

**1963
AIR FORCE
ALMANAC**

SEPTEMBER 1963 / \$1.00

AIR FORCE

and **SPACE DIGEST**

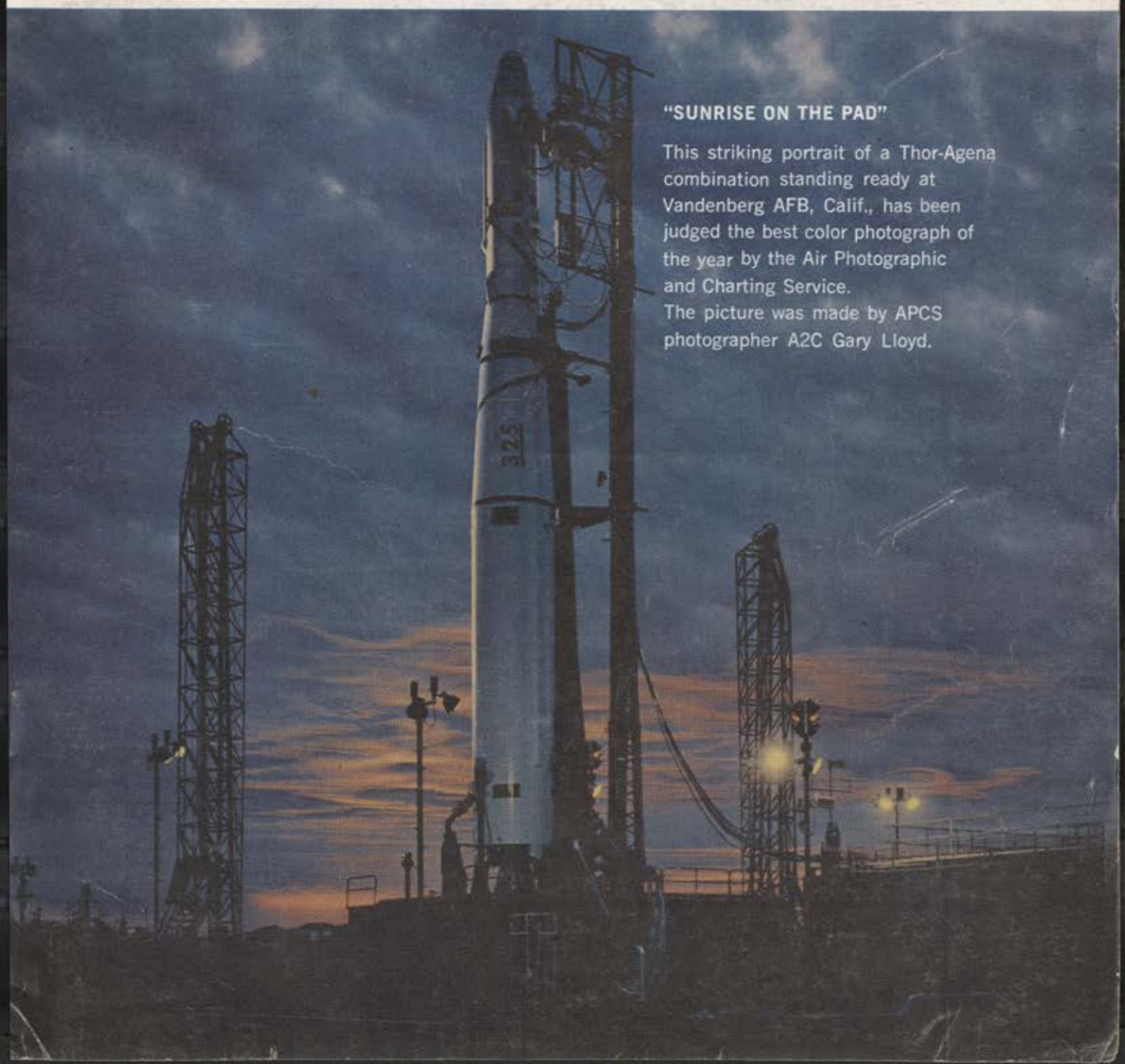
The Magazine of Aerospace Power

Published by the Air Force Association

"SUNRISE ON THE PAD"

This striking portrait of a Thor-Agena combination standing ready at Vandenberg AFB, Calif., has been judged the best color photograph of the year by the Air Photographic and Charting Service.

The picture was made by APCS photographer A2C Gary Lloyd.





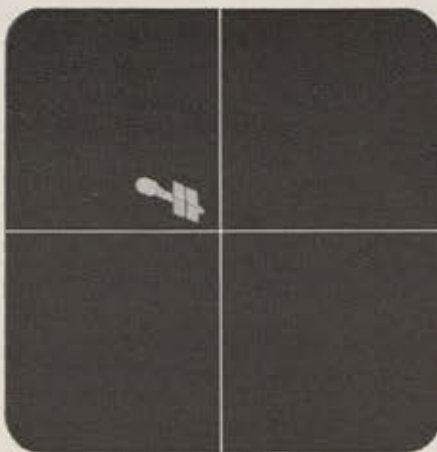
**Ask
the
Bolivians
about
Kaman
Performance**

Mount Tacora rises 19,626 feet at the juncture of the Bolivian, Peruvian and Chilean borders. In March 1963 an airliner smashed into Mount Tacora just below the summit. To rescue possible survivors, two Kaman HUSKIES were airlifted from South Carolina, assembled in a small Peruvian town and ready to go in hours. Twenty-six sorties were flown under extremely adverse conditions in two days. There were no survivors, but the HUSKIES, with their altitude/payload capabilities, enabled the ground rescue teams to complete evacuation in 48 hours. Ask the Bolivians about Kaman Performance. Or the Peruvians. Or the Chileans. Kaman Aircraft Corporation, Bloomfield, Connecticut.

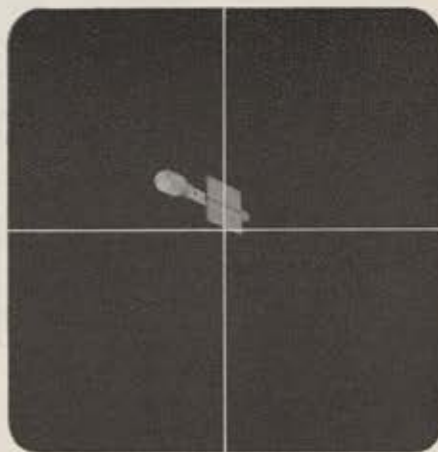




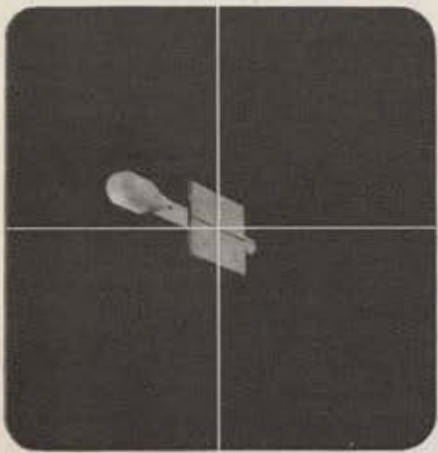
Rendezvous with space station



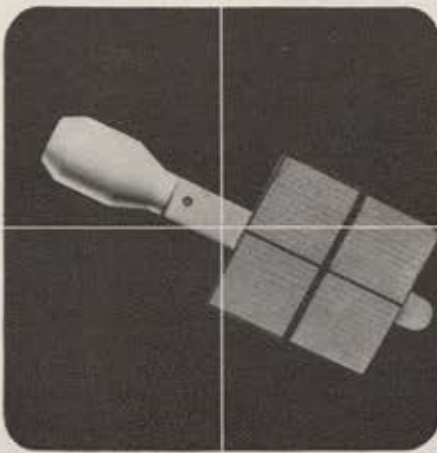
Range 2,000 feet, closing velocity 20 f.p.s.



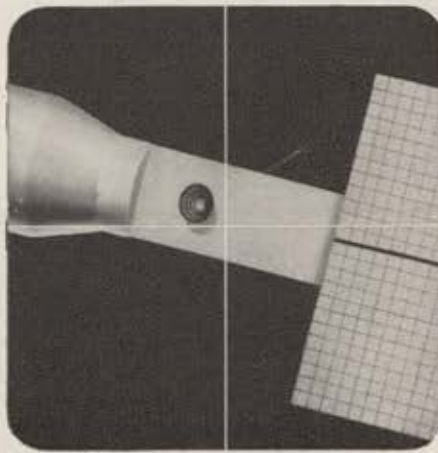
Aligning with solar panels and closing



Range 600 feet, aligned with solar cells . . .



Maneuvering for final alignment, velocity 3 f.p.s.



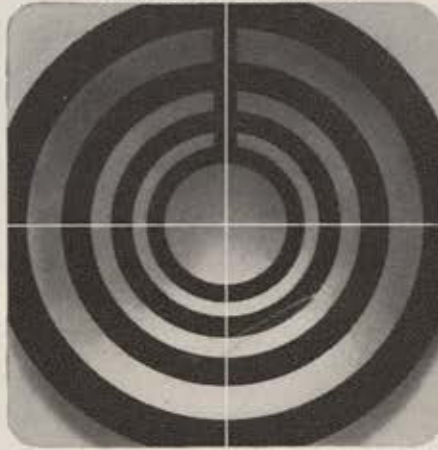
Translating toward docking port



Correcting left yaw and left roll, range 50 feet



Velocity 1 f.p.s., yaw 0, roll 0 — correcting pitch



Alignment aid shows all attitudes 0. Ready to latch.

Rendezvous in space

To investigate space rendezvous techniques, Boeing has developed a simulator capable of reproducing conditions involved in bringing two orbiting vehicles together in a docking mission.

Through a projected TV presentation, the pilot, shown in the "planetary exploration vehicle" cockpit above, sights his target vehicle. Using controls operating through a computer system, the pilot maneuvers his vehicle and completes his docking run.

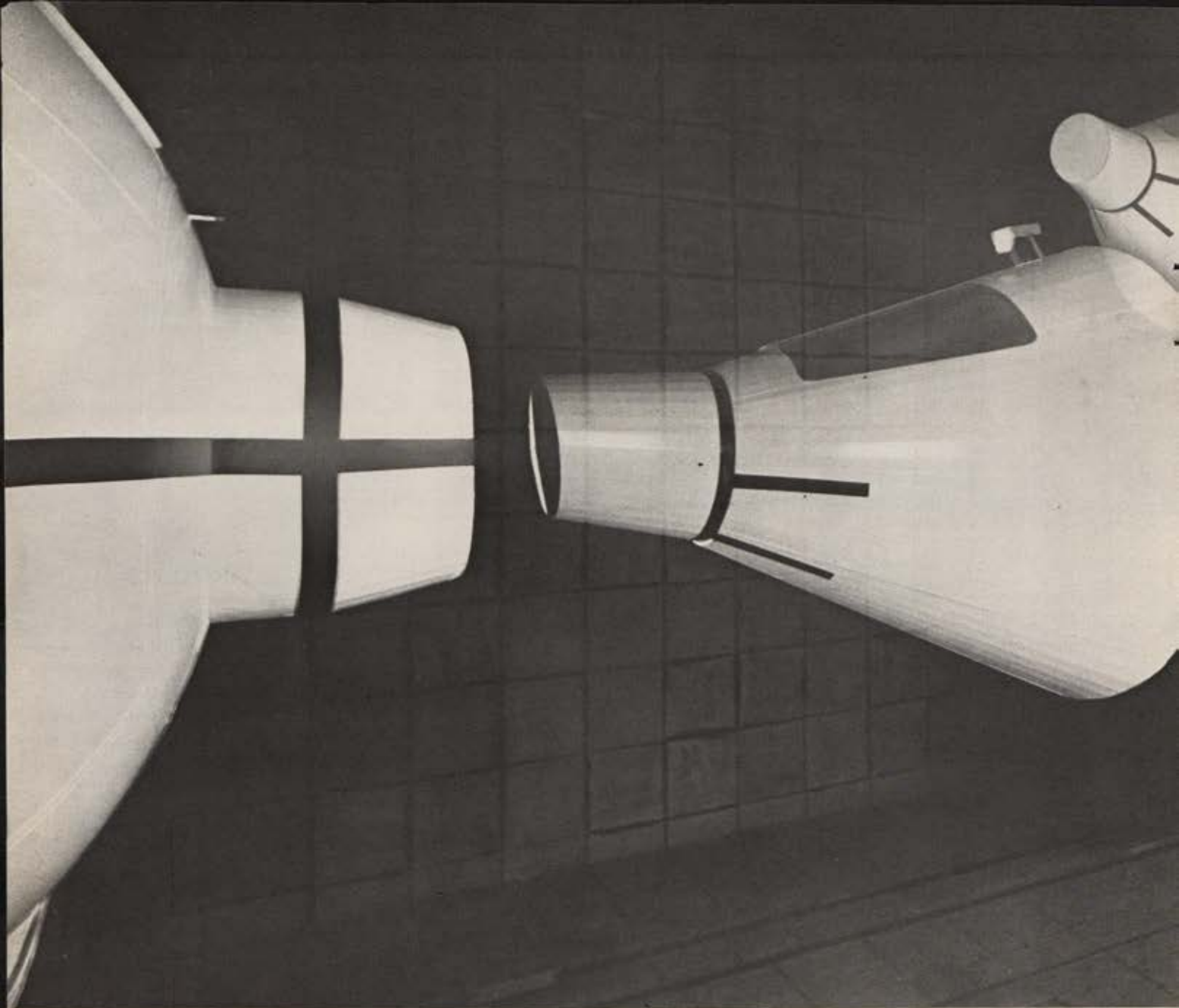
The program is determining space station and shuttle vehicle design requirements, types of docking mechanisms, impact conditions and energy absorbing requirements.

