to Eugene M. Zuckert, his Special Assistant. They hoped to avert the jungle of jurisdiction entwining the civilian authority of the Secretary of War and the prerogatives of the uniformed War Department General Staff.

After the war, the AAF wanted to structure its own organization to profit from the experience of its parent service. It hired the C. D. Cline Management Associates from Chicago to relate the Air Staff organizationally to an independent Air Force. Other surveys and studies were conducted, more notable among them being the work of Professor Edmund P. Learned of the Harvard Business School.

When the National Security Act of 1947 became effective, early relations between the Office of the Secretary of the Air Force (OSAF) and the Air Staff were informal. There was a special "in-the-family" camaraderie between Secretary Symington and Gen. Carl A. Spaatz, the first Chief of Staff of the United States

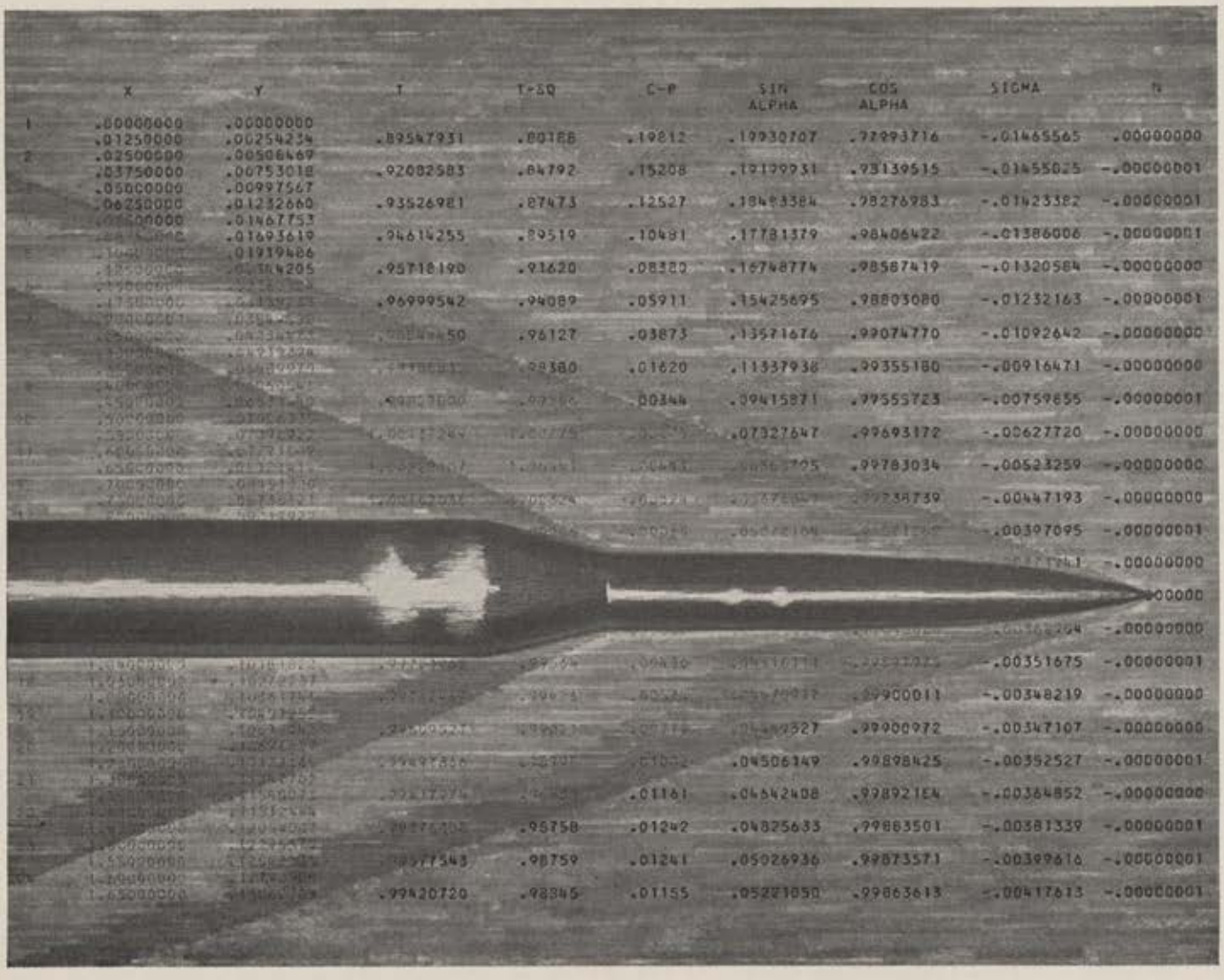
(*Continued on page 102*)

A basic problem facing the designers of submersible, sea-going, air-cushion, flying or space-seeking vehicles is the resistance of the liquid or gaseous fluids through which these craft must pass. The shape of the vehicle becomes critical in determining its speed and efficiency.

□ Research on fluid dynamic shapes at Douglas Aircraft Division laboratories is among the most advanced in the world. Included are studies and experimental work relating to submarines, ships, subsonic, supersonic and hypersonic aircraft, and manned re-entry space-planes. Also under present development are new computer methods of calculating the potential flow and heat about arbitrary bodies throughout the speed spectrum and solving the various configuration problems which are involved.

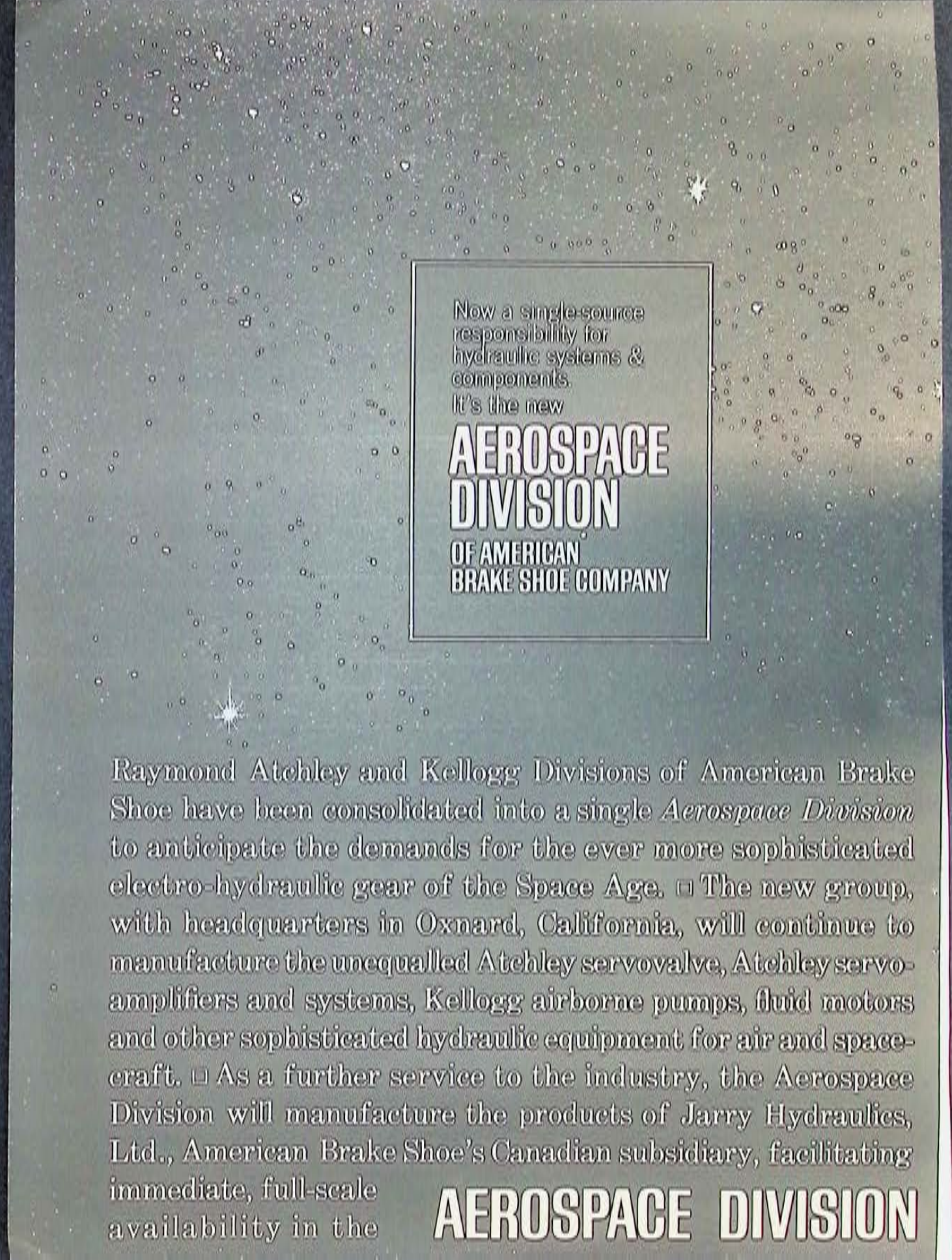
THE SHAPE OF SPEED

...AND WHAT DOUGLAS IS DOING ABOUT IT



Douglas leadership in the above field has evolved from wide experience in the design of aerodynamic vehicles over the past 40 years. The advanced study of fluid dynamics is among more than 500 research programs under way at Douglas.

DOUGLAS



Raymond Atchley and Kellogg Divisions of American Brake Shoe have been consolidated into a single *Aerospace Division* to anticipate the demands for the ever more sophisticated electro-hydraulic gear of the Space Age. □ The new group, with headquarters in Oxnard, California, will continue to manufacture the unequalled Atchley servovalve, Atchley servo-amplifiers and systems, Kellogg airborne pumps, fluid motors and other sophisticated hydraulic equipment for air and spacecraft. □ As a further service to the industry, the Aerospace Division will manufacture the products of Jarry Hydraulics, Ltd., American Brake Shoe's Canadian subsidiary, facilitating immediate, full-scale availability in the

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Air Force, and it was also shared by Gen. Hoyt S. Vandenberg, who succeeded General Spaatz in 1948. Spaatz and Vandenberg were never "directed" to do anything other than what they and the Secretary had already agreed to do.

In 1948, the Air Force established the program "Management Control through Cost Control." This heavy emphasis upon dollars vs. effectiveness had previously persuaded us to set up a military comptroller in the Air Staff. The Air Force was the first service to do so, an innovation which the first Hoover Commission endorsed in 1949.

On June 27, 1950, President Truman ordered US air and naval forces to help repel the invasion of South Korea. Our carefully nurtured Management Control through Cost Control made a 180-degree turn as the Air Force underwent successive accelerations with little regard to cost. From a starting position of forty-eight paper wings (actually about forty-two wings) and 416,000 men in July 1950, the Air Force expanded to seventy, then to eighty-seven wings. It was ordered to beef up to ninety-five wings and 1,061,000 men by July 1952. In October 1951 the Joint Chiefs of Staff set a goal for further expansion to 143 wings, later trimmed to 137 wings.

John J. McLaughlin, 43, has been Administrative Assistant to every Secretary of the Air Force, having been appointed to that post by Stuart Symington when the Department of the Air Force was established in September 1947. A native of Brooklyn, N. Y., he entered government service in 1940, and saw Navy duty during World War II. He received USAF's Exceptional Civilian Service Award in 1956. This article is based on a treatise published in the current issue of the Air University Quarterly Review.

Informal administration of the USAF on a first-name basis began to disappear. To cope with the explosion in manpower, materiel procurement, and installations, it became necessary in 1950-51 to construct new channels of command and coordination between the OSAF and the Air Staff to permit orderly consideration of policy.

A more formal relationship between the Secretary and the Air Staff was dictated by another compelling reason. Congress was strongly moved to give clearer statutory basis to civil-military relationships not only in the Air Force but throughout the Pentagon. The lines had become blurred in the protracted B-36 hearings of 1949 and the MacArthur hearings of 1951, when the sight and sound of high-ranking military leaders publicly taking sides on controversial national and military policies had become disquieting.

Shortly thereafter, so that the civil-military relationship could not possibly be misunderstood, the Organization Act of 1951 (Public Law 150, 82d Congress) provided a new legal basis for the internal organization of the Air Force. It reaffirmed the authority of the Secretary of the Air Force and fixed beyond doubt the principle of civilian control. The original unification law of 1947 was amended to limit the command power of the Chief of Staff, USAF, by striking out the words "command over the United States Air Force" and substituting the words "command over the Air Defense Command, the Strategic Air Command, the Tactical Air Command, and such other major commands as may be established by the Secretary. . . ."

In 1953 the incoming Administration gave further impetus to subordination of the military influence in the Pentagon. President Eisenhower tended to advocate greater civilian control of the Department of Defense. In a letter to Congress in April 1953, he stated: "Basic decisions relating to the military forces must be made by politically accountable civilian officials. Conversely, professional military leaders must not be thrust into the political arena to become the prey of partisan politics."

In June 1953, Reorganization Plan No. 6 raised the number of Assistant Secretaries of Defense from three to nine, and added a General Counsel. The intent of this reorganization, based on the Rockefeller report endorsed by the President, was to clarify the lines of authority within the DoD by strengthening civilian control. Secretary of Defense Charles E. Wilson implemented Reorganization Plan No. 6 to make the service secretaries "truly responsible administrators."

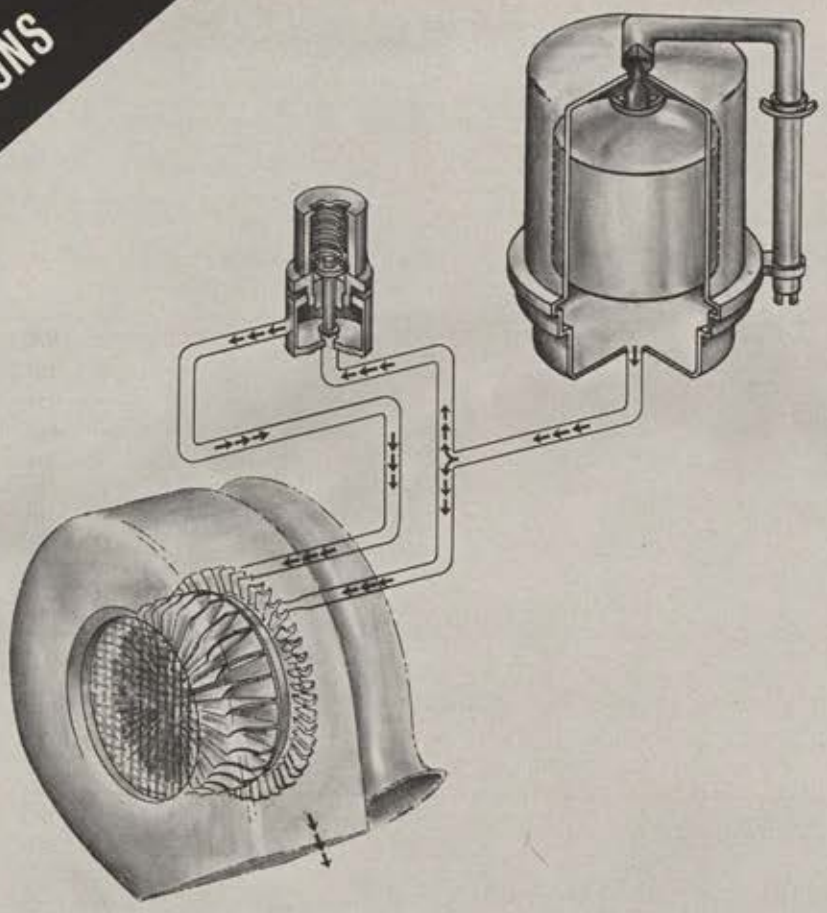
Professional military influence was further deemphasized by legislation passed in 1954. Public Law 562 (83d Congress) added two more assistant secretaries to each military department, making four for each. The Air Force Organization Act of 1951 was amended to require that one of the new assistant secretaries "shall be designated Assistant Secretary of the Air Force for Financial Management and may also act as Comptroller of the Air Force, if so designated by the Secretary of the Air Force." Similar legal provisions were inserted into statutory regulations of the Army and Navy. In February 1955, the Secretary of the Air Force established an unprecedented command line in Air Force organization charts to make his Assistant Secretary for Financial Management "responsible for directing and supervising the Comptroller of the Air Force."

Such a departure from chain-of-command procedure was dictated by the importance placed upon civilian-dominated management, which the Administration believed could be effectively attained through control of the budget. In a broader sense than had been attempted six years earlier, management control through dollar apportionment achieved some success in the years 1953-57.

In 1955 national defense expenditures dipped to $35.8 billion, the lowest figure since before the Korean conflict. Principal credit for the economies should properly go to the "vice presidents" of OSD. Uninfluenced by service ties, they swept away many cobwebs of vested interest.

(Continued on page 105)

ADVANCED DESIGNS



Positive control of hot gas flow . . .

essential element in dependable cartridge starting

The Sundstrand Cartridge-Pneumatic Starter now being delivered to bases throughout the free world has been designed to provide complete operating safety consistent with the highest degree of reliability. The advanced design of these starters is a direct outgrowth of Sundstrand's research and development experience in hot gas technology related to various APU systems for missile and spacecraft.

The key to the successful development of this new concept has been the adoption of a modular design that incorporates positive control of hot gas flow. Since the ammonium nitrate cartridge propellant burn time varies with temperature and pressure, each of these variables must be closely controlled for efficient, reliable starting.

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These advantages of hot gas control are realized . . . mass flow and burn time can be established independent of nozzle sizing . . . nozzle pressure can be varied from 1:1 to 41:1 without affecting burn time of cartridge . . . all cartridge gases are used to drive the turbine . . . variation in temperature from -65° to 160°F will cause only slight variation in nozzle pressure ratio.

This advancement in hot gas technology plus inherent turbine overspeed control and overpressure protection makes the use of the Sundstrand Cartridge-Pneumatic Starter the reliable and safe method to start aircraft engines. The modular design provides the configuration flexibility to adapt the basic starter to your aircraft installation requirements through minor alterations to the static elements. More detailed information is available at your nearest Sundstrand office.

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Management Control through budget control in the Eisenhower Administration had no sooner built up a full head of steam than, like its predecessor of 1948-49, it began to be overtaken by events. Early in 1954 the Von Neumann "Teapot Committee" had completed a prophetic report. Development of an ICBM that could carry a compact nuclear weapon was now feasible. In August 1954, the Air Force established the Western Development Division and a month later contracted with the Ramo Wooldridge Corporation to exercise broad technical management authority in expediting Air Force ballistic missile research and development.

The Western Development Division under command of Brig. Gen. Bernard A. Schriever was given important *ad hoc* authority over many functions performed by the Air Materiel Command and the Air Research and Development Command. The requirement for concurrent research, development, testing, and procurement began to overshadow the need for economy, although for a while they continued alongside one another in not-so-peaceful coexistence. To be sure, AMC people continued to perform certain contracting functions, but they did so under the management direction of ARDC. In time, the functional relationships between AMC and ARDC became clouded.

Reports of Soviet progress in ballistic missiles at this time gave impetus to the US national ballistic missile program, culminating in award of the highest presidential priority in the fall of 1955. Two years later the first Sputnik was sent into orbit. By 1958, management difficulties began to center on the missile and space development programs. The civilian-oriented defense management found itself ill-equipped to cope with technology. In fact, the enlargement of the immediate staffs of the Secretaries of Defense, Army, Navy, and Air Force to twenty-five, each with additional deputies and special assistants, which had taken place in 1953, had not speeded up all essential business of the Department of Defense.

At the top governmental levels, Dr. James R. Killian and Roy Johnson were brought in to give unity to the accelerated effort in basic and applied research. At the service level, project direction began to be decentralized. "Systems analysis" became the order of the day in the management of many technical military programs.

Systems acquisition in the Air Force achieved good success, although some basic shortcomings persisted because program directors in the field had to spend altogether too much time reconciling their authority with the divided control existing between ARDC and AMC.

In June 1958, an *ad-hoc* committee on research and development headed by Dr. H. Guyford Stever, Chief Scientist, USAF, reported to Gen. Thomas D. White, Chief of Staff, on the problem of authority resting within one group of men while the bulk of knowledge and experience resided in another:

> The typical Air Force R&D project officer, who has the responsibility for bringing a technical development or weapon system into being, has above him too many officials who have or assume authority for controlling critical portions of his resources and for approving in detail his project decisions. . . .
>
> The trend of the past few years must be reversed. Authority and responsibility must be delegated together. The authority must include control of all resources required to get a job done, and the opportunity to stand or fall on the basis of competence to make sound decisions. Higher headquarters must limit the direction which they give the operating echelons to general policy and fiscal guidance. The operating levels must be freed from the present unending demands for information on all minutiae of all phases of their activity.

The Stever Committee was "convinced" that a principal reason for our long weapon development cycle as compared to the Soviet Union's was "the failure of each echelon and organization to trust lower echelons . . . and to discipline itself to do its own job well and not to meddle with others." As a case in point, ARDC had reported in 1958 that weapon system cycles from concept to operation took ten years, that the cycle for large capital facilities ran from four to fourteen years.

The Stever Committee in effect was attacking a basic DoD management concept reflected in Mr. Hensel's argument of 1954 that there was a "need for generalists" in the Department of Defense who could blend into a single decision the knowledge and experience accumulated by "specialists." By 1958, however, technological breakthroughs had enforced a different approach.

The Reorganization Act passed by Congress in 1958 took account of the diffusion of R&D authority and responsibility. In establishing the Director of Defense Research & Engineering, the legislation recognized the greater need for a scientific expert with a knowledge of management than for a management expert with a knowledge of science. To reinforce this trend, in 1961 Secretary of Defense Robert S. McNamara gave Research & Engineering a second statutory position by designating the Deputy Director of Defense Research & Engineering as an Assistant Secretary of Defense.

By February 1959, when the Reorganization Act became effective, the civilian "vice presidents" had been cut down in number, OSD losing two, each service one. Furthermore an Assistant Secretary of Defense was enjoined from issuing orders to a military department unless the Defense Secretary specifically delegated such authority to him. The new law also restored considerable power and prestige to the Joint Chiefs of Staff. The Chairman was given increased status, and the Joint Staff was enlarged from 210 to 400 officers.

The Secretary of Defense delegated to the JCS operational direction over the unified and specified commands. Over-all it meant that the pendulum of power had swung back to a more central point after a decade of diminution of the professional military man in government councils.

To those concerned that increased authority granted to the Joint Chiefs of Staff would give rise to a "Prussian general staff," it should be pointed out that the new law gave the *civilian* Secretary of Defense greater authority over service roles, missions, and budgets and

(Continued on following page)

also spelled out his authority to engage directly in military research and development.

At the Defense Department level, there was also increasing interest in the concept of functional force groupings whose history properly begins with the recommendations of the first Hoover Commission in 1949. Dr. James R. Killian in 1956 criticized the existing DoD organization in testimony before the Symington "Airpower" Subcommittee:

> The military task no longer divides up neatly into three mission areas, defined by the vehicle the fighting man rides in. . . . There are no longer any natural boundaries which cannot be penetrated by comprehensive offense, and our defense against this . . . threat does not separate naturally into three parts but requires new, functional-type military organizations to do the job.

The functional forces idea found acceptance in recommendations to President-elect Kennedy in December 1960 by a committee headed by Senator Symington.

Shortly after the new Administration took office, Secretary McNamara initiated 130 penetrating studies of defense activities. Out of these studies emerged further changes in the management of national defense. In addition to the Defense Communications Agency established by Secretary of Defense Thomas S. Gates in 1960, a Defense Supply Agency and a Defense Intelligence Agency have been established. The US Strike Command has been created, combining much of the Army and Air Force tactical capabilities.

Beginning in FY '63 the Department of Defense appropriation ($48 billion) will be divided among nine "program packages": Central War Offensive Forces, Central War Defensive Forces, Reserve and National Guard Forces, General Purpose Forces, Sealift and Airlift, Research and Development, Servicewide Support, Classified Projects, and Office of the Secretary of Defense. Significantly, each fiscal package will contain all military programs contributing to the same function, regardless of which service "owns" the function.

We have sought to translate the functional force concept into Air Force organization. In April 1961, the Air Force Systems Command and the Air Force Logistics Command were established. Both acquired complete managerial control over their specialized areas of interest. Concurrently, the Office of Aerospace Research was activated in Washington with direct access to the Chief of Staff, USAF.

The inherent philosophy of President Kennedy's plan has also found its way into OSAF-Air Staff relations. The Chief of Staff is directly responsible to the Secretary of the Air Force for the effectiveness of the Air Force and its preparedness for military operations, and the Secretary's role is being shaped around the establishment of policy and the review of performance. As Leonard D. White suggested in his *Introduction to the Study of Public Administration*, the Service Secretary intangibly personifies the ultimate supremacy of civil leadership over the military establishment. In the Air Force as in the other services, he is the "outpost of the Chief Executive and a representative of the political party whose policies he is to pursue."

The Secretary's role includes management of all Air Force missions plus the responsibility of acquiring weapon systems. It has thus become necessary for him to evaluate Air Force systems acquisition proposals consistent with program packaging evolved at the Secretary of Defense level.

To this end, in July 1961, the Air Force established the Designated Systems Management Group and the Systems Review Board, with a membership of fifteen, including the highest statutory civilian and military officials. The DSMG replaces the Air Force Ballistic Missiles and Space Committee, and provides a formal method of applying the collective judgment of senior Air Force officials to assist the Secretary in discharging his R&D and production responsibilities.

At the present time twelve systems are under the DSMG concept—"red-line procedures" in the Air Staff. To each is assigned a Systems Staff Officer (SYSTO). He serves as the "Washington representative" for the System Program Director in the field, who actually manages the program. Timely and reliable cost and package program data are being produced by this new system.

There may be complaints about DSMG operating "out of channels," but not because it has failed to work. As we look back, military history demonstrates that "normal staff action" generally got sidetracked for the really big projects. This happened during the war when the Manhattan Engineering District was given a job and $2 billion to bring in the atomic bomb. It happened in 1954 when the Western Development Division was set apart from ARDC-AMC channels to produce an ICBM, and in December 1956 when the Navy Special Projects Office assigned top priority to a ballistic missile that could be fired from a nuclear submarine. The Air Force, in fact, is itself a historic example of "abnormal" organization that was created to capitalize on a decisive new idea.

Special handling of critical development programs is now a defense-wide practice. Only a few weeks ago, on July 30, 1962, the US Army announced that the newly organized Army Materiel Command would accord "exceptional treatment" to the Nike-Zeus antiballistic missile and to other high-priority programs in order to shorten development cycles.

Air Force managers are not among those who regard consistency or normal procedure as virtues apart from results. One may recall the classic example of the Army Commissary General who in 1898 bitterly complained when the Spanish-American War came along and disrupted his splendid organization. He had simply lost sight of the purpose of his organization which was to prepare to meet the ultimate test of war.

As managers in the Air Force, we must keep continuously in focus that we work with imprecise safeguards against inflexibility or carelessness. In contrast to private industry, we have not the finite measuring stick of profit nor the last resort of bankruptcy as a way out. We have no alternative to success.—END

BIGGER JOBS FOR A PAIR OF ACES

R. E. Galer and Chance Vought's *Crusader*. A new two-place version of the *Crusader* is the Navy's first supersonic, carrier-capable trainer with provisions for schooling pilots in the use of guns, rockets, bombs and guided missiles. The F8U-2NE — latest in the *Crusader* tactical series — can handle the largest enemy bomber, any time, in any kind of weather, and recently added striking power now gives the 2NE attack capability. Fighter for fighter, the *Crusader* has logged more flight time than any other 1000-mph aircraft in U. S. service. Its basic design furnished the reliability and flexibility which permitted boosted performance at minimum cost in each successive model, and these same features give the *Crusader* great potential as a solution to tomorrow's problems. Chief of the *Crusader* program for LTV is R. E. Galer, Vice President and General Manager of Chance Vought's Aeronautics and Missiles Division. A pilot who fought in World War II and Korea, retired Marine General Bob Galer shot down 11 enemy aircraft in 29 days, earning 20 decorations including the Congressional Medal of Honor. Before joining LTV, he helped conceive the Polaris Missile concept and what now is the Pacific Missile Range. By combining this caliber of management in depth with proved technical competence in aerospace, communications, electronics and consumer products, LTV is furthering U. S. progress, security and well-being.

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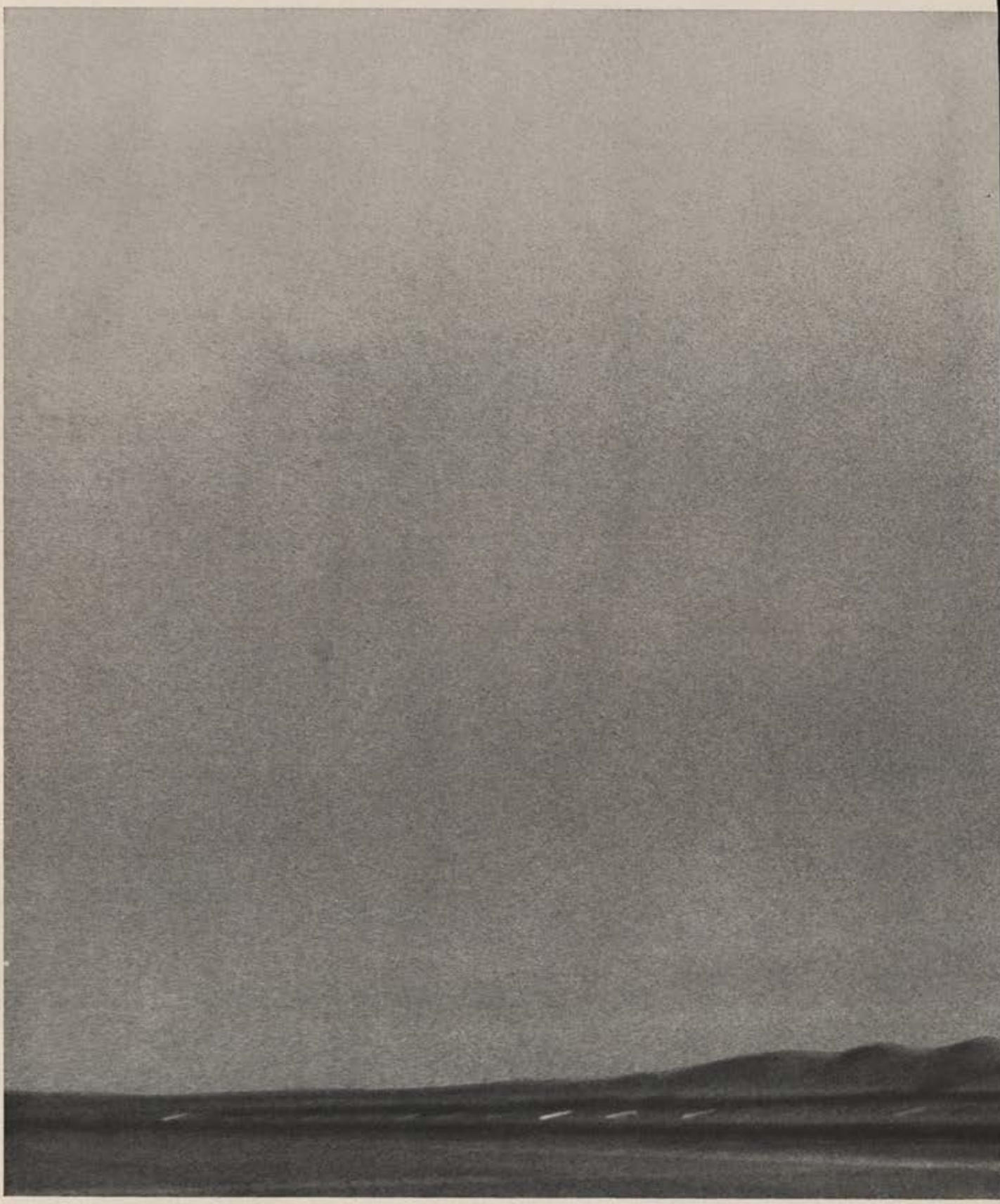

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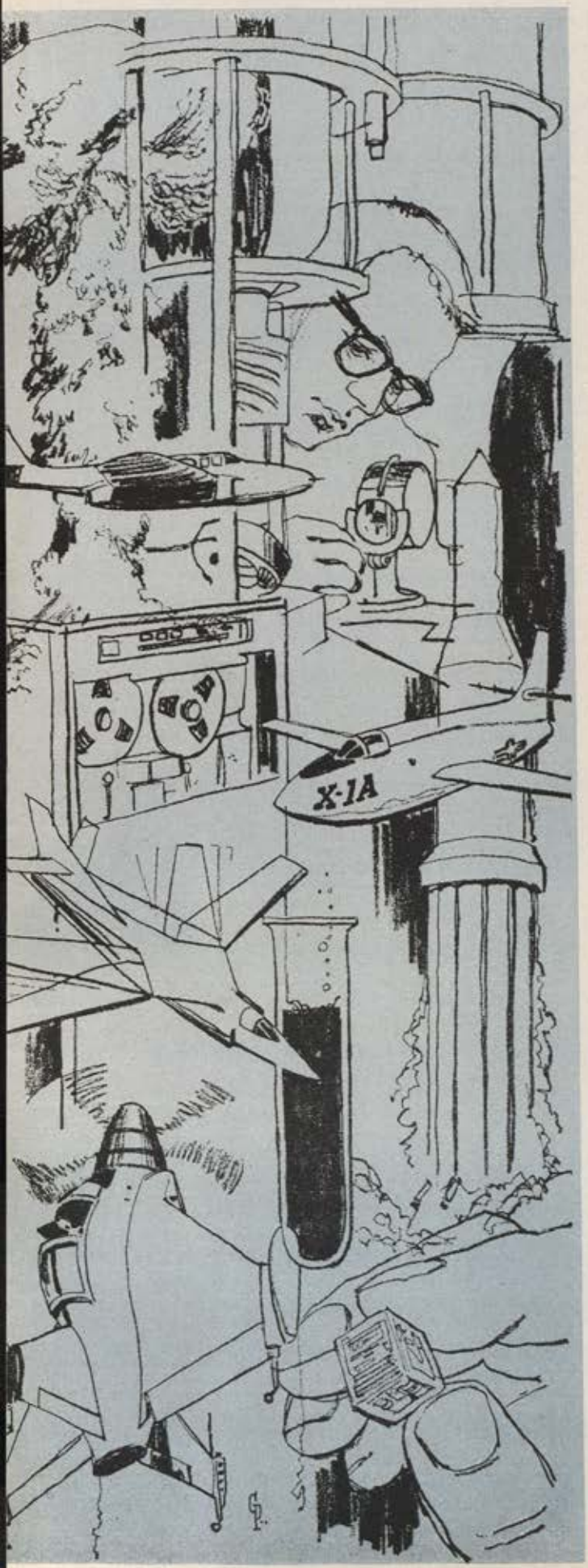

Our century—especially the crisis-packed years since the end of World War II—has seen the greatest expansion of human scientific understanding and technological skills in the history of mankind. This "boom" promises to continue; man may even create living matter and true "thinking machines." Two major points emerge in analyzing such a future:

- **Consequences of today's technological decisions will be experienced by the generation making the decisions. Today's decisions will affect *us* as well as our descendants.**
- **There must be a concerted effort to create understanding among the public of the content and portent of the scientific-technological explosion.**

The Science-Technology 'BOOM'
Its Promise and Challenge

By J. S. Butz, Jr.
TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

AVIATION stands on a technological height today that most experts couldn't foresee fifteen years ago.

In 1947, jet-engine technology, the molding force of the past decade and a half, was still struggling with its first generation of power plants. The first US jet flight of the Bell XP-59, powered by the General Electric I16 engines of 1,600 pounds thrust each, had taken place only five years before, in October 1942. Jet engines were producing only about two pounds of thrust per pound of engine weight and they gulped fuel at the discouraging rate of more than twice that of the piston engine.

Early in 1947 the sound barrier was still a "barrier." The critical factors in supersonic stability and control were imperfectly understood. Few were daring enough to predict sustained operations of supersonic aircraft during the next decade or so.

Today, and for the past five years, operation of thousands of aircraft above Mach 1 is routine. Small, lightweight, and complex radar-electronic-computer equipment are solving navigation, bombing, and fire-direction problems with an accuracy a human pilot could never approach.

Later this year the first aircraft designed for supersonic cruising, the North American RS-70, will make

(Continued on page 113)

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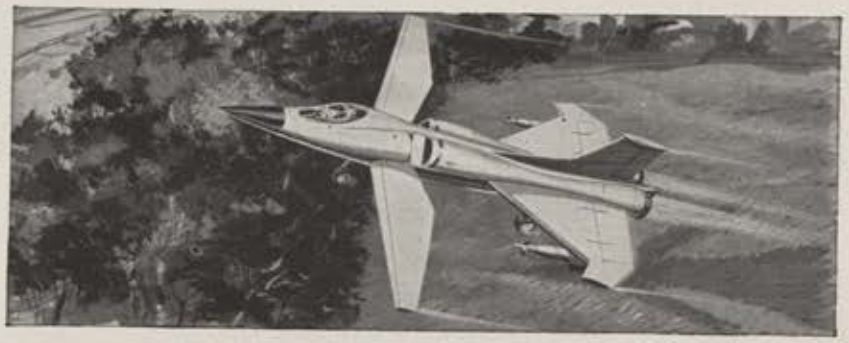

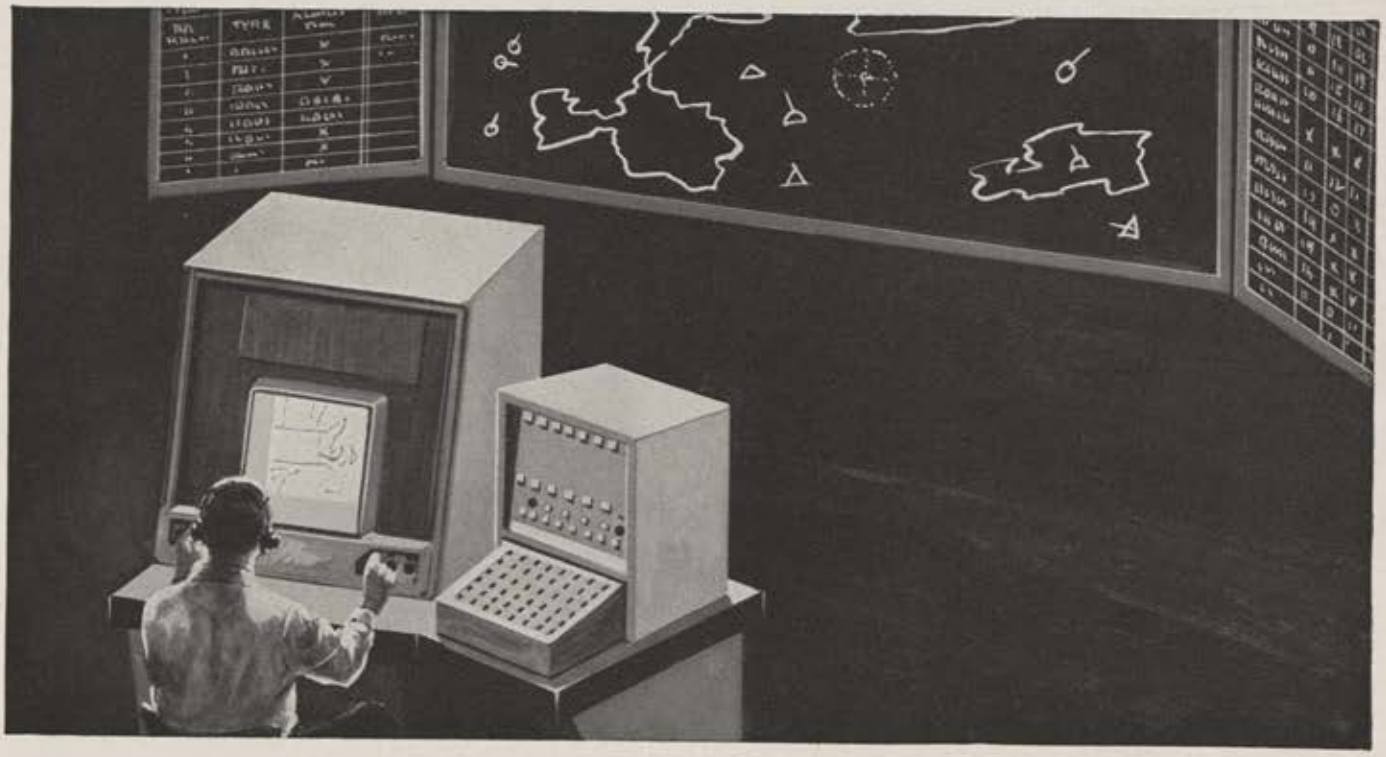

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its first flight. This remarkable aircraft, made of thin-gauge steel rather than aluminum, will glow during 2,000-mph flight as its skin temperature stabilizes at about 500° F. The air entering its six General Electric YJ93 turbojets will be hotter than the exhaust on some older engines.

Today the speed and performance of all high-speed aircraft reflects the fact that jet engines now produce in the neighborhood of eight pounds of thrust per pound of engine weight. Their specific fuel consumption is less than half that of the 1945 jets.

There is more to come, however, much more. Some believe that aviation is about to experience its most rapid advancement yet (*see* AIR FORCE, *June, page 33*). Most engine companies believe that it is now possible to build turbine engines delivering fifteen to twenty pounds of thrust per pound of engine weight. New regenerative design techniques are expected to reduce fuel consumption on some types of turbine engines by thirty percent, moving them into the diesel class. Significant advances are predicted in materials and structural design. Major advances in aerodynamic efficiency for high-performance aircraft at *all* flight speeds and altitudes will accrue from the variable sweep-wing, now under development. Many engineers believe this device will ease the over-all aerodynamic design problem more than did flaps and slats.

At long last effective VTOL aircraft seem possible. Most experts in this field expect them to become operational during the next decade. The X-15 has pushed flight speeds to 4,100 mph and altitudes over 300,000 feet. And most people familiar with high-speed aircraft design believe that it will be possible for one-stage aircraft to fly themselves into orbit within ten to fifteen years, using air-breathing engines most, if not all, of the way.

Despite its great gains, aviation technology has not grown as rapidly as it might have. It has been hampered by the lack of a constant government policy and a firm long-range plan. Virtually all technical projects have suffered from traumatic changes in economic and political support. Some went through several go and no-go cycles before they were completed or canceled.

Today aviation's economic and political problems are increasing even while technological problems are being solved. They have the power to stunt growth more than at any time in the past.

The primary fact about the current situation is that aviation is no longer the pacing technology for most of industry. Its theoretical and practical problems are no longer the most challenging. Aviation is now just one of many technologies on the threshold of advances which were completely undreamed of two decades ago.

Technical and scientific knowledge is "exploding" even faster than the population. It is expected that the earth's human population will reach 6.2 billion or so by the year 2,000, or about double today's figure. But the store of human knowledge is doubling every five to ten years. It is difficult to say which phenomenon is the easiest to visualize and/or to understand in terms of consequences. Few people are equipped to predict, in even the simplest manner, the effects of a world population of six billion, especially when half of it is born within the next forty years. The same is true of the growth of knowledge. Conservatively, between four and eight times more technical and scientific information is expected to be available in 1982 than today. And if the world is able to adjust to this situation in 1982, the conservative estimate again is that, in another decade, it will face a library of knowledge somewhere between twenty and thirty times greater than it was in 1962.

For most people such a world is as unfathomable as if it were on another planet. Certainly anyone who cherishes a particular current economic, political, or social system, much less his own privacy, must view the prospects of these "explosions" with apprehension. Massive changes in human institutions seem inevitable in accommodating such fundamental changes in our environment. The population and knowledge "explosions" will be the equivalent of a series of major wars or the coming of another ice age in disrupting life as we know it now.

The changes are coming so rapidly that for the first time the generation now running the world cannot escape the "long-term" consequences of its actions. It is no longer possible to hand most of our problems on to our children. Most of us alive today will live to face a revolutionary future of our collective making.

No one has any hope of predicting where this adventure will end. But a brief review of the technical history of the past few decades and a rough appraisal of current knowledge can provide some sensible guidelines for the future.

Nuclear Physics: The vastness of the coming revolution in science and technology can be amply illustrated by a brief look at the field of nuclear physics. Progress in nuclear physics has already transformed our world. Yet, knowledge of the atom is still rudimentary. But the stage is set for a rapid change. Many more competent men are working in this field than ever before. They have better financial support than ever before. Every sign points to the prediction that in the next two decades there is much more knowledge to come.

Nuclear physics today is built on the foundation of the laws of quantum theory. The detailed formulation of these laws occupied physicists during the first quarter of this century. Max Planck in Germany first postulated them in attempting to explain the mechanism of heat radiation. He took a radically new step in assuming that radiation energy consisted of finite parcels, which he called "quanta." Independent evidence that Planck's quanta concept was valid was provided by Albert Einstein's 1905 paper on the photoelectric effect, which earned him the Nobel Prize.

The late start of atomic theory is illustrated by the fact that it was 1911 before the inside of an atom was accurately described. Lord Rutherford, in Great Britain discarded the theory that the atom was something akin to a solid ball. He saw it as a virtually empty sphere with an unbelievably small core or nucleus surrounded by rings of even smaller electrons.

(Continued on following page)

Rutherford's description changed man's concept of matter forever.

In 1913, Nils Bohr of Denmark first applied the quantum theory to Lord Rutherford's ideas of atomic construction. Bohr's results conflicted in many ways with the accepted laws of physics, but he had constructed the clearest mathematical picture of atom functioning yet achieved. Refinements in Bohr's original theory were made during the next fifteen years or so, until a set of consistent laws were formed. These laws of quantum theory have been described by the prominent physicist Professor Otto Frisch of Cambridge University as "the greatest revolution in physical thought since the time of Galileo and Newton, even more so than the theory of relativity."

The first splitting of the atomic nucleus was accomplished in 1919 by Lord Rutherford when he broke a piece out of the nitrogen nucleus. The neutron was discovered in 1932 by James Chadwick at the Cavendish Laboratory in England. In the same year, the first cyclotrons were built in England and the United States. These devices enormously speeded up experimental research and progress in nuclear physics. The next high point was reached when Enrico Fermi performed an original series of experiments in Italy and the US that culminated in the first controlled fission of uranium, in a squash court at the University of Chicago on December 2, 1942.

The Manhattan Project produced the first nuclear weapons and laid the foundation for the secret industry at the heart of the US policy of deterrence. The first H-bomb was exploded in 1952. Since then great efforts have been expended in the US and the USSR to reduce the size of fission and fusion weapons and to increase their explosive yield.

Efforts to generate power with atomic energy have not matched weapon production and development. This is especially true of the US with its large industries producing fossil fuels—coal and oil. The Soviet Union operated the first atomic power station in 1954. Great Britain followed in 1956 with the Calder Hall station and the US began commercial nuclear power production in 1957 at Shippingport, Pa.

However, progress in nuclear theory and experimentation has been steadily advancing. Neutrons, protons, and electrons are no longer considered the ultimate construction particles of matter. At least thirty fundamental particles now have been isolated. Physicists believe that they are getting close to a clear picture of how these particles relate to one another and how they control the structure of matter. There are strong suspicions that these particles all have a dual nature, for they clearly exhibit wave properties as well as the properties of particles. Intense efforts are being made to explain this duality. Professor Frisch describes some of the deeper implications of these efforts, "... some important new ideas have come into existence as a result of trying to reconcile the wave aspect and the particle aspect, and philosophical questions, touching for instance, the validity of the principle of causality (the doctrine that everything has a precise cause), have to be tackled. Indeed it has been suggested that our idea of reality may have to give way to complementarity: the idea that everything in the world has two sides, of which we can see one or the other but not both at once."

Barely fifty years after the atom was first described physicists are at the doors of a fundamental understanding of matter, understanding that will dwarf all nuclear development to date.

Electronics: Similar momentum has built up in all fields of science and technology. For instance, the dynamic growth in electronics rivals, if not surpasses, that in nuclear physics. Today's thumbnail-sized microelectronic circuits, automatic tools for precision manufacturing, computer-run air defense systems, and other notable achievements provide a deceptively primitive preview of the electromagnetic systems envisioned for the next two decades or so.

The great surge began in World War II. Radar, computers, and other new electronic devices grew suddenly out of the radio technology that had developed slowly but steadily after the invention of the triode vacuum tube in 1906. Military necessity catalyzed the industry into a growth that shows no sign of dissipating.

Today the sales volume of the electronics industry is estimated at $11 billion a year. It is credited with a growth rate five times higher than that of the national economy. Its dynamism is shown by an estimate of a major manufacturer, the Raytheon Company, that eighty percent of its business is in products that were not in existence in 1952.

The civil fallout from military-sponsored electronic developments is perhaps greater than in any other field. Despite the fact that electronic guidance, communication, control, and computation devices are the cornerstone of all advanced military systems, industrial and commercial equipment account for about half of the industry's business. This even split is expected to continue with both military and commercial sales increasing steadily.

In 1945 it was clear that major progress was impossible if component and circuitry sizes were not reduced. Military requirements calling for smaller equipment to perform more tasks—more precisely and more reliably while consuming less power—could not be met with existing hardware. Significant reduction in circuitry size began in 1948 with the discovery of the tiny, semiconducting transistor to replace the vacuum tube. Shortly thereafter a miniature circuit was usually defined as one having ten or twenty equivalent components to the cubic inch. Today, miniaturization has advanced to incomprehensibility for the layman. The smallest devices are usually termed "micro" and they must contain more than *one thousand equivalent components per cubic inch* to be worthy of the name.

This advance has been brought about by the development of extremely refined methods of accurately depositing thin films of various conducting, semiconducting, and insulating materials on thin base materials. These layers of materials, a few microns thick,

(Continued on page 117)

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Sikorsky's twin-turbine S-61 carries twice the payload of its piston-powered predecessor, the S-58.

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To date, operating costs for the 28-passenger S-61 have averaged only 8¢ per seat mile. Sikorsky is currently designing advanced helicopters that will reduce this figure even further.

This emphasis on engineering progress has always characterized Sikorsky design. It is one of the many reasons for Sikorsky leadership in vertical flight.

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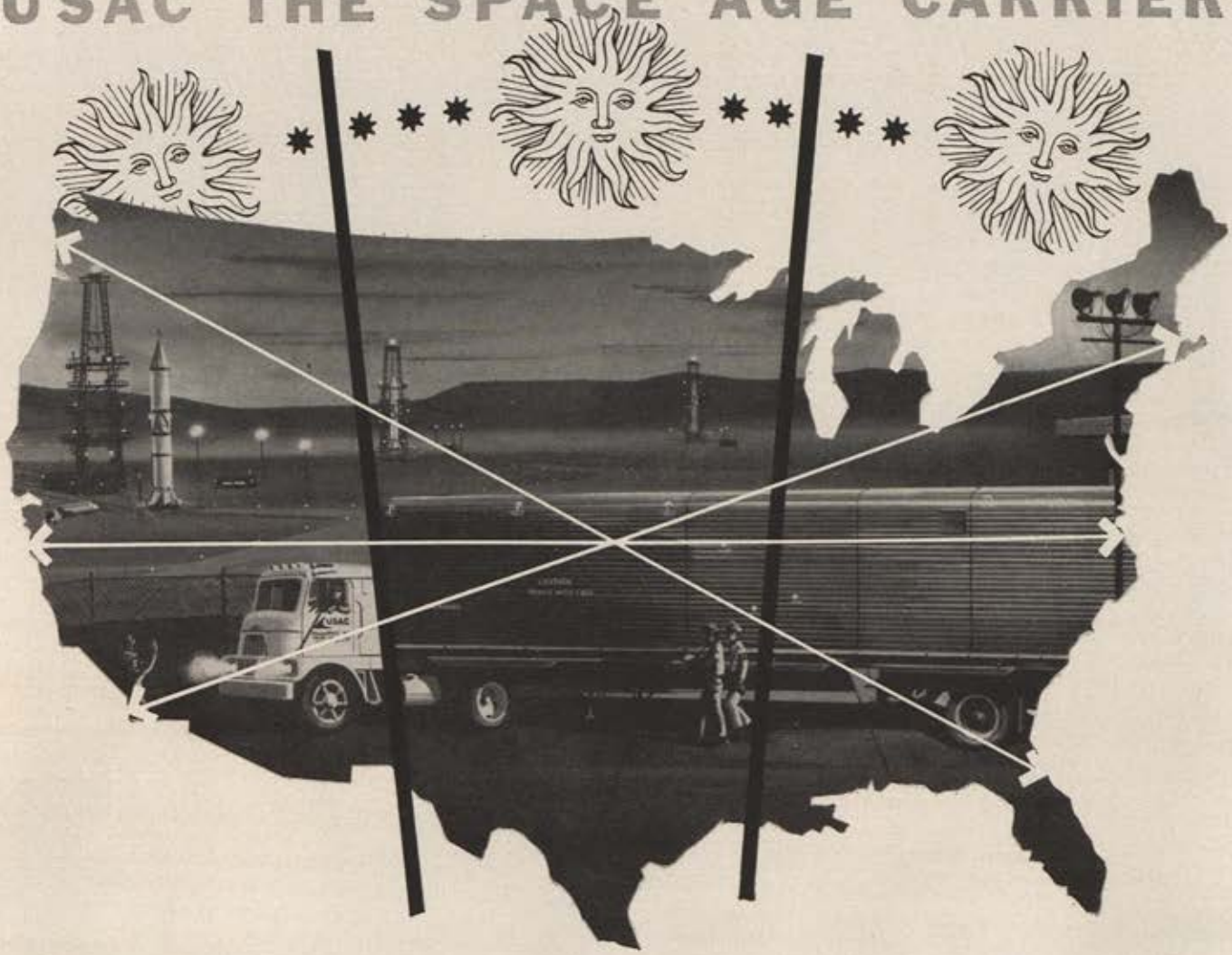

COAST TO COAST IN THREE DAYS

U.S.A.C. welcomes tighter Defense Department shipping schedules. Prior to July 1, in preparation for MILSTRIP, it stepped up its maintenance program, purchased new trailers, augmented its fleet of sleeper units, completed intensive studies of transit time on every shipment handled in the six preceding months. It hired more men, speeded up driver training. It gave older drivers refresher courses with special emphasis on the new requirements. It notified Defense Traffic Management Service offices that pickup service on priority loads would be available 24 hours a day, seven days a week.

Result: Highest priority military cargoes now move from Coast to Coast in three days, with corresponding reductions in time on shorter hauls. U.S.A.C. is happy to be a heavy-specialized hauler able to gear up to meet more stringent demands from the Armed Forces. All classes of shippers will share in the benefits.

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are connected to form a circuit and perform a given function. These circuit elements then are used in the makeup of complete systems such as computers, guidance systems, etc. Several methods of vapor-depositing the layers of thin, single-crystal materials have been developed. The rate of progress in this area is illustrated by the fact that a year or so ago many top industry leaders predicted a rather slow development of such tiny circuits to truly replace the vacuum tube and larger elements and perform all of the thirty-odd functions needed in complete systems. Today, these predictions are completely reversed, for most of the troubles foreseen a year ago have already been overcome.

From the standpoint of future potential, two devices developed in the last seven years stand at the head of the list. They are the maser (Microwave Amplification by Stimulated Emission of Radiation) and the laser or optical maser, which have opened a whole new era in electronics by providing the potential for: opening completely unparalleled new frequency ranges for communication purposes; jam-free communications in space and the atmosphere; effective transmission of hundreds of millions of watts of power without wires on beams only a few centimeters in diameter; unmatched new spectrographic tools for scientific work in materials and chemistry; radar pictures with the clarity and resolution of the best photographs; and a seemingly endless list of devices of comparable importance.

More important, from the military aspect, the gas laser transmits extremely high powers in extremely narrow beams. It offers the distinct potential of operating high energy, highly directional beams or "death rays" which can destroy ICBM warheads and other space vehicles from either earth bases or from vehicles in space. In a typical experiment recently, at a Martin Marietta Corp. laboratory, a medium-powered laser beam burned a hole two millimeters in diameter through ten tempered-steel razor blades with one extremely short pulse of light. Even chronically pessimistic electronics experts predict that an anti-ICBM weapon can be created in five to ten years using such devices.

Gen. Bernard A. Schriever, Commander of the Air Force Systems Command, has described the laser in the following terms: "Lasers will open a completely new area of micro-technology, by giving us the ability to drill or cut to tolerances measured in hundreds of molecules. All materials, including diamonds, can now be drilled or cut with extreme precision. . . . Lasers offer a completely new approach to the design of large computers, which—in spite of their tremendous speeds—are still too slow to do all of the scientific and business jobs we would like. . . . Elements of the inner eye have been 'spot welded' (with lasers) without cutting any portion of the organ itself. In the near future similar techniques may be used for nerve surgery, brain surgery, and the removal of undesired tissue . . . in the next few years lasers will open more than a million times the present communications spectrum. . . . Surveillance, data readout, mapping, surveying, and navigation and control may be revolutionized by the full application of the laser principle. . . . If a high-energy laser beam were directed at a satellite . . . it would be possible to recharge batteries or activate a chemical power source in a space vehicle. . . . This same capability could also be used for defensive purposes in space. With an increase in energy level of a laser beam, or with more precise aiming techniques, it . . . perhaps could be used to degrade or destroy the sensors and structure of the space vehicle at which it was directed."

The maser was invented in 1955 by Professor C. H. Townes, then of Columbia University. The creation of the laser came during the summer of 1960, stemming from Professor Townes's work, but involving a number of scientists working independently. During the past two years a wide variety of lasers have been developed and tested. The competition and progress in laser development is as high as it has ever been in any technical field.

Computers: Computer development is moving toward higher switching speeds, less time to solve a given problem, smaller and more reliable circuit elements, and cognitive systems. Computers are being applied to an ever-broadening range of civil and military design, manufacturing, operational, and management problems. The rate at which these applications are being made depends largely on the rate at which personnel can be trained to manufacture and operate the equipment.

Recent progress in cognitive or self-teaching systems has quieted the talk that computers will never be able to match the human brain in making decisions and handling unusual situations. While this doesn't appear possible in the next several decades and such machines are certainly in their infancy, they are now performing quite complicated recognition and information sorting tasks. Men are still needed to teach the machines, but this teaching process is a far cry from merely programming a digital computer. Cognitive machines logically organize the information they receive. Today they are fed the information largely by optical means, but sonic and voice experiments are scheduled in the relatively near future and eventually such computers can have more senses than a human by being coupled to various electromagnetic detection systems.

Materials: Some scientists believe that the next decade will be remembered for its progress in materials technology. Virtually every phase of technology is up against some sort of materials problem, due to high temperature, radiation, fatigue, etc. The whole materials effort is picking up steam and a rich harvest in new materials is expected.

High-temperature materials, refractory metals with oxidation-resistant coatings, and phenolic resin and silicon base ablation materials have been developed to a much higher state than thought possible even two years ago. These developments have removed virtually all questions regarding the feasibility of reentry structures for moon-return vehicles and orbital vehicles such as the Dyna-Soar.

(Continued on following page)

The working strength of metals has been pushed up around 200,000 psi in solid-rocket cases through better understanding of crack propagation and the removal of impurities from metals. The best working strengths thirty years ago were around 100,000.

Small-diameter, single crystal strands of pure metals have exhibited yield strengths of 600,000 psi. They can be used as reinforcing in a low-strength binding material, much as steel rods reinforce concrete, to provide a material with usable strengths well over 200,000 psi.

Despite such progress, more advances are predicted by the chemists and metallurgists working with materials. They are continually finding new ways to link molecules together to form polymers or very large molecules. For all practical purposes an infinite variety of these polymers are possible and theoretically they can be tailored to provide an infinite variety of properties (such as strength, stiffness, elasticity, etc.).

The plastics industry was built on polymers of carbon and hydrogen either by themselves or in combination with other nonmetallic elements such as oxygen, chlorine, and nitrogen. Success is now being reported in incorporating metals and semimetals, such as silicone, into polymer chains. Some of these new polymers seem to be especially resistant to heat and attack by chemicals. Others apparently will not be subject to the embrittlement (fatigue) common to metals. It is possible to join many of these polymers together easily and with no loss of strength using polymeric adhesives. Therefore, it is expected by many that, in the not-too-distant future, space vehicles and many structures and vehicles on the earth's surface will be made of polymers.

Polymeric chemistry is also having a revolutionary effect on biology. Most of the organic material in the human body is polymeric, including the nucleic acids that carry genetic information and control human structure and growth. Viruses, enzymes, and hormones are all polymeric. Today, many scientists believe it eventually will be possible to control the body's polymeric chemistry to the point that virtually all disease can be eliminated.

A step beyond this is the creation of life. Some of the basic building blocks of life have already been synthesized in the laboratory. And few people who understand this field doubt that, in the next twenty years or so, the final questions will be answered and that man will create life.

Obviously, any brief review of science and technology has limitations. It cannot cover all of the important fields. And it cannot present all of the major differences among specialists concerning the correctness of present ideas or development timetables.

Many leading scientists and engineers have been wrong in some of their predictions of technical achievement. For instance, Lord Rutherford contended, until his death in 1937, that the large-scale use of nuclear energy would never be possible. Vannevar Bush, who led the US scientific effort during World War II, stated emphatically that it was impractical to develop an ICBM. Some of the principal designers of the X-1 research aircraft were convinced for several years after its flights that supersonic turbojets were not feasible.

General Schriever provided another good rule of thumb in his statement that the general tendency is to overestimate the advances that can be made in the short run, but to underestimate long-term progress.

Recent history has also emphasized that sociological, economic, and political influences can be decisive in slowing down or speeding up technical progress. These critical influences will be studied and debated with increasing intensity in the years just ahead. They include such perplexing questions as: Will political and economic roadblocks prevent the new science from benefiting all men, or will it simply widen the gap between developed and underdeveloped nations? Should the US have a military space program? Can equitable arrangements be made as the bulk of the labor force faces its second great transition in 100 years?

It is possible that in a very few years technological questions such as these will become major national issues. If political action is to truly fit the future, the public's understanding of the new technical revolution must be greatly improved. There is great peril in leaving the public on the sidelines marveling at the Buck Rogers aspects of a revolution that confronts it like an iceberg, ninety percent hidden and misunderstood.

Two initial steps appear necessary if the technical revolution is to be kept manageable from the standpoint of either the public or the specialist. First, the information flood must be controlled. Future library systems must be far advanced over today's models. Completely new systems must be developed for rapidly cataloging, storing, locating, and retrieving information. In this case, as in so many others, the new technology carries within it the seeds of solutions to the problems it has created. Electronic engineers believe the necessary libraries can be created.

Second, teaching methods must improve all along the line—in secondary schools, colleges, and graduate schools. The rapid growth in curricula must continue if the next generation's education is to be adequate. Teaching machines and other new concepts developed since 1958 will be useful at all levels. They appear to speed the rote learning of fundamentals and the capacity for problem solving and independent thought as well. There is considerable justification for optimism in this area even though school populations soon will rise drastically and there is going to be a serious shortage of teachers and physical plant.

An entirely different, but just as serious, problem is educating the present generation of adults who will control politics during the next decade or two. The majority of this generation, even those with a healthy interest in public affairs, are vastly more ignorant of the basic trends in science and technology than the seniors in a good high school today. Bringing this generation up to date on the major management and technical issues in the new technical revolution is a murky problem. But it is worthy of the best thoughts and efforts of scientists, politicians, military men, and average citizens.—END

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Gen. Thomas S. Power, an active military flyer for more than thirty years, has been SAC Commander in Chief since mid-1957. Previously, he was SAC Vice Commander from 1948 to 1954 and Commander, ARDC (now Systems Command) from 1954 to 1957. General Power served in Europe, North Africa, and the Pacific during World War II, has held many top USAF posts.

The primary deterrent force of the free world continues to be the Strategic Air Command, and its performance criteria are still . . . overwhelming strength, high flexibility, and quick response capability . . .

STRATEGIC AIR COMMAND

THERE can be little doubt among realistic world statesmen today that the Strategic Air Command's ability to deliver nuclear striking power on demand has constituted a most important "strategic umbrella" for the free world.

Such a potential is a stabilizing element acting to prevent unsettled world conditions from growing into general nuclear war. The capability of SAC bombers and missiles to survive a massive surprise attack with enough striking power to win a military victory is a key element to be weighed at conference tables all over the world.

Although, today, the bomber still dominates our inventory, SAC has become a truly "mixed" force of missiles and bombers. SAC now has more than 2,600 combat aircraft—approximately 900 B-47s, 600 B-52s, and a growing force of B-58s, plus a tanker fleet of some 450 KC-135 and 600 KC-97 aircraft. Together, these aircraft make up the most powerful strike force in history. Strategic Air Command's alert posture, plus dispersal, makes enough of the force certain of survival, even in a surprise missile attack, to win a war if one should start.

SAC's B-52s on airborne alert training have flown thousands of sorties to date. Under the airborne-alert concept of SAC, bombers can be in the air continually within range of enemy targets.

Maintaining fifty percent of the bomber-tanker force on alert and capable of taking off within the warning time of the Ballistic Missile Early Warning System (BMEWS) is a tough, time-consuming job.

The work week of SAC combat crews still averages more than seventy hours. An alert week is a *work* week for a combat crew because the majority of this alert time is spent in training. Details of emergency war orders change frequently and must be virtually memorized. Tactics and procedures used in flying and penetration, weather data, safety measures must all be mastered continually.

When off alert, combat crews fly their aircraft to keep proficient. For instance, SACmen flew about 800,000 hours from January to July 1962.

To cut proficiency training costs and increase crew availability, SAC began testing a program in January 1962 in which a rail-mounted B-52 simulator was rolled to SAC bases for crew training. The simulator duplicates the actual aircraft cockpit and allows crews to practice emergency procedures and rehearse difficult missions at a tiny fraction of the cost of flying the actual aircraft.

Bringing simulators to the crews avoids taking crews off alert and sending them on temporary duty to other bases for simulator training.

Eventually, nine KC-135 and B-52 simulators will be on the road at all times. Furnishing an actual B-52 for training would cost about $8 million. By comparison a new B-52 mobile simulator costs about $1.5 million and can serve several bases.

Meanwhile, exhaustive combat-crew training has paid off in dramatic achievement in the skies.

The past year was a record-smashing one for the Strategic Air Command bomber force. During this period three major aircraft performance records were set by SAC aircraft. The world was shown repeatedly that SAC, if called upon, can perform its mission of striking targets anywhere on the globe. SAC's bombers, charged with the responsibility of carrying between eighty and ninety percent of the firepower of the free world, when measured in TNT equivalents, demonstrated their performance beyond question.

A 4136th Strategic Wing, Minot AFB, N. D., B-52H demonstrated in convincing fashion the command's intercontinental bombing capability when at 9:00 a.m. on January 10, the Stratofortress (gross takeoff weight

nearly 500,000 pounds) took off from Kadena Air Base, Okinawa, for a nonstop, nonrefueled flight to Torrejon Air Base, Madrid, Spain. En route, the B-52 smashed two world distance records and nine course speed records. Elapsed time for the 12,519-mile flight was 21 hours, 52 minutes, and 42 seconds.

One June 6, a B-52H did it again. Starting off from Seymour Johnson Air Force Base, N. C., a 19th Bomb Wing B-52H flew 11,400 statute miles in 22 hours and 38 minutes. The flight terminated at Seymour Johnson after a closed-course run around the North American continent that took the SAC bomber over Greenland, Alaska, California, and Florida without refueling.

On March 5, 1962, a SAC B-58 Hustler returned the Bendix Trophy to the Air Force with a cross-country dash from Los Angeles to New York at an average speed of 1,214.71 miles per hour, making the trip in 2 hours and 56.8 seconds. On the same flight, the plane set a New York to Los Angeles record of 2 hours, 15 minutes, and 48.6 seconds—beating the sun by over 41 minutes—and averaging 1,081.77 miles per hour. On its way east, the Hustler was refueled twice, once over the Midwest and once off the New York coast. A quick aerial turnaround enabled the aircraft to set a new round-trip record of 4 hours, 41 minutes, and 11.3 seconds, while averaging 1,044.96 miles per hour.

During the same period, launch of the air-to-ground Hound Dog missile became part of the routine training of B-52 aircrews. With two Hound Dogs under its wings, the B-52 becomes a platform bomber. The missiles can reach out some 500 miles ahead of the bomber's course, clearing its path to targets with what Gen. Thomas S. Power, SAC Commander in Chief, has called "the greatest penetration aid in the world—the atomic bomb." Hound Dog also can be used against primary targets.

In another important development program, Skybolt, the Air Force's first air-launched ballistic missile, began a series of successful tests at Eglin AFB, Fla. Skybolt will have double the range and far greater speed than Hound Dog and is designed as a companion to the B-52G and B-52H. Four of them will be carried by each bomber.

SAC aircraft also contributed to the command and control of the mixed strike force.

At Offutt AFB, Neb., the Airborne Command Post—

A prime mainstay of US strategic power is the Boeing B-52 Stratofortress, shown here armed with its deadly Hound Dog missile, transportable aloft for air-to-ground firing.

modified KC-135s, with a SAC general officer aboard—continues to fly round-the-clock vigil, totaling some 13,000 flying hours to date. If other command and control facilities were destroyed, the Airborne Command Post would have the people and communications equipment to direct the strike force to its target and return.

To keep proficient in their hazardous and critical tactics, SAC bombers crisscrossed the country in low-level and high-altitude bomb runs at speeds ranging from 300 miles per hour to over 1,000 miles per hour. For example, twelve supersonic corridors were in operation during January-July 1962 for B-58s to practice simulated attacks. B-52 and B-47 bombers also flew

(Continued on following page)

STRATEGIC AIR COMMAND

Headquarters, Offutt AFB, Neb.

Commander in Chief
Gen. Thomas S. Power

2d Air Force
Hq., Barksdale AFB, La.
Lt. Gen. John D. Ryan,
Commander
Bases in Central US

8th Air Force
Hq., Westover AFB, Mass.
Lt. Gen. Hunter Harris, Jr.,
Commander
Bases in Eastern US,
Puerto Rico, Labrador,
Newfoundland, Greenland

15th Air Force
Hq., March AFB, Calif.
Lt. Gen. Archie J. Old, Jr.,
Commander
Bases in Western US

1st Missile Division
Hq., Vandenberg AFB, Calif.
Maj. Gen. Joseph J. Preston,
Commander

7th Air Division
Hq., High Wycombe, England
Maj. Gen. Charles M. Eisenhart
Commander
Bases in the United Kingdom

3d Air Division
Hq., Andersen AFB, Guam
Maj. Gen. William C. Kingsbury,
Commander

16th Air Force
Hq., Torrejon AB, Spain
Maj. Gen. David Wade,
Commander
Bases in Spain and Morocco

SAC's Atlas-F, raised from silo to firing position during a checkout procedure at Vandenberg AFB, Calif.

Teaching incoming missilemen the intricacies of military rocketry is an arduous, painstaking task, aided greatly by the realism that can be attained in this "make-believe" launch control center. Above, students get first briefings.

simulated attacks against seventeen Radar Bomb Scoring sites manned by SAC, including three RBS Express Trains. These trains carry the radar needed to track and score simulated bomb drops and are moved from point to point in the United States, giving combat crews the opportunity to attack a wide variety of targets on unfamiliar routes. Missions were also flown against thirty-two Army Nike sites and fifty-six other sites operated by the Air Force, Army, or Navy, worldwide.

Despite the remarkable record of the SAC bomber force in the past year, the growth of the free world's first and only intercontinental ballistic missile armada continued at an increasing pace.

This summer SAC has Atlas and Titan operational missile squadrons standing continuous alert and more joining the mixed strike force with well-planned regularity. This fall the new Atlas-F is scheduled to join the inventory, and Minuteman should be operational by late 1962.

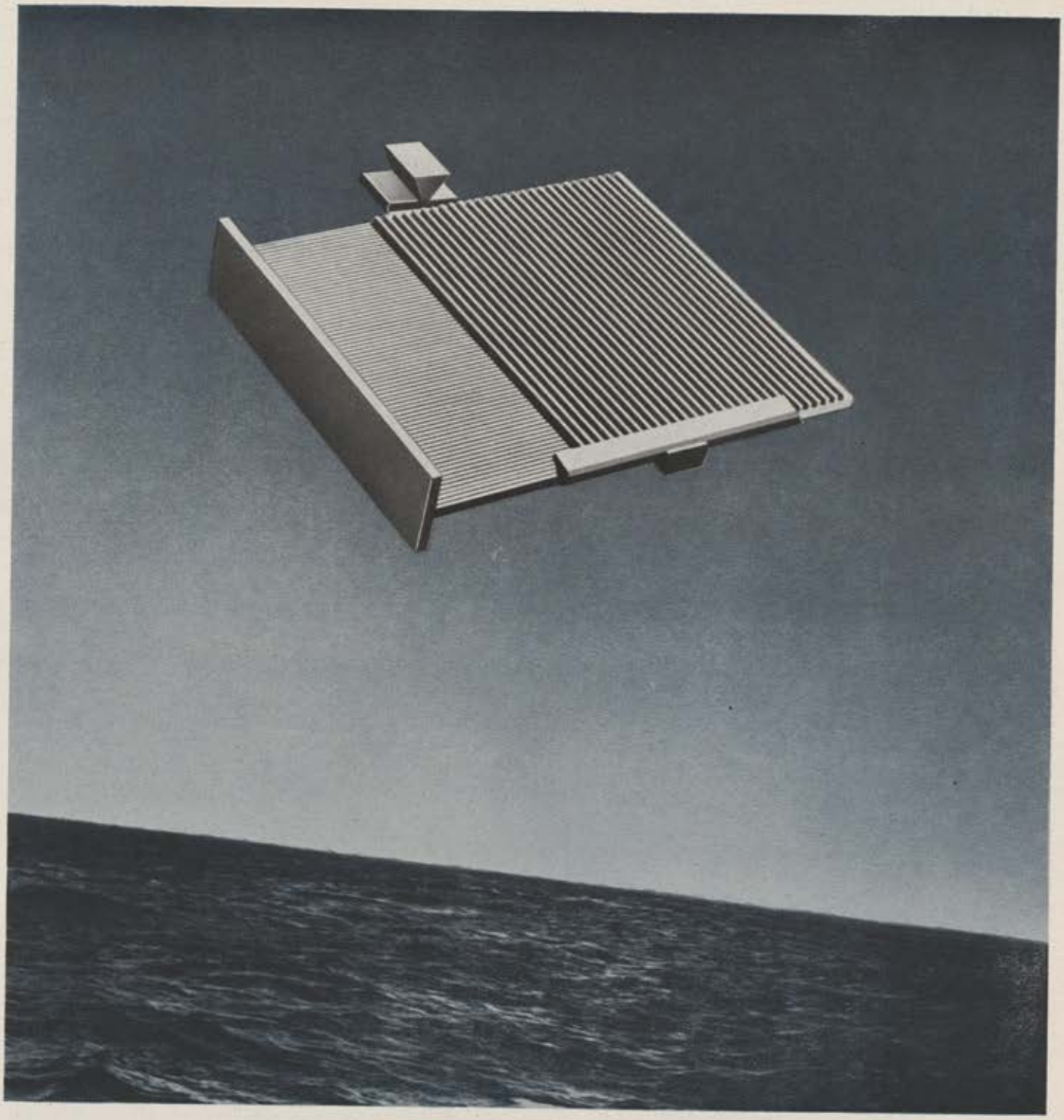
At both Cape Canaveral and Vandenberg Air Force Base, Atlas, Titan, and Minuteman were proving their reliability by making successful launches and hitting their targets. By midsummer Minuteman had an unprecedented box score: of a total of fifteen development launches from Cape Canaveral, all but three were completely successful. In June, installation and checkout of aerospace ground equipment was under way at all of the Minuteman sites at Vandenberg.

Atlas has continued to demonstrate its reliability by boosting test warheads, satellites, and Astronauts into space. On February 15, 1962, an Offutt AFB operational missile combat crew successfully launched Operation Big John from Vandenberg. This launch of an operational Atlas initiated a new program of proficiency launches by missile combat crews. This was followed on March 23 by a highly successful demonstration for President Kennedy of SAC's operational missile capability. At that time a missile combat crew from Francis E. Warren AFB, Wyo., counted down an Atlas-D with split-second timing, and launched it to an impact accuracy of eight-tenths of a mile. On July 12, another proficiency launch by an Offutt AFB missile combat crew impacted an Atlas-D on target in the Philippine Sea after a 7,000-statute-mile flight from Vandenberg AFB, Calif.

By July 1962 all seven Atlas-D and -E squadrons were operational at Fairchild AFB, Wash.; Francis E. Warren AFB, Wyo.; Forbes AFB, Kan.; Offutt AFB, Neb.; and Vandenberg AFB, Calif.

On April 18, 1962, the first Titan I units became operational at Lowry AFB, Colo. The Titan is stored in a concrete-lined silo until seconds before firing time when a giant elevator lifts the ninety-eight-foot missile to the surface where it is fired.

Two squadrons are now operational at Lowry and three more at Ellsworth AFB, S. D. Beale AFB, Calif., and Larson AFB, Wash., will be operational soon.



GILFILLAN: SPACE BLOODHOUND

Gilfillan's two long range frequency-scan radar systems, under development for the U.S. Marine Corps and U.S. Navy, promise performance compatible with future requirements of missile system designation for the Navy and interceptor director radar for the Marine Corps. ▪ A high average power amplitron-chain transmitter in conjunction with a unique program beam-scanning technique will provide superiority in range, improved angular accuracy, and greater data-rate over comparable systems now in use, with the same outstanding Gilfillan dependability. ▪ Soon to be delivered for U.S. Navy and U.S. Marine Corps evaluation in the operating environment, these two advanced radar systems may also possess expansion potential to full three-dimensional output data capability for utilization in a variety of weapons systems and air traffic control applications. ▪ (The illustration above symbolizes a frequency sensitive, two dimensional antenna to be utilized for the U.S. Navy system.)

Gilfillan Corporation

Los Angeles, California

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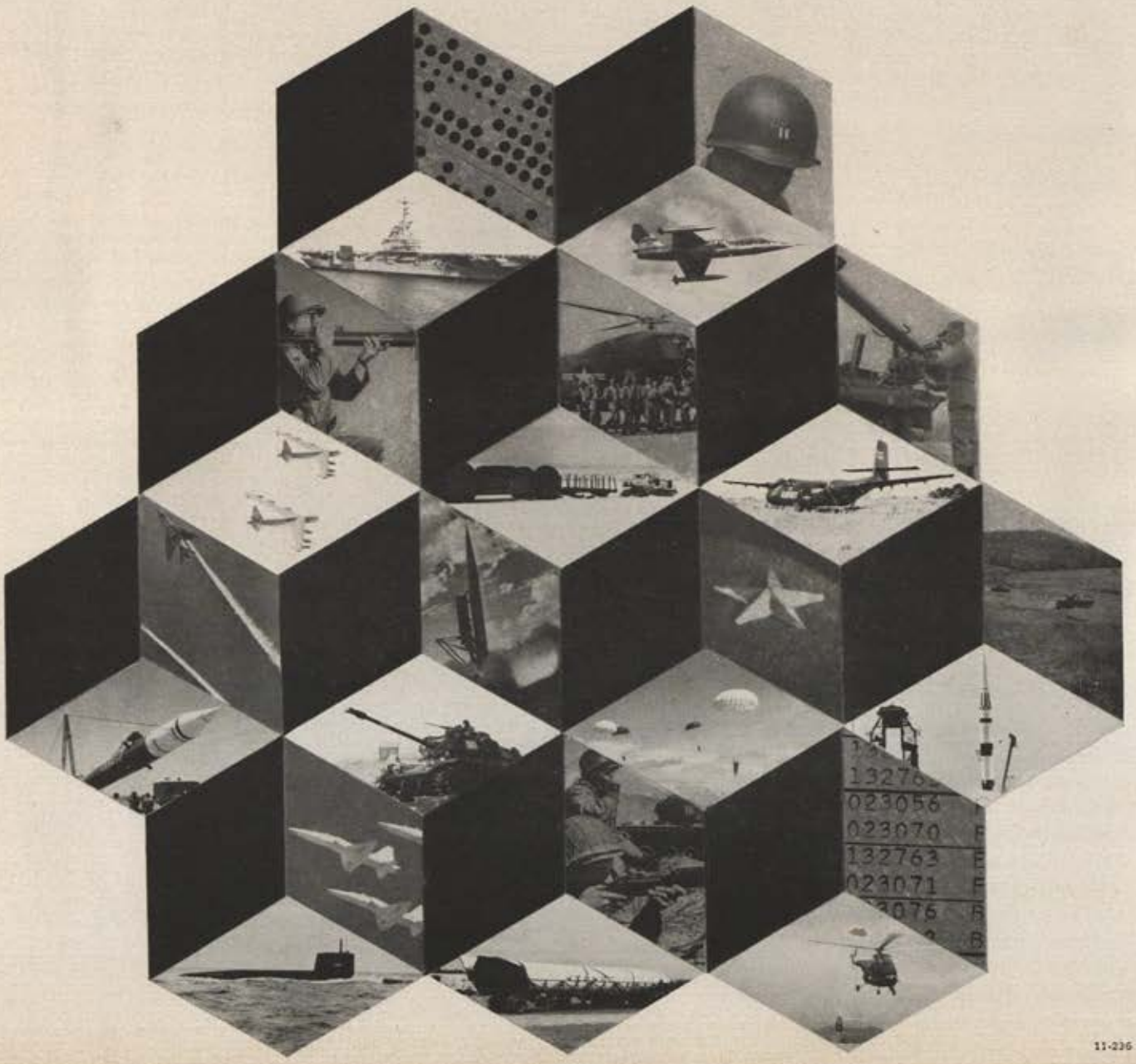


11-236

New strength for USAF's deterrence arsenal—Titan I ICBM, whose launches will be manned from underground.

Thorough understanding of every assignment in the missile force is absolutely essential to quick and effective retaliatory capability. Above, a Titan site commander at Vandenberg talks requirements with one of his supervisors.

While Titan I units were being turned over to SAC, the new and improved Titan II was being tested. There have been two successful Titan II firings from Cape Canaveral. Titan II has a jam-proof all-inertial guidance system and faster reaction time than Titan I. It will be fired from inside the silo rather than elevated to the surface, as is Titan I.

With construction of its first operational launch sites ahead of schedule at Malmstrom AFB, Mont., and test launches complete at Vandenberg, Minuteman is moving into the final stages of development. To date 800 missiles have been programed to be deployed in five wings at Malmstrom; Ellsworth AFB, S. D.; Minot AFB, N. D.; Whiteman AFB, Mo.; and Francis E. Warren AFB, Wyo.

Construction had begun at all bases, except Francis E. Warren, by July 1962. First Minuteman missile combat crews began individual training this summer and were beginning operational readiness training at Vandenberg.

Meanwhile, other SAC missile combat crews and support people for Atlas, Titan, and Minuteman units were in training during the past year. By 1964 one out of seven SAC officers and one out of fourteen SAC airmen will be involved in operating or direct support of command missile activities.

Missile training usually begins with individual training at an Air Training Command technical school or at an industry school where he learns fundamental systems and basic theory. Then the missileman proceeds to Vandenberg AFB for operational readiness training on a crew or to his missile base for "over-the-shoulder" training on the actual missile while launch sites are still under construction.

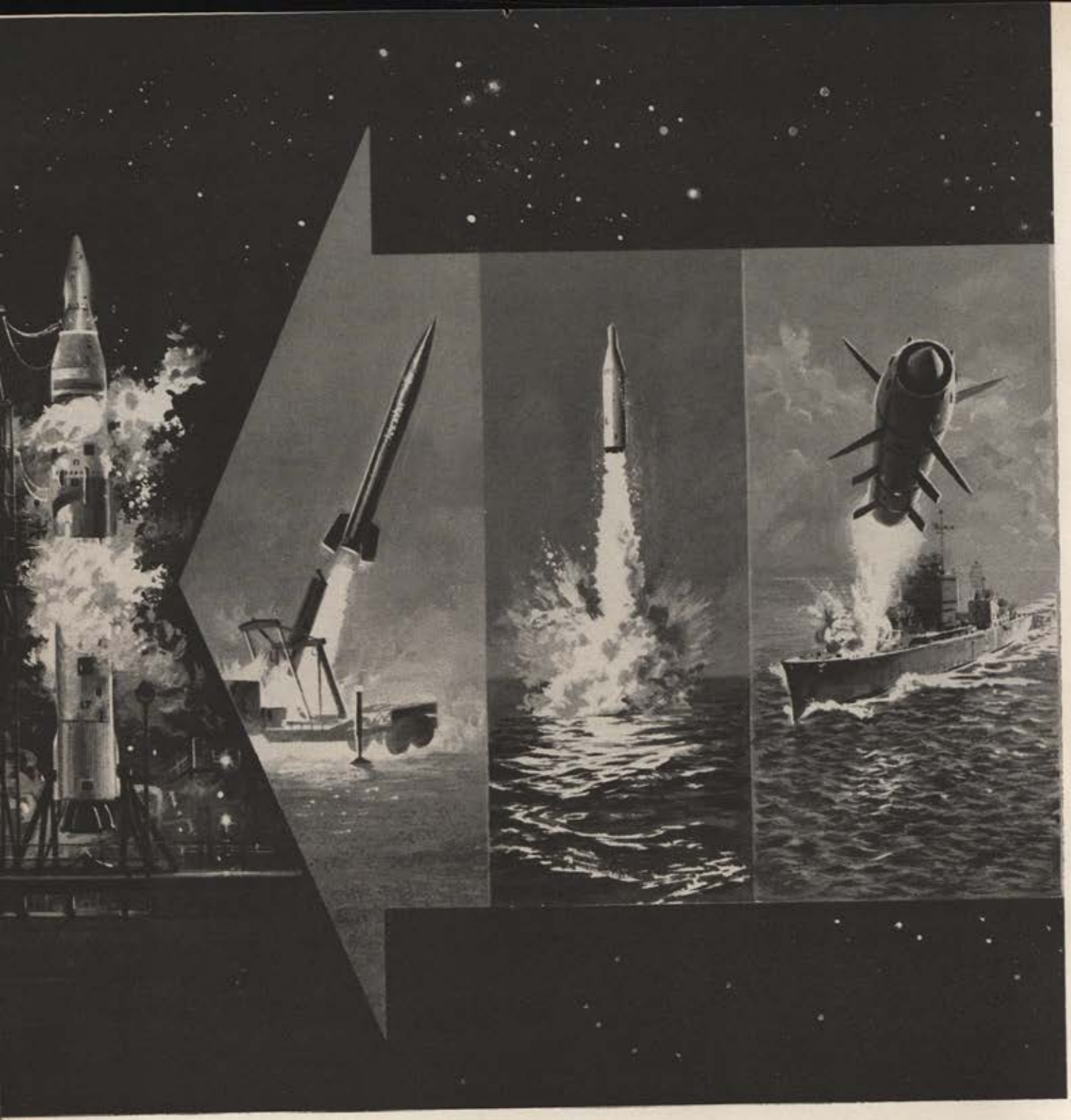
Once combat-ready at an operational unit, alert crews practice procedures continually. Periodically, crews return to Vandenberg for combat-training launches of actual missiles.

Early in 1962, SAC proposed a program to the Air University and Headquarters US Air Force in which Minuteman combat crews would work toward a graduate degree while on duty at remote launch-control centers.

Such a program would make good use of an ideal study environment, increase the attractiveness of the duty, and prepare key men for highly technical future jobs that can only be imagined today. By midsummer a test program had been approved for Malmstrom AFB, Mont., where the first Minuteman missiles will become operational.

Where will the future take the Strategic Air Command?

Gen. Thomas S. Power outlined SAC's future requirements clearly in April in a Union League Club speech in New York. He said, "SAC will need, in addition to its bomber and missiles, weapon systems that can perform the functions required by its mission in the space environment. This means that instead of the present mixed force of bombers and missiles, SAC eventually must have a triple-mixed force of aircraft, missiles, and spacecraft so that it can cover the entire spectrum of aerospace operations."—END

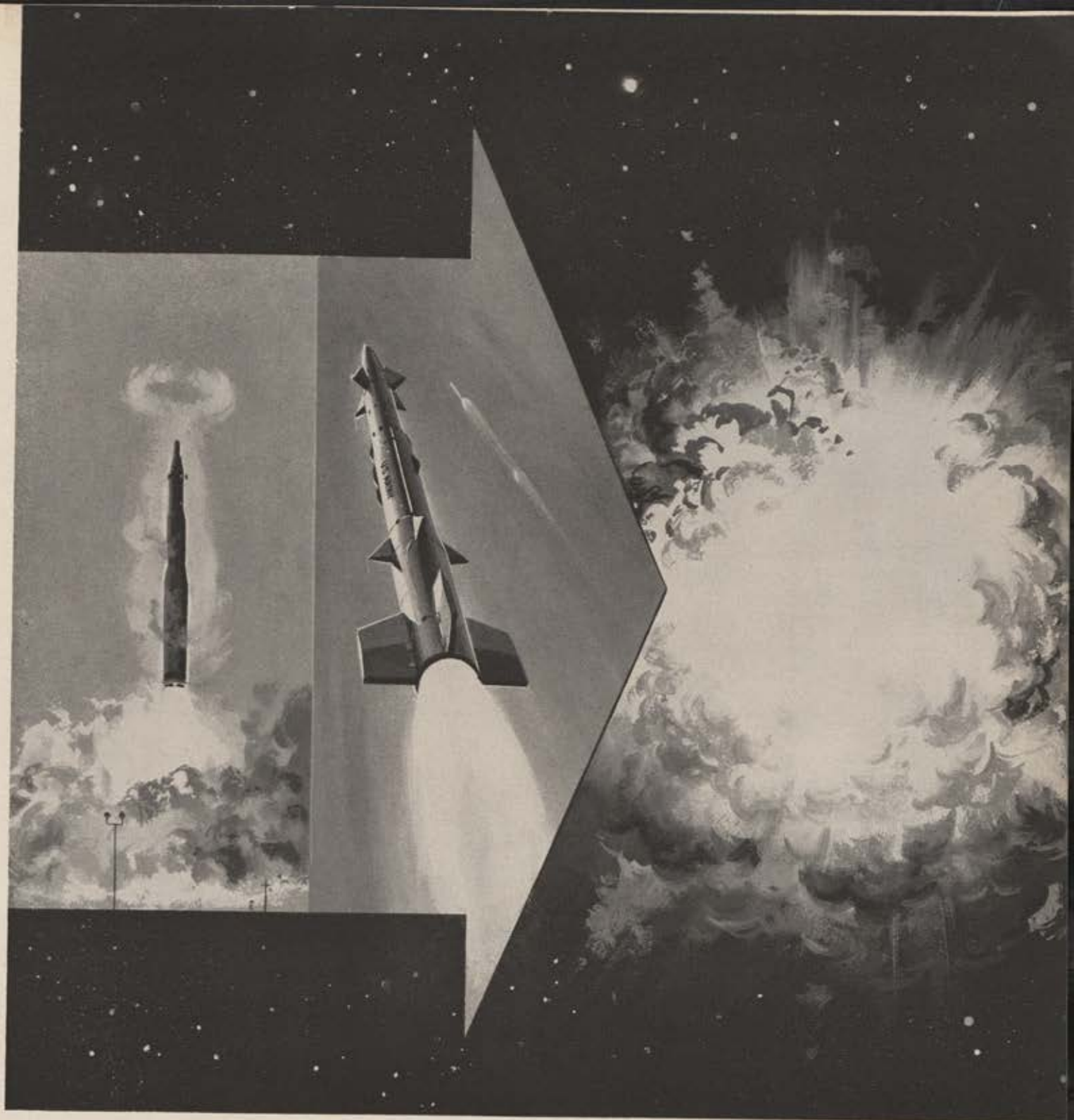


Calling the shots

Sperry knowledge and experience is helping to shape and sharpen America's missile capability—current and future.

Beginning with recent history, Sperry was responsible for the Sparrow I, first air-to-air missile in the nation's armament, as well as providing guidance and control for Army's Jupiter, Navy's Regulus, and Air Force's B-58 "manned missile" bomber.

Now in training with the troops is Sergeant, a highly mobile Army tactical missile system of stake-splitting accuracy. It is transported to the launch site in four sections... field-supported by integral maintenance test stations, also on wheels. Sperry



is systems manager for the entire program.

Navy's Polaris-firing submarines are under the navigation systems management of Sperry . . . are navigated by Sperry SINS (Ship's Inertial Navigation System) . . . steered and stabilized by Sperry gear . . . dived and maneuvered with Sperry controls. A Sperry NAVDAC computer correlates all data for launching. Also for Navy, Sperry makes guidance radars for the surface-to-air Terrier and Talos missiles.

Latest Sperry subcontract is for stable platforms for Air Force's Minuteman, to provide exacting references against which the slightest change in the missile's course can be measured with high accuracy. And at the extreme end of the missile spectrum is Army's Nike Zeus – the nation's only anti-missile missile system in advanced development – for which Sperry provides the critical extended range target tracking and discrimination radar transmitters.

In addition, Sperry has supplied a number of arming and fusing systems, a wide variety of ground support equipment, and superaccurate miniature components for missiles and space vehicles—to help America's missile men "call the shots" with ever greater certainty.

General offices: Great Neck, New York.

SPERRY

DIVISIONS OF SPERRY RAND CORPORATION

Gen. Walter C. Sweeney, Jr., assumed command of TAC last September, succeeding Gen. Frank F. Everest. General Sweeney, a command pilot and veteran of the air war in the Pacific during World War II, also has served as Director of Plans for the Strategic Air Command and as Commander of SAC's mighty Eighth Air Force. In 1954, he led history's first nonstop jet-bomber flight across Pacific.

In a cold-war world calling for a broad USAF spectrum of aerospace capabilities ranging from overwhelming retaliatory blows to selective interdiction and counterinsurgency skills, TAC plays an increasingly vital role . . .

TACTICAL AIR COMMAND

IMPELLED by events which confirmed that the importance of tactical airpower is increasing, Tactical Air Command enjoyed a period of dynamic growth and change in fiscal year 1962.

Early in 1961 President Kennedy called for stronger and more flexible nonnuclear, limited-war forces. Shortly thereafter Nikita Khrushchev created a new crisis in Berlin, adding to continuing tensions in Southeast Asia.

The mandate was clear. The nation must continue to bolster its strategic deterrent forces while expanding and improving "general-purpose forces" to meet any contingency short of general war.

Because of its inherent flexibility and demonstrated versatility, Tactical Air Command became a key focal point for the accelerated buildup. Long the Air Force's primary combat command for limited war, TAC had to expand quickly to meet the broadening spectrum of probabilities.

Since its inception in 1946, TAC has had one mission: to provide fast-reacting, combat-ready tactical airpower for employment anywhere in the world on short notice to operate unilaterally or in concert with other forces.

The command's history has been marked by fluctuating fortunes, characterized by maximum capabilities with limited resources. In 1950-53, TAC gained wide respect by supporting the combat forces in Korea while continuing to reinforce the NATO defenses in Europe. But not until 1955 was TAC able to demonstrate the full significance of tactical airpower as a new dimension in air warfare.

This came with the development of the Composite Air Strike Force concept—the carefully "packaged" tactical air force tailored for a precise mission and poised for immediate deployment to a trouble spot.

In 1958, the CASF doctrine was successfully tested under real conditions. Twin CASFs, deployed only weeks apart to opposite sides of the world, responded to the Lebanon and Taiwan Straits crises with salutary results. TAC's flexibility was further demonstrated during this crucial period when the command continued to meet its normal training and European support commitments.

It was during this same 1955-60 period that TAC's primary weapon system went totally supersonic with the introduction of the F-100, F-101, and F-105 tactical fighter and reconnaissance aircraft into the inventory. Supersonic aircraft and refined in-flight refueling techniques enabled the Tactical Air Command to provide a fast-reacting, global strike force that added a new chapter in air warfare.

Concurrently, TAC was making advances in air-ground operations doctrine, command communications, logistics support, and combat-crew training. Thus the command was in an excellent position to accept the challenges FY '62 offered.

Perhaps the most significant event of the year occurred in October when Gen. Walter C. Sweeney, Jr., assumed command of TAC, after serving thirteen years in Strategic Air Command. He immediately set about instituting new programs in TAC to improve command control and communications, accelerating combat training to achieve a higher level of skills, streamlining and improving management procedures, and ensuring a more responsive combat-readiness posture.

Two projects were given top priority. First, the mobilized Air Force Reserve and Air National Guard units (27,000 personnel and 750 aircraft) had to be made immediately combat-ready. Success of this program was dramatically demonstrated in November when, only six weeks after their mobilization, more than 200 ANG pilots flew their F-84 and F-86 jets to Europe for combat-ready duty with US and NATO defenses. It was an unprecedented feat of the highest

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General Sweeney's second top-priority project was establishment of a Headquarters Command Post, designed to give him and his Battle Staff constant, centralized control over all TAC forces, no matter where they were located or in what strength. Within months, the Command Post was in full operation, providing General Sweeney with the necessary system for controlling his far-flung forces.

Tied in with the Command Post and other major command centers around the world is the C-135 airborne command post of the Nineteenth Air Force—the permanent command element for TAC's CASF operations. Both the Headquarters CP and the C-135 CP played a vital part in the deployment of the ANG forces in November. General Sweeney and key staff officers monitored the deployment from the C-135 somewhere over the Atlantic.

In another move to improve command control and combat-readiness, General Sweeney realigned the Ninth and Twelfth Air Forces along geographical lines. The Twelfth controls all units west of a line roughly following the Mississippi and Ohio Rivers, and the Ninth has everything east of that line. This division includes Regular, Reserve, and Air National Guard units. The realignment not only tightened command lines but gives each air force commander tactical fighter and troop carrier elements.

While these programs were being implemented, TAC was actively involved in two new and equally important developments. One was the newly established unified air-ground command, United States Strike Command. The other was the Air Force's renewed interest in counterinsurgency—more commonly known as antiguerrilla operations—which began with the activation of the 4400th Combat Crew Training Squadron at Eglin AFB, Fla., in April, 1961.

As Commander in Chief of Air Forces for STRICOM, General Sweeney directed his staff to devote maximum effort to ensure the coordination, cooperation, and assistance the new command required. He described the new command—the apex of a triangle bringing together the highly skilled forces of TAC and the Army's CONARC as an integrated fighting team—as the answer to a long-time problem.

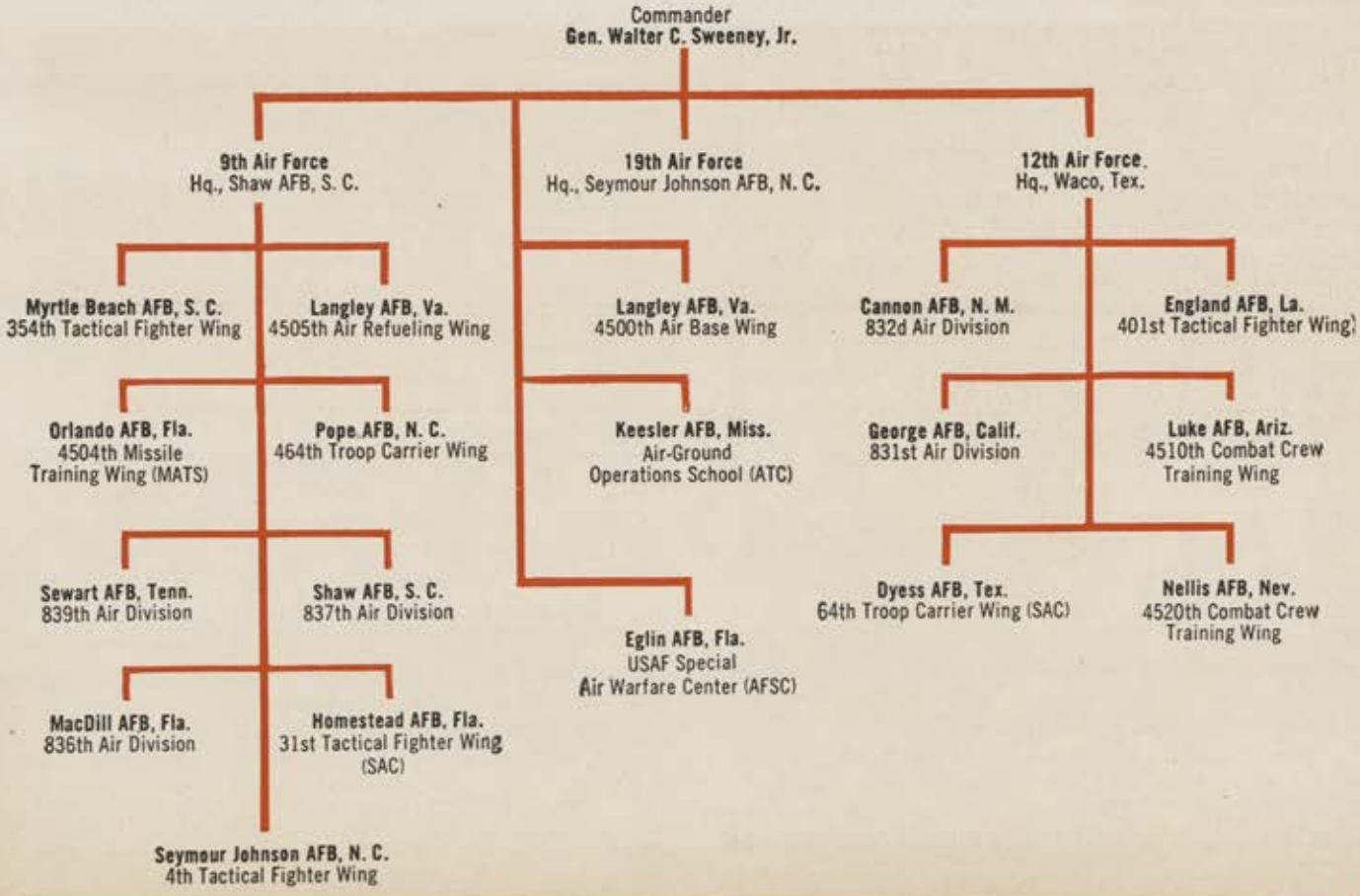
Similar attention was devoted to the rapidly expanding counterinsurgency (COIN) operation at Eglin, which on April 27, 1962, was to become the USAF Special Air Warfare Center. Comprising the 1st Air Commando Group and the 1st Combat Applications Group, the SAWC is responsible for developing techniques and tactics for airborne counterinsurgency operations, and for deploying detachments to train allied aircrews in the art of counterinsurgency. Such units were sent to South Vietnam and Africa in 1961. Present proposals call for the center to expand from 850 personnel to more than 5,000 by the end of fiscal year 1963, with a commensurate increase in its aircraft inventory.

Currently the Air Commandos employ World War

(Continued on following page)

TACTICAL AIR COMMAND

Headquarters, Langley AFB, Va.



A combat team of TAC's 1st Air Commando Group at USAF's Special Air Warfare Center, Eglin AFB, Fla., examines a power unit designed for airdrop behind enemy lines in remote areas where the Air Commandos are expected to operate.

A TAC Commando student learns how a machine gun can be carried in pod on a T-28 for use in jungle warfare.

II-type aircraft—C-46, C-47, B-26, T-28. However, the Combat Applications Group, in addition to developing new tactics and techniques, will experiment with new types of aircraft and weapons in order to achieve maximum effectiveness.

Despite the urgency of these key developments, TAC was busy with a number of internal changes designed to further improve combat and management skills. General Sweeney installed the time-tested Management Control System to monitor and measure all TAC management functions. He also elevated the Standardization and Evaluation Program to priority status, providing an objective and realistic yardstick of performance for all TAC operations: pitting TAC aircrews against the highest possible level of achievement in every phase of operations, with a continuing evaluation to pinpoint deficiencies quickly.

Improved and more mobile command and control equipment was undergoing intensive operational evaluation; this included the new "Talking Bird" portable command communications kits tailored to fit snugly into C-130 transports. Both nuclear and nonnuclear ordnance was undergoing design change for greater standardization and to reduce maintenance and logistics problems. New techniques were being developed to improve accuracy in the visual and nonvisual delivery of munitions, troops, and supplies.

Similar improvements were achieved in supply and logistics during the year. A telephonic system for requisitioning priority spare parts was installed. This ensured minimum interference with combat-readiness and also cut costs. In addition, each base supply was provided a revamped electronic data-processing system to save time and money and to make stockpiles more responsive to TAC requirements.

Training programs throughout TAC were realigned and improved to accelerate the process and smoothly accommodate the quick infusion of Reserves and the programed increase in wing structure.

Incoming ANG pilots were given accelerated combat training to raise their combat readiness. A Combat Crew Training Squadron was activated for Military Assistance Program crews flying the F-104G. Crew training in F-100s was consolidated and intensified. A CCTS for C-130 crews was established, and refresher courses were given to C-123 crews. Plans were mapped for an F-84F CCTS to train pilots who would be assigned to the programed 12th and 15th Tactical Fighter Wings; and future crew training in the F-110 would be provided by a CCTS.

TAC's Air-Ground Operations School at Keesler AFB, Miss., was expanded to meet new requirements. The AGOS curriculum was revamped to include Forward Air Controller (FAC) training, and in a concurrent move, jump training was accelerated for FACs, with the ultimate goal of ten jump-qualified FACs for each tactical-fighter squadron. AGOS also developed courses for STRICOM exercise staff officers and special briefings on Southeast Asian activities.

A command-level Sea Survival School was established, with mandatory attendance required for all aircrew personnel. Also, the TAC Small Arms Center was activated at Cannon AFB, N. M. And in April, TAC implemented the command-wide physical-fitness program.

(*Continued on page 135*)

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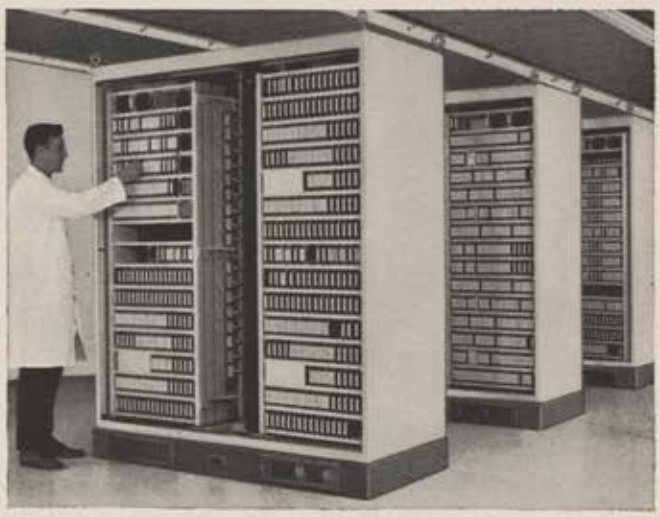

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The intensive efforts required to develop and initiate these key programs did not detract from TAC's normal operational commitments. During the year, TAC aircraft logged an estimated 17,000,000 miles of operational flying, an average of about 500 TAC aircraft were deployed in support of free-world defense, and the Command's aging fleet of KB-50J tankers accomplished approximately 15,000 refueling hookups, delivering almost 7,500,000 gallons of jet fuel to fighter and reconnaissance aircraft.

Fiscal year 1962 also saw a marked increase in the number of unilateral and joint training exercises. Preliminary reports indicate that each of the estimated 53,000 men in TAC participated in at least one training exercise or deployment. Of the twenty-five conducted during the year, seventeen were joint exercises, eleven of which came under the supervision of STRICOM.

The largest exercise was Swift Strike, employing some 40,000 Regular and Reserve forces of TAC and CONARC and more than 500 aircraft. Aircrews flew 1,370 sorties during the exercise, and troop carriers delivered a record 14,622 airborne troops to the combat zone. For ANG fighter and reconnaissance units Swift Strike was a profitable rehearsal for the mobilization that came only weeks later.

Exercise Star Blazer II sent F-104s to the Pacific, and Wind Drift was a joint exercise in Europe, followed closely by Diamond Lil in Alaska, first of a series of joint maneuvers. Exercises Tack Hammer and Checkmate II/Scrap Iron became grimly realistic in the face of increasing tensions in Berlin and Europe, with five TAC fighter squadrons deploying to support NATO forces for training drills. Sea Wall, in Puget Sound, was a joint amphibious exercise, similar to Long Base/Quick Kick in the Atlantic later in the year.

In December, Exercise Trail Break marked the beginning of STRICOM's control over joint air-ground operations. Conducted in the Camp Drum area in New York, Trail Break was a test for both cold-weather airborne and close-support operations and the new unified command. Both proved highly successful.

From that point on, STRICOM supervised a rapid series of joint exercises. Among them were Red Hills at Fort Bragg, N. C., and Fort Campbell, Ky.; Strong Arm/Great Bear in Alaska; Banyan Tree III in Panama; Bristle Cone in California; Track Down in Texas; and Clear Lake/Quick Silver in Florida.

In addition to its heavy commitments to unilateral and joint training exercises, TAC continued the routine deployment of Fox Able rotation tactical fighter and troop carrier squadrons to Europe. During the year there were twenty Fox Able deployment and redeployment movements, each averaging eighteen aircraft.

The most significant deployment, however, was Operation Stair Step, the rapid deployment to Europe of more than 200 ANG tactical fighters and reconnaissance aircraft early in November. This force comprised seven tactical fighter squadrons and one reconnaissance squadron, with 218 aircraft, 9,974 personnel, and 7,473 tons of equipment. The movement began on October 28, only twenty-seven days after the units were mobilized and ended, without incident, on November 8.

TAC also was able to provide the normal flow of aircraft for special missions during FY '62. In August five C-130s airlifted heavy road-building equipment to Peru for the construction of a highway through the Andes. In September, ski-equipped C-130s resupplied and later evacuated Ice Island Bravo off Alaska. TAC's aerial demonstration team, the Thunderbirds, visited South America on a good-will tour, performing before more than 6,000,000 spectators.

While FY '62 was a time of dynamic change for TAC and a general broadening of its obligations, it also was a period of accelerated growth. Four new tactical fighter wings were authorized and either have been or soon will be activated. These are the 12th, 15th, 355th, and 388th. In addition, the 4420th and 836th Combat Support Groups were activated at the start of FY '63.

One of the most important additions to TAC's resources during the year was the F-110 tactical fighter, the Air Force version of the Navy's highly successful F4H. It will join the F-100 and F-105 to form TAC's family of supersonic strike aircraft. The RF-110 configuration eventually will enhance TAC's aerial reconnaissance posture. Another significant newcomer was the C-130E, latest model of the remarkable Hercules family, which will appreciably increase TAC's combat-airlift capabilities.

With the addition of new wings, TAC prepared to increase its base structure by adding MacDill AFB and Hurlburt AFB (Eglin No. 9) in Florida, bringing to thirteen the number of TAC-operated bases. The 31st Tactical Fighter Wing (F-100) shifted to Homestead AFB (SAC), Fla., and the new 388th Tactical Fighter Wing (F-100) is programed for tenant status at McConnell AFB, Kan. The new 12th and 15th Tactical Fighter Wings will be located at MacDill. Hurlburt will continue as the hub of TAC's counterinsurgency operations.

The future holds great promise. During FY '62, TAC accelerated operations with KC-135 tankers in preparation for full implementation of the single-manager jet-tanker fleet with the phaseout of KB-50Js. Also ahead is the F-111, the first truly multipurpose, all-weather tactical fighter, and a jet transport of the C-141 type that will greatly enhance TAC's ability to provide fast-reacting airlift for STRICOM.

TAC maintains a lively interest in the proposed Mobile Mid-Range Ballistic Missile. Although TAC does not operate ground-to-ground tactical missiles, it is responsible for training missile crews for overseas theaters—at the 4505th Missile Training Wing, Orlando, Fla. As TAC views it, the MMRBM will permit a realistic dispersal of deployed tactical fighter units and at the same time provide flexibility in the use of them.

The significance of TAC's accelerated activity in FY '62 and a clue to what lies ahead were emphasized recently by General Sweeney.

"The importance of tactical airpower is increasing because it possesses the quality of flexibility that is essential to our survival in this age.... We are ready at a moment's notice to meet the challenge presented by an aggressor nation, no matter how large or small the challenge may be."—END

Lt. Gen. Robert M. Lee has been Commander, ADC, since March 1961. A flyer who started out in the cavalry, he helped develop teamwork concepts for air-ground forces before World War II and during the war served in Europe. He has served in a number of important command and staff posts, and from 1958-59 was Chief of Staff, UN and US Forces in Korea.

In an age of increasing technological complexity, the task of aerospace defense requires ever-broadening capabilities. In 1962 ADC's mission is to meet both the air and potential space threat . . .

AIR DEFENSE COMMAND

AIR Force responsibilities in the vital area of aerospace defense are discharged by the dual-oriented Air Defense Command. From his headquarters in Colorado Springs, ADC's Commander, Lt. Gen. Robert M. Lee reports to the United States Air Force Chief of Staff as a major air commander and to Commander in Chief, North American Air Defense Command as a component of that international aerospace defense organization.

In discharging its mission of organizing, training, equipping, and providing to CINCNORAD combat-ready aerospace defense forces, ADC makes an impressive contribution to the North American Air Defense Command (NORAD). Approximately seventy percent of the men and equipment of NORAD come from ADC. These include more than 110,000 personnel and a capital investment of nearly $8 billion, represented in early warning, command and control, and weapon systems extending from the Arctic to the Rio Grande and for several hundred miles off both ocean coasts.

In recent years, ADC has been faced with the difficult and expensive task of building a defensive capability in space while still maintaining and improving its defenses against bombers. The space threat has been added to the air-breathing threat, and survival demands a capability against both.

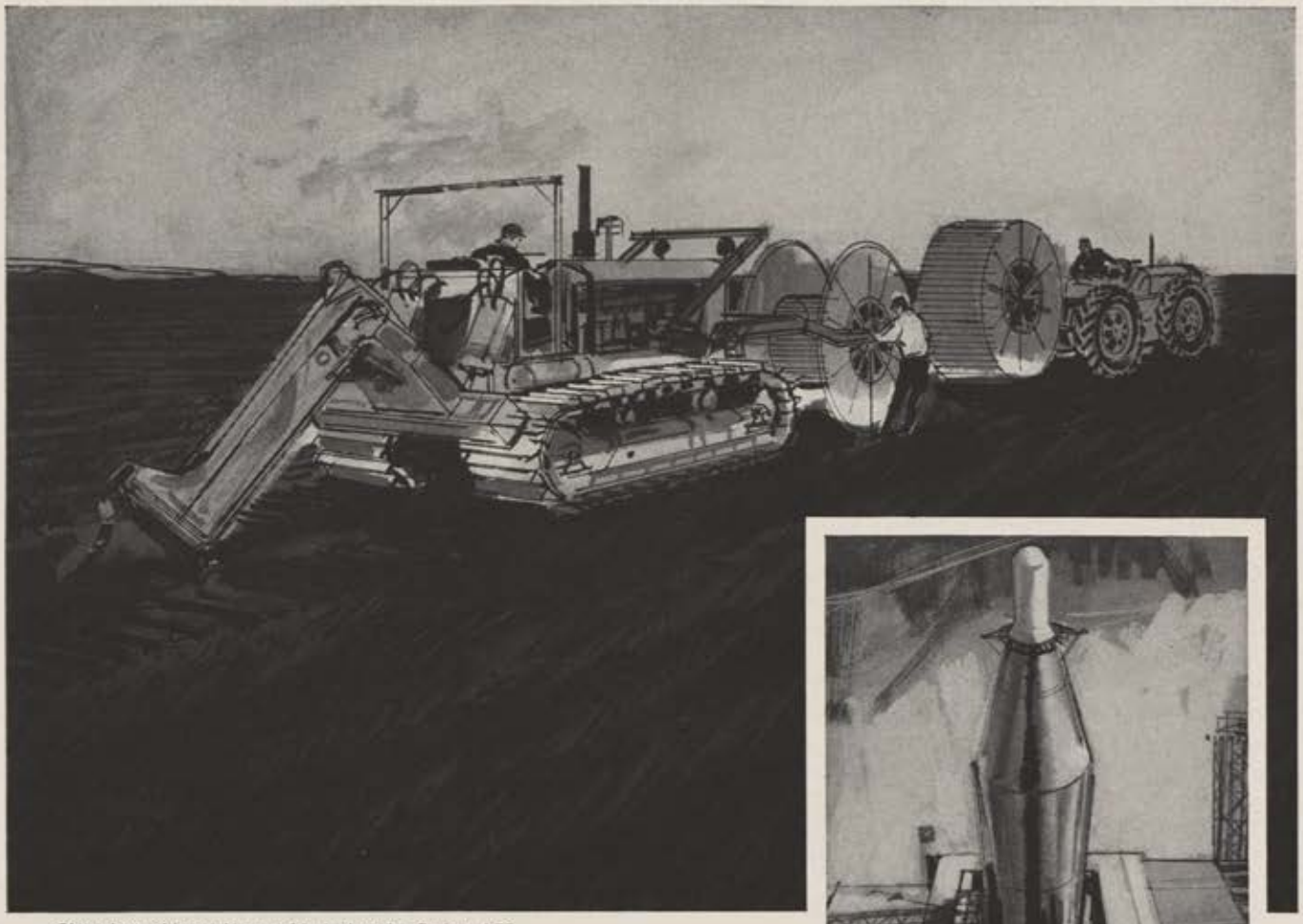
In its continuing efforts to achieve such a dual capability, the Air Defense Command—during the year ending July 1, 1962—witnessed a number of significant changes:

- The modernization of the fighter-interceptor force was essentially completed with the acceptance of the last of the present production of F-101s and F-106s. ADC's fighter-interceptor force is now all Century series.
- The last of eight Bomarc sites in the United States became operational in January 1962 at Niagara Falls.
- The Semi-Automatic Ground Environment (SAGE) Sector at Sioux City, Iowa, was put into operation in December 1961. This event marked the completion of the SAGE system within the United States.
- The eastward extension of the Distant Early Warning Line from Cape Dyer on Baffin Island to the east coast of Greenland was completed in the late summer of 1961. The extension, known as DEW-EAST, consists of four sites across the southern part of Greenland.
- To further extend its early-warning capability, ADC took over, on July 1, 1962, the radar stations and fighter-interceptors stationed in Iceland. MATS had previously controlled these forces. Because NORAD is limited to operations in the United States and Canada, defense arrangements in Greenland and Iceland are handled by ADC for the Air Force.
- In a three-part agreement, aimed at improving the air defense capability of Canada, the Air Force, through ADC, transferred sixty-six F-101Bs to Canada. In return, Canada took over operational and funding responsibilities for eleven Pinetree radar sites previously manned by ADC personnel. The first site, at Beausejour, was transferred to Canada in a ceremony on October 1, 1961. Three other sites had changed hands by June 30, 1962. The third part of the arrangement involved the procurement in Canada of F-104 aircraft to meet Canadian and US commitments to NATO. In addition, Canadian radar technicians and F-101 pilots are being trained by the Air Defense Command.
- In October 1961 three F-104 squadrons of the Air National Guard, assigned to ADC, were federalized and transferred to TAC for use in strengthening the

(Continued on page 138)

PERFORMANCE REPORT
from ETS-HOKIN & GALVAN, INC.

ATLAS MISSILE COMPLEX
FORBES AFB, KANSAS



Changing cable-reels on cable laying rig, Forbes AFB

Assignment: install and check out intersite communications system—including more than 200 miles of buried cable—for Atlas Missile Complex under ITT Kellogg.

Schedule: seemingly impossible! The first 10-channel, two-way, point-to-point link in the network was to be installed and operational in just *ten days!* Delivery dates for other segments of the system were more realistic, but still critical.

Progress: in spite of adverse weather and placing cable under the Kansas River, all phases of the job were operational either on schedule or ahead of schedule.

Summation: we had our problems on this job. But we also had the courage and skill to push ahead and get the job done . . . on time. If you could use this brand of dependable, no-excuse performance on your next project, let us talk with you.

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PERFORMANCE **NOW** FOR SPACE AGE DEMANDS

USAF forces in Europe during the Berlin crisis. Beginning in July 1961 all ANG squadrons scheduled for permanent retention in the air defense program were placed on alert status. ANG squadrons now stand alert commitments as do Regular ADC units, emphasizing ADC's policy that ANG units are part of its immediate force capability.

• A new form of data-link communication, known as Time Division Data Link (TDDL), became operational within the majority of the SAGE system this year. The new system permits a considerably increased volume of communication over the old frequency division system.

• Perrin AFB, Tex., whose mission is combat-crew training in the F-102, transferred from Air Training Command to ADC on July 1, 1962. Since ADC is the principal user of F-102 graduates, the new assignment will permit a closer integration of ADC's combat-crew requirements and the curriculum at the Perrin school. Perrin is now part of ADC's 73d Air Division, with headquarters at Tyndall AFB, Fla.

While most of these developments are related to ADC's improved capability against the air-breathing threat, the command's capability in space also continued to improve. On July 1, 1961, the Space Detection and Tracking Center at Colorado Springs began operations. This center maintains a continually updated catalog and inventory of all man-made objects in space. These include not only satellites but burned-out booster engines and other objects classified generally as "space junk." Every object is watched around the clock. Sensors located throughout the free world feed data to the SPADAT Center, which ADC operates for NORAD.

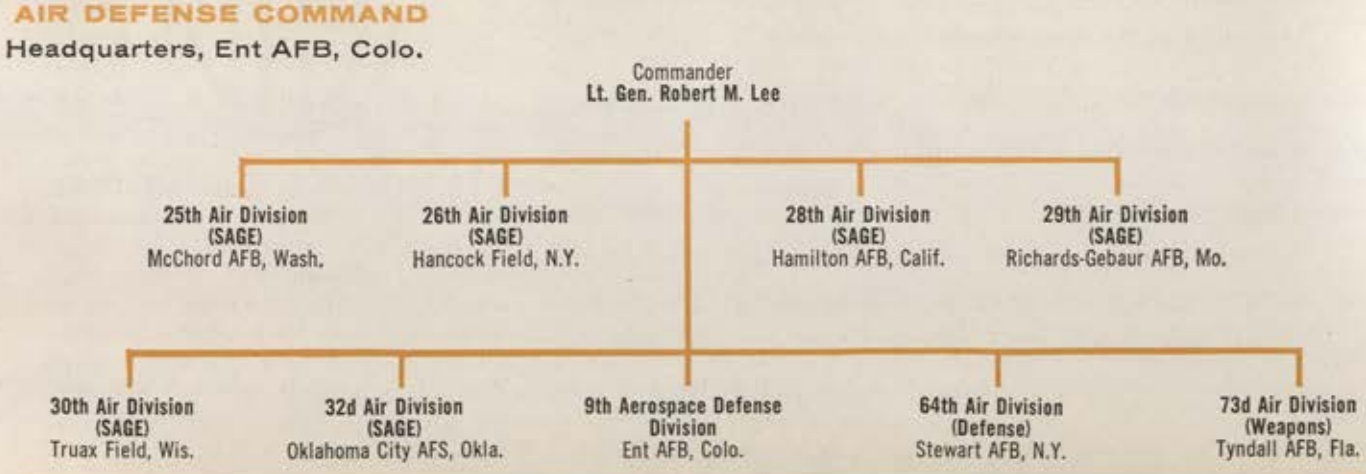
On July 15, 1961, the 9th Aerospace Defense Division was activated at Colorado Springs. This is the first ADC unit whose area of responsibility is not confined to a specific geographical area. It is also the first Air Force organization with a twenty-four-hour-a-day mission in space. It controls sensor sites at Shemya, in the Aleutians, and Laredo, Tex., as well as the BMEWS system and the SPADAT Center.

To further augment its space capability ADC's 9th ADD assumed control of the two BMEWS sites at Clear, Alaska, and Thule, Greenland, on January 1, 1962. To operate these and the third site at Fylingsdale Moor, England (expected to be completed next year), the 71st Surveillance Wing was activated on the same date. Thus all organizational machinery now is in place to assure the effective discharge of ADC's new space responsibilities.

To be effective, an aerospace defense force must first be able to survive a surprise attack. Steps to ensure such survival were also taken by ADC during the past year. As one effort in this direction USAF began construction in the summer of 1961 of an impregnable underground shelter for the NORAD Combat Operations Center. Excavation has now been completed on this project, and the design and testing of equipment is under way. When completed, the new underground NORAD COC will house vital terminal elements of the SPADAT system, the BMEWS system, and the command and control system for aerospace defense.

To further enhance survival, ADC has instituted a new Alert and Dispersal Plan for its fighter forces. One-third of ADC's fighter-interceptors are now on instant alert. To maintain this alert, ADC combat crews are working a seventy-five-hour week. In addition, a comprehensive plan for dispersing fighter aircraft to less likely target areas in the event of ballistic missile attack is in the process of implementation. Aircraft-handling facilities at smaller cities throughout the country have been included in the plan. Most of the personnel to operate these facilities will come from Reserve Recovery Groups, demonstrating again that ADC's Reserve Forces are "ready now."

While these changes have been in progress throughout the command, ADC has also been busy at its primary business of maintaining a current tactical effectiveness against today's threat. To keep its forces at a razor-edge of efficiency, the command employs a continuing series of tactical evaluations and operational-readiness inspections. Using its own fleet of B-57 bombers and T-33 trainers and with a considerable assist from SAC bombers, ADC constantly runs attacks against its air divisions and sectors. These unannounced raids are as realistic as the command can make them, employing ECM, chaff, and all known



ADC's RC-121 "airborne radar sites," carrying technicians and several tons of electornic gear, operate round the clock off the Pacific and Atlantic coasts. This is a crew of Air Defense Command technicians hard at work scanning Atlantic waters. Two wings extend ADC's land-based systems.

ADC personnel at Ent AFB, Colo., study typical spacecraft orbital paths as part of training operations for work with ADC's Space Tracking and Surveillance Center at Ent. SPADATS has job of cataloging space vehicles.

evasive tactics. So skilled have the SAGE teams become, because of repeated exercises such as these, that they have regularly "knocked down" over the past two years an impressively high percentage of the invaders—a percentage several times greater than the predictions of not too many years ago. ADC's fighter force is running intercepts at altitudes and speeds that, a few short years ago, were only dreams. Their kill capability has also increased many-fold.

These facts were adequately borne out at the ADC Fighter-Interceptor Meet at Tyndall AFB, Fla., in October of 1961. At this meet, known as William Tell II, the command's fighter-interceptors achieved the best scores in history. At the conclusion of the meet, ADC's Commander, Lt. Gen. Robert M. Lee, said that "had we been using live warheads, we would have scored kills on 137 out of 142 targets."

In the fall of 1961, the NORAD exercise known as Sky Shield II gave the entire command practice in working under electronic countermeasures, communications jamming, and navigational-aid interferences. These are conditions approaching what might be faced in an actual attack. While there was no box score for Sky Shield II, since this was not the purpose of the exercise, the 6,000 sorties flown by NORAD forces were highly successful from all points of view. NORAD Commander in Chief, Gen. Laurence S. Kuter, called this total operation "the greatest exercise in information analysis, decision-making, and action-taking in continental aerospace defense in all our history."

While ADC thus continued to make progress in its defenses against the manned bomber, there were disturbing indications that the threat, too, continued to grow. The Moscow Air Show in July 1961 paraded a whole new series of aircraft for the Red Air Force. The Soviet Minister of Defense, Marshal Malinovsky, openly boasted of a standoff bomber, "capable of delivering a rocket-nuclear blow from afar without entering the zone of defense." The ballistic missile portion of the threat continued to be a source of deep concern to everyone in the aerospace defense business.

The situation boiled down essentially to this: Air Defense Command was performing all four of its basic functions—Detection, Identification, Interception, and Destruction—well against today's bomber threat. Against an expected sophistication of that threat and more especially against the threat from ballistic missiles and from space, the command's position was not as good. Two of the four basic functions—detection and identification—were on the way to being satisfied in the space age. The other two functions—interception and destruction—were still matters of urgent priority.

With confidence in its current capability but with concern for the future, the Air Defense Command thus continues to fill its role as a vital element of USAF's counterforce capability, as a significant part of the deterrent effort, and as the force that must ensure survival if deterrence fails.—END

A QUESTION OF SUPREMACY:

Pilots of U. S. Navy fighting planes will shortly be able to rendezvous or fly in formation with greater security under a wider range of conditions... for they'll know exactly how far they are from each other. ■ Air-to-air ranging will be added to their present TACAN sets with the General Dynamics/Electronics – Rochester SC-704 modification kit. No bigger than a "best seller," lighter than the circuits it replaces, it permits as many as 5 planes to judge their distances from a sixth, such as a group leader or air tanker. Conversion time? Negligible – only 3 fast hours. And the SC-704 actually improves the reliability of the air-to-ground function of the TACAN set because the vacuum tube modulator is replaced with a new, completely solid-state modulator. ■ Proficiency in air and missile-borne ranging equipment comes naturally to a division of General Dynamics, where the B-58 Hustler and Atlas ICBM were born and bred; General Dynamics/Electronics – Rochester is today's seed-bed of advanced ideas in the technology of navigational equipment and radar beacons. ■ Every product we make started with a question. We solicit yours. Write 1405 North Goodman St., Rochester 1, New York.

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GENERAL DYNAMICS | ELECTRONICS – ROCHESTER

Gen. Truman H. Landon became Commander in Chief of USAFE in July 1961. He succeeded Gen. Frederic H. Smith, Jr., until recently was USAF's Vice Chief of Staff. A bomber commander in the Pacific in World War II, General Landon was previously DCS/Personnel, Commander of the Caribbean Air Command, and prior to that was the USAF Inspector General.

Responding to the tense international situation created by Red threats to Berlin, USAFE in the past year effectively and efficiently contributed to the beefing up of US strength in Europe ordered by the President . . .

UNITED STATES AIR FORCES IN EUROPE

PRESIDENTIAL orders—in the face of the Berlin crisis—for an over-all buildup of US military strength during the past year stimulated growth of the United States Air Forces in Europe into the strongest American air command ever maintained overseas during peacetime.

Air National Guard units and Reservists from across the nation were called to active federal service in late summer of 1961, and within weeks wing headquarters, squadrons, and support units totaling more than 10,000 men and 250 aircraft were deployed to Europe.

Meanwhile USAFE continued previously announced weapon-conversion programs to build up command strike power with an additional wing of F-105 Thunderchiefs and introduction of the "B" model of the TM-76 Mace tactical guided missile.

The immediate major buildup began in early November as eight squadrons of tactical-fighter and reconnaissance aircraft flew the Atlantic to USAFE bases in France. The overseas deployment of the combat-ready F-86 Sabrejets, F-84F Thunderstreaks, and RF-84F Thunderflashes was completed without major incident, the largest peacetime aerial transfer of military aircraft to Europe on record.

Later in November, three additional squadrons of F-104 Starfighters, also former Air National Guard units, were airlifted to Europe.

Welcoming the units to Europe, Gen. Truman H. Landon, USAFE Commander in Chief, stressed the USAFE combat role, pointing out the "principal mission of this command is the defense of Western Europe and the support of US military and civil agencies in its geographical area."

The federalized Air National Guard units returned to the US during June and July of 1962. As their contribution to command strength and know-how, they left four squadrons of F-84F Thunderstreak tactical fighters to equip the newly formed 366th Tactical Fighter Wing in France; a strengthened command aircraft control system for close ground support, now manned by Air Force Regulars; improved base facilities at Phalsbourg, Chaumont, Chambley, Etain, and Dreux; and provided command planners with valuable experience in high-speed deployment of US-based aircraft to standby bases overseas.

While the attention of the free world was focused on the deployment of additional men to Europe, USAFE continued its everyday task of remaining combat-ready for any eventuality.

To perform its job, the command has the equivalent of fourteen combat and transport wings and maintains more than 400 installations and sites including thirty-two major bases.

Headquartered at Lindsey Air Station, Wiesbaden, Germany, USAFE has responsibility for US interests in fifteen nations extending from the British Isles east to Pakistan. In addition to combat commitments to the North Atlantic Treaty Organization, its more than 75,000 military personnel provide logistical support to the forces of the European Command, carry out Air Force responsibilities of the Military Assistance Program in the European area, provide command-wide aeromedical service, and operate air search and rescue missions from the North Atlantic to the Indian Ocean.

USAFE's inventory of more than 1,000 tactical aircraft covers the four classic functions of airpower: Strike, Defense, Reconnaissance, and Transport.

By far the greater number of aircraft and missiles support USAFE's strike capability. This mixed force is in an around-the-clock alert posture seven days a week and could be launched at any time regardless of weather.

Strike aircraft include the F-84F Thunderstreak,

(Continued on following page)

the F-100 Supersabre, the F-101 Voodoo, and the F-105 Thunderchief. The Mace tactical missile provides USAFE with a missile capability.

For its air defense role, USAFE utilizes the supersonic F-102 Delta Dagger and F-104 Starfighter.

USAFE's reconnaissance wings stationed in England and France are equipped with all-weather RB-66 and RF-101 aircraft.

The intratheater transport force, the 322d Air Division (Combat Cargo), uses C-130 Hercules troop carriers and C-124 Globemasters to operate a scheduled air cargo service throughout the command. In addition it is employed in joint training with the US Army for movement of tactical units, aeromedical evacuation, and numerous special missions. The transport force can be readily augmented from the United States when necessary, as was demonstrated in the Lebanon crisis of 1958 and USAFE support of the United Nations in the Congo.

Upon arrival in Europe last year, the federalized Air National Guard units were introduced immediately into the continuing USAFE combat-readiness training program to achieve and maintain maximum capability for any eventuality.

The combat-readiness program includes operational readiness inspections in which units are placed on mock wartime alert and required to perform all tasks short of firing on an enemy. Live gunnery rocket and bombing training is a necessary requirement for units stationed in Europe. The large USAFE air base, Wheelus, at Tripoli, Libya, on the North African coast of the Mediterranean, serves as an excellent facility for this type of training and for MATS throughout the area.

Strenuous exercises and maneuvers sponsored by both USAFE and NATO provide realistic training throughout the year. A few of the major exercises of the past twelve months in which the USAFE units flew include: Checkmate, an international maneuver directed by NATO to perfect the defense capability of land, sea, and air forces; Royal Flush, an annual reconnaissance photography competition including aircraft from the US, Great Britain, Canada, Germany, Belgium, and France; Wind Drift, a combined maneuver of US Army and Air Force units; Long Thrust, battle-group size NATO field exercise in West Germany, in which US pilots, flying both fighter close-support and reconnaissance missions were part of an international air arm including aircraft of the German and French forces; Grand Slam, a joint NATO Central Army Group and 4th Allied Tactical Air Force exercise. Grand Slam was the first military maneuver organized and directed jointly by NATO Army and Air Force commands located in Germany. The big exercise stressed close air support, interdiction, reconnaissance, and attack missions.

A close look at the operating techniques and procedures of US NATO allies is provided by the Squadron Exchange Program of Air Forces, Central Europe. Under the program, begun some eighteen months ago. US detachments of four to twelve pilots with aircraft, ground crewmen, and communications men operate for two-week periods from the bases of fellow NATO members. The NATO units, in turn, use the facilities of the USAFE bases.

Purpose of the exchange is to train personnel in performing combat missions from unfamiliar airfields and to familiarize air and ground crews in operating procedures of other NATO units.

Allied aircraft taking part in the program include French Super Mysteres, German Mark VI Sabrejets, British Canberras, Norwegian F-86s, Danish F-100s, and Belgian and Dutch F-84s. Now in its second year, the Squadron Exchange Program is considered by NATO planners a single most effective instrument in building friendship and solidarity among NATO air forces.

During the year USAFE continued to make history with the world's greatest geographical airlift—Operation New Tape—the UN-requested air transport to and from the Congo. USAFE, working with the Military Air Transport Service but retaining operational responsibility for the mission, by July of 1962 totaled more than 1,280 sorties, hauling approximately 8,665 tons of cargo and 57,714 UN passengers from seventeen nations to or from the Central African nation. In miles

UNITED STATES AIR FORCES IN EUROPE

Headquarters, Lindsey AS, Wiesbaden, Germany

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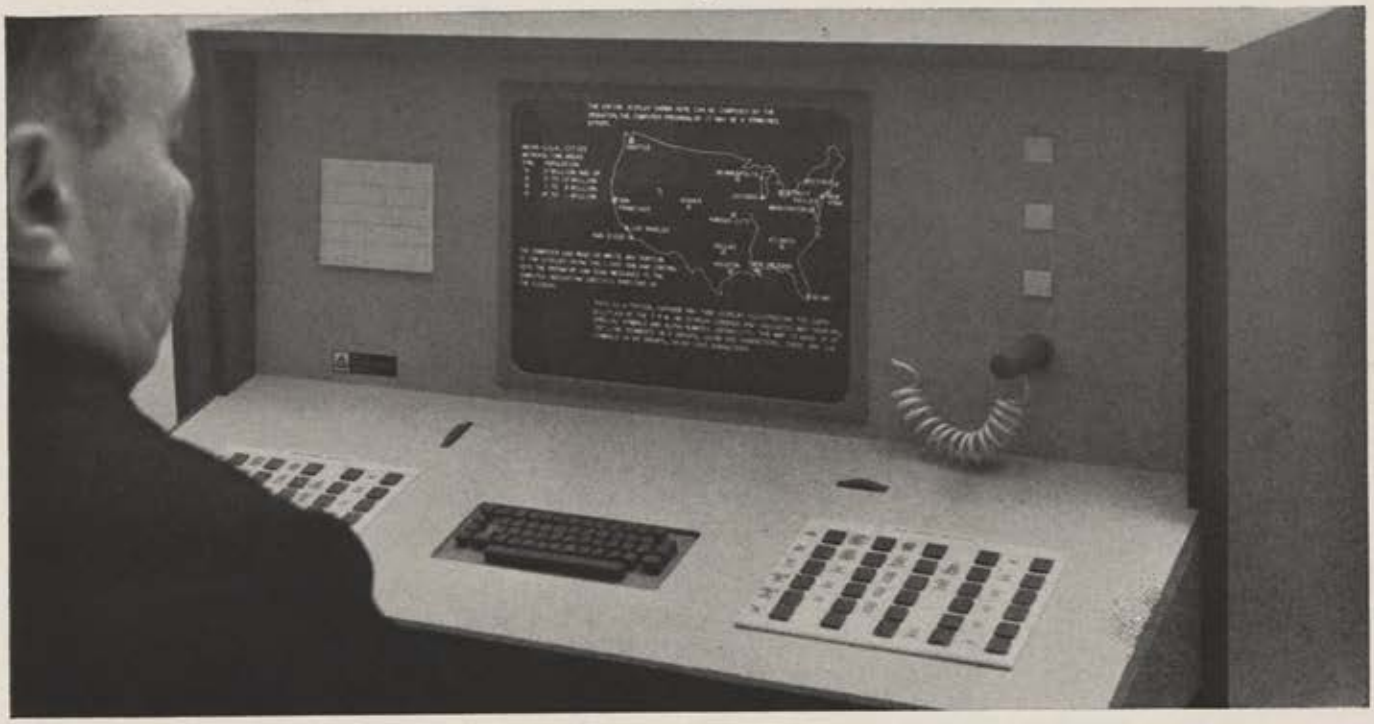

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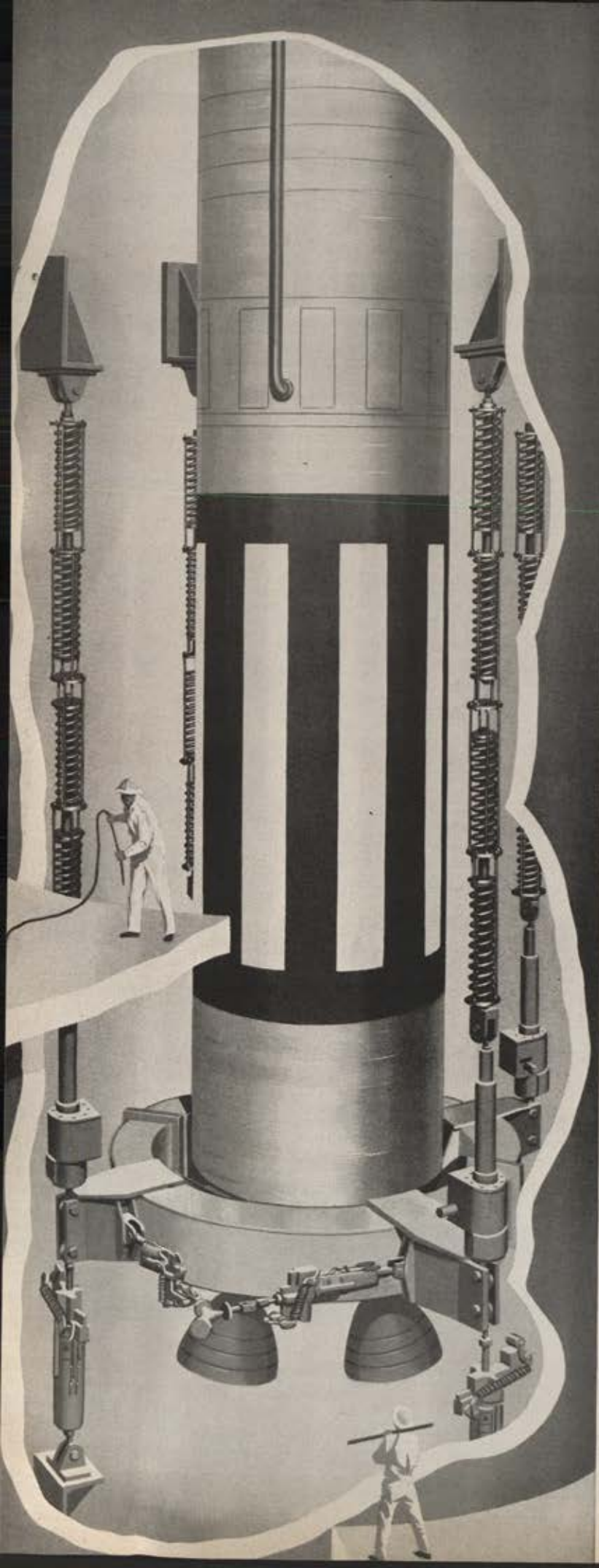
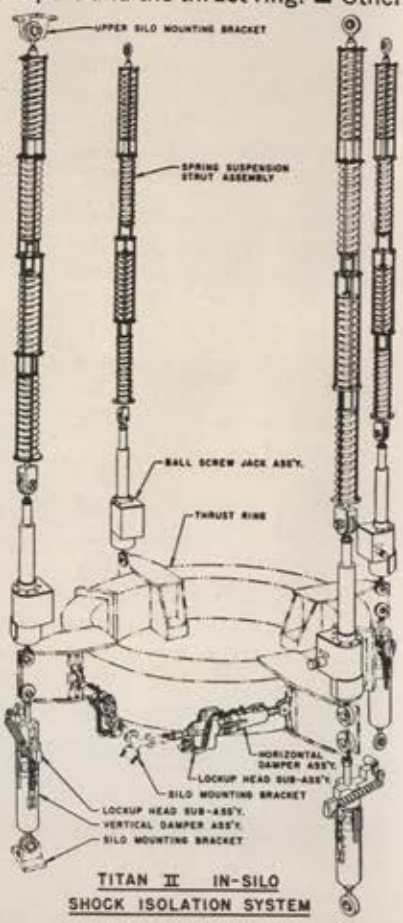


SAFE NEST FOR A BIG BIRD

Shock isolation system by Western Gear cradles the Titan II

The Titan II takes it easy until lift-off. Then, the same system which cradles it against shock is hardened to withstand the thrust of firing. ■ This shock isolation system, built by Western Gear for Martin Company, the aerospace division of Martin Marietta Corporation, is impressive new evidence of Western's ever-expanding capabilities in missile ground support equipment. ■ The system is made up of five major components: the spring suspension strut assembly, ball screw jack assembly, vertical and horizontal dampers and the thrust ring. ■ Other contributions from Western Gear to missile ground support include: ball screw door actuators; door actuators; Minuteman spring can assemblies; M-1 engine turbo pump and transmission test facility; missile erector launchers; missile nozzles and turbo pump drives; Titan I elevator hoists; Minuteman lightweight emplacement hoist. ■ Explore further how Western Gear's missile ground support capabilities can serve you. ■ Write WESTERN GEAR CORPORATION, Precision Products Div., P.O. Box 192, Lynwood, California. Cable address WESTGEAR, Lynwood, California.



TITAN II IN-SILO
SHOCK ISOLATION SYSTEM

WG PRECISION PRODUCTS DIVISION

Speedy reaction to call of the klaxon is demonstrated by these pilots and crewmen of 151st F-I Squadron, one of the called-up Guard units, as men streak for their F-104s in the alert hangar at USAFE's Moron AB, Spain.

flown, the two-year-old Congo Airlift had become the longest in history. The safety record of the giant lift is unsurpassed. The entire operation, involving more than 33,000 flying hours, has been carried out thus far without a single flying accident.

Top Air Force honors were awarded a crack USAFE wing during the year. On June 12, 1962, Gen. Truman E. Landon presented the Air Force Outstanding Unit Award to the 81st Tactical Fighter Wing at RAF Station, Bentwaters, England.

The highest unit citation awarded to USAF units in peacetime was made in recognition of the pioneering efforts of the 81st in developing an advanced all-weather capability for tactical-fighter aircraft during the period March 28, 1959 to June 30, 1961.

In other developments, USAFE is backing a strenuous program of savings by individual families and a policy of "Buy-American" in response to President Kennedy's appeal to stem the flow of gold from the US. Objective of the savings and investment program is a reduced gold flow output of about $13 million.

In July 1962, twin-engined jet T-39 Sabreliners arrived in the command to initiate a program that will eventually phase out the famed C-47 Gooney Bird. First to receive the T-39 was Wiesbaden Air Base.

In November 1961, USAFE wrote another chapter in its long history of providing aid to people struck by natural disaster. A C-130 assigned to the 322d Air Division flew a nine-man medical team and 12,000 pounds of medical supplies from Germany to the flood-stricken Republic of Somalia.

At the same time, another C-130 transport returned to its home base at Evreux after completing a mercy mission to Kenya, East Africa. The transport made three food drops near Nairobi to natives suffering near-famine following floods.

Shortly before Christmas, USAFE aircraft flying routine supply flights into West Berlin delivered more than sixteen tons of gifts, food, and clothing to refugees from communism living in the former German capital.

During February 1962, a shipment of some 30,000 pounds of emergency supplies was airlifted from Ramstein to Hamburg, Germany, to aid victims of a flood along the northern coastal region. An additional 30,000 pounds of urgently needed donations was airlifted from Sembach, Bitburg, Wiesbaden, and Rhein-Main, all in Central Germany, several days later.

A new form of training began in the command during the summer of 1962 when 122 Air Force Academy Cadets of the Class of 1964 reported to nineteen USAFE installations for Operation Third Lieutenant. "Third Lieutenants" have been assigned to Stateside bases for a number of years, but it was the first time for the operation overseas. Purpose of the program is to give the Cadets opportunities to see how the Air Force lives in order that they will have a close-up view of their chosen career.

USAFE and community relations have become virtually the same word to many Europeans. Typical of the sustained, intense effort of the command to acquaint its host nations with the Air Force image is the work of the USAFE Band.

That hard-working organization of forty-four musicians set a new record in its sixteen-year-old history during May 1962 by traveling twenty-six days of the month as the command's musical ambassadors in Europe. It virtually covered the USAFE area of responsibility. The band was home only five days at its Wiesbaden Air Base duty station.

On another front, USAFE's television station at Ramstein was named winner of the "American Heritage" contest conducted at Air Force-wide television stations. Operated by USAFE's 7122d Support Squad-

(Continued on following page)

Go, go, go. One of USAFE's F-105 Thunderchiefs gets the takeoff signal from 36th Tactical Fighter Wing crew chief, TSgt. Richard De Mass. The F-105 is the newest addition to the command's inventory of combat aircraft.

UNITED STATES AIR FORCES IN EUROPE

CONTINUED

ron (AFRS-TV) headquartered at Lindsey Air Station, Wiesbaden, the station won top honors for the best presentation of the American way of life and the threat of international communism, theme of the contest.

In February 1962, the 7272d Air Base Wing at Wheelus Air Base, Libya, won the first annual USAFE Commander in Chief's community relations award. Second place went to the US Logistics Group in Turkey, and third was taken by the 65th Air Division in Spain. The award is accompanied by a large silver cup mounted on a mahogany base.

During the year USAFE combined physical fitness with community relations as American athletes competed in eleven different events sponsored by the Conseil International du Sport Militaire (International Military Sports Council). The thirty-nation organization, which is headed by USAFE's Brig. Gen. Royal Hatch, DCS/Personnel, conducts a broad program of sports competition for military forces of member countries.

In Africa, USAFE elements at four scattered points stood ready last May as Astronaut Scott Carpenter made his orbit of the earth. As a part of the over-all US space effort, the responsibility for contingency recovery in Europe was assigned to USAFE. In the European area aircraft, helicopters, communications, and medical support were provided by both USAFE and Army units. USAFE lookout points for the Scott Carpenter orbit included Ben Guerir Air Base, Morocco; Kano, Nigeria; Nairobi, Kenya; and Salisbury, South Rhodesia.

As a component of the United States European Command (EUCOM), which is made up of the United States Army, Navy, and Air Force in the European area, USAFE is responsible to the EUCOM Commander (CINCEUR). In addition, USAFE answers to the Air Force Chief of Staff in Washington, D. C. on questions of Air Force policy and on administrative matters related to its command over assigned units. Finally, USAFE's NATO missions are directed by the Supreme Allied Commander, Europe (SACEUR).

USAFE aircraft earmarked for NATO use in time of war constitute the largest single air contribution of any nation in the fifteen-country alliance.

The Seventeenth Air Force, headquartered at Ramstein, Germany, is USAFE's principal operational command. Headquarters of the Seventeenth is not only on the same base, but is in the same building as the 4th Allied Tactical Air Force, a NATO Headquarters, also commanded by General Landon. The majority of Seventeenth Air Force tactical units, in time of war, would be assigned NATO duty with 4th ATAF. Other major components of the 4th ATAF are the 1st Tactical Air Command of the French Air Force; the 1st Air Division of the Royal Canadian Air Force; and the Tactical Air Division, South, of the Air Force of the Federal Republic of Germany.

The Third Air Force Headquarters, South Ruislip, England, is primarily a logistic command. It also acts as a point of contact, as authorized, between US forces and United Kingdom government agencies.

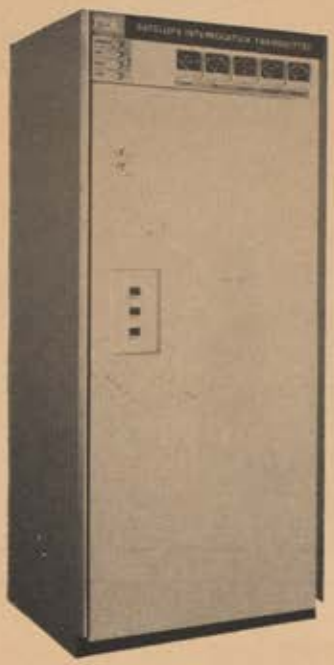
The 322d Air Division at Evreux, France, is USAFE's air transport organization.

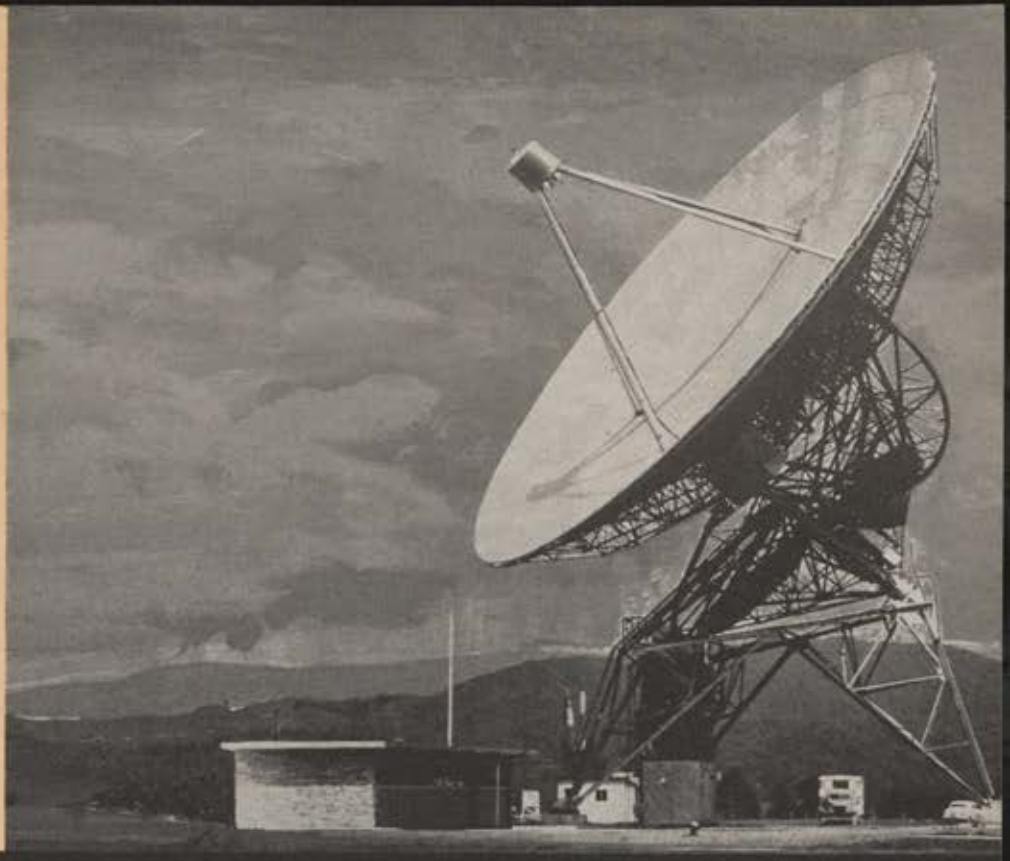
The 65th Air Division, Torrejon, Spain, is the air defense organization which protects US bases in Spain.

The United States Logistics Group in Turkey (TUSLOG), with its headquarters at Ankara, has support responsibilities in Turkey, Greece, and Crete for all US forces stationed there.

Seventeen critical years, from 1945 to 1962, mark USAFE's development from an administrative organization, largely concerned with redeployment, disarma-

(*Continued on page 149*)





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The United States effort to achieve an anti-missile missile to destroy enemy ICBM's is approaching reality. If, however, one should slip through, the United States Air Force will be able to pinpoint the location of the blast the instant it happens. The nationwide USAF Nuclear Bomb Alarm System, built by Western Union, will perform this vital function.

The system literally blankets all critical target areas with strategically located sensor devices. In the event of a blast, two or more of several sensors would automatically and instantaneously alert military and government installations across the country. So fast is each sensor that it reacts to the light of a nuclear explosion, and transmits its message . . . *even if the sensor itself is obliterated by the effects of blast or heat!*

Sensors are designed to react only to a nuclear blast. Natural "false alarms"—such as lightning or fire—have no effect at all. And every two minutes, day and night, a built-in testing device "checks in," guarding against circuit defects.

The USAF Nuclear Bomb Alarm System is typical of how Western Union is moving ahead in all forms of electronic communications: record, facsimile, and voice/data. Interested in knowing how these new Western Union services can improve your communications and cut costs? Wire us collect: Western Union, 60 Hudson Street, New York, N.Y.

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Above, constantly alert, USAFE launch control personnel stand duty round the clock in blockhouse at USAFE missile site, 38th Tactical Missile Wing.

Right, West German Air Force, USAFE pilots on flight line at Phalsbourg AB, France, home of 102d Tactical Fighter Wing, talk over navigation in NATO Squadron Exchange program.

UNITED STATES AIR FORCES IN EUROPE—CONTINUED

ment, and the disposal of surplus property, into the large combat-ready command of today.

USAFE was formed in August 1945 from the World War II organization, known as the United States Strategic Air Forces, Europe.

The shooting war was over. United States forces in the European Theater were involved in the redeployment of hundreds of thousands of servicemen destined to return to their homes and civilian life. And there remained the formidable task of assisting in the reconstruction of war-torn Europe and the occupation and rehabilitation of the defeated powers.

USAFE shared in the duties of occupation. As the initial enormous tasks were completed—such as the inventory and disposition of surplus Air Force property finished in 1947—the work of occupation was reduced to routine. USAFE shrank to as few as 15,000 men and maintained virtually no combat capability.

But ominous developments were taking place in Eastern Europe. The Communists continued to maintain a huge army on a wartime footing in the East, and one country after another was forced into the Soviet camp. The Western Powers were compelled to review the missions of their occupying forces.

In 1947, United States Forces, European Theater, was organized and redesignated "European Command" or "EUCOM." Gen. Lucius D. Clay became the EUCOM Commander in Chief and Military Governor of Germany. In October, Lt. Gen. Curtis E. LeMay was made Commander in Chief of USAFE.

Determination to resist Soviet aggression was growing in the West. In 1948, Soviet aggression against Berlin provided an opportunity to harden resolution into action. On June 16, 1948, the Soviets withdrew from the Four-Power municipal government, and one week later came the blockade.

General Clay gave orders to institute the Berlin Airlift. General LeMay set the lift in motion by ordering the first flight, which took off from Wiesbaden Air Base and landed at Berlin's Tempelhof Airfield.

An Airlift Task Force was established under the command of Maj. Gen. William H. Tunner and made up of men and aircraft from USAFE, the British Air Force of Occupation, and flying units of the United States Navy. French military forces provided essential ground support, while United States Army transport units carried goods to airlift loading points.

USAFE was becoming more than an occupation Air Force. Its new mission took precise shape after the establishment of NATO in April 1949 and an Allied Defense Organization late in 1950.

The Korean conflict added additional urgency to NATO plans for the establishment of an international military organization for the defense of Europe.

In the meantime, USAFE was being prepared for its role in NATO defense. In January 1951, the Twelfth Air Force (now the Seventeenth Air Force) and the 3d Air Division (later the Third Air Force), were assigned to USAFE.

Allied Air Forces, Central Europe (AAFCE, later AIRCENT) was established in April 1951 as an element of Supreme Headquarters, Allied Powers, Europe (SHAPE) Command. The then-USAFE Commander in Chief, Gen. Lauris Norstad, was given an additional responsibility in the NATO defense organization as AAFCE Commander in Chief. Combat units of USAFE's Twelfth Air Force were committed to AAFCE for operational control during emergencies and NATO exercises.

Hereafter, USAFE continued to provide the major United States contribution to NATO's air capability. —End.

Gen. Emmett O'Donnell, Jr., has been Commander in Chief of PACAF since August of 1959. He served as DCS/Personnel at Hq. USAF from 1953 to 1959. At the start of the Korean War in 1950, he set up FEAF Bomber Command in Japan. General O'Donnell served with heavy bomb groups in the Pacific through much of World War II. He led the first B-29 raid on Tokyo.

While the world's eyes are on Europe, smoldering conflicts continue in the Pacific, and it is PACAF's job to see that they do not ignite into general war . . . a vital role in global deterrence . . .

PACIFIC AIR FORCES

THE Pacific Air Forces' three-hour deployment of F-100s from Clark Air Base, the Philippines, to Thailand in May depicts the flexibility and mobility of this far-flung command in responding to a crisis.

Lt. Gen. Thomas S. Moorman, PACAF's Vice Commander in Chief, ordered the Thirteenth Air Force's combat forces on alert. Minutes later, while staff officers at Clark Air Base were relaying the initial call to their unit commanders, Brig. Gen. John B. Henry and Col. David L. Evans, III, from PACAF Operations, were ordering the launch of alerted aircraft from the PACAF Command Center.

As pilots of the 510th Tactical Fighter Squadron were assembling in the unit's ready room for briefings on the deployment, two Military Air Transport Service C-124 Globemasters were airborne for Thailand with the first of tons of equipment needed to support the jets that would follow.

At another section of sprawling Clark Air Base, PACAF refueling aircraft prepared to leave for their aerial rendezvous with the F-100s over the South China Sea.

At 7:15 a.m. on May 15, the first of the supersonic fighters left the Clark runway. High over the South China Sea they met KB-50J refueling tankers. Each fighter refueled for the three-hour flight to Thailand.

During the first forty-eight hours of the crisis more than 280,000 pounds of equipment and hundreds of support personnel were scheduled into the airlift program. Loading crews worked around the clock.

In a matter of hours everything needed to establish a complete combat air base in the field—kitchen equipment as well as parts, tools, and office supplies—had either left Clark or was scheduled for airlift in the next few days. Personnel from other PACAF bases, needed to support the operation, were being processed through Clark.

This move, completed in a matter of hours, was ordered by President Kennedy and is typical of PACAF readiness to respond immediately to assist in counter-insurgency actions against Communist encroachment in Southeast Asia.

Headed by Gen. Emmett O'Donnell, Jr., PACAF is the air arm of the unified Pacific Command (PACOM). As a member of PACOM, Pacific Air Forces has the mission of assisting in defending the US against attack from across the Pacific Ocean; assisting in the defense of friendly nations in the Far East; providing air defense of land masses and mobile strike forces; supporting the Military Assistance Program; and performing aerial reconnaissance.

For months airmen from PACAF units in the Pacific/Far East have been on duty in South Vietnam. Training South Vietnamese airmen in tactical air operations is bringing about a steady, improved development of that nation's air force.

PACAF is also teamed in the airpower role with the air forces of our Asian allies, including Japan, Korea, the Philippines, Taiwan, Thailand, Australia, and New Zealand. Close cooperation with these air forces is on a daily basis.

PACAF's compact Mobile Strike Force is specially designed for quick reaction in Southeast Asia. By virtue of its location on forward bases, the Mobile Strike Force has the capability to quickly initiate air operations in any area.

In a continuing emergency, it is supplemented by Tactical Air Command's Composite Air Strike Force, stationed on US bases. Such was the case in the 1962 Southeast Asia crisis.

Thirteenth Air Force's 510th Tactical Fighter Squadron, deployed from Clark Air Base to Thailand in response to the President's order, was replaced in that nation in the first week of June by F-100s of TAC's

478th Tactical Fighter Squadron based at Cannon AFB, N. M.

Tailored for use in Southeast Asia against brush-fire-type warfare, the Mobile Strike Force is composed of the F-100, B-57 bombers, cargo aircraft, communications and support equipment, and personnel from Fifth and Thirteenth Air Forces and the 315th Air Division (Combat Cargo).

Complete equipment for operating from a forward base is prepacked in special containers designed for rapid on-off loading. Periodic exercises are staged to keep the force alert to unexpected actions and to smooth out bugs encountered in rapid deployment operations.

Pacific Air Forces has approximately 69,000 people and thirty-five squadrons operating from twenty air bases in a half dozen countries. PACAF's versatility includes tactical bombers which can deliver both conventional and atomic weapons; supersonic fighter-bombers which also have a dual capability; fighter-interceptors for air defense; missiles; reconnaissance aircraft; and cargo aircraft.

In no part of the world is the airpower mission more important than in the Pacific where sea distances are tremendous and transportation by land often is impossible.

PACAF's "ball park" of aerial responsibility covers nearly forty percent of the earth's surface. The command has units and bases in Okinawa, Japan, Korea, Taiwan, the Philippines, and Hawaii. Headquarters for this vast network of offensive and defensive forces are at Hickam AFB, Hawaii. Individually, those air forces of SEATO and ANZUS allies are not large. Collectively, they have more squadrons than PACAF.

In addition to these alliance air forces, PACAF can count on the potent Chinese Nationalist Air Force. Operating against the Communist MIGs over the Taiwan Strait in 1958, the Chinese Nationalists ran up a reported 16-1 kill ratio against the Red jets and played an important part in turning back an aggressive thrust of major proportions.

Symbolic of mutual determination of the US and Thailand to forestall Communist aggression in the troubled East, a Thai Air Force airman stands guard as a USAF C-130 transport, loaded with vital cargo, taxis down the runway.

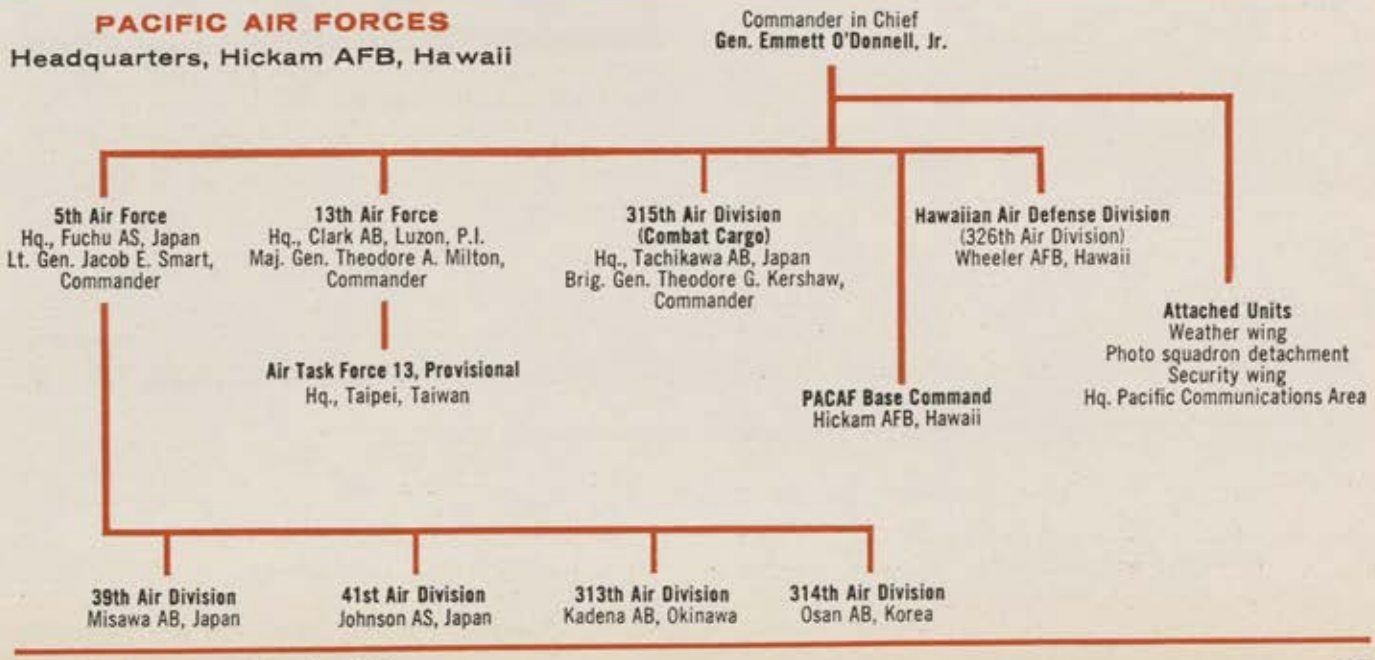
Before July 1, 1957, Far East Air Forces in Japan was responsible, as the air component of Far East Command, for air defense of the Pacific.

On that date Headquarters Pacific Air Forces was formed at Hickam AFB as the air component of the consolidated Pacific Command. For the first time in history, all United States Air Forces combat forces in the Pacific were to be placed under a single commander.

Highlights of PACAF activities during the period July 1, 1961, to June 30, 1962, include:

September 1961—PACAF's 6102d Air Base Wing at Yokota Air Base, Japan, was selected to receive the USAF semiannual Flying Safety Award. Commanded by Col. Eric T. de Jonckheere, the 6102d was accident-free during 9,020 hours of flying from January 1, 1961,

(Continued on following page)



to June 30, 1961. The unit flies T-33 trainers, C-47 transports, and H-19 helicopters.

October 1961—PACAF hosted the eleventh annual medical conference at Clark Air Base, Philippines. More than 350 Asian and USAF doctors attended the three-day exchange of medical views.

November 1961—PACAF was honored by the Air Force Accounting and Finance Center for having the most improved command in Group II ratings for accuracy and timeliness in submitting financial data to the center.

During 1961 announcement was made of the entry of three new types of equipment into the command. Scheduled to begin integration into the PACAF arsenal at various bases were the F-105, T-39 utility trainer, and the Mace missile.

January 1962—PACAF witnessed establishment of a new Southeast Asia communications region with headquarters at Clark Air Base, as a unit of the Pacific Communications Area of the Air Force Communications Service. The new organization offers a single manager for communications operations in the Philippines, Taiwan, Guam, and Southeast Asia and provides PACAF with a fully integrated communications system.

January 1962—PACAF units joined with US Army and Philippine air and army units in Exercise Great Shelf, a simulated combat exercise. PACAF provided air defense and close support for ground units. The 315th Air Division (Combat Cargo) airlifted personnel and equipment connected with the excercise.