Backed by the most extensive facilities in industry, Aero-

Space Division's scientists, engineers and technicians are achieving technological advances in a wide spectrum of areas, including space medicine, guidance, electronics, vehicle design, lunar base requirements and life support systems and equipment.

These advanced capabilities, plus experience in depth in the management of vast, complex systems, equip Boeing to make major contributions to the nation's progress in launch systems, space travel, planetary landing programs, and space rendezvous and logistics missions.

BOEING
AERO-SPACE DIVISION

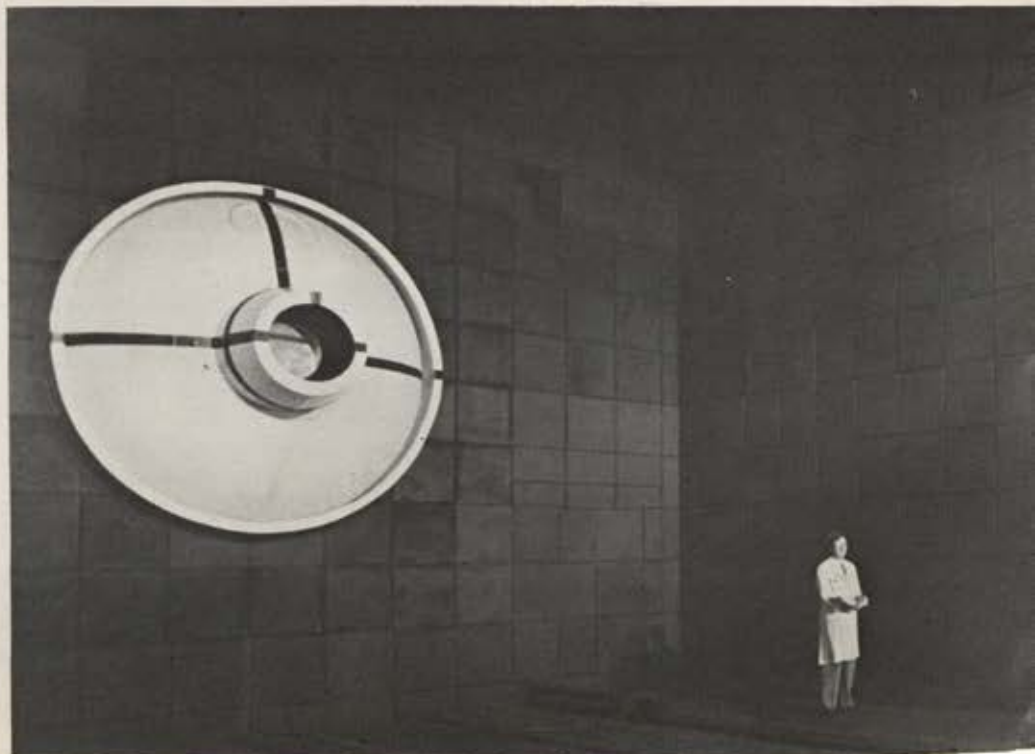


Triple exposure photograph in new Martin Rendezvous Laboratory shows spacecraft making approach

New 100-foot-long laboratory simulates complete closing and docking for both manned and unmanned missions. Visual and television surveillance can be used during manual operation, radar and laser sensors in fully automatic exercises.

A bank of analog computers supplies effects of space to the mobile module. All room walls are anechoic to free sensors of interfering noise.

MARTIN MARTIN
MARIETTA 



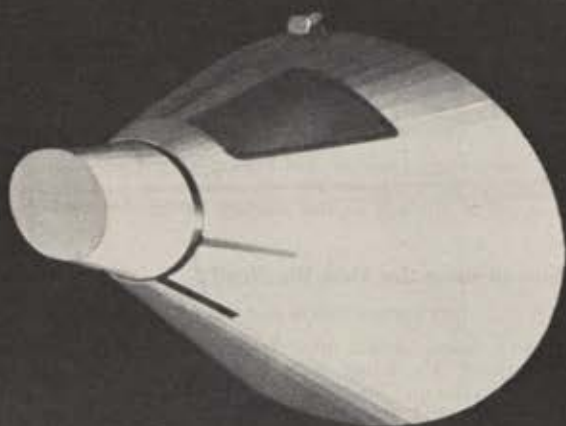
MANNED RENDEZVOUS:

New Rendezvous Laboratory at Martin investigates closure and docking techniques

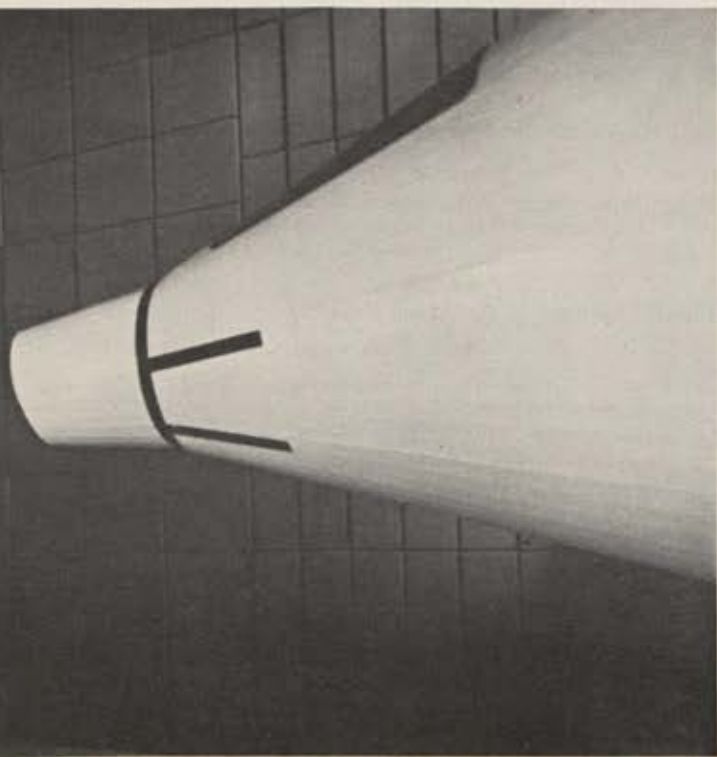
Rendezvous of orbiting spacecraft is an indispensable technique in future space planning. It is a science of precision without precedent, dependent largely on booster accuracy and extremely sophisticated closing and docking techniques.

To enhance the nation's capabilities in this vital science, Martin has built a unique Rendezvous, Closure and Docking Laboratory. It simulates for technicians and astronauts all the sensor and control problems of orbital rendezvous, and it utilizes full-scale hardware. It simulates both manual and automatic closure from 100 miles out to lock-on.

This Martin facility will speed the nation's development of rendezvous techniques for manned space systems. At Martin, systems management means the best possible product, in the shortest possible time, at the lowest possible cost.



and closure for docking under simulated space conditions.



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AIR FORCE

and **SPACE DIGEST**

AIR FORCE ALMANAC • 1963

Volume 46 • Number 9 • September 1963

On the "Ban" Wagon—An Editorial / BY JOHN F. LOOSBROCK

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"Total Dedication of Thoughtful Men" /

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Any truly viable US-Soviet cooperative moon-exploration program would require the Russians to give more than they'd get, but there's no harm in asking. It might clear the air of post-test-ban euphoria.



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Best short story of the year

...written by a Douglas DC-8



To how big an airport do you have to reroute a jetliner, if its scheduled landing field is locked in by fog?

If it's a DC-8 or DC-8F, not very big. The DC-8 has been approved by the F.A.A. for the shortest landing field length of any long range jetliner. It needs airports with runways no longer than those which can handle a DC-6...and that often means as small as 5,000 feet.

Credit some of this capability to a new landing gear modulated anti-skid system which continually monitors all brake pressures to maintain optimum traction. Also to the important fact that the DC-8's control at low speeds is superior to that of any other jetliner.



But even before the new landing gear system was perfected, DC-8s had landed on runways shorter than 5,000 feet. This capability is characteristic of the extra margin built into so many of the DC-8 and DC-8F systems.

And as for fog, latest Douglas transport designs already are capable of operating at weather minimums of 200 feet and $\frac{1}{2}$ mile visibility. Developments will soon lower these minimums to 100 feet and $\frac{1}{4}$ mile, and may eventually achieve fully automatic landings when ceilings are zero.

DOUGLAS BUILDS GREAT TRANSPORTS



PROGRESS REPORT ON STORABLE LIQUID PROPELLANT ROCKET ENGINES AT UTC

Projected space missions involving upper-stage storable liquid propellant rocket engines impose certain rigid performance requirements:

1. The propellant must be space-storable. Future flights will last for weeks or even months, and most conventional earth-storable propellants can seriously deteriorate before the missions are completed.
2. Engine weight will be critical, particularly when the task involves orbital rendezvous.
3. Specific impulse must be improved over the current performance level of earth-storable propellants.
4. Variable thrust control will be required for maneuverability in space.

■ At United Technology Center we are now devoting major efforts toward development of engines to meet these demanding performance requirements.

■ New fluorine-based propellants, proved in more than 20 recent test firings at UTC, provide 20-25% higher I_{sp} than conventional fuels; and these new propellants are storable in space.

■ Engine weight has been reduced significantly by using filament-wound propellant tanks and highly efficient ablation-cooled thrust chambers. (Our recent test-firing using ablative chambers with fluorine-based propellants is an industry first.)

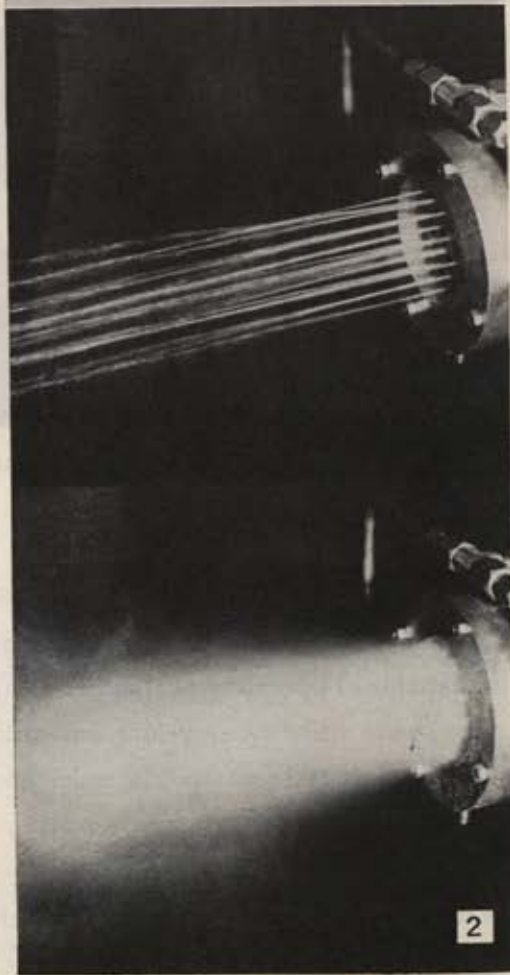
■ We have developed engines of various sizes which will stop and start in space, and which have thrust control over a range of 1 to 100. The advanced throttling techniques use aeration and variable area injectors.

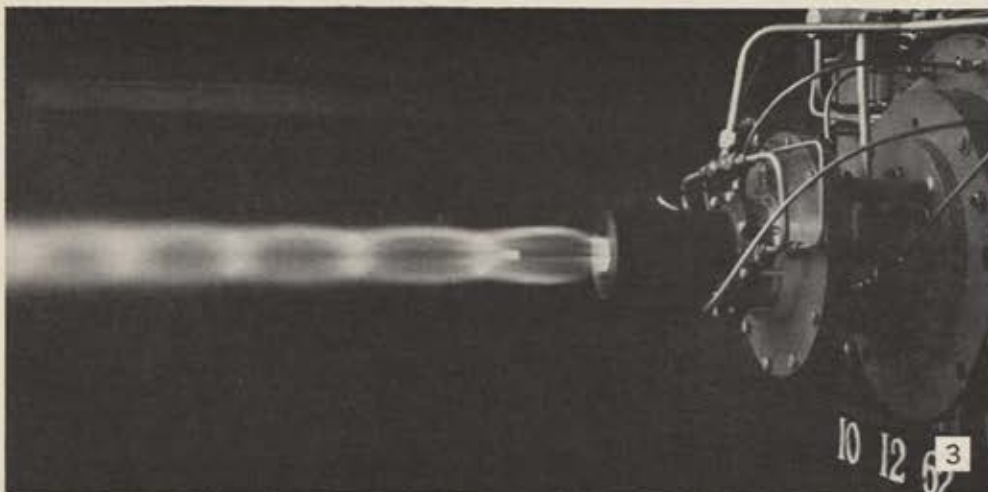
■ In addition to our work in liquid engines, we are developing hybrid rocket engines which will combine the best qualities of both solid and liquid propellant engines. And UTC is the prime contractor for the first stage of the Air Force Titan III C, which includes two 120-inch diameter segmented solid rocket motors. Together, these motors will generate over 2 million pounds of thrust at lift-off, more than 80% of the vehicle's total thrust.

■ UTC's Sunnyvale headquarters have recently been enlarged and the Coyote Development Center's facilities are modern and extensive. Our 2,500 people provide us with a reserve of experience and talent. We have the men and machinery. This manpower and these facilities are devoted to advancing the state of the art for space propulsion.