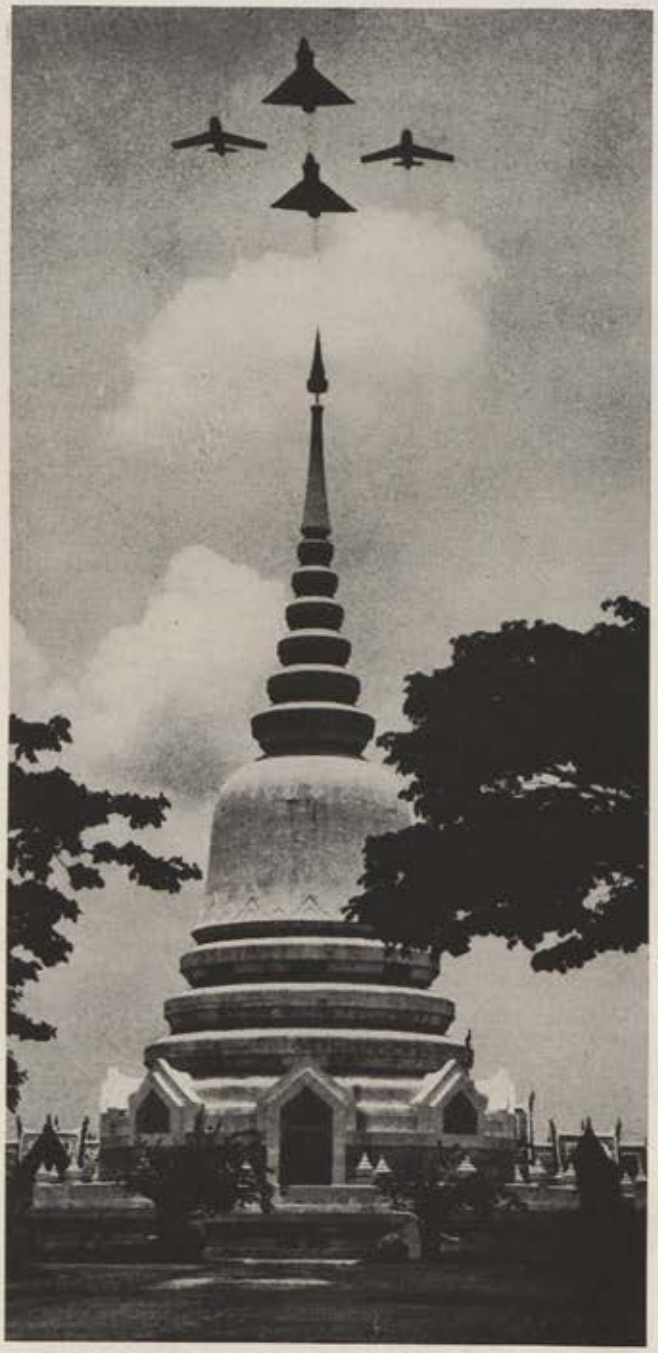
April 1962—In a SEATO exercise—Air Cobra—PACAF units joined with airmen from Thailand, Australia, and France in joint aerial operations designed to improve and coordinate efforts of the four allied air forces. Air Cobra was held in Thailand.

The USAF's highest award for aviation maintenance—the Daedalian Maintenance Trophy—was presented to PACAF's 3d Bombardment Wing at Yokota Air Base, Japan.

Additionally, two PACAF units received the USAF Outstanding Unit Award. The 315th Air Division was honored for the first six months of 1961 for combat effectiveness and instant reaction capability in support of allied forces throughout the Pacific and Southeast Asia. Detachment 2, 314th Air Division, received the award for its outstanding achievements in the field of photo reconnaissance.

April-May 1962—Gen. Emmett O'Donnell, Jr., CINCPACAF, toured major cities in Australia and New Zealand as official US representative to the twentieth annual commemoration of the Battle of the Coral Sea.

May 1962—Thirteenth Air Force's 405th Fighter Wing sent F-100s into Thailand at the start of the Southeast Asia crisis. The F-100s joined PACAF F-102s already in Thailand for routine training and were followed up by more than 280,000 pounds of equipment and hundreds of support personnel in a matter of hours. The 405th is part of PACAF's Mobile Strike Force. (These units were later augmented by the entry of Tactical Air Command CASF elements.) PACAF's



USAF F-102A jets and Royal Thai Air Force F-86s fly over Wat Prasri Mahadhat near Bangkok in aerial salute to Thailand, host nation for the SEATO exercise, "Air Cobra."

Mobile Strike Force elements reached Thailand approximately three hours after being alerted.

Also in May, PACAF received the National Safety Council "Award of Honor" for the year 1961. The command witnessed a ground accident reduction of 16.54 percent.

July 1962—PACAF units in Hawaii, Japan, Taiwan, and the Philippines hosted a group of 113 Air Force Academy Cadets (Class of 1964) on a summer tour of the Pacific/Far East.

Special training for PACAF aircrews during the 1961-1962 period included jungle-survival training at a school operated by the Royal Air Force near Singapore.

A similar school, to be operated by PACAF's Thirteenth Air Force in the Philippines, was programed

Below, PACAF F-100s provide air cover for ground forces during recent transpacific exercise "Long Pass."

Below, a PACAF airman, armed with a shotgun, marks a lonely but vital vigil on guard duty at Yokota AB, Japan.

Earlier this year the President ordered, at the request of the Royal Thai government, US military forces to the Southeast Asia kingdom threatened by Communist aggression. Above, pilots of F-102As from elements of US forces sent to Thailand, working alongside their Royal Thai Air Force counterparts, check out last-minute details before boarding their aircraft and starting mission.

for late summer 1962 activation. Approximately 1,000 PACAF airmen would attend the course each year.

More than a combat force of men and machines, PACAF airmen throughout the Pacific, Far East, and Southeast Asia serve as a bridge of understanding to people of many nations.

Individual touches of kindness and organized assistance by whole units occur daily. From one airman's small contribution to an orphanage to a mass airlift of emergency rations to flood victims, PACAF offers living proof of America's concern for people everywhere.

Each of these humane, friendly acts helps promote better understanding and cooperation between the US Air Force and its host publics. Probably nowhere else in the world is USAF's people-to-people program more active or more appreciated.

Community relations programs are very much alive with constant activity wherever PACAF airmen are assigned. From student exchange programs and organizing Little League baseball clubs to emergency airlifting of non-US citizens who require immediate and special medical attention, every member of the PACAF is a personal representative of the American way.

"Friends through Understanding" is the theme of both impromptu and planned acts designed to benefit both those who give and those who receive. Such activity, the norm rather than the unusual throughout Pacific Air Forces bases and sites, constantly wins friends for the United States and helps cement relationships between the US and her allies in the Pacific area.—END

Lt. Gen. Joe W. Kelly, MATS Commander since June 1960, flew the airmail in 1934, a year after completing pilot training. In World War II he led a Martin B-26 bomb group in Europe, later spent five years in SAC. From 1953 to 1958 he headed Air Force congressional liaison in Washington, commanded Air Proving Ground Center before assuming his present post.

Recognizing that the cold war is a way of life rather than a series of interruptions to normal operations, MATS has come of age as the global airlift arm of United States national policy . . .

MILITARY AIR TRANSPORT SERVICE

IN FISCAL year 1962, the Air Force Military Air Transport Service, commanded by Lt. Gen. Joe W. Kelly, came of age as the global-reaching airlift arm of United States national policy.

Coming of age after a mere fourteen years of existence might normally seem somewhat precocious—until it is recalled that MATS was forced to skip the formative years of infancy altogether. Formed in June 1948 from elements of the World War II Air Transport Command and Naval Air Transport Service, MATS in its first month was committed to fourteen months of sudden maturing in the crucible of the Berlin Airlift.

Operation "Vittles," as that blockade-breaking venture was known, made "airlift" a household word—and set the pattern for almost impossible achievement for the years to come.

The blockade of Berlin, and then the Korean War, hammered home the point that a ready means of global airlift had to be made available to our combat forces. The problem—one which had to compete with many other complex military problems—how to use such airlift potential in peacetime to keep it thoroughly trained for sudden and urgent demands . . . and how to equip it?

For many years, when it still seemed reasonable to assume that cold-war excursions requiring global airlift would be the exception to the peacetime rule, it seemed most logical to exercise an airlift organization in the constant reinforcement and resupply of overseas bases and treaty alliance forces. For that reason, a good part of MATS airlift training hours were used for this daily logistical support of the overseas theaters—flying scheduled missions on fixed routes or "channels."

With this practice, costly weapon and supply inventories were slashed through speed of distribution, most overseas depots were eliminated, and personnel pipeline times were greatly reduced. At the same time, MATS people along the air routes—supply, maintenance, aircrew, cargo handling, terminal, and all the rest—had the advantage of the continuous and realistic training that would enable them to accelerate to emergency workloads at a moment's notice whenever it might become necessary.

But was this the best possible type of global airlift training? To a degree it was, since the routes were those that would be used in war and had to be kept open and operational. And the airlift crews themselves had to know the routes—in all types of weather—as well as they knew their own names.

Unquestionably, the theater commanders would require a great deal of logistical support in war or emergency—but, on the other hand, could we expect the war to be based entirely on fixed routes and schedules? In addition, wasn't the nature of logistical airlift such that the commercial airlines could be depended upon to help with a great deal of it? As another consideration, although joint tests and exercises with the Strategic Air Command and Tactical Air Command were certainly of prime necessity, where did they leave the Army?

Clearly, as the nuclear deterrent was built up, the likelihood of small wars became more prominent, and the airlift of massive Army forces to distant lands became an urgent requirement.

Above all, it had become all too obvious that the cold war was a way of life rather than a series of interruptions to normal operations. Certainly, then, a military airlift force such as MATS had to be geared to this reality.

Thus, a realignment of MATS toward a more purely military configuration was strongly indicated. In no single previous year has the progress toward this goal

been as marked and as widespread as in fiscal year 1962.

First, the evolution of MATS from a quasi-airline mode of operation—flying routine scheduled missions along fixed and well established air routes—to a proven military airlift command, specializing in strategic mobility exercises with all the combat arms of the Department of Defense, and in special assignment airlift to the remotest ends of the earth, was an accomplished fact.

Whereas, for example, only eighteen percent of the airlift capability was devoted to a special assignment airlift in FY '60 (about 300 missions per month), by the end of FY '62, fifty-five percent of the capability was being flown on unscheduled, point-to-point operations at a rate of more than 700 special missions per month.

At the same time, airlift exercises with Tactical Air Command, Continental Army Command, US Strike Command, and unified theater forces grew from 24,000 flying hours in 1960 and 38,500 in 1961, to 94,000 hours —with a forecast of more than 116,000 hours for next year.

As a result, the commercial airlines took over more and more of the scheduled logistical airlift. By the end of the fiscal year, they were handling better than fifty percent of the traffic on the transoceanic channels. In fact, the airlines received an estimated $185 million for overseas airlift in fiscal 1962.

The second change that marked the fiscal year was the heightened pace of MATS airlift and technical service activities in the related technologies of missiles and space exploration. The strategic airlift force flew close to 800 special missile airlift missions, carrying 30,000,000 pounds of missiles and associated cargo for the Army, Navy, and Air Force—including the Titan, Minuteman, Pershing, Polaris, and Skybolt.

The Atlas boosters that hurled Lt. Col. John Glenn and Lt. Cmdr. Scott Carpenter into orbit took their first rides in the cargo compartments of MATS C-133s

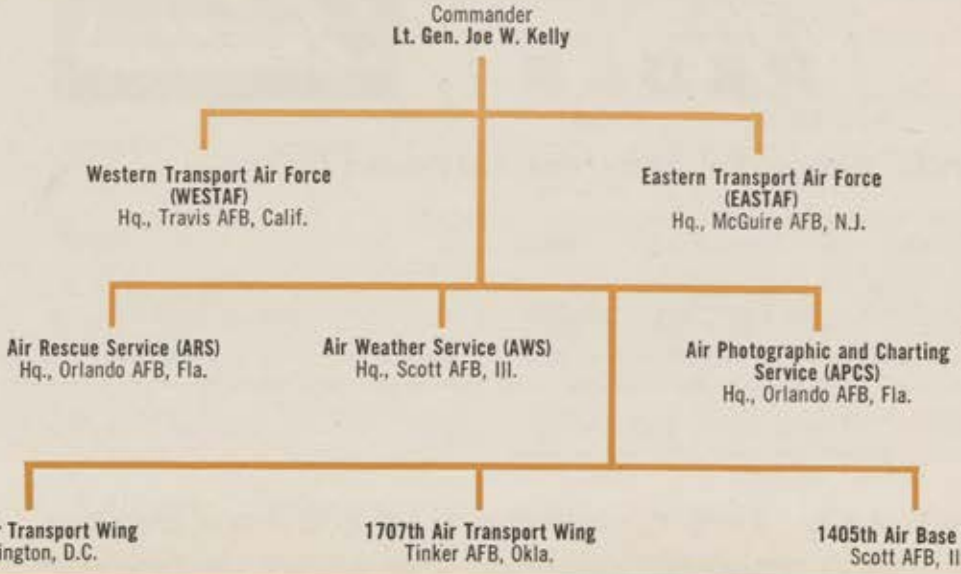
(Continued on page 157)

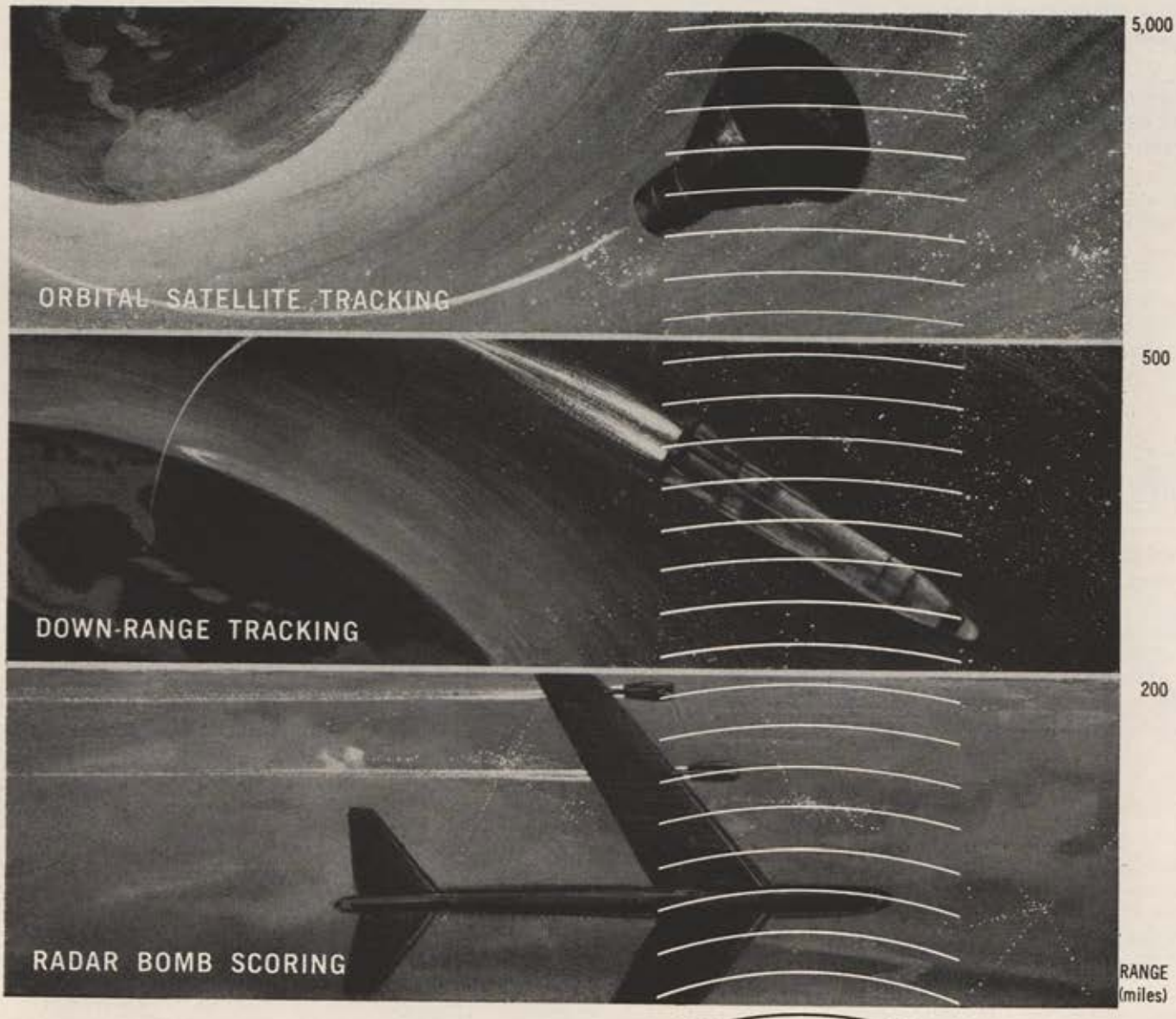
MATS delivers Army troops faster than ever with its 45 new Boeing C-135 Stratolifters. In July, MATS swapped two battle groups between US and Germany in 45½ hours.

Pararescue men A1C John Heitsch and SSgt. Ray McClure show Brig. Gen. Joseph A. Cunningham, Air Rescue Service Commander, where they jumped from SC-54 to aid Astronaut M. Scott Carpenter until Navy arrived to pick him up.

MILITARY AIR TRANSPORT SERVICE

Headquarters, Scott AFB, Ill.





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New Lockheed C-130E, with improved range and payload, flies Atlantic nonstop with normal load, Pacific in one stop.

—from the manufacturer's plant in California to the launch complex at Cape Canaveral.

While those gentlemen were orbiting the earth, aircraft and crews of MATS Air Rescue Service were also deployed around the globe—although flying 100 miles lower and 17,000 miles an hour slower than the Astronauts. Commander Carpenter's unprogramed splash point in *Aurora 7* brought the new ARS pararescue teams into action. Two Air Rescuemen parachuted from an SC-54 to assist the Astronaut and placed a flotation gear around the space capsule to prevent its sinking. This, actually, was simply a logical extension of the basic mission of Rescue, which celebrated its sixteenth birthday in May 1962. In those years, Rescuemen have flown more than 43,000 missions adding up to a third of a million flying hours, have found and rescued from almost certain death 8,300 persons, aided more than 52,000 others, and saved eighty-four aircraft from destruction.

As it rounded out twenty-five years of achievement, the MATS Air Weather Service also expanded its natural horizons, both in meteorological observation and forecasting and in its new role as single manager for aerial sampling. Firmly implanted in the space age, AWS worked with the National Aeronautics and Space Administration, the US Weather Bureau, and other scientific agencies in the data-evaluation phase of the Tiros III weather satellite experiment. And, rounding out the support provided by strategic airlift and rescue services, AWS went all out with weather-reconnaissance flights, observations and forecasts, and weather-radar manning to support the orbital Mercury shots.

The Air Photographic and Charting Service of MATS continued to measure and map the globe, and to complete its assigned missile-launch-site geodetic surveys on schedule. Total global photo-mapping completed by APCS during FY '62 comprised 278,000 square miles. In its other technical specialty, documentary motion-picture photography, APCS was nominated for an award by the Academy of Motion Picture Arts and Sciences for the film, "Breaking the Language Barrier," the first Air Force film ever to be so honored.

The third feature to distinguish FY '62 for MATS was the call to active duty of certain Air Reserve Forces in connection with the Berlin buildup. On October 1, 1961, six Air National Guard C-97 airlift squadrons and eight Guard Air Weather Flights joined in full partnership with MATS on full-time active duty. More than 500 individuals of the Air Force Reserve joined these units to bring them to full strength. Five Air Rescue Squadrons of the Air Force Reserve also volunteered for limited periods of active duty, both for Operation Stair Step in which TAC fighter units were deployed to Europe, and for the Mercury orbital shots.

The fourth change to mark FY '62—and the one to which, actually, all the others were geared—was the true beginning of airlift force modernization. By the end of the year, forty Boeing C-135A and -B Stratolifters were assigned to EASTAF and WESTAF, the remaining five to be delivered by August 1962.

The big jets made their first formal operational appearance in the fall of 1961 during a troop rotation to Korea. Each Stratolifter airlifted eighty troops and their personal equipment from Fort Riley, Kan., to Kimpo Air Base, Korea, and returned with eighty troops to Shaw AFB, S. C.—in less than thirty-two flying hours. They pointed a sharp contrast to the Korean War, when a one-way flight from the West Coast took the better part of two days and the journey by ship as much as eighteen days.

The worth of the jet airlifters was confirmed on a larger scale in Air Force/Army Exercise Long Thrust II in January 1962, when they flew 800 troops from the state of Washington to Frankfort, Germany, over the great-circle polar route in a little more than ten hours nonstop. MATS piston aircraft, carrying another 4,500 troops in the same exercise, took more than thirty hours to go the long way across the States and the Atlantic, with three refueling stops en route.

(Continued on following page)

When floods cut off many sectors of Tanganyika, in East Africa, from normal food sources last spring, MATS C-124s flew three airdrop missions a day for nearly a month. Here, grateful people of Dar Es Salaam, the capital city, salute a Globemaster on one of its mercy flights.

The Stratolifter also demonstrated the value of speed, range, and capacity in medical airlift over both the Atlantic and Pacific Oceans. En route time, often a critical factor in medical cases, was cut from twenty-four hours to nine between Germany and the United States, while noise, vibration, and en-route processing for the patients were held to a minimum. From Japan to California, a flight which had previously taken forty-two hours with two stops, the C-135B airlifted patients nonstop in nine hours, seven minutes.

And, in April 1962, a turbofan Boeing/MATS C135B established three new world records for transport aircraft, and broke seven others which had previously been held by the Soviet Union.

These advances in airlift productivity, however significant, merely foreshadow the greater effectiveness of the MATS force when all forty-five C-135s will have been delivered, when the Lockheed C-130Es come into inventory, and when the Lockheed C-141, Starlifter becomes the advanced workhorse of MATS global airlift force.

From the experience of this last year, however, there is every indication that increased productivity in military airlift will inevitably be accompanied by continually growing airlift requirements of the Army, Navy, and Air Force—as well as NASA, the State Department, and other agencies of the government.

In strategic mobility exercises, even a quick listing of joint operations during FY '62 reveals the magnitude of this airlift task. Such a list would include: Check Mate II/Scrap Iron (CONARC and TAC forces to Italy, Greece, and Turkey for NATO manuevers); Stair Step (deployment of TAC fighter units to Europe); Swift Strike; Deep Freeze 62; Trail Break; Long Thrust II (the first large-scale exercise using jets); Great Shelf (deployment of Army troops to the Philippines); Banyan Tree; Blue Straw; Bristle Cone; Long Thrust III; Quick Kick; and Clear Lake among many others.

In addition, MATS completed its second year on the long-range Congo Airlift, chalking up more than 1,400 missions and 40,000 flying hours to airlift some 43,000 United Nations troops and refugees and close to 12,000 tons of cargo.

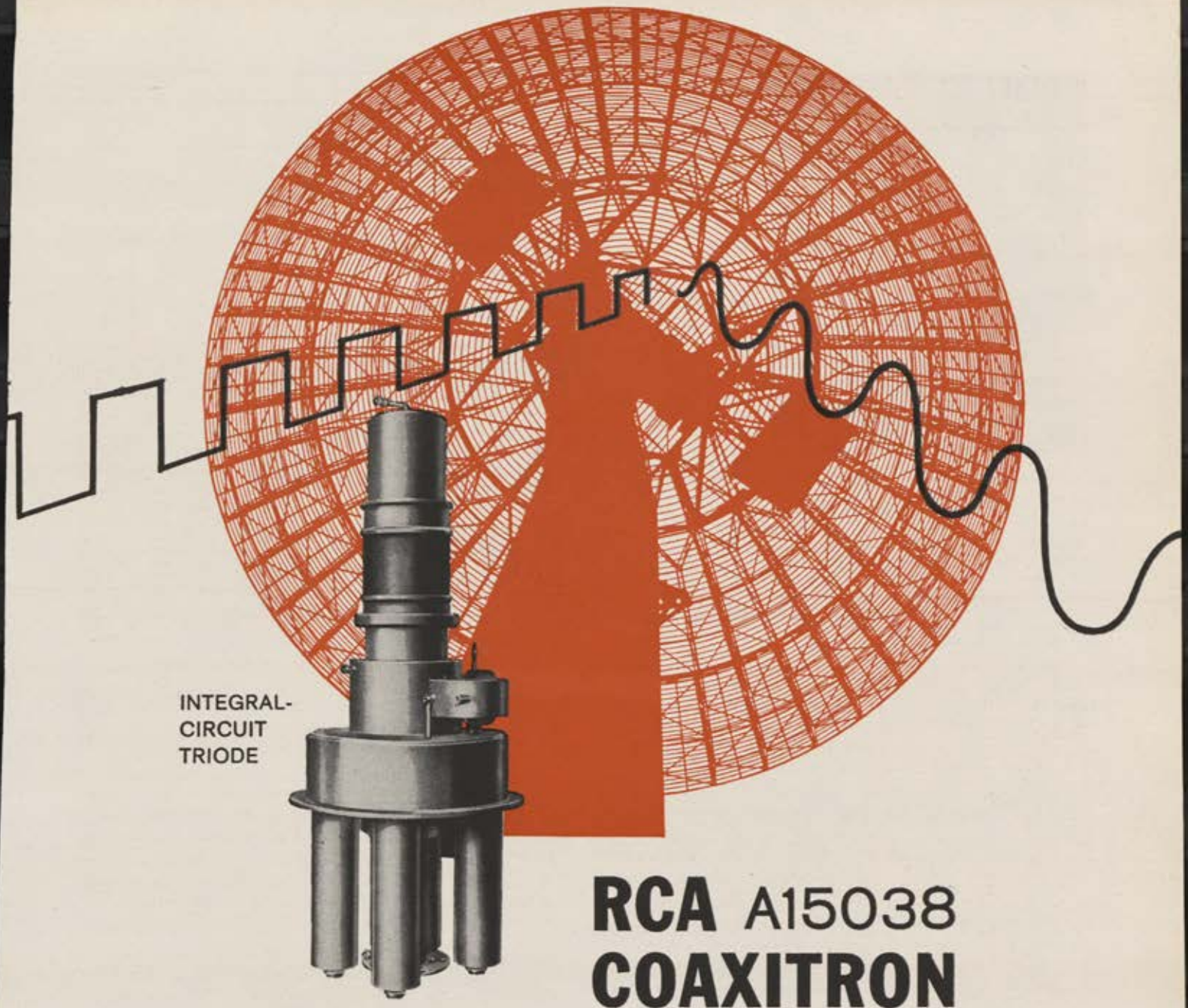
Besides flying these operations to the far corners of the earth, 700 special missions per month, the missile airlifts and war-readiness logistical missions—and on top of a constant runway alert to support the Strategic Air Command in the event of war—MATS was able to continue the long tradition of humanitarian airlifts that began in Berlin in 1948.

In September 1961, it was insecticide to Egypt to combat a crop-destroying invasion of cotton worms; in December, flood relief to Cambodia; in March 1962, school supplies to Hong Kong; April, self-help impact packages to Africa; May, grain to flooded Tanganyika, school books to Paraguay; and X-ray equipment to the Azores.

All this, despite the variety, scope, and complexity of the missions, the various types of aircraft involved, and the remote and primitive areas of many of the operations, was accomplished with an outstanding safety record. The MATS record flying safety rate of 1.08 accidents per 100,000 flying hours (.51 per 100,000 in the airlift units) between January 1 and December 31, 1961, won the command the coveted Daedalian Trophy.

As fiscal year 1962 came to a close, MATS was again a prime mobility factor in the cold war, airlifting Army and Marine Corps troops into and within Thailand, and military equipment to Thailand and South Vietnam.

With its accelerated missile and space airlifts and technical service support, an ever-increasing number of special assignment airlifts, cold-war and humanitarian airlifts, and a constantly enlarging commitment to joint military exercises, fiscal year 1962 was without question the year that Military Air Transport Service global airlift came of age.—END



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In short pulse service (pulse duration: 30 μsec), its efficiency is 43 per cent—at a gain of 13 db. Power output capability is 5 megawatts, minimum.

Operation of RCA A15038 over this bandwidth is made possible by integrating the radio-frequency input and output circuitry, high-voltage blocking circuit and the gridded tube structure within a common vacuum envelope. The tube is suited to a variety of modulation techniques—amplifying at any frequency within the pass-band at which it is driven.

Developed by RCA for the Rome Air Development Center, A15038 Coaxitron also features a low temperature matrix-oxide filamentary cathode to provide high emission, long life, and economical operation. These and other features combine to provide greater power output, broader bandwidth, higher power gain, better stability and greater reliability.

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Gen. Bernard A. Schriever was named Commander of the Air Research and Development Command, predecessor to AFSC, in April 1959. From 1954 to 1959 he headed USAF's Ballistic Missile Division, part of ARDC, through the early days of United States missile development. He saw extensive duty as pilot and commander of heavy bombers in the Pacific in World War II.

Managing the giant technological task of development of aerospace weapons systems and providing primary military support to the nation's space effort are among the array of assignments for . . .

AIR FORCE SYSTEMS COMMAND

ON MARCH 17, 1961, the Secretary of Defense announced a reorganization of Air Force systems management with the aim of centralizing direction of the ballistic missile programs and ensuring the most effective discharge of those military space responsibilities assigned to the Air Force. This reorganization consolidated all activities involving acquisition and development of aircraft and missile systems into a new command, the Air Force Systems Command, organized effective April 1, 1961.

Tasks assigned to AFSC included production, procurement, development, and testing of aerospace weapon and support systems, missile site activation, and supervision of Contract Management Regions—including Air Procurement Districts and Air Force Plant Representative Offices to administer Air Force contracts.

Today, weapon systems come under the managerial control of AFSC from initial development to delivery to operational commands.

From his headquarters at Andrews AFB, Md., Gen. Bernard A. Schriever, AFSC Commander, directs the operations of seven divisions, seven centers, three contract management regions, and the Armed Services Technical Information Agency (ASTIA).

Staffed by 26,650 officers and airmen and 37,000 civilian employees, the command currently is accountable for all Air Force aerospace systems.

An indication of the scope and range of AFSC activities is evidenced from its procurement authority and monies disbursed.

AFSC directs the spending of about forty percent of the AF budget. The command handles some 54,000 contracts annually. More than 11,000 new contracts are awarded annually. The budget to support AFSC programs totaled more than $7 billion for fiscal 1962.

Currently, AFSC supervises about eighty weapon systems in varying stages of acquisition. Twelve are "Designated Systems" of high priority.

The command's official mission statement succinctly describes its responsibility.

"The Air Force Systems Command (AFSC)," it reads, "is responsible for the research, development, testing, production, and procurement actions required to place a complete aerospace system in operation. It must deliver complete, timely, and operable systems to using commands such as the Strategic Air Command, Tactical Air Command, and the Air Defense Command. AFSC conducts or supervises scientific and technical studies required for the accomplishment of Air Force missions."

Significant breakthroughs in the race for space earned a major share of news headlines throughout the world for AFSC during FY '62.

Foremost among America's space achievements were manned orbital flights in the National Aeronautics and Space Administration's Project Mercury. On February 20, 1962, an Air Force Atlas successfully boosted the Friendship 7 spacecraft carrying Lt. Col. John Glenn, USMC, on a three-orbital flight around the world.

Three months later, on May 24, Lt. Cmdr. M. Scott Carpenter, USN, duplicated the feat in his Mercury spacecraft. He, too, was boosted into orbit by an Air Force Atlas.

Achievements of manned aircraft also won America's space efforts worldwide prestige. On November 9, 1961, AFSC's Maj. Robert M. White piloted the X-15 rocket plane to a speed of 4,093 mph in a joint Air Force-NASA-Navy test conducted at the Air Force Flight Test Center, Edwards AFB, Calif. Major White, on July 17, 1962, became the first manned aircraft pilot to earn Astronaut wings, reserved for those who have flown higher than fifty miles, when he piloted the X-15 to an altitude of 314,750 feet.

The year also recorded numerous major milestones in Air Force space probes and missile-launching projects as well as in USAF developmental programs—prime concern of AFSC.

The initial silo launching of Minuteman—the nation's first solid-propellant ICBM—on November 17, 1961, marked one of the year's highlights in missile progress.

Later that month, Atlas-E sites at Warren AFB, Wyo., were turned over to the Strategic Air Command ahead of scheduled completion date. The turnover marked the complete activation of the first ballistic missile wing by AFSC for use by SAC. More missile sites currently are undergoing completion throughout the country.

For the first time in ICBM history, an all-Air Force missile crew conducted the test launch of a Titan I. Fired on November 21, 1961, by members of the 6555th Aerospace Test Wing at Patrick AFB, Fla., the missile rocketed about 5,000 miles down the Atlantic Missile Range from Cape Canaveral. The launch was hailed as a "milestone accomplishment" by General Schriever, who sent personal congratulations to personnel participating in the firing. The forty-four previous test firings had been conducted by contractor crews.

During April and May of 1962, eighteen Titans imbedded in silos near Lowry AFB, Colo., known as Lowry Complex #1 and Complex #2, were turned over to SAC.

Discoverer XXX was launched on September 12, 1961. The capsule was ejected on its thirty-third orbit and successfully recovered in the air by a C-130.

The first in a series of three drop tests of the Skybolt air-launched ballistic missile under the project responsibility of the Aeronautical Systems Division (ASD) Wright-Patterson AFB, Ohio, was successfully completed in February 1962, at AFSC's Air Proving Ground Center (APGC), Eglin AFB, Fla. The test—carried out by an Air Force Systems Command crew from a B-52 Stratofortress—was conducted to deter-

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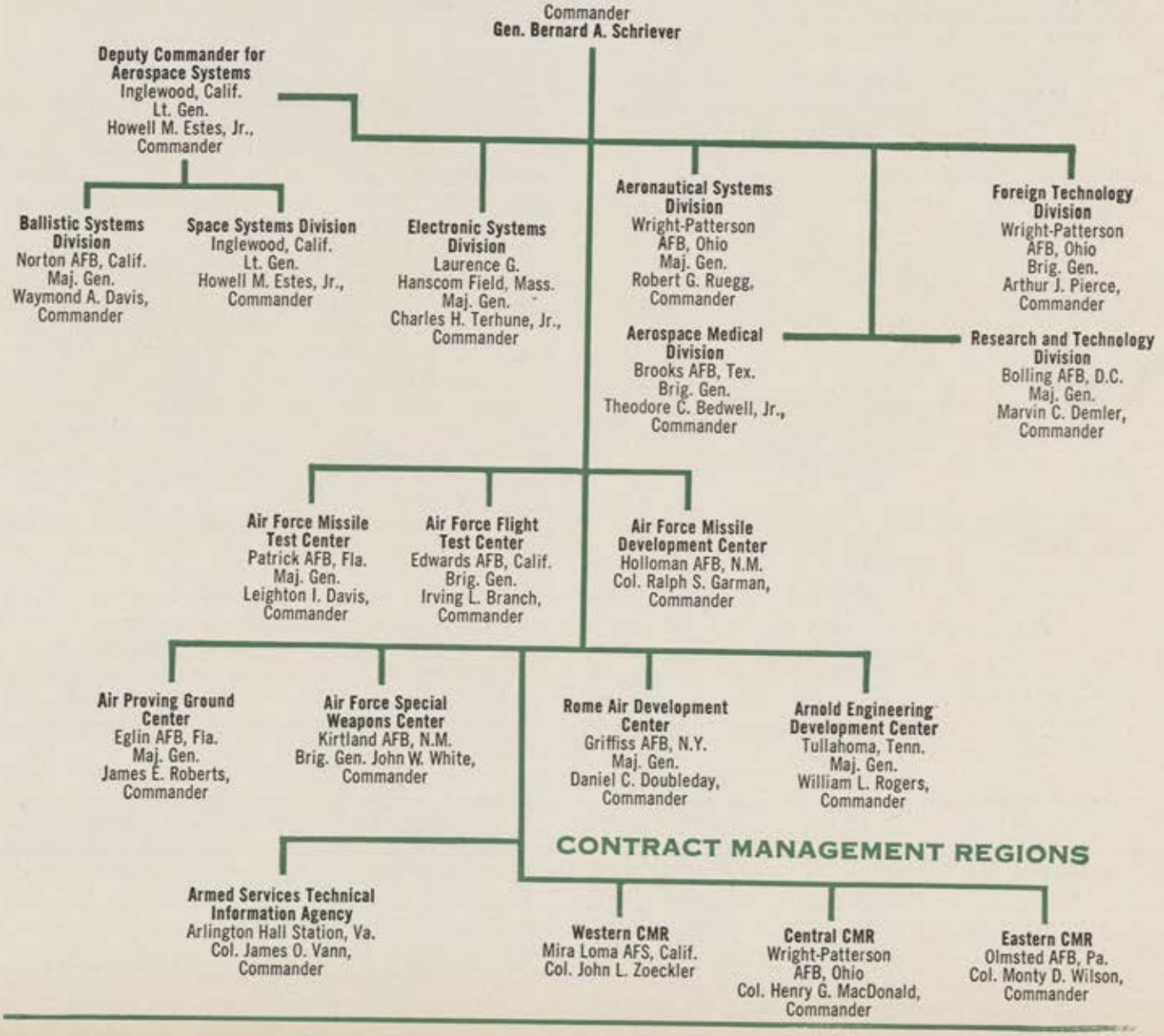
AIR FORCE SYSTEMS COMMAND

Headquarters, Andrews AFB, Md.



Systems Command's Air Force Flight Test Center at Edwards AFB, Calif., is the home of the high-flying X-15 manned research rocket airplane, which has already contributed heavily to aerospace research for the space age.

A SAC B-52 releases a Hound Dog air-to-surface guided missile, powered by a Pratt & Whitney J52 engine. With a nuclear warhead and a 500-mile range, the Hound Dog's job is to clear a penetration path for the Boeing Stratofort.

mine the missile's trajectory patterns and drop characteristics.

Other major aeronautical systems supervised by the Aeronautical Systems Division include the X-20 (Dyna-Soar) and the RS-70 advanced aerospace weapon system.

The first Atlas-F silo-model intercontinental ballistic missile was launched August 7, 1961, from the Air Force Missile Test Center at Cape Canaveral.

In addition to advances in the space and missile areas, AFSC recorded progress in numerous other research-and-development fields covering a wide area of technological projects.

One such project was the completion of an Air Force camera known as the "Facet Eye" at the Air Force Missile Development Center (AFMDC), Holloman AFB, N. M. Moving on a massive but delicately balanced tracking mount, the camera—which consists of twenty-five long-barrelled five-inch telescopes lined to a similar number of TV-like, image-orthicon tubes—is capable of capturing clear and continuous views of Venus, Jupiter, and Saturn in broad daylight.

The first live test of a rocket-powered escape capsule was conducted January 31, 1962, at the Air Force Flight Test Center, Edwards AFB, Calif., when a chimpanzee was safely ejected from a B-58 traveling at 650 mph, at a 20,000-foot altitude.

One month later, on February 28, the first manned B-58 capsule-ejection test also met with success. WO Edward J. Murray, Aeronautical Systems Division, was ejected from an altitude of 20,000 feet over AFFTC while the B-58 was flying at 565 mph.

The Semi-Automatic Ground Environment (SAGE) for directing the air defense of North America reached completion for the continental United States on December 15, 1961. The multibillion-dollar SAGE project ties together the twenty-one direction centers' housing computers and automated equipment, communication lines, radar stations, and radio sites into an interconnected system. The Electronic Systems Division (ESD) at Laurence G. Hanscom Field, Bedford, Mass., was responsible for development and acquisition of the project.

ESD also is responsible for design and construction supervision of BMEWS, which attained two-thirds completion with activation in August 1961, of a radar station at Clear, forty miles southwest of Fairbanks, Alaska. A second site is operational at Thule, Greenland, and a third is nearing completion. BMEWS radars, with a range of 3,000 miles, can detect oncoming ballistic missiles shortly after launch.

Other ESD projects of noteworthy interest during the past fiscal year included completion of a radio link from Greenland to Iceland, which placed seven new DEW Line stations in operation, and completion of the world's largest radome—a 134-foot-high sphere atop Tyngsboro Hill, Mass. The radome will serve as a shelter for one of the most sensitive research antennas ever built—a "dish" 120 feet in diameter, designed for global communications and space studies.

Another major and national ESD project concerns SPADATS (Space Detection and Tracking System). Eventually, the system is expected to be able to track all objects in space to altitudes of 20,000 miles.

In fulfilling its mission, AFSC cooperates with private industry and with other military and governmental agencies. AFSC's Space Systems Division, Inglewood, Calif., for example, is responsible for development projects in support of the Army, Navy, and NASA as well as for military space programs assigned to the USAF. Resident representatives of the Army, Navy, and NASA are located with SSD to provide daily participation in development programs.

The Air Force Special Weapons Center (AFSWC), Kirtland AFB, N. M., is assisting the Atomic Energy Commission in physical studies of space nuclear tests. The object of this research is to learn how to integrate nuclear weapons into USAF weapon systems with increased safety and reliability.

Another cooperative effort involves the use of the Atlantic Missile Range with headquarters at Patrick AFB, Fla. (Cape Canaveral), for Army, Navy, and NASA as well as for Air Force missile launches.

By agreement with the US Army, operational control of the US Army Corps of Engineers Ballistic Missile Construction Office with its subordinate units is assigned to Ballistic Systems Division, Norton AFB,

(*Continued on page 105*)

INSTANT INTELLIGENCE FOR INSTANT DECISIONS

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A COMPLETE VISUAL IMAGING SYSTEMS CAPABILITY

NEW HOPE FOR UNDER-DEVELOPED NATIONS RESULTING FROM BASIC SPACE RESEARCH

Lunar and space missions such as Project Apollo seldom seem, in their far-out glamour role, to be closely related to that great fundamental... mankind. Yet one single aspect of the Apollo program —fuel cells—holds a vast amount of hope. Especially for under-developed nations.

Often referred to as "continuous batteries," fuel cells convert chemical energy directly to electrical. They are the newest power sources to emerge from scientific research into the realm of practical engines. The specific cell system aboard Apollo will be a Hydrox® unit, reacting hydrogen and oxygen, and is the result of research at Leesona Moos Laboratories, one of the first in America to undertake studies on fuel cells. Hydrox will supply electrical power for vehicle control, communications, and numerous other power needs aboard this lunar mission. Marking the first such use of these new power sources, the Hydrox installation will inaugurate a new age in the generation of electrical power. Final engineering and manufacture of the units for Project Apollo will be carried out by Pratt & Whitney Division of United Aircraft, under license from Leesona Corporation.

But space missions are only the first part of the story. At the same point in time that Leesona Moos began studies of Hydrox fuel cells, a concomitant project was undertaken to develop an even more advanced system... a cell using air as oxidant and inexpensive hydrocarbons or their derivatives as fuels. These hydrocarbon-air (Carbox®) and mixed-gas/air (Aminox™) developments of Leesona Moos do not require reactants of high purity, and are very flexible from a logistics point of view. Low cost and readily available fuels are used, and the universal oxidizer—air—supplies the other portion of the reaction mix. Because the fuel cell is an extremely efficient engine—efficiencies of up to 70% are attainable, vs. 30% for a conventional diesel—the result is an exciting new means of generating electrical power at low operating expenditure. Pratt & Whitney Aircraft in the United States, and Energy Conversion Ltd.,* of England, are carrying out further developmental engineering on these systems under license from the Leesona Corporation.

These new Leesona power sources, of high efficiency and low fuel costs, can readily be seen to provide the world with an entirely new type of electric generator. Fuels of the hydrocarbon variety are fairly abundant throughout the world. The fuel cell, though scientifically sophisticated, is neither unwieldy nor complex in its operation, and requires little maintenance. Units with power levels from those required for a one-family dwelling up to communal or industrial ground-power stations have been projected in Leesona Moos studies, and found feasible.

The impact Carbox and Aminox can have on the emerging countries is readily understandable. The development of a nation can almost be measured by its ability to produce and consume electrical power. In this mechanized world, virtually all industry waits on the availability of electricity. If an emergent economy must hold off its development until completion of large-scale hydroelectric projects, a distinct problem of time and expenditures arises. If, on the other hand, the nation had access to Carbox and Aminox type fuel cell systems, which could be tailored to the need and would operate on locally available fuels, the basic first step toward an industrialized economy and higher living standards would be achieved.

Leesona believes its efforts, plus the great additive capabilities of our United States and international partners, will soon result in working installations of the Carbox and Aminox systems to advance the standards of all mankind. Meanwhile, the sibling Hydrox system supplies power for a moon voyage. And research continues.

**Energy Conversion, Ltd., is a new corporation founded by four British companies: National Research and Development Corporation; British Petroleum Company, Ltd.; British Ropes, Ltd., leading manufacturer of rope and steel cable; and Guest, Keen, and Nettlefolds Group, major steel manufacturers.*

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Calif. BSD is responsible for eighteen Site Activation Task Forces which include the Atlas, Titan, and Minuteman missile programs. An Army Corps of Engineers major general is in charge of facility design, installation, and checkout.

Functioning in a staff capacity, Maj. Gen. O. J. Ritland, Deputy to the Commander, AFSC, for Manned Space Flight, plans, programs, and coordinates the allocation of AFSC resources necessary to support specific NASA projects and programs for manned flight, being provided under basic agreements between NASA and the Department of Defense.

In the test facility area AFSC has found it necessary to augment "blue suit" capability by drawing on industrial contractors. Some of the larger ones called upon to operate AFSC facilities include Pan American Airways, which operates the Atlantic Missile Range; ARO Inc., to operate the test facilities at the Arnold Engineering Development Center, Tullahoma, Tenn.; and Vitro Inc., to operate the Gulf Missile Test Range, headquartered at Eglin AFB, Fla.

AFSC has three Contract Management Regions—each of which is responsible for managing the administration of Air Force and other government contracts as assigned within its respective geographical area.

AFSC contracts with numerous universities and nonprofit organizations throughout the country to conduct scientific studies of specific interest to the US Air Force.

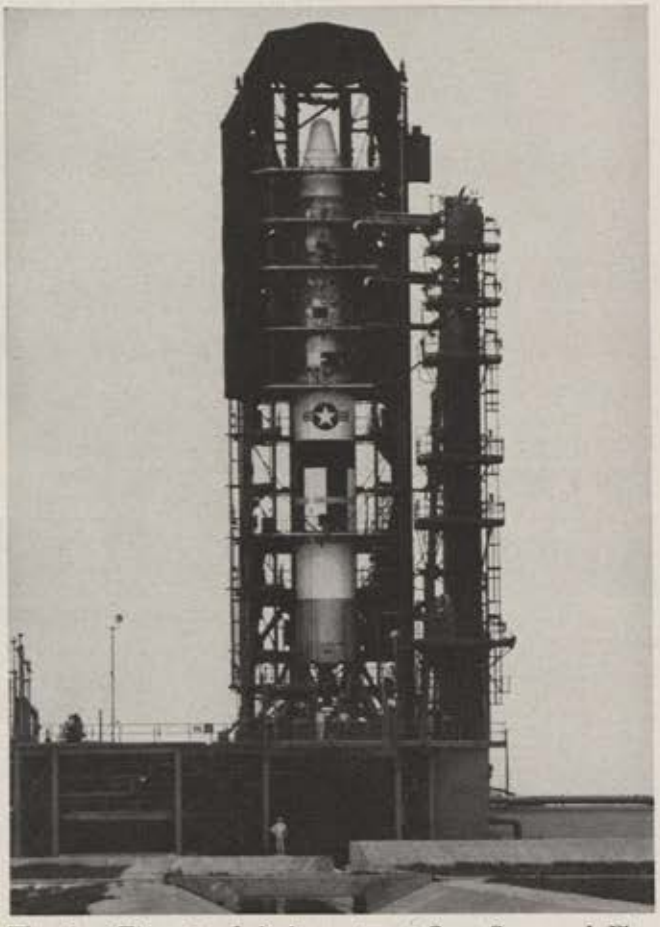
Two singularly significant Air Force management changes occurred within AFSC during the year.

One of these was the consolidation of Air Force aeromedical facilities under one division—the Aerospace Medical Division, commanded by Brig. Gen. Theodore C. Bedwell. Facilities assigned to it include the School of Aerospace Medicine at Brooks AFB, Tex.; the Aerospace Medical Laboratories at Wright-Patterson AFB, Ohio; the Aeromedical Research Laboratory at Holloman AFB, N. M.; the Personnel Research Laboratory and Air Force Hospital at Lackland AFB, Tex.; and the Arctic Aeromedical Laboratory at Fort Wainwright, Alaska.

The second significant management change involved the formation of the Research and Technology Division, currently headquartered at Bolling AFB, Washington, D. C.

Commanded by Maj. Gen. Marvin C. Demler, the R&T Division will be responsible for the AFSC applied research (exploratory development) and advanced technology programs. The division will create a broad base of applied research and advanced technology which will be incorporated as rapidly as possible in the development of superior advanced aerospace systems.

One of the main objectives in establishing the division was to eliminate piecemeal R&T activities within AFSC. A parallel goal was to bring activities under a strong central direction at division level. Thus, General Demler and his staff now function as the focal point for prompt decision-making and over-all direction of the command's inhouse laboratory capability.



The giant Titan stands in its gantry at Cape Canaveral, Fla., while final preparations are made for launch. Titan, along with Atlas and Minuteman, form the trio of ICBMs whose development has been overseen by Systems Command.

Management proved to be the main contributing factor to space and missile technological progress during fiscal 1962.

This fact was borne out by General Schriever when he addressed a four-day management conference of 300 military and industrial leaders—the first such management conference to be sponsored by AFSC—at Monterey, Calif., May 2-5, 1962.

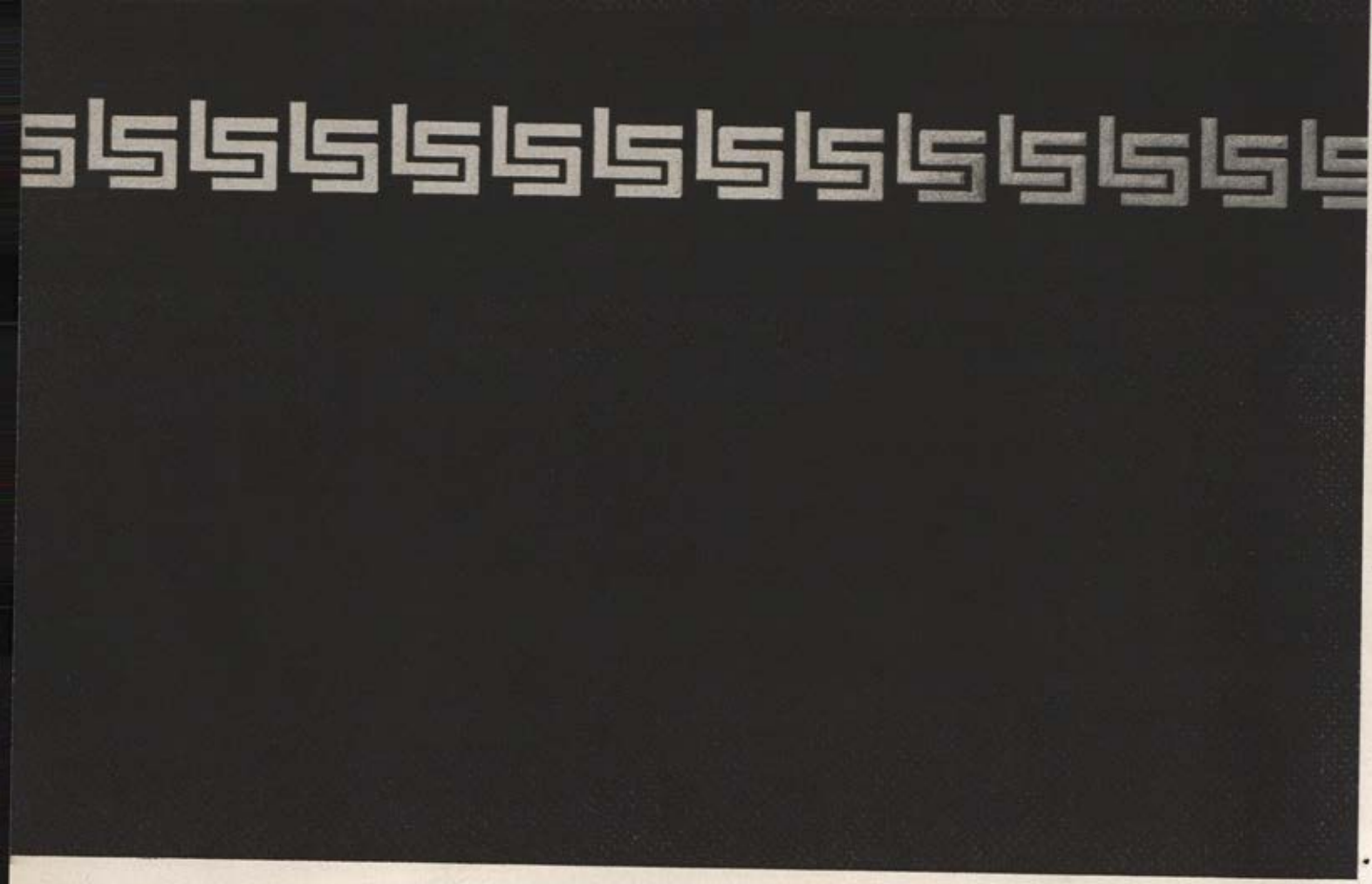
The purpose of the conference was to provide a common understanding of today's management environment, improvement of the relationship between AFSC and industry, and formulation of joint AFSC-industry approaches to systems management.

General Schriever told the delegates that in systems acquisition today, "management is the pacing factor."

"Management is our theme because management is our need," the AFSC chief said. "Increased scientific and engineering competence will not speed up the rate of technical progress unless we learn to manage our resources more wisely and efficiently."

Although the conference was not expected to come up with any pat answers to the problems confronting the industry-Air Force relationship, General Schriever voiced the hope that the gathering would serve as a "solid beginning" in this direction.

Current AFSC progress supports that philosophy. —END



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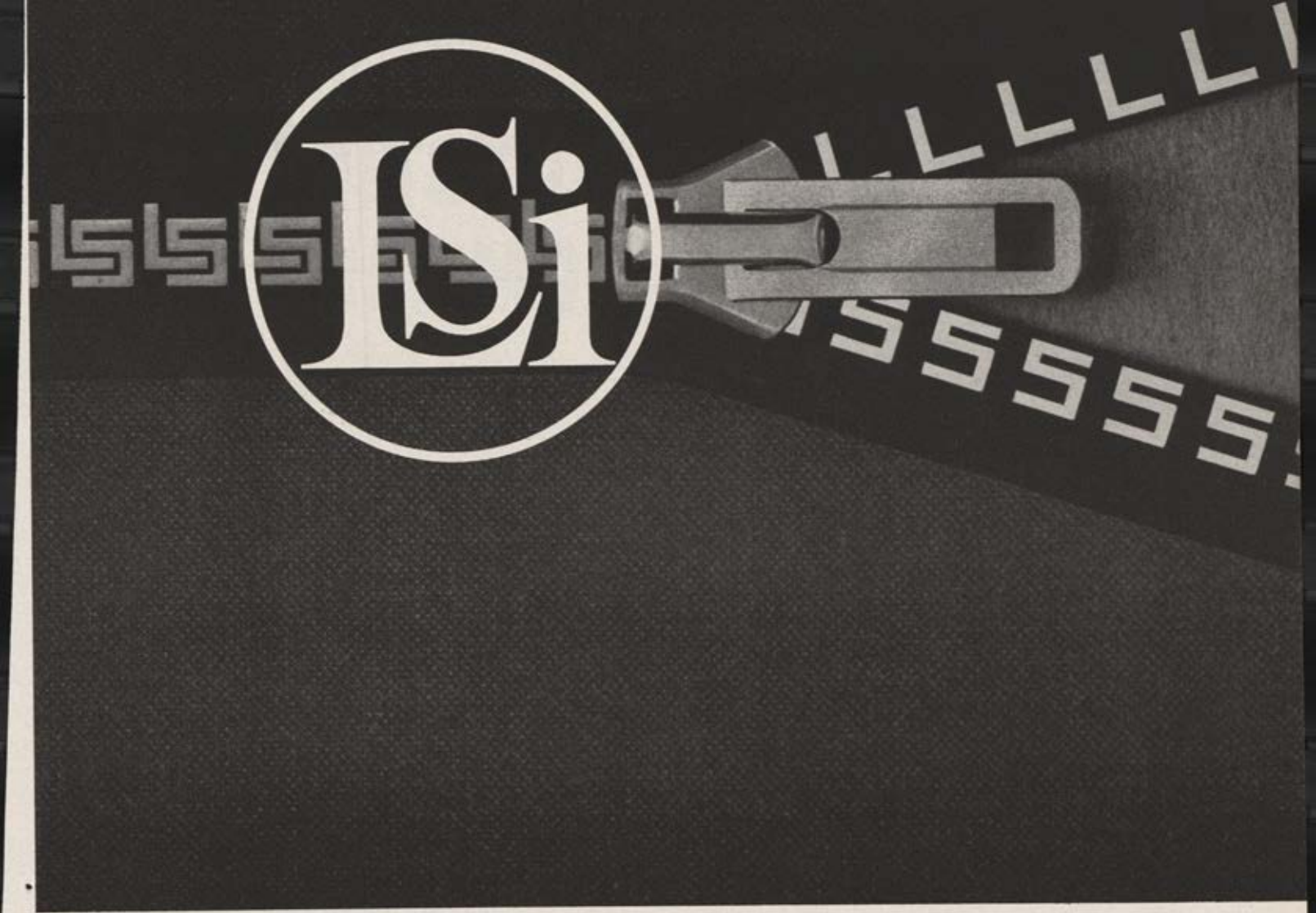

in military and aerospace programs; industrial and consumer electronics; and heating and air conditioning.

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Gen. Mark E. Bradley, Jr., succeeded Gen. William F. McKee as Commander of the Air Force Logistics Command on July 1, 1962, as General McKee moved to the Pentagon to become Air Force Vice Chief of Staff. General Bradley, an airman with wide experience in industrial, materiel, and procurement assignments, had previously served as Deputy Chief of Staff for Materiel at Hq. USAF.

The efficient support and maintenance of the most advanced aerospace systems of our time: this is the primary assignment of the Logistics Command . . .

AIR FORCE LOGISTICS COMMAND

DURING the past year, Air Force Logistics Command continued its drive toward more efficient management of its many faceted tasks in support of the Air Force—on the ground, in the air, and in space.

It laid the foundation for support of the most advanced aerospace, electronic, and aeronautical developments of our time.

It readied the Heath facility near Newark, Ohio, for repair and calibration of inertial-guidance systems.

It streamlined its organization, including discontinuance of two overseas forces.

It developed plans for turnover to the Defense Supply Agency of the Air Force electronic items that are common to all the services, during FY '63, together with an AFLC depot.

It continued its annual retraining of thousands of civilian employees to meet the demands for new skills and highly trained specialists caused by today's complex weapons.

But it still found time to provide logistics support for the combat units of the Air Force—its primary mission. AFLC's job is to see to it that all Air Force combat units are properly equipped and ready for instant action at all times, anywhere in the world. This involves procurement, supply, maintenance, and transportation. Procurement amounts to about $3 billion a year. Supply deals with one and one-third million different kinds of items. Maintenance requires the services of 54,000 persons—one-third of the AFLC total—in processing three million aircraft and engine components annually through AFLC depots.

A foundation stone in the support of advanced systems, whether on the ground, in the air, or in space, was the development of a new concept that intensifies management attention on systems being acquired by the Air Force. This evolved into a Systems Support Program, set up to monitor logistics functions from the early or design stages of systems until normally a year after delivery of the last production article to the using command.

Today, detailed support plans must be made concurrently with systems design, as reliability and maintainability are designed into the system. A life-support plan for people must be built into a spacecraft. Recovery costs dictate building maximum reliability and in-flight maintainability into the systems design.

Under the program, an AFLC systems support manager or facility is assigned the task of support management of a specific system. Those already assigned include the X-20; the Discoverer; the Atlas, Titan, and Minuteman missiles; the Distant Early Warning electronic system; the RS-70, F-110, F-111, B-52, B-58; and a number of special guided missiles.

July 1, 1962, was a very active day for Air Force Logistics Command. On that day it acquired a new Commander, Gen. Mark E. Bradley, Jr. Its Commander for a year and previously Deputy Commander for eight years, Gen. William F. McKee, moved up to Vice Chief of Staff of the Air Force. General Bradley, an old hand at logistics, now has direct control of the command, whereas for the past three years he had staff surveillance over its activities as Deputy Chief of Staff for Systems and Logistics at Hq. USAF.

Also, on July 1 the Defense Supply Agency took over Dayton Air Force Depot in Ohio, with a chance to assume, on a progressive basis, responsibility for management, procurement, and distribution of some 400,000 common Air Force electronic items.

Then, too, on July 1, AFLC's 3079th Air Depot Wing with its five groups was inactivated. This organization had been responsible for handling special weapons. The functions remaining were divided between Strategic Air Command, Military Air Transport Service,

and AFLC. This streamlining was accomplished to effect better management and to shift military personnel to combat units.

It was also on July 1 that AFLC's two overseas organizations—Air Materiel Force, Pacific Area, and Air Materiel Force, European Area—were inactivated, culminating several years' development of direct support of overseas units from Air Materiel Areas in the United States.

The program to eliminate AFLC overseas depots and stockpiles was made possible primarily by flyaway kits containing replacement parts for thirty days, high-speed movement of priority and Hi-value material, faster communications, and electronic data processing. When a part is removed from a flyaway kit, the supply officer flashes an order back to the United States and the replacement item is sent directly to the squadron.

Back in the United States, requisitions are filled by AFLC's nine Air Materiel Areas (AMAs). They have geographical responsibilities for various areas of the country and simultaneously have worldwide logistics responsibilities for specific systems and items. Each AMA gets its name from the location of its headquarters and of the depot that is the hub of its activities, as, for example, Oklahoma City Air Materiel Area.

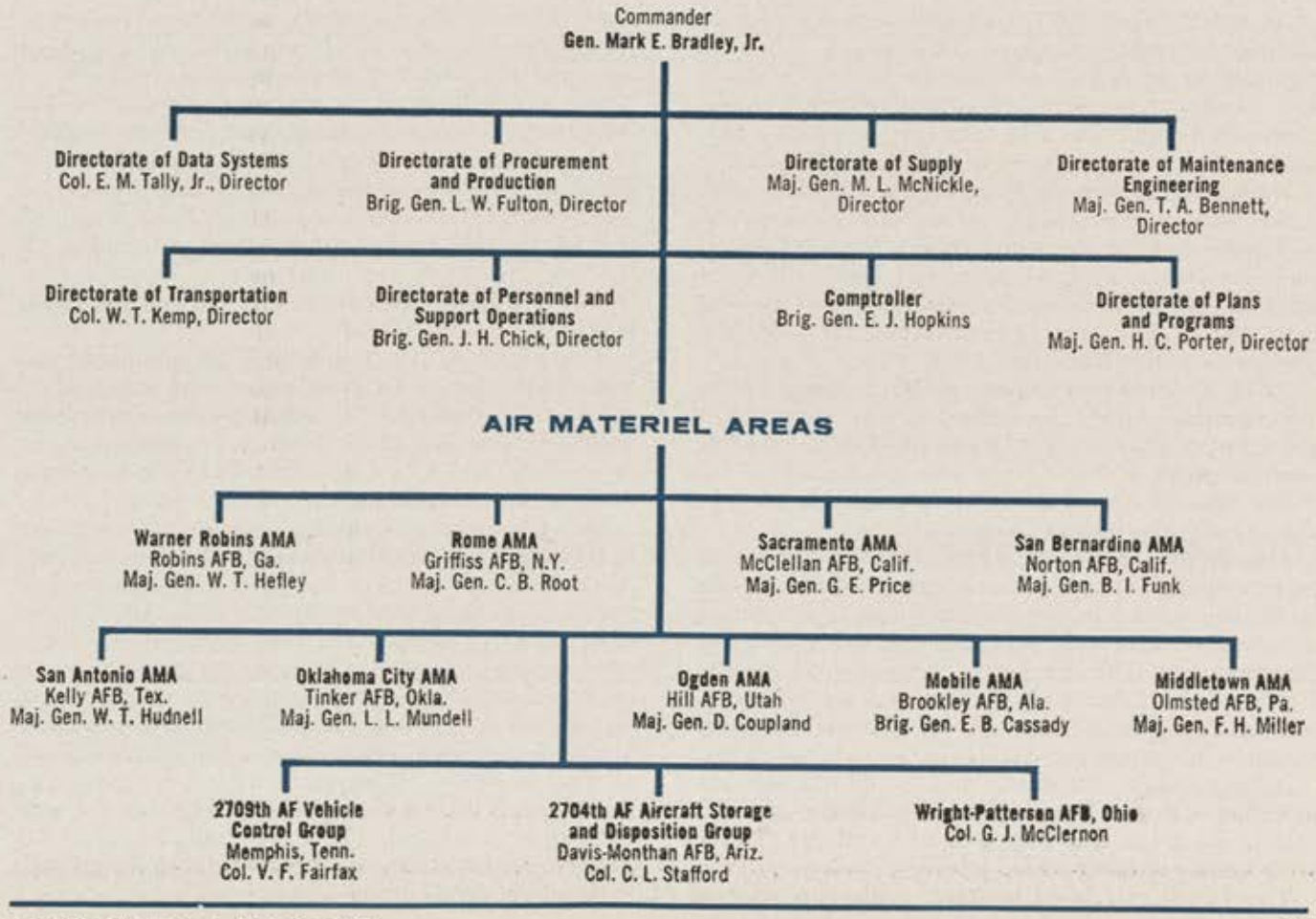
Most of AFLC's procurement is accomplished by its AMAs. A revitalized Procurement Management Pro-

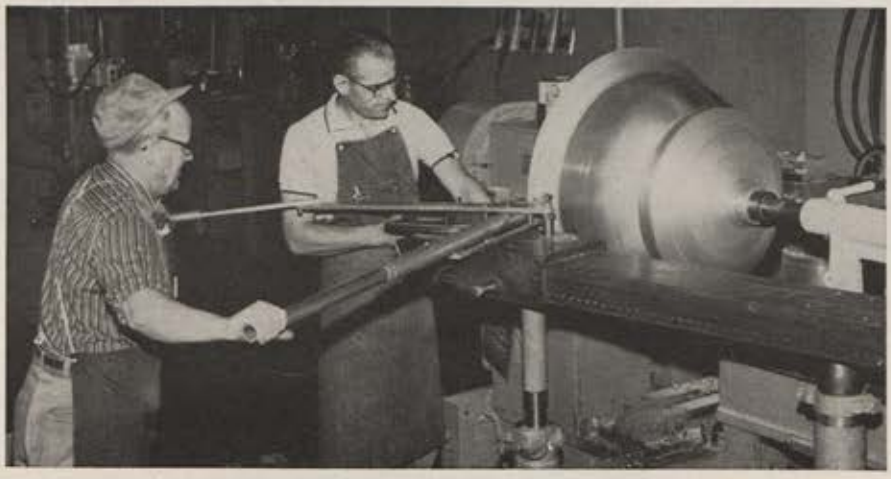
(Continued on following page)

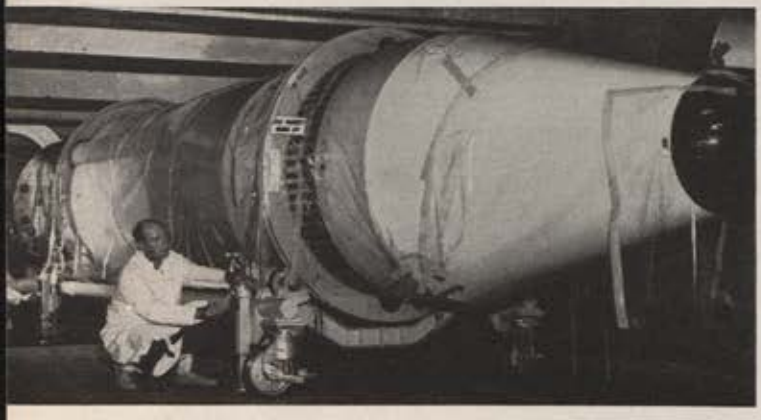
Half of Strategic Air Command's B-52s undergo overhaul and modernization in Aircraft Maintenance Shops at AFLC's San Antonio Air Materiel Area, Kelly AFB, Tex. Thirteen B-52s can be handled simultaneously in this huge hangar at Kelly. The building is 2,000 feet long, 300 feet wide.

AIR FORCE LOGISTICS COMMAND

Headquarters, Wright-Patterson AFB, Ohio







Above, mechanics at Sacramento AMA, "spin" practice capsule for mid-air snare training. Capsules keep USAF capsule-catchers in trim.

Left, Sacramento workers at McClellan AFB secure an Air Force Agena-A vehicle, precious component for future space shot, with plastic cover.

Logistics Command technician at Olmsted AFB, Pa., "clean room" checks out a delicate Astro Compass Tracker.

gram was inaugurated in mid-1961 with the goal of cutting costs. AFLC buyers were told to buy only what was actually needed (the elimination of projects which had become unnecessary because of changed conditions or circumstances), to increase competitive bidding, and to improve negotiations with contractors.

High-speed movement of priority and Hi-value materiel between the AMAs, certain Air Force bases, and aerial ports in the United States is accomplished by LOGAIR, a contractual, scheduled cargo airlift managed by AFLC. To indicate its size, contracts totaling over $30 million have been awarded for LOGAIR operations during fiscal year 1963.

AFLC is involved in many phases of cargo airlift. For example, AFLC determined it was necessary to place larger doors on the Douglas C-133, in order to load the Atlas missiles. They were developed by Air Force Systems Command in time to be included in the aircraft's production designs.

During the past year, AFLC readied the Heath facility in Ohio—a former heavy-press plant that is to be the repair shop for the inertial-guidance systems of missiles and the home of Air Force precision calibration measurements. The Air Force Calibration Standards Facility, to be dedicated in October, will assume a vital role in aerospace logistics. It will provide the most sensitive laboratory for calibration in the free world.

Among Heath's employees will be 650 technicians servicing the Air Force's inertial-guidance systems. Except for a handful, they will be retrainees from a wide variety of other AFLC jobs.

The Heath retraining program represents only a small part of AFLC's activities in this area. During the period 1957-62, nearly 60,000 employees will have been retrained and placed in new jobs within AFLC.

This mammoth program was made necessary by the increasingly complex weapons and electronic equipment entering the Air Force inventory. While some of the most complex retraining courses still are carried on at the plants of Air Force suppliers, most retraining is done by 475 Air Force instructors at the nine AF bases where the depots are located. Courses extend from two weeks to two years, with the average a year long.

A principal factor in retraining is the familiarity and basic knowledge of Air Force equipment possessed by many AFLC personnel. A number of them have been with AFLC or one of its predecessors for twenty or more years, and it has been found feasible to retrain many of them, including some in their fifties.

Such employees have served under a long succession of changes in organization and redesignations in name. Air Force Logistics Command was a redesignation of Air Materiel Command on April 1, 1961. Air Materiel Command was organized in 1946, replacing Air Technical Service Command. The genealogy of AFLC traces back to the Materiel Division of the Army Air Corps, established at McCook Field, Dayton, Ohio, in 1926.

The future may bring some more organizational changes to AFLC. However, under one designation or another, it is certain that aerospace logistics will continue to be a major factor in the readiness of the Air Force to respond to any challenge—be it on the ground, in the air, or out in space.—END

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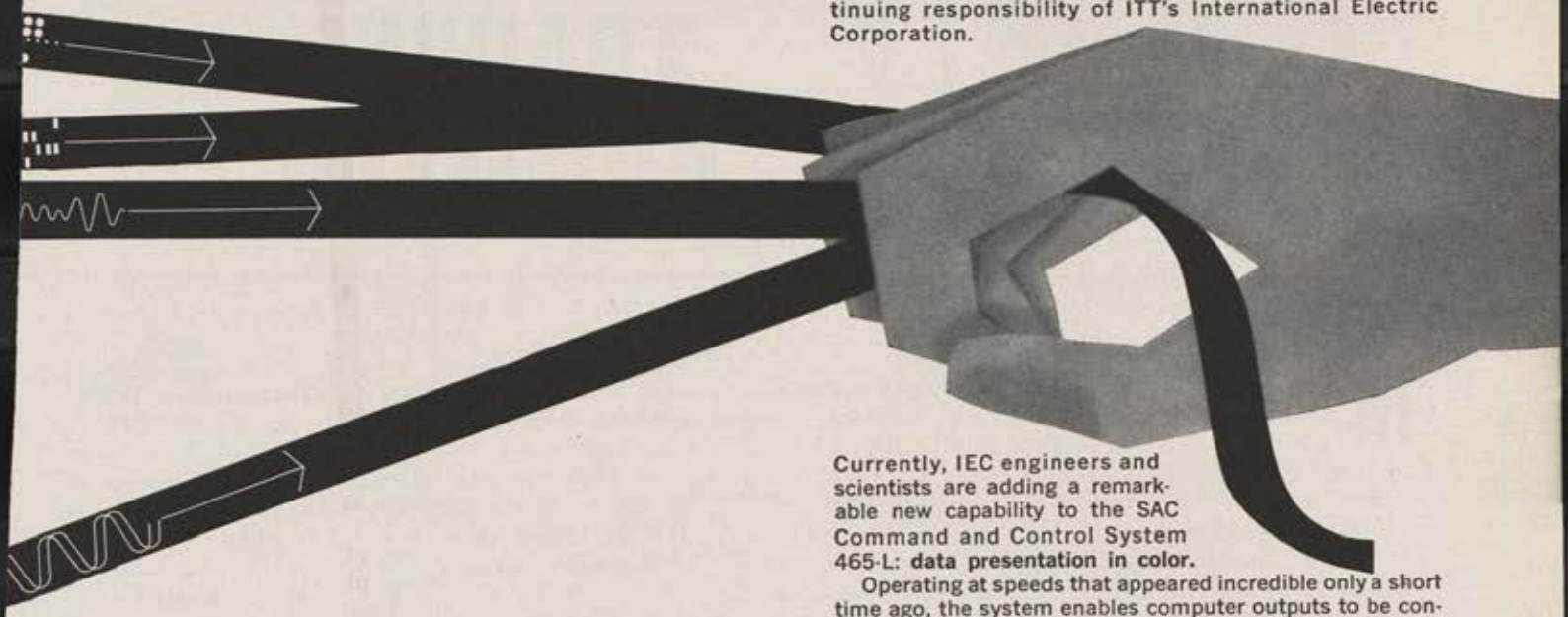
securing man's control of the complex weapons he has invented

Factoring into large scale command and control systems the latest advances in all relevant technologies is a continuing responsibility of ITT's International Electric Corporation.



Currently, IEC engineers and scientists are adding a remarkable new capability to the SAC Command and Control System 465-L: **data presentation in color.**

Operating at speeds that appeared incredible only a short time ago, the system enables computer outputs to be converted to alpha-numeric form . . . photographed . . . developed and projected on control center screens in as many as 7 colors **in a matter of seconds.**

This new capability opens up a whole new field of data format techniques to be explored. An obvious and immediate value is the enhancement of human perception through color changes denoting differing degrees of situation criticality.

OPPORTUNITIES IN MANY COMMAND AND CONTROL AREAS NOW OPEN TO SYSTEMS ENGINEERS AND SENIOR PROGRAMMERS

Many of these positions are on 465-L, for which IEC is providing systems management, development and design. Other opportunities relate to large-scale commercial digital communication systems, oceanic systems, and satellite control. Your inquiry about any of the positions listed below will receive immediate attention.

PROGRAMMERS/ANALYSTS. For real-time programming analysis and development. Broad activities encompass advanced programming systems, including special color display routines; diagnostic programs; automatic recovery; problem-oriented language; artificial intelligence.

OPERATIONS ANALYSTS. To establish systems requirements in satellite control, air traffic control, ASW and command/control. Also, assignments in man/machine communications and information retrieval.

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A veteran flyer, military instructor, and combat commander who served in Europe during World War II and in Korea during the conflict, Lt. Gen. James E. Briggs assumed command of ATC in 1959. Prior to that, he had held a number of important staff posts in Washington, as well as serving a tour in Colorado as the Superintendent of the US Air Force Academy.

Building Air Force skills in an increasingly complex age is the important mission of the Air Training Command, and the effort in ATC is under way to keep up with and ahead of demands . . .

AIR TRAINING COMMAND

MENTION the name Air Training Command (ATC) to a group of Air Force men and it's certain to strike a familiar chord with at least nine out of every ten of them.

ATC enjoys this widespread recognition in Air Force circles not just because it is one of the nation's major air commands. Rather, it is widely known because the majority of Air Force personnel now on active duty have, at one time or another, had a close association with it.

This close association can be seen in the fact that during the past eight years ATC recruiters have enlisted enough men, numbers-wise, to effect a complete turnover of all USAF personnel. The Air Force manpower ceiling now stands at about 887,000 men while ATC, during the same period, has signed up more than 900,000 recruits.

What now constitutes ATC came into being in 1943 as the Army Air Forces Training Command.

Training strength was at its peak during World War II, but with the war's end, demobilization brought a striking reduction in command strength. From a high of 80,693 pilots trained by AAFTC in 1944, ATC trained only 344 in 1946.

In 1949, ATC administered its entire training system —consisting of seventeen active bases—from a single headquarters at Scott AFB, Ill. With the outbreak of the Korean conflict in 1950, USAF expansion resulted in skyrocketing training requirements.

Since the truce in Korea, ATC has added and revised training courses to keep pace with modern aerospace-age technology and mission realignment. The command's operation has been centralized at fewer bases to provide more efficient training.

ATC's three subordinate commands, born of the Korean conflict, were discontinued by mid-1958. Their responsibilities were assumed by the reorganized command headquarters, moved in 1957 from Scott AFB to Randolph AFB, Tex.

Today, the Air Training Command conducts training at nineteen bases throughout the nation. One of the largest of the nation's major air commands, its job is the recruiting and training of officers and airmen for America's aerospace force.

Responsibility for the huge task of supplying the Air Force with young men and women falls to the USAF Recruiting Service, a major component of ATC. With headquarters at Wright-Patterson AFB, Ohio, the recruiting service is divided into seven groups and fifty-four detachments.

Nearly 1,500 recruiters staff about 750 offices throughout the United States. These recruiters are continually searching for young men and women who have the potential to master the skills demanded by present and future aerospace weapon systems. Last year they interviewed and tested hundreds of thousands of people before making their final selection of more than 121,000 of the nation's youth.

The education level of these new enlistees reached an all-time high last year. More than eighty-five percent of all nonprior-service personnel signed up were high-school graduates, while the previous year only about seventy percent of a similar group had completed high school.

Virtually all new enlistees begin their Air Force careers at ATC's Lackland Military Training Center near San Antonio, Tex. Every man without prior military service reports to Lackland where all receive the same reception and processing. They enter the same organization—the 3720th Basic Military School.

This concentration of training in the 3720th gives each man, regardless of his civilian background, equal opportunity with his fellow trainees. The Air Force considers this common initial experience so important

that Lackland is now undergoing a complete physical modernization in order to give its trainees a first impression commensurate to the aerospace age.

Recruits spend a minimum of five weeks at Lackland in Phase I military training. Some, who are not selected for technical training, remain for another three weeks for Phase II military training. They are then assigned to bases throughout the Air Force for on-the-job training.

All WAF recruits complete their full eight weeks of military training before leaving Lackland.

Male personnel who, through extensive tests and interviews, have been selected for technical courses leave Lackland at the end of their fifth week and go to one of ATC's six technical training centers.

Technical training centers and some of their courses are:

- **Amarillo AFB, Tex.**—Jet mechanics, airframe repair, and Dyna-Soar (X-20) training.
- **Chanute AFB, Ill.**—Weather observers; advanced aircraft mechanic specialists; Minuteman, Bomarc, Hound Dog missile training.
- **Keesler AFB, Miss.**—Electronics, air traffic control, missile-guidance systems.
- **Greenville AFB, Miss.**—Personnel and fire fighting.
- **Lowry AFB, Colo.**—Armament; photography; Mace, Matador, Skybolt, and guided-air-rocket (GAR) training.
- **Sheppard AFB, Tex.**—Conventional-type aircraft mechanic; intelligence; helicopter mechanic; Atlas, Titan, Thor, Jupiter missile training.

(Continued on following page)

First step on proud road to full-fledged membership in the USAF team, to which Air Training Command contributes heavily, is marked by these young recruits, including a new WAF at swearing in. WAFs get full training at Lackland Air Force Base, Tex. Males are tested, interviewed there.

AIR TRAINING COMMAND

Headquarters, Randolph AFB, Tex.

Commander
Lt. Gen. James E. Briggs

USAF Recruiting Service
Hq., Wright-Patterson AFB, Ohio

Hq., 3501st USAF Recruiting Group
Stewart AFB, N.Y.

Hq., 3502d USAF Recruiting Group
Olmsted AFB, Pa.

Hq., 3503d USAF Recruiting Group
Robins AFB, Ga.

Hq., 3504th USAF Recruiting Group
Lackland AFB, Tex.

Hq., 3505th USAF Recruiting Group
Chanute AFB, Ill.

Hq., 3506th USAF Recruiting Group
Mather AFB, Calif.

Hq., 3507th USAF Recruiting Group
Lincoln AFB, Neb.

Military Training
Lackland AFB, Tex.

Technical Training

Chanute AFB, Ill.

Lowry AFB, Colo.

Sheppard AFB, Tex.

Amarillo AFB, Tex.

Keesler AFB, Miss.

Greenville AFB, Miss.

Flying Training

Navigator Training

3535th Navigator Training Wing
Mather AFB, Calif.

3565th Navigator Training Wing
James Connally AFB, Tex.

Undergraduate Pilot Training
3500th Pilot Training Wing
Reese AFB, Tex.

3575th Pilot Training Wing
Vance AFB, Okla.

3640th Pilot Training Wing
Laredo AFB, Tex.

3560th Pilot Training Wing
Webb AFB, Tex.

3615th Pilot Training Wing
Craig AFB, Ala.

3550th Pilot Training Wing
Moody AFB, Ga.

3525th Pilot Training Wing
Williams AFB, Ariz.

3646th Pilot Training Wing
Laughlin AFB, Tex.

Advanced Pilot Training
3635th Flying Training Wing
Stead AFB, Nev.

3510th Flying Training Wing
Randolph AFB, Tex.

3625th Combat Crew Training Wing
Tyndall AFB, Fla.

Missile-side instruction is given at Sheppard AFB, Tex. Air Training Command trains future Air Force missilemen at five of its technical training centers, each with its own specialties.

Now that Northrop supersonic T-38 Talon jet trainer is being phased into the Air Training Command Undergraduate Pilot Training Program, new pilots like these are getting the chance to start early flying in a supersonic fashion. Webb AFB, Tex., was the first of Air Training Command's bases to conduct all training with T-38, while continuing to use the T-37 as primary trainer for students.

Last year these centers provided formal resident training for more than 148,000 students, while mobile and field training units conducted on-site training for an additional 198,000 US and allied Air Force personnel at bases throughout the free world.

ATC's Undergraduate Pilot Training Program (UPT) officially entered the supersonic flight era during fiscal year 1962. The new T-38 Talon was phased into the UPT program at Webb AFB, Tex., and student pilots began training in the twin-jet, Mach 1.2 aircraft in February. Webb thus became the first of ATC's eight UPT bases to conduct all its undergraduate pilot training using the T-37/T-38 aircraft combination.

Other UPT bases are still using the subsonic T-33 jet as the basic trainer; however, the T-38 will replace it at the remaining bases as it becomes available. The T-37 will continue to be used as the primary trainer.

UPT bases in addition to Webb are: Laredo, Laughlin, and Reese AFBs, Tex.; Craig AFB, Ala.; Moody AFB, Ga.; Vance AFB, Okla.; and Williams AFB, Ariz. About 1,300 students won their pilot wings at these bases last year.

All Undergraduate Navigator Training now is conducted at James Connally AFB, Tex. Harlingen AFB, Tex., was phased out of the program in June 1962. Many Connally graduates—1,240 won their wings last year—are assigned to SAC, TAC, and MATS. Some, however, remain in ATC and receive advanced navigator training at Mather AFB, Calif.