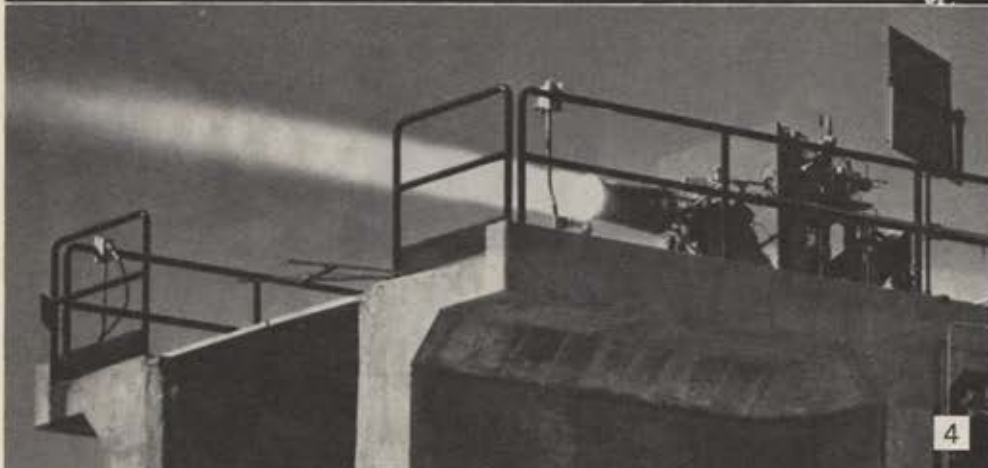
UNITED TECHNOLOGY CENTER

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A
DIVISION OF UNITED AIRCRAFT CORPORATION

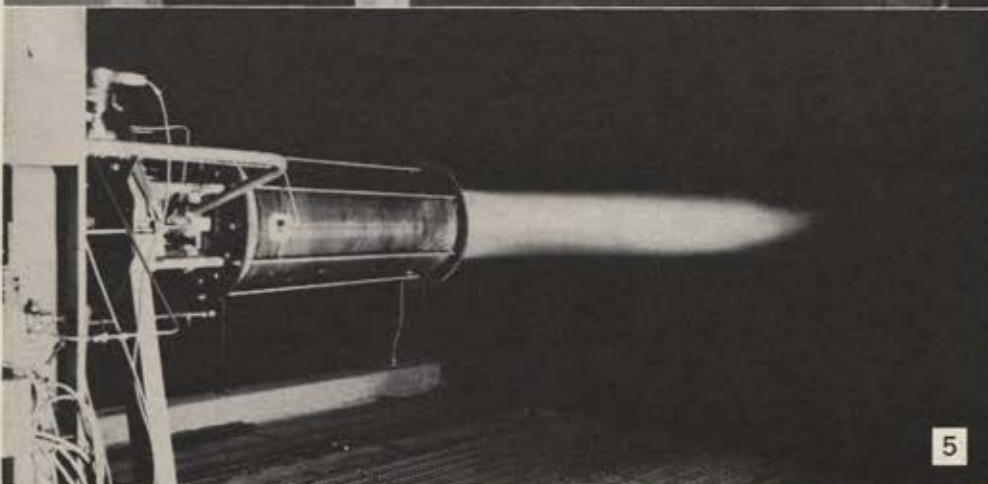




1. ABLATION-COOLED THRUST CHAMBER literally boils off its liner in order to cool itself. Ablative liners eliminate heavy, expensive tubing required for regenerative cooling systems.



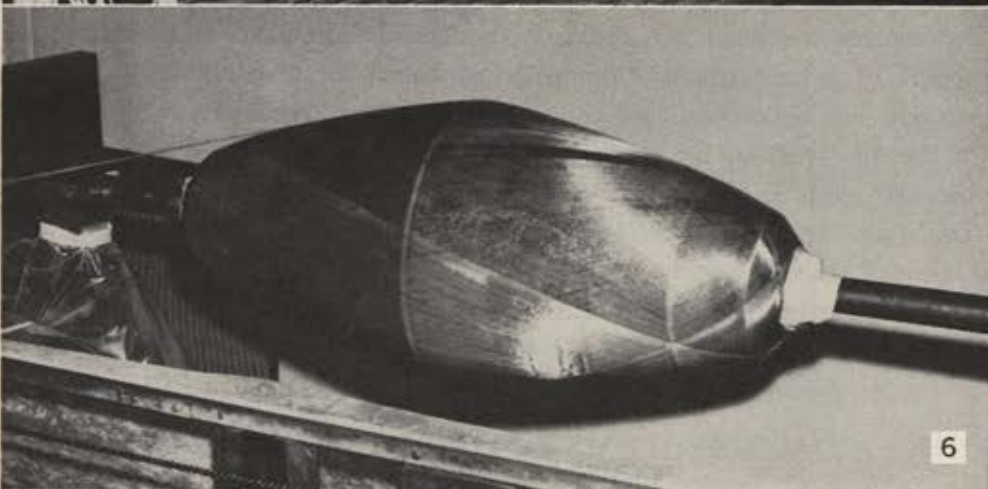
2. VARIABLE THRUST CONTROL over a 1 to 100 range is now possible with UTC's technique of aeration. Conventional propellant injection (top) does not allow reduction of rate of flow without danger of unstable combustion. Aeration throttling (below) diffuses propellant and gives precision control.



3. SPACE SIMULATION TESTS prove the start-stop capability of advanced liquid propellant rocket engines. Flight-scale engines are hot fired in our test cells.



4. OVER 3,000 TEST FIRINGS have already been conducted at our three major test stands. This picture shows an engine using new fluorine-based propellants.



5. EXTENDED DURATION FIRING of lightweight storable liquid propellant engine achieved stable combustion and high efficiency over a period of almost twenty minutes in a recent test at UTC.



6. GLASS FIBER FILAMENT WINDING, a weight-saving fabricating technique, is being used for liquid propellant bottles for upper-stage engines.



FAST AIR LIFT TO THE HOT SPOT

MODICON* V — designed to counter the insurgent threat with decisive command and control of the air and close air support of ground troops. Compactly packaged for global mobility in air-transportable shelters suitable for helicopter and vehicular operations. Instantly ready to move anywhere to dominate the air situation by providing first day capability, mixed weapons control, tactical flexibility through modular dispersibility. Already researched and developed for immediate integration into special air warfare units. *MODICON systems are configured to support a high order of military initiative and resourcefulness. Engineers and scientists qualified to exercise these traits towards the furtherance of data handling and display systems will find substantial opportunities at Litton Systems. Send resume to Professional Employment Manager, 6700 Eton Avenue, Canoga Park, California. An Equal Opportunity Employer.* *MODular DISpersed CONTROL

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ON THE 'BAN' WAGON

By John F. Loosbrock

EDITOR, AIR FORCE/SPACE DIGEST

ONE thing is clear at this writing. By the time this issue of AIR FORCE/SPACE DIGEST reaches its readers the United States Senate will have advised and consented to the ratification of the nuclear test-ban treaty. Only a handful of Senators have expressed outright opposition; a mere double-handful have raised questions they would like to see answered before voting "Yea." The majority jumped on the ban wagon as soon as it had barely begun to rumble. Some had been on it from the beginning of the years-old negotiations.

There has been no diminution in the distrust of the Communists consistently exhibited by many of the Senators who are voting for ratification. There has been no erosion of the senatorial concern about what a test ban might do to our deterrent posture. There is almost tacit acknowledgment by all hands that the Soviets will abrogate the treaty if and when it suits their purpose. Even the Administration supporters of the treaty, including President Kennedy himself, Secretary of State Dean Rusk, Secretary of Defense Robert McNamara, Chairman of the Atomic Energy Commission Glenn Seaborg, and the corporate statement of the Joint Chiefs of Staff, took great pains to make clear what the treaty would *not* do.

The President, in his special message to the Senate requesting speedy ratification, ticked off the points:

- The treaty will not assure world peace.
- It will not halt nuclear testing.
- It will not halt the production or reduce existing stockpiles of nuclear weapons.
- It will not end the threat of nuclear war or outlaw the use of nuclear weapons.

The President assured the Senate that "this treaty does not halt American nuclear progress" and promised that "our atomic laboratories will maintain an active development program, including underground testing, and we will be ready to resume testing in the atmosphere if necessary."

He further asserted that "this treaty is not a substitute for, and does not diminish the need for, continued Western and American military strength to meet all contingencies. It will not prevent us from building all the strength we need; and it is not a justification for unilaterally cutting our defensive strength at this time."

Premier Khrushchev took similar pains to assure his countrymen that the treaty was not a "giveaway" to the capitalistic imperialists and that he was still as anti-West as the next Communist, no matter what that fellow Mao might be saying over in Peiping. In France, Charles de Gaulle was going right ahead in his quest for a bomb of his own, and presumably the Red Chinese were doing the same. At this writing the treaty has been signed by sixty-seven countries on both sides of the Iron Curtain, including East Germany.

The attractiveness of a treaty which apparently does so little harm to and carries so little advantage for either side lies in one word: "fallout." So long as the treaty is not abrogated, one cannot deny that further contamina-

tion of the atmosphere—except, of course, by France or Red China—will be halted. This is what whipped otherwise recalcitrant Senators and other opponents into line.

"This, literally, is a motherhood theme," grumbled one Senator. "Who the hell wants to go on record in favor of strontium 90?"

The treaty was also hailed, in the words of the President, as "a first step toward limiting the nuclear arms race." This theme likewise was echoed and reechoed by supporters of the treaty.

Washington has its share of cynics, and one of them put it this way: "Motherhood, sure. Who can be against it? But even motherhood can be a problem when there hasn't been a wedding. First step? Sounds great. But remember the old joke about watching that first step. It might be a long one."

The Joint Chiefs have their reservations about the test ban, reservations that are essentially technological and military in nature. Their statement to the Senate Preparedness Subcommittee examined what might happen if the treaty were to be ratified and faithfully observed by both sides. The Chiefs conclude that:

- "The United States would not be able to overtake the present advantage which the USSR probably has in the high-yield [tens of megatons] weapons field, whereas the Soviets, by underground testing, probably could retrieve in time any lead which we may presently have in the low-yield tactical field.

- "Both sides could achieve an antiballistic missile, but one with less desirable characteristics than would be the case were additional atmospheric tests conducted.

- "Knowledge of weapons effects is incomplete at best and, although knowledge could be gained from underground testing, knowledge which only testing in the prohibited media [atmosphere, underwater, and outer space] could provide would be denied. Also, there would be no opportunity to conduct environmental tests of current weapons or of those which might be acquired in order to verify their performance."

This means that underground testing has its limits and that we can never know just how a weapon will perform until we test it in the environment in which it is to be used. The reference to weapons effects concerns, for example, what a fifty- or 100-megaton warhead might do to a Minuteman site, which we do not know and will not be able to find out under the test ban. It likewise refers to the radiation effects of big nuclear blasts on sensitive communications systems and radar. Communications are critical to control of the deterrent strategic force—a control on which much store is set in the quest for stability of that force. And radar may be the pacing factor in achieving a workable antiballistic missile system. The Chiefs' worry, obviously, is about the prospect of deterring aggression, or of being forced to go to war, with weapons which are untried and which may prove inefficient or not even work at all.

The Chiefs also are worried about the possibility of clandestine testing but believe this to be a relatively minor

(Continued on following page)

factor, "if adequate safeguards are maintained." The Chiefs likewise are concerned about a repetition of the September 1961 Soviet atmospheric test program in which the Soviets broke the previous test moratorium without warning and gained the acknowledged lead they now possess in very-high-yield nuclear weapons. The Chiefs, says their statement, "are impressed . . . by the possibility of an abrupt abrogation by the Soviets, followed by a comprehensive series of atmospheric tests."

The safeguards the Chiefs require for their corporate peace of mind are listed:

- "The conduct of comprehensive, aggressive, and continuing underground-nuclear-test programs designed to add to our knowledge and improve our weapons in all areas of significance to our military posture for the future.

- "The maintenance of modern nuclear laboratory facilities and programs in theoretical and exploratory nuclear technology which will attract, retain, and ensure the continued application of our human scientific resources to these programs on which continued progress in nuclear technology depends. [*This means that good scientists will leave the nuclear weapons fields in droves if an active program is not pursued.*]

- "The maintenance of the facilities and resources necessary to institute promptly nuclear tests in the atmosphere should they be deemed essential to our national security or should the treaty or any of its terms be abrogated by the Soviet Union.

- "The improvement of our capability, within feasible and practical limits, to monitor the terms of the treaty, to detect violations, and to maintain our knowledge of Sino-Soviet nuclear activity, capabilities, and achievements."

The Chiefs then acknowledged that there were other than military considerations in the treaty. They, too, came to grips with motherhood and concluded that "if we can achieve significant political advances, these will compensate for foreseeable fluctuations in nuclear technology."

What really worried the Chiefs was a fear of a kind of psychological fallout, a mental contamination of the atmosphere of alertness. Said their statement:

"The most serious reservations of the Joint Chiefs of Staff with regard to the treaty are more directly linked with the fear of a euphoria [a false feeling of well-being] in the West which will eventually reduce our vigilance and the willingness of our country and our allies to expand continued effort on our collective security. If we ratify this treaty, we must conduct a vigorous underground testing program and be ready on short notice to resume atmospheric testing. We should strengthen our detection capabilities and maintain modern nuclear laboratory facilities and programs. Finally, we must not forget that militant communism remains committed to the destruction of our society."

The Chiefs, in other words, while deeply concerned about the technological and military hobbles imposed by the test ban, also recognize the political facts of life as clearly as do the worried solons on Capitol Hill. You just can't be in favor of fallout, not even in the Pentagon.

Other reservations were expressed as to the treaty, notably by Nelson Rockefeller, who asked that ratification be undertaken only with "the understanding that certain ambiguous language in Article I does not prohibit the use of nuclear weapons to repel aggression anywhere." The New York Governor's reference was to what some consider a "sleeping" provision. In prohibiting atmospheric, underwater, and outer-space testing, Article I says:

"Each of the parties to this Treaty undertakes to prohibit, to prevent, and not to carry out any nuclear-weapon test explosion, or any other nuclear explosion at any place

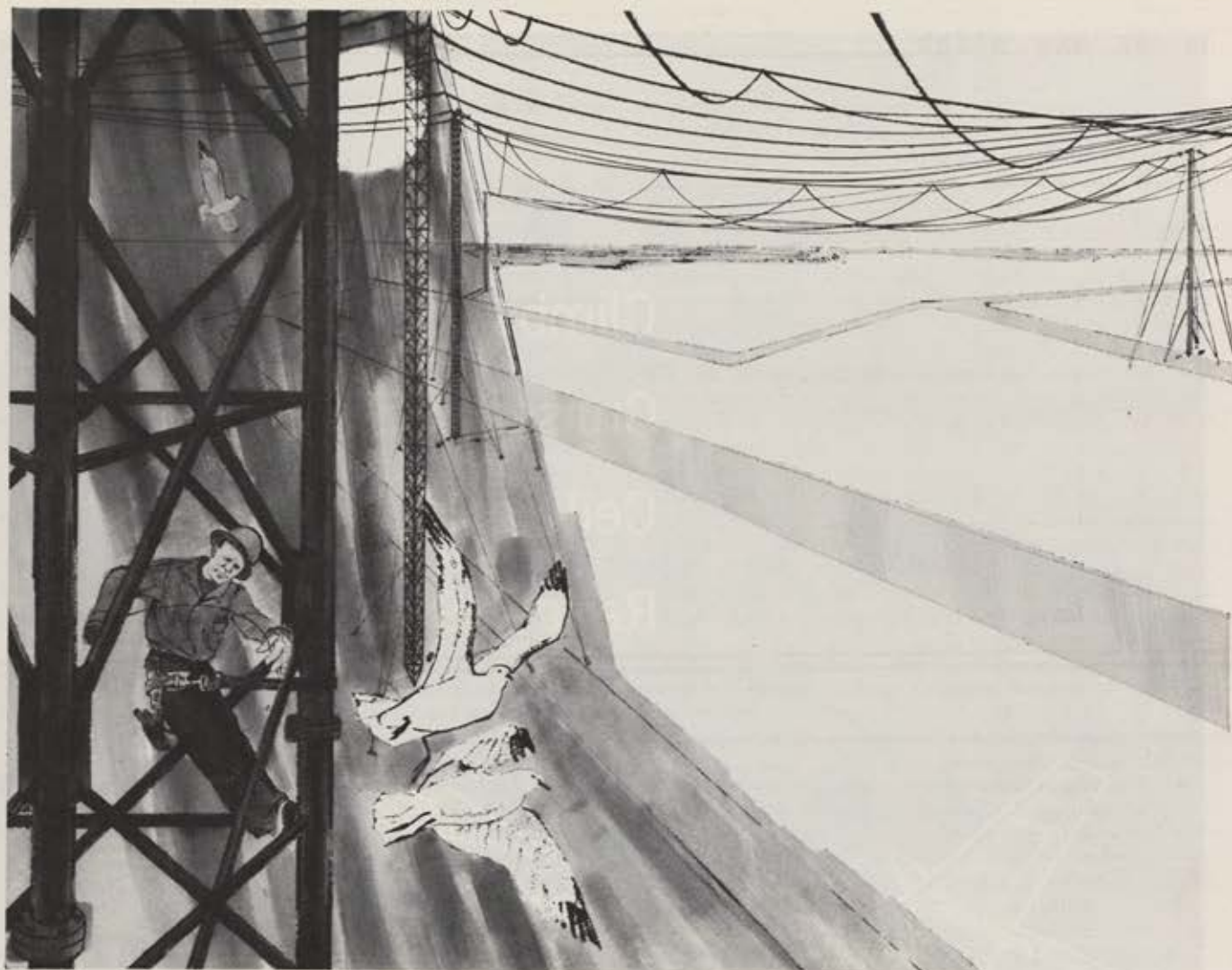
under its jurisdiction or control," except underground (*emphasis supplied*). The phrase "or any other nuclear explosion" would seem to prohibit the use of tactical nuclear weapons under any conditions, even including a massive surprise aggression with conventional arms. Both Secretary Rusk and Secretary McNamara deny that the treaty means this but no one has said it does not say this. It has been pointed out that in theory this clause could prevent the United States from employing nuclear weapons to seal the mountain passes in the Himalayas, even if the Chinese Reds were mounting a massive assault through these passes upon India and even if India requested such use of nuclear weapons on its behalf. The same clause appears to restrict the use of nuclear explosions in Operation Plowshare for such peaceful purposes as digging canals or creating artificial harbors.

We are struck by the speed with which the treaty was drafted, negotiated, signed, and ratified. Less than three months ago the test-ban negotiations were bogged down in the old argument about inspection—how to ensure against underground cheating. Then the deadlock was suddenly broken, by the obvious expedient of eliminating underground testing from the provisions of the treaty.

The watershed point, apparently, was reached on May 27, when Senator Thomas J. Dodd, a Connecticut Democrat and a highly articulate critic of our previous test-ban negotiations (*AIR FORCE*, June '63, "What Kind of Test Ban Makes Sense," by John F. Loosbrock and "You Can't Ban Technology," by J. S. Butz, Jr.), introduced a resolution declaring the Senate's support of a ban "on all nuclear tests that contaminate the atmosphere or the oceans." Senator Dodd named as cosponsors a total of thirty-four Senators from both sides of the aisle, ranging from such an ardent supporter of a test ban as Hubert Humphrey of Minnesota to highly suspicious Peter Dominick of Colorado. The thrust of the Dodd-Humphrey-*et-al* resolution was that such a ban could be effectively monitored to detect cheating, would eliminate fallout, and would be a start toward curtailing the arms race. It is only speculation, but we conjecture that Senator Dodd has received assurances that the pure-fission neutron bomb, which had worried him on the grounds that it could be developed and tested clandestinely by the Soviets under an across-the-board ban, can be developed and tested underground, or in other ways that do not involve atmospheric contamination.

It is both interesting and disturbing, however, to note the significant differences in language between the Dodd resolution and the actual treaty. The Dodd resolution called for a ban on "all tests that contaminate the atmosphere or the oceans." Such a ban would have permitted tests in outer space and indeed any tests that would not contaminate the atmosphere. The treaty goes much further. It prohibits all atmospheric nuclear explosions, tests or otherwise, whether or not contamination is involved. It extends the test ban to outer space, where contamination is likewise not involved.

We are not in favor of fallout, although we note that the degree of risk involved therein is a matter on which there is no scientific unanimity. We could support, without significant reservation, a treaty that would have maintained the sense of the Dodd resolution. Such a treaty would have given the United States maximum technological advance and maximum military security in a fallout-free world. Instead, the US has settled for a treaty in which the prevention of fallout is the only major advantage and in which grave technological and military risks are involved. At this writing no one has raised the question of why we did so. It's a good question.—END



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NATO voice of
command...**

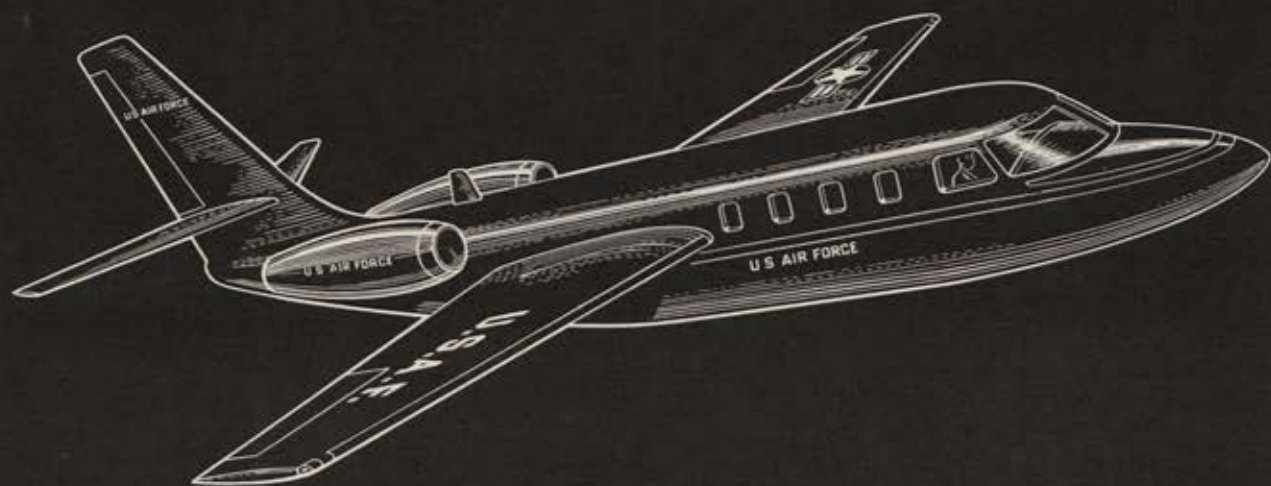
During World War II, the air over Anthorn, England, crackled with control-tower chatter typical of B-17 bases everywhere. Soon, that air will be charged again — this time with the big voice of NATO's new Very-Low-Frequency radio transmitter. With a power of 550-kw, it will feed a six-point-star antenna array stretching 4300 ft. over the old runways.

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Long recognized as the producer of the world's most powerful transmitters, Continental produced the megawatt Voice of America transmitters, the BMEWS multimegawatt radar transmitters, and Nike-Zeus acquisition radar. Combined with Continental's activity in the fields of standard broadcast AM, HF, UHF, Single Sideband and microwave transmitters, these projects reflect another facet of LTV versatility. Continental Electronics Manufacturing Company, 4212 South Buckner Blvd., Dallas 27, Texas, a subsidiary of Ling-Temco-Vought, Inc.

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AIRPOWER in the news



By Claude Witze

SENIOR EDITOR, AIR FORCE/SPACE DIGEST

Where Does the Hot Line Lead?

WASHINGTON, D.C., AUGUST 14

While watching senatorial investigations into the award of the TFX contract to the General Dynamics/Grumman team and of the X-22 V/STOL contract to Bell Aerosystems Company, there has been a fascinating parallel exercise that may not be alien to these major subjects. It has been the progress, through the House and Senate, of the authorization bill for the National Aeronautics and Space Administration.

The New York Times, which is under no compulsion to get morassed in a million technological details, said editorially that there is a "hot line" between the White House and Capitol Hill and that its temperature was kept high about the first of the month with insistence that approval be given to a new space electronics center in Boston. At one point this \$50 million project was rejected. Later it was given a blessing. This led the Times to speculate that it is only a coincidence that the center's biggest booster is Senator Edward M. Kennedy, the President's brother. Senator Kennedy, you may remember, campaigned last year on the promise that he "can do more for Massachusetts." It has been charged on the floor of the Senate that the Boston center won committee approval "under White House pressure," and there has been no spirited denial of this on behalf of the Administration.

The point to be made is that in the case of what can be done for Massachusetts there has been a fairly open discussion of the role of the White House. In the case of what could be done for Texas and New York, which are the states involved in the TFX and X-22 matters, there has been a minimum of discussion. A Capitol Hill cynic, looking at the way these source-selection decisions were handled, has commented that the trend is toward the procurement of weapon systems "by the kind of procedures used to buy trap rock at Boston City Hall." That is an extreme statement here in 1963, but it is true that this Administration has, as a goal, the confinement of source-selection decisions to a narrow secretariat. The utility of a "hot line" from the White House or party headquarters in this situation cannot be contested.

Current witness before the Senate Subcommittee on Investigations that is probing the TFX situation is Air Force Secretary Eugene M. Zuckert. He is easily the most competent witness the Pentagon has produced and shows more over-all familiarity with his material than any other, in uniform or out. He came prepared, at one session, to place in the record a list of contractor representatives and members of Congress who had contacted him in regard to the pending TFX decision last year between January 17 and October 18, which covers nine crucial months leading up to the verdict. All during those visits it was assumed by contractors and congressmen alike that a couple of hundred men on the payroll of the Air Force and Navy would contribute to a source-selection recommendation that would,

unless it broke considerable precedent, determine the winner. Said Mr. Zuckert on the stand, "I was never subjected to the slightest bit of outside influence whatsoever." He did not add that the most important reason for this was that the existing source-selection procedure was designed to guarantee the futility of "outside influence."

Probably the most portentous part of Mr. Zuckert's testimony dealt with his evaluation of the evaluations, as they were presented to the Service Secretaries. This is important because, regardless of the merits of the long-established source-selection system, and the buffer it provides between the secretariat and pressures, it is vulnerable if a critic of Mr. Zuckert's stature can cite serious failings.

The Air Force Secretary had repeated, at the Senate hearing, the same formal presentation that he had seen, along with the Source Selection Board and the Air Force Council, last November. He said it showed how closely the competitors had been rated. Yet, the operational section of the briefing gave the Boeing design a higher score and expressed a preference for it. And this was the section of which Mr. Zuckert was most critical:

"It must be understood, however, that the operational portion of the briefing was not a balanced résumé," he told the Senators. "Unlike other portions, it did not purport to summarize both sides of the actual evaluations, but was instead a statement of reasons to support a preference for the Boeing design. It was a brief, rather than a briefing."

The Secretary then gave a long review of what had been said in the operational portion of the briefing. And here is the heart of his criterion—and the Defense Department's—of the TFX source-selection machinery:

"We have now seen how the two designs actually compared in the operational area, according to the Fourth Evaluation Report. I have dwelt on this, first, so that you might judge for yourself whether the operational briefing was fairly representative of the evaluations themselves.

"Frankly, I think not. The handful of characteristics it had singled out for Boeing could be found in the evaluations, but only in conjunction with a host of other factors, pro and con, many of which pointed in the direction of General Dynamics. I personally was not affected by this lack of balance.

"According to these hearings, however, none of the members of the Source Selection Board, aside from its nonvoting chairman, apparently read the Fourth Evaluation Report through before they reached their recommendation."