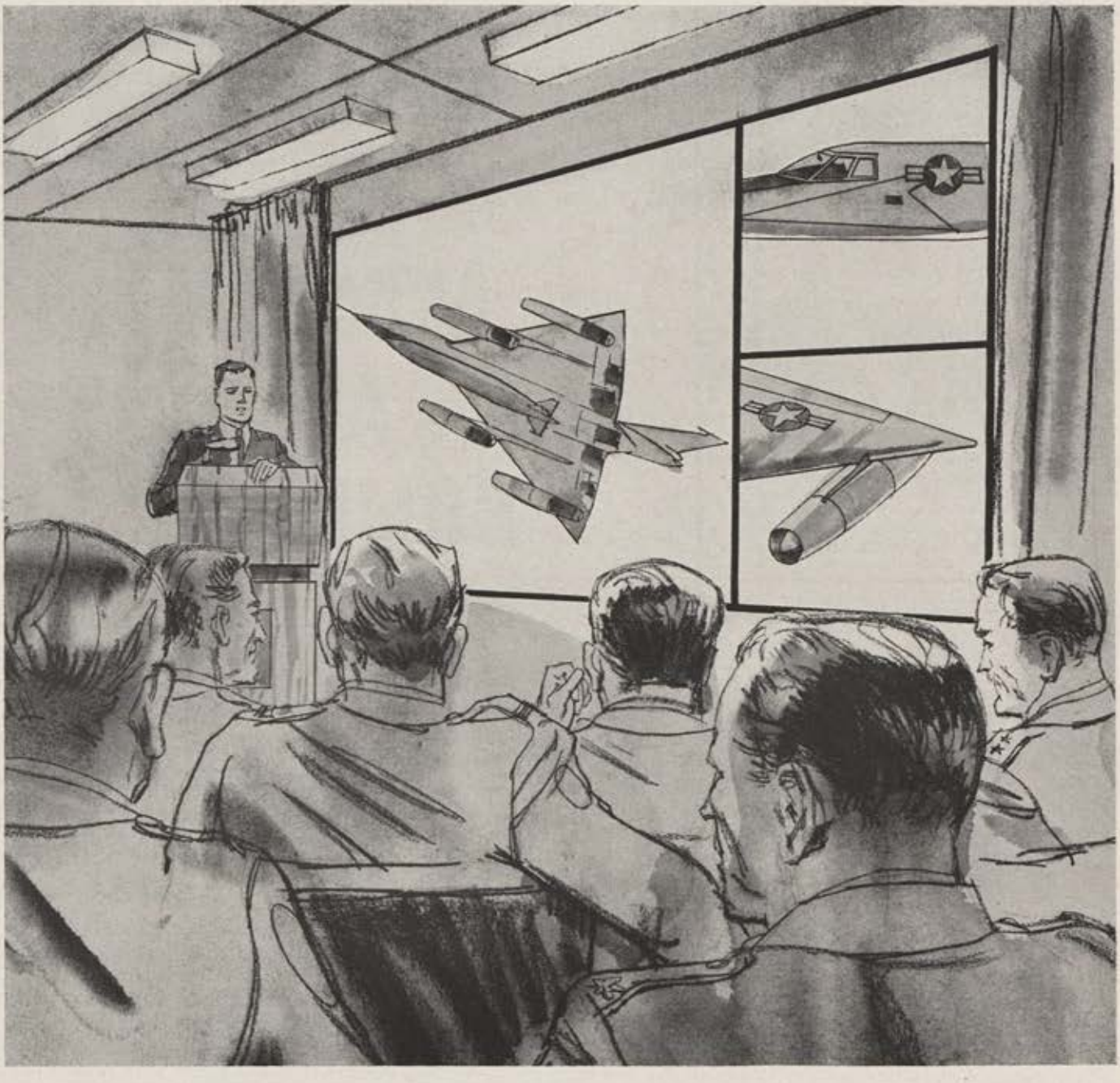
Helicopter and survival special training is conducted by ATC at Stead AFB, Nev., where students are trained in the H-19 and H-21 helicopters. They receive transition training, instrument training, navigation and operational training over mountainous terrain and in confined areas. The H-43B Huskie helicopter is used to train pilots and fire fighters in the operation of the Huskie and auxiliary equipment, including the 1,000-pound fire-suppression kit. Graduates enter base rescue units through the Air Force.

Survival and special training at Stead teaches students, under near actual conditions, the use of survival equipment, principles, techniques, and procedures needed to survive in any climatic condition. In addition counterinsurgency material is presented to acquaint the students with this subject. Students are generally aircrew members and return to their home bases after graduation.

Randolph AFB, Tex., in addition to being the home of ATC Headquarters, specializes in instructor training. Pilot instructor courses are conducted in the T-33, T-38, and T-39 aircraft. Emphasis is placed on motivating techniques, teaching methods, counseling, student/instructor relationship, and techniques of building student confidence. Graduates are assigned as instructor pilots within ATC.

The USAF Instrument Pilot Instructor School moved from James Connally to Randolph last year and two new aircraft—the T-38 and T-39—were introduced into the course. Graduates of this course return to their home bases throughout the Air Force as instrument instructors or supervisors.

Thus ATC, during the past year, continued to improve its training techniques in various areas to better "Prepare the Man" for the Aerospace Force.—END



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T-11

Named Commander, AAC, in July 1961, Maj. Gen. Wendell W. Bowman, was one of the Air Force communications and navigational-aid pioneers during World War II and was cited for his contributions to a then-infant art. Since the war, he has served in a number of communications and air defense posts in the US, among them that of Commander, Central Air Defense Force.

In the supersonic—and space age, the defense of the North American continent is even more significantly connected with defense of our forty-ninth state to the north, Alaska, where we border with the Soviet . . .

ALASKAN AIR COMMAND

WITH the changing of world events, the importance of the Air Force in Alaska significantly increased during the past year.

The state of Alaska is a steppingstone to the Far East as well as a key in the North American aerospace defense system. Occupying the prominent role in the system is the Alaskan Air Command, headquartered at Elmendorf Air Force Base, near Anchorage.

The command's aircraft-control-and-warning sites are located from above the Arctic Circle to the outer fringes of the Aleutian Chain. Coupled with the F-102 fighter-interceptor aircraft, they form a formidable barrier to any enemy intent on approaching North America from this point.

Since assuming command of the air arm of the unified Alaskan Command and the Alaskan NORAD Region in August 1961, Maj. Gen. Wendell W. Bowman has been employing "Operation Close Look" within the AAC.

Some units, like the 5070th Air Defense Wing, were discontinued while others, like the 5040th Consolidated Aircraft Maintenance Group, were streamlined and placed directly under the operational control of the AAC's headquarters.

But whatever the changes, all have succeeded in giving General Bowman a closer-knit command which today generates greater effective personnel management, while providing America with the protection that it needs.

During the year, one AAC station was closed—Ice Island Bravo, a floating weather base. Since the late summer of 1961, it had been fastened to a land shelf some ninety-five miles from Point Barrow, thus losing its value to the Air Force as a research center. It was abandoned in September 1961.

In an interservice shift, the oldest Air Force Hospital in Alaska, the 5060th, located at Fort Wainwright, was transferred to the Army's control on July 1, 1962.

But the most significant changes in the Air Force organization in Alaska were in the communications area.

Foremost of these was the announcement of the transfer of the sixty-two-year-old Alaska Communications System from the Army's Signal Corps to the Air Force for operation by the Alaska Communications Region located at Elmendorf. The change was made effective July 1, 1962.

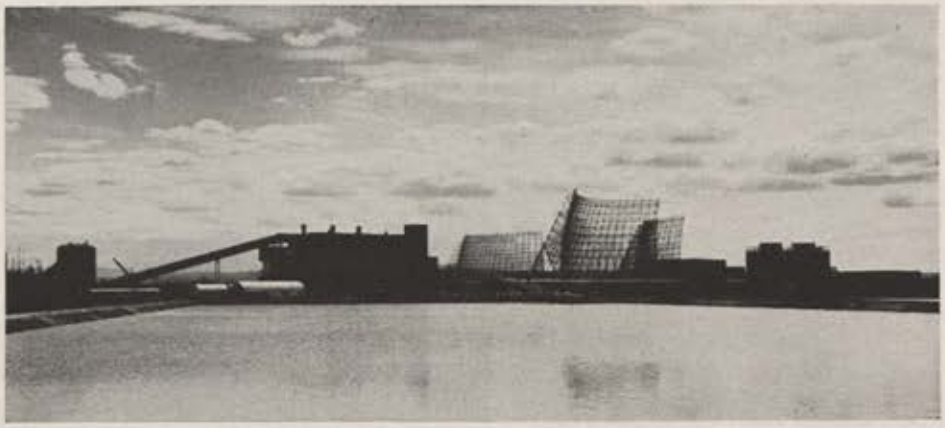
The defense posture of AAC was strengthened in another communications area when the first military direct-dialing system was put into effect by the Alaska Communications Region in March of this year. The new system now permits AC&W site commanders to dial directly to their headquarters, as well as furnishing immediate communications to the sites from the AAC commander and members of his staff.

Strike Command called its 1962 winter exercise in Alaska "Operation Great Bear," but, though the name was different, the mission had the same definition as past ones: to train America's fighting men in cold-weather tactics.

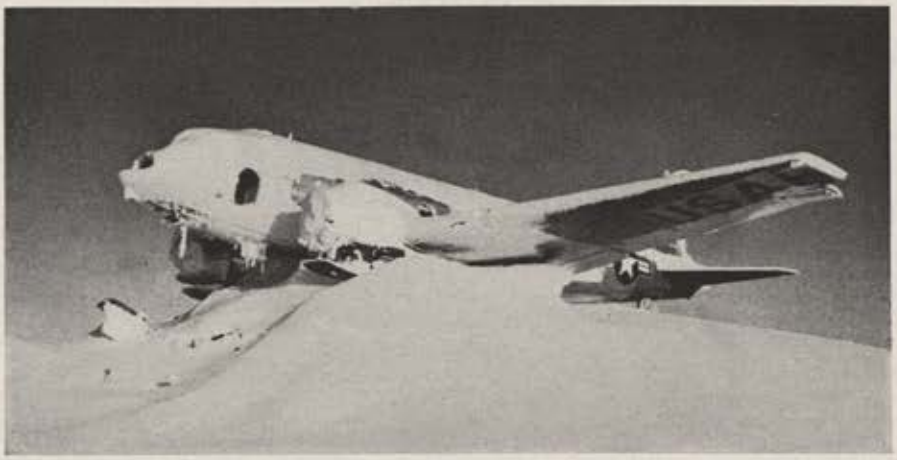
Air Force Reserve, Air National Guard and Military Air Transport Service units from the South 48 again were the supporting cast as they airlifted men and equipment to and from the exercise area with AAC's Elmendorf AFB serving as their base of operation.

There were many other exercises during the year. The Tactical Air Command's Composite Air Strike Force found AAC country apt for its cold-weather training, and they used it to their best advantage.

Eielson AFB, near Fairbanks, AAC's other main base, continued to serve as a launching platform for the Strategic Air Command's northern strike force, giving the B-47 bombers a geographical advantage not available anywhere else in America.



Key link in NORAD's defense system is the Clear, Alaska, Ballistic Missile Early Warning System "electronic fence" installation, consisting of three antennas that take up more space than a football field. BMEWS and other aerospace defense operations in Alaska underscore Alaskan Air Command's vital cold-war importance.



Lonely, eerie sentinel symbolic of the far-flung operations in the Alaskan north is this derelict C-47, left as frozen artifact in the deep freeze after it had crashed onto the Ice Island Bravo weather station base. The Alaskan Air Command has since abandoned the island, but the metal mastodon stands guard, cold and mute.

SAC's importance as a tenant organization at Eielson was emphasized when, in July 1962, it was revealed that Reflex Action Force and its support group were to be reorganized into a strategic wing and it would get a permanent commander, the first in several years.

Many other major Air Force commands found Alaska suitable for some of their activities with the AAC providing them with all the support they needed.

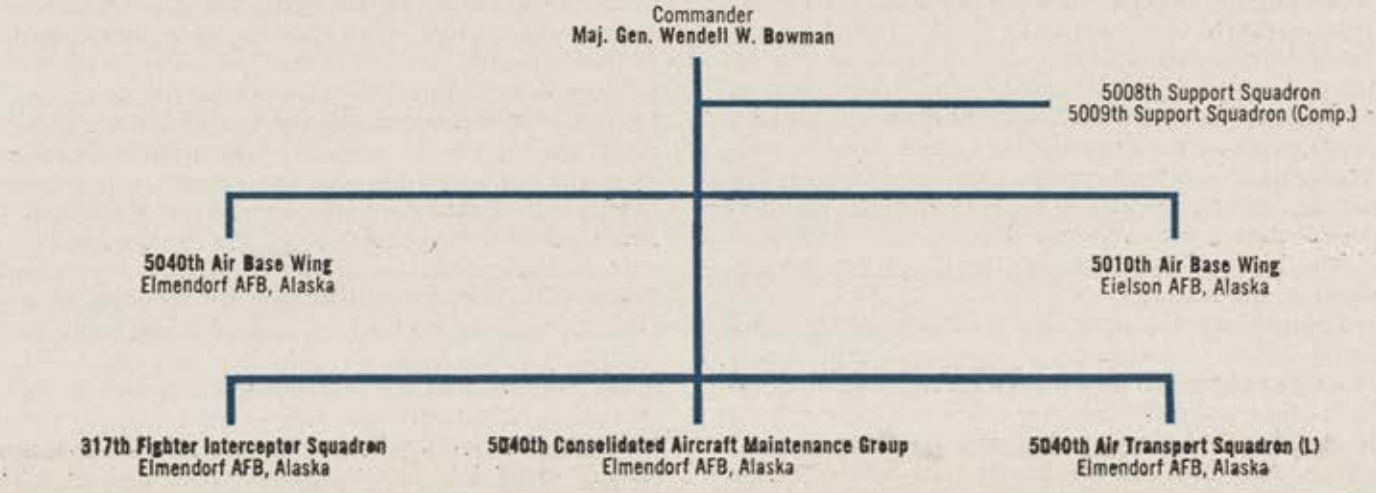
The Air Force Systems Command, for example, has the Aeromedical Laboratory at Fort Wainwright and also works with AAC's Arctic Survival School.

One of the main links in the North American Air Defense Command's aerospace defense system is the Alaskan Ballistic Missile Early Warning System site located at Clear, one of three such sites around the world. This clearly places Alaska and the Alaskan Air Command in the missile age.

Today, AAC's elaborate and widespread warning system is there in hopes that it will never have to be used. But to anyone who is thinking of testing their ability, the men of the Alaskan Air Command send out the word in advance: "We're ready."—End

ALASKAN AIR COMMAND

Headquarters, Elmendorf AFB, Alaska



Maj. Gen. Leland S. Stranathan assumed command of CAIRC in 1959. A veteran airman who contributed significantly to gunnery technique development in World War II and also served in the Pacific, he has held a number of important assignments in training and developmental fields since, including that of Director, Development Planning, Hq. USAF.

Our increasingly important commitments to and stake in Latin America underscore the operations of the Caribbean Air Command, a vital center of military planning and coordination for hemispheric defense . . .

CARIBBEAN AIR COMMAND

THE Caribbean Air Command's mission in Latin America is performed through detachments located in sixteen of the twenty republics, and through the USAF School for Latin America at Albrook AFB, Canal Zone, which provides training in technical air force subjects to officers and airmen of all of the Latin American republics. The USAF Missions are located in Argentina, Uruguay, Paraguay, Chile, Bolivia, Peru, Ecuador, Colombia, Venezuela, Nicaragua, Guatemala, Honduras, El Salvador, and Haiti. An Air Force Section of the Joint Brazil-United States Military Commission is located in Rio de Janeiro, Brazil, and an Air Force Section of a Military Assistance Advisory Group is stationed in the Dominican Republic.

The technical training offered to Latin Americans at Albrook AFB, now organized at the USAF School for Latin America, is a continuation of a program which started in March 1943. The school's curriculum is based on the training needs of the air forces it supports as determined by the Chiefs of the USAF Missions. The five-month courses are based on the standard courses offered to US airmen by the Air Training Command but adapted to Latin American needs and offered in Spanish by bilingual USAF instructors. In addition to the formal training, the USAF School for Latin America has developed a varied social, educational, and recreational program designed to overcome national differences and to develop attitudes of Inter-Americanism and Western Hemispheric solidarity. Friendship and understanding are important by-products of the school.

The primary objective of the Caribbean Air Command is that of assisting and advising the air forces of Latin America so they can attain that degree of effectiveness and self-sufficiency which will permit them to perform the missions assigned by their national governments and assist in the over-all defense of the Western Hemisphere if that need should arise. The USAF Mission personnel earn the respect and confidence of their hosts for the US Air Force and for the United States through careful performance of their assigned duties in behalf of the host government, through a sincere desire to assist the host air force in arriving at the same level of technical proficiency exhibited by the US Air Force, and through a willingness to cooperate fully with the host air force.

With the close identification between military and commercial aviation existing in many of the Latin American republics, the USAF efforts in Latin America contribute directly and effectively to the development and improvement of the economic strength of the host country. The development of modern airfields, communications systems, and the training in technical aviation specialties enrich countries dependent upon air transportation in the absence of adequate highways and railways.

In addition to those activities directly in support of the Latin American air forces, the Caribbean Air Command is charged with a number of other missions in the promotion of the US Air Force's interests and policies within the southern continent. As a component of a unified command, the Caribbean Air Command participated in an annual joint training exercise to test defense measures for the Panama Canal and other US installations in the Caribbean. Frequently, Army and Air Force elements of Latin America participate in the exercise with CONUS-based Army/Air Force units. The responsibility for the operation of an air rescue service for the land mass of South and Central America has been vested in the command and is being implemented by detachments attached to the command. Other units attached to the command provide weather information, communications services, aircraft chart and information services, and photo-

Survival training is serious business at CAIRC, as represented by such activities as this Air Commando exercise at Albrook AFB Tropic Survival School.

Aerospace power is increasingly significant in Latin America, and US Air Force Mission system personnel throughout Central and South America work in close harmony with airmen in host countries in mutual cooperation efforts to develop local aerospace capabilities through enhancement of technical, other skills.

Bilingual skills among the instructors at the US Air Force School for Latin America are vital to achievement of the cooperation-instruction mission. Here a USAF instructor who speaks Spanish fluently works with a student from Uruguay. Note school patch visible under right-hand collar of Uruguayan student's uniform.

Above, a Latin American student, left, gets snake-skinning, eating, lesson from USAF survival instructor. Snakes are eaten during survival exercises.

mapping services. The attached units perform important mission objectives for which the Caribbean Air Command has been made responsible.

Logistic support for the Missions, Air Attachés or other Air Force units in Latin America is provided by the 5700th Air Base Group at Albrook. The group also operates the Tropic Survival School which provides practical training for aircrews, both US and foreign, on survival techniques under tropical conditions. Because of the roughness of the terrain and the extensive jungle areas in Latin America and the relative scarcity of navigational aids and emergency landing strips, survival training has become an increasingly important activity. At the request of Latin American republics, the Albrook school has assisted in the establishment of similar schools in other countries.

Other than for the normal highlights following from the nature of the command's operations within Latin America, two important events occurred during the past year. As a solution to the increasing air traffic through the Canal Zone, Howard AFB, on the Pacific side of the Isthmus and west of the Panama Canal was reactivated. The longer runways at Howard AFB assure the command of a capability for servicing visiting aircraft more promptly and more safely.

For the first time, the USAF Medical Conference was held at Albrook in March 1962. The conference brought leading medical officers of the US Air Force and the command surgeons, and other prominent medical officers, of the Latin American air forces together to discuss mutual problems and medical progress in the areas of aeromedical services and tropical medicine.

Recent events and developments on the international scene have redirected the attention of many Americans toward Latin America. With the new emphasis on Latin America, new programs to strengthen the countries have been initiated by US government agencies, and existing programs have received new support and new objectives. The Caribbean Air Command with its more than twenty years of experience in working with Latin American air forces has shared in the renaissance of interest.—END

Maj. Gen. Kenneth P. Bergquist became Commander, AFCS, in February 1962. His prior assignment had been as Commander of the Electronic Systems Division of Air Force Systems Command. General Bergquist served in the Pacific during World War II, and he has been in a number of air defense posts and staff positions in Europe and the continental United States since the war's end.

Now in its second year of operations, the Air Force's sixteenth major command is pressing ahead with its vital mission—responsibility for all Air Force communication and navigational aids . . .

AIR FORCE COMMUNICATIONS SERVICE

PROVIDING the "Reins of Command"—this is one of the Air Forces's most simply stated yet one of its most important missions. A glance behind these words reveals a complex aerospace activity, one conducted by a major air command established slightly more than a year ago: the Air Force Communications Service (AFCS).

For this mission AFCS technicians "wire" the world, through 558 units at 500 locations in forty-six of the United States, in thirty-five other countries, and at way stations between. This vast operation is commanded by Maj. Gen. Kenneth P. Bergquist, with headquarters at Scott AFB, Ill.

AFCS operates and maintains aerospace communications in five distinct types of service—(1) On-Base Communications; (2) Long-Haul Communications as components of the Defense Communications System (DCS); (3) Flight Facilities; (4) Air Traffic Control; and (5) Emergency Mission Support—each a family of communications functions grouped according to systems or procedural similarity.

This command's five-part mission draws primarily from two highly technical Air Force skill groups, informally called Communicators and Air Traffic Controllers. Communicators operate and maintain air/ground communications, on-base and interbase wire cable, and radio and digital communications systems. Television, maintenance-expediter, and fire/crash communications facilities are also their charge.

The Air Traffic Controllers operate and maintain a worldwide system of 1,500 air traffic control facilities and electronic aids to aerial navigation. Constantly performing service evaluation of these facilities is AFCS's fleet of specially equipped T-33s and C-140A JetStars.

The command's current organizational structure has eleven direct-reporting subordinate headquarters of which two are designated "Areas"—comparable to numbered air forces in strength and responsibility—and seven are "Independent Regions"—similar in size and responsibility to air divisions.

The European-African-Middle Eastern Communications Area, commanded by Brig. Gen. J. Francis Taylor, Jr., from headquarters at Wiesbaden AB, Germany, includes subordinate United Kingdom, Central European, Mediterranean, and Spanish Regions.

With headquarters at Wheeler AFB, Hawaii, the Pacific Communications Area is commanded by Brig. Gen. James H. Weiner. Included in this organization are Far East and Southeast Asia Regions.

Independent regions are:

- **Alaskan Communications Region** at Elmendorf AFB, Alaska, which is commanded by Col. Harold L. Hughes.
- **Midwestern Communications Region,** Chanute AFB, Ill., Col. Harry J. Bullis.
- **North Atlantic Communications Region,** Westover AFB, Mass., Col. James T. McElhone.
- **Southeastern Communications Region,** Robins AFB, Ga., Col. Albert H. Snider.
- **Southwestern Communications Region,** Randolph AFB, Tex., Col. H. L. Gandy.
- **Western Communications Region,** Hamilton AFB, Calif., Col. Guy H. Rockey.
- **Continental Systems Region,** Tinker AFB, Okla., Col. Frank T. West.

In addition, AFCS is responsible for training four Air National Guard communications groups, with twenty-one squadrons; two mobile communications squadrons, containing nine subordinate flights; and one special squadron. These organizations are manned by some 6,000 Guardsmen.

This command also trains three Air Force Reserve mobile communications squadrons, each of which has

seven subordinate detachments. About 1,250 Reserve personnel are assigned to these units.

On July 1, 1962, AFCS marked a year of progress toward achieving the USAF goal of a single, unified organization to employ most efficiently the critical communications skills and resources in the service of the entire Air Force.

Phased organizational integration of the communications of the separate commands began with the July 1961 activation. At that time AFCS assumed communications responsibility for the Military Air Transport Service, Aeronautical Chart and Information Center, Air Force Accounting and Finance Center, and the Caribbean Air Command.

January 1962 brought the next realignment of communications operations facilities, as AFCS was assigned communications responsibilities for the Air Force Logistics Command, Systems Command, Alaskan Air Command, Air University, Pacific Air Forces, Air Training Command, and Air Force Academy.

On July 1, 1962, AFCS was assigned responsibility for operating Defense Communications System elements serving the United States Air Forces in Europe, Continental Air Command, and units of Security Service. The Alaskan Communications System, a Signal Corps organization that has provided telephone and telegraph service for both military and civilian users in the forty-ninth state for sixty-two years, was also transferred to the Air Force for operations.

Here are some representative events within each of AFCS's five mission elements.

In the field of Long Haul Communications—a re-

(Continued on following page)

AFCS controller on the job at Scott AFB, Ill., symbolizes worldwide Flight Facilities mission of the Air Force Communications Service. That C-140A JetStar reflected in the controller's glasses is a mockup, but his job is real, vital.

AIR FORCE COMMUNICATIONS SERVICE

Headquarters, Scott AFB, Ill.

Commander
Maj. Gen. Kenneth P. Bergquist

European-African-Middle Eastern Communications Area
Hq., Wiesbaden AB, Germany
Brig. Gen. J. Francis Taylor, Jr., Commander

Pacific Communications Area
Hq., Wheeler AFB, Hawaii
Brig. Gen. James H. Weiner, Commander

North Atlantic Communications Region
Hq., Westover AFB, Mass.

Southeastern Communications Region
Hq., Robins AFB, Ga.

Southwestern Communications Region
Hq., Randolph AFB, Tex.

Midwestern Communications Region
Hq., Chanute AFB, Ill.

Alaskan Communications Region
Hq., Elmendorf AFB, Alaska

Continental Systems Region
Hq., Tinker AFB, Okla.

Western Communications Region
Hq., Hamilton AFB, Calif.

3d Mobile Communications Squadron
Tinker AFB, Okla.

Hq., 1801st Communications Group
(Office of Commercial Communications Management)
Scott AFB, Ill.

1865th Facility Checking Flight
Tinker AFB, Okla.

1800th Support Squadron
Scott AFB, Ill.

1866th Facility Checking Flight
(Service Evaluation)
Scott AFB, Ill.

Communications Service technician working on one of the more than 200 emergency operations handled by the new Air Force command during its first eventful year. This phase of the job involved adjustment of antenna position.

sponsibility of AFCS's Deputy Chief of Staff for Telecommunications, Col. John E. Frizen—installation continued on a high-speed, computerized, data-communications network, capable of instantaneous transmission, reception, editing, and reconversion of any kind of digitalized information from punch-cards and perforated and magnetic tape. As one of the newest components of the Defense Communications System AF DATACOM (Phase I-COMLOGNET), will link 450 Air Force, industry, and other Department of Defense activities into a network system for the high-speed exchange of information.

The "Talking Birds" took to the air in this first year. These are complete communications packages operated and maintained by AFCS personnel. They are designed to be transported in easily adapted C-130 aircraft of the commands to which the airplanes are assigned. Two of the "Talking Birds" are on continuous standby in the United States, two are in Europe, and two in the Pacific. From their home bases, task organizations can quickly deploy to any geographic area to provide on-site command-post communications for contingency operations.

Base Communications, also within the Telecommunications mission, was streamlined by consolidation of on-station communications facilities. This development gathered telephone, crash/alarm and alert systems, and air-police security and maintenance-expediter networks under single management. Improved efficiency was gained by standardization, and greater economy achieved by eliminating Base Communications Squadrons, with a saving of administrative, maintenance, and operational personnel space.

Flight Facilities, and Air Traffic Control—under the Deputy Chief of Staff for Flight Facilities, Col. Robert C. Sears—recorded numerous advances. Among the more prominent was continued development of the C-140A JetStar, five of which are scheduled for delivery to AFCS within the next few months to satisfy, primarily, Air Force requirements for evaluation of mobile navigational aids deployed for contingency operations. The speed, range, and special capabilities of this all-weather, twin-jet, when deployed, will enable it to reach any contingency area in ten hours.

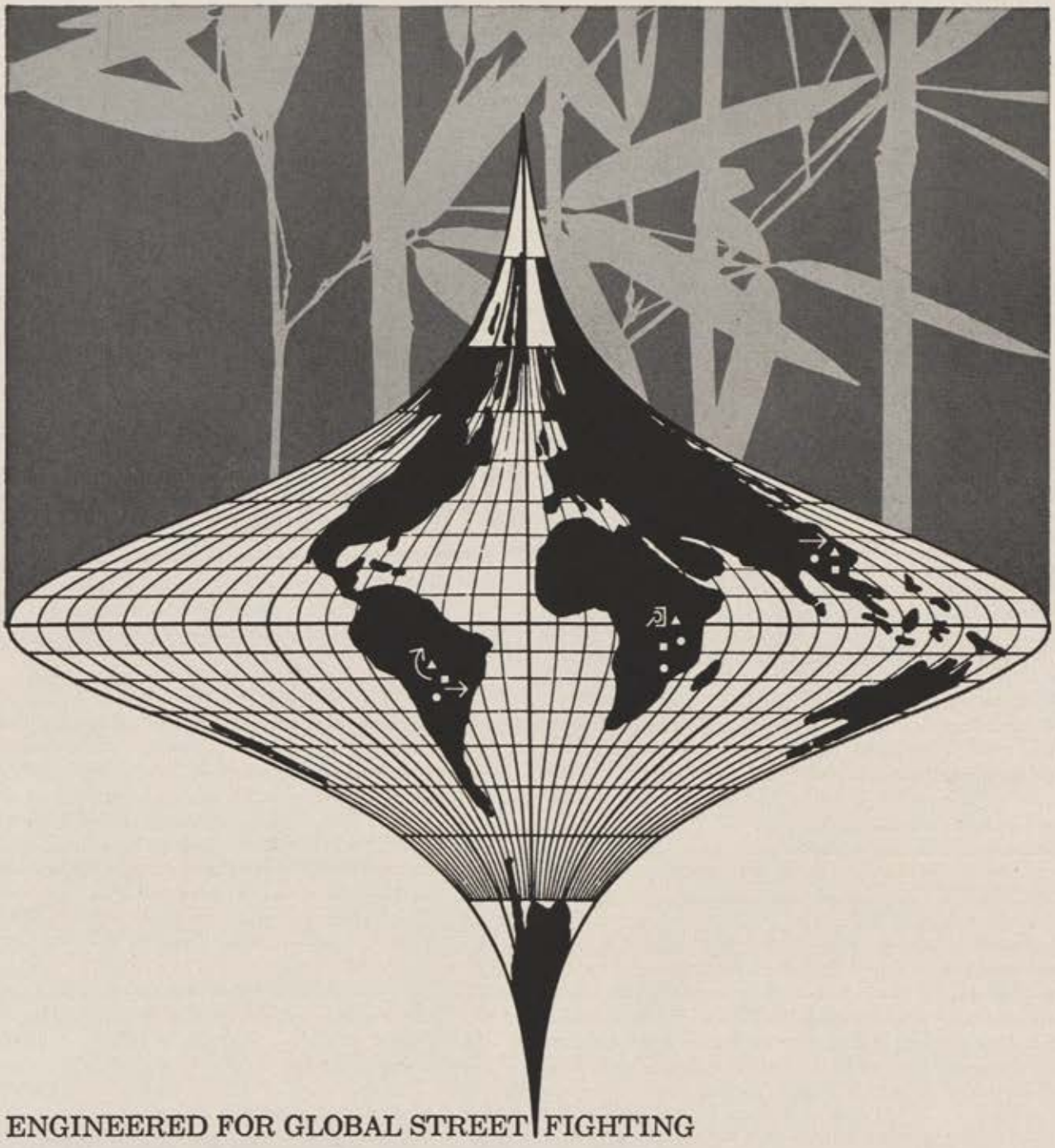
Still in the realm of Air Traffic Control and Flight Facilities, during AFCS's first year the Air Traffic Controllers are credited with "saves" of aircraft, worth about $98.5 million, and bringing to safety their 339 aircrew members. This figure is approximately four times the annual salaries of all active-duty Air Force Controllers.

Emergency Mission Support—a responsibility of the Deputy Chief of Staff for Objectives, Col. Harry A. French—applied the most advanced techniques of mobile communications operations to some 195 deployments, with communications support for Project Mercury, United Nations operations in the Republic of Congo, the Air Force counterinsurgency training mission in Southeast Asia, and Air Force civil assistance following natural disaster, such as Hurricane Carla in the Caribbean, to list a few.

Another important development was AFCS's appointment by the Department of Defense to manage all commercial leased communications for the Army, Navy, and Defense Telephone Service, as well as the Air Force under the over-all management of the Defense Communications Agency. As the responsible agency, the Office of Commercial Communications Management, leased and administered for DoD $180 million this year in privately owned communications services and equipment, giving AFCS what might be called the world's largest telephone bill. The chief of OCCM is Col. Cecil V. Broadaway.

Others in the AFCS staff at Scott are Maj. Gen. Donald P. Graul, Deputy Commander; Brig. Gen. William T. Smith, Chief of Staff; Col. Byron V. Pepitone, DCS/Personnel; Col. Albert C. Windell, DCS/Comptroller; Col. William J. Worcester, DCS/Logistics; Col. Edison T. Weatherly, Inspector General; Col. Marvin J. Goodwin, Staff Judge Advocate; Lt. Col. Milton Frank, Director of Information; Lt. Col. Robert B. Alexander, Director of Administrative Services; and Maj. William C. Jenkins, Commander, 1800th Support Squadron.

Some 42,000 Communicators, Controllers, and support technicians make up AFCS's worldwide professional community who are "providing the reins of command."—END



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MODICON* V – ready to move on instant notice to anywhere in the world to counter aggression on enemy-selected ground and under enemy-prescribed conditions. Designed to assure mastery of the air situation with command and control of aerial operations and close support of ground forces. Engineered for first day capability, mixed weapons control, modular dispersibility. Compactly packaged for global mobility in air-transportable shelters suitable for helicopter and vehicular operations. Fully researched and developed for rapid integration into special air warfare units./Engineers and scientists qualified to assume important assignments in advanced data handling and display systems will find a broad spectrum of challenging opportunities at Litton Systems. Complete information on openings may be obtained by submitting resume to Professional Employment Manager, 6700 Eton Avenue, Canoga Park, California. An Equal Opportunity Employer. *MOdular DIspersed CONtrol

LITTON SYSTEMS, INC./DATA SYSTEMS DIVISION A Division of Litton Industries

Lt. Gen. Troup Miller, Jr., became Commander, AU, in August 1961 after having served as Vice Commander. A flyer since 1931, the General served in the Pacific during World War II, later in materiel assignments. Prior to service as Vice Commander, AU, he was Commander of the Arnold Engineering Center, Tullahoma, Tenn., now an element of AF Systems Command.

Steeped in aerospace scholarship and cognizant of its significant role in the development of Air Force leadership and doctrine, the Air University continues its outstanding record of achievement . . .

THE AIR UNIVERSITY

EDUCATION, doctrine, research – in developing these essential fields, Air University continued to operate as the intellectual core of the USAF. Fiscal year 1962 brought changes in top personnel, expanded and amended educational programs, improved instructional facilities, and an accelerated aerospace briefing program.

When AU began operation in 1946, its founders discarded outmoded doctrine and stressed academic freedom as a cardinal educational principle. Geared to meet aerospace challenges, present programs reflect this initial academic philosophy as they pursue the command's mission: to prepare officers for command and staff duties; provide specified scientific and technical education; administer the AFROTC program.

Lt. Gen. Troup Miller, Jr., assumed command of AU in August 1961. The following month, Maj. Gen. C. H. Pottenger became Vice Commander.

In June, 164 students completed AU's senior school, the Air War College. The Associate AWC program, whereby senior officers who cannot attend the resident course obtain AWC diplomas, expanded to twenty-five seminars at selected bases in the United States and overseas.

A total of 545 officers graduated at AU's intermediate school, Air Command and Staff College; and 165 students completed the school's annual Reserve Officer Orientation Course. ACSC finalized plans for conducting in early FY '63 the initial class of a two-week AF Counterinsurgency Course for 250 students from all major commands.

Three Squadron Officer School classes produced 2,700 graduates during fiscal year 1962. This junior professional school redesigned its curriculum to direct major emphasis toward aerospace power and leadership.

Air University Headquarters, Maxwell AFB, Ala., font of past and present aerospace power doctrine, and school for future leadership of the Air Force.

Not only US Air Force officers, but officers from other services and from allied countries benefit from the instruction and research facilities at the Air University, all in an academic atmosphere that encourages creativity.

The AF Institute of Technology recorded a total graduate output of 2,792—475 from its resident courses and 2,317 from its civilian institutions program. The institute doubled the quota of its Airman Education and Commissioning Program.

Some 1,600 individuals completed the various courses offered by the Warfare Systems School to increase the technical knowledge of AF officers in warfare systems. In late 1961, WSS conducted the pilot class of its Aerospace Operations Course.

Academic Instructor and Allied Officer School continued its dynamic "people-to-people" approach in its allied officer program. AU officers and local civilians sponsored individual allied students to give them an "at-home" feeling in the military-civilian community. During FY '62, AIAOS had 1,078 graduates in its various courses.

Extension Course Institute reported an average enrollment of 320,000 correspondence students. And the AFROTC program flourished with 108,000 cadets enrolled in 187 detachments.

New equipment afforded greatly expanded closed-circuit television facilities on AU's main campus, Maxwell AFB, Ala. The new service allowed three programs to run simultaneously to three schools.

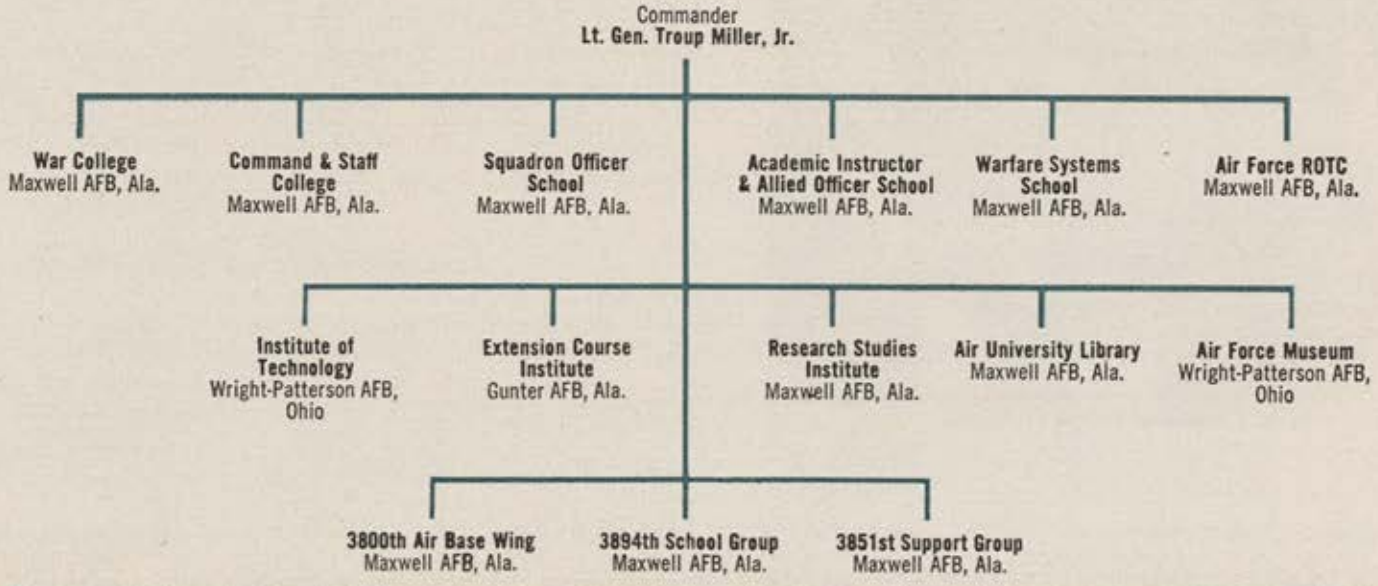
AU aerospace briefing teams, speaking to forty groups throughout the nation, brought the "story of space" to audiences totaling over 15,000.

George Washington University established a resident center at AU to enable AWC students and selected AU faculty members to earn a master's or a bachelor's degree. A similar program is planned for ACSC.

Air University's job, simply stated, is to produce key officers to guide the USAF in this dawning age of space. It follows that this educational, doctrinal, and research center will continue its important role in assuring that America maintains leadership of the free world—both in strength and in conviction.—END

AIR UNIVERSITY

Headquarters, Maxwell AFB, Ala.



Lt. Gen. Edward J. Timberlake assumed command of CONAC July 1, 1962. His immediately prior posts were as Vice Commander, USAFE, and Deputy Chief of Staff, Personnel, Hq. USAF. He served in Europe in World War II and was a planner of the Ploesti raids. He went with the Fifth Air Force to Korea in 1950 and later served as the Commander of the Fifth.

"Ready now" and post-attack recovery are two of the vital missions of the Continental Air Command, and much progress has been made in the past year in these support-of-USAF roles . . .

CONTINENTAL AIR COMMAND

Pararescue, a skill that has saved many precious lives in air operations, is a proud element of Continental Air Command's spectrum of capability, as symbolized by this member of one of CONAC's Reserve Air Rescue Squadrons.

THE Continental Air Command concept of a lean and hard "Ready-Now" Air Force Reserve has been spotlighted as a firmly established fact during the past year.

Two C-124 wings called to active duty in October 1961 moved smoothly into the Regular Air Force structure, transitioned into their new C-124 aircraft and performed airlift missions for the Tactical Air Command. Reserve Recovery organizations proved their worth in "no-notice" training exercises in cooperation with various major commands. Reserve troop carrier wings conducted impressive airlift and airdrop missions.

Providing logistical, budgetary, administrative, and personnel support for all Air Force Reserve units and individual trainees is CONAC's primary mission. It also has the prime responsibility for support of dispersal aircraft and reconstitution of the Air Force in event of attack on the United States.

The wings recalled in the Berlin crisis and scheduled to return to Reserve status in August were the 435th at Homestead AFB, Fla., and the 442d at Richards-Gebaur AFB, Mo., along with their five squadrons—the 77th, Donaldson AFB, S. C.; 78th, Barksdale AFB, La.; 303d and 304th, Richards-Gebaur; and 305th, Tinker AFB, Okla.

The thirteen other wings in the CONAC organization are located at widely separated sites throughout the nation. They have been involved in a number of missions in support of the active establishment and have participated extensively in airdrop and airlift training exercises, working primarily with Tactical Air Command and the Army. For instance, nearly 100 CONAC Reserve troop carrier aircraft and crews were involved in the giant joint Air Force-Army Exercise Banyan Tree III, conducted in Panama during the

early part of 1962. Reserve C-119s and C-123s dropped and air-landed tons of equipment and flew a large number of support missions in that massive operation.

The Air Force Reserve Recovery program has also been active since it went into full-scale operation July 1, 1961, with eighty-two recovery groups and 200 squadrons. Under this program, Reservists at widely dispersed, predetermined airstrip locations will stand ready to give combat aircraft a choice of alternate landing fields if their home bases should be knocked out by an aggressor. Recovery units are training to prepare these alternate airfields, guide aircraft to these safe havens, provide necessary services, and get the aircraft airborne again quickly. Recovery units will be able to provide refueling, communications, crash and rescue, medical, food, billeting, and security services. In recent months, there have been frequent exercises involving other command aircraft ranging from propeller-driven planes to the latest jets. These exercises, often on a "no-notice" basis, have proved that this new Reserve concept provides realistic pre-D-Day preparation of Reservists for a time when they would be most sorely needed.

There are many other types of CONAC Reserve organizations such as Aerial Port Squadrons, Air Rescue Squadrons, medical units, Air Terminal units, Navigation Squadrons, and others, as well as individual training facilities.

Supervision of the Reserve program is a vast operation, and another CONAC organization—the Air Reserve Records Center at Denver, Colo.—has the huge task of maintaining master records of about a half million Air Force Reservists. The Center is also responsible for all personnel actions affecting these records.

In addition to its Reserve mission, CONAC has a number of special missions such as advisory and liaison responsibilities for the Civil Air Patrol, an Air Force auxiliary; coordination of Air Force plans in

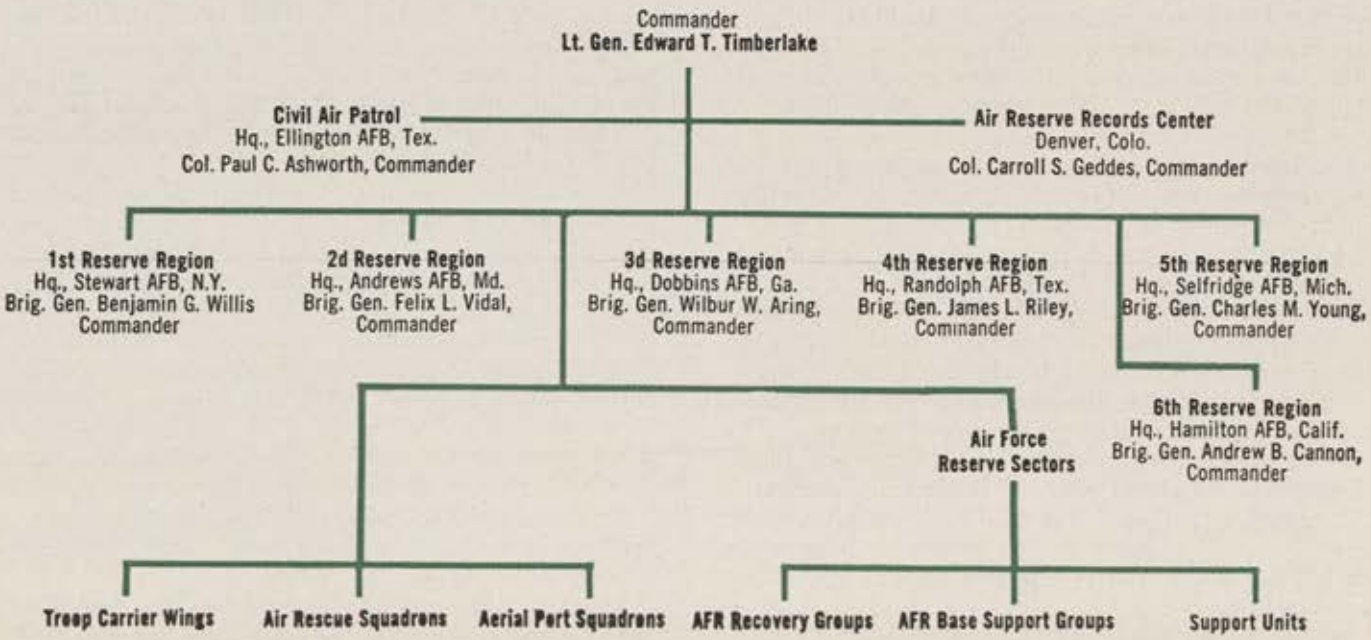
First-line aircraft get minor maintenance as part of the training of CONAC's Reserve Recovery organization.

domestic and civil emergencies; Air Force representation on Civil Defense Boards; Reserve recruiting for other commands; cooperation with the Army and Navy in basic plans for defense other than air defense; Air Force representation on State Reserve Facilities Boards; liaison with Selective Service; and liaison with the Boy Scout Explorer Program.

Organizationally, CONAC is divided into six numbered Air Reserve Regions, geographically corresponding with numbered Army areas.

Lt. Gen. Edward J. Timberlake assumed command of CONAC on July 1, 1962, replacing Lt. Gen. Gordon A. Blake, who became Director of the National Security Agency. General Timberlake, a graduate of West Point, came to CONAC after a tour of duty as Deputy Chief of Staff for Personnel, Hq. USAF.—END

CONTINENTAL AIR COMMAND
Headquarters, Robins AFB, Ga.



Maj. Gen. Brooke E. Allen has, since July 1959, commanded the Headquarters Command. A wartime bomber pilot, he took off in a B-17 during the Japanese attack on Pearl Harbor, logged more than 350 combat hours in the Pacific. In the '50s, he served almost six years in MATS and before his present assignment headed NATO's 6th Allied Tactical AF in Turkey.

Though all flying activity has been curtailed at historic Bolling AFB, the base remains as the center of one of the most diversified missions in the Air Force . . .

THE HEADQUARTERS COMMAND

HEADQUARTERS Command, USAF, has a unique and broad mission . . . worldwide support. Its primary mission is to support Hq. USAF, its special activities and field extensions throughout the world. Command headquarters are at historic Bolling AFB, Washington, D. C., the home of Headquarters Command's 1100th Air Base Wing. Another command wing, the 1001st Air Base Wing, operates nearby Andrews AFB, Md., while the third wing, the 1020th USAF Special Activities Wing, is located at Fort Myer, Va. This latter wing supports USAF missions, MAAGs, Air Attachés, and other special missions throughout the world.

In addition to the command's mission of providing logistic and administrative support, disbursing services for Hq. USAF and other assigned Air Force units in the Washington area whose organizational structure does not permit self-support, other aspects of its mission are:

- To provide aircraft for and supervise Air Force administrative and combat-readiness flying for the Washington area. This includes all Headquarters USAF helicopter operations;
- To organize, train, and maintain a Ceremonial Unit and Headquarters Command Band, which represent the Air Force at public ceremonies within the area of the nation's capital. The command also operates the USAF Bandsmen's School in support of USAF's music program. In addition, the command directly supports the USAF Band, comprising the USAF Symphony Orchestra, the Concert Band, the USAF Drum and Bugle Corps, "The Airmen of Note," "The Singing Sergeants," "The Strolling Strings," and the USAF Bagpipe Band;
- To act as "housekeeper" for airmen on duty within the Military District of Washington, providing housing and dining facilities;
- To operate the USAF Hospital at Andrews AFB, one of the major military hospitals in the area. It was recently redesignated "The Malcolm Grow USAF Clinical Center" named in honor of the late Maj. Gen. M. C. Grow, USAF Surgeon General from October 1947 until November 1949.

Two of the major events of the year were the observance of the forty-fourth anniversary of Bolling Air Force Base and the movement of all fixed-wing flying operations from Bolling AFB to Andrews.

Twelve of Bolling's former base commanders returned for the July 1, 1962, anniversary observance as honored guests. The day's events included: The present base commander laying wreaths on the graves of five former commanders who are buried in Arlington National Cemetery; a review on the flight line that attracted over 17,000 spectators; the takeoff of the last aircraft—terminating forty-four years of aviation history; and a formal anniversary dinner that evening at the Bolling Officers' Open Mess that was attended by aviation pioneers, Air Staff officers, and congressional and distinguished civic leaders.

All nonflying activities at Bolling will remain and future plans for the base will vastly increase the administrative mission and importance of both the command and the base. The total hours of flying at Bolling in 1961 were 59,244; at Andrews AFB, 68,879. Headquarters Command's flying safety record in 1961 was .71 per 100,000 flying hours, an AF-wide record low. During 1961, Andrews AFB averaged over 320,000 flight operations. This made it one of the busiest airports in the country, and its operation will expand now that Bolling's aircraft have moved there.

On June 30, 1962, Bolling AFB was the scene of retirement ceremonies for the former USAF Vice Chief of Staff, Gen. Frederic H. Smith, Jr.

Andrews AFB is the home base for President Kennedy's aircraft as well as the aerial port of arrival and

departure for other distinguished US and foreign dignitaries who visit the nation's capital. Among the visitors this year were: President Sukarno of Indonesia, President Keita of Mali, President Aboud of Sudan, Prime Minister Nehru of India, President Kekkonen of Finland, Chancellor Adenauer of West Germany, King Ibn Saud of Saudi Arabia, President Goulart of Brazil, and Prime Minister Macmillan of the United Kingdom. Five days after his historic spaceflight and earth orbits, Lt. Col. John H. Glenn, Jr., was given a hero's welcome at Andrews.

As usual, the national observance of Armed Forces Day was held at Andrews AFB and there was a record attendance.

Maj. Gen. Brooke E. Allen is Commander, Headquarters Command, USAF, a post he has held since mid-1959. His immediate subordinates this year were Maj. Gen. James C. McGehee, Commander at Andrews; Col. Wilson R. Wood, Commander at Bolling; Col. Robert W. Elliott, Commander of the 1020th USAF Special Activities Wing, Fort Myer; Col. Richard D. Vitek, Commander of the 1100th Support Group; and Col. Archie A. Hoffman, Commander of the USAF Hospital at Andrews AFB.—END

Some of Bolling's past commanders gather for 44th anniversary celebration. From left: Martin Scanlon, Robert Walsh, Howard Davidson, William Ryan, Edmund Hill, Thomas Hastey, Robert Wimsatt, William Boyd, Burton Hovey, Henry Amen, Stoyte Ross, Edwin Miller, Wilson Wood.

Maj. Gen. Robert H. Warren, named Superintendent of the US Air Force Academy in July 1962, was instrumental in plans for the Academy as Military Executive to the late Secretary of the Air Force and Deputy Secretary of Defense Donald A. Quarles. A 1928 graduate of West Point, he commanded the Air Proving Ground Center before assuming his present duties.

The aerospace force of tomorrow will mirror today's achievements at the young, visionary, educationally advanced "School of the Sky" in the Colorado Rockies . . .

UNITED STATES AIR FORCE ACADEMY

THE United States Air Force Academy, the nation's newest service academy, graduated its fourth class on June 6, 1962, and, with the admission of the 750 members of the Class of 1966 later in June, reached its full authorized strength of 2,512 Cadets. The legislation establishing the Air Force Academy was signed by President Eisenhower on April 1, 1954, and the first class of 305 Cadets was sworn in a little more than one year later, on July 11, 1955, at Lowry AFB, Denver, Colo. On August 29, 1958, the Cadets began to move into their new quarters at the foot of the Rampart Range of the Rocky Mountains a few miles north of Colorado Springs.

There is abundant evidence that the Academy is accomplishing its mission of providing instruction, experience, and motivation to each Cadet so that he will graduate with the knowledge, character, and qualities of leadership essential to his progressive development as a career officer in the United States Air Force. More than 800 graduates of the Academy, now serving as Air Force officers, are living proof that their four years

(Continued on page 192)

THE AIR FORCE ASSOCIATION

Invites You to the World's Leading

AEROSPACE DISPLAY and AERIAL DEMONSTRATION

AEROSPACE PANORAMA

. . . a major feature of Air Force Association's National Convention, the largest aerospace power and defense meeting in the nation. Nearly 100,000 square feet of defense-equipment exhibits—from missiles and aircraft to transistors. This is a show that will increase your professional knowledge of the aerospace industries and the products and services these companies offer to the Air Force and national defense. The Aerospace Panorama will feature:

Missiles—Full-scale Titan, Minuteman, and Thor-Discoverer in front of the Convention Center. The Skybolt and Bullpup will be nearby.

Aircraft—Fighters from Tactical Air Command, including the F-100, RF-101, F-104, F-105, F-106, and the newest addition to the Air Force, the McDonnell F-110, for your close inspection.

Air Force—Will feature a new display known as "Scope 360" to tell the full story of the Air Force mission, its command structures, and their capabilities. An Air Force protocol display and an exhibit honoring the 15th Anniversary of the Department of the Air Force (September 18) will dominate the entrance to the exhibit hall. Fifteen major commands of the United States Air Force will also have exhibits showing the equipment and functions of each command . . . these alone are worthy of your professional interest . . . some of them dealing with space efforts.

You will be in good company—As a visitor to this show you will join top Air Force, government, education, and industry leaders in record numbers; 150 industry and business executives of the Defense Orientation Conference Association; distinguished physicians of the Aerospace Medical Association; educators from fifty nations and 300 more from throughout the country; Air Force Reservists and Air National Guardsmen; USAF Information Officers from all commands of the Air Force, worldwide; Outstanding Airmen from all Air Force commands; Air Force personnel from Nellis AFB and those participating in the USAF Tactical Air Demonstration; and top Cadets of the Air Force Academy.

PARTIAL LISTING OF PARTICIPANTS IN AFA CONVENTION EVENTS

ADAMS, Gen. Paul D.
Commander in Chief
United States Strike Command

BRIGGS, Lt. Gen. James E.
Commander
Air Training Command

BURCHINAL, Lt. Gen. David A.
Deputy Chief of Staff
Plans & Programs, USAF

CABELL, Gen. Charles P.
USAF (Ret.)

CANNON, Senator Howard W.
(D., Nev.) Member, Senate Armed Services Committee and Senate Committee on Aeronautical and Space Sciences

CONSIDINE, Bob
Syndicated Columnist

CUNNINGHAM, Brig. Gen. Joseph A.
Commander
Air Rescue Service

DERTHICK, Dr. Lawrence G.
Assistant Executive Secretary
National Education Association

DICKIESON, Dr. A. C.
Bell Laboratories, Inc.

FOSS, Joe
President, Air Force Association

GERHART, Gen. John K.
Commander in Chief
North American Air Defense Command

GOLDWATER, Senator Barry M.
(R., Ariz.) Member, Senate Armed Services Committee and Senate Appropriations Committee

HEBERT, Representative F. Edward
(D., La.) Member, House Armed Services Committee

HOPE, Bob
Radio, TV, Motion Picture Star

HUBBARD, Brig. Gen. Boyd, Jr.
Commander
4520th Combat Crew Training Wing, Tactical Air Command

KELLY, Lt. Gen. Joe W.
Commander
Military Air Transport Service

LANG, John A.
Deputy Assistant Air Force Secretary for Reserve and ROTC Affairs

LEE, Lt. Gen. Robert M.
Commander
Air Defense Command

LeMAY, Gen. Curtis E.
Chief of Staff
United States Air Force

LOVELACE, Dr. Randolph, II
Chairman, Board of Trustees
Aerospace Education Foundation

McCARTY, Maj. Gen. Chester E.
Assistant Chief of Staff for Reserve Forces, USAF

MILLER, Lt. Gen. Troup, Jr.
Commander
Air University

MONTGOMERY, John B.
National Director
Air Force Association

PETERSON, Brig. Gen. Norman L.
Commander
Air Weather Service

PIERCE, Dr. John R.
Bell Telephone Laboratories, Inc.

POWER, Gen. Thomas S.
Commander in Chief
Strategic Air Command

PRITCHARD, Brig. Gen. Gilbert L.
Commander
Special Air Warfare Center

REED, Dr. Wayne O.
Deputy Commissioner
US Office of Education

SCHRIEVER, Gen. Bernard A.
Commander
Air Force Systems Command

STILES, Dr. Lindley J.
Dean, College of Education
University of Wisconsin

STONE, Lt. Gen. William S.
Deputy Chief of Staff
Personnel, USAF

SWEENEY, Gen. Walter C., Jr.
Commander
Tactical Air Command

TIMBERLAKE, Lt. Gen. Edward J.
Commander
Continental Air Command

TOWNES, Dr. Charles H.
Provost
Massachusetts Institute of Technology

WARREN, Maj. Gen. Robert H.
Superintendent
United States Air Force Academy

WELSH, Dr. Edward C.
Executive Secretary
National Aeronautics and Space Council

WHITE, Maj. Robert M.
X-15 Test Pilot

WILSON, Maj. Gen. Winston P.
Deputy Chief
National Guard Bureau

ZUCKERT, Hon. Eugene M.
Secretary of the Air Force

AFA's 16th Annual Convention September 18-23, 1962 Las Vegas, Nevada

THE PROGRAM

• TUESDAY, SEPTEMBER 18

9:00 AM AFA Committee Meetings
10:00 AM Convention Registration Opens
8:00 PM AFA Directors' Meeting

• WEDNESDAY, SEPTEMBER 19

8:00 AM Convention Registration Opens
10:00 AM 1st AFA Business Session
1:30 PM 2d AFA Business Session
2:30 PM Industry Seminar; Space Communications and Electronics

• THURSDAY, SEPTEMBER 20

8:00 AM Convention Registration Opens
10:00 AM 3d AFA Business Session
10:00 AM Industry Seminar: Space Communications and Electronics
10:00 AM Guided Tours for Educators
12:30 PM Aerospace Luncheon
2:30 PM Symposium: Deterring General War
5:00 PM Air Force Anniversary Reception

• FRIDAY, SEPTEMBER 21

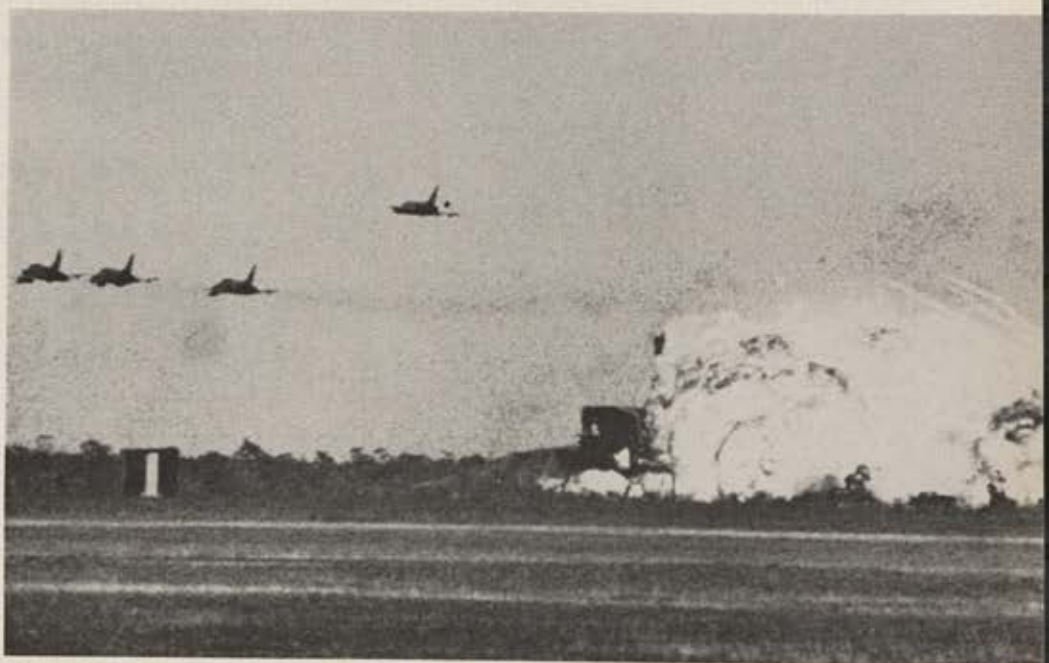
8:00 AM Aerospace Education Foundation Breakfast Meeting
10:00 AM Airport Dedication—Finish of Ricks Flight and CONAC Troop Carrier Event
10:00 AM Symposium: Limited War and Counterinsurgency
10:00 AM Aerospace Education Seminar
10:00 AM Space Briefing for Students
12:30 PM Air Force Anniversary Luncheon
2:30 PM Symposium: Space and National Security
2:30 PM Reserve Forces Seminar
2:30 PM Space Symposium for Women
5:00 PM Reception for AF Secretary and Chief of Staff
6:30 PM Air Force Honors Night

• SATURDAY, SEPTEMBER 22

10:00 AM USAF Tactical Air Demonstration
12:00 N Panorama Open to Public
3:00 PM AFA Directors' Meeting

• SUNDAY, SEPTEMBER 23

12:00 N Panorama Open to Public



One of the highlights of AFA's Las Vegas Convention in September will be a tactical airpower demonstration at Indian Springs AFB. Delegates will see scenes like this shot of TAC F-100s sweeping away after scoring direct hits with napalm.

at the Academy were a very worthwhile investment in the present and future aerospace development of the nation.

A new Superintendent, Maj. Gen. Robert H. Warren, reported for duty this summer from his former position of Commander, Air Proving Ground Center. He succeeded Maj. Gen. William S. Stone, who has been promoted to lieutenant general and reassigned as Air Force Deputy Chief of Staff, Personnel.

Two new structures were virtually completed at the Academy during the past year. They are the seventeen-spired Academy Chapel and Falcon stadium. The unique Chapel has been so designed that it is possible to conduct Protestant, Catholic, and Jewish services simultaneously. The stadium, with a seating capacity of 40,000 persons, is being constructed with private funds secured through the efforts of the Air Force Academy Foundation.

Vice President Lyndon B. Johnson delivered the commencement address at the June 1962 graduation ceremonies, which saw 297 members of the Class of 1962 receive degrees of bachelor of science and commissions as officers in the armed services. A total of 290 of the graduates accepted commissions in the United States Air Force, three elected to receive commissions in the Navy, three in the Marine Corps, and one in the Army.

The Academy continued to maintain its position very near the top among all of the nation's institutions of higher learning. Two members of the Class of 1962 were selected as Rhodes Scholars and are entering Oxford University this fall. The largest group, 254, entered Air Force pilot training, seventeen are attending graduate schools under the Air Force Institute of Technology program, fifteen entered Air Force technical schools, one went to navigator training, and one is attending medical school.

The United States Air Force Academy Preparatory School was established on the Academy campus in September of 1961. Two hundred students were admitted to the first session, and of this number 144 graduated in June 1962. Ninety-nine secured appointments to the Air Force Academy and are members of the Class of 1966. Two were named to the US Naval Academy, two were appointed to the Merchant Marine Academy, and three to naval ROTC units.

The Academy has been successful in lowering the attrition rate of its fourth class, the Class of 1965 having a rate of only fifteen percent as compared with twenty-six percent in the Class of 1964.—END

Maj. Gen. Paul W. Scheidecker took command of AFAFC in 1960 after four years as Air Defense Command Comptroller. A graduate of West Point, he served in the Army until 1948, switched to USAF on completing Harvard Business School, later attended Air War College. His son, Paul, Jr., is in the Air Force; a daughter, Lynn, is married to an Air Force officer.

With total assets of more than $82.7 billion, today's Air Force is big business, indeed. The job of overseeing the finances of this global aerospace force falls to . . .

AIR FORCE ACCOUNTING AND FINANCE CENTER

TODAY'S modern aerospace Air Force, with total assets of more that $82.7 billion, is big business. It is the Air Force Accounting and Finance Center's primary responsibility to furnish Hq. USAF with valid, timely, and easy-to-understand financial data. In addition to this responsibility, AFAFC performs other centralized accounting and finance operations for the Air Force, such as:

Summarizing data received from more than 560 field offices in forty-four countries and possessions; making financial status reports to many different agencies of our government—including the Congress, Bureau of the Budget, General Accounting Office, Department of Defense, Civil Service Commission, Army, and Navy.

AFAFC's mission has considerable military, eco-

(*Continued on page 195*)

To the Air Force Association Convention – September 18-23

FLY TWA to LAS VEGAS

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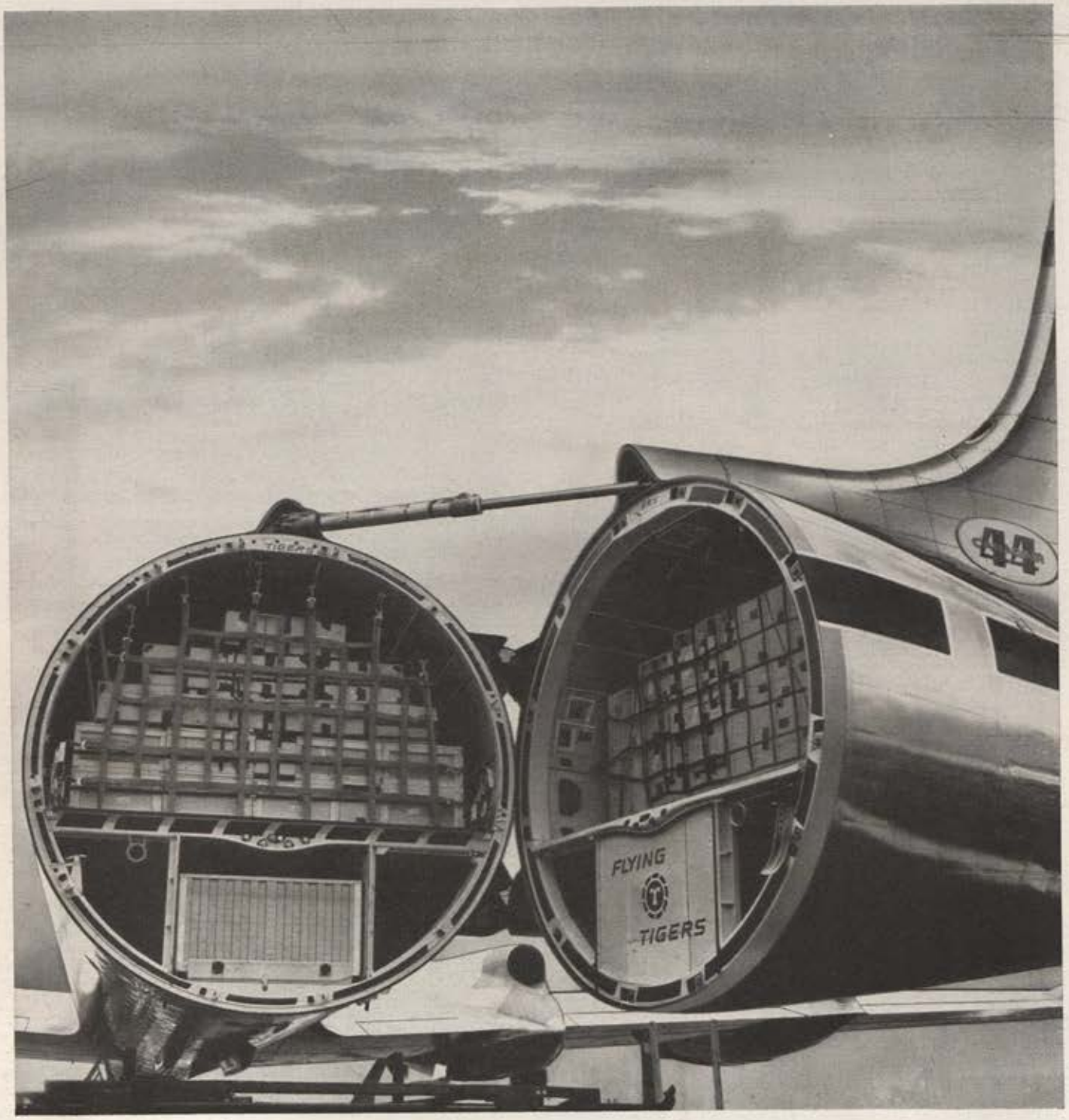

Did the new Canadair Swingtail-44 change your way of shipping, too?

It's changed a lot of bright shipping minds in the past 3 months. Powered by Rolls-Royce, this revolutionary Turbo-Prop Jet has launched a service never before available. Bulky, out-size cargo—too large to fit into any other airplane—is now taking to the air.

And this freight leaves later — arrives earlier on both coasts. For example, it leaves New York City at 1:00 A.M. and arrives Los Angeles at 5:48 A.M. the same morning.

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AIR-FREIGHT SPECIALISTS

The Canadair Swingtail-44 has a tail section that swings open in 90 seconds. It loads faster. It unloads faster. It carries 33 tons of freight—44% more than any other airfreighter. What you ship tonight will fly tonight; it never waits for space.

Isn't it time you changed to the Airfreight Specialist? Your shipment will be on its way to any place you say—except behind the Iron Curtain. And it'll go tonight.

FLYING TIGER LINE

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nomic, and social significance. It administers over 1,300,000 allotment accounts for Air Force members and almost 58,000 retired Air Force pay accounts—together an annual disbursement of over $1 billion. For these two functions, more than 650,000 checks are issued each month. They go to ninety-nine countries and possessions—accurate and on time—arriving when needed, when expected.

Over $360 million in Income and Social Security taxes, withheld from the pay of Air Force personnel, are paid each year to the Internal Revenue Service and Social Security Administration.

The center emphasizes time- and money-saving procedures and courtesy in performing all of its service functions, with the impetus for service coming *from* AFAFC *to* its over 1,500,000 customers.

This year the center inaugurated project IMPACT (Integrated Military Pay, Accrued, Controlled and Timely). The project is designed to develop a modern centralized military pay system for the Air Force, using state-of-the-art data-processing and communications technologies.

Applications on the center's computer increased. Significant applications converted to computer processing were Civilian Payroll and Military Pay Accounting. In the civilian pay area better service is now provided, which includes furnishing an earnings statement to all employees each payday.

Earlier, Central Accounting reports and the payment of Military Allotments were placed on the computer. In these areas computer-processing has been expanded to improve and increase the service to customers.

A new functionally designed Communications Center Command Post Complex, tied directly with the Air Force-wide Communications Network, was activated. It is of vital importance to the center's present and future operations.

Improvements were also made in internal administration. Chief among these were the adoption of PERT (Program Evaluation and Review Technique), point-of-origin tele-dictation, and a center-wide rating system to score each organizational component's progress and performance.

The center participated in broad community relations projects. Cosponsored with the Denver Art Museum, the "Air Force in Aerospace" exhibit featured selected paintings from the Air Force art collection along with aerospace gear from industry. Enthusiastic support was given to the Teacher's Award Foundation program which recognizes excellence in teaching by teachers of the Denver Public School System.

These activities are the highlights of the timely, accurate, and customer-service products of the center's work in the past year. Much has been accomplished, much remains to be accomplished, and much will be accomplished.—END

Col. Stebbins W. Griffith, named Commander of the Aeronautical Chart and Information Center in February 1962, is a graduate of the University of Southern California and was commissioned upon completing pilot training at Kelly Field, Tex., in 1941. Overseas tours took him to China, Japan, and Libya where he commanded Wheelus AB before being assigned to ACIC.

The aim of the Air Force's map-makers is to provide everything from the latest aeronautical charts and target material to large-scale maps of the moon . . .

AERONAUTICAL CHART AND INFORMATION CENTER

THE Aeronautical Chart and Information Center, a Separate Operating Agency of Hq. USAF, has its Headquarters, Production and Distribution Plant in St. Louis, Mo.; squadrons and subelements in Europe and the Far East; and detachments in Washington, D, C., Alaska, and the Canal Zone.

As the Air Force agency responsible for the production of aeronautical charts and related materials, ACIC compiles, produces, stores, and disseminates:

- Aeronautical charts, film strips, slides, tapes, and air-target materials;

(Continued on following page)

- Flight information publications;
- Geodetic missile data;
- Astronautical and geophysical charts and reference materials.

The center also designs and develops cartographic products for:

- Aeronautical and astronautical programs;
- New weapon systems.

And ACIC operates and maintains:

- USAF Central Print and Index Library;
- DoD depository for aerial, radarscope, and ground photography;
- Master aeronautical chart and information office to provide worldwide aeronautical information.

Changing weapon systems, new tactics, new Air Force objectives and new equipment, as well as new information, cause constant change and revision to ACIC's products. Conventional aeronautical charts and air-target materials in support of high-altitude-jet and conventional aircraft are rapidly taking on new formats with larger sheet sizes showing four times as much terrain at the same scale as their predecessors and with detailed contour depiction in order to match the advent of very-high-speed aircraft having greatly increased range and flying at either high or low altitude.

During the past year ACIC changed many of its activities to provide the necessary positional data to guide US missiles accurately from launch point to target. In addition, the compressed cockpit space of modern jet aircraft dictated an expanded miniaturization program to provide semiautomatic navigational guidance materials for the F-106 and other high-speed manned aircraft.

The redesign of flight-information publications covering the free world was completed this year to improve flight safety and to ease the problem of air traffic control as it concerned military aircraft.

In support of NASA the Aeronautical Chart and Information Center is charting the moon at scales of 1:1,000,000 (one inch equals sixteen miles) to provide information necessary to plan for a lunar landing. ACIC also provides NASA specially designed space charts used by all Astronauts while orbiting the earth.

Anticipating deeper space probes requiring more sophisticated navigational support, ACIC is studying the planet Mars and the requirement for space referencing systems of the future. This requirement is one which will create increasingly complex problems and will cause further revisions and modifications to our astronautical charts and related products.—END

Maj. Gen. Don R. Ostrander, who will become Chief of the Office of Aerospace Research later this month, has served in USAF research and development almost continuously since 1947, except for a year in NATO headquarters in 1959 and two years with ARPA and NASA before being named Vice Commander of AFSC's Ballistic Systems Division in Los Angeles, Calif., a year ago.

The job of managing all Air Force basic and applied research—the two keys to future technology—falls to the complex of laboratories and detachments that make up the . . .

OFFICE OF AEROSPACE RESEARCH

THE OFFICE of Aerospace Research (OAR) was established April 1, 1961, as "a separate operating agency with the procedural functions and responsibilities of a major air command." It was assigned the job of managing all Air Force basic research (*i.e.*, research directed toward the increase of scientific knowledge per se, rather than toward specific operational applications) plus assigned portions of Air Force applied research. Except for its newly acquired independent status, OAR was the same organization that had existed under the title of Air Force Research Division (AFRD) within the former Air Research and Development Command, now Air Force Systems Command. Though AFRD had been created in January of 1960, and OAR in April of 1961, the major subordi-

(*Continued on page 199*)

How to get maximum performance from V/STOL aircraft?

The Ryan V/STOL engineering team has the answer. With three million engineering manhours devoted to four vertical take-off research projects, Ryan is the world's most experienced and knowledgeable specialist in high speed V/STOL aircraft.

Newest and most advanced of these projects is the U.S. Army's VZ-11 research aircraft now being designed and built by Ryan. Powered by General Electric's lift-fan propulsion system, it will be capable of vertical take-off, yet cruise in normal flight at more than 500 mph. The VZ-11 concept provides maximum jet thrust augmentation for take-off (*engine thrust is multiplied 3 to 1 for vertical flight*).

In many space age areas, flexible, fast-moving Ryan is making significant contributions. Ryan is the world's largest designer and producer of Doppler navigation systems and jet target drones. Among other Ryan activities are Flex Wing applications, electronics systems for lunar landings, and structures for space vehicles.

At Ryan Aerospace and Ryan Electronics, technical and management capabilities are designed to assure compliance with the most stringent standards.

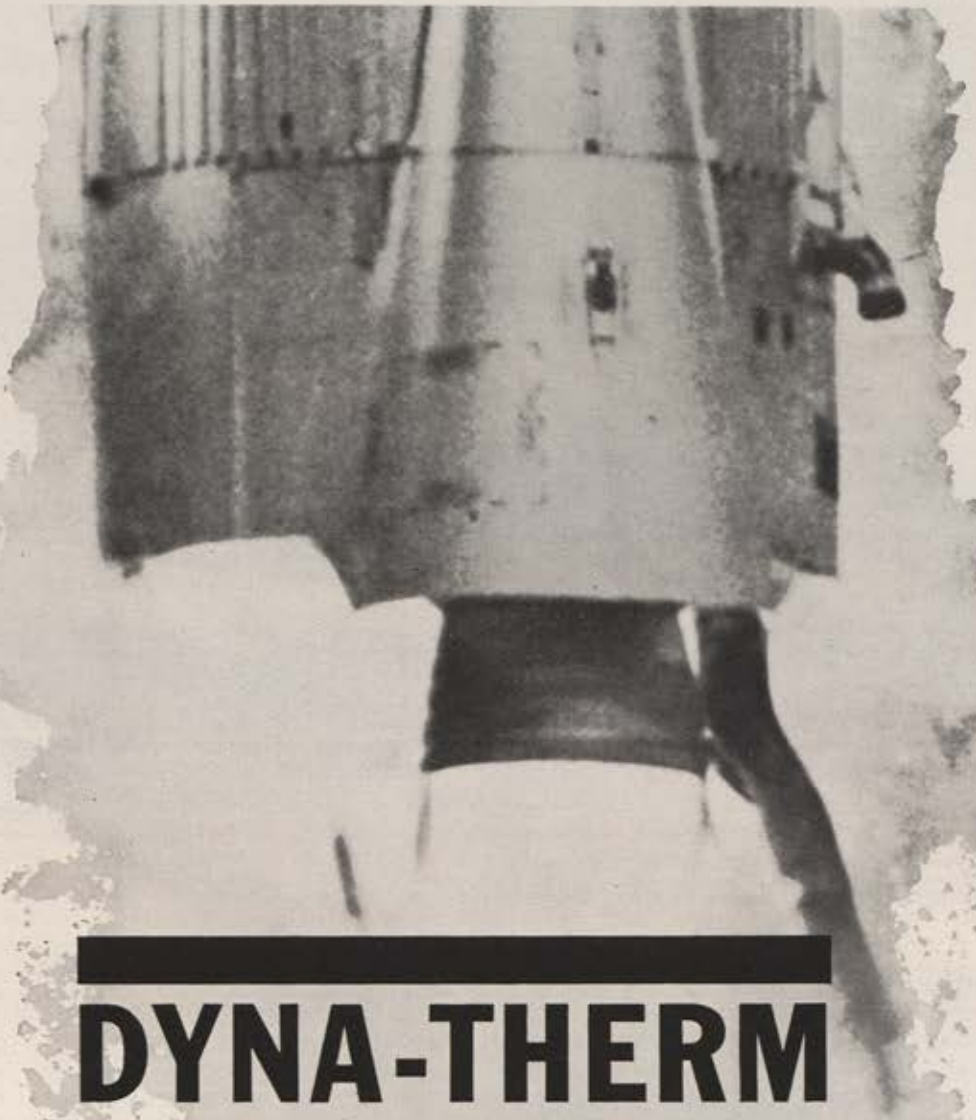
RYAN AERONAUTICAL COMPANY, SAN DIEGO, CALIFORNIA

TRI-SERVICE TILT-WING V/STOL TRANSPORT, *being built by Ryan (jointly with Vought and Hiller). Designed to transport troops, cargo and weapons, the VHR-447 will be produced to meet Army, Navy and Air Force logistical requirements.*

RYAN X-13 VERTIJET, *world's first jet VTOL aircraft, was developed under Air Force and Navy contracts dating back to 1946. This was first aircraft to demonstrate the feasibility of vertical jet take-off with transition to level flight.*

RYAN VZ-3RY VERTIPLANE, *a research aircraft designed, built and flown by Ryan for the U.S. Army and Office of Naval Research. It uses prop-jet engines and slip-stream deflected by large wing flaps to achieve STOL take-off and landing.*

RYAN
AEROSPACE



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Pioneering in research, development and application of thermal protection coatings, Dyna-Therm's Thermal Space Division is ready to work with your technical staff in applying D-65, D-100, E-300 and Flameastic 700 protective coatings, or in developing materials with advanced concepts to meet your special requirements. Dyna-Therm's unequaled experience and technical capabilities are reasons why its products have been selected to protect vital components and systems against fire and heat from missile blast, airborne rocket firings, and aerodynamic heating on many major projects. (**Savings** exceed $12 million on 36 recent Atlas firings.) For information on Dyna-Therm products, and its research and development capabilities, write Thermal Space or Swedlow, Inc., exclusive sales agent, Los Angeles 22.

THERMAL SPACE DIVISION

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nate elements have a considerably longer history.

The largest of these subordinate elements is the Air Force Cambridge Research Laboratories (AFCRL) at Laurence G. Hanscom Field, Mass. AFCRL is an outgrowth of the military-electronics research complex that developed around Harvard and MIT during World War II. A geophysics research capability was added shortly after the war, and research in these two areas still constitute their primary mission.

A second OAR component is the Aeronautical Research Laboratories (ARL) at Wright-Patterson AFB, Ohio. ARL can trace its ancestry back to the Applied Research Section, Air Materiel Command, but the line of descent is somewhat complicated. The current mission of ARL is primarily basic research.

Both AFCRL and ARL are in-house research facilities, although they conduct some contractual research that is related to their in-house work.

A new OAR in-house research facility is scheduled to open on October 1 this year at the Air Force Academy. This OAR Laboratory will accomplish research in the areas of chemistry and aeromechanics. Its establishment in existing space at the Academy where Air Force research will benefit from the high academic qualifications of the Academy faculty and outstanding Cadets is without parallel in US military history.

The last major element of OAR, the Air Force Office of Scientific Research (AFOSR) in Washington, D. C., has been in operation since October 1951, when it was a staff section of Headquarters ARDC. It conducts a basic research program that consists entirely of contracts and grants to outside investigators in colleges, universities, and private industry.

Finally, OAR includes a number of smaller and more specialized detachments, such as the European Office in Brussels, Belgium, that helps to administer research being performed for Air Force agencies by European scientists, and the Rocket Research Facility at Fort Churchill, Canada. The latter was acquired as an OAR management responsibility in July 1962. OAR maintains research and technical liaison offices in Los Angeles, Calif.; Patrick AFB, Fla.; and Rio de Janeiro, Brazil.

AFOSR seeks research data in a wide range of scientific disciplines from chemistry to topology. Some of the sponsored work is very basic indeed; for example, a current research grant is for a fundamental study of gravitational radiation (gravity waves). AFOSR supports this work, not with a view to developing an "antigravity machine," but simply to learn something new about the physical universe, with possible application to Air Force problems that are not yet anticipated. One recent indication of the high quality of the AFOSR program was the award of a Nobel Prize in physics (November 1961) to Dr. Robert Hofstadter's of Stanford University. Dr. Hofstadter's work in nuclear physics with the Stanford electron linear accelerator has been jointly supported for some years by AFOSR, the Office of Naval Research, and the AEC.

During 1962, the AFCRL electronics research capability at Hanscom Field was significantly increased by the inauguration of a new Crystal Physics Laboratory.

Growth and investigation of compound crystal structures is one of the major efforts of Aeronautical Research Laboratories' Solid State Physics Laboratory. Here Dr. Bernard Kulp uses the million electron volt electrostatic generator to study radiation damage effect on some crystal structures.

The laboratory is the nation's most complete facility for growing single crystal materials. AFCRL geophysicists, meanwhile, were setting new records for reentry speed of a man-made object (twelve kilometers a second, in an artificial meteor experiment of May 1962) and for duration of a constant-level research balloon flight (thirty days—June-July 1962). AFCRL scientists were also assisting Air Force and National Aeronautics and Space Administration satellite operations through refinement of solar-proton forecasting techniques at the Sacramento Peak Observatory. From March 1961 to March 1962, this AFCRL research installation reduced the time lost through "false alarms"—warnings of the possibility of proton showers that did not actually materialize—by approximately one-half.

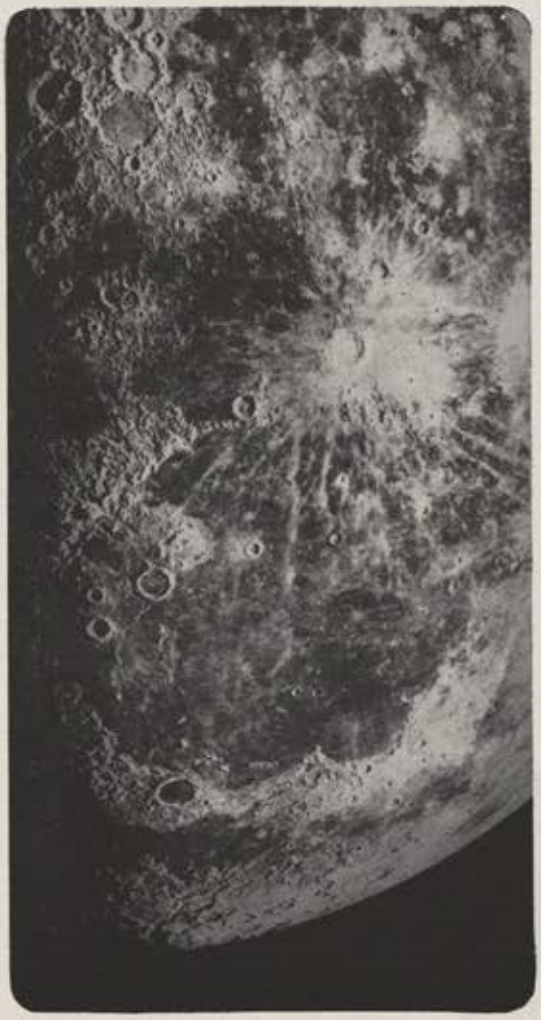
OAR's other major in-house laboratory complex, ARL, is also making significant contributions to the fund of human knowledge. Within the last year, for example, ARL's unique and pioneering research effort on compound semiconductors (Cds, Zns) has reached a particularly fruitful stage. Practical applications of this basic work are already in sight, as suggested by the recent development (under an Air Force Systems Command applied research contract) of an experimental-model solar battery based on the photovoltaic characteristics of cadmium sulfide which were discovered at ARL. The parchment-like cadmium sulfide battery promises to become highly efficient. Its flexibility is an additional convenience for use in space vehicles.

Basic research, which is OAR's assigned responsibility, produces few operational "highlights." Instead, it aims at a gradual accumulation of small bits of research data. The importance of this data may not be immediately apparent, but it makes a very large contribution to practical Air Force objectives.—END

Closer

Closer

Soon? Yes, sooner than most people think, there will be Americans on the moon. And—just as surely—that historic event will inspire and accelerate even more bold and far-reaching space exploits. But to keep America ahead, the time to get young Americans interested in our nation's "space-blazing" efforts and Aerospace technology is now. You can help vitally. How? By cooperating with the Air Force Recruiting Service in attracting the finest young minds toward thinking "Air Force." From these ranks will come the trained and skilled Aerospace professionals on whom so much depends.



Closer

Closer

You who are knowledgeable about the Air Force have a duty to perform as regards the forward-looking young men and women who will be tomorrow's Aerospace leaders. You can do much to help them learn about the Air Force of today and tomorrow, its officer and enlisted programs. Any U.S.A.F. Recruiting Office will be glad to furnish you with interesting, authoritative information. You will find your nearest Recruiting Office in your telephone directory (under "U. S. Govt.").

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Director, Office of Information
Maj. Gen. William K. Martin

Director, Office of Space Systems
Col. John L. Martin, Jr.

The UNITED STATES AIR FORCE COMMAND and STAFF

USAF COMMANDERS IN SPECIAL ASSIGNMENTS

Commander in Chief, North American Air Defense Command
Gen. John K. Gerhart
Hq. Ent AFB, Colo.

Supreme Allied Commander, Europe
Gen. Lauris Norstad
Hq. Paris, France
(Retires November 1, 1962)

Commander in Chief, Alaskan Command
Lt. Gen. George W. Mundy
Hq. Elmendorf AFB, Alaska

Chief of Staff
Gen. Curtis E. LeMay

Vice Chief of Staff
Gen. William F. McKee

Ass't Vice Chief of Staff
Maj. Gen. John K. Hester

Chief Scientist, USAF
Dr. Launor F. Carter

The Inspector General
Lt. Gen.
William H. Blanchard

The Judge Advocate General
Maj. Gen. Albert M. Kuhfeld

Chairman, Scientific Advisory Board
Dr. H. Guyford Stever

The Surgeon General
Maj. Gen. Oliver K. Niess

Ass't Chief of Staff, Intelligence
Maj. Gen.
Robert A. Breitweiser

Ass't Chief of Staff for Reserve Forces
Maj. Gen. Chester E. McCarty

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(As of August 15, 1962)

Director of Administrative Services
Col. Robert J. Pugh

Director, Designated Systems Management Group and Systems Review Board Secretariat
Col. Harry L. Waesche

Secretary, The Air Force Council
Col. Felix M. Rogers

Chief, Operations Analysis Office
Carroll L. Zimmerman, Sr.

Secretary of the Air Staff
Brig. Gen. Robert R. Rowland

the DEPUTY CHIEFS of STAFF

An AIR FORCE Magazine Photochart

(As of August 15, 1962)

Comptroller of the Air Force
Lt. Gen. Frank A. Bogart

Deputy Comptroller of the Air Force
William B. Petty

Ass't Comptroller of the Air Force
Brig. Gen. Julian H. Bowman

Ass't for Data Automation
Brig. Gen. Elbert Helton

Deputy Chief of Staff, Operations
Lt. Gen.
Gabriel P. Disosway
(effective November 1, 1962)

DCS/O
Maj. Gen.
Edwin B. Broadhurst
(effective October 8, 1962)

Special Ass't to the DCS/O
Col. Laurence H. Macauley

Ass't for Weather
Col. James T. Seaver, Jr.

Deputy Chief of Staff, Personnel
Lt. Gen. William S. Stone

Ass't DCS/P
Maj. Gen. Cecil H. Childre

Chief of Air Force Chaplains
(Position unassigned, August 1, 1962)

Director of Civilian Personnel
John A. Watts

Deputy Chief of Staff, Research and Technology
Lt. Gen. James Ferguson

Ass't DCS/R&T
Maj. Gen. James F. Whisenand

Ass't DCS/R&T for Atomic Energy
Col. Ola P. Thorne

Ass't for Foreign Developments
Col. James T. Stewart

Deputy Chief of Staff, Systems and Logistics
Lt. Gen. Thomas P. Gerrity

Ass't DCS/S&L (Logistics)
Maj. Gen. William O. Senter

Ass't DCS/S&L (Systems)
Maj. Gen.
Joseph R. Holzapple

Ass't for Logistics Planning
Brig. Gen. Paul L. Barton

Deputy Chief of Staff, Plans and Programs
Lt. Gen. David A. Burchinal

Ass't DCS/P&P
Maj. Gen. Horace M. Wade

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Maj. Gen.
John W. Carpenter, III

Director of Programs
Maj. Gen.
Prescott M. Spicer

Auditor General
Maj. Gen.
William P. Farnsworth

Director of Accounting and Finance
Brig. Gen. Joseph F. Delaney

Director of Budget
Maj. Gen. Jack G. Merrell

Director of Data Systems and Statistics
Brig. Gen.
Louis B. Grossmith, Jr.

Director of Status Analysis
Col. Frederick F. Vreeland

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Maj. Gen. Augustus M. Minton

Director of Manpower and Organization
Maj. Gen.
Benjamin O. Davis, Jr.

Director of Operational Requirements
Maj. Gen. William W. Momyer

Director of Operations
Maj. Gen. Sam W. Agee

Director of Telecommunications
Maj. Gen. John B. Bestic

Director of Military Personnel
Maj. Gen. Albert P. Clark

Director of Personnel Planning
Maj. Gen.
Henry G. Thorne, Jr.

Director of Personnel Procurement and Training
Maj. Gen. James C. McGehee

Director, Women in the Air Force
Col. Elizabeth Ray

Ass't for Research Programming
Col. Harold J. Crumly

Director of Advanced Technology
Brig. Gen. Richard D. Curtin

Director of Development Planning
Brig. Gen. Andrew J. Kinney

Director of Research
Brig. Gen. Ralph L. Wassell

Ass't for Materiel Programming
Col. Samuel Hale

Ass't for Mutual Security
Brig. Gen.
Joseph T. Kingsley, Jr.

Director of Maintenance Engineering
Brig. Gen. Lawrence F. Loesch

Director of Procurement Management
Maj. Gen. William T. Thurman

Director of Supply and Services
Maj. Gen. Melvin F. McNickle

Director of Systems Acquisition
Brig. Gen. Milton B. Adams

Director of Systems Services
Brig. Gen. Marion C. Smith

Director of Transportation
Brig. Gen. Edgar W. Hampton

the MAJOR COMMANDS

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Hq. Ent AFB, Colo.

Military Air Transport Service
Lt. Gen. Joe W. Kelly
Hq. Scott AFB, Ill.

Commander in Chief, Strategic Air Command
Gen. Thomas S. Power
Hq. Offutt AFB, Neb.

Air Force Logistics Command
Gen. Mark E. Bradley, Jr.
Hq. Wright-Patterson AFB, Ohio

Air Force Systems Command
Gen. Bernard A. Schriever
Hq. Andrews AFB, Md.

Air Force Communications Service
Maj. Gen.
Kenneth P. Bergquist
Hq. Scott AFB, Ill.

Tactical Air Command
Gen. Walter C. Sweeney, Jr.
Hq. Langley AFB, Va.

Air Training Command
Lt. Gen. James E. Briggs
Hq. Randolph AFB, Tex.

Alaskan Air Command
Maj. Gen. Wendell W. Bowman
Hq. Elmendorf AFB, Alaska

Caribbean Air Command
Maj. Gen.
Leland S. Stranathan
Hq. Albrook AFB,
Balboa, C. Z.

Commander in Chief, United States Air Forces in Europe
Gen. Truman H. Landon
Hq. Lindsey Air Station
Wiesbaden, Germany

Air University
Lt. Gen. Troup Miller, Jr.
Hq. Maxwell AFB, Ala.

USAF Security Service
Maj. Gen. Richard P. Klocko
Hq. San Antonio, Tex.

Headquarters Command
Maj. Gen. Brooke E. Allen
Hq. Bolling AFB, D. C.

Commander in Chief Pacific Air Forces
Gen. Emmett O'Donnell, Jr.
Hq. Hickam AFB, Hawaii

SEPARATE OPERATING AGENCIES

Aeronautical Chart and Information Center
Col. Stebbins W. Griffith
St. Louis, Mo.

Air Force Accounting and Finance Center
Maj. Gen.
Paul W. Scheidecker
Denver, Colo.

Commander, Office of Aerospace Research
Maj. Gen. Don R. Ostrander
(effective September 21, 1962)
Washington, D. C.

Superintendent, United States Air Force Academy
Maj. Gen. Robert H. Warren
Colorado Springs, Colo.

Continental Air Command
Lt. Gen.
Edward J. Timberlake
Hq. Robins AFB, Ga.

the OPERATIONAL FORCES

An AIR FORCE Magazine Photochart
(As of August 15, 1962)

2d Air Force
Lt. Gen. John D. Ryan
Hq. Barksdale AFB, La.

8th Air Force
Lt. Gen. Hunter Harris, Jr.
Hq. Westover AFB, Mass.

15th Air Force
Lt. Gen. Archie J. Old, Jr.
Hq. March AFB, Calif.

16th Air Force
Maj. Gen. David Wade
Hq. Torrejon AB, Spain

1st Strategic Aerospace Division
Maj. Gen. Joseph J. Preston
Hq. Vandenberg AFB, Calif.

3d Air Division
Maj. Gen.
William C. Kingsbury
Hq. Andersen AFB, Guam

7th Air Division
Maj. Gen.
Charles M. Eisenhart
Hq. High Wycombe, England

9th Air Force
Maj. Gen.
Richard T. Coiner, Jr.
Hq. Shaw AFB, S. C.

12th Air Force
Maj. Gen. Karl Truesdell, Jr.
Hq. Waco, Tex.

19th Air Force
Maj. Gen. Maurice A. Preston
Hq. Seymour Johnson AFB, N. C.

3d Air Force
Maj. Gen. Romulus W. Puryear
Hq. South Ruislip, England

17th Air Force
Maj. Gen. James V. Edmundson
Hq. Ramstein AB, Germany

322d Air Division (Combat Cargo)
Col. Charles W. Howe
Hq. Evereux-Fauville AB, France

5th Air Force
Lt. Gen. Jacob E. Smart
Hq. Fuchu Air Station, Japan

13th Air Force
Maj. Gen. Theodore R. Milton
Hq. Clark AB, Luzon, P. I.

315th Air Division (Combat Cargo)
Brig. Gen. Theodore G. Kershaw
Hq. Tachikawa AB, Japan

1st Reserve Region
Brig. Gen.
Benjamin G. Willis
Hq. Stewart AFB, N. Y.

2d Reserve Region
Brig. Gen. Felix L. Vidal
Hq. Andrews AFB, Md.

3d Reserve Region
Brig. Gen. Wilbur W. Aring
Hq. Dobbins AFB, Ga.

4th Reserve Region
Brig. Gen. James L. Riley
Hq. Randolph AFB, Tex.

5th Reserve Region
Brig. Gen. Charles M. Young
Hq. Selfridge AFB, Mich.

6th Reserve Region
Brig. Gen. Andrew B. Cannon
Hq. Hamilton AFB, Calif.

Guide to Air Force Bases

WHERE THEY ARE LOCATED • THEIR PHONE NUMBERS
WHAT THEIR JOBS ARE • HOW THEY WERE NAMED

ALTUS AFB, Okla., 2 mi. E of Altus. Phone: Area Code 405, HUdson 2-2060. Heavy bomber base, 2d AF, SAC; Atlas ICBM site under construction. Named for city.

AMARILLO AFB, Tex., 14 mi. SE of Amarillo, Phone: Area Code 806, DIamond 9-1511. Technical Training Center; jet mechanics and airframe repair schools, ATC; heavy bomber base, 15th AF, SAC. Named for nearby city.

ANDREWS AFB, Md., 1 mi. E of Camp Springs, 11 mi. SE of Washington, D. C. Phone: Area Code 301, 981-9111. Hq. AFSC; fighter-interceptor base, ADC; Hq. 2d Reserve Region, CONAC. Formerly Camp Springs AAB, renamed for Lt. Gen. Frank M. Andrews, airpower pioneer, CG, European Theater of Operations, killed in aircraft accident, Iceland, 1943.

ARNOLD ENGINEERING DEVELOPMENT CENTER, Tenn., 10 mi. E of Tullahoma, Phone: Area Code 615, GLendale 5-2611. Hq. AEDC, AFSC. Named for Gen. H. H. "Hap" Arnold, WW II AF CG.

BAKALAR AFB, Ind., 3 mi. N of Columbus. Phone: Area Code 812, DRexel 2-2500. Reserve training, CONAC. Formerly Atterbury AFB, renamed for Lt. John E. Bakalar, WW II fighter pilot, killed in France, September 1944.

BARKSDALE AFB, La., 1 mi. S of Bossier City, 6 mi. E. of Shreveport. Phone: Area Code 318, SHreveport 5-1211. Hq. 2d AF, SAC; strategic heavy bomber base. Named for Lt. Eugene H. Barksdale, WW I pilot, killed near Wright Field, Ohio, August 1926, while testing observation-type plane.

BEALE AFB, Calif., 11 mi. SE of Marysville. Phone: Area Code 916, STerling 8-2231. Heavy bomber base, 15th AF, SAC; Titan ICBM support base. Formerly Camp Beale, named for Brig. Gen. Edward F. Beale, California Indian agent before the Civil War.

BELLOWS AFB, Oahu, Hawaii, 11 mi. NE of Honolulu. Phone: through Hickam AFB, Honolulu 44-111. Primary communications site. Named for 2d Lt. Franklin B. Bellows who was killed in 1918 while on a reconnaissance mission over France.

BERGSTROM AFB, Tex., 7 mi. SE of Austin. Phone: Area Code 512, GReenwood 6-6481. Heavy bomber base, 2d AF, SAC. Formerly Del Valle AAB, renamed for Capt. John A. E. Bergstrom of Austin, killed at Clark Field, P. I., December 1941, during Japanese bombardment.

BIGGS AFB, Tex., 6 mi. NW of El Paso. Phone: Area Code 915, LOgan 6-6711. Heavy bomber base, 15th AF, SAC refueling base, 9th AF, TAC. Named for Lt. James B. Biggs, WW I fighter pilot, killed in an accident in France, October 1918.

BLYTHEVILLE AFB, Ark., 3 mi. NW of Blytheville. Phone: Area Code 501, LEhigh 2-5667. Heavy bomber base, 2d AF, SAC. Named for nearby city.

BOLLING AFB, 3 mi. S of Washington, D. C. Phone: Area Code 202, JOhnson 2-9000. Headquarters Command, USAF. Fixed-wing flying activities have been transferred to Andrews AFB. Named for Col. Raynal C. Bolling, Assistant Chief of Air Service, died saving life of a 19-year-old private near Amiens, France, 1918.

BROOKLEY AFB, Ala., 3 mi. SW of Mobile. Phone: Area Code 205, HEmlock 8-6011. Air Materiel Area, AFLC. Formerly Bates Field, renamed for Capt. Wendell H. Brookley, test pilot, killed in BT-2B crash near Bolling Field, February 1934.

BROOKS AFB, Tex., 7 mi. SSE of San Antonio. Phone: Area Code 512, LEhigh 2-8811. USAF Aerospace Medical Center. School of Aerospace Medicine, ATC; Hq. Air Evacuation, MATS. Formerly Gosport Field, renamed for Lt. Sidney J. Brooks, Jr., of San Antonio, killed in air crash near Hondo, Tex., November 1917, on final day of cadet training and commissioned posthumously.

BUNKER HILL AFB, Ind., 9 mi. S of Peru. Phone: Area Code 219, MUrdock 9-2211. Medium bomber base, 2d AF, SAC; fighter-interceptor base, ADC. Former naval air station. Named geographically.

CANNON AFB, N. M., 7 mi. W of Clovis. Phone: Area Code 505, SUnset 4-3311. Tactical fighter base, 12th AF, TAC. Formerly Clovis AFB, renamed for Gen. John K. Cannon, TAC Commander from 1950-54, who was Commander of Allied AFs in the Mediterranean in WW II.

CARSWELL AFB, Tex., 7 mi. WNW of Fort Worth. Phone: Area Code 817, PErshing 8-3511. Heavy and medium bomber base, 2d AF, SAC. Formerly Tarrant Field, renamed for Maj. Horace C. Carswell, Jr., of Fort Worth,

WW II B-24 pilot and recipient of CMH, killed in China, October 1944.

CASTLE AFB, Calif., 7 mi. NW of Merced. Phone: Area Code 209, RAndolph 3-1011. Heavy bomber base, 15th AF, SAC; fighter-interceptor base, ADC. Formerly Merced Field, renamed for Brig. Gen. Frederick W. Castle, WW II B-17 pilot and recipient of CMH, killed over Germany, 1944.

CHANUTE AFB, Ill., 1 mi. SE of Rantoul. Phone: Area Code 217, TWining 2-3111. Aircraft maintenance and weather schools, Technical Training Center, ATC. Named for Octave Chanute, aviation pioneer and navigation engineer, died in US, 1910.

CHARLESTON AFB, S. C., 10 mi. N of Charleston. Phone: Area Code 803, SHerwood 7-4111. Air transport base, EASTAF, MATS; fighter-interceptor base, ADC. Named for city.

CHENNAULT AFB, La., 3 mi. E of Lake Charles. Phone: Area Code 318, HEmlock 6-9461. Medium bomber base, 2d AF, SAC. Base was to have been closed, April 1962; full operation restored with continuation of B-47 program. Formerly Lake Charles AFB, renamed for Lt. Gen. Claire L. Chennault, famed leader of WW II Flying Tigers and commander of wartime 14th AF in CBI, died July 1958.

CLINTON CO. AFB, Ohio, 2 mi. SE of Wilmington. Phone: Area Code 513, FU. 2-3811. Reserve training, CONAC. Named geographically.

CLINTON SHERMAN AFB, Okla., 1 mi. W of Burns Flat. Phone: Area Code 405, CLinton 2010. Heavy bomber base, 2d AF, SAC. Formerly Clinton NAS.

COLUMBUS AFB, Miss., 9 mi. N of Columbus. Phone: Area Code 601, GEneva 4-7322. Heavy bomber base, 2d AF, SAC.

CONNALLY AFB. *(See James Connally AFB.)*

CRAIG AFB, Ala., 5 mi. SE of Selma. Phone: Area Code 205, TRinity 4-7431. Undergraduate pilot training, ATC. Named for Bruce K. Craig, flight engineer for B-24 manufacturer, killed during B-24 test flight in US, 1941.

DAVIS-MONTHAN AFB, Ariz., 4 mi. SE of Tucson. Phone: Area Code 602, EAst 7-5411. Medium bomber base, 15th AF, SAC; fighter-interceptor base, ADC; Titan ICBM site under construction. Formerly Tucson Municipal Airport, renamed for Lt. Samuel H. Davis, killed in US, 1921, and Lt. Oscar Monthan, bomber pilot, who was killed in Hawaii in 1924.

DOBBINS AFB, Ga., 2 mi. SE of Marietta. Phone: Area Code 404, MArietta 9-4461. Reserve training, troop carrier, Hq. 3d Reserve Region, CONAC; ADC, joint use. Formerly Marietta AFB, renamed for Capt. Charles M. Dobbins, killed transporting paratroops over Sicily, June 1943.

DONALDSON AFB, S. C., 7 mi. SSE of Greenville. Phone: Area Code 803, CEdar 5-7411. Troop carrier base, EASTAF, MATS. Activity was to have been reduced, spring 1962, with transfer of troop carrier wing to Hunter AFB where B-47 wing was to have been deactivated; full operation restored with continuation of B-47 program. Formerly Greenville AFB, renamed for Maj. John O. W. Donaldson, US ace in WW I, who was killed in flying accident near Philadelphia, September 1930.

DOVER AFB, Del., 3 mi. SE of Dover. Phone: Area Code 302, REdfield 4-8211. Air transport base, EASTAF, MATS; fighter-interceptor base, ADC; air refueling base, 8th AF, SAC. Named for city.

DOW AFB, Me., 2 mi. W of Bangor. Phone: Area Code 207, BAngor 2-5251. Heavy bomber base, 8th AF, SAC; fighter-interceptor and air defense missile base, ADC. Formerly Bangor AB, renamed for 2d Lt. James F. Dow of Oakfield, Me., killed in crash near Mitchel Field, June 1940.

DULUTH MUNICIPAL AP, Minn., 7 mi. NNW of Duluth. Phone: Area Code 218, RAndolph 7-8211. Fighter-interceptor and air defense missile base, ADC. Formerly Williamson-Johnson AP, renamed for city.

DYESS AFB, Tex., 6 mi. SW of Abilene. Phone: Area Code 915, OWen 2-1212. Medium bomber base, 15th AF, SAC; Atlas ICBM site under construction; troop carrier base, 12th AF, TAC. Formerly Tye Field, Abilene Municipal Airport, and Abilene AFB, renamed for Lt. Col. William E. Dyess of Albany, Tex., WW II fighter pilot in South Pacific, killed in P-38 crash in December 1943 in California.

EDWARDS AFB, Calif., 2 mi. S of Muroc. Phone: Area Code 805, CLifford 8-2111. Hq. AF Flight Test Center, AFSC. Formerly Muroc AFB, renamed for Capt. Glen W. Edwards, test pilot, killed at Muroc Field, June 1948, in crash of YB-49 "Flying Wing."

EGLIN AFB, Fla., 2 mi. SW of Valparaiso. Phone: Area Code 305, EGlin 6-6302. Hq. Air Proving Ground Center, AFSC; heavy bomber base, 8th AF, SAC; Special Air Warfare Center. Named for Lt. Col. Frederick I. Eglin, killed in US, 1937.

EGLIN AF AUXILIARY FIELD #9 (Hurlburt Field), Fla., 6 mi. W of Fort Walton. Phone: Area Code 305, OR. 118. Missile training, ADC. On Eglin AFB reservation.

EIELSON AFB, Alaska, 26 mi. SE of Fairbanks. Phone DRake 7-3107. Support base for SAC mission; weather reconnaissance base, WESTAF, MATS; Alaskan Air Command. Named for Capt. Carl E. Eielson, Alaskan air pioneer who flew across the North Pole with Sir Hubert Wilkins in 1928, flew the first US airmail in Alaska, and was killed in a crash while attempting to aid an iced-in vessel in the Bering Sea.

ELLINGTON AFB, Tex., 16 mi. SE of Houston. Phone: Area Code 713, HUdson 6-7181. Air Reserve, CONAC. Named for 2d Lt. Eric L. Ellington, killed during training flight near San Diego in 1913.

(Continued on page 214)

Glossary of Terms Used in Guide to AFBs

AAB	**Army Air Base**
AB	**Air Base**
ADC	**Air Defense Command**
AEDC	**Arnold Engineering Development Center**
AF	**Air Force**
AFB	**Air Force Base**
AFCS	**Air Force Communications Service**
AFLC	**Air Force Logistics Command**
AFROTC	**Air Force Reserve Officers Training Corps**
AFSC	**Air Force Systems Command**
ANG	**Air National Guard**
AP	**Airport**
ASD	**Aeronautical Systems Division**
ATC	**Air Training Command**
AU	**Air University**
AWS	**Air Weather Service**
CBI	**China-Burma-India Theater**
CG	**Commanding General**
CMH	**Congressional Medal of Honor**
CO	**Commanding Officer**
CONAC	**Continental Air Command**
DFC	**Distinguished Flying Cross**
DSC	**Distinguished Service Cross**
EASTAF	**Eastern Transport Air Force**
ETO	**European Theater of Operations**
ICBM	**Intercontinental Ballistic Missile**
MATS	**Military Air Transport Service**
NAS	**Naval Air Station**
NORAD	**North American Air Defense Command**
OCS	**Officer Candidate School**
SAC	**Strategic Air Command**
SAGE	**Semi-Automatic Ground Environment**
TAC	**Tactical Air Command**
USAF	**United States Air Force**
WESTAF	**Western Transport Air Force**
WW I	**World War I**
WW II	**World War II**

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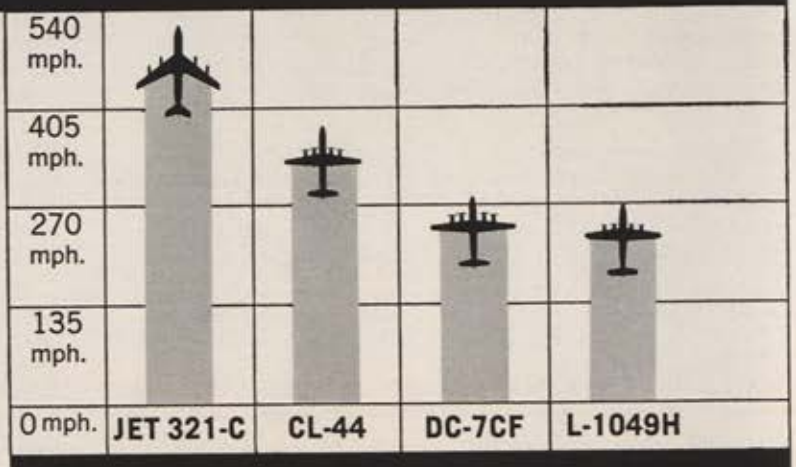

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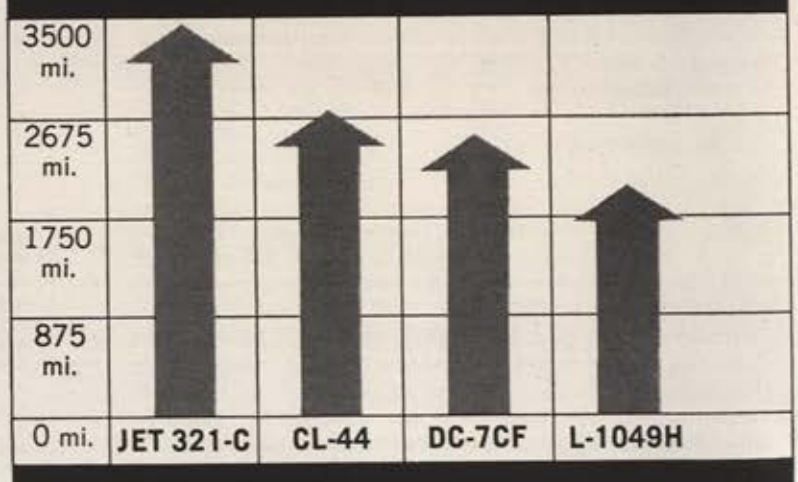

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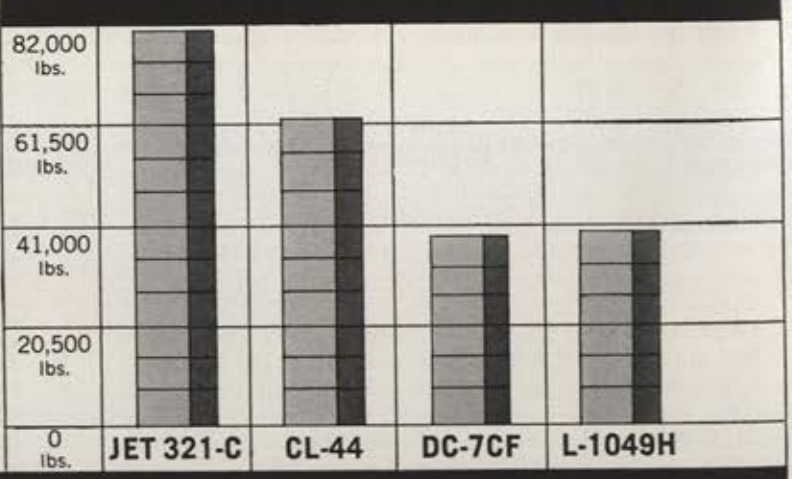

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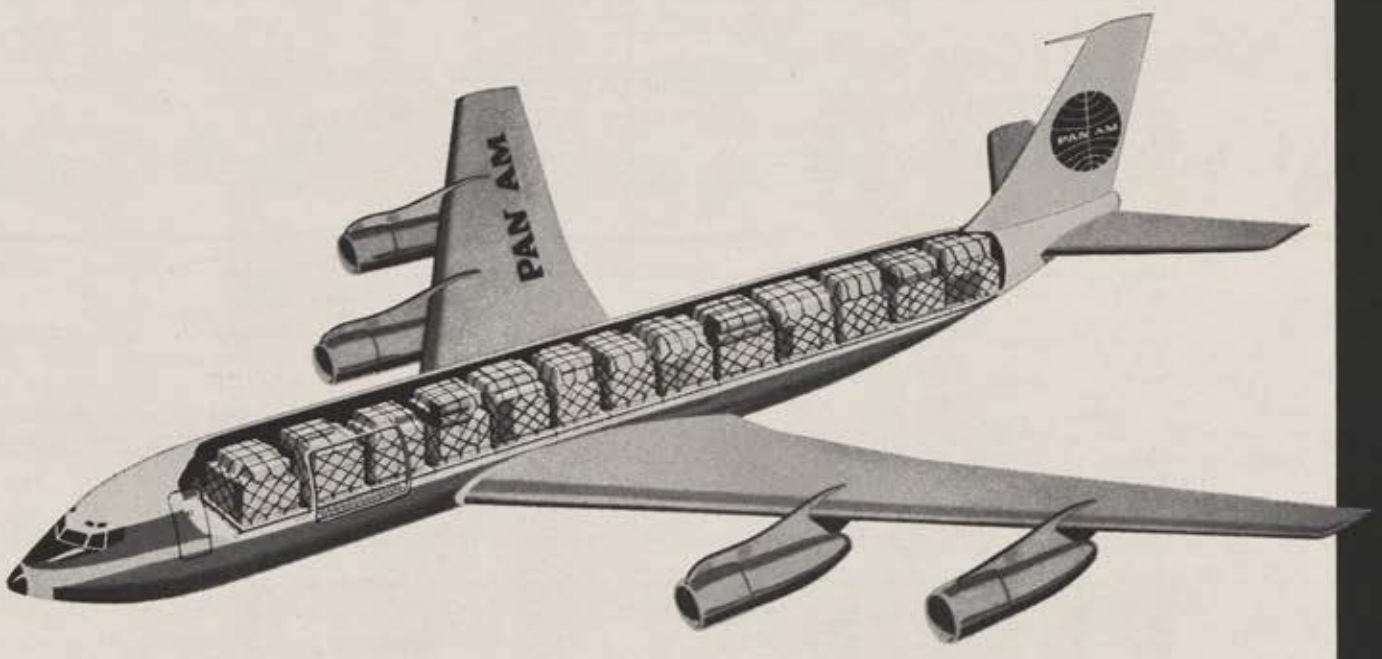
(Look what the Boeing 321-C will mean for U. S. commerce ... for the nation's defense ... for world trade)



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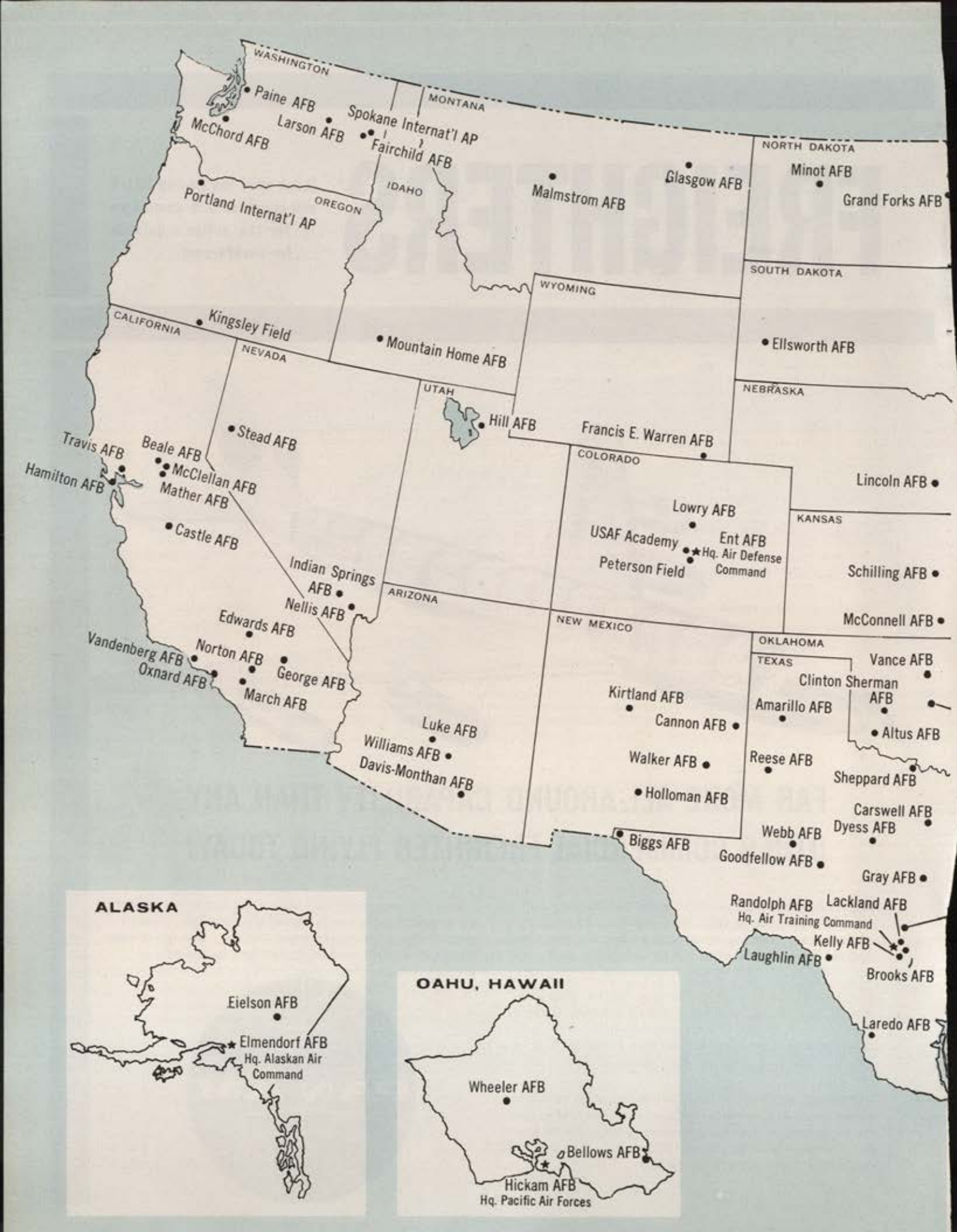
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UTAH
COLORADO
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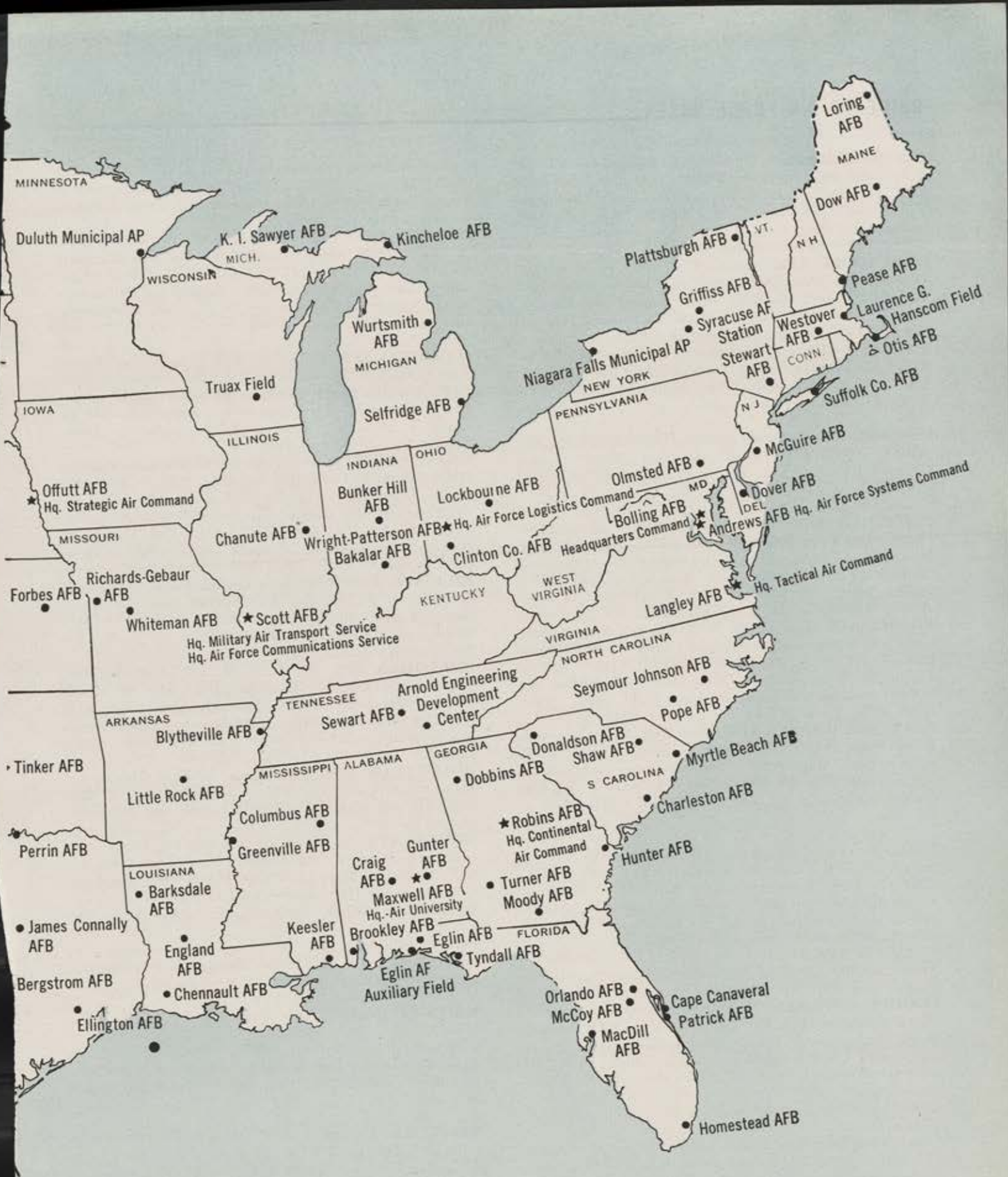
ARIZONA
NEW MEXICO
OKLAHOMA
TEXAS
Paine AFB
McChord AFB
Larson AFB
Spokane Internat'l AP
Fairchild AFB
Portland Internat'l AP
Malmstrom AFB
Glasgow AFB
Minot AFB
Grand Forks AFB
Kingsley Field
Mountain Home AFB
Ellsworth AFB
Hill AFB
Francis E. Warren AFB
Lincoln AFB
Travis AFB
Beale AFB
McClellan AFB
Hamilton AFB
Mather AFB
Stead AFB
Castle AFB
Lowry AFB
USAF Academy
Ent AFB
Hq. Air Defense Command
Peterson Field
Indian Springs AFB
Nellis AFB
Schilling AFB
McConnell AFB
Edwards AFB
Vandenberg AFB
Norton AFB
George AFB
Oxnard AFB
March AFB
Vance AFB
Clinton Sherman AFB
Amarillo AFB
Altus AFB
Kirtland AFB
Cannon AFB
Luke AFB
Williams AFB
Davis-Monthan AFB
Walker AFB
Reese AFB
Sheppard AFB
Holloman AFB
Carswell AFB
Dyess AFB
Webb AFB
Biggs AFB
Goodfellow AFB
Gray AFB
Randolph AFB
Hq. Air Training Command
Lackland AFB
Kelly AFB
Laughlin AFB
Brooks AFB
Laredo AFB
ALASKA
Eielson AFB
Elmendorf AFB
Hq. Alaskan Air Command
OAHU, HAWAII
Wheeler AFB
Bellows AFB
Hickam AFB
Hq. Pacific Air Forces



Major Active Air Force Bases in the United States

An *AIR FORCE* Magazine Map (As of August 15, 1962)

ELLSWORTH AFB, S. D., 8 mi. NE of Rapid City. Phone: Area Code 605, FIllimore 2-2400. Heavy bomber base, 15th AF, SAC; Titan ICBM support base, Minuteman ICBM sites under construction. Formerly Rapid City AFB, renamed for Brig. Gen. Richard E. Ellsworth, killed in B-36 crash in Newfoundland, March 18, 1953.

ELMENDORF AFB, Alaska, 4 mi. NE of Anchorage. Phone: BRoadway 5-8001. Hq. Alaskan Air Command; fighter-interceptor squadron, AAC; support base for SAC mission. Named for Capt. Hugh M. Elmendorf, who was killed in 1933 during a test flight of a P-25.

ENGLAND AFB, La., 6 mi. NNW of Alexandria. Phone: Area Code 318, HI. 3-4561. Tactical fighter base, 12th AF, TAC. Formerly Alexandria AFB, renamed for Lt. Col. John B. England, WW II ace killed in air crash in France, November 17, 1954.

ENT AFB, Colo., Colorado Springs. Phone: Area Code 303, MElrose 5-8911. Hq. NORAD; Hq. ADC. Named for Maj. Gen. Uzal G. Ent, CG, 2d AF, recipient of DSC, died in 1948.

FAIRCHILD AFB, Wash., 11 mi. WSW of Spokane. Phone: Area Code 509, CHestnut 4-2511. Heavy bomber base, 15th AF, SAC; Atlas ICBM support base. Formerly Spokane AFB, renamed for Gen. Muir S. Fairchild, WW I bomber pilot, Vice Chief of Staff, USAF, died of heart attack, Washington, D. C., March 1950.

FORBES AFB, Kan., 7 mi. S of Topeka. Phone: Area Code 913, UNion 2-1234. Medium bomber strategic recon base, 2d AF, SAC; Atlas ICBM support base. Formerly Topeka AAB, renamed for Maj. Daniel H. Forbes, Jr., WW II bomber pilot killed at Muroc Field, Calif., in the crash of the YB-49 "Flying Wing," June 1948.

FRANCIS E. WARREN AFB, Wyo., 2 mi. W of Cheyenne. Phone: Area Code 307, CHeyenne 2-8911. Atlas ICBM support base; Minuteman ICBM site under construction, SAC. Named for Wyoming's first US Senator and first elected governor, Civil War recipient of CMH, died in US, 1929.

GEORGE AFB, Calif., 6 mi. NW of Victorville. Phone: Area Code 714, VIctorville 6-3411. Tactical fighter base, 12th AF, TAC; fighter-interceptor base, ADC. Formerly Victorville AAB, renamed for Brig. Gen. Harold H. George, WW I ace, commander of US Air Forces in Australia in WW II, killed in Australia, April 1942.

GLASGOW AFB, Mont., 18 mi. NNE of Glasgow. Phone: Area Code 406, 228-4311. Fighter-interceptor base; heavy bomber base, 15th AF, SAC. Named for city.

GOODFELLOW AFB, Tex., 2 mi. SE of San Angelo. Phone: Area Code 915, San Angelo 2-2471. USAF Security Service base. Named for Lt. John J. Goodfellow, Jr., of San Angelo, killed in fighter combat, in France, 1918.

GRAND FORKS AFB, N. D., 14 mi. W of Grand Forks. Phone: Area Code 701, Grand Forks 2-3431. Fighter-interceptor base, ADC; heavy bomber base, 15th AF, SAC mission.

GRAY AFB, Tex., 6 mi. SW of Killeen. Phone: Area Code 817, MErcury 4-3161. Special activities base, AFLC. Formerly Camp Hood AAB, renamed for Capt. Robert M. Gray, pilot on first Tokyo bombing mission of WW II, killed in India, 1942.

GREENVILLE AFB, Miss., 6 mi. NE of Greenville. Phone: Area Code 601, EDison 2-1571. Technical training, ATC. Named for city.

GRIFFISS AFB, N. Y., 2 mi. NE of Rome. Phone: Area Code 315, Rome FF 6-3200. Hq. Rome Air Development Center, AFSC; Rome AF Depot, AFLC; fighter-interceptor base, ADC; heavy bomber base, 8th AF, SAC. Formerly Rome AB, renamed for Lt. Col. Townsend E. Griffiss of Buffalo, recipient of DSC, killed in flight from Russia to England, February 1942.

GUNTER AFB, Ala., 5 mi. NE of Montgomery. Phone: Area Code 205, AMherst 2-6661. Extension Course Institute, USAF, AU; USAF Medical Service School, ATC; SAGE Direction Center, ADC. Named for William A. Gunter, mayor of Montgomery for 27 years, ardent exponent of airpower, died in 1940.

HAMILTON AFB, Calif., 6 mi. NNE of San Rafael. Phone: Area Code 415, TUcker 3-7711. Fighter-interceptor base, ADC; Hq. 6th Reserve Region, CONAC; SAGE combat center. Formerly Marin Meadows, renamed for 1st Lt. Lloyd A. Hamilton, recipient of DSC, killed in fighter combat, France, August 1918.

HANSCOM FIELD. (*See Laurence G. Hanscom Field.*)

HICKAM AFB, Oahu, Hawaii, 6 mi. SW of Honolulu. Phone: Honolulu 44-111. Hq. PACAF; air transport base, WESTAF, MATS; support base for SAC mission; fighter-interceptor base, ANG. Named for Lt. Col. Horace M. Hickam, commander of 3d Attack Group, killed in an air crash at Fort Crockett, Tex., 1934.

HILL AFB, Utah, 6 mi. S of Ogden. Phone: Area Code 801, TAylor 5-2211. Hq. Air Materiel Area, AFLC, air transport base, MATS. Named for Maj. Ployer P. Hill, killed near Wright Field while testing one of the first B-17s, October 1935.

HOLLOMAN AFB, N. M., 8 mi. SW of Alamogordo. Phone: Area Code 505, GRanite 3-6511. Hq. AF Missile Development Center, AFSC. Formerly Alamogordo AAB, renamed for Col. George V. Holloman, guided missile pioneer who was killed in an air crash on Formosa, March 1946.

HOMESTEAD AFB, Fla., 5 mi. NNE of Homestead. Phone: Area Code 305, EDison 6-8011. Heavy bomber base, 8th AF, SAC tactical fighter base, 9th AF, TAC. Named for city.

HUNTER AFB, Ga., 3 mi. SW of Savannah. Phone: Area Code 912, ADam 4-4461. Medium bomber base, 8th AF, SAC. Named for Maj. Gen. Frank O'D. Hunter, WW I ace; recipient of DSC, four clusters; past AFA Director.

HURLBURT FIELD. (*See Eglin AF Auxiliary Field #9.*)

INDIAN SPRINGS AFB, Nev., 1 mi. NW of Indian Springs. Phone: Area Code 702, Indian Springs 20. Bombing and gunnery range support base, TAC. Named for city.

JAMES CONNALLY AFB, Tex., 7 mi. NNE of Waco. Phone: Area Code 817, SWift 9-3611. Navigator training, Instrument Pilot Instructor School, ATC. Formerly Waco AFB, renamed for Col. James T. Connally of Waco, who was killed while on a B-29 mission over Yokohama, Japan, May 1945.

KEESLER AFB, Miss., 2 mi. WNW of Biloxi. Phone: Area Code 601, IDlewood 2-1561. Technical Training Center, ATC. Named for Lt. Samuel R. Keesler, Jr., of Greenwood, Miss., aerial observer, killed on special bombing mission near Verdun, France, October 1918.

KELLY AFB, Tex., 6 mi. WSW of San Antonio. Phone: Area Code 512, WAlnut 3-5411. Hq. Air Materiel Area, AFLC. Named for Lt. George E. M. Kelly, pioneer Army pilot, killed in US, 1911.

KINCHELOE AFB, Mich., 3 mi. SE of Kinross. Phone: Area Code 906, MElrose 5-5271. Fighter-interceptor and air defense missile base, ADC; heavy bomber base, 2d AF,

SAC. Formerly Kinross AFB, renamed in honor of Capt. Iven C. Kincheloe, Jr., Korean War jet ace and holder of world altitude record of 126,200 feet, set in 1956 in Bell X-2 rocketplane; killed July 26, 1958, in crash of an F-104 Starfighter at Edwards AFB, Calif.

KINGSLEY FIELD, Ore., 5 mi. SE of Klamath Falls. Phone: Area Code 503, TUxedo 2-4411. Fighter-interceptor base, ADC. Formerly Klamath Falls Municipal Airport, renamed in honor of 2d Lt. David R. Kingsley, killed in Ploesti raid in June 1944.

KIRTLAND AFB, N. M., 4 mi. SSE of Albuquerque. Phone: Area Code 505, CHapel 7-1711. Hq. AF Special Weapons Center, AFSC. Formerly Albuquerque AAB, renamed for Col. Roy S. Kirtland, aviation pioneer and former CO of Langley Field, died in 1941.

K. I. SAWYER AFB, Mich., 16 mi. S of Marquette. Phone: Area Code 906, DIckens 6-9211. Fighter-interceptor base, ADC; heavy bomber base, 2d AF, SAC. Origin of name unknown.

LACKLAND AFB, Tex., 7 mi. WSW of San Antonio. Phone: Area Code 512, OR. 4-3211. Military Training Center, OCS, WAF training, pilot-observer preflight, USAF Recruiting School, USAF Chaplain School, USAF Marksmanship Center, Officer Training School, ATC. Formerly San Antonio Aviation Cadet Center, renamed for Brig. Gen. Frank D. Lackland, former commandant of Kelly Field flying school, died in 1943.

LANGLEY AFB, Va., 3 mi. N of Hampton. Phone: Area Code 703, PArk 2-7911. Hq. TAC; refueling base, TAC; fighter-interceptor and air defense missile base, ADC. Named for Samuel P. Langley, pioneer aeronautical scientist, died in 1906.

(Continued on following page)

UNITED STATES AIR FORCE INSTALLATIONS OVERSEAS

Following is a list of bases, installations, and facilities where men and women of the United States Air Force are stationed outside the continental limits of the United States. This is not a complete list but does include the major stations used by the global USAF.—THE EDITORS

ALASKA
Clear Missile Early Warning Station
Eielson AFB
Elmendorf AFB
Galena Airport
King Salmon Airport
Shemya AF Station

AZORES
Lajes Field

BERMUDA
Kindley AFB

CANADA
Beausejour Air Station, Manitoba
Churchill AB, Manitoba
Ernest Harmon AFB, Newfoundland
Frobisher Airport, Baffin Island
Goose AB, Labrador
Pagwa Air Station, Ontario
Ramore Air Station, Ontario
Sioux Lookout Air Station, Ontario

CANAL ZONE
Albrook AFB
Howard AFB

CRETE
Iraklion Air Station

FRANCE
Bordeaux Meriganac Airport
Chambley AB
Chateauroux Air Station
Chaumont AB
Dreux AB
Etain AB
Evreux-Fauville AB
Laon AB
Orly Airport, Paris
Phalsbourg AB
Toul-Rosieres AB

GERMANY
Bitburg AB
Hahn AB
Lindsey Air Station
Ramstein AB
Rhein-Main AB
Sembach AB
Spangdahlem AB
Tempelhof Central Airport, Berlin
Wiesbaden AB

GREECE
Athenai Airport

GREENLAND
Narsarssuak AB
Sondrestrom AB
Thule AB

GUAM
Andersen AFB
Harmon AFB

HAWAII
Bellows AFB
Hickam AFB
Wheeler AFB

ICELAND
Keflavik Airport

ITALY
Aviano AB

IWO JIMA
Iwo Jima AB

JAPAN
Ashiya AB
Brady AB
Fuchu Air Station
Itazuke AB
Johnson Air Station
Misawa AB
Nagoya AB
Tachikawa AB
Yokota AB

JOHNSTON ISLAND
Johnston Island AB

KOREA
Kimpo AB
Kunsan AB
Osan AB
Seoul Air Station
Suwon Auxiliary Airfield

LIBYA
Wheelus AB

MOROCCO
Benguerir AB
Nouasseur AB
Sidi Slimane AB

NETHERLANDS, THE
Camp New Amsterdam AB

NORWAY
Kolsas AB

OKINAWA
Kadena AB
Naha AB

PAKISTAN
Peshawar Air Station

PHILIPPINE ISLANDS
Clark AB
John Hay AB

PUERTO RICO
Ramey AFB

SPAIN
Moron AB
Torrejon AB
Zaragoza AB

TAIWAN (FORMOSA)
Tainan AB
Taipei Air Station

TRINIDAD
Carlsen AFB

TURKEY
Ankara Air Station
Cigli AB
Incirlik AB
Izmir Air Station

UNITED KINGDOM
Alconbury RAF Station
Bentwaters RAF Station
Brize Norton RAF Station
Bruntingthorpe RAF Station
Burtonwood Air Depot
Bushy Park
Chelveston RAF Station
Denham Air Station
Fairford RAF Station
Greenham Common RAF Station
High Wycombe Air Station
Kirknewton RAF Station
Lakenheath RAF Station
Mildenhall RAF Station
Prestwick Airfield, Scotland
Sculthorpe RAF Station
South Ruislip Air Station
Upper Heyford RAF Station
Wethersfield RAF Station
Woodbridge RAF Station

LAREDO AFB, Tex., 3 mi. NE of Laredo. Phone: Area Code 512, RAndolph 3-9121. Undergraduate pilot training, ATC. Named for city.

LARSON AFB, Wash., 6 mi. NNW of Moses Lake. Phone: Area Code 509, ROckwell 2-2331. Fighter-interceptor base, ADC; heavy bomber base, 15th AF, SAC; Titan ICBM support base. Formerly Moses Lake AFB, renamed for Maj. Donald A. Larson, native of Yakima, Wash., WW II ace, killed on fighter mission over Ulzen, Germany, August 1944.

LAUGHLIN AFB, Tex., 7 mi. E of Del Rio. Phone: Area Code 512, CYpress 8-3511. Strategic recon base, 2d AF, SAC; projected for undergraduate pilot training, ATC. Base was to have been closed by June 1962 with transfer of U-2 recon wing to Davis-Monthan AFB; full operation restored for pilot training, with U-2 wing remaining. Named for Lt. Jack T. Laughlin, pilot who was killed in action in the Far East in 1942.

LAURENCE G. HANSCOM FIELD, Mass., 1 mi. SSW of Bedford, Phone: Area Code 617, CRestview 4-6100. Hq. AF Cambridge Research Laboratory, AFSC. Formerly Bedford AFB, renamed for Laurence G. Hanscom, Boston and Worcester newspaperman, Army Reserve pilot, killed near base, 1941.

LINCOLN AFB, Neb., 5 mi. NW of Lincoln. Phone: Area Code 402, GRover 7-6011. Medium bomber base, 2d AF, SAC; Atlas ICBM site under construction. Named for city.

LITTLE ROCK AFB, Ark., 15 mi. NE of Little Rock. Phone: Area Code 501, FRanklin 2-8311. Medium bomber base, 2d AF, SAC; Titan ICBM site under construction. Named for city.

LOCKBOURNE AFB, Ohio, 11 mi. SSE of Columbus. Phone: Area Code 614, TEmple 3-8211. Medium bomber base, 8th AF, SAC; fighter-interceptor base, ADC. Named for nearby city.

LORING AFB, Me., 2 mi. NW of Limestone. Phone: Area Code 207, FAirview 8-7311. Heavy bomber base, 8th AF, SAC; fighter-interceptor base, ADC. Formerly Limestone AFB, renamed for Maj. Charles J. Loring, Jr., CMH recipient, killed in Korea in November 1952 when he crashed his damaged F-80 into enemy artillery emplacements, destroying them.

LOWRY AFB, Colo., 5 mi. ESE of Denver. Phone: Area Code 303, DUdley 8-5411. Technical Training Center, ATC; Titan ICBM support base, 15th AF, SAC. Named for Lt. Francis B. Lowry of Denver, recipient of DSC, killed on photo mission over France, September 1918; only Colorado airman to be killed in WW I.

LUKE AFB, Ariz., 20 mi. WNW of Phoenix. Phone: Area Code 602, WEstport 5-9311. Tactical fighter crew training, 12th AF, TAC. Named for Lt. Frank Luke, Jr., "balloon-busting" WW I ace, recipient of CMH and DSC, killed in France, September 1918.

MacDILL AFB, Fla., 8 mi. SSW of Tampa. Phone: Area Code 813, Tampa 66-1411. Medium bomber base, 8th AF, SAC; Hq. Strike Command; tactical fighter base, 9th AF, TAC. Activity was to have been reduced, June 1962, with inactivation of B-47 wing; full operation restored with continuation of B-47 program. Named for Col. Leslie MacDill, fighter pilot, killed in air crash at Anacostia, Md., 1938.

MALMSTROM AFB, Mont., 4 mi. E. of Great Falls. Phone: Area Code 406, GLendale 2-9561. Air refueling base, 15th AF, SAC; fighter-interceptor base, ADC; SAGE interim control center; Minuteman ICBM site under construction. Formerly Great Falls AFB, renamed for Col. Einar A. Malmstrom, killed in airplane accident near Great Falls, August 21, 1954.

MARCH AFB, Calif., 9 mi. SE of Riverside. Phone: Area Code 714, Moreno LD 20. Hq. 15th AF, SAC; medium bomber base, SAC. Named for Lt. Peyton C. March, Jr., son of WW I Army Chief of Staff, killed in air crash in US, 1918.

MATHER AFB, Calif., 10 mi. E of Sacramento. Phone: Area Code 916, EMpire 3-3161. Heavy bomber base, 15th AF, SAC; navigator training, ATC. Named for Lt. Carl S. Mather, killed near Ellington Field during training flight, 1918, five days after receiving commission.

MAXWELL AFB, Ala., 1 mi. WNW of Montgomery. Phone: Area Code 205, AMherst 5-5621. Hq. Air University; War College; Command and Staff College; Hq. AFROTC Research Studies Institute. Named for 2d Lt. William C. Maxwell of Natchez, killed on Luzon, Philippines, August 1920.

McCHORD AFB, Wash., 8 mi. S of Tacoma. Phone: Area Code 206, JUniper 8-2121. Fighter-interceptor base, ADC; SAGE combat center; troop carrier base, WESTAF, MATS. Named for Col. William C. McChord, killed in US, 1937.

McCLELLAN AFB, Calif., 10 mi. NE of Sacramento. Phone: Area Code 916, WAbash 2-1511. Hq. Air Materiel Area, AFLC; aircraft early warning and control, ADC. Named for Maj. Hezekiah McClellan, pioneer in Arctic aeronautical experiments, killed during the test flight of a new plane in the US, 1936.

McCONNELL AFB, Kan., 5 mi. SE of Wichita. Phone: Area Code 316, MUrray 3-6511. Medium bomber crew training, 2d AF, SAC; Titan ICBM site under construction; tactical fighter base beginning October 1962, 12th AF, TAC. Formerly Wichita AFB, renamed for the two McConnell brothers of Wichita: Thomas L., killed July 10, 1943, in the South Pacific, and Fred M., Jr., killed in 1945 in a private plane crash in Kansas.

McCOY AFB, Fla., 7 mi. S of Orlando. Phone: Area Code 305, ORlando 3-7611. Heavy bomber base, 8th AF, SAC, aircraft early warning and control, ADC. Formerly Pinecastle AFB, renamed for Col. Michael N. W. McCoy, B-47 wing commander, killed in aircraft accident, October 1957 near Orlando.

McGUIRE AFB, N. J., 1 mi. SE of Wrightstown. Phone: Area Code 609, RAymond 4-2100. Hq. EASTAF; air transport base, MATS; fighter-interceptor and air defense missile base, ADC; SAGE direction center; air refueling base, 8th AF, SAC. Formerly Fort Dix AAB, renamed for Maj. Thomas B. McGuire, Jr., of Ridgewood, N. J., second ranking WW II ace, P-38 pilot, recipient of CMH and DSC, killed over Leyte, 1945.

MINOT AFB, N. D., 11 mi. N of Minot. Phone: Area Code 701, TEmple 7-1161. Fighter-interceptor base, ADC; heavy bomber base, Minuteman ICBM site under construction, 15th AF, SAC mission. Named for city.

MOODY AFB, Ga., 12 mi. NNE of Valdosta. Phone: Area Code 912, EDgewood 3-4211. Undergraduate pilot training, ATC. Named for Maj. George P. Moody, fighter pilot, killed in US, 1941.

MOUNTAIN HOME AFB, Idaho, 11 mi. WSW of Mountain Home. Phone: Area Code 208, TEmple 2-4611. Medium bomber base, 15th AF SAC; Titan ICBM site under construction. Named for city.

MYRTLE BEACH AFB, S. C., 3 mi. SW of Myrtle Beach. Phone: Area Code 803, Myrtle Beach 7411. Tactical fighter base, 9th TAC. Named for city.

NELLIS AFB, Nev., 8 mi. NE of Las Vegas. Phone: Area Code 702, DUdley 2-1800. Tactical fighter crew training,

fighter weapons, 12th AF, TAC. Formerly Las Vegas AFB, renamed for Lt. William H. Nellis of Las Vegas, fighter pilot, killed in action over Luxembourg, in December of 1944.

NIAGARA FALLS MUNICIPAL AP, N. Y., 4 mi. E of Niagara Falls. Phone: Area Code 716, BU. 5-6691. Reserve training, CONAC; air defense missile base, ADC. Named for city.

NORTON AFB, Calif., 5 mi. ENE of San Bernardino. Phone: Area Code 805, TUrner 9-4411. Hq. Air Materiel Area, AFLC; air defense sector, Hq. ADC. Formerly San Bernardino Air Depot, renamed for Capt. Leland F. Norton, bomber pilot, killed in aircraft accident near Amiens, France, May 1944.

OFFUTT AFB, Neb., 9 mi. S of Omaha. Phone: Area Code 402, 291-2100. Hq. SAC; air refueling base, SAC; Atlas ICBM support base. Named for 1st Lt. Jarvis Jennes Offutt, who was killed in fighter action, France, 1918.

OLMSTED AFB, Pa., 1 mi. NW of Middletown. Phone: Area Code 717, WHitney 4-5521. Hq. Air Materiel Area, AFLC. Formerly Middletown Air Depot, renamed for Lt. Robert S. Olmsted, balloon pilot, killed when his balloon was struck by lightning over Belgium, September 1923.

ORLANDO AFB, Fla., 2 mi. E of Orlando. Phone: Area Code 305, GArden 3-0561. Hq. Air Photographic and Charting Service; Hq. Air Reserve Service, MATS. Named for city.

(Continued on following page)

LOCATIONS OF AIR NATIONAL GUARD FLYING UNITS

ALABAMA
Birmingham Municipal Airport, Birmingham
Dannelly Field, Montgomery

ALASKA
Anchorage International Airport, Anchorage

ARIZONA
Sky Harbor Municipal Airport, Phoenix
Tucson Municipal Airport, Tucson

ARKANSAS
Fort Smith Municipal Airport, Fort Smith
Little Rock AFB, Little Rock

CALIFORNIA
Fresno Air Terminal, Fresno
Hayward Municipal Airport, Hayward
Ontario International Airport, Ontario
Van Nuys Airport, Van Nuys

COLORADO
Buckley Air Guard Base, Denver

CONNECTICUT
Bradley Field, Windsor Locks

DELAWARE
Greater Wilmington Airport, Wilmington

FLORIDA
Imeson Airport, Jacksonville

GEORGIA
Dobbins AFB, Marietta
Travis Airport, Savannah

HAWAII
Hickam AFB, Honolulu

IDAHO
Boise Air Terminal, Boise

ILLINOIS
Capital Airport, Springfield
O'Hare International Airport, Chicago
Greater Peoria Airport, Peoria

INDIANA
Baer Field, Fort Wayne
Hulman Field, Terre Haute

IOWA
Des Moines Municipal Airport, Des Moines
Sioux City Municipal Airport, Sioux City

KANSAS
Hutchinson Air Guard Base, Hutchinson
McConnell AFB, Wichita

KENTUCKY
Standiford Field, Louisville

LOUISIANA
New Orleans NAS, New Orleans

MAINE
Dow AFB, Bangor

MARYLAND
Andrews AFB, Washington, D. C.
Martin Airport, Baltimore

MASSACHUSETTS
Barnes Municipal Airport, Westfield
Logan International Airport, Boston

MICHIGAN
Detroit Wayne Municipal Airport, Detroit
Kellogg Municipal Airport, Battle Creek

MINNESOTA
Duluth Municipal Airport, Duluth
Minneapolis-St. Paul International Airport, Minneapolis

MISSISSIPPI
Hawkins Field, Jackson
Key Field, Meridian

MISSOURI
Lambert-St. Louis Municipal Airport, St. Louis
Rosecrans Memorial Airport, St. Joseph

MONTANA
Great Falls International Airport, Great Falls

NEBRASKA
Lincoln AFB, Lincoln

NEVADA
Reno Municipal Airport, Reno

NEW HAMPSHIRE
Grenier Field, Manchester

NEW JERSEY
Atlantic City Airport, Atlantic City
McGuire AFB, Trenton
Newark Airport, Newark

NEW MEXICO
Kirtland AFB, Albuquerque

NEW YORK
Hancock Field, Syracuse
New York NAS, New York
Niagara Falls Municipal Airport, Niagara Falls
Schenectady City Airport, Schenectady
Westchester County Airport, White Plains

NORTH CAROLINA
Douglas Municipal Airport, Charlotte

NORTH DAKOTA
Hector Field, Fargo

OHIO
Clinton County AFB, Wilmington
Lockbourne AFB, Columbus
Mansfield Municipal Airport, Mansfield
Springfield Municipal Airport, Springfield
Toledo Express Airport, Toledo

OKLAHOMA
Tulsa Municipal Airport, Tulsa
Will Rogers Field, Oklahoma City

OREGON
Portland International Airport, Portland

PENNSYLVANIA
Greater Pittsburgh Airport, Pittsburgh
Olmsted AFB, Middletown
Philadelphia International Airport, Philadelphia

PUERTO RICO
Puerto Rico International Airport, San Juan

RHODE ISLAND
Green Municipal Airport, Providence

SOUTH CAROLINA
McEntire Air Guard Base, Columbia

SOUTH DAKOTA
Joe Foss Field, Sioux Falls

TENNESSEE
Berry Field, Nashville
McGhee-Tyson Airport, Knoxville
Memphis Municipal Airport, Memphis

TEXAS
Dallas NAS, Dallas
Ellington AFB, Houston
Kelly AFB, San Antonio

UTAH
Salt Lake City Municipal Airport, Salt Lake City

VERMONT
Burlington Municipal Airport, Burlington

VIRGINIA
Byrd Field, Richmond

WASHINGTON
Spokane International Airport, Spokane

WEST VIRGINIA
Kanawha County Airport, Charleston
Martinsburg Municipal Airport, Martinsburg

WISCONSIN
General Mitchell Field, Milwaukee
Truax Field, Madison

WYOMING
Cheyenne Municipal Airport, Cheyenne

OTIS AFB, Mass., 9 mi. NNE of Falmouth. Phone: Area Code 617, LOcust 3-5511. Fighter-interceptor and air defense missile base, ADC; aircraft early warning and control, ADC; air refueling base, 8th AF, SAC. Named for Lt. Frank J. Otis, killed in air crash in US, 1937.

OXNARD AFB, Oxnard, Calif. Phone: Area Code 805, HUnter 3-1151. Fighter-interceptor base, ADC. Named for city.

PAINE AFB, Wash., 6 mi. S of Everett. Phone: Area Code 206, ELiot 3-1106. Fighter-interceptor base, ADC. Named for 2d Lt. Topliff O. Paine, airmail pilot, who was killed while mapping airmail routes, 1922.

PATRICK AFB, Fla., 12 mi. SE of Cocoa. Phone: Area Code 305, ULysses 7-1110. Hq. AF Missile Test Center, AFSC. Formerly Banana River NAS, renamed for Maj. Gen. Mason M. Patrick, Chief of Army Air Service during and after WW I, died in US, January 1942.

PEASE AFB, N. H., 3 mi. W of Portsmouth. Phone: Area Code 603, GEneva 6-0100. Medium bomber base, 8th AF, SAC. Formerly Portsmouth AFB, renamed for Capt. Harl Pease, Jr., CMH recipient, WW II pilot missing over Rabaul, New Britain, on August 6, 1942.

PERRIN AFB, Tex., 6 mi. NNW of Sherman. Phone: Area Code 214, ST. 7-2971. Pilot interceptor training (Adv.), ATC. Named for Lt. Col. Elmer D. Perrin of Boerne, Tex., killed testing a B-26 near Baltimore, June 1941.

PETERSON FIELD, Colo., 6 mi. E of Colorado Springs. Phone: Area Code 303, MElrose 5-8911. Administrative flying, ADC. Named for 1st Lt. Edward J. Peterson, killed in US, in airplane crash, 1942.

PLATTSBURGH AFB, N. Y., 1 mi. SW of Plattsburgh. Phone: Area Code 518, JOrdan 3-4500. Medium bomber base, 8th AF, SAC; Atlas ICBM site under construction. Named for city.

POPE AFB, N. C., 12 mi. NW of Fayetteville. Phone: Area Code 919, HYatt 7-2311. Troop carrier base, 9th AF, TAC. Named for 1st Lt. Harley H. Pope, killed making a forced landing in a Jenny in South Carolina, January 1919.

PORTLAND INTERNAT'L AP, Ore., 7 mi. NE of Portland. Phone: Area Code 503, ATlantic 8-5611. Fighter-interceptor base, ADC. Named for city.

RANDOLPH AFB, Tex., 15 mi. ENE of San Antonio. Phone: Area Code 512, OLive 8-3511. Hq. ATC; Jet Qualification Course (Adv.), ATC; Hq. 4th Reserve Region, CONAC. Named for Capt. William M. Randolph of Austin, fighter pilot, killed in aircraft accident in Texas, 1928.

REESE AFB, Tex., 12 mi. W of Lubbock. Phone: Area Code 806, POrter 3-1951. Undergraduate pilot training, ATC. Formerly Lubbock AFB, renamed for Lt. Augustus F. Reese, Jr., of Shallowater, Tex., killed on bomber mission over Cagliari, Italy, May 1943.

RICHARDS-GEBAUR AFB, Mo., 16 mi. S of Kansas City. Phone: Area Code 816, EMerson 1-5200. Fighter-interceptor base, ADC; Air Division Hq. SAGE. Formerly Grandview AFB, renamed for Lt. John F. Richards II, of Kansas City, first area pilot to die in combat in WW I; and for Lt. Col. Arthur W. Gebaur, Jr., who was killed in action over North Korea in 1952.

ROBINS AFB, Ga., 14 mi. SSE of Macon. Phone: Area Code 912, WAlker 6-5511. Hq. Air Materiel Area, AFLC; Hq. CONAC; Heavy bomber base, 8th AF, SAC. Named for Brig. Gen. Augustine Warner Robins, Chief of Materiel Division, Air Corps, who devised system of cataloging in 1920s still used; died in 1940.

SAWYER AFB. *(See K. I. Sawyer AFB.)*

SCHILLING AFB, Kan., 4 mi. SW of Salina. Phone: Area Code 913, TAylor 7-4411. Medium bomber base, 15th AF, SAC; Atlas ICBM support base. Formerly Smokey Hill AFB, renamed for Col. David C. Schilling, WW II fighter ace and pioneer of in-flight refueling techniques who led first nonstop transatlantic flight of jet fighters, killed in automobile accident in England, August 1956.

SCOTT AFB, Ill., 6 mi. ENE of Belleville. Phone: Area Code 618, Adams 4-4000. Hq. MATS; Hq. AWS; Hq. AFCS. Named for Cpl. Frank S. Scott, first enlisted man to die in an air accident, killed at College Park, Md., 1912.

SELFRIDGE AFB, Mich., 3 mi. E of Mount Clemens. Phone: Area Code 313, HOward 3-0511. Fighter-interceptor base, ADC; Hq. 5th Reserve Region, CONAC; air refueling base, 2d AF, SAC. Named for Lt. Thomas E. Selfridge, killed in 1908 while on flight with Orville Wright to demonstrate Wright plane.

SEWART AFB, Tenn., 3 mi. N of Smyrna. Phone: Area Code 615, GLendale 9-2561. Troop carrier base, 9th AF, TAC. Formerly Smyrna AFB, renamed for Maj. Allan J. Sewart, Jr., bomber pilot, recipient of DSC, killed in action over the Solomons, November 1942.

SEYMOUR JOHNSON AFB, N. C., 2 mi. SSE of Goldsboro. Phone: Area Code 919, REpublic 5-1121. Tactical fighter base, 9th AF, TAC; fighter-interceptor base, ADC; heavy bomber base, 8th AF, SAC. Named for Lt. Seymour A. Johnson, Navy pilot of Goldsboro, killed in 1942.

SHAW AFB, S. C., 7 mi. WNW of Sumter. Phone: Area Code 803, SPruce 5-1111. Hq. 9th AF, TAC; tactical recon base; combat crew training group. Named for 1st Lt. Erwin D. Shaw of Sumter, killed during recon flight over German lines, July 1918, while serving with Royal Flying Corps.

SHEPPARD AFB, Tex., 6 mi. N of Wichita Falls. Phone: Area Code 817, 322-5621. Technical Training Center, ATC; heavy bomber base, 2d AF, SAC. Named for Morris E. Sheppard, US Senator from Texas, chairman of Senate Military Affairs Committee, died in 1941.

SHERMAN AFB *(See Clinton Sherman AFB.)*

SPOKANE INTERNAT'L AP, Wash., 6 mi. WSW of Spokane. Phone: Area Code 509, TEmple 8-2771. Fighter-interceptor base, ADC. Formerly Geiger Field, named for Maj. Harold Geiger, WW I dirigible expert, killed in crash landing at Olmsted Field, Pa., May 1927; renamed for city.

STEAD AFB, Nev., 10 mi. NW of Reno. Phone: Area Code 702, FIreside 9-0711. Survival training, ATC. Formerly Reno AAB, renamed for Lt. Craston Stead, Nevada ANG pilot killed in a crash at the base.

STEWART AFB, N. Y., 4 mi. NW of Newburgh. Phone: Area Code 914, JOhn 2-1300. SAGE direction center, ADC; Reserve training, Hq. 1st Reserve Region, CONAC. Named for Lachlan Stewart, sea captain whose son provided land for the base.

SUFFOLK CO. AFB, N. Y., 3 mi. N of Westhampton Beach, L. I. Phone: Area Code 516, WEsthampton 4-1900. Fighter-interceptor and air defense missile base, ADC.

SYRACUSE AF STATION, N. Y., 5 mi. NNE of Syracuse. Phone: Area Code 315, GLenview 8-5500. Hq. ADC Air Division; SAGE combat center, ADC. Named for city.

TINKER AFB, Okla., 8 mi. ESE of Oklahoma City. Phone: Area Code 405, PErshing 2-7321. Hq. Air Materiel Area, AFLC. Named for Maj. Gen. Clarence L. Tinker, a Pawhuska Indian, bomber and fighter pilot; CG, 7th AF, killed in raid on Wake Island, June 1942.

TRAVIS AFB, Calif., 6 mi. ENE of Fairfield and Suisun. Phone: Area Code 707, IDlewood 7-2211. Hq. WESTAF, MATS; heavy bomber base, 15th AF, SAC; air transport base, MATS; fighter-interceptor base, ADC. Formerly Fair-

field-Suisun AFB, renamed for Brig. Gen. Robert F. Travis, bomber pilot, recipient of DSC, killed in B-29 crash in US, August 1950.

TRUAX FIELD, Wis., 1 mi. E of Madison. Phone: Area Code 608, CHerry 9-5311. Fighter-interceptor base, ADC; SAGE combat center. Named for 1st Lt. Thomas L. Truax of Madison, pilot, killed in training flight in US, November 1941.

TURNER AFB, Ga., 4 mi. ENE of Albany. Phone: Area Code 912, HEmlock 5-3411. Heavy bomber base, 8th AF, SAC. Named for Lt. Sullins Preston Turner of Oxford, Ga., killed in aircraft accident at Langley AFB, May 1940.

TYNDALL AFB, Fla., 8 mi. SE of Panama City. Phone: Area Code 305, ATlantic 6-2111. Weapons employment center, ADC. Named for Lt. Frank B. Tyndall of Port Seward, Fla., WW I fighter pilot, killed in air crash in 1930; first Florida military flyer to be killed.

VANCE AFB, Okla., 4 mi. SSW of Enid. Phone: Area Code 405, ADams 7-2121. Undergraduate pilot training, ATC. Formerly Enid AFB, renamed for Lt. Col. Leon R. Vance, Jr., WW II recipient of CMH, lost in hospital aircraft forced down at sea off Iceland, 1944.

VANDENBERG AFB, Calif., 10 mi. NW of Lompoc. Phone: Area Code 805, WAlnut 5-8651. Hq. 1st Strategic Aerospace Division, SAC; Atlas ICBM site. Formerly Cooke AFB, renamed for Gen. Hoyt S. Vandenberg, 9th AF Commander in ETO in WW II, Air Force Chief of Staff from 1948 to 1953, who died April 2, 1954.

WALKER AFB, N. M., 6 mi. S of Roswell. Phone: Area Code 505, FIrestone 7-5411. Heavy bomber base, 15th AF, SAC; fighter-interceptor base, ADC; Atlas ICBM site under construction. Formerly Roswell AAB, renamed for Brig. Gen. Kenneth N. Walker, a native of New Mexico, CG, 5th Bomber Command, WW II recipient of CMH, killed in Southwest Pacific while leading a bomber attack, 1943.

WARREN AFB. (*See Francis E. Warren AFB.*)

WEBB AFB, Tex., 1.8 mi. SW of Big Spring. Phone: Area Code 915, AMherst 4-2511. Undergraduate pilot training, ATC; fighter-interceptor base, ADC. Formerly Big Spring AFB, renamed for 1st Lt. James L. Webb, Jr., F-51 pilot, killed off Japanese coast, 1949.

WESTOVER AFB, Mass., 3 mi. NNE of Chicopee Falls. Phone: Area Code 413, LYceum 3-6411. Hq. 8th AF, SAC; heavy bomber base, SAC; fighter-interceptor base, ADC. Named for Maj. Gen. Oscar Westover, Chief of the Air Corps, who was killed in air crash near Burbank, Calif., September 1938.

WHEELER AFB, Oahu, Hawaii, 23 mi. NW of Honolulu. Phone: 7730. Hq. Pacific Airways and Air Communications, AFCS. Named for Maj. Sheldon H. Wheeler, killed in an aircraft accident in 1921 at Luke Field, Hawaii.

WHITEMAN AFB, Mo., 3 mi. S of Knob Noster. Phone: Area Code 816, LOgan 3-2201. Medium bomber base, Minuteman ICBM site under construction, 2d AF, SAC. Formerly Sedalia AFB, renamed for 2d Lt. George A. Whiteman of Sedalia, killed in action at Pearl Harbor on December 7, 1941.

WILLIAMS AFB, Ariz., 10 mi. E of Chandler. Phone: Area Code 602, YUkon 8-2611. Undergraduate pilot training, ATC. Formerly Higley Field, renamed for Lt. Charles L. Williams, native of Arizona, bomber pilot, killed in Hawaii, July 1927.

WRIGHT-PATTERSON AFB, Ohio, 2 mi. ENE of Dayton. Phone: Area Code 513, CLearwater 3-7111. Hq. AFLC; ASD, AFSC; Air Force Institute of Technology, AU; fighter-interceptor base, ADC; heavy bomber base, 2d AF, SAC. Formerly separate areas including Fairfield Air Depot, Wilbur Wright Field, McCook Field, and Patterson Field; renamed for Orville and Wilbur Wright, and for Lt. Frank S. Patterson, who was killed in air crash near this base during early firing tests of synchronized machine gun, June 1918.

WURTSMITH AFB, Mich., 3 mi. NW of Oscoda. Phone: Area Code 517, SEneca 9-3611. Fighter-interceptor base, ADC; heavy bomber base, 2d AF, SAC. Formerly Camp Skeel, later Oscoda AFB, renamed for Maj. Gen. Paul B. Wurtsmith, CG, 13th AF, who was killed in B-25 crash in North Carolina, 1946.—END

LOCATIONS OF AIR FORCE RESERVE FLYING UNITS

ALABAMA
Bates Field, Mobile

ARIZONA
Luke AFB, Phoenix

CALIFORNIA
Hamilton AFB, San Raphael
McClellan AFB, Sacramento
March AFB, Riverside

CONNECTICUT
Bradley Field, Windsor Locks

FLORIDA
Homestead AFB, Homestead

GEORGIA
Dobbins AFB, Marietta

ILLINOIS
O'Hare International Airport, Chicago
Scott AFB, Belleville

INDIANA
Bakalar AFB, Columbus

LOUISIANA
Barksdale AFB, Bossier City
New Orleans NAS, New Orleans

MARYLAND
Andrews AFB, Washington, D. C.