Mr. Zuckert did read the Fourth Evaluation Report and from that was clearly prepared to defend the choice of General Dynamics. There are other persons, many of them highly qualified and objective, who read the same report and disagree with him. From this thorny dilemma, in which honest men came up with different answers, we can legitimately look elsewhere for a balance.

The Secretary of the Air Force, under questioning, said
(Continued on following page)

he had no idea how a reporter for a Fort Worth newspaper was able to write that General Dynamics would get the TFX contract a month before he, Mr. Zuckert, played a role in reaching this decision. It was pointed out that the reporter, Seth Kantor, testified under oath that he had been told what the decision would be by "very high echelon people," and he did not say they worked in the Pentagon. Logically, the Air Force Secretary pointed out the reporter did not get his tip from military sources because, if he had, the tip would have been wrong. Yet, when an inquisitor said the story must have originated "at the level where the decision for General Dynamics was made," Mr. Zuckert replied, "That is a speculation on your part." He went on to point out that some newspaper stories are not true. Well, the fact is that Mr. Kantor's story in the Fort Worth paper was true, and if he did not get it from top Administration sources he lied under oath to the committee. It is hard to think of a motive for him to do this.

In view of some recent history it is equally hard to avoid the possibility that the TFX award to General Dynamics over Boeing and the X-22 award to Bell over Douglas were policy decisions now being supported after the fact with technological arguments. Two obvious examples of this pattern were the RS-70 and Skybolt reversals. The death of both of these projects as weapon systems came about because they were inconsistent with prevailing strategic doctrine. In both cases the technologies involved were portrayed as placing a stress on our capabilities. There is expert evidence that this is not so.

Both the TFX and X-22 investigations have included references to White House interest. Secretary Zuckert told the McClellan committee he has never reported to the White House on the TFX. But, he said, Defense Secretary McNamara had a meeting with the President on the matter. He did not indicate he knew what was said at this meeting, and he was not asked whether he knew. Senator McClellan may be saving the question for Mr. McNamara.

At the X-22 inquiry, before Senator Stennis and the Armed Services Preparedness Investigating Subcommittee, there was greater interest shown in the role of the White House. The X-22 is a V/STOL project, pure research and development, in which the Bell Aerosystems Co. and Douglas were competing. The Navy clearly favored the Douglas proposal, but the decision was left to Deputy Defense Secretary Roswell Gilpatric, who selected Bell. As in the case of the TFX, the race was close. Mr. Gilpatric said that he decided on Bell in three days of consideration, during which he had expert civilian opinion to rely on, "and I also knew the views of the President's Scientific Adviser, Dr. [Jerome] Wiesner." He said Dr. Wiesner's view was that "either of these proposals could accomplish the program objective, provided the deficiencies that had been noted in the technical evaluation were corrected." He said Dr. Wiesner did not recommend a source, but again he was not asked about other White House suggestions. On another day, Dr. James H. Wakelin, Assistant Secretary of the Navy for Research and Development, said Dr. Wiesner had heard the Navy presentation on the X-22 proposals, which was what the committee counsel called a "source-selection briefing." Yet Dr. Wakelin testified that Dr. Wiesner had no interest in anything but the technical factors, and denied there was any discussion with him about the source. The subject seems to have been brought up because the Stennis committee found a Navy Department document, signed by Vice Adm. Paul D. Stroop, former Chief of the Bureau of Naval Weapons, that said, "It is understood that the White House was expressing considerable interest in this Navy-managed program." The source of this understanding was traced, on the

stand. It turned out to be Dr. Wakelin. If he told the Navy the White House interest was in "technical factors," the document signed by the Admiral did not relay that information.

When Dr. Harold Brown, Director of Defense Research and Engineering, was on the stand, the committee learned that in addition to Dr. Wiesner's technical interest in the V/STOL project, he would be involved in budgetary decisions and that he had been the recipient of "congressional interest." Later, Senator Barry Goldwater asked, "What mechanics do we go through to get Dr. Wiesner interested in us?" The answer:

"I think it was perhaps the other way around, Senator Goldwater. I think that, as I understood it, the White House or [Dr. Wiesner] was contacted by some congressman who had an interest in this program, and that was one of the reasons he came in. He already had been in, as I say, because of technical interests of his own."

This made it clear that the interest of the congressman who called Dr. Wiesner was not technical. If he handled nontechnical interests for congressmen it is not unreasonable that he might handle them for the White House as well.

There has been considerable discussion in the past month of the ethical conduct of some persons involved in the TFX and X-22 source-selection procedures. Specifically, Fred Korth, Navy Secretary, and Mr. Gilpatric have been mentioned. Mr. Korth was president of a bank in Fort Worth, Tex., that has a modest amount of credit available for the General Dynamics Corporation. Mr. Gilpatric comes from a New York law firm that has General Dynamics as a client. Whether these are conflicts of interest in a statutory sense is something only the courts can decide. No one has seriously suggested either man was influenced by any personal profit motive in his source-selection decisions. It should, however, go in the record that a man in uniform would be subject to disciplinary action if he were involved in this kind of situation, no matter how uncorrupt either his motives or actions might be. The civilian secretariat is not subject to military discipline. But its vulnerability to what might come over a "hot line" from the White House is no less than that of a Senate committee.

In fact, it is more.

Inadvertence Is Persistent

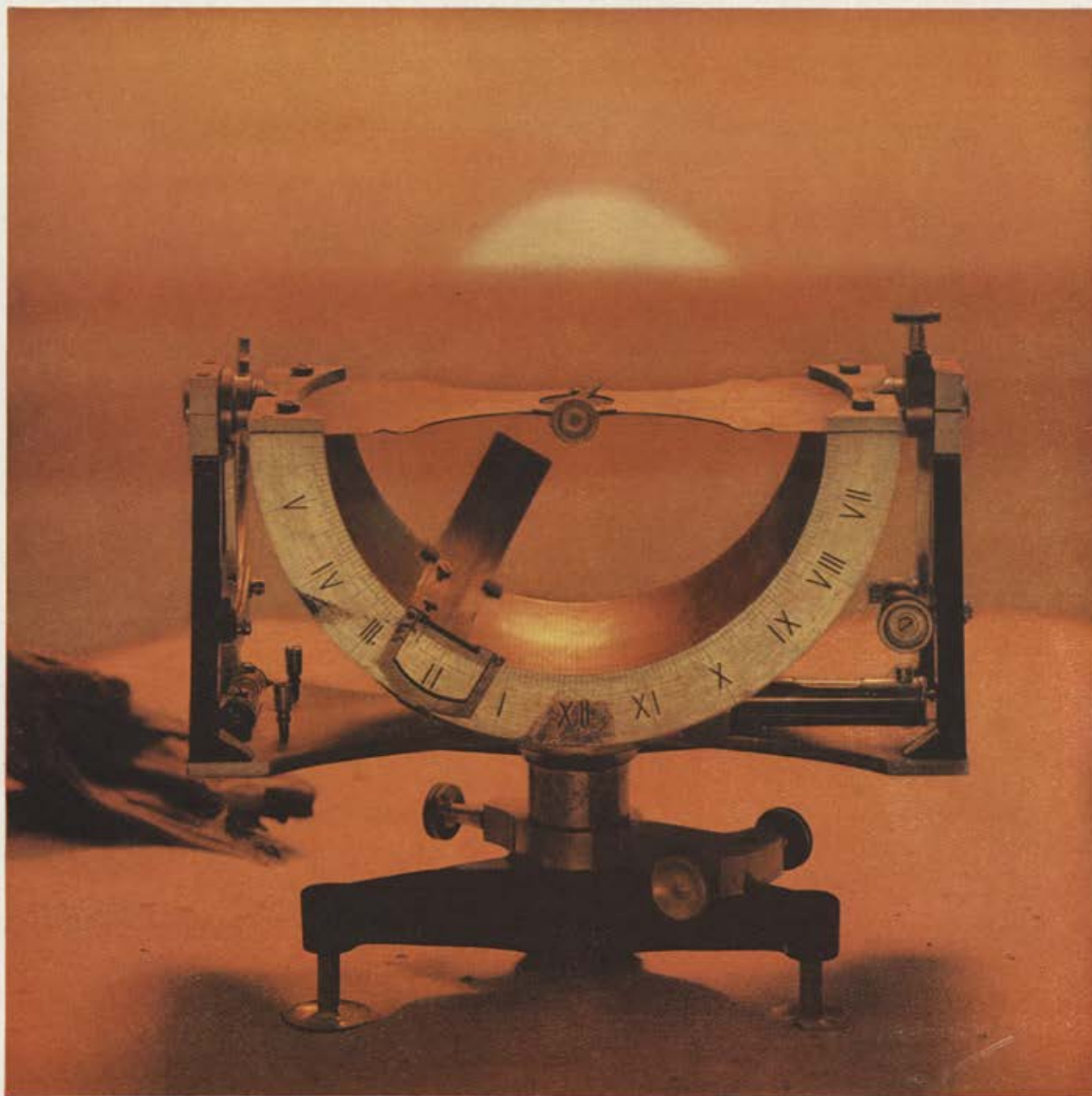
On July 11, at a press briefing on his cost reduction program, Defense Secretary Robert McNamara said:

"Now . . . I want to refer to the cost-plus contracts. These are contracts under which we agree to reimburse the contractor for whatever costs he incurs and in addition to that we pay him a fee, either a percentage of the cost or a fixed fee, depending on the nature of the contract.

"As you can well imagine, I imagine this places no pressure on the contractor to reduce his costs because if he reduces them, in certain cases, his fee actually goes down. In other cases the fee remains constant but we pay for a lesser amount. If he increases the cost, in some cases his fee goes up, where the fee is a percentage of the cost. . . . They are the worst possible form of contract. This has been recognized for years and years. I have operated under them from the other end, and I can speak with some experience on what happens from that end of the equation, and I know exactly what is happening here."

The transcript of the briefing does not show that any reporter challenged Mr. McNamara on this statement. It was accepted as fact.

Later in the day, there was made available at the office
(Continued on page 19)



Wheeler's Solar Chronometer (American—19th Century)—Courtesy Cranbrook Institute of Science

from solar chronometer to space booster guidance

The Wheeler Solar Chronometer was designed to indicate true sun time and longitude, with corrections for the seasons and the earth's position. Highly accurate though it was, the instrument had the basic fault of all sun dials: it was utterly worthless when the sun went down.

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of the Assistant Secretary for Public Affairs, an "Answer to Inquiries." It said:

"Secretary McNamara, at his news conference concerning the cost-reduction program, today inadvertently left the impression that cost-plus-fixed-fee contracts may be cost-plus-a-percentage-of-cost contracts, in which case the contractor gets a flat percent of the costs of the contract.

"Such is not the case. In fact, such contracts are illegal, and rightfully so, since the incentive is for the contractor to incur more costs."

It may be that some reporters asked the question and received this answer. Certainly the correction did not get wide distribution in the daily or trade press.

The correction did nothing to reverse the impression that a cost-plus-fixed-fee contract is anything except what its name implies. The fee is fixed. If a contractor agrees to do a job for \$4 and anticipates costs of \$100, he will get the \$4 even if the costs drop to \$90. If they go to \$200 he still gets \$4, providing that the customer has not changed his order in the course of its being filled.

This is not the "worst possible form of contract" and it has a proper place in the procurement business, which is known to most executives who operate "under them from the other end."

The Pentagon's claim to an inadvertency also made no reference to Mr. McNamara's testimony of last March 28 before the Subcommittee on Defense Procurement of the Joint Economic Committee. Under questioning by Chairman Paul H. Douglas, the Defense Secretary said:

"In a contract in which the formula provides for reimbursement of all costs plus x percent of cost as profit, it simply means that as cost rises the profit rises. This has been a traditional form of contract. As I say, in my mind, that gives an inverse incentive."

Any military procurement officer knows that this is *not* a traditional form of contract and that it has been illegal since some time before World War II. Senator Douglas is an economist studying some procurement areas and appears to accept Mr. McNamara's word. From the dialogue that followed it is clear that the Senator thinks profit is figured as a percentage of cost in some contracts and that

any cost-plus-fixed-fee contract "frequently leads to a padding of costs." There was no reference to the fact that costs are reviewed and passed upon by the customer.

It is not clear what is being accomplished by this kind of repeated inadvertency. It is essential that industry and the press be alert to its appearance and challenge the spokesman, no matter what his position.

The Road to Mediocrity

Short memories are common in this city.

There are sound reasons in mid-1963 to recall the 1961 report of the Subcommittee on National Security Policy of the Senate Committee on Government Operations. This group, headed by Senator Henry M. Jackson, recorded in 1960 and 1961 some illuminating testimony about people, including those in the Pentagon. The transcripts of what was said by Robert A. Lovett, Adm. Arthur W. Radford, Gen. Maxwell D. Taylor, and Thomas S. Gates, Jr., should be filed for permanent reference.

At one point, in November of 1961, Senator Jackson issued a "final statement" in which he posed the major question of our era. The Senator said it is this:

"Can free societies outplan, outperform, outlast—and if need be, out sacrifice—totalitarian systems? Can we recognize fresh problems in a changing world—and respond in time with new plans for meeting them?"

Then he listed broad conclusions, and one of them was:

"Good national security policy requires both good policy makers and good policy machinery. But organizational changes cannot solve problems which are really not due to organizational weaknesses.

"More often than not, poor decisions are traceable not to machinery but to people—to their inexperience, their failure to comprehend the full significance of information crossing their desks, to their indecisiveness or lack of wisdom."

Defense Secretary Robert McNamara, who was a witness before the Jackson subcommittee on August 7, 1961, said he had been fortunate in being able, at that early stage in his regime, "to recruit men of great ability." He said that he faced only two major problems, the low salaries he was able to offer in the upper echelons and the conflict-of-interest regulations. He pleaded for relief in both areas.