MASSACHUSETTS
Laurence G. Hanscom Field, Bedford

MICHIGAN
Selfridge AFB, Mount Clemens

MINNESOTA
Minneapolis-St. Paul International Airport, Minneapolis

MISSOURI
Richards-Gebaur AFB, Kansas City

NEW HAMPSHIRE
Grenier Field, Manchester

NEW JERSEY
McGuire AFB, Trenton

NEW YORK
Niagara Falls Municipal Airport, Niagara Falls
Stewart AFB, Newburgh

OHIO
Clinton County AFB, Wilmington
Youngstown Municipal Airport, Youngstown

OKLAHOMA
Davis Field, Muskogee
Tinker AFB, Oklahoma City

OREGON
Portland International Airport, Portland

PENNSYLVANIA
Greater Pittsburgh Airport, Pittsburgh
Willow Grove NAS, Willow Grove

SOUTH CAROLINA
Donaldson AFB, Greenville

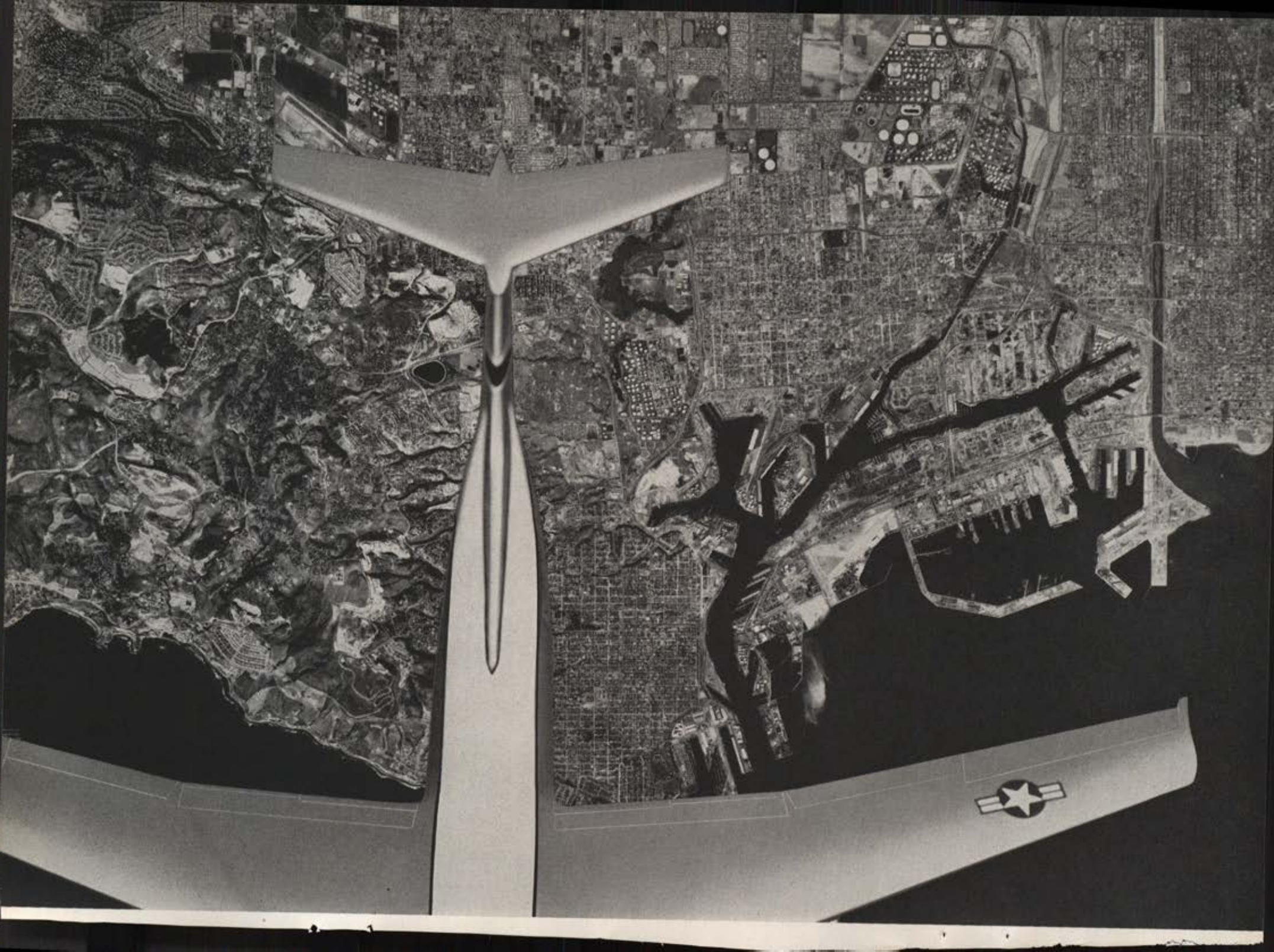
TENNESSEE
Memphis Municipal Airport, Memphis

TEXAS
Dallas NAS, Dallas
Ellington AFB, Houston
Kelly AFB, San Antonio

UTAH
Hill AFB, Ogden

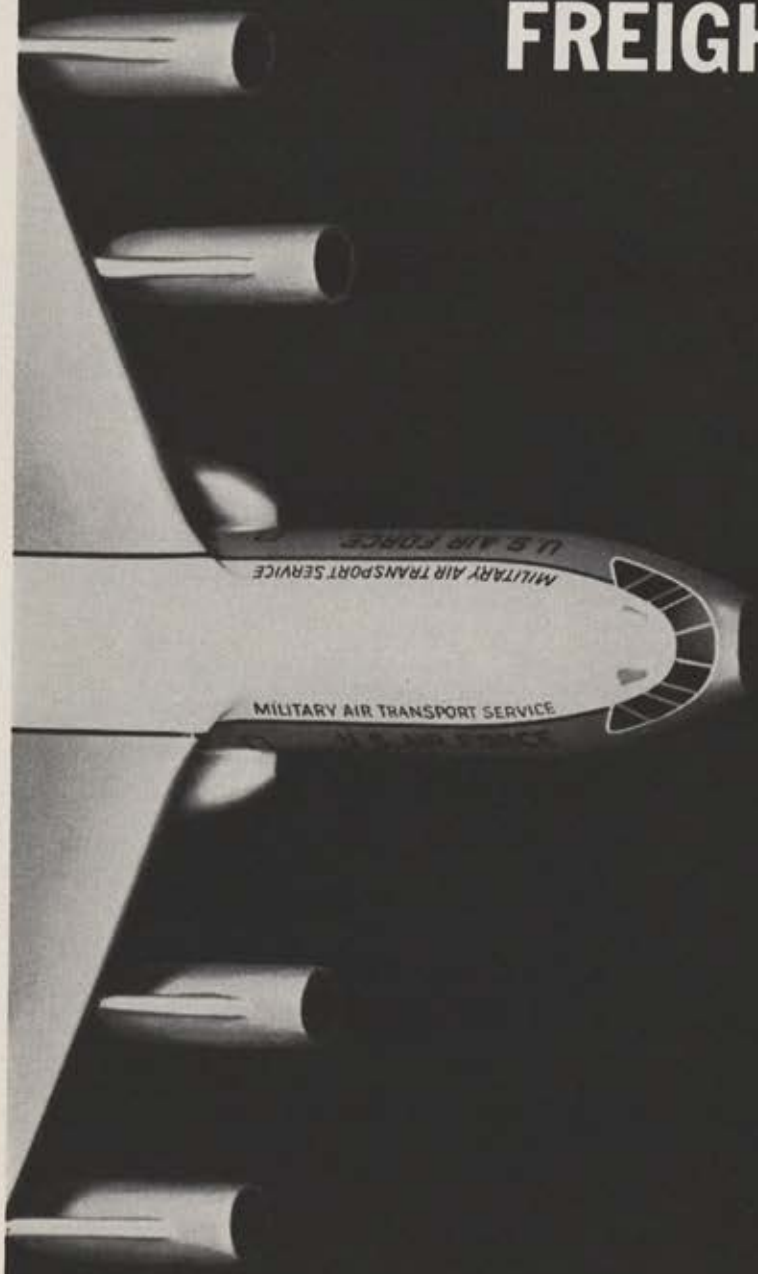
WASHINGTON
Paine Field, Everett

WISCONSIN
General Mitchell Field, Milwaukee



coming up:

THE C-141 TURBOFAN FREIGHTER



Soon the new Lockheed C-141 will extend the basic virtues of the true airlifter into the realm of huge, high-speed jet transports. It is designed for truck-bed-height, straight-in, rear loading, which eliminates jockeying cargo up and around corners. Fast, efficient loading systems will make elaborate support equipment unnecessary. And the C-141 is compatible with and complementary to the C-130, which will be in production and service for many years.

The C-141 will be powered by four 21,000-pound-thrust Pratt & Whitney turbofan engines. It will be able to carry up to 82,000 pounds on transoceanic flights at speeds up to 480 knots. Yet the big turbofan bird can slow to 115 knots, open its giant rear doors, and make airdrops of huge bulldozers and other heavy equipment.

The C-141 is the first transport airplane designed to meet both military specifications and civil air regulations. First military version will fly next year.

Lockheed-Georgia is prime contractor for the C-141, and is subcontracting 60% of the airframe to firms, large and small, throughout the United States.

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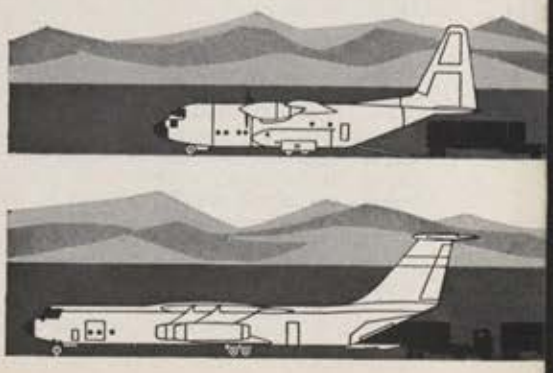


Gallery of
USAF
Weapons

BOMBERS

B-52

B-47

KB-50J

B-26

B-26 INVADER—this venerable bomber, originally designated the A-26, saw combat in World War II and the Korean War. It has returned to the USAF inventory as a counterinsurgency bomber and reconnaissance plane. Air Commandos employ both the hard-nosed and glass-nosed models, the former carrying 8 .50-caliber machine guns, the latter accommodating a bombardier-observer. **Contractor:** Douglas Aircraft Co. **Power Plant:** 2 Pratt & Whitney R2800-79 engines. **Power plant hp/thrust:** 2,000 lb. **Dimensions:** span 70 ft., length 49 ft. 11 in., height 18 ft. 6 in. **Speed:** 300 knots. **Range:** 1,500 mi. **Bomb load:** 4,000-lb. capacity in bomb bay; can carry rockets on wing mounts. **Armament:** B-26B, eight .50-caliber guns in nose. All models six .50-caliber guns in wings. Armament may be modified to carry cameras on reconnaissance missions. **Crew:** 3 or 4 depending on mission. **Maximum takeoff weight:** 35,000 lb. **Primary using command:** Tactical Air Command.

B-47 STRATOJET—medium-jet bomber; one of major components of SAC throughout the '50s and into the '60s. Made first flight December 17, 1947. The RB-47H reconnaissance version patrols borders of Communist bloc in Europe and Asia. In November 1959, an AFSC test B-47 remained airborne for 80 hrs. 36 min., covering 39,200 miles, bettering previous records, also by B-47, in both categories. Production completed late in 1956. Program to gradually phase out the B-47 fleet was delayed by Berlin crisis in 1961, and more than 900 Stratojets of all types remain in USAF inventory. **Contractor:** Boeing Co. **Power plant:** 6 General Electric J-47 turbojets. **Power plant/hp thrust:** 5,970 lb. (7,200 lb. wet). **Dimensions:** span 116 ft. length 110 ft., height 28 ft. **Speed:** over 630 mph. **Ceiling:** above 40,000 ft. **Range:** beyond 3,000 mi. **Bomb load:** more than 20,000 lb. **Armament:** 2 20-mm cannon in tail turret. **Crew:** 3—pilot, co-pilot, navigator-bombardier; (RB-47H also carries 3 electronics operators in converted bomb bay). **Maximum gross takeoff weight:** 200,000 lb. **Primary using command:** Strategic Air Command.

KB-50J SUPERFORTRESS—tactical aerial tanker; as B-50, originally a strategic bomber replacement for the B-29, was supplied to 3 SAC groups prior to Korea, then modified for air-to-air refueling. Present models have been modified to include 2 jet engines along with 4 piston engines to provide greater speed and altitude. KB-50J continues in service as aerial tanker of TAC's Composite Air Strike Force. WB-50, weather reconnaissance version of the versatile B-50 family, is operated by MATS Air Weather Service fitted with large observation windows, special search gear, and carries remote-controlled lifeboat. **Contractor:** Boeing Co., Hayes Aircraft Co. **Power plant:** 4 Pratt & Whitney R4360-PW35 piston engines, two General Electric J47-GE-23 turbojets. **Power plant hp/thrust:** reciprocating engines, 3,500 hp; turbojets, 5,620 lb. **Dimensions:** span 141 ft. 2 in., length 99 ft., height 32 ft. 7 in. **Speed:** over 400 mph. **Ceiling:** about 35,000 ft. **Range:** beyond 2,000 mi. **Cargo capacity:** over 20,000 lb. **Crew:** 6. **Maximum gross takeoff weight:** 173,000 lb. **Primary using commands:** Tactical Air Command, Military Air Transport Service.

B-52 STRATOFORTRESS—strategic heavy bomber; mainstay of USAF deterrent strength. Prototype flew in April 1952. When production ended in June 1962, Boeing had built 744 B-52s from A through H models. B-52G carries two GAM-77 Hound Dog air-launched missiles under wings, plus internal bomb load; B-52H carries four GAM-87 Skybolt ballistic missiles. G and H models are distinguishable from earlier types by shorter vertical tail, and redesigned wing incorporating integral fuel tank. B-52H has turbofan engines, yielding 12% better fuel consumption while eliminating water-injection equipment. In January 1957, three B-52s flew nonstop around world in 45 hrs. 19 min. In January 1962, a B-52 established a nonstop unrefueled straight-line distance record, covering 12,519 mi. from Okinawa to Madrid in 21 hrs., 52 min. In June 1962, a B-52H set a closed-course nonstop unrefueled record of 11,303 mi. in 22 hrs. 58 min. **Contractor:** Boeing Co. **Power Plant:** 8 Pratt & Whitney J57 turbojets. H model, 8 Pratt & Whitney TF33 turbofans. **Power plant hp/thrust:** up to 13,750 lb. each engine. H model, 17,000 lb. each engine. **Dimensions:** (Model A-F) span 185 ft., length 156 ft., height 48 ft.; (Model G and H) span 185 ft., length 157 ft., height 40 ft. 8 in. **Speed:** over 600 mph. **Ceiling:** above 50,000 ft. **Range:** (Model A-F) beyond 6,000 mi. (Model G) beyond 7,500 mi. (Model H) beyond 9,000 mi. **Bomb load:** more than 20,000 lb. **Armament:** 4 .50 caliber machine guns in tail. **Crew:** 6. **Maximum gross takeoff weight:** (Model A, B) more than 350,000 lb. (Model C-F) more than 400,000 lb. (Model G and H) more than 450,000 lb. **Primary using command:** Strategic Air Command.

RS-70

B-57

B-58

B-66

B-57 CANBERRA—light bomber; adaption of English Electric Canberra bomber. Versions of plane include RB-57 reconnaissance model, now the primary type in USAF and ANG use, TB-57 dual-control trainer, B-57E tow-target aircraft. **Contractor:** Martin Co. **Power plant:** Wright J65-5 turbojets. **Power plant thrust:** 7,200 lb. **Dimensions:** span 64 ft., length 65.5 ft., height 14.8 ft. **Speed:** over 600 mph. **Ceiling:** over 45,000 ft., over 55,000 in stripped-down reconnaissance version. **Range:** beyond 2,000 mi. **Bomb load:** 5,000 lb. **Armament/cameras:** bombs, 8 5-in. HVAR rockets, 8 .50-caliber machine guns, or high-altitude cameras. **Crew:** 2 seated in tandem; 1 in reconnaissance version. **Maximum gross takeoff weight:** 50,000 lb. **Primary using commands:** Pacific Air Forces, Air National Guard.

B-58A HUSTLER—strategic medium bomber-reconnaissance plane; world's first supersonic bomber. First flight November 1956. Uses disposable pods carried beneath the fuselage which make it unnecessary to haul empty space after weapons or fuel have been expended: payload, cameras, ECM equipment, fuel can be carried in pods; struts of main landing gear, each with 8 wheels, unusually long to give ground clearance to pod. Holds US transcontinental speed records each way between Los Angeles and New York, and round trip in 4 hr. 41 min. 11.3 sec., set March 5, 1962. During 1961, the B-58 set a number of international records—it flew 1,302 mph over a closed course of 669.4 miles, a few months later covered 5,183 miles between Carswell AFB, Tex., and Paris, France, nonstop, in 6 hrs., 15 min. Four aircraft have been converted to TB-58As, dual-control trainers. **Contractor:** General Dynamics/Fort Worth. **Power plant:** 4 General Electric J79 turbojets with afterburners. **Power plant hp/thrust:** over 10,000 lb. each plus afterburners. **Dimensions:** span 56 ft. 10 in., length 96 ft. 9 in., height 31 ft. 5 in. **Speed:** Mach 2 or 1,324 mph at 35,000 ft. **Ceiling:** above 60,000 ft. **Range:** intercontinental through mid-air refueling. **Bomb load:** nuclear weapons in disposable pod. **Armament:** 1-171E3 20-mm. cannon in tail. **Crew:** 3—pilot, bombardier/navigator, defensive systems operator. **Maximum gross takeoff weight:** more than 160,000 lb. **Primary using command: SAC.**

B-66 DESTROYER—tactical light bomber, USAF version of Navy A3D; versatile plane, used as bomber or in photo and weather reconnaissance; fills important roles in TAC Composite Air Strike Force. First flown June 1954. Latest in the series, the WB-66D weather-reconnaissance aircraft, delivered on June 26, 1957. Destroyer is equipped with automatic electrical control system which eliminates at least 10 pilot functions, requires no manual switching. **Contractor:** Douglas Aircraft Co. **Power plant:** 2 Allison J71-A-13 turbojets. **Power plant hp-thrust:** 10,000 lb. each. **Dimensions:** span 72 ft. 6 in., length 75 ft. 2 in., height 23 ft. 7 in. **Speed:** 700 mph. **Ceiling:** above 45,000 ft. **Range:** beyond 1,500 mi. without aerial refueling. **Bomb load:** B-66B, 15,000 lb. including nuclear weapons. **Armament/cameras:** 2 20-mm cannon in tail of all models; RB-66B, RB-66C, full range of camera equipment, WB-66D, special weather-reconnaissance equipment. **Crew:** B-66B, RB-66B, 3; RB-66C, 4; WB-66D, 5. **Maximum gross takeoff weight:** B-66B, 83,000 lb., RB-66, 83,000 lb. **Primary using commands:** Tactical Air Command, United States Air Forces in Europe.

RS-70 VALKYRIE—reconnaissance-strike bomber. Designed to fly throughout its mission at Mach 3 (2,000 mph). First flight scheduled for late 1962. RS-70 design and production plans have been on again, off again, almost constantly since original plan was announced in 1957. Eisenhower Administration canceled production plans for economy reasons in 1959, authorizing only a single prototype. Congress in 1960 appropriated funds for increased production but Kennedy Administration in March 1961 again cut back program, asserting growing US missile capability makes the new bomber "unnecessary and economically unjustifiable." USAF redesigned plans to convert the plane from a straight bomber to the RS-70 with equipment to seek out and destroy mobile and imprecisely located targets, and in June 1962 Congress voted $491 million for the program, though Department of Defense had requested—and announced it would spend—only $171 million. Present contract calls for three aircraft. Roughly the size of a B-52, the RS-70s gross takeoff weight is 550,000 lb., 70,000 lb. more than B-52, but gear arrangement will permit it to operate from B-52 bases. **Contractor:** North American Aviation. **Power plant:** 6 General Electric J93 turbojets. **Power plant hp/thrust:** 33,000 lb. each. **Dimensions:** span 115 ft., length 170 ft. **Speed:** over 2,000 mph (Mach 3) cruise. **Ceiling:** about 70,000 ft. **Range:** intercontinental. **Bomb load:** classified. **Armament:** may carry Skybolt or Hound Dog missiles as well as free-fall nuclear weapons. **Crew:** 4. **Maximum gross takeoff weight:** 550,000 lb. (275 tons). **Primary using command:** Strategic Air Command.

Gallery of USAF Weapons

FIGHTERS

F-100D

RF-84F

F-89

F84F

F-86

F-84F THUNDERSTREAK—sweptwing tactical fighter. Deliveries began in 1953; first TAC units were equipped in 1954. Dropped from active USAF inventory in 1958; returned with recall of 4 ANG wings in October 1961 to strengthen US conventional-war capability, and retained when ANG was released in August 1962. It has tricycle landing gear, jettisonable canopy, pilot ejection seat. **Contractor:** Republic Aviation Corp. **Power plant:** Wright Sapphire J65 single jet. **Power plant hp/thrust:** 7,200 lb. **Dimensions:** span 33 ft. 6 in., length 43 ft. 4 in., height 14 ft. 4 in. **Speed:** over 650 mph. **Ceiling:** above 45,000 ft. **Range:** beyond 2,000 mi. **Bomb load:** 6,000 lb. of conventional or nuclear bombs. **Armament:** 6 .50-caliber machine guns, 24 5-in. rockets. **Crew:** 1. **Maximum gross takeoff weight:** 26,000 lb. **Primary using commands:** Tactical Air Command, NATO, SEATO.

RF-84F THUNDERFLASH—reconnaissance modification of F-84F; like F-84F, left USAF inventory in 1958. One ANG wing of RF-84Fs was recalled in October 1961, released August 1962. Made maiden flight in February 1952 at Edwards AFB. Has virtually same characteristics as the fighter except air-intake ducts are situated in the wing roots rather than nose, which is elongated and enclosed to provide space for cameras, radar, electronic equipment; can carry combinations of a variety of 15 cameras; carries magnesium flares in flash-ejector cartridges under the wings for night photography. Was the first reconnaissance fighter to have camera control system and a view finder for the pilot; also equipped with wire recorder which records pilot's observations during visual reconnaissance. **Contractor:** Republic Aviation Corp. **Power plant:** Wright sapphire J65 single jet. **Power plant hp/thrust:** 7,200 lb. **Dimensions:** span 33 ft. 6 in., length 47 ft. 6 in., height 15 ft. **Speed:** over 650 mph. **Ceiling:** above 45,000 ft. **Range:** beyond 2,000 mi. **Armament/cameras:** 4 .50-caliber machine guns, standard aerial cameras, dicing cameras, Tri-Metrogon camera. **Crew:** 1. **Maximum gross takeoff weight:** 25,000 lb. **Primary using commands:** Air National Guard, NATO, SEATO.

F-86 SABREJET—tactical fighter interceptor. First American sweptwing fighter to go into combat. First flight of F-86A, May 1948. Various models set and held world speed marks from 671 mph to 699 mph. F model gained world fame in Korean War, building 14-1 kill ratio mainly against MIG-15. Principal models A, D, E, F, H, K, L. (K model for NATO powers.) L model modified from D by addition of data-link SAGE equipment. Principal models now flying for US are H and L models, used by Air National Guard. **Contractor:** North American Aviation. F model built under license by Mitsubishi in Japan; K model by Fiat in Italy. **Power plant:** F-86A, General Electric J47-1 3, 9, 13; D, L, GE J47-17, 33; E, GE J47-13; F, GE J47-27; H, J73-3; K, J47-33. **Power plant hp/thrust:** 5,200 to 5,600 lb., except J47-33, 7,650 lb., and J73-3, 9,300 lb. **Dimensions:** span 37 ft. (L, 39 ft.), length 37 ft. 6 in. (H, 38 ft. 9 in, D, L, 41 ft.), height 14 ft. (F, 15 ft.). **Speed:** more than 650 mph. **Ceiling:** above 50,000 ft. **Range:** beyond 1,000 mi. with external tanks. **Bomb load:** 2 1,000-lb bombs, or 2 2,000-lb. bombs without fuel tanks. **Armament:** 6 .50-caliber machine guns; 16 5-in. rockets or 24 2.75-in. rockets, or 4 20-mm cannon in various models. **Crew:** 1. **Maximum gross takeoff weight:** 20,000 lb. **Primary using commands:** Air National Guard, NATO, SEATO.

F-89 SCORPION—all weather interceptor. First flown in August 1948, the Scorpion has gone through numerous model changes, latest being the H. The J-model, used extensively in Air National Guard, is made up of earlier types factory-modified to incorporate features of the production H-model. F-89 will be phased out of active USAF inventory by end of 1962 when last ADC unit, flying F-89Ds, will convert to F-102. ANG F-89Js employ MB-1 Genie missile with nuclear capability. **Contractor:** Northrop Corp. **Power plant:** 2 Allison J35-A-35 turbojets with afterburners. **Power plant hp/thrust:** about 15,000 lb. with afterburners. **Dimensions:** span 59 ft. 8 in., length 53 ft. 4 in., height 17 ft. 7 in. **Speed:** over 600 mph. **Ceiling:** above 50,000 ft. **Range:** 2,000 mi. **Armament:** 104 2.75-in. folding-fin air-to-air rockets or missiles including Falcon or Genie. **Crew:** 2, pilot and radar observer, seated in tandem. **Maximum gross takeoff weight:** more than 40,000 lb. **Primary using command:** Air National Guard.

F-100 SUPERSABRE—first tactical fighter to exceed speed of sound in level flight; made first flight May 25, 1953; went into production at Los Angeles plant mid-1953; first delivery made to TAC in September 1954. F-100F was first two-place jet tactical fighter ordered by Air Force; went into production in Los Angeles in 1956; in use mainly as a trainer. D model has an autopilot. C and D models have in-flight refueling systems. Plane is versatile tool of TAC's Composite Air Strike Force; with new, larger external tanks and ability to refuel internal and external tanks in flight, has almost unlimited range; can be zero-length launched from a mobile translauncher fully armed, fueled, and manned. F-100 production ended in 1959. **Contractor:** North American Aviation. **Power plant:** Pratt & Whitney J57 with afterburner. **Power plant hp/ thrust:** over 10,000 lb. **Dimensions:** span 38 ft., length 47 ft., height 16 ft. **Speed:** over 800 mph. **Ceiling:** above 50,000 ft. **Range:** 1,800 mi. without aerial refueling. **Bomb load:** conventional or nuclear bombs. **Armament:** 4 M-39 20-mm. cannon, Sidewinder or Bullpup air-to-air missiles. **Crew:** 1; 2 in F model. **Maximum gross takeoff weight:** over 30,000 lb. **Primary using commands:** Tactical Air Command, United States Air Forces in Europe, Pacific Air Forces, Air National Guard.

F-101

F-106

F-102

F-104A

F-105

F-101 VOODOO—all-weather fighter-interceptor and reconnaissance. F-101 has been in squadron service with TAC since May 1957. Plane was developed from the XF-88, went supersonic on first flight September 29, 1954. Production ended March 1961. Models include F-101A, F-101B, two-seated long-range interceptor; F-101C, all-weather, heavily armored tactical fighter; and RF-101A and C. Until the F-104, the F-101 was USAF's fastest tactical fighter; on December 12, 1957, F-101C set a world record of 1,207.6 mph at Edwards AFB. On May 22, 1958, two F-101Cs made a 5,600-mile nonstop flight originating and terminating at Bergstrom AFB; on June 28, 1958, 4 F-101Cs flew nonstop from Andrews AFB, to Liege, Belgium, at an average speed of 640 mph; in August 1958, a flight of 7 completed a 6,100-mile nonstop deployment from Bergstrom to Bentwaters, England. **Contractor:** McDonnell Aircraft Corp. **Power plant:** 2 Pratt & Whitney J57 jets. **Power plant hp/thrust:** 29,000 lb. total. **Dimensions:** span 39.8 ft., length 67.5 ft., height 18 ft. **Speed:** over 1,200 mph. **Ceiling:** above 50,000 ft. **Range:** beyond 1,000 mi. without aerial refueling. **Bomb load:** conventional and nuclear bombs. **Armament:** combinations of 4 M-39 20-mm. cannon, MB-1 Genie, Falcon, and Sidewinder air-to-air rockets. **Crew:** F-101A and C, 1; F-101B, 2. **Maximum gross takeoff weight:** over 40,000 lb. **Primary using commands:** Tactical Air Command, Air Defense Command, United States Air Forces in Europe, Pacific Air Forces.

F-102 DELTA DAGGER—all-weather fighter-interceptor. Became operational with Air Force units in mid-1956; design based on XF-92A. YF-102A is first plane to incorporate "coke-bottle" area-rule fuselage design. All electronic equipment, armament, and fuel carried internally; advanced electronic fire-control system, developed by Hughes Aircraft Co., searches out target at long range, directs the pilot on attack course for missiles or rockets, at correct instant fires armament automatically. Two-place TF-102A version used mainly for transition training. B model was redesignated and developed as F-106. **Contractor:** General Dynamics/Convair. **Power plant:** Pratt & Whitney J57-P-35 turbojet. **Power plant hp/thrust:** 17,000 lb. with afterburner. **Dimensions:** span 38 ft., length 68 ft. 3 in., height 21 ft. 3 in. **Speed:** supersonic. **Ceiling:** above 50,000 ft. **Range:** beyond 1,000 mi. **Armament:** 6 GAR-1D or -2A Falcons, plus 24 2.75-in. folding-fin rockets. **Crew:** F-102A, 1; TF-102A, 2 side-by-side. **Maximum gross takeoff weight:** over 25,000 lb. **Primary using commands:** Air Defense Command, Air National Guard.

F-104 STARFIGHTER—tactical fighter and interceptor; as day-night interceptor it is armed with GAR-8 Sidewinders on wingtips; as a tactical fighter, it carries 6 barreled, 20-mm. Vulcan cannon. First flight date in February 1954; set world speed record of 1,404 mph in May 1958, piloted by Capt. Walter Irwin. During same period set altitude record of 91,244 ft. piloted by Maj. Howard Johnson. In December 1959, Capt. Joe B. Jordan, test pilot at Edwards AFB, Calif., established two new world's records in the F-104. He raised the Navy's altitude record of 98,560 ft. to 103,395 ft., setting a time-to-climb record from takeoff to 98,425 ft. in 15 min. 4.92 sec. All these records have since been exceeded. F-104B is tandem-seating version of the A model; F-104D 2-seat version of F-104C; both are in use by TAC. The F-104 played a prominent part in the USAF strike force development to Taiwan in September 1958. Plane being produced in Canada, Western Europe, Japan under license. **Contractor:** Lockheed Aircraft Corp. **Power plant:** General Electric J79 with afterburner. **Power plant hp/thrust:** 15,800 lb. **Dimensions:** span 21 ft. 11 in., length 54 ft. 9 in., height 13 ft. 6 in. **Speed:** over 1,400 mph. **Ceiling:** above 55,000 ft. **Range:** beyond 1,000 mi. **Bomb load:** conventional and nuclear weapons. **Armament:** Sidewinders, Vulcan 20-mm. cannon. **Crew:** F-104A and C, 1; F-104B and D, 2. **Maximum gross takeoff weight:** 20,000 lb. **Primary using commands:** Air National Guard, NATO, SEATO, Tactical Air Command.

F-105 THUNDERCHIEF—all-weather tactical fighter; first flew fall 1955; volume production began in spring 1958; High-speed, long-range, well armed F-105 has bomb bay longer than B-17, fire-control system which permits pinpoint bombing from extremely low level to 50,000 ft. Full arsenal of missiles and rockets. Has delivered on target 7 tons of conventional bombs, largest load ever carried by a 1-engine plane. **Contractor:** Republic Aviation Corp. **Power plant:** Pratt & Whitney J75 with afterburner. **Power plant hp/thrust:** 26,500 lb. **Dimensions:** span 34 ft. 11 in., length 64 ft. 3 in., height 19 ft. 8 in. **Speed:** over 1,200 mph. **Ceiling:** above 55,000 ft. **Range:** beyond 1,500 mi. **Bomb load:** 4,000 lb. of conventional or nuclear bombs. **Armament:** Vulcan cannon, rockets, air-to-air missiles. **Crew:** 1. **Maximum gross takeoff weight:** 48,000 lb. **Primary using command:** Tactical Air Command.

F-106 DELTA DART—all-weather interceptor; first flight of F-106A was at Edwards AFB, December 26, 1956; F-106B followed on April 9, 1958, also at Edwards; both are supersonic and carry the same armament. F-106 is based on the F-102, but it is an altogether new aircraft; A and B are operational with ADC. Last aircraft delivered to ADC July 20, 1961. Plane's fire-control and electronic-guidance systems are capable of automatically flying the aircraft through any kind of weather in darkness or daylight under direction of ground-control intercept stations. December 15, 1959, Maj. J. W. Rogers broke the world's straightaway speed record with a 2-way average of 1,525.9 mph, since exceeded. **Contractor:** General Dynamics/Convair. **Power plant:** 1 Pratt & Whitney J75 turbojet with afterburner. **Power plant hp/thrust:** 24,500 lb. **Dimensions:** span 38 ft., length 70 ft. 9 in., height 20 ft. **Speed:** over 1,500 mph. **Ceiling:** above 60,000 ft. **Range:** about 1,500 mi. **Armament:** GAR-3 or -4 Falcons, MB-1 Genie with nuclear warhead. **Crew:** F-106A, 1; F-106B, 2 in tandem. **Maximum gross takeoff weight:** over 35,000 lb. **Primary using command:** Air Defense Command.

Gallery of
USAF
Weapons

MISSILES

F-4C

F-5A

FIGHTERS—CONTINUED

F-4C—twin-engine, two-seat, all-weather tactical fighter—adaptation of Navy F4H Phantom II. Formerly designated F-110A. USAF has ordered 336, of which 26 will be RF-4Cs for reconnaissance. Phantom II was first flown in May 1958. Can carry more than twice the bomb load of a WW II B-17. Holds several time-to-climb records, from 3,000 to 30,000 meters. It reached 30,000 meters (98,425 ft., or 18½ mi.), in 6 min. 11 sec., from standing start. (Cf, F-104). Unusual features include variable geometry air inlets, blowing boundary layer control on both leading- and trailing-edge flaps to reduce landing speeds. Can carry wide variety of armament, including Bullpup, Sidewinder, Sparrow II, or nuclear weapons. Uses probe-and-drogue refueling, including provision for "Buddy" refueling from one F-4C to another. **Contractor:** McDonnell Aircraft Corp. **Power plant:** 2 General Electric J79-GE-15 turbojets. **Power plant hp/thrust:** 17,000 lb. each with afterburner. **Dimensions:** length 56 ft., span 38 ft. 5 in., height 16 ft. 3 in. **Speed:** over Mach 2.5. **Ceiling:** above 66,000 ft. **Crew:** 2. **Maximum gross takeoff weight:** over 40,000 lb. **Primary using command:** Tactical Air Command.

F-5A FREEDOM FIGHTER—tactical fighter or photo-reconnaissance. Formerly designated N-156F, it is similar to USAF T-38 supersonic trainer. Department of Defense announced in April 1962 it was buying F-5As for delivery to allied nations under military assistance program. A model is 1-seater; B-model, 2 seats. In first flight July 30, 1959, exceeded Mach 1. Capable of Mach 1.4 in level flight. Carries up to 5,000 lb. external stores—armament or fuel. Can take off or land from sod field, has provision for JATO units for zero-length launch. **Contractor:** Northrop Corp., Norair Div. **Power plant:** 2 General Electric J85-5 turbojets with afterburner. **Power plant hp/thrust:** 3,850 lb. with afterburner. **Dimensions:** span 26 ft. 5 in., length 43 ft. 11 in., height 13 ft. **Speed:** 900 mph. **Ceiling:** over 55,000 ft. **Range:** 2,100 mi. with external tanks. **Armament:** no fixed armament. Can carry Sidewinder or Falcon missiles, or 2,000-lb. bomb, or rockets in combinations. **Crew:** F-5A, 1; F-5B, 2. **Maximum gross takeoff weight:** 12,400 lb. **Primary using commands:** NATO allies.

SM-75 THOR

SM-65 ATLAS

SM-68 TITAN

SM-65 ATLAS—intercontinental ballistic missile, free world's first operational ICBM. Flight testing began at Cape Canaveral in 1957. Eight such flights preceded tests of complete missile, including sustainer engine and separable nose cone, beginning summer 1958. Full-range 6,000-mile flight made November 28, 1958; missile fired into orbit December 18, 1958 (talking satellite). In September 1959, following further extensive testing, Atlas declared operational at Vandenberg AFB, Calif., home of USAF's 1st Ballistic Missile Division. Thirteen Atlas squadrons with 126 missiles expected to become operational by end of 1962. D, E models are semihardened in surface coffins. F model is silo housed. First Atlas-F fired August 8, 1961. Missile also slated for space missions including manned space capsule program; basic guidance radio-inertial, advanced versions all-inertial. **Contractor:** General Dynamics/Astronautics. **Power plant:** North American Rocketdyne, one-and-a-half stage, liquid fuel. **Power plant hp/thrust:** about 360,000-lb. takeoff thrust, advanced E and F models about 10% higher. **Dimensions:** length 75 to 82 ft. depending on nose cone, diameter 10 ft. **Speed:** over 15,000 mph. **Range:** more than 6,000 mi., 8,050 in later version, achieved 9,000-mile flight in early 1960. **Bomb load:** nuclear. **Maximum gross takeoff weight:** about 260,000 lb. at launch. **Primary using command:** Strategic Air Command.

SM-68 TITAN—intercontinental ballistic missile. Will be fired from deep, concrete-lined silos at Vandenberg AFB and other sites in Midwest and Far West. Pits 155 feet deep, 40 feet in diameter; later version Titan II is fired directly from storage position in silo; earlier version is raised prior to firing. Titan II is generally improved missile with storable cryogenic liquid fuel compared to nonpackaged liquid in basic Titan; this allows faster response and salvo firing from silos. First Titan squadron operational April 18, 1962. Six squadrons of 9 Titans each will be operational by end of 1962. Titan, as in case of early Atlas, has radio-inertial guidance, later models all-inertial. Titan II, possessing 20% more power than Titan I, made maiden flight of 5,000 mi. March 16, 1962. Will be used in NASA Gemini program. Titan III is same as Titan II plus two strap-on auxiliary power units. **Contractor:** Martin Co. **Power plant:** Aerojet-General, RP-1, two-stage liquid propellant. **Power plant hp/thrust:** first stage 300,000 lb., second stage 60,000 lb. Titan II about 20% more from all stages. **Dimensions:** length 90 ft., diameter 10 ft. **Speed:** over 15,000 mph. **Range:** more than 6,000 mi., 10,000 in Titan II. **Bomb load:** nuclear. **Maximum gross takeoff weight:** 222,000 lb. at launch. **Primary using command:** Strategic Air Command.

SM-75 THOR—intermediate-range ballistic missile; full production missile deployed with Royal Air Force in Britain since early 1959, now scheduled to be phased out there. First opera-

GAR-1, -2, -3, -4, -11 FALCON

MB-1 GENIE

SM-78 JUPITER

SM-80 MINUTEMAN

IM-99 BOMARC

TM-76 MACE

tional free-world IRBM, initially tested at Cape Canaveral, early in 1957; has been past test stage since mid-1959. Reliable and much-used space booster both singly and in combinations such as Thor-Able, Thor-Delta, Thor-Agena. Was also first ballistic missile fired from new Vandenberg AFB, Calif., missile facility and first to be fired by all-SAC crew. **Contractor:** Douglas Aircraft Co. **Power plant:** North American Rocketdyne single-stage liquid rocket engine. **Power plant hp/thrust:** 150,000-lb. takeoff thrust. **Dimensions:** length 65 ft., diameter 8 ft. **Speed:** Mach 15. **Range:** beyond 1,500 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** 110,000 lb. at launch. **Primary using commands:** SAC, RAF.

SM-78 JUPITER—intermediate-range ballistic missile; was developed by Army in conjunction with Chrysler Corp. for USAF employment; now deployed in certain NATO countries; 15 missiles per squadron. **Contractor:** Chrysler Corp. **Power plant:** North American Rocketdyne single-stage liquid rocket. **Power plant hp/thrust:** 150,000 lb. **Dimensions:** length 60 ft. 4 in., diameter 9 ft. **Speed:** Mach 15. **Range:** beyond 1,500 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** 110,000 lb. **Primary using command:** NATO.

SM-80 MINUTEMAN – second-generation, solid-propellant ICBM; designed around concept of instantaneous, massive response to enemy attack. Small in size and easy to handle; dispersed in hardened underground sites. First Minuteman site complex being completed near Great Falls, Mont. Several hundred will be operational in 1963 in 60-unit squadrons. **Contractor:** Boeing Co. **Power plant:** 3-stage solid propellant, first stage by Thiokol, second by Aerojet-General, third by Hercules Powder Co. **Power plant hp/thrust:** first stage, 170,000 lb., second stage, 65,000 lb.; third stage, 35,000 lb. **Dimensions:** length 55 ft., diameter 5 ft. 5 in. **Speed:** Mach 22. **Range:** over 6,500 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** about 65,000 lb. **Primary using command:** SAC.

IM-99 BOMARC—ramjet surface-to-air defense intercept missile; used in conjunction with SAGE (Semi-Automatic Ground Environment) electronic system as primary control. Guided from ground to altitude and target area; then target-seeker and proximity fuse take over. In test at Eglin AFB, Fla., Bomarc-A intercepted drone F-104 150 miles out over Gulf of Mexico. Bomarc-A operational in late 1959; advanced B model, with twice the range of Bomarc-A, in mid-1961. **Contractor:** Boeing Co. **Power plant:** Aerojet-General liquid- or Thiokol solid-propellant booster, two Marquardt ramjets. **Power plant hp/thrust:** ramjets over 10,000 lb. each, booster 50,000 lb. **Dimensions:** span 18 ft. 2 in., length 46 ft. 9 in., height 10 ft. 3 in. **Speed:** about Mach 3, B model about Mach 4. **Ceiling:** above 60,000 ft., B model; 100,000 ft. **Range:** IM-99A, 200-250 mi.; IM-99B, over 400 mi. **Bomb load:** conventional or nuclear. **Maximum or gross takeoff weight:** about 15,000 lb., B model 16,000 lb. **Primary using commands:** Air Defense Command, Royal Canadian Air Force.

TM-76 MACE—air-breathing, surface-to-surface guided missile; improved, much-changed version of Matador. TM-76A has improved map-matching guidance system known as ATRAN; B model is inertially guided; missile has wide versatility to penetrate enemy electronic detection screens at extreme low level or in upper altitudes. Like Matador, which it has replaced, it is zero-launched from roadable launcher; deployed to Europe and Pacific. **Contractor:** Martin Co. **Power plant:** Allison J33-A-41 turbojet and solid-propellant booster. **Power plant hp/thrust:** 5,200 lb. plus 100,000-lb. booster. **Dimensions:** span 22 ft. 10 in., length 44 ft., height 10 ft. **Speed:** more than 650 mph. **Ceiling:** above 40,000 ft. **Range:** A model over 650 mi., B model 1,000 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** about 14,000 lb. **Primary using commands:** United States Air Forces in Europe, Pacific Air Forces.

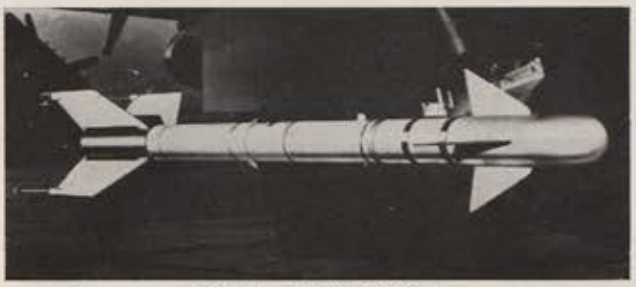
MB-1 GENIE—air-to-air rocket with atomic warhead; unguided; uses solid-propellant engine. Preliminary studies in October 1953; contract negotiated with Douglas Aircraft, July-August 1954; first tests from F-89D and YF-102, March and May 1956; ADC operational capability, January 1957. Genie has 4 fins with sloped leading edges, horizontal tips, vertical trailing edges for free-flight stabilization; carried by F-89, F-101, F-102, F-106, F-4C. Advanced version with guidance system under development. **Contractor:** Douglas Aircraft Co. **Power plant:** Aerojet-General Corp. **Power plant hp/thrust:** about 36,000 lb. **Dimensions:** length 8 ft., diameter 15 in. **Speed:** about Mach 3. **Ceiling:** above 50,000 ft. **Range:** about 6 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** about 800 lb. **Primary using command:** Air Defense Command.

GAR-1, -2, -3, -4, -11 FALCON—supersonic, guided air-to-air missiles. Hughes Aircraft has produced 5 basic versions of the Falcon plus a number of improved models including the -1D, -2A, -3A, -4A; the -3, -4, and -11 versions are sometimes termed Super Falcons. The -1 and -3 are radar-homing; -2 and -4 infrared homing; -11 has a nuclear warhead and radar guidance, as such is the nation's first guided nuclear-tipped air-to-air weapon. A nuclear GAR-9, originally intended as armament for the dropped F-108 fighter program, is also under development. GAR-ID and -2A have been operational since 1956 on ADC, TAC F-89, F-101, F-102, now also on F-106 and F-4C; can be carried internally or under aircraft wings. **Contractor:** Hughes Aircraft Co. **Power plant:** Thiokol solid-propellant rocket motor. **Power plant hp/thrust:** about 6,000 lb. **Dimensions:** length 6 ft. 6 in., diameter 6 ft. 5 in., span 1

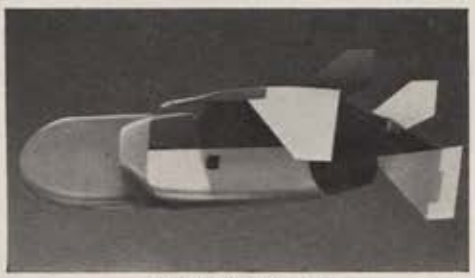
GAM-77 HOUND DOG

GAM-87A SKYBOLT

GAM-83A BULLPUP



GAR-8 SIDEWINDER



GAM-72 QUAIL

ft. 8 in.; the -11 model is considerably larger. **Speed:** Mach 2. **Ceiling:** above 50,000 ft. **Range:** beyond 5 mi. **Bomb load:** conventional warhead; -11, nuclear. **Maximum gross takeoff weight:** over 100 lb. **Primary using command:** Air Defense Command.

GAR-8 SIDEWINDER—supersonic, guided air-to-air missile. Initially developed by US Navy for fleet air defense; in USAF used by TAC, ADC F-100, F-101, F-104, F-105, and F-4C. Considered simple, inexpensive missile with little training required for handling and use. Homes on tailpipe of target aircraft through passive infrared guidance system; has been used successfully in combat by Chinese Nationalist Air Force against Chinese Communist planes. In operational use with several Allied air forces. **Contractor:** Philco Corp. and General Electric. **Power plant:** Naval Powder Plant solid propellant. **Power plant hp/thrust:** over 6,000 lb. **Dimensions:** length 9 ft. 4 in., diameter 5 in., span 1 ft. 7 in. **Speed:** Mach 2.5. **Ceiling:** above 50,000 ft. **Range:** at sea level 3,500 ft., at 50,000 ft. 11,000 ft. **Bomb load:** conventional. **Maximum gross takeoff weight:** 155 lb. **Primary using commands:** Tactical Air Command, Air Defense Command, ChiNat Air Force.

GAM-72 QUAIL—air launched diversionary bomber-defense missile designed for launch from SAC bomber when approaching target to confuse enemy radar defenses; first successful test flight August 1958, has undergone continuing launches since from B-47, B-52 aircraft; test missiles recovered by parachute and reused. Last missile delivered to USAF May 28, 1962. **Contractor:** McDonnell Aircraft Corp. **Power plant:** General Electric J85 turbojet. **Power plant hp/thrust:** 2,450 lb. **Dimensions:** length 12 ft. 10 in., tail span 5 ft. 4 in., diameter 2 ft. 1 in. **Speed:** subsonic. **Ceiling:** classified. **Range:** 200 mi. **Maximum gross takeoff weight:** 1,100 lb. **Primary using command:** Strategic Air Command.

GAM-77 HOUND DOG—air-breathing air-to-ground guided standoff missile; it is intended to increase and supplement the destructive power of long-range SAC bombers; GAM-77 operational on B-52G aircraft; guidance is inertial. Attacking B-52 would carry two Hound Dogs primarily to attack air defense targets on the ground, such as airfields and missile sites, and assist the bomber in reaching the primary target area. **Contractor:** North American Aviation Co. **Power plant:** Pratt & Whitney J52 turbojet. **Power plant hp/thrust:** 7,500 lb. at sea level. **Dimensions:** span 12 ft. 2 in., length 42 ft. 6 in., height 9 ft. 4 in. **Speed:** Mach 1.6 to 2.2. **Ceiling:** above 50,000 ft. **Range:** beyond 500 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** 9,600 lb. **Primary using command:** Strategic Air Command.

GAM-83A BULLPUP—air-to-surface guided weapon; adaptation of Navy-developed Bullpup for use by tactical fighters. Guidance provided by radio signals from launch plane's pilot. Number of advanced versions under development, one being developed for USAF with nuclear capability. Rocket power plant uses either solid or storable liquid propellant. **Contractor:** Martin Co. **Dimensions:** length 11 ft., diameter 1 ft., span 3 ft. 1 in. **Speed:** Mach 1.8. **Range:** over 15,000 ft. **Bomb load:** conventional. **Maximum gross takeoff weight:** 540 lb. **Primary using command:** Tactical Air Command.

GAM-87A SKYBOLT—air-launched ballistic missile (ALBM); now in development, designed to complement the GAM-77 Hound Dog air-launched guided missile. First airborne launch, April 19, 1962, was partial success, but second stage failed to ignite. With range comparable to an IRBM, would be able to attack many targets from airborne alert station of launch aircraft, and all targets after short redeployment flight of plane; in most cases, plane itself would not have to penetrate enemy defenses; thus Skybolt will extend range and useful life of bombers in the inventory. Two or more missiles could be carried on SAC attack aircraft, usually in addition to normal load of nuclear bombs; ALBM's ballistic trajectory and nonjammable guidance would serve well in getting through enemy defenses. Numerous feasibility tests have been conducted. **Contractor:** Douglas Aircraft Co. **Power plant:** Aerojet-General two-stage solid propellant. **Power plant hp/thrust:** first-stage engine, 35,000 lb.; second stage 19,000 lb. **Dimensions:** length, 33 ft. without tail fairing, diameter about 3 ft. **Gross weight:** about 11,000 lb. **Speed:** about 9,500 mph. **Range:** about 1,150 mi. after launch from bombers, at present B-52s and British Vulcan. **Bomb load:** nuclear. **Primary using commands:** Strategic Air Command, Royal Air Force.

Gallery of
USAF
Weapons

TRANSPORTS

C-47

C-119

C-97

C-54

C-118

C-46

C-46 COMMANDO—cargo-troop carrier used extensively in World War II, returned to the USAF inventory for use by 1st Air Commando Group in counterinsurgency operations. More than 3,000 C-46s were built in World War II. Now in civilian use as freighters in many parts of the world. **Contractor:** Curtiss-Wright Corp. **Power plant:** 2 Pratt & Whitney R2800-51 or -75 radial engines. **Power plant hp/thrust:** 2,000 hp each. **Dimensions:** span 108 ft., length 76 ft. 4 in., height 21 ft. 9 in. **Speed:** 250 mph. **Ceiling:** over 25,000 ft. **Range:** 1,800 mi. **Cargo capacity:** 16,000 lb. or 50 troops. **Crew:** 4. **Maximum gross takeoff weight:** 50,000 lb. **Primary using command:** Tactical Air Command.

C-47 SKYTRAIN—cargo-troop carrier; popularly known as "Gooney Bird," a historic worldwide work horse for USAF, other services, many nations. First flight as DC-3, civil designation, February 1932; since then more than 10,000 built; a good many of them still flying somewhere. Was backbone of the Troop Carrier Command in all theaters of World War II and used extensively in the Korean War; remains in general-purpose use today. **Contractor:** Douglas Aircraft Co. **Power plant:** 2 Pratt & Whitney R1830-90-D. **Power plant hp/thrust:** 1,200 hp each. **Dimensions:** span 95 ft., length 64 ft. 4 in., height 16 ft. 10 in. **Speed:** 230 mph. **Ceiling:** 23,000 ft. **Range:** 2,125 mi. **Cargo capacity:** 7,500 lb., 28 troops. **Crew:** 3. **Maximum gross takeoff weight:** 33,000 lb. **Primary using commands:** All USAF commands.

C-54 SKYMASTER—cargo-troop carrier; made first flight February 1942; later served as a heavy cargo transport for Air Corps and Navy. Used extensively by MATS, some other commands as an administrative command aircraft. SC-54 used by Air Rescue Service. **Contractor:** Douglas Aircraft Co. **Power plant:** 4 Pratt & Whitney R2000-9 piston engines. **Power plant hp/thrust:** 1,450 hp each. **Dimensions:** span 117 ft. 6 in., length 93 ft. 9 in., height 27 ft. 6 in. **Speed:** 300 mph. **Ceiling:** 30,000 ft. **Range:** beyond 2,000 mi. **Cargo capacity:** 32,000 lbs., 50 troops. **Crew:** 3 to 5. **Maximum gross takeoff weight:** 82,500 lb. **Primary using commands:** MATS, other USAF commands.

C-97 STRATOFREIGHTER—four-engine heavy transport. Also KC-97 tanker. Military Air Transport Service turned over its C-97 transports to Air National Guard in 1960 but six ANG C-97 transport squadrons were recalled to active duty with MATS from October 1961 to August 1962. KC-97 tankers are being released to ANG by Strategic Air Command as KC-135 tankers become available. Production of last model of C-97, the KC-97G, was completed in July 1956. **Contractor:** Boeing Co. **Power plant:** 4 Pratt & Whitney R4360-59 Wasp Majors. **Power plant hp/thrust:** rated hp 2,650; takeoff hp 3,500. **Dimensions:** span 141 ft. 3 in., length 110 ft. 4 in., height 38 ft. 3 in. **Speed:** over 350 mph. **Ceiling:** above 35,000 ft. **Range:** beyond 4,000 mi. **Cargo capacity:** 96 troops, or 69 litter patients without refueling equipment, or more than 65,000 lb. **Crew:** 5. **Maximum gross takeoff weight:** over 160,000 lb. **Primary using commands:** Strategic Air Command, Air National Guard.

C-118 LIFTMASTER—cargo-troop carrier; military version of civil airlines' DC-6A; made first flight September 1949; initially designed as cargo carrier to meet requirements for swift and economical transportation of air freight; still widely used in MATS. **Contractor:** Douglas Aircraft Co. **Power plant:** 4 Pratt & Whitney R2800-CB-17 piston engines. **Power plant hp/thrust:** 2,500 takeoff hp, 10,000 hp total. **Dimensions:** span 117 ft. 6 in., length 106 ft. 6 in., height 28 ft. 8 in. **Speed:** 372 mph maximum. **Ceiling:** above 25,000 ft. **Range:** about 5,000 mi. **Cargo capacity:** 25,500 lb. or 76 equipped troops. **Crew:** 5. **Maximum gross takeoff weight:** 107,000 lb. **Primary using commands:** Military Air Transport Service, other major air command headquarters.

C-119 FLYING BOXCAR—cargo-troop carrier; improved and considerably modified version of C-82. In use since 1947; long a Tactical Air Command standby, particularly for troop drops and aerial resupply, now used mainly by Air Reserve troop carrier wings and Air National Guard aeromedical evacuation squadrons. **Contractor:** Fairchild Engine & Airplane Corp. **Power plant:** 2 Wright R3350-85 piston engines. **Power plant hp/thrust:** 3,250-hp takeoff. **Dimensions:** span 109 ft. 4 in., length 86 ft. 6 in., height 26 ft. 2 in. **Speed:** 250 mph. **Ceiling:** above 30,000 ft. **Range:** 2,000 mi. with 10,000 lb. **Cargo capacity:** more than 30,000 lb., or 62 equipped troops. **Crew:** 3 to 5. **Maximum gross takeoff weight:** 74,000 lb. **Primary using commands:** Pacific Air Forces, United States Air Forces in Europe, Air Force Reserve, Air National Guard.

C-123

C-121

C-133B

C-131

C-124

C-130E

C-121 SUPER CONSTELLATION—cargo-troop carrier-picket aircraft; famous for unique design in which fuselage serves as airfoil as do horizontal planes, C-121 has had a long career in both military and civilian configurations. Among military versions are C-121 cargo-troop carrier; RC-121 radar early-warning picket aircraft fitted with wingtip tanks for added range and 6 tons of electronic gear, operated by ADC; VC-121 executive version operated by Special Air Missions group and including the *Columbine,* once President Eisenhower's aircraft. Now entering service with Air National Guard as aeromedical evac plane, replacing its C-119s. **Contractor:** Lockheed Aircraft Corp. **Power plant:** 4 Curtiss-Wright R3350 turbocompound piston engines. **Power plant hp/thrust:** 3,250-hp takeoff. **Dimensions:** span 123 ft., length 116 ft., height 23 ft. **Speed:** 370 mph. **Ceiling:** above 25,000 ft. **Range:** nearly 5,000 mi., more for RC-121. **Cargo capacity:** 40,000 lb. or 106 passengers. **Crew:** 3 to 5, plus radar operators in RC-121. **Maximum gross takeoff weight:** 145,000 lb. **Primary using commands:** Air Defense Command, Air National Guard.

C-123 PROVIDER—assault transport; made first flight October 1949; designed to operate from short, unprepared landing strips to land troops and supplies, evacuate wounded. Fuselage similar to C-119; high-stepped tail assembly to permit tail-ramp loading reminiscent of C-130. Modification to develop a STOL capability now being tested. **Contractor:** Fairchild Engine & Airplane Corp. **Power plant:** 2 Pratt & Whitney R2800-99W piston engines. **Power plant hp/thrust:** 2,500 hp each. **Dimensions:** span 110 ft., length 76 ft. 3 in., height 34 ft. 1 in. **Speed:** 240 mph maximum. **Ceiling:** above 25,000 ft. **Range:** beyond 3,000 mi. **Cargo capacity:** 24,000 lb. or 60 equipped troops. **Crew:** 2 to 4. **Maximum gross takeoff weight:** about 60,000 lb. **Primary using commands:** Tactical Air Command, United States Air Forces in Europe, Pacific Air Forces, Air Force Reserve.

C-124 GLOBEMASTER II—transport; in service since 1950, until recently USAF's largest heavy cargo transport. From Korea to Operation Deep Freeze in Antarctic, has operated in all areas of globe including North, South Poles. Special features include clamshell nose door which opens to allow use of built-in ramp; 94 percent of all military vehicles can be driven up ramp, transported fully assembled; elevator located in middle of fuselage also can quickly load or unload from ground to cargo sections, which can be converted to double-deck cabin for troops. Last C-124 delivered to USAF in May 1955. **Contractor:** Douglas Aircraft Co. **Power plant:** 4 Pratt & Whitney R4360-63A piston engines. **Power plant hp/thrust:** 3,800 hp. **Dimensions:** span 174 ft. 2 in., length 130 ft., height 48 ft. 3 in. **Speed:** over 300 mph. **Ceiling:** above 30,000 ft. **Range:** 2,300 mi. with 50,000-lb. load. **Cargo capacity:** 200 fully equipped troops or 127 litters or 74,000 lb. of cargo. **Crew:** 5, plus doctors and nurses with litter patients. **Maximum gross takeoff weight:** 194,500 lb. **Primary using commands:** Strategic Air Command, Military Air Transport Service, Air Force Logistics Command, Air Force Reserve.

C-130E HERCULES—assault transport. E model delivered to Military Air Transport Service and Tactical Air Command in April 1962, joining A and B models. Its mission is long-range, high-speed air transport of personnel and materiel for delivery by parachute or assault landing, making it key support aircraft for US Strike Command and TAC's Composite Air Strike Force. Can cross Atlantic with 27,000-lb. payload. In May 1961, set a heavy-equipment paradrop record by dropping 35,000 lb. in one bundle. Modified version is used to catch Discoverer satellites in the Pacific. Also equipped with "Talking Bird" communications equipment to accompany military missions worldwide and maintain contact with home stations. **Contractor:** Lockheed Aircraft Corp. **Power plant:** 4 Allison T56A-7A turboprop engines. **Power plant hp/thrust:** 4,050 equivalent-shaft hp each. **Dimensions:** span 132 ft. 7 in., length 97 ft. 9 in., height, 38 ft. 4 in. **Speed:** 365 mph maximum, 311 mph normal. **Ceiling:** above 30,000 ft. **Range:** 4,300 mi. with 25,000-lb. payload; 3 500 mi. with 35,000-lb. payload. **Cargo capacity:** 35,000 lb., 92 troops, 64 paratroops, or 74 litters. **Crew:** 5. **Maximum gross takeoff weight:** 155,000 lb. **Primary using commands:** Tactical Air Command, Military Air Transport Service, United States Air Forces in Europe, Pacific Air Forces.

C-131 SAMARITAN—cargo-troop carrier-trainer; C-131 and T-29 are military versions of the Convair 240/340/440; used variously, mainly as troop carrier, for transportation of litter patients, as trainer for bombardier/navigator/radar operators. VC-131 is executive transport. **Contractor:** General Dynamics/Convair. **Power plant:** 2 Pratt & Whitney R2800-99W piston engines. **Power plant hp/thrust:** 2,500-hp takeoff each. **Dimensions:** span 91 ft. 8 in., length 74 ft. 8 in., height 27 ft. 4 in. B & D models slightly larger. **Speed:** more than 300 mph. **Ceiling:** above 25,000 ft. **Range:** beyond 1,000 mi. **Cargo capacity:** 40 passengers, 27 litters, about 12,000 lb. **Crew:** 2. **Maximum gross takeoff weight:** 47,000 lb. **Primary using commands:** Military Air Transport Service, Air Training Command, Strategic Air Command, Tactical Air Command, Pacific Air Forces, United States Air Forces in Europe.

C-133B CARGOMASTER—transport; second and largest turboprop transport to be accepted by USAF; first flight of production aircraft April 23, 1956; first delivery of C-133A August 28, 1957. Production completed April 1961. Basically a freighter, C-133B has floor tie-down facilities that permit installation of 200 airline-type passenger seats; can transport wide variety of cargo. Has two loading entrances, fore and aft; simultaneous loading through both doors possible. It can transport twice the

KC-135

C-140A

VC-137A

C-141

C-142

cargo of a C-124. In December 1958, a production model airlifted a 117,900 lb. of cargo to an altitude of 10,000 ft. in five minutes. **Contractor:** Douglas Aircraft Co. **Power plant:** 4 Pratt & Whitney T34-9W turboprops. **Power plant hp/thrust:** 7,500 equivalent shaft hp each. **Dimensions:** span 179 ft. 8 in., length 158 ft., height 48 ft. **Speed:** over 325 mph. **Ceiling:** above 20,000 ft. **Range:** 2,250 mi. with 90,000-lb. cargo, 4,300 mi. with 44,000-lb. **Cargo capacity:** over 100,000 lb. maximum. **Crew** 4, plus 1 loadmaster or doctors and nurses. **Maximum gross takeoff weight:** 300,000 lb. **Primary using command:** MATS.

KC-135 STRATOTANKER—jet aerial tanker; (C-135 Stratolifter was developed from the KC-135.) In quantity production since October 1954; refuels B-52, B-58. First production KC-135 made maiden flight August 31, 1956, was placed in operational service with SAC June 28, 1957. Equipped with streamlined "flying boom" for high-speed, high-altitude refueling; somewhat larger than Boeing 707 prototype used by civilian airlines. Five KC-135s serve as SAC aerial command posts, of which at least one is airborne at all times. On April 8, 1958, a KC-135 flew from Tokyo to the Azores nonstop, a distance of 10,228 mi., another flew from New York to London in 5 hr. 27 min. at an average speed of 630 mph; on the return trip, June 29, 1958, it averaged 588 mph, completing the flight in 5 hr. 51 min. First C-135 was delivered to MATS, June 8, 1961, initiating its strategic jet fleet. In April 1962, a C-135B set a transport altitude record of 47,171 ft., and next day a speed record of 615.59 mph. In July 1962, 20 C-135s made the fastest transatlantic troop switch on record, taking 1,525 men and equipment from Kansas to Germany and returning 1,361 troops to Washington state in 45½ hours. **Contractor:** Boeing Co. **Power plant:** 4 Pratt & Whitney J57 turbojets. **Power plant hp/thrust:** 13,750 lb. each engine. **Dimensions:** span 130 ft. 10 in., length 136 ft. 3 in., height 38 ft. 5 in. **Speed:** over 600 mph. **Ceiling:** above 50,000 ft. **Range:** beyond 4,500 mi. **Cargo capacity:** 50,000 lb. or 126 troops. **Crew:** 4. **Maximum gross takeoff weight:** 297,000 lb. (272,000 lb. for C-135.) **Primary using commands:** Strategic Air Command, Military Air Transport Service.

VC-137A—PRESIDENTIAL TRANSPORT—identical to the Boeing 707-120 transport, except for interior furnishings and special electronic and communications equipment. Center section is equipped with conference table, swivel chairs, projection screen, and two sofa-bunks. Rear compartment has 14 double reclining passenger seats. Forward area contains communications center and 8 seats. First VC-137 flew April 7, 1959. Three are in service with USAF. A new model, VC-137C, was rolled out of Boeing Renton plant, July 20. It is the military version of the 707-320C, larger and with longer range than 707-120, equipped with Pratt & Whitney JT3D-3 turbofan engines each developing 18,000-lb. thrust. Data below is on VC-137A. **Contractor:** Boeing Co. **Power plant:** 4 JT3 turbojet engines. **Power plant hp/thrust:** 13,000 lb. each. **Dimensions:** span 130 ft. 10 in., length 144 ft. 6 in., height 41 ft. 8 in. **Speed:** 585 mph. **Range:** 3,500 mi. **Primary using command:** Military Air Transport Service.

C-140A JETSTAR—jet utility plane; USAF ordered 11 of these planes in the summer of 1960, 6 for use by MATS as executive transports and 5 by the Air Force Communications Service for use in checking on navigation aids and communications facilities; in this role high-speed, high-altitude JetStar will be able to duplicate flight paths, approaches, etc. of various large jets. First production models flew in July 1960. Prototype flew in September 1957. **Contractor:** Lockheed Aircraft Corp. **Power plant:** 4 Pratt & Whitney JT12 jets. **Power plant hp/thrust:** each 3,000 lb. **Dimensions:** span 53.7 ft., length 60.5 ft., height 20.5 ft. **Speed:** 600 mph. **Ceiling:** 45,000 ft. **Range:** 2,200 mi. **Cargo capacity:** 10 passengers, or equivalent weight in equipment as appropriate. **Crew:** 2. **Maximum gross takeoff weight:** 41,000 lb. **Primary using commands:** Air Force Communications Service, Military Air Transport Service.

C-141—long-range, turbofan-powered, cargo transport under development by Air Force. It is being designed to meet civil air-freight standards and needs as well as military requirements. Prototype expected to fly in late 1963, with first deliveries in 1965. The C-141 features truck-bed height, straight-in loading from the rear. It will be equipped with a mechanical loading system to reduce turn-around time on the ground. Its wings will be swept 25 degrees. **Contractor:** Lockheed Aircraft Corp. **Power plant:** 4 Pratt & Whitney TF33-P-7 turbofans. **Power plant hp/thrust:** 22,000 lb. each. **Dimensions:** span 160 ft. 7 in., length 146 ft. 2 in., height 39 ft. 1 in. **Speed:** maximum cruise 552 mph. **Ceiling:** over 45,000 ft. **Range:** maximum ferry, 7,540 mi. **Cargo capacity:** at transcontinental range, more than 85,000 lb.; transatlantic, more than 50,000 lb.; transpacific, more than 20,000 lb. **Maximum military paradrop load:** 35,000 lb. **Maximum gross takeoff weight:** 315,000 lb. **Primary using command:** Military Air Transport Service.

C-142—VTOL, STOL TRANSPORT—an operational research vehicle, the C-142 is being designed for both vertical takeoff and short takeoff. Contract let by USAF in spring 1962. **Contractor:** Vought/Hiller/Ryan. **Power plant:** 4 General Electric T64 turboshaft engines, linked by an interconnecting shaft. **Power plant hp/thrust:** 2,850 effective shaft hp each. **Dimensions:** span, 67 ft. 6 in., length, 58 ft. 4 in., height 26 ft. 1 in. **Speed:** 300 mph. **Ceiling:** 29,000 ft. **Range:** 3,000-mi. ferry range; 230 mi. with maximum payload. **Cargo capacity:** 17,000 lb. or 32 fully equipped troops, STOL; 8,000 lb. VTOL. **Crew:** 3. **Maximum gross takeoff weight:** STOL, 47,000 lb.; VTOL, 37,000 lb. **Primary using command:** AF Systems Command.

Gallery of
USAF
Weapons

TRAINERS

T-39

T-29

T-37

T-38

T-28B

T-33

T-28B TROJAN—originally a primary and basic trainer, T-28 is enjoying a rejuvenation as a counterinsurgency fighter bomber with USAF's 1st Air Commando Group. T-28A first flew in September 1949. The Commandos are using the T-28B, more powerful than the A model, employing a three-bladed prop. Data below is for the T-28B. **Contractor:** North American Aviation. **Power plant:** Wright R-1820 piston engine. **Power plant hp/thrust:** 1,425 hp. **Dimensions:** span 40 ft. 1 in., length 32 ft., height 12 ft. 8 in. **Speed:** 343 mph. **Ceiling:** 35,500 ft. **Range:** 1,060 mi. **Bomb load:** 2 100-lb. bombs. **Armament:** optional, 2 .50-caliber machine guns. 6 2.25-in. rockets. **Crew:** 2. **Maximum gross takeoff weight:** 8,500 lb. **Primary using command:** Tactical Air Command.

T-29 FLYING CLASSROOM—bombardier/navigator/radar-operator trainer; T-29 and C-131 are military versions of the Convair 240/340/440; are used variously, mainly as troop carriers, for transportation of litter patients, as trainer for bombardier/navigator/radar operators. B and subsequent models are pressurized. In T-29 most up-to-date Air Force navigation, bombardment, radar instruments installed; has 14 fully equipped stations for students plus radio operator's station; each student has map table, loran scope, altimeter indicator, radio-compass panel; 4 astrodomes, 5 driftmeters, 18 radio antennas, a radome plus periscopic sextant facility, T-29Ds have the complex "K" bombing system installed, space for only 6 students. T-29 made first flight September 1949. **Contractor:** General Dynamics/Convair. **Power plant:** 2 Pratt & Whitney R2800-99W piston engines. **Power plant hp/thrust:** 2,500 hp each. **Dimensions:** span 91 ft. 9 in., length 74 ft. 8 in., height 27 ft. 3 in. **Speed:** more than 300 mph. **Ceiling:** above 25,000 ft. **Range:** 1,500 mi. **Cargo capacity:** 14 students and 2 instructors. **Crew:** 2, plus students, instructors. **Maximum gross takeoff weight:** 47,000 lb. **Primary using commands:** Air Training Command, Headquarters Command, Continental Air Command.

T-33 T-BIRD—jet pilot trainer; highly versatile trainer version of F-80 Shooting Star; has dual controls, ejection seats; made first flight in March 1948; widely used throughout Air Force for proficiency flying. **Contractor:** Lockheed Aircraft Corp. **Power plant:** Allison J33-A-35 turbojet. **Power plant hp/thrust:** 5,200 lb. **Dimensions:** span 38 ft. 11 in., length 37 ft. 8 in., height 11 ft. 7 in. **Speed:** 600 mph. **Ceiling:** above 45,000 ft. **Range:** beyond 1,000 mi. **Bomb load/cargo capacity:** about 200 lb. **Armament:** optional, 2 .50-caliber machine guns. **Crew:** 2—student and instructor in tandem. **Maximum gross takeoff weight:** 16,000 lb. **Primary using commands:** Air Training Command, most major USAF commands.

T-37—primary jet pilot trainer; first flight October 1954; side-by-side seating for student and instructor; in wide use by ATC. Gives future pilots "feel" of jet flying; also provides high margin of safety. **Contractor:** Cessna Aircraft Corp. **Power plant:** 2 Continental J69-T-25 turbojets. **Power plant hp/thrust:** maximum 1,025 lb. each. **Dimensions:** span 33 ft. 10 in., length 29 ft. 4 in., height 9 ft. 2 in. **Speed:** over 400 mph. **Ceiling:** 40,000 ft. **Range:** over 900 mi. **Crew:** 2—student and instructor. **Maximum gross takeoff weight:** 6,600 lb. **Primary using command:** Air Training Command.

T-38 Talon—high-speed jet pilot trainer; supplanting T-33 as advanced jet pilot trainer; used primarily by ATC, also in general USAF training in supersonic techniques, multijet handling, aerobatics, night and instrument flying, cross-country navigation, etc. First T-38 flight April 1959; entered USAF inventory March 1961. Similar to T-5A. Jacqueline Cochran set eight world class records in speed, distance, and altitude in T-38 from August to October 1961, achieving top speed of 844 mph and peak altitude of 56,072 ft., for which she was awarded the Harmon International Aviatrix Trophy for extraordinary flying skill in the year 1961. **Contractor:** Northrop Corp. **Power plant:** 2 General Electric J85s. **Power plant hp/thrust:** 3,850 lb. **Dimensions:** span 25 ft. 3 in., length 46 ft. 4 in., height 12 ft. 11 in. **Speed:** about 850 mph, or more than Mach 1.2. **Ceiling:** above 55,000 ft. **Range:** beyond 1,000 mi. **Crew:** 2—student and instructor, tandem. **Maximum gross takeoff weight:** over 11,000 lb. **Primary using command:** Air Training Command.

T-39 SABRELINER—utility plane-trainer; first flight September 16, 1958; twin-jet featuring sweptback wings, two engines mounted externally on the fuselage aft of the wing. Considered suitable for single-pilot operation, has dual controls and instrumentation; passenger seats have individual reading lights and cold-air inlets. Best cruise altitude 35,000 ft.; used in administrative roles and in training F-105 pilots. **Contractor:** North American Aviation. **Power plant:** Pratt & Whitney J60-P3. **Power plant hp/thrust:** 3,000 lb. each. **Dimensions:** span 44 ft. 5 in., length 43 ft. 9 in., height 16 ft. **Speed:** over 575 mph. **Ceiling:** over 40,000 ft. **Range:** beyond 1,500 mi. **Cargo capacity:** 4 to 8 passengers. **Crew:** 2. **Maximum gross takeoff weight:** 17,760 lb. **Primary using commands:** Air Training Command, Tactical Air Command.

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Gallery of USAF Weapons

OTHER AIRCRAFT

U-6A

H-43

U-10A

U-2

H-21

U-4B

U-3B

H-19B

U-2—high-altitude reconnaissance and research aircraft. First flew in 1955. Used primarily in collecting high-altitude weather data. U-2 piloted by Francis G. Powers of CIA was downed by Soviets over Sverdlovsk, USSR, May 1, 1960. **Contractor:** Lockheed Aircraft Corp. **Power plant:** Pratt & Whitney J75-P13 turbojet. Early models used P&W J57C. **Power plant hp/thrust:** 11,000 lb. **Dimensions:** span 80 ft., length 49 ft. 7 in., height 13 ft. **Speed:** 500 mph. **Ceiling:** 70,000 ft. **Range:** over 3,000 mi. **Crew:** 1; U-2D is 2 seater. **Maximum gross takeoff weight:** 17,270 lb. **Primary using command:** Strategic Air Command.

U-3A—liaison-administration; low-wing, twin-engine; advanced version U-3B with more powerful engines and sweptback vertical tail also purchased; both models off-the-shelf versions of the Cessna 310 series. **Contractor:** Cessna Aircraft Co. **Power plant:** Continental D470-M. **Power plant hp/thrust:** 260 hp. **Dimensions:** span 36 ft., length 29 ft. 7 in., height 10 ft. **Speed:** 240 mph. **Ceiling:** 21,300 ft. **Range:** 1,125 mi. **Maximum gross takeoff weight:** 4,830 lb. **Primary using commands:** All major commands.

U-4B—liaison-administration; high-wing, twin-engine; earlier model U-4A also purchased; both models off-the-shelf versions of the Aero Commander. **Contractor:** Aero Commander, Inc. **Power plant:** 2 Lycoming IGO-540 6-cylinder air-cooled engines. **Power plant hp/thrust:** 340 hp. **Dimensions:** span 49 ft. 6½ in., length 35 ft. 2 in., height 14 ft. 6 in. **Speed:** 250 mph. **Ceiling:** 21,900 ft. **Range:** 1,625 mi. **Maximum gross takeoff weight:** 7,500 lb. **Primary using command:** Headquarters Command.

U-6A BEAVER—liaison-administration; high-wing lightplane produced in limited quantities for Air Force and Army since 1947. **Contractor:** de Havilland Aircraft Co. **Power plant:** Pratt & Whitney R985-AN-100-3 piston engine. **Power plant hp/thrust:** 450 hp. **Dimensions:** span 48 ft., length 30 ft. 4 in., height 9 ft. **Speed:** 163 mph. **Ceiling:** 18,000 ft. **Range:** about 600 mi. **Cargo capacity:** 7 passengers, 1,000 lb. **Crew:** 1. **Maximum gross takeoff weight:** 5,100 lb. **Primary using command:** Strategic Air Command.

U-10A—light utility transport, formerly designated L-28. Employed in counterinsurgency role. First flown in 1958. Can fly at minimum speed for observation purposes; stalling speed 28 mph. **Contractor:** Helio Aircraft Corp. **Power plant:** Lycoming GO 480 six-cylinder air-cooled engine. **Power plant hp/thrust:** 295 hp. **Dimensions:** span 39 ft., length 30 ft., height 8 ft. 10 in. **Speed:** 180 mph. **Ceiling:** 22,500 ft. **Range:** 850 mi. **Cargo capacity:** seats 4, including crew. Fitted with variable armament. **Crew:** 2—pilot, observer. **Maximum takeoff gross weight:** 3,900 lb. **Primary using command:** Tactical Air Command.

H-19B—liaison-evacuation helicopter; in worldwide and extensive USAF use; first flight November 1949. Performed magnificently in Korea. Used also by Navy, Marines, Coast Guard, civilian firms, foreign nations. **Contractor:** Sikorsky Aircraft Div., United Aircraft Corp. **Power plant:** A and C models use Pratt & Whitney R1340-57; B and D use Wright R1300-3. **Power plant hp/thrust:** R1340-57, 600 hp; R1300-3 800 hp. **Dimensions:** blade 53 ft., length 42 ft. 3 in., height 13 ft. 4 in. **Speed:** over 100 mph. **Ceiling:** 10,500 ft. **Range:** A and C models, 400 mi.; B and D models, 360 mi. **Cargo capacity:** 2,250 lb. **Crew:** 2 or 3. **Maximum gross takeoff weight:** A and C models, 7,500 lb.; B and D models, 7,900 lb. **Primary using commands:** Most USAF major air commands.

H-21 WORKHORSE—troop carrier helicopter; first flight April 1952; fuselage of all-metal stressed skin, semimonocoque construction. Cockpit has side-by-side seating with the pilot on the right. In H-21 through H-21C, single Wright R1820-103 piston engine drives both rotors; in H-21D test-bed, rotors driven by one General Electric T58 turbine engine apiece. **Contractor:** Vertol Div., Boeing Co. **Power plant:** Wright R1820. **Power plant hp/thrust:** 1,425 hp. **Dimensions:** blade 44 ft., length 52 ft. 6 in., height 16 ft. **Speed:** 140 mph. **Ceiling:** above 15,000 ft. **Range:** 600 mi. maximum. **Cargo capacity:** 20 troops or 12 litters plus attendant. **Crew:** 2 or 3. **Maximum gross takeoff weight:** 15,000 lb. **Primary using commands:** Tactical Air Command, Alaskan Air Command, Headquarters Command.

H-43 HUSKIE—crash-rescue, fire-fighting helicopter; H-43B, redesigned, improved version, rolled out at Bloomfield, Conn., December 1958. Improvements include lighter engine, "airplane-handling" characteristics through use of rudders in the design. First delivery of B made in June 1959. Holds several world records for its type. Altitude, 32,840 ft. Time to climb to 3,000 meters, 2 min. 44.5 sec.; to 6,000 meters, 6 min. 42.3 sec. Closed-course distance, 656.258 mi.; straight-line distance, 900 mi. Previous records were held by USSR. **Contractor:** Kaman Aircraft Corp. **Power plant:** Pratt & Whitney R1340-48

HU-16

UH-49A

Q-2

X-20

X-15

X-19

piston engine, H-43A; Lycoming T-53L-1A turbine, H-43B. **Power plant hp/thrust:** A model 600 hp; B model, 800 hp. **Dimensions:** rotor diameter, 47 ft., length 25 ft., height 12 ft. 7 in. **Speed:** over 100 mph. **Ceiling:** above 25,000 ft. **Range:** A model, 220 mi.; B model, 250 mi. **Cargo capacity:** 2,000 lb. or 7 passengers plus pilot. **Crew:** 2. **Maximum gross takeoff weight:** A model, 6,800 lb.; B model, 7,100 lb. **Primary using commands:** Tactical Air Command, Air Rescue Service, MATS.

HU-16 ALBATROSS—search-and-rescue amphibian, operational since 1947, has been extremely active around the world since. Formerly designated SA-16. Used mainly by the Air Rescue Service, in limited numbers by major air commands with own crash-rescue units. Used by Air National Guard as medium transport for Army Special Forces. Extremely versatile, durable aircraft. **Contractor:** Grumman Aircraft Engineering Corp. **Power plant:** 2 Wright R1820-76A or B piston engines. **Power plant hp/thrust:** 1,425 hp. each. **Dimensions:** span 80 ft., length 62 ft. 1 in., height 24 ft. 4 in. **Speed:** 230 mph. **Ceiling:** 25,000 ft. **Range:** 2,500 mi. maximum. **Cargo capacity:** 10 passengers plus rescue and aid equipment. **Crew:** 6. **Maximum gross takeoff weight:** 30,000 lb. **Primary using commands:** MATS Air Rescue Service, Air National Guard.