There is a long list of secretaryships, assistant and deputy secretaryships on the Pentagon rosters. Almost without exception these positions have been filled in the past by high-salaried men out of industry who have taken substantial pay cuts to serve. Their single reward, in most cases, has been the prestige of the office and the administrative power that goes with it.

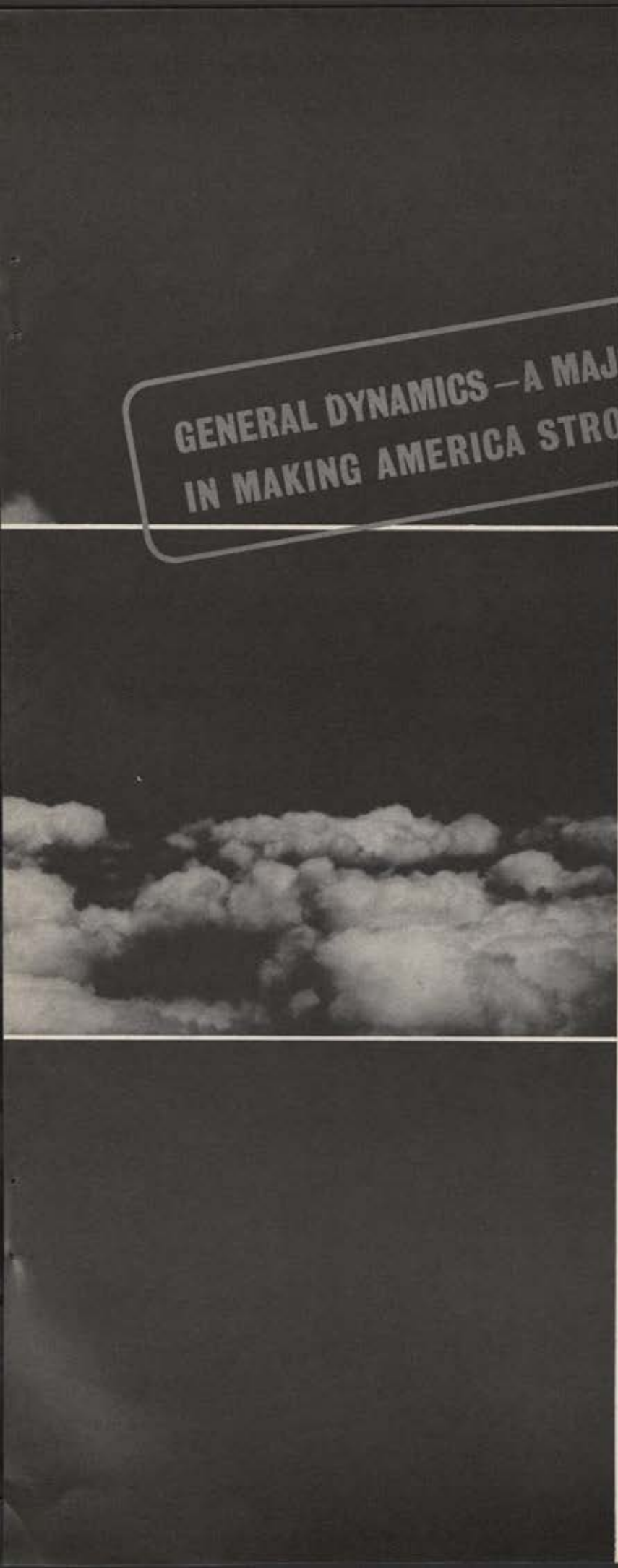
Since 1961, when all this good advice was recorded by the Jackson subcommittee, these jobs have been steadily degraded in both power and prestige. It is necessary to recall only the parting sad song of Elvis J. Stahr, Jr., first Secretary of the Army in the Kennedy Administration, to identify the way in which the Defense secretariat has grown increasingly unattractive to competent men.

The status of the civilian Secretaries of the Army, Navy, and Air Force is protected by law. Mr. Stahr did not refer to this in his comments, but he made it clear that decision making has been taken over by Mr. McNamara, down to the point where most executives would look upon it as an "overreaching" of control. There is today a real threat to our capability in the reluctance of nominees to take these jobs. When an assistant secretary's desk must be filled by an appeal to an employment agency, the third-rate executives are on their way in.—END



Newest approach in the V/STOL studies now going on is the triservice Curtiss-Wright X-19, unveiled recently at Caldwell, N. J. Army, Navy, and USAF will evaluate the aircraft for a variety of missions, including transport, search and rescue, armed escort, surveillance, ASW, fire support, and infiltration. The X-19 is designed to land and take off vertically, shift to horizontal flight by tilting its propellers, and fly at 460 mph in level flight. It will have a capacity of 1,200 pounds or six passengers in the cargo version.





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USAF B-58 Bomber
Convair 990 Airliner
USAF F-106 Interceptor

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For a Brighter Future

Gentlemen: Amen and a thousand more amens to your July editorial [on military pay]. You have taken the words right out of my heart on prospects for the future of military personnel.

AIR FORCE/SPACE DIGEST is getting better all the time, and I like the balance you're keeping between the "aerospace" features and the "down-to-earth" articles like "The Vocation of Arms," by Maj. Paul L. Briand, Jr., and Capt. Malham M. Wakin.

Keep up the good work.

ENTHUSIAST

Gentlemen: John F. Loosbrock's editorial in the July issue is a masterpiece.

With a fourteen-year-old son who aspires to the Air Force Academy, I

have often pondered how, when, and in what manner, I should describe or present "The Dark Side of a Bright Future."

Editor Loosbrock has come to my rescue! I shall save his editorial until the appropriate time. I am sure that in the few intervening years there will be little if any change.

LT. COL. A. F. MACNIVEN
Geiger Field, Wash.

Success or Failure?

Gentlemen: After carefully reading Vernon V. Aspaturian's article titled "Dialectics and Duplicity in Soviet Diplomacy" [July issue], I want only to repeat one statement he wrote. "Although Khrushchev's Cuban enterprise failed, it was nevertheless a rational gamble which only narrowly missed being successfully executed."

Mr. Aspaturian . . . will have to do more researching to make me swallow that remark. With Khrushchev's troops on Cuban soil, please explain how his enterprise failed. How gullible can we get?

GRAEFF A. GALEBACH
Maytown, Pa.

Nothing "Leisurely" About It!

Gentlemen: I like Amrom Katz's article on tactical reconnaissance ["Some Ramblings and Musings on Tactical Reconnaissance," August '63 issue]. It needed saying. But I wonder just where he was sitting during World War II and those limited conflicts he talks about that he can categorically describe their pace as "leisurely." Football looks leisurely from the box seats but just try stopping a burly tackle on his way to the showers

Throughout the



and saying, "That was a good leisurely game out there today, fella."

Are we talking about the same wars, Mr. Katz?

H. VOLK GATTI
Chevy Chase, Md.

Dear Mr. Gatti: Before I am accused of being antisemitic, let me explain again what I meant. Clearly, anyone of my readers who was involved in World War II or Korea, or anyone else involved in any one or more of the dirty little wars that have sullied history since World War II, has a legitimate, understandable, and moral right to take severe umbrage at my usage of "leisurely." I don't mean that the wars were "phoney," that they were regarded as vacation sport by the participants, that prosecution of war was desultory, or that long lunch breaks were taken. I did mean that there was enough time to change procedures, try new ideas, and gradually converge toward a "better" operation.

Remember, I said "comparative," and in my paper I defined this term by reference to the kind of pace envisioned by some strategists for some kinds of thermonuclear war. Let me be more specific. I suggest that "limited" wars have been, and likely will continue to be, characterized by "months" and "years" rather than by

"days" and "weeks." That's all.

Am I sure of this? Of course not! If I am forced to make a single statement about the future, it is that *I believe the future will be composed of a series of unique situations.* We had better stop looking in our library of past occurrences for an exact carbon copy of the future. *The future ain't going to be no retread.* Consider this simple, but relevant, point. (I almost said pedestrian example!) I remember when street-car passes were introduced in Milwaukee. This was about one hundred years ago, say 1928. Every week a new pattern was printed to assist conductors in rejecting the pass of the previous week. Some of us thought that if we saved all the old passes, eventually the patterns would repeat and we'd have a free pass. It never happened. As the old German folk saying puts it, "*A n chtige Tag!*" [A loose translation—"That'll be the day!"—The Editors.] There are still some loons in Milwaukee, about 1,800 passes later, collecting passes, and waiting for the cycle to repeat! They are good historians but it still costs them a new pass each week. I recall also that many of us made (and executed) adequate contingency plans. The original N-person game was getting N persons to ride the same street car on one pass. We did it, and did

related maneuvers, close-order drills, and variations on the theme, as well. But that's another set of stories. All this doesn't mean that we should ignore history lest, as others have previously suggested, we may be condemned to repeat it. The worst kind of mistakes are old mistakes.

Can we count on future limited wars lasting, in this sense? What if they're not so intended? My answer is, count on nothing, and especially count not on intentions which can change faster than capabilities can be developed. I argued that *recce* principles and practice were developed during World War II (and redeveloped in Korea). I don't believe that anyone engaged in this development made inquiries or was concerned about intentions with respect to the duration of the war.

It might be sporting to wait for a limited war and then to start improvising. But this sporting component is scarcely enough to recommend such waiting. I proposed *preparing to improvise*, and suggested a revision of attitudes and experimental programs to develop and sharpen required skills, and to discover and uncover people who have these skills.

These suggestions may not cover all future situations. I'll be happy if my
(Continued on page 27)

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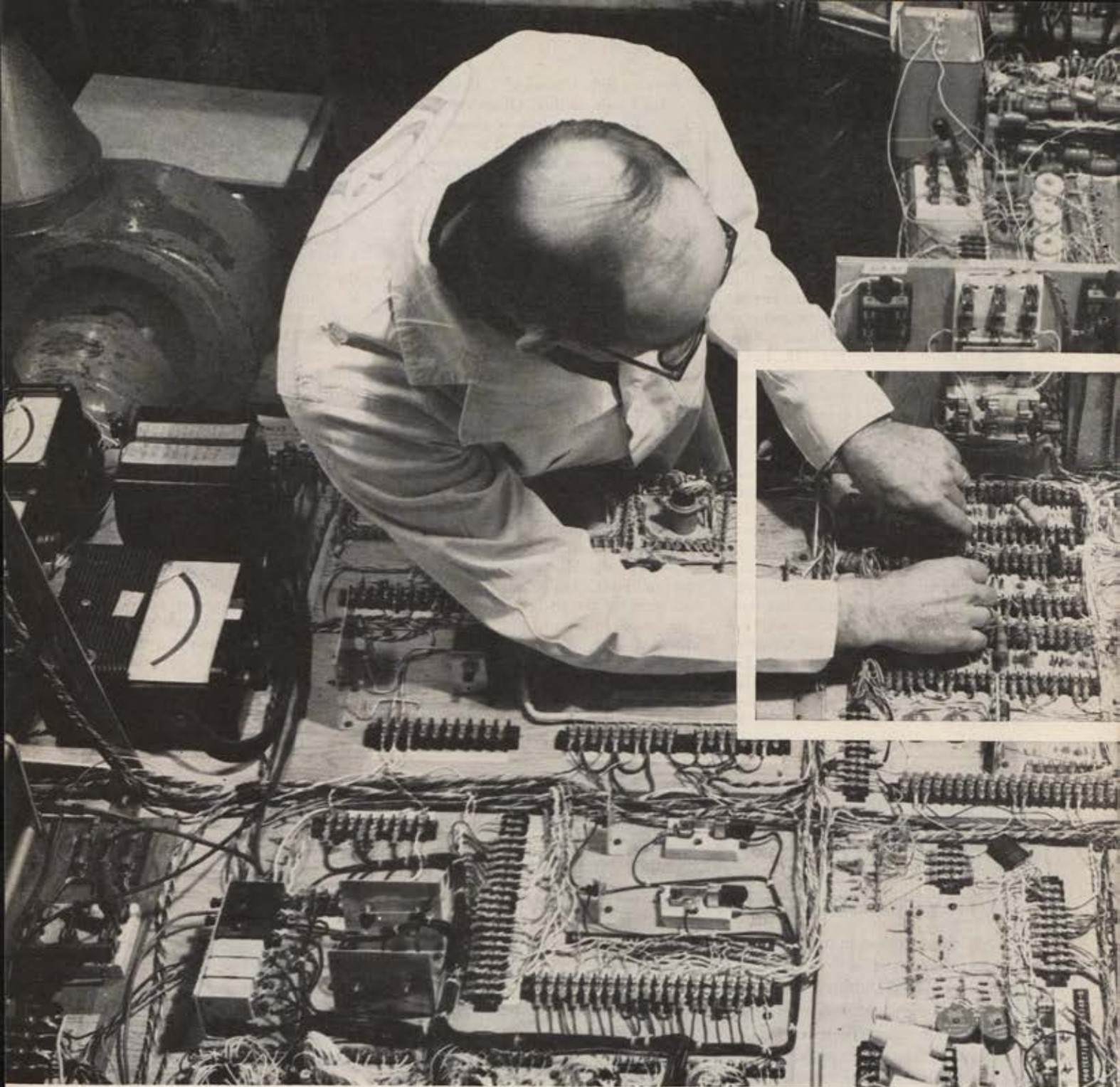