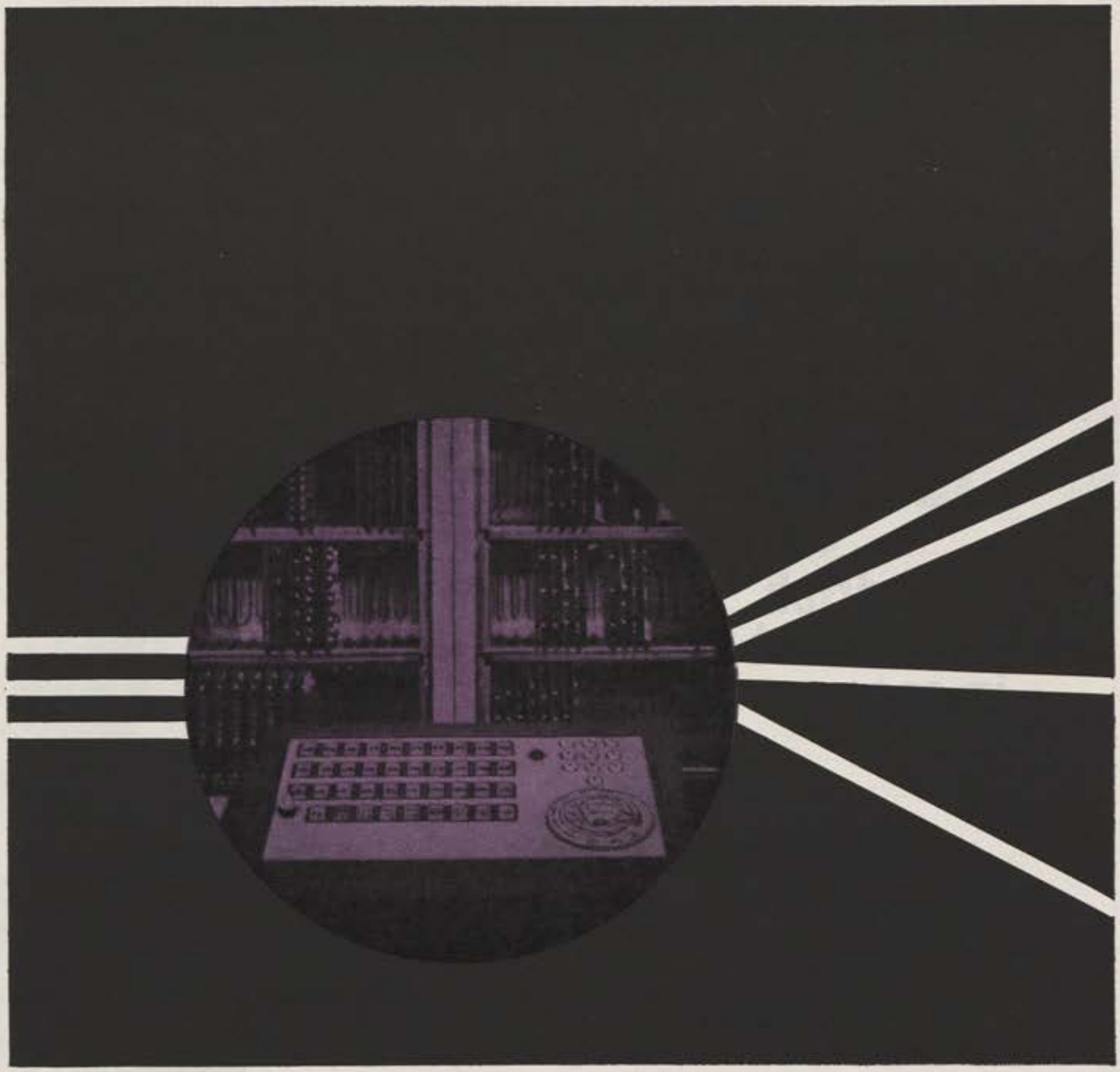
Q-2 FIREBEE—target drone; first flight April 1951; can be air- or ground-launched, has parachute-recovery system. Internal electronic system scores how close fire has come to drone. Advanced version is Q-2C. **Contractor:** Ryan Aeronautical Co. **Power plant:** Continental J69. **Power plant hp/thrust:** 1,000 lb. **Dimensions:** span 11 ft. 3 in., length 17 ft. 7 in., height 6 ft. 3 in. **Speed:** 575 mph. **Ceiling:** 40,000 ft. **Range:** about 1 hour flying time maximum. **Maximum gross takeoff weight:** 1,850 lb. **Primary using commands:** Air Defense Command, Systems Command.

UH-49A—long-range utility support transport. USAF counterpart of Vertol 107-II commercial model; previously designated HX-2. Amphibious capability. First flown April 1958. Contract let in June 1962. **Contractor:** Boeing Vertol. **Power plant:** 2 General Electric CT-58 shaft turbines. **Power plant hp/thrust:** 1,250 shaft hp each. **Dimensions:** rotor diameter 50 ft., length 44 ft. 7 in., height 16 ft. 10 in. **Speed:** 168 mph. **Ceiling:** 13,700 ft. **Range:** 700 mi. with 2,400-lb. payload, 115 mi. with 7,000-lb. **Cargo capacity:** 25 troops or 15 litter patients with 2 attendants. **Crew:** 2 or 3. **Maximum gross takeoff weight:** 18,450 lb. **Primary using Commands:** Tactical Air Command, Strategic Air Command.

X-15—hypersonic research aircraft; achieved an altitude of 314,750 ft. July 17, 1962, flown by Maj. Robert White, USAF, and a top speed of 4,193 mph on June 27, 1962, piloted by Joe Walker, NASA. First free flight without power, June 8, 1959; first powered flight, September 17, 1959, both by Scott Crossfield of North American. X-15's power plant is considered capable of propelling it to 500,000 ft. or more and to Mach 7 (about 4,750 mph), but skin friction may be limiting factor. X-15 pilots were awarded Harmon Trophy in November 1961 (Crossfield, White, Walker) and Collier Trophy in July 1962 (White, Walker, Crossfield, and Navy Cmdr. Forrest Peterson). Three X-15s have been built. **Contractor:** North American Aviation. **Power plant:** Reaction Motors XLR99. **Power plant hp/thrust:** 57,000 lb. at sea level, 70,000 lb. at peak altitude: **Dimensions:** span 22 ft., length 50 ft., height 13 ft. 6 in. **Speed:** Mach 7. **Ceiling,** 500,000 ft. **Range:** not applicable. **Crew:** 1. **Maximum gross takeoff weight:** 31,276 lb. **Primary using command:** National Aeronautics and Space Administration.

X-19—twin-engine, tandem high-wing, high-speed VTOL aircraft, with four tilting propellers mounted in nacelles at wing tips. Designed to fly on 1 engine if necessary. Intended for exploratory work on triservice V/STOL transport development program. Contract awarded by USAF July 17, 1962; delivery of 2 aircraft scheduled for mid-1963. Speed range: from 0 to 460 mph. **Contractor:** Curtiss-Wright Corp. **Power plant:** 2 Lycoming T55-L5 engines, installed within fuselage, to drive 4 propellers. **Power plant hp/thrust:** 2,250 shaft hp each. **Dimensions:** span 22 ft. 10 in., length 44 ft. 5 in., height 17 ft. **Speed:** 460 mph. **Ceiling:** 6,000 ft. with load. **Range:** Beyond 1,000 mi. **Cargo capacity:** 2,000 lb. **Crew:** 2. **Maximum gross takeoff weight:** 12,300 lb. **Primary using command:** Air Force Systems Command.

X-20 DYNA-SOAR—first US orbital winged vehicle, capable of circling the earth in space and returning under pilot control. First flights scheduled for 1965; test airdrops likely in 1963-64. **Contractor:** Boeing Co. **Power plant:** Martin Titan III booster; Sundstrand auxiliary self-contained gaseous hydrogen-oxygen unit. **Approximate dimensions:** span 20 ft., length 35 ft., height 8 ft. **Crew:** 1. **Maximum gross takeoff weight:** 10,000 lb. **Primary using command:** Strategic Air Command.



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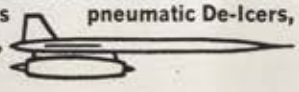

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July 1, 1961 — June 30, 1962

HIGHLIGHTS OF THE YEAR IN THE US AIR FORCE

By Murray Green

July 1, 1961—The Air Force Communications Service was activated at Scott AFB, Ill., under the command of Maj. Gen. Harold W. Grant. AFCS, the sixteenth major air command, consolidates direction of USAF's worldwide communications operations and supplants the Airways and Air Communications Service (AACS), a subcommand of MATS.

July 1, 1961—SPADATS (Space Detection and Tracking System) operated by NORAD went into operation. SPADATS will eventually provide round-the-clock electronic cataloging of all man-made objects in space, indicating what and where they are at any given moment.

July 1, 1961—The Air Force established 268 Recovery Reserve units in forty-seven states. In the wake of nuclear attack, the Reserve units would provide refueling, some maintenance, security, and medical services for returning USAF aircraft.

July 1, 1961—The second BMEWS station—at Clear, Alaska, between Mt. McKinley and Fairbanks—was completed. Its three huge detection radars supplement BMEWS at Thule, Greenland. The radars will detect missiles, compute their location, trajectory, speed, general predicted impact areas, and launch points by using high-speed computers, and will give the US up to fifteen minutes' warning.

July 1, 1961—The DEW Line system for defense of North America was extended across the North Atlantic Ocean, making it possible to close three USAF radar installations in the northeast part of Canada plus six gap-filler radars on the Labrador-Newfoundland coast. The DEW Line is an electronic warning network designed to cope with manned aircraft or air-breathing missiles.

July 6, 1961—The Hq. USAF staff was reorganized, with staff responsibility for development, procurement, and logistic support of aircraft, missile, space, and electronic systems placed in one office—Deputy Chief of Staff for Systems and Logistics. Research, advanced technology, studies requirements, and development planning were placed in another—Deputy Chief of Staff for Research and Technology. The System Staff Officers (SYSTOs) were designated for individual programs to ensure prompt attention to critical problems.

July 7, 1961—An Atlas-E ICBM, launched before midnight, July 6, impacted its 1½-ton nose cone about 1,000 miles southeast of Capetown, South Africa, 9,050 miles from Cape Canaveral, a record for a military missile.

July 7, 1961—An exchange of letters between Secretary of Defense McNamara and NASA Administrator James Webb paved the way for establishment of a Joint Large Launch Vehicle Planning Group under Dr. Nicholas E. Golovin. The Golovin Group was to concern itself with launch vehicles, associated subsystems, test, and launch facilities.

July 8, 1961—President Kennedy ordered a general review of US military strength and of planned expenditures to determine whether they were adequate to meet the growing crisis over Berlin.

July 9, 1961—Discoverer XXVI capsule was recovered from the air after thirty-two orbits following launch from Vandenberg AFB, Calif., on July 7. The decision to attempt recovery on Pass 32 instead of Pass 64 was caused by a three-minute delayed cutoff of the Agena second stage.

July 10, 1961—Secretary of Defense McNamara announced the first of several moves to step up American military power. Among US moves projected were recall to active duty of thousands of Air Reserve and Air National Guard personnel.

July 10, 1961—A TAC F-105D completed a 1,520-mile nonstop, blind-flying mission at altitudes of 500 to 1,000 feet to test its capability to fly by radar under simulated combat conditions.

July 12, 1961—Midas III, a 3,500-pound missile-detection satellite, was launched from Point Arguello, Calif. It was placed into a near-circular orbit by the "kick-in-the-apogee" technique. After the Atlas stage was exhausted, the Agena-B (satellite) stage was detached; it coasted briefly, then was ignited to add speed enough to achieve an elliptical orbit; it then coasted without power halfway round the world and was restarted again at apogee to attain the higher circular orbit.

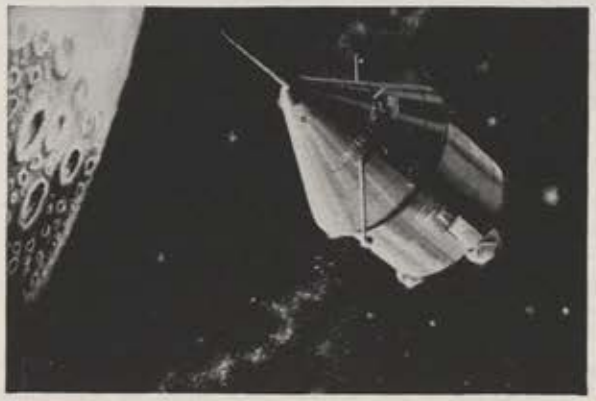
July 19, 1961—An Air Force H-43B Huskie rescue helicopter claimed two time-to-climb records to altitudes of 3,000 meters (attained in 2 minutes, 44.5 seconds) and 6,000 meters (in 6 minutes, 42.3 seconds). Previous records were held by US Army helicopters. Records must be certified by the FAI.

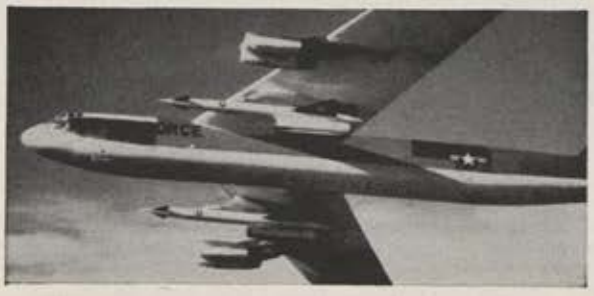
July 20, 1961—A Titan was fired downrange from Cape Canaveral with a cargo of ten slender rocket decoys, the first ever carried by this missile. When released in midflight, the decoy tips expanded, balloonlike, to simulate different warhead shapes to give downrange Nike-Zeus radar and other tracking devices practice in discriminating between the decoys and the real nose cone, which was parachuted into the South Atlantic and quickly retrieved by an ocean range vessel.

July 20, 1961—The last F-106 Delta Dart was turned over to the Air Defense Command in San Diego, Calif.

July 21, 1961—The 1st Strategic Aerospace Division was activated at Vandenberg AFB, Calif. Renaming of the SAC 1st Missile Division pointed up the Air

(Continued on page 243)





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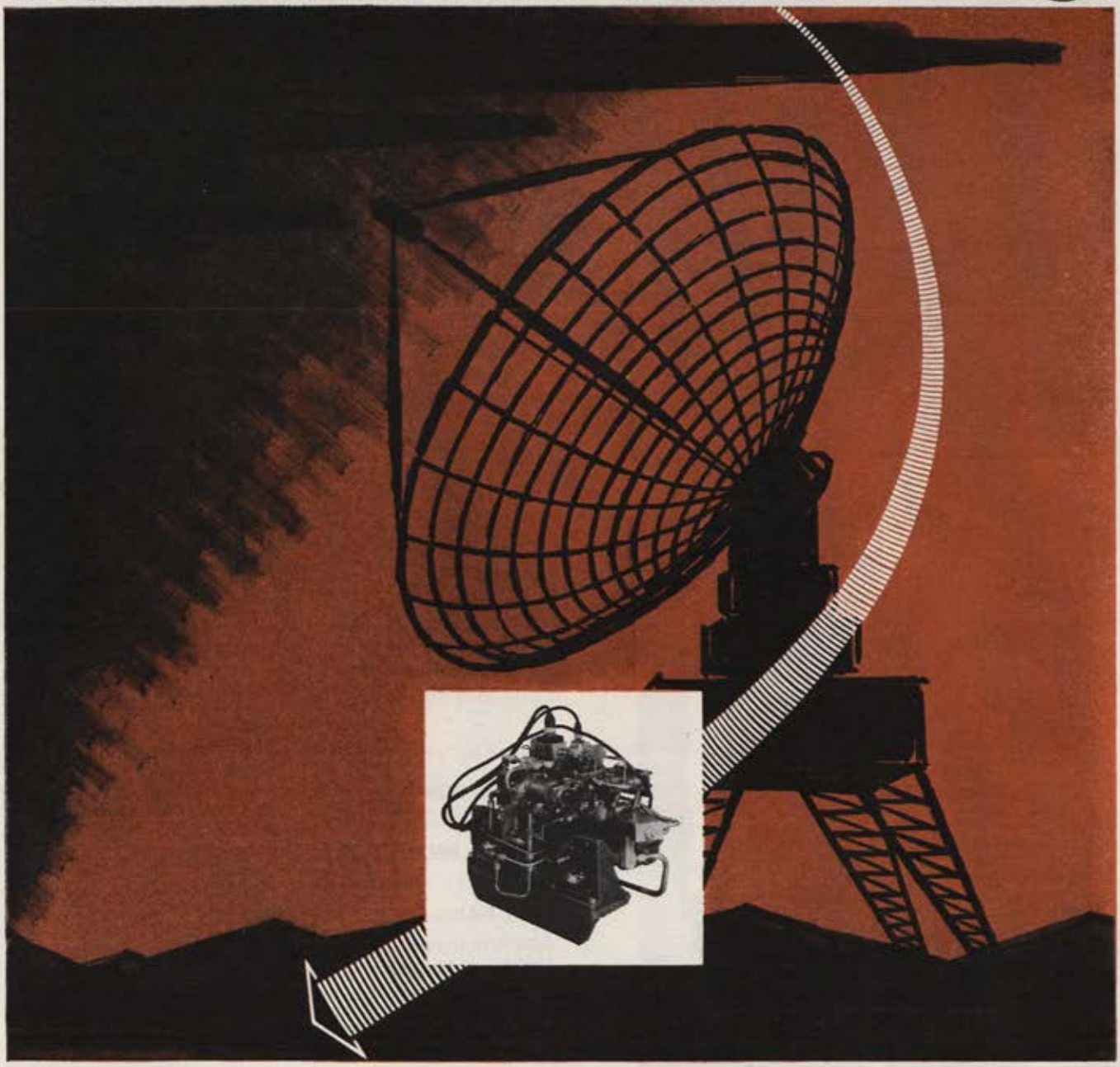

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Creep Speeds as Low as .000005 RPM On this same application, the Vickers drives provide speeds from 2.78 RPM down to .000005 RPM (1 antenna revolution every 4.63 months!), an overall speed ratio of 556,000 to one.

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* * *

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Force's new emphasis on space operations.

July 21, 1961—Astronaut Virgil I. Grissom, Captain, USAF, rode a NASA Project Mercury capsule boosted by a modified Army Redstone to an altitude of 118 miles. He attained a speed of 5,310 mph and landed safely by parachute 303 miles downrange from Cape Canaveral.

July 22, 1961—The Fédération Aéronautique Internationale announced recognition of flight records by Soviet Maj. Yuri Gagarin and USN Cmdr. Alan B. Shepard, Jr., as follows: Gagarin: duration in orbital flight, 108 minutes; apogee, 203 miles; greatest mass lifted in earth orbital flight, 10,393 pounds. Shepard: altitude without earth orbit, 115.696 miles; greatest mass lifted without earth orbit, 4,031.7 pounds.

July 25, 1961—President Kennedy called for an increase in defense spending of $3.455 billion, to include $207 million for civil defense, and $771.4 million additional for Air Force obligations in aircraft, missiles, M&O, and military personnel. Augmentation of military personnel by 207,000 included 63,000 Air Force officers and men.

July 25, 1961—A Titan flew 5,000 miles down the Atlantic Missile Range in the first full-range closed-loop flight of the Titan II all-inertial guidance system.

July 25, 1961—The Designated Systems Management Group was established by the Air Force with the Secretary of the Air Force as Chairman to provide a formal method of applying the collective judgment of senior Air Force officials to advise and assist the Secretary in making decisions.

July 27, 1961—A Minuteman solid-fuel ICBM flew 5,000 miles downrange from Cape Canaveral, the second success in three firings. The flight signaled a go-ahead to a more advanced phase of the test program—launching from a ninety-foot-deep silo.

July 29, 1961—Four Air Force bases scheduled to be closed—Laughlin, Tex.; MacDill, Fla.; Donaldson, S. C.; and Chennault, La.—were retained on active status for an indefinite period because of a DoD decision, underscored by increasing world tension, to prolong the use of B-47 bombers.

July 31, 1961—An Atlas-E hit a target 5,000 miles away from its Cape Canaveral launching site. The missile discharged colored flares in a test to devise safety requirements for spaceborne atomic power units.

August 1, 1961—President Kennedy signed Senate Joint Resolution No. 120 which granted him authority, up to July 1, 1962, to call up to 250,000 Reservists for active duty for not more than one year and to extend the active-duty training periods of Reservists beyond the usual two weeks a year. Included were sixty-four Air National Guard and seven Air Reserve units, containing 25,000 Guardsmen and 3,000 Reservists. A majority of the units operated tactical fighter, reconnaissance and transport planes, or radar warning and communications networks.

August 2, 1961—The Air Force announced the beginning of a series of air-sampling flights over Western Pacific waters by U-2 planes based in Okinawa. The planes would bear normal Air Force markings.

August 3, 1961—A Titan carried a packet of nose cone decoys 5,000 miles downrange from Cape Canaveral to test its ability to confuse enemy defenses and to help devise means of intercepting similar hostile decoys.

August 4, 1961—The third Titan I complex at Lowry AFB, Colo., was turned over to the Air Force by the Army Corps of Engineers. The 724th Strategic Missile Squadron would be declared operational by SAC when second-phase hardware and the Titan ICBMs themselves were installed.

August 8, 1961—An Atlas-F missile was fired from Cape Canaveral for the first time. It carried a Minuteman reentry vehicle that was dropped into the splash net off Ascension Island. The "F" missile contains special fuel valves to permit long-term storage of liquid fuels and other improvements designed to permit a shortened countdown. The "F" is the only Atlas model that will be placed in underground hardened silos.

August 8, 1961—Joint Army-USAF Operation Swift Strike began near Fort Bragg, N. C., with the parachuting of 7,500 troops of the 82d Airborne Division from Air Force planes.

August 10, 1961—A TAC F-105 delivered on target more than seven tons of conventional bombs, the largest load ever carried aloft by a single-engine plane.

August 11, 1961—Project Golden Ram was announced by SAC to update and modernize Atlas missile bases in Nebraska and Wyoming to include reviews of equipment and technical data. SAC assigned 125 engineeers and technicians to make up the Golden Ram contingent at each launching site, with completion expected in four to six months.

August 11, 1961—Pepperrell AFB in Newfoundland was returned to the custody of the Royal Canadian Navy as the Stars and Stripes were lowered on the base. It was acquired in 1940, along with other base sites, in exchange for fifty lend-lease destroyers to help embattled Britain against the Nazi U-boat menace. Official papers returning the base to the Canadians were signed on July 29, 1961.

August 12, 1961—Lt. Gen. Joseph F. Carroll, USAF, was chosen to head the new joint Defense Intelligence Agency that, beginning in October 1961 unified the service intelligence production capabilities.

August 16, 1961—The first public test of the F-1 liquid-fueled rocket, potentially as powerful as the Russian rocket that hurled Gherman Titov into orbit, built up about 1,000,000 pounds of thrust in a brief test at Edwards AFB, Calif., but the fuel system failed after 1½ seconds. The F-1 has generated up to 1.64 million pounds of thrust in bursts up to twenty seconds' duration in previous tests.

August 17, 1961—Bomarc-B testing reached a climax with the destruction of a drone B-47 at an altitude of 5,000 feet and minimum range of fifty nautical miles, one of the most critical profile flights yet to be flown. In all, nine of the last twelve tests of the IM-99B interceptor resulted in assessed bomber kills, with proximity fuze impulse occurring on each successful mission.

August 17, 1961—An Air Force Systems Command Blue Scout Junior solid-propellant rocket was launched from Cape Canaveral lofting a twenty-seven-pound package of radiation measuring instruments toward an apogee of 140,000 statute miles. Radio contact was lost during the fourth stage. The payload was intended to reach peak altitude over the South Pacific fifty-seven hours later. It was presumed to be burned up upon reentry.

August 17, 1961—The fiscal 1962 defense appropriation of $46.663 billion, including $266 million more than the President had requested, was signed by President Kennedy. Major changes by Congress included additions of $695 million for long-range bombers and $59 million for bolstering the Air Force and Army Reserves and National Guard. Subtractions included a two percent across-the-board cut in procurement funds to encourage economy. Major items in the bill included $18.84 billion for the Air Force.

August 24, 1961—Cape Canaveral was selected as the major launch site for the Manned Lunar Landing Program. NASA will supervise the program and seek 80,000 acres of land in the vicinity of the Cape to accommodate launch pads and supporting facilities. The Air Force was designated agent for NASA in master planning of the site and in arranging for construction.

August 30, 1961—The first underground silo launching of a Minuteman from Cape Canaveral went awry when the signal for second-stage ignition was erroneously given almost immediately after launch and range-safety action had to be taken.

August 30, 1961—Discoverer XXIX was orbited and its capsule recovered from the Pacific on September 1 by an AF skin-diving team after a C-119 failed to effect aerial recovery. The capsule, containing biomedical experiments and specimens from the AF School of Aerospace Medicine, made thirty-three passes.

August 31, 1961—The DoD Defense Supply Agency was established to take over single managership for procurement in six areas managed by the Army and three others managed by the Navy. The DSA was also directed by Secretary of Defense McNamara to handle the entire procurement of electronics. Total central procurement inventory by the DSA was expected to exceed $21 billion and its headquarters management staff was expected to number about 1,000. The Chief, DSA, would report directly to the Secretary of Defense, bypassing the service secretaries. Each service retained control over development and management of its assigned weapon systems.

September 1, 1961—The Air Force and Navy jointly announced a historic first,

(Continued on following page)

their agreement upon a tactical fighter aircraft satisfactory to both services. The TFX program will be managed by USAF with full Navy participation. It will seek a plane able to operate on small and austere airfields in remote areas which will necessitate extra ruggedness and power, the two constant needs of Navy carrier aircraft.

September 2, 1961—Four squadrons—comprising seventy-two F-100 fighters—were flown to Europe for NATO war games, and their arrival was given additional meaning by the intensifying Berlin crisis.

September 5, 1961—Resumption of nuclear tests by the US was ordered by President Kennedy in response to the Russian series of high-yield atmospheric tests which ruptured an unwritten cessation in effect since 1958. The President specified, however, that the tests should take place "in the laboratory and underground, with no fallout."

September 6, 1961—A Titan ICBM rocketed 6,100 miles downrange into the South Atlantic, equaling the previous record distance for this weapon.

September 7, 1961—Another Titan with inertial guidance was launched from Cape Canaveral, the second successful firing in two days. The ICBM performed as planned and landed 5,000 miles downrange.

September 7, 1961—The Air Force ordered consolidation of supply cataloguing conducted at eleven logistic centers into a single organization to function at Wright-Patterson AFB, Ohio.

September 12, 1961—Discoverer XXX was launched into polar orbit from Vandenberg AFB, Calif., and the capsule recovered on September 14 by air catch on the first pass by a C-130 in the primary drop zone north of Hawaii. The payload included equipment being tested in support of Midas, biomedical specimens, and metallurgical samples. All primary test objectives were met.

September 15, 1961—The US resumed nuclear testing underground at the AEC Nevada test site.

September 15-25, 1961—Checkmate II, the biggest and most complex NATO training maneuver in Southern Europe, ended after intensive mock warfare in Turkish Thrace by thousands of American, Turkish, and Greek soldiers, sailors, airmen, and marines.

September 17, 1961—Discoverer XXXI was orbited from Vandenberg AFB, Calif., with a payload consisting of two X-ray detectors and a solid-state electron spectrometer plus the normal advanced engineering test package. Recovery on September 19 failed because of a power system failure. Separation of the satellite was indicated, but no radar beacon or telemetry signal was picked up until the forty-second pass.

September 18, 1961—The world's largest radome was completed on Haystack Hill, Tyngsboro, Mass., by the Electronic Systems Division, AFSC. The antenna is 120 feet wide and is the most precise structure of its type, featuring a surface tolerance of .076 inch. It will be in operation by the end of 1962 as a test bed for ground-based high-capacity satellite relay systems.

September 19, 1961—A Bomarc-B missile made a successful U-turn test interception of a supersonic Regulus II drone at an altitude of seven miles, 250 miles off the coast of Florida.

September 26, 1961—President Kennedy signed into law HR 8302 appropriating $952 million for construction at US military bases, including $498 million for the Air Force and $18.3 million for the Air National Guard.

September 28, 1961—In a visit to Berlin, Air Force Secretary Eugene M. Zuckert reaffirmed US determination to maintain uncontrolled air access to West Berlin and stated his complete confidence in the US Air Force to assure it.

September 28, 1961—A Titan ICBM hurled a dummy warhead 5,300 miles down the Atlantic Missile Range to test the guidance system for accuracy. The missile passed all tests and landed right on target.

September 28, 1961—The X-15 attained a speed of 3,600 mph and an altitude of 100,800 feet in a test flight that withstood temperatures at 1,000 degrees F.

September 28, 1961—The 567th Strategic Missile Squadron, the first SAC unit to be equipped with advanced Atlas-E-type ICBMs, became operational at Fairchild AFB, Wash.

September 30, 1961—The second BMEWS tracking station went operational on full automatic at Clear, Alaska.

October 1, 1961—A new policy of defense contracting procedures that would reward good defense production records and penalize poor results was announced by Secretary McNamara. He also said DoD would abandon traditional cost-plus contracting in favor of placing greater reliance on incentives for better quality production.

October 1, 1961—Seven new DEW Line system stations comprising "DEW East" were placed in operation over the North Atlantic Ocean with the completion of a radio link spanning the 1,200-mile corridor of airspace from Baffin Island, Canada, across Greenland to the west coast of Iceland.

October 2, 1961—An Atlas-E ICBM, bristling with bonus experiments which made it a virtual flying space laboratory, streaked 5,000 miles downrange from Cape Canaveral in a successful flight. A capsule recovered by an ocean range vessel contained data on experiments such as the first flight trial of a guidance system for the Centaur space rocket, space-borne nuclear power units, radiation sensors, and a nose cone built for the Minuteman ballistic missile.

October 2, 1961—Deputy Secretary of Defense Roswell L. Gilpatric clarified the responsibilities and relationships within the DoD and between the DoD and NASA in the matter of their joint participation in the Manned Lunar Landing Program. Within the Air Force, the Director of Systems Services was made the Office of Primary Interest to guide Air Force participation in the MLLP.

October 3, 1961—The Air Force was given development responsibility for Mobile Medium Range Ballistic Vehicles with a range up to 2,000 miles. Such a mobile missile force can supplement manned strike forces and replace fixed-base nuclear capability overseas.

October 3, 1961—Air Force Secretary Zuckert disclosed that shutdown of four of the sixteen US air bases in Britain had been "postponed indefinitely." Furthermore, the seven squadrons of B-66 and RB-66 light bombers based at these four fields would remain in Britain.

October 5, 1961—Secretary of Defense McNamara forbade civilian and military defense officials to express politically partisan views sponsored by nongovernment groups. His memorandum order also forbade the use of military facilities and personnel for public information programs if responsible authorities believe that participants would express views contrary to national policy.

October 5, 1961—Air Force Lts. Melvin E. Pollard and Craig V. Miller completed a seventeen-day stay in an eight-by-twelve-foot steel cabin in a nearly 100 percent oxygen atmosphere. To provide data for bioastronautic study, they spent twenty hours a day alternating at the control panel of a behavior simulator designed to test mental and physical reflexes and processes.

October 5, 1961—An Atlas ICBM was fired nearly 9,000 miles on a low trajectory to lengthen its exposure to reentry heat of the atmosphere to measure ability to withstand buffeting under extreme conditions. The missile landed within the assigned target area 700 miles southeast of Capetown, South Africa, and its data cassette was retrieved from the Indian Ocean by a range vessel.

October 6, 1961—A Titan ICBM, with an inertial-guidance system featuring a technique that enabled it to "memorize" the path to several targets, was launched 5,000 miles downrange from Cape Canaveral. In an operational situation, the firing officer could select one of these targets and set the advanced Titan II guidance system.

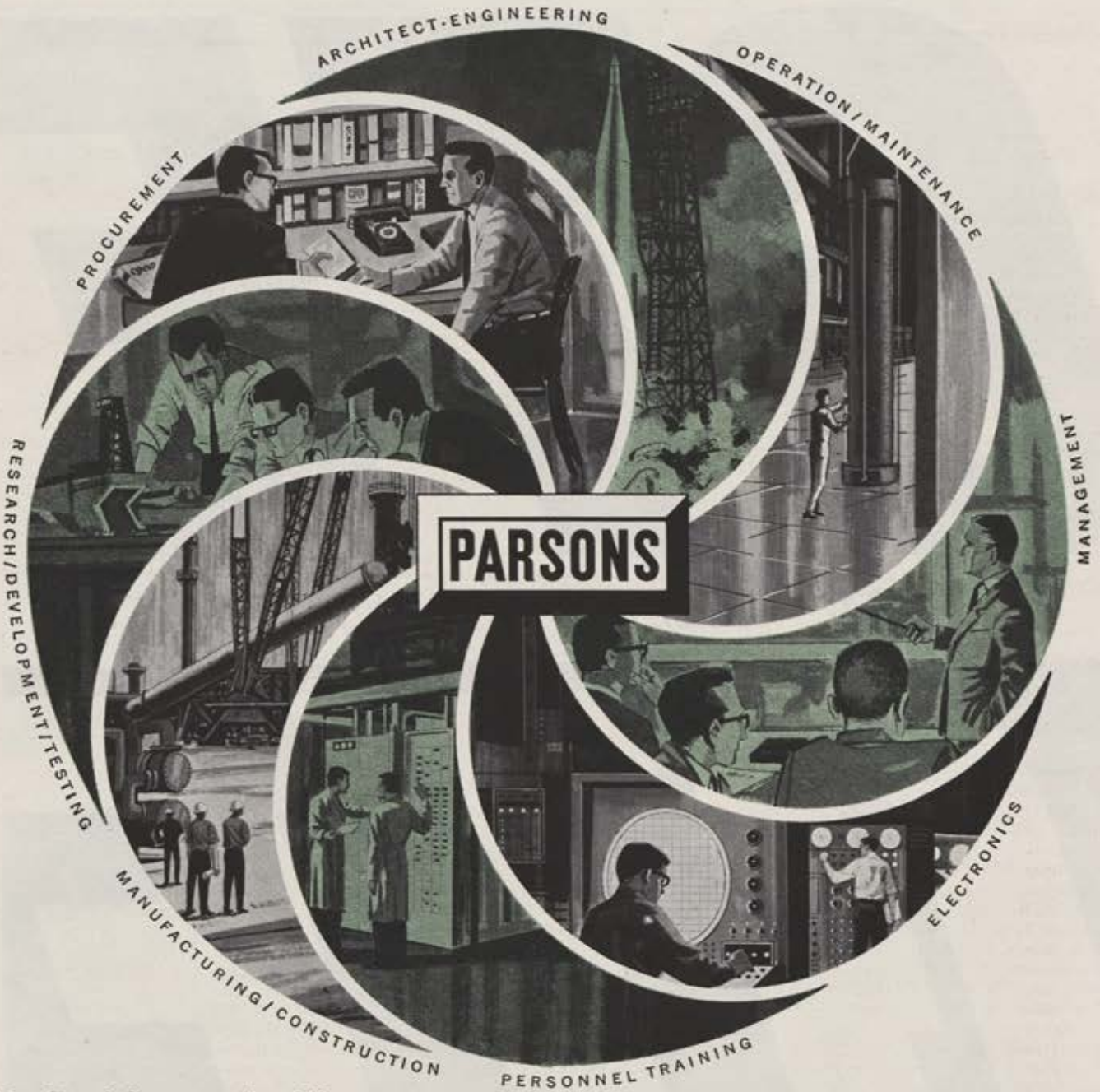
October 6, 1961—The same day, another Titan was lowered into a 165-foot-deep, hardened ICBM silo at an underground site fifteen miles east of Denver—the first protected ICBM site of its kind in the US.

October 7, 1961—Gen. Curtis E. LeMay, USAF Chief of Staff, announced the formation of a single jet tanker force to serve both SAC and TAC.

October 11, 1961—The X-15 rocket ship, with Maj. Robert M. White, USAF, at the controls, attained a speed of 3,647 mph, better than a mile per second, and reached an altitude of 217,000 feet, more than forty-one miles above the earth.

October 12, 1961—The US Strike Command was established at MacDill AFB, Fla., comprising units of the Continental Army Command (CONARC) and

(Continued on page 247)



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the Tactical Air Command (TAC) which were combined on September 19, 1961. STRICOM brought together all the combat-ready forces of both sources, including 115,000 Army troops in three divisions, including paratroopers, and many of TAC's 50,000 men and 1,800 planes.

October 13, 1961—Discoverer XXXII was launched into orbit from Vandenberg AFB, Calif. Recovery was made on the eighteenth pass on October 14 by Capt. Warren C. Shensted (his second consecutive catch), flying a C-130. The point of recovery was just eight miles southwest of final impact prediction. Payload consisted of a transponder device for the Army Map Service, a radio propagation experiment, an ion density range, dosimeters, a corn genetic experiment, and bioastronautic tests for the School of Aerospace Medicine.

October 14-15, 1961—Operation Sky Shield II, the largest air-defense maneuvers ever held in the Western World, directed by Gen. Laurence S. Kuter, Commander in Chief of NORAD, pitted a force of about 250 bombers against 250 missile sites and 1,800 fighter planes, flying more than 6,000 sorties. The defenders were aided by flashes of approaching aircraft from the DEW Line and other radar picket lines farther south strung across the continent. NORAD officials stated the exercise was 99.9 percent successful. One B-52 "attacker" was lost at sea.

October 16, 1961—The 548th Strategic Missile Squadron, SAC, was declared operational at Forbes AFB, Kan. Of the forty-eight Atlas ICBMs reported to be deployed so far by the Air Force, the 548th was the first to reach combat status on schedule.

October 17, 1961—The X-15, under the guiding hand of NASA pilot Joe Walker, attained a record speed of 3,900 mph, nearly Mach 6. During parts of this flight, skin temperatures of the craft reached 1,110 degrees F.

October 18, 1961—An Air Force H-43B Huskie rescue helicopter claimed a new world record altitude of 32,840 feet in the Class E-1d field. The previous record of 29,846 feet, set in 1959, was also held by a H-43B helicopter.

October 19, 1961—The US served notice in the United Nations that it would resume nuclear tests in the atmosphere unless a treaty prohibiting tests, with effective controls, was promptly signed.

October 19-20, 1961—USAF announced that four of its French air bases—at Chaumont, Chambley, Etain, and Phalsbourg—would be reactivated as part of the current Western military buildup in Europe.

October 21, 1961—Midas IV, a 3,500-pound satellite equipped with heat-sensing equipment intended to detect the firing of ballistic missiles at great distances, was launched into a 2,100-mile orbit from Point Arguello, Calif. A packet of millions of tiny copper wires for Project West Ford was released to create a metallic space belt intended to relay radio communications. The project was opposed by some astronomers and radio engineers who feared the filaments would interfere with astronomic observations. The issue became moot when the fllaments failed to release into space.

October 23-November 2, 1961—William Tell 61, an air defense test, brought together at Tyndall AFB, Fla., top ADC fighter-interceptor teams in a realistic defense exercise. In one of the key tests, 137 kills were made out of 142 weapons fired, a kill percentage of ninety-six percent.

October 24, 1961—A Titan ICBM was fired from Cape Canaveral to coincide with the overhead passage of Midas IV, 2,100 miles above. The test evaluated the effectiveness of the ICBM firing detection gear. Results were not disclosed.

October 26, 1961—Gen. Curtis E. LeMay, USAF Chief of Staff, told a Detroit audience that the US should expect and prepare for war in space, with entirely new weapons—perhaps not even nuclear ones. General LeMay's statement was a major pronouncement pointing up the increasing emphasis being given in the US to attain a major space military capability.

October 27, 1961—Defense Secretary McNamara announced Administration decisions to end the production of B-52 bombers as scheduled and not to expand production of the B-70 or accelerate the Dyna-Soar space-glider project. The decisions were made after a review ordered by the President. Secretary McNamara said the progress of the Administration's accelerated defense buildup made it unnecessary to use the extra $780 million appropriated by Congress for these programs.

November 1, 1961—The Aeromedical Division was established to consolidate within one agency of AFSC all principal bioastronautical research programs which includes activities previously conducted under AMC, ARDC, and the Air Training Command. Under command of Brig. Gen. Theodore C. Bedwell, the AMD was expected to give major impetus to Life Sciences research in the USAF.

November 1, 1961—A Hound Dog air-to-surface strategic missile was launched over the Atlantic Missile Range from beneath the wing of a B-52. The range was not disclosed. On a previous test, in April 1961, Hound Dog flew 600 miles.

November 5, 1961—Discoverer XXXIV was fired into orbit with a recoverable capsule. It was the twenty-second successful launch in the series. Recovery of the 300-pound gold-plated capsule was not made.

November 7, 1961—The largest single overseas deployment of tactical-fighter planes since World War II was completed as the last of more than 200 F-84 Thunderjets and F-86 Sabrejets, piloted by remently mobilized members of the Air National Guard, reached European bases.

November 9, 1961—The X-15, piloted by Maj. Robert M. White, USAF, attained a record speed of 4,093 mph for a maneuverable manned craft. The peak speed was reached at an altitude of 101,600 feet with the engine at full throttle for the first time.

November 10, 1961—The 100th Atlas, launched from Cape Canaveral, was destroyed by ground radio signal about thirty seconds after launch when it veered in flight. The nose cone, carrying a six-inch-tall monkey and an assortment of biological experiments to test the effects of space radiation on living organisms, was recovered from the Atlantic Ocean two days later.

November 11, 1961—Defense Secretary McNamara said that no effective countermeasures have yet been developed against "our" ICBMs.

November 13, 1961—The first underground Minuteman silo was completed at Malmstrom AFB, Mont., and accepted by the Air Force by Col. Harry E. Goldsworthy, head of the Site Activation Task Force. The tenth and last silo was accepted on December 15, 1961, less than a month later. The Minuteman squadron will be manned by SAC's 341st Strategic Missile Wing.

November 14, 1961—Air University began a course on Aerospace Operations with thirty student officers selected to attend the first class.

November 15, 1961—Discoverer XXXV was orbited from Vandenberg AFB, Calif., made eighteen passes, and was recovered twenty-seven hours later by air catch over the Pacific on the first attempt. The gold-plated capsule contained a number of organic specimens designed to provide information on space environment. The air catch was witnessed by tracking station personnel, a first of its kind, on Tern Island, near Hawaii.

November 16, 1961—DoD-NASA entered an agreement that there would be no "joint" programs of divided responsibility. When carrying out part of a NASA project, the Air Force shall do so as a contractor to NASA, and not assume through such assignment a responsibility for over-all program direction or execution.

November 17, 1961—The fifth Minuteman—the second silo launching—on a 3,000-mile flight from Cape Canaveral was completely successful. Major test objectives demonstrated the capability of the guidance and control subsystems to compute trajectory, steer the missile, and maintain stability by separate commands. Impact point was within five miles of the planned target.

November 21, 1961—The first test-firing of a Titan was made by an Air Force crew of the 6555th Aerospace Test Wing at Cape Canaveral. USAF personnel were in charge of all phases of checkout and launch, including missile erection, stagemating, loading countdown, and firing. The test missile, carrying an experimental target reentry vehicle to be used in Nike-Zeus tests in 1962, landed 5,000 miles downrange in the South Atlantic.

November 22, 1961—A satellite employing an Atlas-Agena-B booster combination containing "a number of classified test components" was launched by the Air Force from Point Arguello, Calif. No public disclosure was made of the nature or success of this launching. An

(Continued on following page)

official NASA "Satellite Situation Report" indicated that this satellite failed to achieve orbit.

November 22, 1961—The Navy claimed a new world jet speed record of 1,606.342 mph for its F4H Phantom II flown by Marine Lt. Col. Robert B. Robinson, who attained a maximum speed of 1,650 mph in setting the new mark. The previous record was held by USAF Maj. Joseph W. Rogers who, on February 15, 1959, had flown an F-106 at 1,525.96 mph.

November 24, 1961—A false alert involving a communications difficulty between SAC and NORAD caused Gen. Thomas S. Power, Commander in Chief of SAC, to order his bombers into readiness for takeoff. The emergency did not reach a point where it became necessary to launch ground alert forces or to notify the President.

November 28, 1961—President Kennedy awarded the Harmon International Trophy for Aviators to X-15 pilots Joe Walker, Scott Crossfield, and Maj. Robert M. White, USAF.

November 29, 1961—The Air Force announced a new insigne for "pilot-astronauts" and established fifty miles (264,000 feet) above the earth as the point at which astronautics begin. The insigne consists of a shooting star superimposed on USAF silver wings.

November 29, 1961—An Atlas ICBM was launched over the Pacific from Vandenberg AFB, Calif., by a SAC crew in a combat-readiness test by the 576th Strategic Missile Squadron.

November 29, 1961—A Titan ICBM with advanced guidance system intended for Titan II soared 5,000 miles downrange from Cape Canaveral to its eleventh straight success.

December 1, 1961—An Atlas was fired 5,000 miles downrange from Cape Canaveral and ejected thirty-two small capsules containing potassium, sodium, and other inflammables which erupted into colorful flares as the capsules hit the heat barrier of the atmosphere. The experiment was designed to develop safe containers for nuclear power units to be carried in future satellites and spaceships. By studying the ionization trails created by the flares, scientists hoped to learn about how radioactive material disperses in the atmosphere.

December 4, 1961—The first Blue Scout vehicle launched from the Pacific Missile Range at Point Arguello, Calif., sent a twenty-nine-pound payload to make radiation measurements over the South Pole at a maximum apogee of 27,600 miles to determine low-energy proton flux in regions beyond the outer Van Allen radiation belts. The launch was accomplished entirely by Air Force personnel.

December 7, 1961—An Atlas ICBM was raised from a horizontal emplacement by a crew from the 576th Strategic Missile Squadron (SAC), and launched from Vandenberg AFB, Calif.—the second such success in eight days.

December 8, 1961—Project Cambridge was carried out involving the firing of a thirty-two-foot rocket from Point Arguello, Calif., to a point 900 miles out over the Pacific and 1,300 miles high. At prearranged times, each of the three sets of flares was ignited and splashed 62,000,000 candle power against the night sky. This display was simultaneously photographed by observers in Hawaii, Alaska, and Berkeley, Calif. By photogrammetric triangulation, the Air Force was enabled to locate Hawaii more precisely on its map.

December 9, 1961—A giant solid-fuel rocket engine weighing seventy tons, forty feet high (bolted in four segments), and eight feet in diameter was test-fired at Sunnyvale, Calif., under an Air Force contract. The engine generated nearly 500,000 pounds of thrust before burnout eighty seconds later.

December 12, 1961—Discoverer XXXVI, launched from Vandenberg AFB, Calif., orbited the earth sixty-four times and was ejected over Kodiak, Alaska. The capsule landed outside the Pacific Ocean "ball park" and was recovered December 16 by Air Force frogmen. Payload included an Army Sequential Correlation of Range (SECOR) tracking transponder, a radiation time package and shielding experiment, a space medicine biopack prepared by the USAF School of Aerospace Medicine, and a ten-pound piggyback OSCAR (Orbiting Satellite Carrying Amateur Radio) satellite, the first built by private citizens to be put into orbit.

December 12, 1961—Professor Neil E. Harlan of the Harvard Business School, was named Assistant Secretary of the Air Force for Financial Management.

December 12, 1961—A new model "quick-firing" Atlas carrying a package of twenty-eight dummy atomic fuel cores was sent 5,000 miles downrange from Cape Canaveral. The test cores made of sodium, potassium, ribidium, and cesium were exposed to atmosphere reentry to obtain information for use in building satellite nuclear generators.

December 13, 1961—The Air Force was directed by DoD to abandon its plan for the mobile Minuteman ICBM. The decision was taken after two years of R&D and costs of $108 million. Plans were substituted for increasing the number of underground Minuteman launching facilities.

December 13, 1961—The final Titan I flight test missile landed on target 5,000 miles downrange from Cape Canaveral to mark the completion of the test-firing program. It concluded thirty-five successes in forty-seven launchings since 1959.

December 13, 1961—SAC accepted the last Atlas launch site in the twenty-four-missile complex at Warren AFB, Wyo., to be under command of the 389th Strategic Missile Wing.

December 15, 1961—A Titan ICBM steered by a new inertial-guidance system failed when the second stage did not ignite. It was the first Titan failure in the thirteen launchings from the Atlantic Missile Range.

December 15, 1961—The first class of five USAF military space pilots graduated from the Aerospace Research Pilots School. The course consisted of eight months of schooling in four areas: academic, flying, simulator work, and aeromedicine. Four graduates remained as faculty at the school; the other was assigned to Edwards AFB, Calif., Flight Test Center as a test pilot.

December 15, 1961—The SAGE air-surveillance and weapons-control system covering the continental US was completed when the last of twenty-one control centers began operation at Sioux City, Iowa, as a part of NORAD.

December 18, 1961—A Minuteman "Instant ICBM" was fired from a concrete-lined silo at Cape Canaveral. Twenty minutes later its instrument-loaded nose cone landed 3,600 miles downrange. It was the second consecutive successful silo launching of Minuteman.

December 20, 1961—An advanced Atlas-F ICBM aborted into the Atlantic short of its 5,000-mile goal as the result of a premature engine shutdown.

December 20, 1961—Scatback, a rhesus monkey, was rocketed 600 miles into space in an Atlas. All went well as the capsule was detached and parachuted into the Atlantic 5,000 miles southeast of Cape Canaveral. However, the radio beacon that was to guide searchers to the floating capsule malfunctioned, and the monkey was lost.

December 22, 1961—A construction contract for $67.8 million for Minuteman launch facilities near Minot AFB, N. D., was awarded by the USAF. Minot AFB will be the support base for the third of four planned Minuteman wings.

December 22, 1961—An Atlas-Agena-B satellite was launched from Point Arguello, Calif., by the Air Force. No disclosure of additional information was made at the time. A NASA "Satellite Situation Report" indicates that the satellite achieved orbit, that one object from this shot decayed on December 31, 1961, and that another decayed on January 9, 1962 (all Greenwich Civil Time).

December 23, 1961—Titan III was given approval for development. This giant rocket booster will combine solid- and liquid-fuel technology, involving a Titan II center booster and two or more solid-fuel rockets, each ten feet in diameter, strapped outside. Total thrust (about 1.5 million pounds in this configuration) would depend on how many and what size solid-fuel rockets were clamped to the sides. Titan III will be capable of sending over fourteen tons into orbit, thus approaching the lift capability of Saturn C-1 being developed by NASA.

December 26, 1961—The Dyna-Soar space-glider program received major emphasis as the DoD approved programs designed to send an Air Force pilot on a trip from Cape Canaveral around the earth to Edwards AFB, Calif.

December 26, 1961—As of the close of 1961, USAFE had grown into the strongest American air command ever maintained outside the US in peacetime, mustering 75,000 officers and airmen in fourteen wings, and manning over 1,400 aircraft.

(Continued on page 251)

The Manager's Responsibility

One man runs a winning ball club in the big leagues—the Manager. He determines the lineup, manages the team and reports to the front office.

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CompuDyne Corporation

December 26, 1961—The first of six "Talking Bird" communication packages was delivered to the Air Force Communications Service at Tinker AFB, Okla. Each package will contain all the equipment necessary to establish a communications center in any remote area rolled into a C-130 for rapid transport.

December 27, 1961—DoD indicated increases of the SAC bomber alert force by fifty percent and Minuteman production capacity by 100 percent since January 1961.

December 27, 1961—The Defense Electronics Supply Center was established at Gentile AFS, near Dayton, Ohio, to procure 1,000,000 separate common-use electronic items for the Army, Navy, and Air Force.

December 27, 1961—A reconnaissance-strike mission for the B-70 bomber (redesignated RS-70) was disclosed. The new mission reflected a shift of emphasis from a capability to detect known, fixed targets to seeking out and destroying mobile and imprecisely located targets.

December 28, 1961—A Titan II ICBM was captive fired at Denver, Colo. The complete airborne and ground equipment was subjected to simulated flight conditions and the test achieved all objectives. Titan II, with a 530,000-pound thrust, is planned as a booster to orbit a two-man Gemini capsule.

December 29, 1961—The USAF terminated design studies for the RF-105D reconnaissance fighter and switched to a reconnaissance version of the Navy's F4H to be designated RF-110 and to be built to meet Air Force tactical reconnaissance requirements.

December 29, 1961—Joint Task Force 8 was established by the DoD to prepare for resumption of atmospheric nuclear tests under the control of the Defense Atomic Support Agency (DASA).

January 1, 1962—The Air Force assumed full responsibility for the Jupiter IRBM which was transferred to it from the Army Ballistic Missile Agency, which went out of existence in an Army reorganization.

January 1, 1962—The new Defense Supply Agency became operational and assumed command of seven commodity and service agencies, including the Subsistence Supply Agency, the Traffic Management Agency, the Petroleum Supply Agency, the Clothing and Textile Supply Agency, the Medical Supply Agency, and the National Surplus Property Bidders Control Office. The DSA also assumed control of the Construction Supply Agency and General Supply Agency which are not yet fully operational. Dayton Air Force Depot will become the single manager for electronic and electrical supplies and under DSA cognizance.

January 1, 1962—The 44th Strategic Missile Wing, to be comprised of one Titan and two Minuteman ICBM squadrons, was established with headquarters at Ellsworth AFB, S. D. Commanding officer designated was Col. Virgil M. Cloyd, USAF.

January 1, 1962—MATS set its ninth consecutive flying safety record in calendar 1961 by achieving a low-accident rate of 1.08 for each 100,000 flying hours as compared to the 1.45 rate for the preceding year.

January 1, 1962—The 390th Strategic Missile Wing was activated with headquarters at Davis-Monthan AFB, Ariz. It will become the parent organization for the 570th Strategic Missile Squadron (SAC), which will operate Titan ICBMs in the Tucson, Ariz., area.

January 5, 1962—The "Instant ICBM" program of the Air Force was fully restored to schedule when the seventh Minuteman ICBM was fired from a concrete-lined silo at Cape Canaveral and achieved the third consecutive success. The nose cone landed in the planned target area 3,200 miles downrange.

January 5, 1962—The Ballistic Missile Early Warning System (BMEWS) was formally turned over to the Air Defense Command, with operational installations at Thule and Clear, Alaska. The third site, at Fylingdales Moor, Yorkshire, England, is nearing completion. More than 2,400 private contractors participated in the BMEWS construction project.

January 9, 1962—Seven SAC ICBM squadrons are now on constant alert, Gen. Thomas S. Power, SAC Commander in Chief, told a Commander's Conference in Omaha, Neb.

January 10, 1962—The Air Force plans to increase its regular forces to cope with future cold-war flareups to preclude short-term callup of Reserve or Air National Guard units, according to Secretary Eugene M. Zuckert.

January 11, 1962—An Air Force B-52, flown by Maj. G. E. Evely and a crew of eight, claimed the new world record distance in a straight line plus eleven new nonstop distance and course speed records in flying 12,519 miles from Okinawa to Madrid, Spain, in twenty-one hours and fifty-two minutes without refueling. The B-52 weighed 488,000 pounds at takeoff and averaged 575 mph.

January 11, 1962—In his State-of-the-Union address, President Kennedy called for an increase in this country's long-range nuclear-tipped missiles by nearly 300 Minutemen and Polaris missiles.

January 19, 1962—The Air Force was authorized to proceed with development of a mobile midrange ballistic missile (MMRBM) capable of deployment on land or on surface ships.

January 19, 1962—Based on Secretary McNamara's congressional testimony, US strategic retaliatory forces would include 243 Atlas and Titan ICBMs, 800 Minuteman, and forty-one Polaris submarines capable of firing a total of 656 missiles. Major reliance would also be placed upon more than 1,000 aircraft including B-58s, B-52s, and B-47s.

January 20, 1962—SAC crews ran through a Titan salvo-firing operation, launching one "J" model from an underground silo at Vandenberg AFB, Calif., and readying another for firing. It was the first SAC combat-crew launching of Titan.

January 22, 1962—Exercise Long Thrust II, a seven-day maneuver involving the transatlantic airlift of 5,273 American troops from the US to Germany, was completed under US Strike Command auspices. One battle group from the 4th Infantry Division was airlifted by C-135 jets, from McChord AFB, Wash., across the polar route to Rhein-Main Air Base, the longest of its kind to be completed.

January 23, 1962—The second Atlas in one week was launched successfully in an operational training exercise after being raised to a vertical position from a horizontal semihardened emplacement at Vandenberg AFB, Calif., by a SAC combat crew.

January 24, 1962—Two Navy F4H Phantom tactical fighters, newly designated F-110A by the Air Force, arrived at Langley AFB, Va., for a 120-day loan for orientation and evaluation.

January 25, 1962—The fifth Minuteman launched from a silo, the fourth consecutive successful one, landed 3,000 miles downrange from Cape Canaveral and met all major test objectives.

January 27, 1962—Britain agreed to permit the US to use Christmas Island for a new series of atmospheric nuclear tests.

January 29, 1962—The final Air Force Titan I flew 5,000 miles down the Atlantic Missile Range from Cape Canaveral. The shot brought the Titan record at the Cape to thirty-four successes, nine partial successes, and four failures.

January 30, 1962—The last of six "Talking Bird" communications packages was delivered to the Air Force Communications Service. Two were assigned to USAFE, two to the Pacific, and two to the ZI.

January 31, 1962—TFX final study contracts were let by the USAF. This new tactical fighter will be designed to meet land-based TAC and Navy carrier-mission requirements.

February 1, 1962—DoD approved in principle Project Northern Tier embracing the proposed joint use of selected SAGE Centers for civil air-traffic control. Negotiations were begun with FAA to move civil-air-traffic-control centers at Great Falls, Mont., and Minneapolis, Minn., into the air defense SAGE centers at Great Falls, and, in North Dakota, Minot AFB and Grand Forks AFB within the next year.

February 13, 1962—The Atlas-E model ICBM completed its test-flight program with a 7,000-mile strike down the Atlantic Missile Range. The Atlas-E, already operational at Vandenberg AFB, Calif.; Warren AFB, Wyo.; Fairchild AFB, Wash.; and Forbes AFB, Kan., showed an overall test record of nine successes, seven partial successes, and two failures.

February 15, 1962—Minuteman scored its fifth straight silo-launching success with a 3,900-mile flight down the Atlantic Missile range, 300 miles beyond any previous silo-launched ICBM of this type. Major test objectives: to gather data on heat, shock, accoustic, and vibration effects of the subterranean firing of the rocket.

(Continued on following page)

February 16, 1962—A SAC combat missile crew successfully launched an Atlas ICBM from Vandenberg AFB, Calif.

February 16, 1962—Titan III preliminary design study contracts for $3.3 million were let. Titan III will consist of a liquid-fueled Titan II with solid propellant boosters as the initial stage and a standardized upper-stage vehicle atop. Titan III will develop over two million pounds of thrust, about four times that of Titan II and will be a "workhorse booster" to place in orbit a broad range of payloads, including Dyna-Soar.

February 17, 1962—A basic defense requirement for CONELRAD (Control of Electromagnetic Radiation) no longer exists. The DoD decided it was no longer essential to minimize the use of nongovernment transmitters as navigational aids to the enemy. CONELRAD has employed two airwave frequencies—640 kc and 1240 kc—exclusively and these frequencies will continue to be used for broadcasting civil defense and emergency instructions.

February 17, 1962—A flight-weight solid-fuel test rocket fifty-three feet long in five segments, and weighing 119 tons, developed 600,000 pounds of thrust and burned for ninety-eight seconds during a static test firing which set a record thrust at Aerojet-General Corp. facilities in Sacramento, Calif.

February 19, 1962—USAF claims for international time-to-climb records were made for its T-38 Talon supersonic trainer, including: 3,000 meters (9,842.5 feet) in 35.62 seconds; 6,000 meters (19,685 feet) in 51.429 seconds; 9,000 meters (29,527.5 feet) in 64.76 seconds; 12,000 meters (39,370 feet) in 95.74 seconds. On March 6, 1962, these records were apparently broken by a Navy F4H Phantom II, "the world's fastest jet aircraft," quantities of which are being purchased by the USAF.

February 19, 1962—The Air Force Space Plan, a ten-year blueprint for regaining the lead in military space technology, was given to a House committee by Lt. Gen. James Ferguson, DCS/R&T. The Space Plan foresees a military need for rendezvous, docking, and transfer. The USAF expects to depend on a manned rendezvous vehicle, using the two-man Gemini, built by NASA, as an initial transport vehicle. The Space Plan was sent to the Air Force Scientific Advisory Board for review.

February 20, 1962—Lt. Col. John H. Glenn, Jr., USMC, became the first American to achieve orbital spaceflight as he rode a one-ton Project Mercury capsule three times around the earth. *Friendship 7* was boosted into a 17,545-mph, 88.29-minute orbit, with an apogee of 162.5 miles; perigee of 98.9 miles, by a 360,000-pound-thrust Atlas. Colonel Glenn parachuted safely into the Atlantic and was recovered by a Navy destroyer 166 miles east of Grand Turk Island four hours and fifty-six minutes after the flight began.

February 21, 1962—Secretary of Labor Arthur J. Goldberg established a special interdepartmental "task force" to study labor problems in the missile industry and to review wage levels and other sources of potential disagreement to forestall strikes.

February 21, 1962—The Air Force launched a satellite from Vandenberg AFB, Calif., that was successfully boosted into orbit by a Thor-Agena-B combination. The object in orbit decayed on March 9, 1962.

February 21, 1962—The Air Force and Navy entered into an agreement under which the Air Force will in FY '62 procure twenty-nine F4H aircraft together with associated ground equipment and spares. Both services agreed on a tentative procurement of about 270 aircraft (AF designation F-110) through FY '64.

February 22, 1962—Exercise Banyan Tree III got under way in the Caribbean Sea area. US Air Force and Army elements of the newly established Strike Command began a coordinated defense against a simulated "aggressor" in Panama's Rio Hato training area. More than 1,000 airborne troops supported by troop carriers, jet reconnaissance, and fighter aircraft participated in the maneuver.

February 23, 1962—DoD and NASA signed an agreement that neither agency would begin the development of a launch vehicle or a space booster without the written acknowledgement of the other.

February 23, 1962—A Titan I was raised to ground level just before launch time from its underground storage in a reinforced silo and launched successfully from Vandenberg AFB, Calif., by a combination contractor, AFSC, and SAC crew. Purpose of the test launching was to confirm total weapon system reliability. Titan I was programed to impact 4,000 miles downrange into the Eniwetok target area, but dropped into the sea 100-200 miles offshore due to a malfunction prior to first-stage engine shutdown.

February 25, 1962—The Air Force's first portable nuclear powerplant went critical (self-sustained chain reaction). PM-1 (Portable Medium Plant No. 1) is located at Sundance, Wyo., and will provide the prime source of electrical power (1,000 kw) and space heat (2,000 kw) to a radar squadron's technical site in the Warren Peak area of Wyoming. PM-1 is under AEC control for a six-month testing period after which it will become the first fully operational ground nuclear power plant in the USAF inventory.

February 27, 1962—Discoverer XXXVIII was launched into orbit from Vandenberg AFB, Calif., with a classified cargo. It made sixty-five orbits in four days, breaking the previous record by one. It was recovered in the air on March 3 about 200 miles north of Honolulu.

February 27, 1962—Gen. Curtis E. LeMay, Chief of Staff, USAF, supported fiscal 1963 appropriations for 300 Minuteman ICBMs, instead of the 200 requested by the Administration. He urged funding of the RS-70 as a full weapon system vs. limited development as a prototype. He expressed concern that the US could maintain an "umbrella of strategic superiority" when allocations to these forces were scheduled to decline in the next four years from the current eighteen percent to an estimated eight percent of the annual national defense budget.

February 28, 1962—An Atlas-E was hurled 4,000 miles across the Pacific Missile Range from an above-ground coffin-type launcher. It was the first such launch from Vandenberg AFB, Calif.

February 28, 1962—The Air Force tested a steel cocoon 700-pound escape capsule by projecting it from a B-58 flying over Edwards AFB, Calif., at 565 mph (Mach 0.80) by two 5,000-pound-thrust rockets. The pilot, Edward J. Murray, experienced a twenty-six-second free fall from 20,000 feet until his main parachute floated the capsule to earth eight minutes after ejection.

February 28, 1962—A new Air Force Regulation 35-9 on "Human Reliability" listed nineteen categories of officers and twelve of airmen who would be screened for mental stability in order to retain critical job assignments as fighter-interceptor pilots, missile commanders, nuclear weapons specialists, missile maintenance men, and others who handle nuclear weapons. The regulation would help to screen personnel who might through boredom, impulse, or psychosis act in a way contrary to the national interest.

March 2, 1962—An F-105 wing (the 355th Tactical Fighter Wing) was activated by TAC at George AFB, Calif., to supplant another (the 31st TFW) which would be transferred to Florida. TAC will now have one Thunderchief TFW on each coast for rapid deployment in either direction in case of emergency.

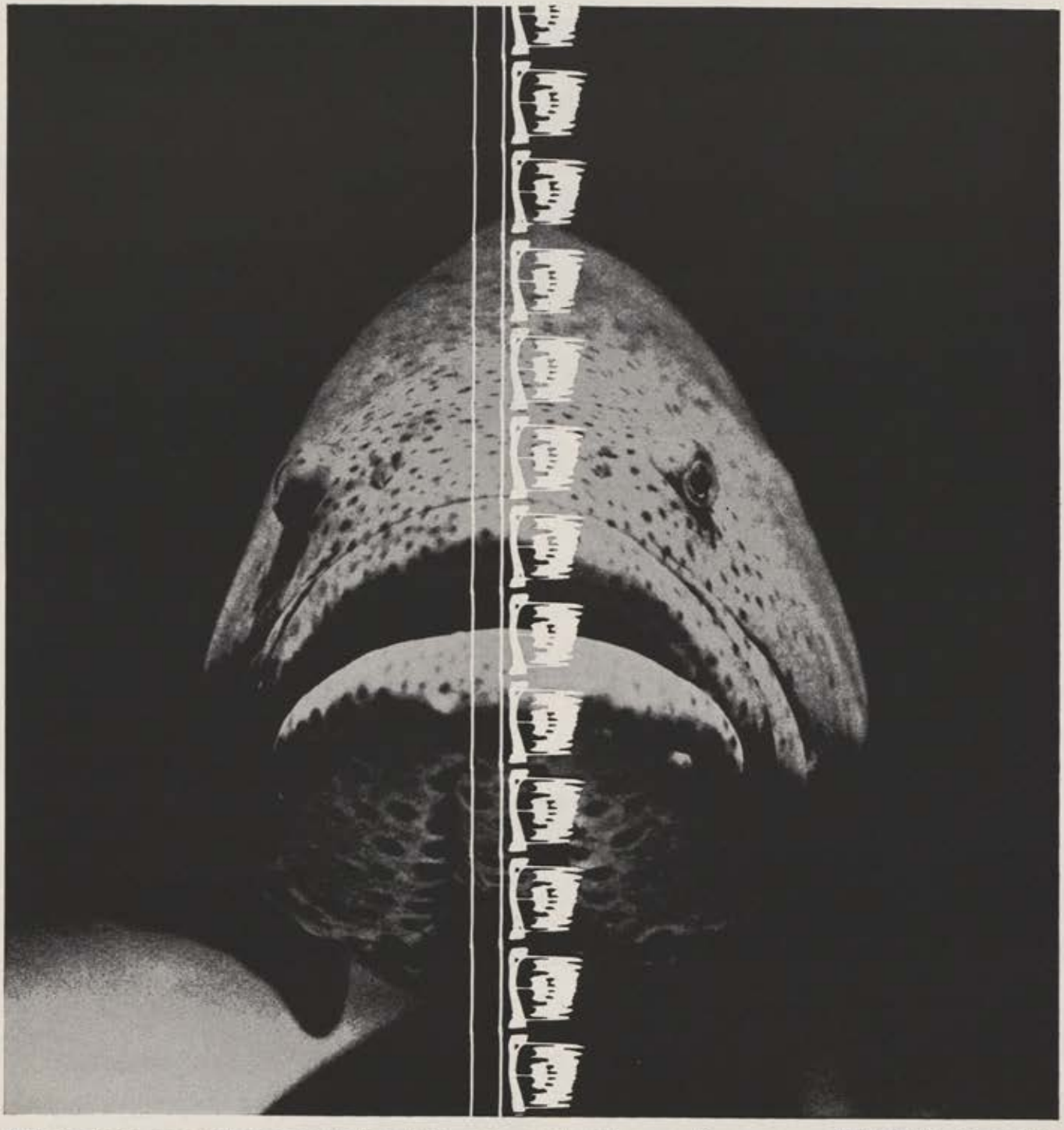
March 2, 1962—Operation Bristle Cone, a combined twelve-day Army-Air Force training exercise, began on the West Coast to test under simulated emergency conditions the military strategic airlift capability to move 40,000 combat troops from Fort Lewis, Wash., and Fort Riley, Kan., to George AFB, Calif.

March 2, 1962—USAF reported that an experiment aboard an Agena had provided the first continuous data on the actual size and intensity of the inner belt of proton radiation belt over the equator at altitudes of from 300 to 3,000 miles. USAF reported that center belt radiation intensity was 600,000 proton particles passing through one square inch per second instead of 100,000 as previously estimated.

March 4, 1962—A Project Stargazer test aborted when its supporting 400-foot-high plastic helium bag exploded two hours after launching. A gondola loaded with Air Force telescopic camera equipment plunged into deep Sierra Mountains snow in California.

March 5, 1962—A B-58 piloted by Capt. Robert Sowers, USAF, set speed records by making a round trip between New York City and Los Angeles in four hours, forty-one minutes, and 11.3 seconds. On its East-West leg the Hustler beat the sun across the United States, attaining an average speed of 1,081.77 mph. Average speed for the round trip, including turnaround time, was 1,044.96 mph.

(Continued on page 255)



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March 7, 1962—An Air Force satellite was launched by an Atlas-Agena-B combination from Point Arguello, Calif. According to a NASA report, a portion of it achieved orbit and decayed on March 31, 1962.

March 7, 1962—Skybolt ALBMs will be furnished for our operating inventory of more than 640 B-52s at a cost of over $1 billion, according to President Kennedy. Advanced B-52 types will each mount four Skybolts.

March 8, 1962—Minuteman scored its sixth straight underground silo-launching success with a flight of more than 3,000 miles down the Atlantic Missile Range.

March 9, 1962—Titan II was captive-fired at full first-stage thrust of 430,000 pounds for twenty seconds at Cape Canaveral preparatory to its maiden flight. It burns liquid fuels which create no flame. Instead, intensely hot gases are emitted from the combustion chamber. When operational, Titan II will be used in a variety of space missions.

March 13, 1962—Project Stargazer succeeded on its second attempt to launch a high-altitude, unmanned balloon to an altitude of about 88,000 feet over California. The balloon responded well to all ground commands transmitted by radio. It is intended to loft two men and a specially stabilized telescope to similar high altitudes for astronomical observations.

March 14, 1962—The Air Force will extend space surveillance to the moon through a system developed by the Space Track Research & Development Facility at Laurence G. Hanscom Field, Mass. There will be surveillance of orbiting man-made or natural objects beyond the earth's nominal, low-altitude orbital areas out toward the moon.

March 14, 1962—Six candidates were selected by the USAF for Dyna-Soar, including four Air Force and two NASA test pilots. Dyna-Soar is designed to be boosted into orbit by a Titan III.

March 15, 1962—Maj. Donald K. Slayton, USAF, was replaced by Lt. Cmdr. M. Scott Carpenter, USN, on the next Project Mercury orbital space flight (MA-7) after an Air Force medical board and civilian cardiologists found Major Slayton to be subject to "erratic heart rate."

March 16, 1962—The Air Force accepted the DoD ruling against expanding the RS-70 program beyond three prototype aircraft previously approved. Secretary Zuckert announced that Secretary McNamara's ruling is "binding upon us."

March 16, 1962—On its maiden flight, Titan II streaked 5,000 miles downrange from Cape Canaveral. Titan II generates 430,000 pounds of first-stage thrust and is powered by propellants that can be stored for long periods. It is also designed to be fired from underground silos.

March 20, 1962—RS-70 prototype contracts providing for fabrication of three aircraft were awarded. Contract cost was in excess of $37 million.

March 21, 1962—A bear strapped inside an escape capsule was ejected from a B-58 traveling 870 mph at an altitude of 35,000 feet, and parachuted to earth unharmed seven minutes, forty-nine seconds later. It was the first time that a living creature had been ejected from an aircraft at supersonic speed.

March 22, 1962—Minuteman was sent 4,000 miles downrange from Cape Canaveral in the seventh straight, and the first night, launching from a silo.

March 23, 1962—The 47th Tactical Bomb Wing flying B-66s was ordered "phased down" in July 1962.

March 23, 1962—Project Stargazer sent a 400-foot balloon aloft at Chico, Calif., with equipment to take photographs of planets in the clear atmosphere. It was the second success in four attempts.

March 23, 1962—John F. Kennedy became the first President to watch an ICBM fired—an Atlas-D successfully launched from Vandenberg AFB, Calif.

March 27, 1962—Warren AFB, Wyo., was selected by the USAF as headquarters for its fifth Minuteman complex. A total of 150 silos will be spread through five neighboring counties in western Nebraska and Wyoming. Earlier Minuteman complexes under construction have headquarters at Malmstrom AFB, Mont.; Ellsworth AFB, S. D.; Minot AFB, N. D.; and Whiteman AFB, Mo.

March 28, 1962—Gen. Curtis E. LeMay, Chief of Staff, USAF, expressed the Air Force's interest in developing powerful light beams to intercept ICBMs in flight. He told an audience at Assumption College, Worcester, Mass., that space operations were not "merely an extension of the use of nuclear weapons." He said national security in the future might depend on armaments far different than were known today, but they, too, would not be considered to be ultimate weapons.

March 30, 1962—DoD will dispose of ninety-seven additional base facilities including eleven overseas outmoded military installations.

April 1, 1962—USAF officially abandoned the giant Dhahran Air Base in the Middle East when Col. Willard W. Wilson, Commander of the 2d Air Division, turned the base back to Saudi Arabia.

April 2, 1962—The Air Force selected a contractor under monitorship of Rome Air Development Center, N. Y., to begin development of a phased array radar for detection and tracking of satellites. Phased array radar consists of radar beams aimed electronically rather than mechanically.

April 3, 1962—The Air Force will procure twelve additional Thor space boosters to meet future requirements. Since January 1957 there have been 142 launches of Thor with 111 successes, thirteen partial successes, and eighteen failures.

April 4, 1962—Air Force proposals for a Nuclear Detection System (NUDETS)—a largely unmanned, fully automatic network of detectors that will stick up like periscopes from fifty-two shafts sunk around the nation—were disclosed in congressional testimony. NUDETS will be able to spot nuclear bursts out to 100 miles, measure their shock effect, altitude, and destiny. The information derived would flow automatically to eight regional data-processing centers. NUDETS will provide more precise information than can be expected from the 100 bomb alarm locations around the US.

April 6, 1962—The Air Force took delivery on the first two C-130E Hercules transports which will substantially add to Army-Air Force tactical mobility. The C-130E can overfly the Atlantic with a payload of 27,000 pounds.

April 6, 1962—"Yogi," a brown bear, was successfully ejected from a B-58 flying 1,060 mph at 45,000 feet over Edwards AFB, Calif.

April 9, 1962—A satellite employing an Atlas-Agena-B booster combination was successfully launched by the USAF from Point Arguello, Calif. The satellite carried a number of test components, some of them classified. According to a NASA "Satellite Situation Report," this satellite attained orbit and a portion of it decayed on May 4, 1962 (G.C.T.).

April 10, 1962—New maintenance procedures utilizing computers which digest information taken from cards have saved the Air Force about $155 million in maintenance costs. These procedures made available for flying seventy-five B-52s that were not available a year before.

April 11, 1962—About 11,500 Air Force Reservists who were sent overseas with fighter units as part of the Berlin crisis buildup in the fall of 1961 were to be released by August 1962.

April 11, 1962—An Atlas was raised to a vertical position from a horizontal semi-hard (partially sunken) emplacement and then launched by a SAC combat missile crew at the Pacific Missile Range at Vandenberg AFB, Calif.

April 11, 1962—A classified directive has been issued curtailing the release of information on military space vehicles. From now on there will be no advance notice on military satellite launches. Brief announcements will be made after launch. Later, after analysis, some additional information may be released. Military satellites will no longer have special names. This policy does not apply to missile shots.

April 12, 1962—A Blue Scout vehicle was launched from Cape Canaveral with a 300-pound payload intended to measure ionization effects upon radio frequency transmissions. First-stage burnout was confirmed but second stage apparently failed to ignite and the vehicle impacted in the Atlantic.

April 12, 1962—The first assembly-line Minuteman ICBM was completed at Air Force Plant 77 in Utah. Missile stages and other hardware are manufactured in Utah, Washington, and California and will be shipped to this plant. Under present plans, 800 "instant ICBM" Minutemen will be emplaced in silos.

April 14, 1962—The Air Force selected proposals submitted by the United Technology Corporation for the 120-inch solid motor and STL-ARMA for the guidance efforts to be placed in Titan III which will serve as a principal booster vehicle for space projects in the decade ahead. Contracts are contingent upon final program approval.

(Continued on following page)

April 15, 1962—A rectangular atmospheric testing area of 480,000 square miles surrounding Christmas Island in the Pacific was designated as a possible danger area by Joint Task Force 8, assigned by DoD and AEC to monitor forthcoming nuclear tests by the US.

April 16, 1962—DoD announced the release before July 1, 1962, of 700 Air Force officers and 12,300 airmen whose enlistments or obligated terms of service were "frozen" in August 1961 because of the Berlin crisis.

April 17, 1962—DoD mechanism for a five-year program of balanced national defense planning was made public. Secretary McNamara's plan creates for the first time a completely coordinated long-range defense program embracing all three services. Henceforth, all major budget items submitted by each service would be under continuous scrutiny in each detail by the Office, Secretary of Defense, which may permit speedup or require a cutback as dictated by international developments or technological breakthrough.

April 17, 1962—A Thor-Agena-B was successfully launched from Vandenberg AFB, Calif. The Air Force made no further disclosure of data concerning this satellite. However, a NASA report subsequently indicated that this satellite attained orbit. One object relating to this launch decayed on April 20 and two others on April 21.

April 17, 1962—MATS C-135B piloted by Maj. David W. Crow established an altitude record of 47,171 feet with the payloads: 15,000 kilograms (33,069 pounds); 20,000 kilograms (44,092 pounds); 25,000 kilograms (55,115 pounds); and 30,000 kilograms (66,138 pounds).

April 18, 1962—A MATS C-135B piloted by Maj. Vernon W. Hamann established a speed record of 615.59 mph over a 2,000-kilometer closed-course with following payloads: 5,000 kilograms (11,023 pounds); 10,000 kilograms (22,046 pounds; 15,000 kilograms (33,069 pounds); 20,000 kilograms (44,092 pounds); 25,000 kilograms (55,115 pounds); and 30,000 kilograms (66,138 pounds).

April 18, 1962—The first Titan I squadron was declared operational as SAC accepted from the AF Ballistic Systems Division, AFSC, nine missiles sited in the nation's first underground hardened missile base at Lowry AFB, Colo. This first Titan ICBM squadron is added to seven Atlas ICBM squadrons, placing an estimated sixty-three missiles in operational status.

April 18, 1962—The new Lockheed C-141 jet transport was officially designated Starlifter by the US Air Force.

April 19, 1962—The Skybolt (GAM-87) was launched for the first time from a B-52 flying over the Atlantic Missile Range. The flight was only partly successful as the second stage failed to ignite and the Skybolt landed downrange far short of its projected range of 1,000 miles.

April 20, 1962—Eight seasoned test pilots, including seven Air Force officers and one from the Navy, were picked to train for future military space projects. These officers will be trained by the USAF at Edwards AFB, Calif.

April 23, 1962—Exercise Air Cobra, a week-long test of SEATO's tactical airpower against a possible aggressor, began.

April 24, 1962—President Kennedy gave the order to resume nuclear testing in the atmosphere, to be conducted by Joint Task Force 8 under the command of Maj. Gen. A. D. Starbird.

April 24, 1962—A Minuteman ICBM from a Cape Canaveral underground silo exploded in the air about forty seconds later by signal of the range-safety officer when the missile deviated from its planned course.

April 24, 1962—The first transmission of TV pictures by way of an orbiting satellite was accomplished by the Air Force. The transmitting waves soared 1,000 miles from an MIT Lincoln Laboratory field station at Camp Parks, Calif., to Echo I, a balloon which has been orbiting the earth for two years, thence to Millstone Hill, Westford, Mass. The signals traveled an estimated 3,000 to 4,000 miles in order to make their 2,700-mile transcontinental jump. Success was attained under difficult circumstances because Echo I had partly deflated and its surface had become wrinkled due to continuous meteoric bombardment which reduced its reflection capabilities. The experiment was successfully repeated on April 26.

April 25, 1962—A US Air Force B-52 flying at about 50,000 feet in the Central Pacific Ocean near Christmas Island dropped a nuclear cargo which detonated with a force estimated in the intermediate range of between twenty kilotons and one megaton. This explosion marked the beginning of Operation Dominic and the end of a three-and-one-half-year respite by the US in atmospheric testing of nuclear weapons.

April 25, 1962—Maj. Gen. Thomas P. Gerrity, Commander of the Ballistic Systems Division, AFSC, said that the US now stands even with the USSR in ballistic-missile potential. He called this the "payoff year" for bringing to fruition our $17 billion ballistic-missile programs.

April 25, 1962—The N-156, a supersonic fighter, was chosen by the DoD for use by selected countries under the Military Assistance Program. The twin-jet N-156 carries an Air Force designation of F-5A and is similar to the Air Force T-38. It can exceed Mach 1.4 in level flight, carry over 5,000 pounds of external stores, weapons, or a combination of external fuel tanks. In May 1961 the N-156 was the first US supersonic jet to take off and land on a sod field. Its armament will include bombs, guided air-to-ground missiles, gun pods, and air-to-air missiles such as the Sidewinder. Built by Northrop, the N-156 is specifically designed to meet the requirements of allied nations for an economical, multimission aircraft.

April 26, 1962—The 1962 Bendix Trophy went to the USAF for the record-breaking flight of the B-58 Hustler on March 5, 1962, which crossed the country between New York and Los Angeles in two hours and 56.8 seconds, averaging 1,214.71 mph.

April 26-May 6, 1962—A superpressurized balloon with a forty-pound payload was launched from Chico, Calif., to a 70,000-foot altitude which it maintained constantly for ten days before landing on command near Cedar City, Utah. The experiment was conducted under auspices of the USAF Cambridge Research Laboratory.

April 26, 1962—Two satellites were launched from Point Arguello, Calif. In the first launch, a four-stage Blue Scout rocket was used; in the second, an Atlas-Agena-B was used. No official details were disclosed. However, a NASA report indicates that one payload decayed on April 28, 1962 (G.C.T.).

April 27, 1962—The Air Force established a Special Air Warfare Center at Eglin AFB, Fla., under the command of Brig. Gen. Gilbert L. Pritchard. The Center is assigned to train USAF counterinsurgency (COIN) forces.

April 27, 1962—An Air Force Missile Combat Crew from the 564th Strategic Missile Squadron, Warren AFB, Wyo., successfully launched an Atlas ICBM from Vandenberg AFB, Calif.

April 28, 1962—The Air Force fired its fourth military satellite in ten days from the Vandenberg AFB, Calif., base area, this one launched by a Thor-Agena-B booster combination. No mission was disclosed. A NASA report, however, indicates successful orbit and subsequent decay of two portions of the satellite, one on May 1, the other on May 26, 1962 (both G.C.T.).

April 30, 1962—The X-15, piloted by Joe Walker, climbed to a record altitude of 246,700 feet for a piloted aircraft, just short of the X-15's designed maximum altitude and 29,700 feet higher than the previous mark of 217,000 feet set by Air Force Maj. Robert M. White. NASA pilot Walker managed to cut off the 57,000-pound-thrust engine after eighty-one seconds of burning time. Another two or three seconds thrust might have sent him as high as 300,000 feet. Walker's peak speed of 3,489 mph, approached the 4,093-mph record set by Major White on November 9, 1961.

May 1, 1962—Construction at Malmstrom AFB, Mont., for the first five Minutemen "flights" was completed ahead of schedule. Each "flight" includes ten missiles and a single launch control post. Ground had been broken for the entire Malmstrom AFB wing of 150 missiles (three squadrons and fifteen "flights") in March 1961.

May 1, 1962—A Deputy Commander for Spaceflight was established in AFSC. Maj. Gen. Osmond J. Ritland was named to this post on May 23. He was assigned to duty at NASA and charged with responsibility at the operating and management levels for Air Force participation in the manned space program.