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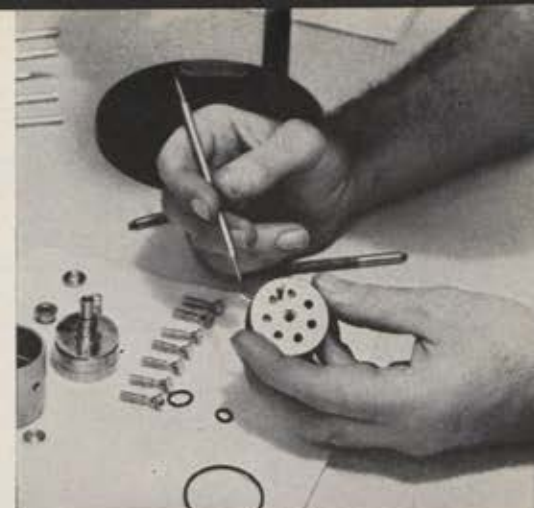
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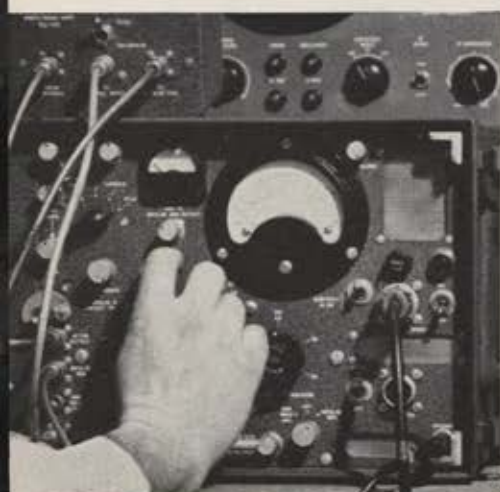
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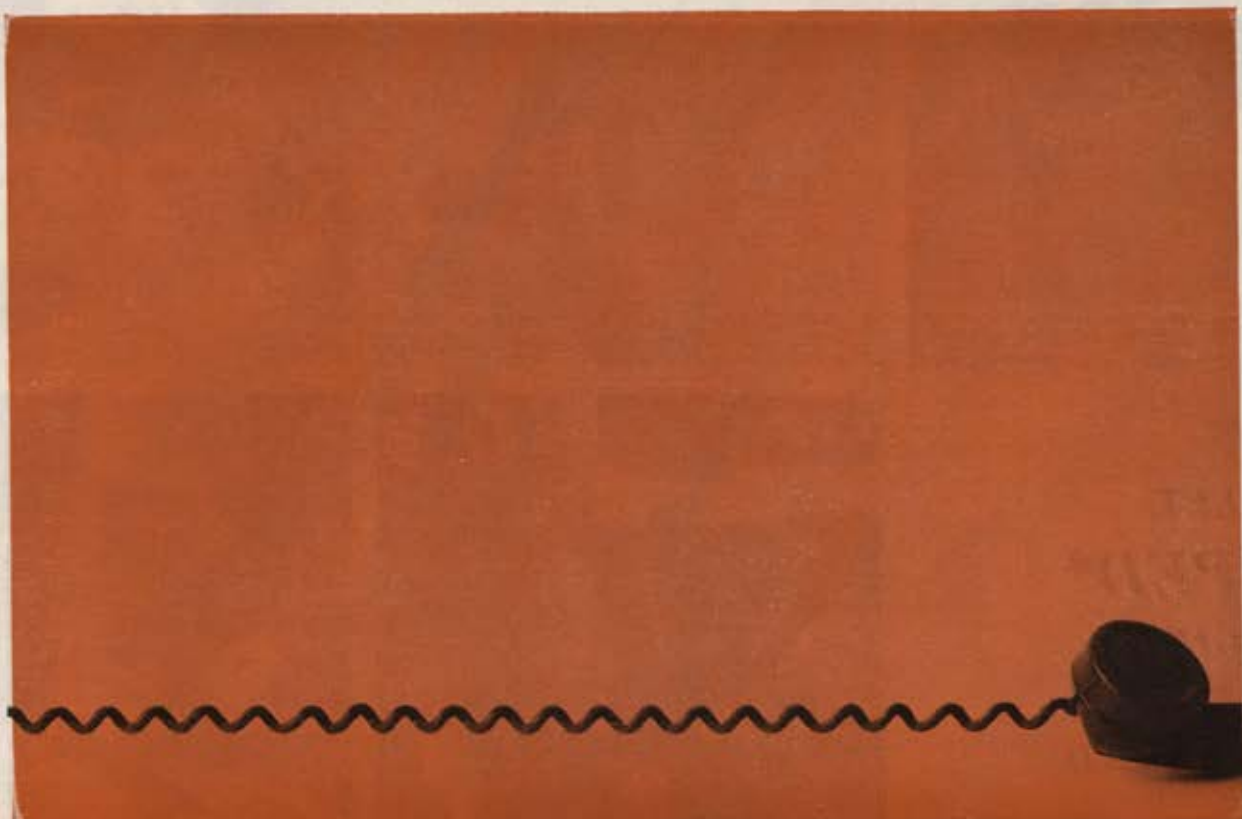
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ideas dent the problem, if they aim in the right quadrant, and if we stop worshipping at the shrine of prepackaged mechanistic "solutions."

AMROM KATZ
Santa Monica, Calif.

New Logistics Era

Gentlemen: Please convey my appreciation and congratulations to Mr. Allan Scholin for his interesting and excellent story "Push-Button Logistics" in the July issue of *AIR FORCE/SPACE DIGEST*. His grasp for the big logistics picture and interesting style in reporting it have a rare and fine touch.

MAJ. GEN. T. ALAN BENNETT
Director, Office of Maintenance
Engineering
Hq. AFLC
Wright-Patterson AFB, Ohio

Gentlemen: Al Scholin's story on logistics was one of the best I have read on the subject. His factual reporting of the maintenance story was of particular interest and excellently done. This came as no surprise to me as I was aware of his logistics background as well as his journalistic skill. Let's have him do more of same soon.

COL. DONALD L. DAVIS
Hq. AFLC
Wright-Patterson AFB, Ohio

Is This the Road to World Peace?

Gentlemen: I feel that *AIR FORCE/SPACE DIGEST* is a fine magazine as far as it goes. But in view of the overriding issues concerning our national security, I feel that *AIR FORCE* does not contain the really vital information that military personnel should be receiving from someone. Let me try to explain. I notice that the objective of the Air Force Association is adequate aerospace power for national security and world peace. As I see it, national security and world peace are counter-objectives in the light of post-World War II events. For example, in the interest of world peace, we

1. Denied ourselves victory in Korea.
2. Allowed ourselves to be forced into the Berlin Airlift.
3. Did not respond during the Hungarian uprising.
4. Forced a Communistic coalition government on Laos.
5. Permitted the Berlin wall to be built and remain.
6. Paid for the UN action against pro-west Katanga.
7. Imposed a nuclear test ban on ourselves.

(Continued on following page)



"Don't tell me about 99% quality. Would you ride in it?"

(From an imaginary but realistic exchange between a Source Selection Board and Tapco.)

Source Selection Board (cont.): This thing has *hundreds* of components. Put in just one that's only 99% good, and there goes your mission.

TAPCO: I didn't mean 99% *performance*. Our stuff *works*. Our reliability factor is 99 and five or six more nines. Sometimes we express it in thousands or tens of thousands of hours mean time between failures. Or a failure probability per cycle of one times ten to the minus eight power. That's as close to perfection as you can get.

SSB: But you said 99% quality.

TAPCO: Right. *Quality*. Actually, it's 99.4%. We've delivered better than 10 million missile and aircraft subsystems, components, parts — rocket nozzles, APU's, fuel pumps, you name it. Of all

these just six-tenths of one percent required corrective action.

SSB: Let's hear about those.

TAPCO: Sure. Most of those oddballs were in the early roll-off stages. In many cases the problem wasn't quality control but *communications*. We and our customer hadn't reached complete understanding on requirements, check-out procedures, or test-stand correlation, the sort of things engineers and quality people get together on and iron out.

SSB: I hear you. But would you *ride* in it?

TAPCO: Yes, I'd ride in it.

If you'd like to continue this conversation in terms of your specific requirements, write R. A. Paetz, Director, Requirements and Contracts, Tapco, TRW, 23555 Euclid Ave., Cleveland 17, Ohio.

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AIRMAIL CONTINUED

8. Backed down and reversed ourselves on Cuba to where we now protect Castro.

We can have world peace as long as we are willing to appease or fail to act because of fear of war. In the process, however, our national security becomes increasingly doubtful. Every citizen, and particularly every commissioned officer, should be aware of Public Law 87-297 (Arms Control and Disarmament Act of 1961) and State Department Publication 7277, which provides for the ultimate transfer of control of our deterrent forces to the UN. I wonder how many American military men are aware that the head of the UN military staff is always a Communist. Incredible? It certainly is. Your magazine could bring this type of information to those who are to be so vitally involved.

In closing, may I suggest that the objective of the Air Force Association be changed from "Aerospace power for national security and world peace" to "Aerospace power for national security and national honor."

MAJ. HAROLD T. BOEHM,
USAF (RET.)
Tacoma, Wash.

Eastern Air Command History

Gentlemen: I am working on a history of the Eastern Air Command of USSTAF during World War II. Will anyone who served on the Eastern Air Command, or in one of the flying units that operated into its bases, contact me?

I am particularly interested in corresponding with anyone who has any pertinent materials from his association with the Command still in his possession.

CAPT. THOMAS A. JULIAN,
USAF
Department of History
USAF Academy, Colo.

UNIT REUNIONS

36th Fighter Wing Officers

The first week end in October has been set for the 36th Fighter Wing Officers' Reunion in Oklahoma City, Okla., Contact:

Capt. Ron Everett, Reunion Sec'y
SAFOI-2a, The Pentagon
Washington 25, D. C.

American Balloon Corps Veterans

The National Association of American Balloon Corps Veterans will hold their annual reunion in the Continental Hotel, Kansas City, Mo., October 2-5, 1963. All former members of the Balloon Service and their wives are invited. Former Ballooners (or if you know any former Ballooners please notify them of this reunion) contact:

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For additional information about all Bell helicopters, write Dept. 334J MIL, P. O. Box 482, Fort Worth, Texas.



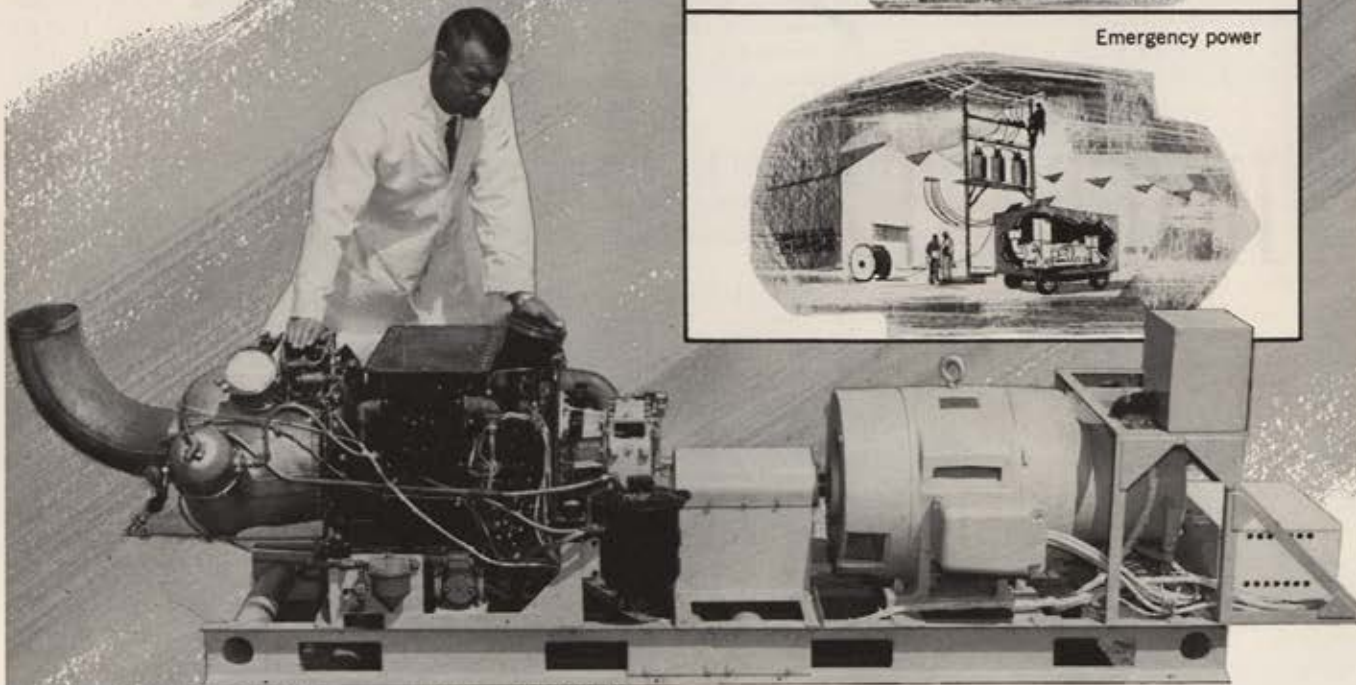
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AEROSPACE WORLD

By Allan R. Scholin

ASSOCIATE EDITOR, AIR FORCE/SPACE DIGEST

WASHINGTON, D. C.
AUGUST 17

Swift Strike III, the nation's biggest military exercise since the Louisiana maneuvers of 1941, ended with a flourish August 16 when Gen. Paul D. Adams, Commander in Chief of US Strike Command and director of the exercise, suddenly ordered the 101st Airborne Division to withdraw from the maneuvers because of a simulated real emergency elsewhere.

The 101st scrambled to round up its men and equipment, scattered over hundreds of square miles in the Carolina sandhills, piled into waiting transports, and flew off to an unspecified destination which turned out to be its home base, Fort Campbell, Ky.—but could just as well have been an island in the Caribbean.

General Adams and his commanders and staff will be sifting the results of Swift Strike III for some time to come. It was an exercise of unbelievable complexity, with two Army divisions and a numbered Air Force on each side, harrassed by guerrilla and counter-guerrilla units, and involving thousands of civilians in the exercise area. Military forces totaled 96,000 men.