May 4, 1962—President Kennedy witnessed a spectacular air firepower demon-

(Continued on page 259)

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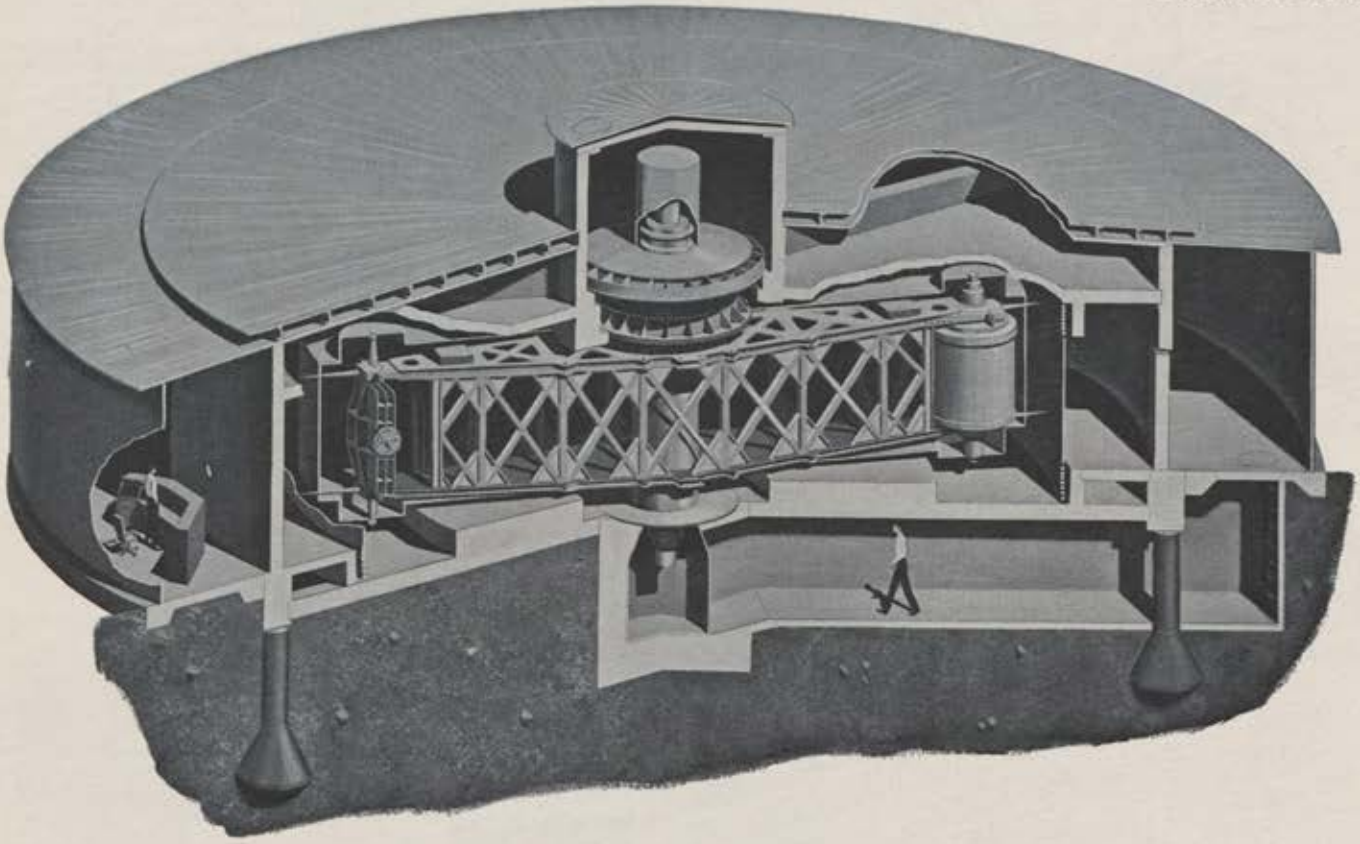

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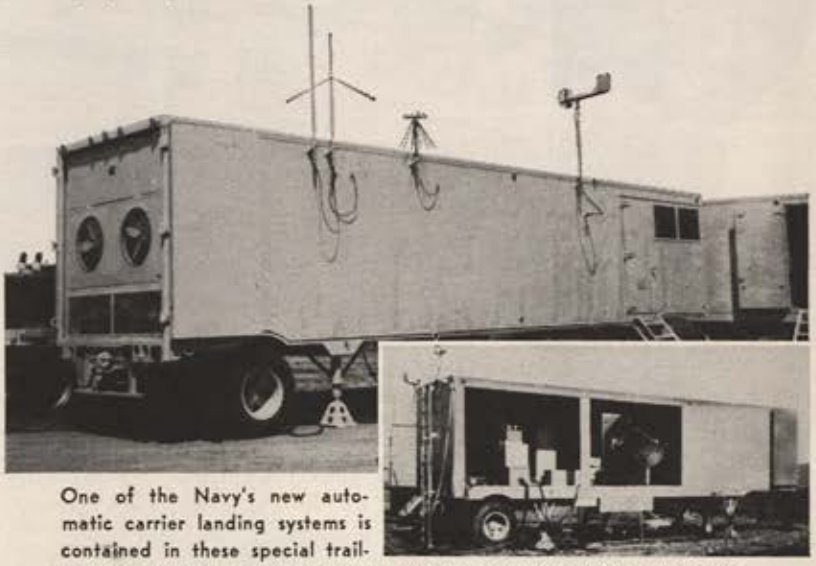

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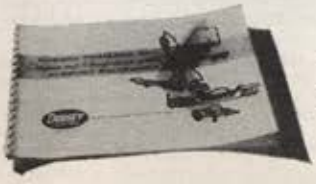

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stration at Eglin AFB. Two minutes and twenty-two seconds after the President pushed the "scramble" button, six jet F-101 Voodoo interceptors were airborne.

May 4, 1962—A Titan I ICBM was raised from its underground silo and fired into the Pacific Missile Range to become the one-hundredth missile launched from Vandenberg AFB, Calif., since December 1958, including twenty-one Thor IRBMs, thirty-two Atlases and five Titan ICBMs, and forty-two satellites.

May 7, 1962—The Dyna-Soar research program is to be upgraded to provide a more maneuverable vehicle, Secretary Zuckert indicated in testimony before the House Appropriations Committee. The availability of an additional $42 million to a previous Administration request of $115 million indicated increased DoD interest in its own program to develop the techniques of manned rendezvous in space, instead of complete reliance upon NASA orbital-rendezvous experiments.

May 7, 1962—Operation Quick Kick, the largest exercise of its type held in the US since the end of World War II, brought together Army, Navy, Air Force, and Marine units in a coordinated land-sea-air triphibious assault on a beachhead. The Air Force support comprised elements of TAC and MATS and was directed by Maj. Gen. M. A. Preston, Nineteenth Air Force Commander. General Preston, a B-17 bomber commander in World War II, is the first AF two-star general to earn Army paratrooper wings.

May 8, 1962—A second squadron of Titan ICBMs was declared combat-ready at Lowry AFB, Colo., by the Air Force, giving the US a ready force of eighteen Titans emplaced in underground silos.

May 8, 1962—"The Effects of Nuclear Weapons," a report jointly issued by the DoD, and the AEC, stated that high-altitude nuclear explosions could "black out" radio communications 1,000 miles or more distant from the detonation report. Such explosions could also be used to jam tracking radars for several hours and to shorten the range at which search radar can pick up enemy bombers or missiles. These disclosures pointed up a principal reason for resumption of atmospheric testing by the US—a desire to explore the extent to which high-altitude explosions could impair or disrupt a nation's communications, defenses, and retaliatory capability.

May 8, 1962—Maj. Robert Rushworth, USAF test pilot, took the NASA X-15 through a protracted heat test and safely withstood record temperatures of 1,250 degrees F. in a flight which achieved a top speed of 3,524 mph. The cockpit was armored with protective insulation and cooled with liquid oxygen. In addition, Major Rushworth wore a pressurized flight suit of silver nylon.

May 9, 1962—MIT scientists under USAF sponsorship successfully hit the moon with optical maser rays on thirteen separate occasions. The high-energy rays fired by the maser (microwave amplification by stimulated emission of radiation) could blind a person in 1/2,000 second at 100 yards, and suggest possible military applications for this device.

May 10, 1962—Bomarc-A completed its flight testing begun three years ago by intercepting a supersonic F-104 150 miles distant from its Eglin AFB, Fla., launching point. Bomarc-A is assigned to the bases in the Northeastern United States. It has a range of more than 200 miles and an altitude capability in excess of eleven miles. Bomarc-B with a range about twice that of Bomarc-A is still being tested.

May 10, 1962—Titan III will include a fourth stage to be powered by liquid-fuel engines, the Air Force revealed. This stage contains the guidance system and controls the entire Titan III system during boost.

May 10, 1962—DoD will conduct an intensive analysis of what new military space systems may be needed, according to Deputy Secretary of Defense Roswell L. Gilpatric.

May 10, 1962—Anna 1A, a triservice geodetic satellite, was launched from Cape Canaveral by a Thor-Able-Star booster. The satellite contained an Air Force "Flashing Light" for optical measurements, a Navy instrument for doppler measurements, and an Army transponder for radio-ranging data. These three types of observation were intended to provide independent measurements for a high degree of geodetic accuracy. Anna 1A failed to orbit because of a probable second-stage ignition and separation failure.

May 11, 1962—An Atlas ICBM was raised from a horizontal semihardened emplacement and successfully launched from Vandenberg AFB, Calif., by a missile combat crew of twelve men from SAC's 565th Strategic Missile Squadron.

May 11, 1962—A Minuteman was fired from an underground silo at Cape Canaveral landed 3,000 miles downrange, and fulfilling all major test objectives.

May 15, 1962—The Air Force Logistics Command announced the elimination of its last permanent Air Force overseas logistics facilities with the closing down of Air Materiel headquarters at Tachikawa, Japan, and Chateauroux, France.

May 15, 1962—A satellite was launched from Vandenberg AFB, Calif., using a Thor-Agena-B combination, the same booster which has sent previous Discoverer satellites into orbit. No Air Force announcement was made concerning the nature of this shot. A NASA report indicated a successful orbit. One portion of the satellite decayed on July 3, 1962; another portion decayed on July 13, 1962 (both G.C.T.).

May 16, 1962—Gen. Frederic H. Smith, Vice Chief of Staff, USAF, was to retire shortly as the result of a vascular system disorder, characterized by sustained hypertension. Gen. William F. McKee, Commander, AF Logistics Command, will become Vice Chief of Staff, effective July 1, 1962.

May 16, 1962—During a presentation requested by Congress, General LeMay stated the need for $491 million for the further development of the RS-70 in testimony before a Senate Appropriations Subcommittee. General LeMay said the program had been "slowed down at least four years."

May 16, 1962—Twelve Air Force F-100s from the 510th Tactical Fighter Squadron, Thirteenth Air Force, flew in from the Philippines to become the first arrivals in Bangkok, Thailand, as a result of the President's order of May 12 to reinforce Southeast Asia in the face of renewed Communist aggression in Laos. Other USAF units in the mobile strike force included RF-101 recce planes from the 15th Squadron (based on Okinawa) and the 45th Squadron (based in Japan), plus C-130 and C-124 transports and KB-50 tankers, along with communications and air-rescue detachments.

May 17, 1962—The Air Force began Operation Jungle Jim, sending sixty Air Commandos to the Panama Canal Zone to train Latin American forces on counterinfiltration and guerrilla activities. They comprised one of two units which completed training at the Air Force's Special Air Warfare Center, Eglin AFB, Fla.

May 18, 1962—A Minuteman ICBM was launched from Cape Canaveral 3,000 miles downrange to a predetermined target area. This was the eleventh success in fourteen attempts.

May 22, 1962—The Air Force Cambridge Research Laboratory launched a 150-foot balloon made of .001-inch-thick plastic. The test, intended to provide data for better research balloons, will send the balloon to an altitude of 117,000 feet for a fifty-hour period.

May 23, 1962—A solid-propellant Blue Scout rocket propelled an Air Force payload toward space from Point Arguello, Calif. No official disclosure was then made as to the purpose of the shot or whether it was intended to orbit the earth. A NASA "Satellite Situation Report" subsequently indicated that the payload did not attain orbit.

May 24, 1962—Lt. Cmdr. M. Scott Carpenter, USN, became the second American to orbit the globe. His three-orbit trip in *Aurora VII* ended in a period of uncertainty as Commander Carpenter overshot his target area in the Atlantic Ocean by about 250 miles. He accidently left on a manual control system as he switched to a fly-by-wire system. This left him short of fuel to control his spacecraft's position. As his capsule came down in the water, two USAF paramedics from the Air Rescue Service jumped to assist him and to keep the capsule afloat until a Navy helicopter arrived and picked up the Astronaut. The flight was also noteworthy because the Atlas booster performed well within nominal programed limits and sent the capsule into orbit. There were no technical holds.

May 24, 1962—An accident resulting in an explosion of liquid oxygen wrecked a Titan missile being readied at a nearly completed underground silo near Beale AFB, Calif.

(Continued on page 261)

There's more to light than meets the eye

This candle is producing two kinds of light. One is the visible light you see. The other is "invisible" light—or infrared energy. This energy is produced not only by the flame, but by the candle itself. Because in the strange world of infrared, *all* objects which are "warm"—above absolute zero—radiate. In fact, Hughes infrared detection equipment could measure the infrared energy produced by an ice cube 5 miles away! Hughes scientists and engineers have been applying the science of "invisible light" to problems of national defense for well over a decade. Their work has produced striking results—such as the capability to sense distant temperature variations as small as 1000th of a degree.

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Infrared windows—since glass is not transparent to infrared, "windows" and lenses of other materials, such as silicon or germanium, must be used. Hughes manufactures many types of such optical components.

Hughes infrared search-track sensor head designed for interceptor aircraft enables pilots to detect "bogies" by the infrared they generate. The infrared system works effectively even against very low altitude targets.

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tracker, seeking a navigational "fix," will identify the star Canopus simply by the amount of energy it generates.

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In total, these activities represent one of the most important reservoirs of infrared capability in our nation—wholly devoted to helping man productively use the light he cannot "see."

HIGHLIGHTS OF THE YEAR—CONTINUED

May 26, 1962—The F-1 liquid-fueled rocket engine was fired at full power for the first time at Edwards AFB, Calif., and attained a thrust in excess of 1.5 million pounds in a test lasting two and a half minutes. The F-1, the most powerful rocket engine developed in the West to reach advance test-firing, will send Saturn in flights to the moon and other space destinations.

May 28, 1962—A chapter in Air Force history was closed when the last turbojet-powered GAM-72 Quail was delivered to SAC. Quail was used as a penetration aid by B-47 and B-52 bombers.

May 29, 1962—DoD and NASA signed an "Agena-D Agreement" which would permit the DoD to develop a standardized Agena-D stage for joint use with the Atlas and Thor first stages. Agena-D is designed to use present flight-proven equipment, to emphasize simplification in vehicle design, to employ production techniques that will allow adaptability to advanced components without basic design change, and to permit lower cost and firm scheduling of space shots.

May 29, 1962—The Air Force launched a satellite employing a Thor-Agena-B combination from Vandenberg AFB, Calif. It was the same combination previously used to launch the Discoverer series. The Air Force declined to identify this shot. A NASA report subsequently indicated that it attained orbit. One portion decayed on June 2, 1962; another portion June 11, 1962 (both G.C.T.).

May 30, 1962—The US will triple its ICBM force by the end of 1962, according to congressional testimony of Maj. Gen. Thomas P. Gerrity. The SAC force will increase from six Atlas and one Titan squadrons to a total of nineteen squadrons, including twelve Atlas and six Titan squadrons, plus a fifty-missile squadron of the solid-fueled Minuteman ICBMs.

May 31, 1962—A Blue Scout booster combination space probe was launched from Point Arguello, Calif., by the Air Force. No details were released.

May 31, 1962—An Air Force superpressure balloon made a record-breaking nineteen-day flight at a constant altitude of 68,000 feet in a test conducted by Cambridge Research Laboratories. The balloon was launched from Kindley AFB, Bermuda, and landed by radio command in the Pacific, near Iwo Jima, 3,600 miles west of Hawaii, covering a total of 9,300 miles.

June 1, 1962—The Air Force launched a satellite with a Thor-Agena-B booster combination from Vandenberg AFB, Calif. No official information was released about the shot other than the fact that it carried a ten-pound transmitting radio satellite (Oscar II) piggyback. A NASA "Satellite Situation Report" indicates successful orbit and that three portions of the satellite separately decayed on the following dates: June 6, June 21, and June 28, 1962 (G.C.T.).

June 1, 1962—Maj. Robert M. White, USAF, tested the X-15 rocket plane at 3,675 mph and 132,600 feet at a twenty-two-degree "angle of attack" for reentry in order to test the ability of the craft to withstand high temperatures and buffeting.

June 3, 1962—A Thor booster carrying a nuclear payload was launched just before midnight over Johnston Island in the Pacific. A malfunction in the Thor's tracking system necessitated destruction of the missile and its contents shortly after lift-off. The debris fell harmlessly into the ocean. There was no nuclear detonation and no injury to personnel or damage to installations.

June 4, 1962—The HX-2 long-range helicopter was selected by the Air Force for production. This vehicle is designed to carry a minimum of 5,000 pounds for 200 nautical miles or 2,400 pounds for 700 miles.

June 6, 1962—Two MATS C-124s completed an airdrop of 1,543 tons of corn to 55,000 hungry inhabitants in the severely flooded Rufiji River delta area in Tanganyika, Africa. The C-124s made seventy-seven flights, dropping about twenty tons of corn on each mission.

June 6-7, 1962—A SAC B-52H landed at Seymour Johnson AFB, S. C., to complete an 11,303-mile closed-circuit flight without refueling in twenty-two hours, fifty-eight minutes to exceed the previous world nonrefueled record of 10,078 miles set by a B-52G in 1960. Another record was set for distance by this heavyweight class C-1, Group 1 aircraft.

June 7, 1962—NASA pilot Joe Walker took the X-15 through a giant fishhook curve to pioneer a new landing maneuver that will be adapted for future spaceships. The X-15 hit speeds up to 3,672 mph as the plane was subjected to and successfully met extremes of heat and stress in flight.

June 7, 1962—A Titan II ICBM launched on a 5,000-mile programed test flight from Cape Canaveral. Following second-stage ignition, telemetry contact with the missile became erratic and the payload fell short of intended impact area.

June 8, 1962—Zena, a 104-pound chimpanzee, was safely ejected via new rocket-powered escape capsule from a B-58 traveling at 1,060 mph. This test was a prelude to ejecting a man from an aircraft at supersonic speed.

June 8, 1962—A Minuteman ICBM was successfully fired from a Cape Canaveral underground silo and landed about 3,000 miles downrange in the Atlantic.

June 8, 1962—The full $491 million requested by the US Air Force for the RS-70 program was restored to the FY '63 budget by the Senate Appropriations Committee, as against $171 million called for in the Administration budget which provided for continued development of partial prototype of the XB-70.

June 11, 1962—The Project Advent communications satellite program under Army direction was reorganized. The Air Force was directed to conduct research on two smaller communication satellites continued on a modified scale. The weight of the payload was reduced to permit use of the existing Atlas-Agena booster.

(Continued on page 263)

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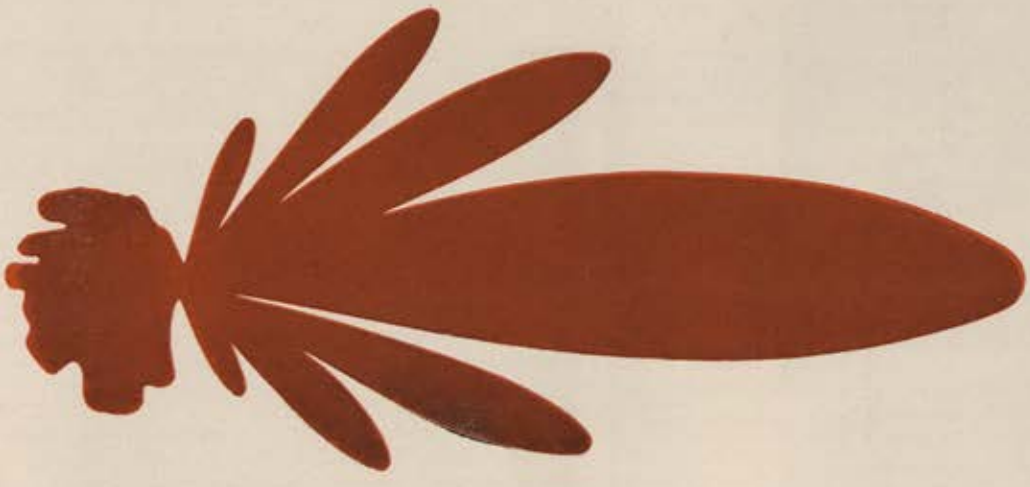

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HIGHLIGHTS——CONTINUED

June 13, 1962—An Air Force H-43B Huskie helicopter piloted by Capt. Richard H. Coan, USAF, broke the world's record for distance flight when it flew 656.258 miles over a twenty-five-mile closed course. The previous record of 625.464 miles was established by a Russian helicopter in June 1960. The new record was submitted to the FAI for verification.

June 17, 1962—The Air Force launched a payload toward space with an Atlas-Agena-B booster from the Point Arguello, Calif., facility. The object successfully orbited the earth and decayed the following day, according to a NASA "Satellite Situation Report."

June 18, 1962—Another payload, this one launched toward space by a Thor-Agena-B booster, went up from Vandenberg AFB, Calif. This Air Force satellite achieved orbit, according to a NASA "Satellite Situation Report." One portion decayed on July 12, another on July 14, 1962 (both G.C.T.).

June 18, 1962—The Air Force announced tests of a device called SMU—"self-maneuvering unit"—that would enable an Astronaut to leave his vehicle, move around and work in space. The tests will be conducted in a KC-135 jet capable of simulating zero-gravity for two minutes at a time. The pack is designed to permit an Astronaut to transfer from one spaceship to another or to move large sections of a spacecraft during assembly work. The SMU includes a complete life-support system for a four-hour mission.

June 18, 1962—Aerospace Research Pilot School began a seven-month course to train seven Air Force and one Navy officer for future space missions and projects. This is the second space-training course given at Edwards AFB, Calif., but the first for potential "operational" personnel.

June 18, 1962—Operation One Shot II dropped 450 paratroopers into a Florida cow pasture, 1,000 miles away from their home base, as Strike Command demonstrated its quick-reaction capability. The Army and USAF units participating were first alerted thirteen hours before the drop was made and the operations completed.

June 19, 1962—Astronaut Virgil I. Grissom, Captain, USAF, received the first Gen. Thomas D. White Space Trophy from Secretary of the Air Force Eugene M. Zuckert for his "outstanding contribution to the nation's progress in aerospace."

June 20, 1962—A Thor missile with a nuclear payload was launched in the Central Pacific, but both were destroyed just seconds after launching because of a malfunction in the system. Some debris from this second failure to set off a rocket-borne nuclear device fell onto Johnston Island. The remainder fell into the ocean. There was no damage to the launching or injuries to any personnel involved.

June 22, 1962—The last and the 744th B-52 produced for SAC came off the

(Continued on following page)

HIGHLIGHTS——CONTINUED

Wichita, Kan., assembly line of The Boeing Co.

June 22, 1962—The 850th Strategic Missile Squadron, the third Titan squadron to become operational, was accepted by SAC at Ellsworth AFB, S. D.

June 22, 1962—The Air Force launched from Vandenberg AFB, Calif., a satellite employing a Thor-Agena-B booster combination. A NASA report indicates this satellite attained orbit and decayed on July 7, 1962 (G.C.T.).

June 25, 1962—The Air Force Academy will acquire a basic research laboratory under supervision of the Air Force Office of Aerospace Research. The laboratory will be the first such facility to be established at a service academy. The laboratory will be operative in the fall of 1962, and will cost $850,000 annually to operate in two fields—chemistry and servomechanics.

June 26, 1962—The X-20 supplanted "Dyna-Soar" as the Air Force designation for an experimental winged vehicle that will be shot into space by the Titan III and be able to glide down to earth after making a number of orbits.

June 27, 1962—The X-15, flown by NASA pilot Joe Walker, streaked at 4,105 mph along the fringes of space, and thereby accidentally surpassed the speed record of 4,093 mph for a manned, maneuverable aircraft in a test high over Edwards AFB, Calif. The flight was intended to study behavior of the craft in a technique to be used by space vehicles to brake their return to the atmosphere.

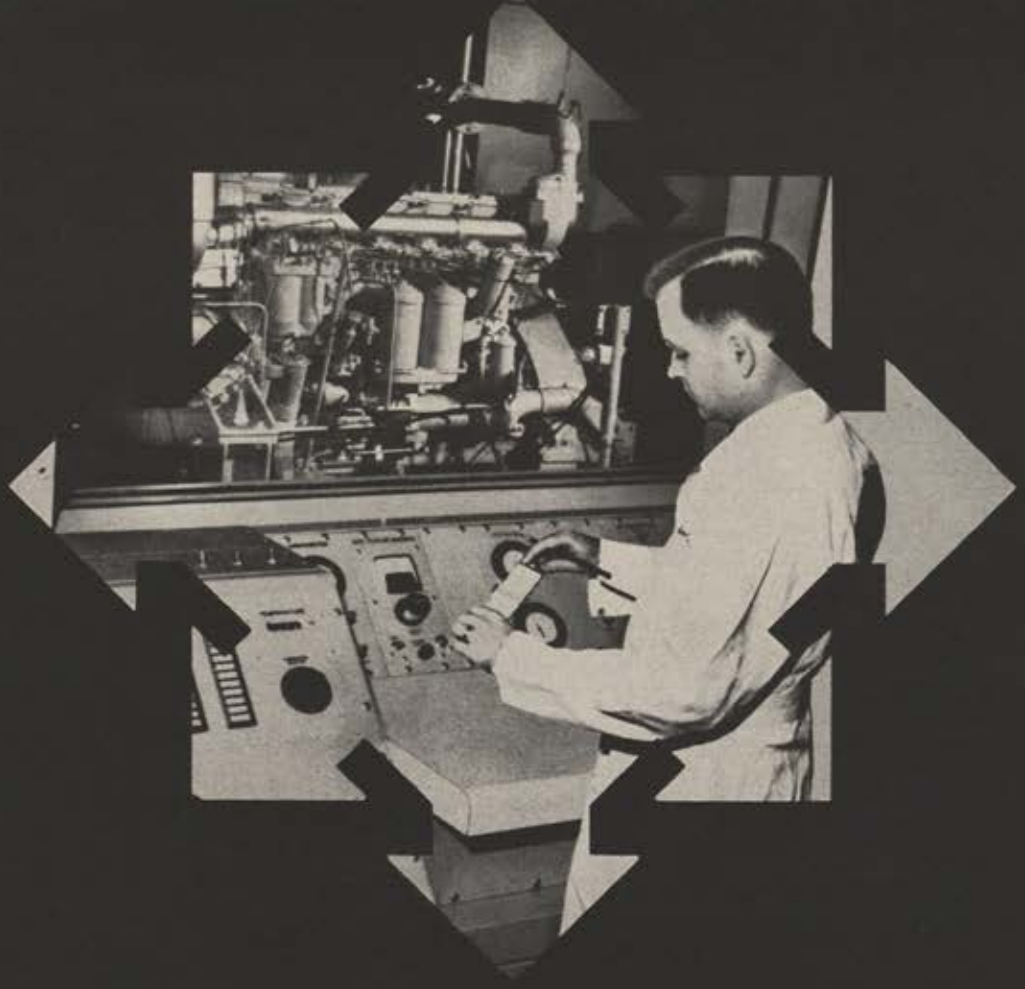
June 27, 1962—A Thor-Agena-B booster combination launched a payload toward space from Vandenberg AFB, Calif. A NASA report indicates that this satellite successfully attained orbit.

June 29, 1962—A Skybolt projectile failed to ignite after it was launched by a high-flying B-52 and plummeted into the Atlantic. It was the second flight test of this strategic missile to go awry, although the first test on April 19, 1962, achieved a partial success.

June 29, 1962—An all Air Force team fired a Minuteman ICBM from an underground silo at Cape Canaveral about 2,300 miles downrange. It marked the eleventh success in thirteen silo launchings.

June 29, 1962—Simultaneously, at Vandenberg AFB, Calif., the Minuteman passed its first ground tests of coordination of an operational-type model with underground launch and control facilities preparatory to remote controlled actual flight tests of operational versions of this ICBM which are to be conducted later in 1962.

June 29, 1962—USAF awarded a contract for two high speed X-19 VTOL aircraft which will be used to explore VTOL characteristics on behalf of the triservice V/STOL Transport Development program. The X-19 is a twin-engine, tandem high-wing aircraft with four tilting propellers mounted in nacelles at the wingtips, and is designed to cover a range of speed from 0 (hovering) to 400 knots in conventional flight.—END



PROJECT: PROVE RELIABILITY

This research specialist is subjecting a military power package to programmed torture. Purpose . . . establishing design and hardware reliability. This type of practical research was applied to the development of a 700 HP aluminum compression ignition engine weighing about four pounds per HP.

A standard procedure at Caterpillar, testing of this type is used regularly with new components, engines and vehicles. A new facility has been completed which will expedite these engine testing programs through the built-in fuel, water, exhaust, control and instrument systems.

A six-winged building of 164,000 sq. ft., the new Engine Research and Development Laboratory houses a complex of 72 testing cells where a wide variety of engines can be tested.

Each cell is air conditioned to 75° Fahrenheit and is maintained at a slight vacuum. Each has its own inertia block to eliminate the transfer of vibration from one test zone to another. Each is completely soundproof. The researcher and the engine are separated by thick pane glass panels.

During testing, an automatic console control permits the researcher to subject the engine to any of the many stresses and strains it could encounter during its work life. With the flick of a switch or the turn of a dial, the specialist can adjust the water temperature of the cooling system, the horsepower, the oil and fuel pressure, the RPM, the load and torque, or many other conditions.

The effect these changing conditions have on the engine's performance is accurately measured at the console. Test results are correlated—and often predicted—by digital and analog computers. The analysis of these results is combined with the findings of a physical examination of individual parts for ways to provide maximum reliability.

Another building soon to be ready at the Technical Center is the Gas Turbine Engine Laboratory. Here will be housed facilities for the research group which has been exploring this exciting new engine concept for the past five years.

When the Center is completed it will consist of six buildings. It will house 1400 engineers, physicists, applied mathematicians, chemists, metallurgists, instrumentation specialists and laboratory technicians who are part of the Caterpillar research and development team.

It will provide needed additional space and facilities for the intensive research currently going on in metal fatigue, high-speed rotational phenomena, fluid mechanics, fuels and lubricants, special studies in basic materials, and dozens of other projects.

This type of research helps assure you of effective performance, with minimum maintenance, from specialized vehicles such as the AUET and eight-ton GOER vehicles, and new-concept power packages such as the LDS-750 and LVDS-1100 aluminum engines.

For more information about how Caterpillar's expanding R & D facilities can contribute to the solution of your ground mobility problems, write Defense Products Department, Caterpillar Tractor Co., Peoria, Illinois.

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". . . guerrilla warfare (has) since 1945 constituted the most active and constant threat to free world security." *President Kennedy, January 1961.*

"In guerrilla warfare, as in other forms of warfare, there are many things that can be done well by men and equipment in the air. . . . I would like to see you familiarize yourself with the literature on this form of warfare." *Gen. Curtis E. LeMay in AIR FORCE INFORMATION POLICY LETTER FOR COMMANDERS, April 1962.*

Today, when 6,000 American troops, including USAF units, are helping South Vietnam help itself, when the USAF has just set up the Special Air Warfare Center, Eglin AFB, Fla., when American forces are moving into Thailand across the river from Laotian guerrilla units, the subject of guerrilla warfare is more important than ever before. MODERN GUERRILLA WARFARE is the first book to probe guerrilla wars so extensively . . . and the *only* one not restricted to a single area. Its thirty-seven contributions by military and political experts will give you a new understanding of how slash-and-run techniques can paralyze nations.

Here, for example, are the guerrilla handbooks of "Che" Guevara and Lenin, and analyses of Mao Tse-Tung's strategy for revolution (basic reading for US military planners). Here is the whole documented record of Communist mastery of guerrilla warfare in Russia, China, the Philippines, Malaya, Indo-China, Laos, Vietnam, and Greece. And here, also, are highlights of non-Communist conflicts and the book concludes with presidential adviser Walt W. Rostow's summing up of a bold US program for counteraction. You'll find MODERN GUERRILLA WARFARE fascinating reading, valuable knowledge.

You can get your copy and a free book through the AeroSpace Book Club. Here's how the club works. There are six military affairs or aerospace selections a year, chosen by our editorial board. You receive a review of the book and a list of alternate selections. You decide whether you want the selection or an alternate or no book at all. Special members' prices average from twenty percent to forty percent below bookstore prices for selections and alternates. And for every four books taken you get another *free* bonus book of your choice. Pick your *free* book now, and fill out the coupon below.

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GRAND OLD LADY, THE STORY OF THE DC-3 by Lt. Col. Carroll V. Glines, USAF, and Lt. Col. Wendell F. Moseley, USAF, retail $3.95, member's price $3.50. The DC-3 has flown more miles, carried more cargo and passengers, and performed more "impossible" feats than any other airplane in the world. No bomber, it flew at least one mission and blew up a convoy of Japanese trucks. No fighter, it has at least one Japanese "Zero" to its credit. A fascinating, fast-paced story about an airplane, the men and women who have flown it, and many amazing adventures they have shared.

THE LEGACY OF HIROSHIMA by Dr. Edward Teller with Allen Brown, retail $4.95, member's price $4.25. The "Father of the H-bomb" launches into a frankly controversial call for the greatest possible nuclear effort, offensive and defensive. Edward Teller believes that we must be ready to use nuclear weapons in limited warfare; that we must prepare to survive all-out nuclear attack upon our cities and towns. He tells how American "atomic secrecy" backfired and why Russia may very likely be ahead in the nuclear arms race.

JOURNEY OF THE GIANTS, THE STORY OF THE B-29 by Maj. Gene Gurney, USAF. Introduction by Gen. Thomas S. Power, retail $4.95, member's price $3.95. The fascinating story of the B-29 Superfort . . . from the gamble behind its production to the long chance taken by Gen. Curtis LeMay when he ordered all 399 planes stripped of armor and guns into the air for a long-range attack on Tokyo.

A HISTORY OF THE SOVIET AIR FORCE by Robert Kilmarx, retail $7.50, member's price $5.95. The full sweep of Russian airpower development—from the prewar Czarist days, to World War II, Korea, and the present-day rocket-rattling of the cold war. A complete explanation of Soviet doctrine, strategy, tactics, training, organization, and technology as they have shifted throughout the years.

DICK BONG, ACE OF ACES by Gen. George C. Kenney, USAF (Ret.), retail $2.95, member's price $2.50. In this book about the top US air ace of all time, General Kenney writes about air combat with feeling and accuracy. He weaves the lives of the other great aviators who served under him into the tale of Dick Bong's colorful life in combat in the South Pacific and finally his early death in a flame-out of the new P-80 fighter.

THE WILD BLUE edited by John F. Loosbrock and Richard M. Skinner, retail $5.95, member's price $4.95. A forty-two-year accumulation of the best writing and thinking of American airpower selected from AIR FORCE/SPACE DIGEST.

BUT NOT IN SHAME: The Six Months After Pearl Harbor by John Toland, retail $6.50, member's price $4.95.

MAN IN SPACE edited by Lt. Col. Kenneth F. Gantz, with a foreword by Gen. Thomas D. White, former Chief of Staff, USAF, retail $4.00, member's price $2.95. Key findings, factors, conditions involved in the current USAF program to put man into space. Radiation . . . weightlessness . . . military impact.

airman's bookshelf

The Year in Aerospace Power Books

THE YEAR just past was a good one for aerospace books, with a bumper crop of 278 titles. The trend continues toward missilry, rocketry, and space, though many of the year's 273 volumes dealt with air history, and in 220 of them, the Air Force was featured in one way or another. There were 117 hardcover books and thirty-two paperbacks dealing exclusively with USAF or Air Force-related topics—a significant increase over last year's production. Following are highlights of the 1961-62 year in aerospace publishing.

History

Above and Beyond: The Story of the Congressional Medal of Honor, by Joseph L. Schott (Putnam's, $4.95). A definitive account of America's highest military award and the men who won it from its inception during the Civil War to the present.

Aircraft of World War I, Fighters, Scouts, Bombers and Observation Planes, by C. B. Colby (Coward-McCann, $2.50). Photo story of aircraft of World War I, done in the usual fine style of C. B. Colby. For young adults.

Aircraft the World Over, by Kenneth G. Munson (Sport Shelf $4.25). Present-day activities of all phases of aviation.

Air Force Combat Units of World War II, edited by Dr. Maurer Maurer (Government Printing Office, $3.50). Complete historical encyclopedia of Air Force combat groups active during World War II.

The American Heritage Book of the History of Flight (Simon and Schuster, regular edition, pre-Christmas price, $11.95; thereafter $15. Deluxe edition, pre-Christmas price, $14.45; thereafter $17.50.) A beautiful pictorial history of man's attempt to fly, from Icarus to John Glenn.

The Boys' Book of World Airlines, by Kenneth Wolstenholme (Roy, $3.75). Traces evolution of the airplane, describes airplanes and airports throughout the world. For young adults.

Dirigibles That Made History, by David C. Cooke (Putnam's, $2.50). Photo-narrative of dates, events, and famous dirigible flights. For young adults

Early Air Pioneers: 1862-1935, edited by Maj. James F. Sunderman, USAF (Watts, $4.95). Selected writing on the early days of aviation beginning with the use of balloons during the Civil War. (An AeroSpace Book Club selection.)

Fighter Pilot, edited by Stanley M. Ulanoff (Doubleday, $5.95). An anthology of exciting accounts of individual aerial combat, from World War I to present.

Fighters: Warplanes of the Second World War, Vol. IV, by William Green (Hanover House, $2.75). Fourth in the photo-caption narrative series of aircraft of all combatant countries of World War II. This one is about aircraft of the United States and Yugoslavia.

Great Weapons of World War II, by John Kirk and Robert Young (Walker, $10). The story of World War II in terms of the weaponry. Illustrated.

Guns of August, by Barbara W. Tuchman (Macmillan, $6.95). Intensive study of the background of the first World War and battles fought during the first thirty days.

The Incredible 305th, by Wilbur H. Morrison (Duell, Sloan & Pearce, $3.95). Rugged, exciting story of the heavy bombardment group—the "Can Do" B-17 bombers of World War II, led by Curtis LeMay.

Jet and Rocket Planes That Made History, by David C. Cooke (Putnam's, $2.50). Photo-narrative of jet and rocket planes that made history, from the Heinkel-178 to the X-15. For young adults.

Jets, by Charles Spain Verral (Prentice-Hall, $2.95). History of the four leading types of jet engines—how they work and why. For young adults.

The Lady Be Good by Maj. Dennis McClendon, USAF (John Day, $4.50). Dramatic reconstruction of the story of the World War II B-24 that disappeared with its crew in the Libyan Desert and was found in 1958 by oil geologists.

Legion of the Lafayette, by Arch Whitehouse (Duell, Sloan & Pearce, $4.95). The exciting story of the handful of American volunteers who formed the Escadrille and served and flew for France between 1914-18.

Lifelines through the Arctic, by William S. Carlson (Duell, Sloan & Pearce, $5.95). Story of the USAF pioneers in the Arctic, World War II to the present.

Night Drop: The American Airborne Invasion of Normandy, by Brig. Gen. S. L. A. Marshall, USA Res. (Ret.), (Little, Brown, $6.50). The air invasion of Normandy written from official documents and personal accounts.

1,000 Destroyed, by Grover C. Hall (Morgan, $7.50). Reprint of the classic, intimate story of the 4th Fighter Group, USAAF in World War II, including the role of the 4th Fighter Wing in the Korean War.

Ploesti: The Great Ground-Air Battle 1 August 1943, by James Dugan and Carroll Stewart (Random House, $6.95). Exceptionally well written account of the August 1, 1943, air attack on the Ploesti oil refineries in Romania. (An AeroSpace Book Club selection.)

Skyhooks, by Kurt R. Stehling and William Beller (Doubleday, $4.95). Story of men and balloons from 1783 to the twenty-mile-high Skyhooks of today.

Tail of the Paper Tiger, by O. H. P. King (Claxton, $6). Review of the Korean War and the period following by a correspondent who covered it.

The United States Air Force in Korea, by Dr. Frank Futrell (Duell, Sloan & Pearce, $12.50). The official account of history's first jet war and the first modern limited war testing the strength of the free world against communism. (An AeroSpace Book Club selection.)

The War Against Japan, by Stanley

(Continued on following page)

NOTE: Any book reviewed in Airman's Bookshelf may be obtained, postpaid, from the AeroSpace Book Club, Mills Building, Washington 6, D. C. Full payment must accompany order. Information on the Book Club may be obtained from the same source. Club members are eligible for substantial savings on Club selections.

W. Kirby (British Information Services, $11.35). History of the war in the Pacific, 1939-45.

The War in the Air: A Pictorial History of World War II Air Forces in Combat, by Maj. Gene Gurney, USAF (Crown, $7.50). More than 1,500 photos illustrate this history of the world's air forces in World War II.

Who Destroyed the Hindenburg?, by A. A. Hoehling (Little, Brown, $4.95). The story of the German dirigible which died by fire at its mooring mast, Lakehurst, N. J., May 7, 1937.

World War II in the Air: The Pacific, edited by Maj. James F. Sunderman, USAF (Watts, $4.95). Historical anthology covering the Pacific air war from Pearl Harbor to Hiroshima—AAF, Marine, and Navy action. Highly illustrated.

The Wright Brothers at Kitty Hawk, by Donald J. Sobol (Nelson, $2.95). An account of the Wright brothers and their flying efforts at Kitty Hawk. For young adults.

Biography

A Thousand Springs, by Anna Chennault (Taplinger, $4). The story of Anna Chennault's marriage to Gen. Claire Chennault, the Flying Tiger.

The Big Serenade, by Col. George S. Howard, USAF (Instrumentalist, $4.95). Story of the USAF Band and its leader, Col. George S. Howard.

Famous American Military Leaders of World War II, by the editors of *Army Times* (Dodd, Mead, $3). Biographical sketches of twelve of our leading World War II military leaders. For young adults.

Home Is the Hero: The Case of Maj. Claude Eatherly, by William B. Huie (Putnam's, $4.50). Biography of Claude Eatherly who piloted the reconnaissance plane over Hiroshima prior to the dropping of the first A-bomb.

Honest John, by Walter "Bud" Mahurin (Putnam's, $4.95). Autobiography of a famous World War II air ace shot down in Korea, imprisoned by Communists, and who, under duress, signed a germ warfare statement.

The Little Toy Dog, by William L. White (Dutton, $5). Story of Capts. John R. McKone and Freeman B. Olmstead, USAF RB-47 fliers shot down over the Barents Sea and imprisoned by the Russians, and their eventual release in January 1961.

The Long Lonely Leap, by Capt. Joseph W. Kittinger, Jr., USAF, with Martin Caidin (Dutton, $4.95). Dramatic story of the life of Captain Kit-

tinger, climaxed by his sixteen-mile free fall before his parachute opened.

Men of Space, Vols. III and IV by Shirley Thomas (Chilton, $3.95 each). Biographies of prominent scientists and space pioneers.

Billy Mitchell, by Arch Whitehouse (Putnam's, $2.95). Biography of Gen. William E. Mitchell. For young adults.

Robert Goddard, Space Pioneer, by Anne Perkins Dewey (Little, Brown, $3.50). Biography of the builder of the first American liquid rocket.

Fiction

Action in the Sky, by Arch Whitehouse (Duell, Sloan & Pearce, $3.95). Collection of fictional air stories. For young adults.

Bruce Larkin, Air Force Cadet, by Jack Pearl (Hammond, $2.95). First in the Young Falcon series. Cadet life during the intensive first year at the Air Force Academy. For young adults.

Catch-22, by Joseph Heller (Simon and Schuster, $5.95). War novel about a B-24 bombardier in the closing months of World War II in Italy and his own private war for survival.

Combat Stories of World War II and Korea, by William Chamberlain (John Day, $3.95). Stories of military combat.

The Conquest of Air, by Pierre LaCroix (Harvey House, $3.50). Beautifully illustrated story of man's conquest of the air through the birth of rockets. For young adults.

Countdown for Cindy, by Eloise Engle (Hammond, $2.95). Features an aerospace-force nurse on her first trip to the moon. For young adults.

Dawn Mission: A Flight Nurse in Korea, by Eloise Engle (John Day, $3.50). Novel about a flight nurse in the Korean War. For young adults.

Flight Deck, by Robb White (Doubleday, $2.95). Novel about a young aviation lieutenant who performs a dangerous mission in World War II. For young adults.

Mike Mars, Astronaut; Mike Mars Flies the X-15; Mike Mars at Cape Canaveral; Mike Mars in Orbit; Mike Mars Flies the Dyna-Soar, by Donald Wollheim (Doubleday, $1.25 each). A series of novels featuring a young US Air Force pilot chosen for the top-secret Project Quicksilver. For young adults.

The Young Falcons, by Jack Pearl (Hammond, $2.95). Second in the Young Falcon series, featuring Bruce Larkin, Air Force cadet. For young adults.

Service Topics

Air Force Academy, Cadets, Training and Equipment, by C. B. Colby (Coward-McCann, $2.50). The picture story of the Air Force Academy, the Cadets, training, and equipment. For young adults.

Edwards AFB: Flight Test Center, USAF, by John Ball, Jr. (Duell, Sloan & Pearce, $4.50). An account of the mission, men, and hardware of Edwards AFB, Calif.

Let's Go to the United States Air Force Academy, by Marian Talmadge and Iris Gilmore (Coward-McCann, $1.95). An illustrated trip to the USAF Academy. For young adults.

SAC: Men and Machines of Our Strategic Air Command, by C. B. Colby (Coward-McCann, $2.50). A visit to the underground headquarters of SAC. For young adults.

Strike Command: The Elite New Combat Team, by Frank Harvey (Duell, Sloan & Pearce, $4.95). Story of the men of TAC and their place in the nation's newest élite combat force, the US Strike Command. (An Aero-Space Book Club selection.)

U. S. Air Force Academy: The Life of a Cadet (revised and augmented), by Jack Engeman (Lothrop, Lee & Shepard, $3.50). Picture story of the life of a USAF cadet. For young adults.

Missiles and Space

Ace in the Hole: The Story of the Minuteman Missile, by Roy Neal (Doubleday, $3.95). The unbelievable story of the USAF Minuteman program from its early problems in design to the end product—an economical ICBM for the defense establishment.

Americans in Orbit: The Story of Project Mercury, by Maj. Gene Gurney, USAF (Random-Landmark, $1.95). A detailed history of NASA Project Mercury and the associated Air Force projects. Includes spaceflights of Glenn and Carpenter. For young adults.

America on the Moon, by Jay Holmes (Lippincott, $4.95). Space exploration in terms of why and how man will go to the moon and what will happen when he does.

America's Space Vehicles, by Will Eisner (Sterling, $4.95). A pictorial review of the progress made in America's space program.

An Introduction to Space Travel, by P. E. Cleator (Pitman, $3.95). An easy-to-read introduction to the vast frontier of space travel.

Aviation and Space Medicine: Man Conquers the Vertical Frontier, by Martin and Grace Caidin (Dutton, $3.75). Aerospace medicine from the early days to Project Mercury. For young adults.

Ballistic Missile and Aerospace (Continued on following page)

BOOKSHELF — CONTINUED

Technology, 4 Vols. (Academic Press, $9 each). Papers presented at the 6th Symposium on Ballistic Missile and Aerospace Technology.

Ballistic Missile and Space Vehicle Systems, edited by Howard S. Siefert and Kenneth Brown (Wiley, $12). Reproduction of one of the Engineering and Physical Science Extension Courses at the University of California. Technical.

B-70 Monarch of the Skies, by Charles Coombs (Morrow, $2.95). Story of the B-70 Valkyrie in terms of engineering accomplishments and the many operational uses which it could accomplish. For young adults.

Combat Missilemen, by James Baar and William E. Howard (Harcourt, Brace & World, $4.75). The story of military missiles and the men who man them, including those of Russia as far as is known. (An AeroSpace Book Club selection.)

Express to the Stars, by Homer E. Newell (McGraw-Hill, $5.75). Comprehensive story of where we are and where we are going in space by the Director of the Office of Space Science, NASA.

Go! The Story of Outer Space, by Charles Spain Verral (Prentice-Hall, $2.95). Man's past, present, and future in outer space, plus a glossary of "Space Patter."

Long-Range Ballistic Missiles, by Eric Burgess (Macmillan, $7). Complete survey of the ballistic missile field.

Man and the Space Frontier, by G. Harry Stine (Knopf, $3.50). Description of the physical and psychological preparations needed for a spaceflight. For the young adult.

Men, Rockets and Space Rats, by Lloyd Mallan (Messner, $5). Revised edition of Air Force contributions to the conquest of space with chapter on American and Russian spacemen and their records.

Reach for the Moon, by Walter B. Hendrickson, Jr. (Bobbs-Merrill, $3.95). An account of man's attempt to get to the moon and what he will do there. For young adults.

Rendezvous in Space: The Story of Projects Mercury, Gemini, Dyna-Soar and Apollo, by Martin Caidin (Dutton, $4.95). The story of Project Mercury, the flights of Soviet Cosmonauts, and future American programs.

Rocket Power, by Erik Bergaust (Putnam's, $2.50). Detailed descriptions of major rocket engines developed in the US. For young adults.

Rockets and Space Flight, by Hans K. Kaiser (Pitman, $4.75). A look at the entire subject of spaceflight with

an over-all discussion of man's entry into the hostile environment of space.

Spacecraft and Missiles of the World, 1962, by James Baar and William E. Howard (Harcourt, $5.95). Compilation of facts on spacecraft, satellites, space weapons, strategic and tactical missiles, and defense systems.

Space Research by Rocket and Satellite, by R. L. F. Boyd (Harper, $2.25). A review of what has been learned about space from rockets and satellites.

Space Stations, by Erik Bergaust (Putnam's, $2.50). Roundup of all current plans for space platforms. For young adults.

Space Travel, by Heinz Gartmann (Viking, $5). A profusely illustrated history of USSR and US rocketry and space travel.

Thrust into Space: The Story of America's Growth in Missile Power, by Lloyd Mallan (Prentice-Hall, $3.95). Firsthand, behind-the-scenes report on the race with Russia.

Victory in Space, by Otto O. Binder (Walker, $6). An analysis and discussion of the space race between the US and the Soviets.

Women in Aeronautics, by Charles Paul May (Nelson, $3.50). A comprehensive account of woman's part in aviation from 1784 to 1962. Illustrated. For young adults.

Airmanship and Reference Texts

Aeronautics and Astronautics: An American Chronology of Science and Technology in the Exploration of Space 1915-1960, by Eugene M. Emme (Government Printing Office, $1.75). Chronology of airpower and space including names of recipients of awards and honors in aeronautics and astronautics.

The Airman's Guide (Stackpole, $3.95). Revised compendium of valuable material for all airmen.

The Air Officer's Guide, 13th edition (Stackpole, $6). Revised 1962 edition.

Airplanes of the World, by Douglas Rolfe and Alexis Dawydoff (Simon and Schuster, $4.95). Revised, updated edition with more than 1,000 drawings and textual history.

Aviation & Space Dictionary, edited by Ernest J. Gentle and Charles E. Chapel (Aero, $10). Revised fourth edition which now includes space technology.

Careers and Opportunities in Astronautics, by Lewis Zarem (Dutton, $3.95). Guide for the future for young American men and women.

Careers in Astronautics and Rocketry, by Carsbie C. Adams and Wernher von Braun with Frederick I. Ordway, III (McGraw-Hill, $6.95). General survey of the many opportunities in the field of astronautics offered by universities, government agencies, and industrial organizations.

Early Warning: Electronic Guardians of Our Country, by Robert Wells and C. R. Whiting (Prentice-Hall, $3). Explanation of how our detection systems—BMEWS, DEW Line, SAGE—work. For young adults.

Escape and Survival, edited by P. Bergeret (Pergamon, $6.50). Of primary interest to the flight surgeon and others connected with research, but contains material of interest to all aircrew members.

The Fighter Aircraft Pocketbook, by Roy Cross (Crown, $1.95). Fighter aircraft from 1914-15 to present. Illustrated.

A History of Soviet Air Power, by Dr. Robert A. Kilmarx (Praeger, $7.50). A survey of development and growth of Soviet airpower. (An Aero-Space Book Club selection.)

Jet Engine Manual, by E. Mangham (Philosophical Library, $3.75). Updated, with new illustrations.

Navigation in the Jet Age, by Robert Wells (Dodd, Mead, $3). Explains modern navigation equipment used in precision planes, ships, submarines, missiles, and satellites.

1962 Aerospace Year Book (American Aviation, $10). 43d annual edition of photo-narrative-statistical guide to US civil and military aviation.

1962 United States Aircraft, Missile, and Spacecraft (National Aviation Education Council, $1.50). Well illustrated guide to US aircraft, missiles, and spacecraft.

The Observer's World Aircraft Directory, by William Green (Warne, $3.50). New edition of photo-caption guide to the world's current aircraft.

1001 Questions Answered About Space, by Clarke Newlon (Dodd, Mead, $6). Questions and answers covering space sciences and related disciplines.

Speaking of Space, edited by Richard M. Skinner and William Leavitt (Little, Brown, $5.95). Collection of twenty-nine of the best articles from SPACE DIGEST in its first three years of publication, complete with glossary of space and missile terms. (An Aero-Space Book Club selection.)

The Student's Guide to Military Service, by Michael Harwood (Channel Press, $5.95, paperback, $2.95). Guide to the opportunities in branches of the armed services, designed to help the average draftee get ahead while in the service.

United States Army and Air Force Fighters, 1916-1961, edited by Bruce Robertson (Aero, $9.75). Combined

(Continued on following page)

narrative-pictorial history of US Army and Air Force pursuit and fighter planes of three wars.

U. S. Bombers B-1 to B-70, by Lloyd S. Jones (Aero, $7.75). US bombers from first model to spectacular B-70. Heavily illustrated.

Wonders of Flight, by Robert Wells (Dodd, Mead, $3). Basic primer on theory and actual flight and discussion of problems man encounters in keeping an airplane aloft. For young adults.

Related Professional Topics

Communist China's Strategy in the Nuclear Era, by Alice L. Hsieh (Prentice-Hall, $4.50). A discussion of Communist China's expressed attitudes toward nuclear warfare.

Communist Revolutionary Warfare: The Vietminh in Indochina, by George K. Tanham (Praeger, $5). A description of the military organization, tactics, logistics, and propaganda techniques of the Southeast Asian revolutionaries.

Guerrillas in the 1960's, by Peter Paret and John W. Shy (Praeger, $3.50). A concise study of the history of guerrilla activities with an emphasis on its politico-military aspects.

How to Survive the H-Bomb—and Why, by Pat Frank (Lippincott, $2.95). Highly readable guide and reference to survival in nuclear attack.

Legacy of Hiroshima, by Dr. Edward Teller with Allen Brown (Doubleday, $4.95). Strong opinions on national policy by the "father of the H-bomb." (An AeroSpace Book Club selection.)

Limited Strategic War, edited by Klaus Knorr and Thornton Read (Praeger, $6). The first book to devote itself to the intriguing subject of how to wage meaningful strategic war without devastating the world. (An AeroSpace Book Club selection.)

The Limits of Defense, by Arthur I. Waskow (Doubleday, $2.95). A review by a young historian of the deterrent theories of nuclear warfare —and the conclusion that none will serve survival.

Modern Guerrilla Warfare, edited by Franklin M. Osanka (Free Press of Glencoe, $7.50). Background on the employment of guerrillas in modern warfare with emphasis on ways and means of combating Communist guerrillas from 1941 to the present. (An AeroSpace Book Club selection.)

The Next Stage in the Cold War, by Thomas W. Wilson, Jr. (New York Graphic Society, $4). A State Department official suggests a forceful plan

for the evolution of foreign policy independent of responses to Soviet initiative.

Nuclear Weapons and the Conflict of Conscience, edited by John C. Bennett (Scribner's, $3.95). A group of essays which outline the technical facts of nuclear warfare and a look at the moral issues involved.

100 Million Lives: Maximum Survival in a Nuclear War, by Richard Fryklund (Macmillan, $3.95). An analysis of nuclear-war strategy that would spare heavily populated cities and millions of lives while improving the chances of avoiding war without accepting communism.

On Guerrilla Warfare, Mao Tse-tung, translated by Brig. Gen. Samuel B. Griffith, USMC (Ret.) (Praeger, $4.50). Treatise which establishes Mao as the architect of a new method of warfare. A systematic analysis of guerrilla warfare.

Outer Space: Prospects for Man and Society, edited by Lincoln P. Bloomfield (Prentice-Hall, $3.95, paperback, $1.95). Analysis of the social, political, economic, and psychological implications of the space age and the new space technology.

Street Without Joy, by Bernard Fall (Stackpole, $4.95). The true story of combat operations in the jungles of Indochina and of the men who fought there.

Thinking About the Unthinkable, by Herman Kahn (Horizon Press, $4.50). Nontechnical guide to the military and political realities of the present and future.

Thinking Out Loud About the Space Age, by Capt. Melvin T. Ostlin, USAF Chaplain (Dorrance, $3). Discusses the questions of man taking Christian faith into the space world.

What Price Coexistence: A Policy for the Western Alliance, by Sir John Slessor (Praeger, $4.50). Former RAF Chief of Staff examines the political and military problems facing the free world.

Paperbacks

ABC American Aircraft of World War Two, by Kenneth G. Munson (Sport Shelf, $1.25). An account of American planes used during World War II.

Aerial Dogfights of World War II, by Jack Pearl (Monarch, 35¢). Hair-raising accounts of aerial dogfights in the great land and sea battles over Europe, Africa, and the Pacific.

Aerospace Highlights (National Aviation Education Council, 50¢). Compilation of little-known facts about our aerospace endeavors.

America's Major Air Disasters, by

(Continued on following page)

BOOKSHELF — CONTINUED

D. S. Halacy, Jr. (Monarch, 35¢). Short review of heroism, terror, and death in six major air disasters of recent years.

America's War Heroes, by Jay Scott (Monarch, 35¢). True, dramatic stories of Army, Navy, and Marine Congressional Medal of Honor winners.

America: Too Young to Die!, by Alexander P. De Seversky (MacFadden, 50¢). Dissertation on current military policy, US defense forces and budgets, atomic warfare, and the key role played by aerospace power.

Annotated Bibliography of Space Science and Technology, by Frederick I. Ordway, III (ARFOR Publications, $2.75). History of astronautical book literature—1931 through 1961.

Assault!, edited by Gene Z. Hanrahan (Berkley, 60¢). Accounts of Marine participation in Pacific island warfare.

Battle Hymn, by Col. Dean Hess, USAF (Popular Library, 50¢). Autobiography of Colonel Hess, clergyman turned fighter pilot and nationally known for sponsoring a Korean orphanage and Korean orphan fund.

The Berlin Crisis, by Deane and David Heller (Monarch, 50¢). An authoritative book on the Berlin crisis.

D-Day, by David Howarth (Pyramid, 50¢). Account of military operations in the invasion of Normandy, World War II.

Dick Bong: Ace of Aces, by Gen. George C. Kenney, USAF (Ret.) (Popular Library, 35¢). Biography of America's greatest ace.

Fate Is the Hunter, by Ernest K. Gann (Crest, 60¢). Autobiographical account of an airline pilot's career in the air.

Fighting Eagles, edited by Phil Hirsch (Pyramid, 35¢). Experiences of famous American fliers in combat.

Glory Gamblers, by Lesley Forden (Ballantine, 35¢). Story of the epochal Dole Air Race from the West Coast to Hawaii in 1923.

Hell, Heroes and Glory, by Bob Considine (Crest, 50¢). Collection of the best war stories selected from *True* Magazine.

How Wide We Stray, by Harold Mansfield (Ballantine, 50¢). Documentary novel, based on a visit to the Soviet Union, also answers many American questions about the Soviets.

Korea's Heroes—The Medal of Honor Story, by Bruce Jacobs (Berkley, 35¢). Dramatic story of military men during the Korean War and the acts that won them the Congressional Medal of Honor.

The Man Who Rode Thunder, by Lt. Col. William H. Rankin, USMC

(Pyramid, 50¢). Story of author's life, career, training, and his forty-minute thunder ride after bailout from a jet fighter.

Men of Space, Vol. 1, by Shirley Thomas (Hillman, 50¢). First of a series of profiles of men who have made outstanding contributions to space research, development, and exploration.

The Necessity for Choice, by Henry A. Kissinger (Anchor, 45¢). Defines foreign policy and defense issues facing Americans in the 1960s.

1962 Uniformed Services Almanac (Federal Employees News Digest, $1). Facts all servicemen should know about military pay, taxes, allotments, in-service home buying, etc.

No High Ground, by Fletcher Knebel and Charles W. Bailey, II (Bantam, 50¢). Story behind the dropping of the first A-bomb on Hiroshima.

Not in Solitude, by Lt. Col. K. F. Gantz, USAF (Berkley, 40¢). Novel about the first Air Force expedition to Mars.

Scramble, by Maj. Mario Cappeli, USAF (Ace, 40¢). Novel of USAF fighter-interceptor squadron of ADC.

Sky Fighters of World War I (Fawcett, 75¢). Exciting stories of ten top aces of World War I.

The Sky Suspended, by Drew Middleton (Pyramid, 50¢). The Battle of Britain, as seen by a topflight correspondent.

Space Biology: The Human Factors in Space Flight, by James S. Hanrahan and David Bushnell (Science, $1.95). Reprint of an Air Force study on space biology.

Spacecraft, by James J. Haggerty, Jr. (Scholastic, 50¢). Explains whys and wherefores of US space exploration.

Squadron Airborne, by Elleston Trevor (Ballantine, 50¢). War novel about the men and women serving at an RAF airfield during the Battle of Britain.

Their Finest Hour, by Sir Winston Churchill (Bantam, $1.25). The second book by Churchill covering the Fall of France, Battle of Britain, German U-boats, and the British victory over the Italian Army.

They Flew the Atlantic, by Robert de la Croix (Monarch, 35¢). Exciting stories of men and women who risked their lives to conquer the Atlantic.

13 Against the Rising Sun, by Stanley E. Smith (Belmont, 35¢). True stories of battles in the war against Japan.

X-15: Man's Daring Flight into Space, by Martin Caidin (Scholastic, 25¢). Capsule picture of the early Air Force's X-15 programs and the training received by pilots who fly it.

—COMPILED BY ALICE MARTIN

Throngs such as this set another attendance record for the annual Air Show staged by the Erie, Pa., Squadron.

Nebraska Wing officials look on as Arthur Storz gives Dr. Frank Sorenson Wing Scholarship check.

AFA ON MAIN STREET

Flyable replica of *Vin Fiz* is positioned on lawn of Pasadena hotel by AFA members.

Goddard Sqdn. guests include Gen. Preston, Sen. Cannon, Gene Raymond, Jack Withers.

Youth education activities, including tour of nearby ANG facility, featured Fresno Squadron programs during 1962.

By Gus Duda

THE 1962 AFA National Convention in Las Vegas, Nev., this month marks the official end of AFA's sixteenth year of successful operation. The Association can look back with pride on its accomplishments during that period, and much of the credit for another success-filled year can be traced directly to the efforts of our Squadrons and our Squadron and Wing leaders, who worked together to produce such activities as we feature in this annual roundup of community efforts.

The space age, with all its technological and sociological ramifications, has had a tremendous impact on the education of our youngsters, as well as the adult population. To this problem a major share of Squadron and Wing effort was dedicated during the past year. The **Utah Wing's** seventh annual **Education Symposium** was again one of the most prominent events in this field, with more than 400 educators taking part in a two-day discussion of aerospace matters as they pertain to the continuing leadership of education in preparing the nation's future leaders.

This year, through the cooperation of Air University, which furnished an **Aerospace Briefing Team** for AFA programs, sixteen Seminars were conducted in as many cities, each with the cooperation and cosponsorship of the local Department of Education. Outstanding among these was the event in Syracuse, N. Y., programed by the **Syracuse Squadron** under the direction of Gordon E. Thiel, N. Y. Wing Commander, and Harry Copeland, Aerospace Education Director for the Wing. This program attracted state-wide interest and resulted in the attendance of many educators from the general area.

The annual **Idaho Wing Seminar,** hosted and planned by the **Boise Valley Squadron,** again was the feature of the AFA year in the Northwest Region. Guest lecturers included nationally prominent educators, scientists, and engineers, who appeared before various civic and educational groups with appropriate recognition to the squadron.

Could They Live . . .

ON WHAT YOU'LL LEAVE THEM?

That's a difficult question for many service people to answer, because it depends on government benefits, family circumstances and other factors. But sometimes the answer is "No," and often "Not very well."

You can arrive at your own answer with a little figuring. Even with a modest income, you'll probably make (and spend on your family) about $250,000 in a normal life span.

But many life spans aren't normal. Do you have enough life insurance to give your family a reasonable part of that quarter million (perhaps $50,000) if your career were cut short *right now?*

That's where AFA Group Life Insurance can help you, by providing a large part of the life insurance protection your family needs (up to $20,000) at a cost *any* officer or NCO can afford.

Here are some of the specific benefits you get:

1. Your Policy is Guaranteed Renewable—Guaranteed Convertible even if You Leave the Service.

You can keep your policy at the low group rate—even if you leave the service—provided it has been in force at least one year prior to your date of separation. And your policy is guaranteed convertible to a permanent plan of insurance at Age 65—regardless of your health at that time.

2. Longer Protection.

AFA Group Life Insurance gives you longer protection than any other similar policy—to Age 65, provided your policy is purchased prior to Age 60.

3. Administered by Your Association on a Non-profit Basis.

Also underwritten and guaranteed by United of Omaha, one of the world's largest life insurance companies.

4. One Convenient, Low Premium for all.

Your premium of $10 per month may be paid by government allotment or direct to AFA in convenient installments. See Application below for details.

Active-Duty Officers and NCOs (E-5 and above) are eligible.

SCHEDULE OF COVERAGE

Your Age	Amount of Insurance	
	On Flying Status	Not on Flying Status
20-24	$10,000	$20,000
25-29	11,000	20,000
30-34	12,500	20,000
35-39	13,000	20,000
40-44	13,500	17,500
45-49	12,500	13,500
50-54	10,000	10,000
55-59	10,000	10,000
60-64*	7,500*	7,500*

* *Continuing benefits. Policy must be purchased prior to age 60.*

PLUS 50% ADDITIONAL INDEMNITY FOR ALL ACCIDENTAL DEATHS

EXCLUSIONS—FOR YOUR PROTECTION

There are naturally a few exclusions which apply to your policy, and to keep the record straight, they are listed here in detail, as follows: Death benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your policy has been in force for 12 months. The Accidental Death Benefit shall not be effective if death results: (1) from injuries intentionally self-inflicted while sane or insane, or (2) from injuries sustained while committing a felony, or (3) either directly or indirectly from bodily or mental infirmity, or poisoning, or asphyxiation by carbon monoxide, or (4) during any period while the policy is in force under the waiver of premium provision of the master policy.

MAIL YOUR APPLICATION TO AFA TODAY!

Air Force Association Group Life Insurance

(UNDERWRITTEN BY UNITED OF OMAHA)

Rank (please print) Name

Address

City Zone State

Date of Birth

Beneficiary Relationship

Signature of Applicant..... Date.....

9-62 *Application must be accompanied by check or money order.*

This Insurance is available only to AFA members.

☐ I enclose $6 for annual AFA membership dues.

☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am on active duty, that to the best of my knowledge I am in good health, and that I have successfully passed an Annual Physical Examination within one year.

Please indicate below the form of payment you elect:

☐ Monthly government allotment (I enclose $30 to cover the period necessary for my allotment to be processed.)

☐ Quarterly (I enclose $30)

☐ Semi-annually (I enclose $60)

☐ Annually (I enclose $120)

☐ I am currently on flying status.

☐ I am not currently on flying status.

Send remittance to: INSURANCE DIVISION, AFA • 1901 PENNSYLVANIA AVENUE, N. W. • WASHINGTON 6, D. C.

AFA ON MAIN STREET — CONTINUED

Education of a unique character was stressed by the **Pittsburgh, Pa., Squadron,** which sponsored a program entitled **"God and the Space Age,"** arranged, planned, and conducted by AFA's National Chaplain, Rev. William Laird. Clergymen of all faiths participated in the Pittsburgh project and were unanimous in their praise of the event.

AFA, the Navy League, and the Association of the US Army cooperatively sponsored "interservice" briefings during 1962, which have had a most beneficial effect on the three Boards of Directors. Orientation tours were made of the Navy's New London, Conn., submarine installation, including an all-day cruise aboard the newest nuclear sub *Nautilus.* In return AFA arranged a three-day visit to Colorado Springs where the visitors were briefed on the operations of Air Defense Command, North American Air Defense Command, and the Air Force Academy.

San Diego, Calif., Squadron sponsors a similar program in that city, and this year played host to civic leaders on a two-day antisubmarine exercise aboard a modern vessel, and a one-day trip aboard the Navy's aircraft carrier USS *Ticonderoga.* Along with these community events, members of the San Diego Squadron also continue to operate a highly successful and effective Speaker's Bureau, and probably established some sort of record for distant appearances this year, when one of the members went to Mazatlan, Sinaloa, Mexico, to speak to 700 educators on aerospace education.

Pasadena, Calif., Squadron this year undertook to pay tribute to the first aerial transcontinental crossing of the US, and sponsored the project they dubbed "Operation Vin Fiz." That was the name given to the 1912 aircraft piloted by C. P. Rodgers, who attempted to make the trip in less than thirty days to win a $50,000 prize. He failed in this quest, taking a total of more than forty-nine days and sixty-eight landings, but nevertheless carved a prominent niche for himself by making the trip at all. The **Pasadena Squadron,** under the direction of Commander C. S. Irvine and General Chairman Robert Brooks, paid homage to the feat on the fiftieth anniversary, and had the whole town talking about its exploits.

Another Squadron which made an impact on its community is **Fort Worth, Tex.,** which received its Charter at the 1961 National Convention in Philadelphia. Even before it received the official Charter, this unit had sponsored a highly successful civic dinner honoring a departing SAC Bomb Wing Commander and hasn't let up in its efforts since that time. It wound up the year in a blaze of glory in July 1962 as hosts to the first convention held by the Texas Wing and has served notice that while it is presently the third largest AFA organization, ranking behind California and New York, it intends to move on up the AFA ladder in rapid fashion. The Wing now boasts nine

(*Continued on page 280*)

St. Louis Squadron influenced Mayor R. R. Tucker to proclaim Aerospace Education Week in City for 1962 Seminar.

For All AFA Members / **AFA ACCIDENT INSURANCE GIVES YOU AND YOUR FAMILY COMPREHENSIVE COVERAGE AGAINST ACCIDENTS!**

● ACROSS THE WORLD ● ACROSS THE STREET ● IN YOUR OWN HOME

AFA's uniquely flexible Accident Insurance offers you accident coverage, twenty-four hours a day, every day, in amounts up to $50,000.

You choose the amount that meets *your* family's requirements.

You have your choice of the money-saving family plan that insures you, your wife, and *all* of your children under 21—or individual coverage that makes separate policies available to you and as many other members of your family as you wish (up to $50,000 for adults, $5,000 for children). The table below shows you the amounts of coverage available, and the way the Family Plan works.

Units of Coverage	Your Coverage (Basic Amount)	Extra Benefits of Family Plan	
		Wife	Each Child
1	$ 5,000	$ 2,500	$ 500
2	10,000	5,000	1,000
3	15,000	7,500	1,500
4	20,000	10,000	2,000
5	25,000	12,500	2,500
6	30,000	15,000	3,000
7	35,000	17,500	3,500
8	40,000	20,000	4,000
9	45,000	22,500	4,500
10	50,000	25,000	5,000

All of these benefits increase 5% each year for the first 5 years at no increase in premium.

If you are presently insured under AFA's old Travel Accident policy, please do not apply for Comprehensive Accident Insurance at this time. To avoid the expense to you of short-rate cancellation, we will *automatically* send you an application for AFA Comprehensive Accident Insurance when your present coverage expires.

1. Either plan you choose offers coverage against *any* accident (except those specifically listed as exclusions below) anywhere in the world. Coverage as a passenger in *all* military aircraft is provided at no extra cost. This provision does not, of course, apply to crew members performing their assigned duties.

2. In addition to the accidental death benefit, your policy also provides indemnity for accidental loss of limbs or sight.

3. And, for any injuries you incur, money is set aside in an amount up to $500 for medical expenses not reimbursed by other insurance in excess of $50 deductible for every family member.

LIMITS OF LIABILITY: The Insurer's Aggregate Limit of liability with respect to all insured persons holding certificates issued under this master policy while in any one aircraft shall not exceed $500,000. Should the total of the individual limits of liability with respect to such insured persons while in any one aircraft exceed $500,000, then the amount applicable to each insured person shall be proportionately reduced to effect a proportionate distribution of the said aggregate limit.

EXCLUSIONS: The policy does not cover: (a) suicide or attempted suicide, while sane or insane; (b) death or injury sustained while insane or under the influence of intoxicants or narcotics; (c) death or injury resulting from invasion, bombardment, or enemy action; (d) death or injury sustained while operating or riding in any aircraft or other vehicle used in a manner or for a purpose prohibited by law; (e) death or injury directly or indirectly resulting from medical or surgical treatment (except where such treatment is rendered necessary by bodily injury caused by an accident within the scope of the policy); (f) injuries or death sustained by a minor child in an auto accident wherein the driver of the auto is under 21 years of age.

AIR FORCE ASSOCIATION COMPREHENSIVE ACCIDENT INSURANCE

(Underwritten by Mutual of Omaha)

Name (applicant) _____

Address _____

City _____ Zone _____ State _____

Beneficiary* _____ Relationship _____

*Under the family plan a beneficiary should only be named for the above named family head (applicant). In the event of death of any of his family members the applicant will be the beneficiary.

☐ I am an AFA member ☐ I enclose $6 for AFA membership

Application must be accompanied by check or money order. Send remittance to: Insurance Division, AFA, 1901 Pennsylvania Ave., N. W., Washington 6, D. C.

ANNUAL COST

Basic Amount†	Family Plan†	Individual Plan
$ 5,000	☐$ 9.50	☐$ 6.00
$10,000	☐$19.00	☐$12.00
$15,000	☐$28.50	☐$18.00
$20,000	☐$38.00	☐$24.00
$25,000	☐$47.50	☐$30.00
$30,000	☐$57.00	☐$36.00
$35,000	☐$66.50	☐$42.00
$40,000	☐$76.00	☐$48.00
$45,000	☐$85.50	☐$54.00
$50,000	☐$95.00	☐$60.00

†Family plan includes 50% of basic amount for wife and 10% of basic amount for all children, regardless of number.

Squadrons, an obvious tribute to the effective organizational campaign mapped out by Vice President M. L. "Bo" McLaughlin, and carried through by him and the present Texas Wing officers headed by Earle N. Parker, Ft. Worth.

In the vital area of Squadron membership, the **Ak-Sar-Ben Squadron of Omaha, Neb.**, has, since its entry into the Association in 1955, led the way for all other units as the largest AFA Squadron. This was a stated aim of the Squadron organizers, and they not only met the objective but have continued to surpass it each year since. This year was the most successful in the history of the Squadron, when well over 3,000 individuals were signed up as members of the unit. Considerable credit for this outstanding action goes to Board Member Arthur C. Storz, who annually heads the membership campaign.

Membership refunds from this huge activity are used by both the Squadron and the Wing in a number of highly effective community projects. In 1962, for example, donations were made to the University of Nebraska to pay for ten teacher scholarships in the University's Aviation Education Summer Workshop; to the Offutt AFB Central Fund, in appreciation of the assistance rendered to the campaign for new service members; to the Aerospace Education Foundation, AFA's educational affiliate; and to a special community-wide campaign raising funds for a badly needed elementary school for the Air Force families living in the Capehart Housing units at Offutt AFB.

As the Air Force Association celebrates its sixteenth year of participation in the nation's important activities we can look back with pride on our accomplishments. Clearly the need existed, in 1946, for the establishment of an organization unselfishly devoted to maintaining the peace and security of the American way of life. That this way of life is ever more important to all of us, and continues to spur us on to even greater contributions, is due in no small measure to efforts of the dedicated members of the Association.

In professionalism and effectiveness, our Wings and Squadrons have progressed a long way since 1946. Today, as we study the world situation, we can clearly see an even greater need in the future for the kind of efforts our units, and our individual members, have put forth during 1962. To these units and leaders, to AFA ON MAIN STREET, belongs much of the credit for the success achieved.—END

ANY FLYER CAN BE GROUNDED AND LOSE FLIGHT PAY

$2,000,000

PAID IN AFA FLIGHT PAY BENEFITS IS PROOF OF THIS

AFA has paid two million dollars in claims to grounded flyers since 1956—money that meant the difference between living, and just existing, to hundreds of Air Force families.

We are pleased that a program of insurance which AFA originated has helped Air Force families so substantially. And we believe the information we have gained *about* grounding can help *you* in evaluating your prospects.

For example, the chart below shows the ages when most flyers are grounded—a time when families can *least afford* loss of income.

You can see, too, that the money you would get from just *one* 90-day grounding would pay for your flight pay insurance during the years you are most likely to lose flight pay.

If your flight pay is not protected, you owe it to your family to get this income protection now.

NOTE: All policies are dated on the last day of the month in which the application is postmarked, and protection against accidents begins as of that date; protection against groundings due to illnesses begins 30 days later. Of course, coverage cannot be immediately extended to include illnesses which existed prior to the time at which you insured your flight pay, but after 12 months you are fully covered against all illnesses.

EXCLUSIONS: The insurance under the policy shall not cover loss to any Member resulting in whole or in part from or due to any of the following:

1. Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).

2. "Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the Service in accordance with applicable regulations.

3. Caused by intentional self-injury, attempted suicide, criminal assult committed by the Member, or fighting, except in self-defense.

4. Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.

5. Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.

6. Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such member.

7. Mental or nervous disorders.

8. Alcohol, drugs, venereal disease, arrest, or confinement.

9. Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority of the Member's Service.

10. Suspension from flying for administrative reasons not due to injuries or disease, even though the Member may have been eligible for or was being reimbursed at the time of the administrative grounding because of a previously established disability.

11. Loss of life shall not be deemed as loss for purposes of this insurance.

12. Primary duty requiring parachute jumping.

13. Voluntary suspension from flying.

14. A disease or disability preexisting the effective date of coverage, or a recurrence of such a disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directive of the service concerned, unless the Member was insured under the master policy issued to the Air Force Association for 12 continuous months immediately prior to the date disability (grounding) commenced.

Underwritten by Mutual Benefit Health & Accident Association (Mutual of Omaha).

CHOOSE EITHER CONVENIENT PAYMENT PLAN. MAIL THE APPLICATION TODAY!

AFA FLIGHT PAY PROTECTION PLAN/AIR FORCE ASSOCIATION, 1901 Pa. Ave., N.W., Wash. 6, D.C.

Send me my Flight Pay Protection Policy.

BILL ME FOR:

$_____ semiannual premium (1% of annual flight pay, plus $1 service charge)

$_____ for full payment of annual premium (2% of annual flight pay)

I ENCLOSE:

$_____ semiannual premium (1% of annual flight pay, plus $1 service charge). Bill me every 6 months

$_____ in full payment of annual premium (2% of annual flight pay)

This insurance is available for AFA Members only ☐ I am an AFA Member ☐ I enclose $6 for annual AFA membership

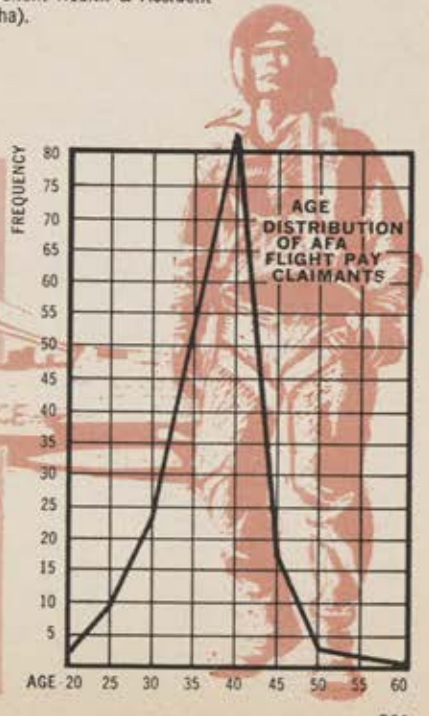
Rank (please print) Name _____ Address _____

City _____ Zone _____ State _____ $ Annual Flight Pay _____ Years Service for pay purposes _____

I understand the conditions and exclusions governing AFA's Flight Pay Protection Plan, and I certify that I am currently on flying status and entitled to receive incentive pay and that to the best of my knowledge I am in good health, and no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

Signature of Applicant _____ Date _____

9-62 (Underwritten by Mutual of Omaha)



This Is AFA

The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• To assist in obtaining and maintaining adequate airpower for national security and world peace. • To keep the AFA members and the public abreast of developments in the field of aviation. • To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

Membership

Active Members: Individuals honorably discharged or retired from military service who have been members of, or either assigned or attached to, the USAF or its predecessor services, or who are currently enrolled in the Air Force Reserve or the Air National Guard, $6.00 per year.

Service Members (nonvoting, nonofficeholding): Military personnel now assigned or attached to the USAF. $6.00 per year.

Cadet Members (nonvoting, nonofficeholding): Individuals enrolled as Air Force ROTC Cadets, Civil Air Patrol Cadets, or Cadets of the US Air Force Academy. $3.00 per year.

Associate Members (nonvoting, nonofficeholding): Individuals not otherwise eligible for membership who have demonstrated their interest in furthering the aims and purposes of the Air Force Association. $6.00 per year.

Industrial Associates: Companies affiliating with the Air Force Association on a nonmembership status that receive subscriptions to AIR FORCE Magazine and SPACE DIGEST, special magazine supplements, and Industrial Service Reports.

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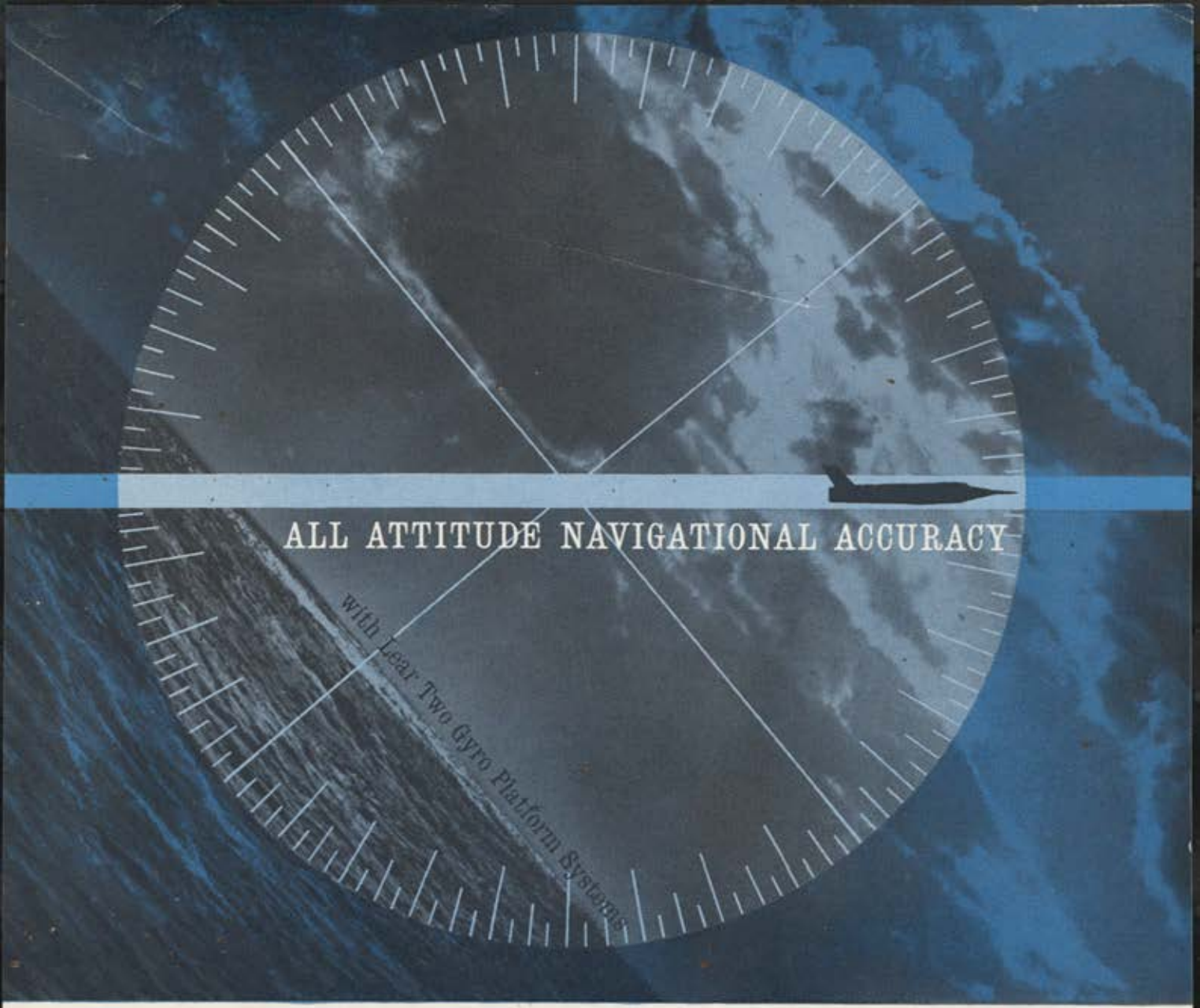

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