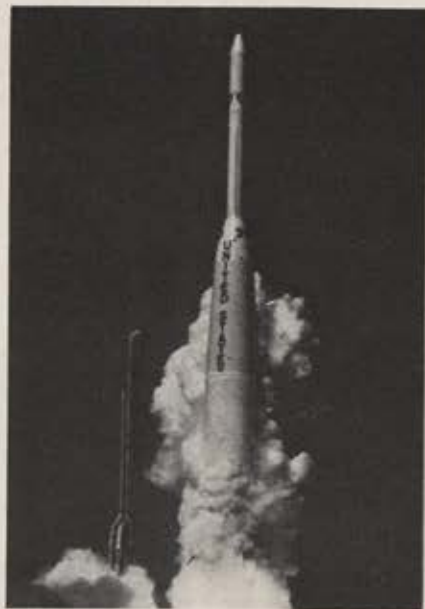
As is inevitable when, happily, no weapons are actually fired, there was a lot of confusion between Red and Blue forces over who did what to whom. Red air forces, for example, claimed more kills than the Blues did in air-to-air combat. But the Blues concentrated their initial efforts on shooting up Red airfields so that many of the Red aircraft which claimed kills were theoretically not even in the air.

There was confusion, too, among newsmen observing the first massive airdrops of men and equipment when the ground phase of the battle got under way early in August. Packed into a neck of land between two drop zones, they were forced to scatter when part of the airborne force was dropped overhead and some of them filed stories that the drop was a flop. It turned out, however, that the drop was well within combat range and that the mistake had been in herding them too close to the drop zones.

General Adams, at least, was well pleased with the performance of his forces in the most realistic major exercise so far conducted under his command—and is already well along with plans for new exercises (see *Continued on following page*)



TSgt. Kellis E. Deaver, member of a Tactical Air Command combat-control team guiding paratrooper-laden aircraft into the drop zone in Swift Strike III, discusses his mission with his boss, Gen. Walter C. Sweeney, Jr., TAC Commander.



Syncom II, Hughes-built communications satellite, is lifted off at Cape Canaveral, July 26, by a three-stage Douglas Thor-Delta into a 22,000-mile-high orbit which keeps it almost stationary in relation to the earth.



Six of the Air Force's top commanders who retired July 31 were guests of Gen. Curtis E. LeMay, USAF Chief of Staff, at a dinner at Bolling AFB in Washington, D.C., August 7. From left are General LeMay; Gen. Samuel E. Anderson, who retired as Air Deputy to the Supreme Allied Commander, Europe; Gen. Emmett O'Donnell, Commander of the Pacific Air Forces; Gen. Truman H. Landon, Commander, US Air Forces in Europe; Lt. Gen. George W. Mundy, Commander, Alaskan Command; Lt. Gen. James E. Briggs, Commander, Air Training Command; and Maj. Gen. William T. Hefley, Commander of the Warner-Robins AMA.

below) calculated to tax the capabilities of his forces.



There has been a lot of talk in recent years about the ability of US airlift to meet Army demands for ground forces mobility. Now the US Strike Command proposes to put that capability to a realistic test.

In the exercise, scheduled for sometime this fall, Strike Command will call upon MATS to airlift an entire armored division—less organic equipment—from Texas to Europe. Once there, the second phase of the exercise will be to see how long it takes the division to unpack its prepositioned equipment and go into action.

Biggest burden of the exercise falls upon MATS, which will have to employ a major portion of its transport force in making the move. The problem is far more complicated than merely scheduling, say, 150 aircraft to carry 100 men each. To bring that many aircraft into a small area at minimum intervals will swamp airways and communications, probably requiring suspension or diversion of civil air traffic. The same is true at the European end, complicated by the need

to clear such arrangements with several foreign governments.

Meanwhile, with its normal airlift demands continuing, MATS will have to call on contract air carriers to expand their services, and to make use of Air Reserve Forces cargo units.

But that is exactly the purpose of the exercise—to find out what bottlenecks exist and how to overcome them, and to get a better indication of how far our airlift can be stretched.

From many angles, it should be an interesting exercise. And it's a cinch that both our NATO allies and military leaders beyond the Iron Curtain will be watching to see how well our forces perform.



A defense against the ICBM is "beyond us and beyond the Soviets technically," President Kennedy reported in a press conference in Washington, August 1. "Many who work in it feel that perhaps it can never be successfully accomplished."

Though it is not impossible to intercept a single ICBM—the Army has demonstrated such a capability in its Nike-Zeus tests in the Pacific against USAF-launched ICBMs—the advan-

tage still lies with the offense, the President said, because the problem is one of discrimination—to pick out lethal warheads among "a hundred objects flying through the air at thousands of miles an hour."

The Army curiously continues to announce only its successes in intercepting ICBM warheads while failures go unreported, but it is apparent from the President's statement that more is being learned about offensive than defensive techniques. The Army privately acknowledges that its intercept attempts have provided USAF with data to design warheads and techniques which make interception more difficult.

Both the Army and Air Force are contributing data input to ARPA's PRESS project—Pacific Range Electromagnetic Signatures Studies—and, as we reported in May, USAF has shifted its Advanced Ballistic Reentry Systems tests to the Pacific range to contribute to that effort.

Early in August the Defense Department announced the US will participate with Britain and Australia in

(Continued on page 35)

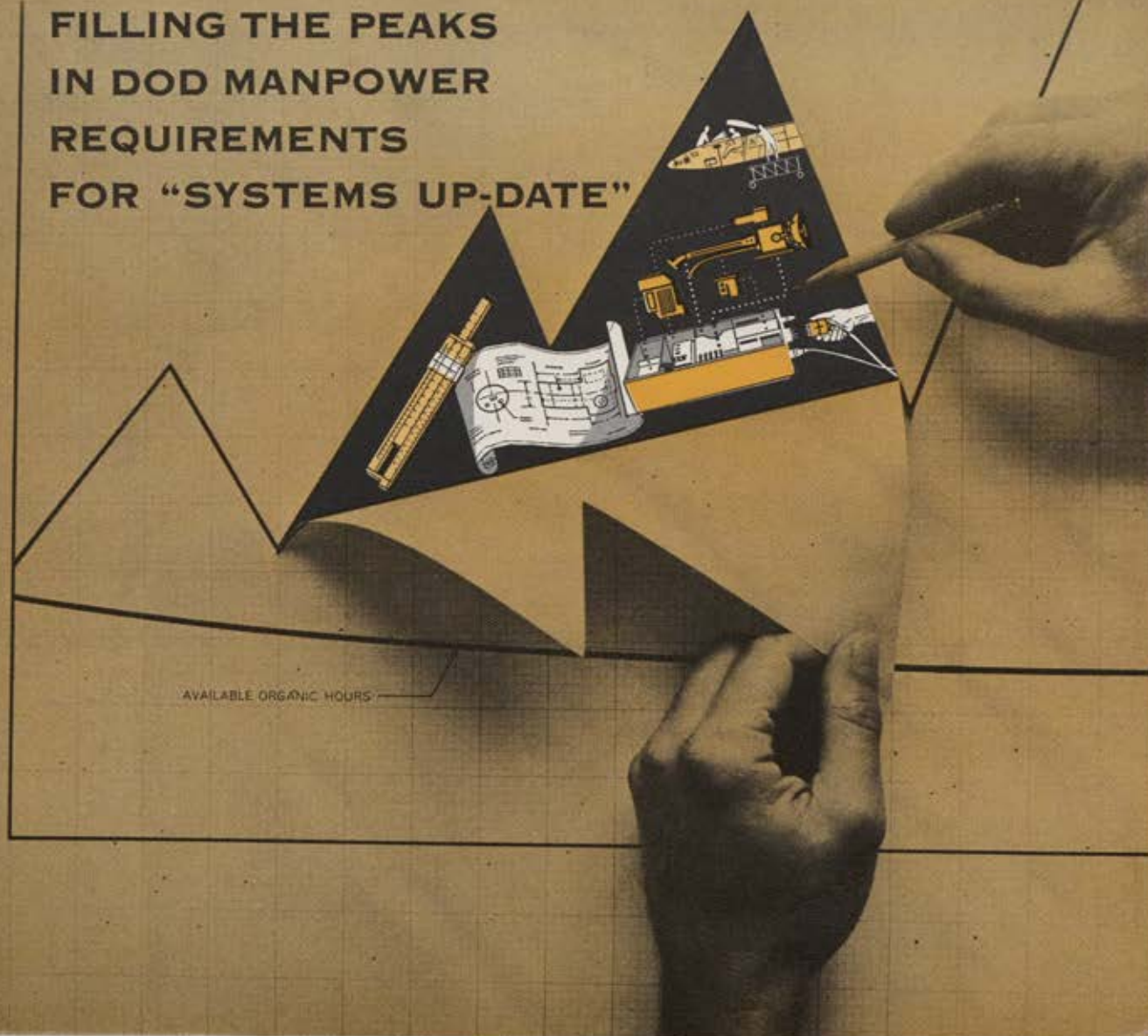
Mackay Trophy for 1962 was presented at Fort Worth, Tex., August 8, by USAF Undersecretary Brockway McMillan, left, to Maj. Robert G. Sowers and Capt. John T. Walton and Robert MacDonald, B-58 crew who set transcontinental round-trip speed record.



Rocket motor generating one million pound thrust is successfully tested in inverted position at Coyote, Calif., July 20. Two of these motors, built by United Technology Center, will make up the first stage of the Titan III-C space booster, scheduled to launch USAF's Dyna-Soar into orbit in 1966.

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still another phase of reentry studies called Project Dazzle.

Its announced purpose is to uncover basic phenomena on the behavior of objects reentering the atmosphere. An understanding of such data, the announcement indicated, will be invaluable in developing new means of identifying and tracking warheads or other objects—in short, improving our ability to discriminate among objects of various weights, sizes, and materials. Thus the US may still hope to come up with some technique to defend against ICBMs—or to devise warheads which cannot be picked out by a Soviet anti-ICBM.

The Dazzle project, to be conducted from Australia's Woomera range, will employ the British Black Knight research missile, built by Sanders Roe Division of Westland Aircraft. The rocket's first stage will boost one of various reentry bodies to a designated altitude, the second stage will shoot it back toward earth. ARPA will provide instrumentation to record what happens to the body on reentry.



Also on the missile front, the Department of Defense has asked USAF to prepare a plan for single-manager operation of all US missile ranges. Atlantic Missile Range at Patrick AFB, Fla., is now USAF operated; Navy runs the Pacific range; and the Army runs White Sands. Presumably, if it approves the study, DoD will put the Air Force in charge of all ranges, with Army and Navy supporting various phases. Maj. Gen. Leighton I. Davis, AMR Commander, who as DoD representative on Project Mercury has had control of all ranges during orbital missions and has already been assigned the same function on military aspects of Project Gemini, would be the logical man to run the enterprise.



Syncom II, NASA's communication's satellite launched on July 26 from Cape Canaveral, is in a virtually synchronous orbit some 22,000 miles above the Atlantic. Early indications are that its repeater communications equipment is operating flawlessly, in distinct contrast to its predecessor, Syncom I, which went silent as soon as it was launched last February 14 and hasn't been heard from since.

Syncom II, built by Hughes Aircraft Company, was boosted aloft by a Thor-Delta vehicle at 10:33 a.m. EDT on July 26, with an initial perigee of 140 miles and apogee of 23,

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000 miles. Five-and-a-half hours later, near apogee, a 1,000-pound-thrust motor kicked it into a circular orbit just above 22,000 miles high. Subsequent adjustments over the next few days by small hydrogen-peroxide jets corrected its drift so that it now flies a lazy-eight pattern along the 55th meridian within thirty-three degrees north and south of the equator.

It joins Relay I in space which holds the record for performance and durability, topping Telstar I's record of 185 days. As this is written Relay I has logged 222 days of operation.

Meanwhile, Telstar II, AT&T's second privately financed communications

satellite, which had been launched May 7, took an unauthorized four-week vacation, going silent over the Indian Ocean on its 450th orbit July 16. On August 12, AT&T engineers at Andover, N. H., received indications it was ready to go back to work and succeeded in restoring normal transmission on its 622d orbit.

In other launch activities of the month, the Soviets sent up Cosmos 19 on August 6 in an orbit angled at forty-nine degrees to the equator, indicating that it is one in a series of relatively small scientific satellites. Its orbit ranges from 168 miles to 322
(Continued on following page)



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miles, in a 92.2-minute circuit. This was the first Cosmos launch since May 24. The Air Force, meanwhile, launched four classified satellites—three Thor-Agenas from Vandenberg AFB, Calif., presumably in the Discoverer series, on July 18, 19, and 30, and an Atlas-Agena from Pt. Arguello, Calif., also on July 19. In announcing that the capsule-snagging 6593d Test Squadron of Hickam AFB, Hawaii, had been presented the Outstanding Unit Award, USAF disclosed that the squadron had successfully recovered more than seventy-five percent of capsules released by USAF satellites.

USAF launched two Minuteman C missiles from Cape Canaveral on July 24 and August 5, but the latter was scored as a partial success when it fell short of its intended range. Two more Minutemen were successfully fired by SAC crews at Vandenberg AFB, July 27 and August 8, making twelve out of fourteen Minuteman successes from there.

In a nonorbital flight from Cape Canaveral, USAF boosted a Blue Scout, Jr., 8,000 miles into space with an instrument package on July 30.

The Navy registered three more successes with its A-3 Polaris in pad launchings from Cape Canaveral on July 18 and 26 and August 13, while the Army logged two successful Nike-Zeus tests at White Sands, N. M., July 26 and August 8.



At the Mach 2.5 speed and high-altitude flight of the F-111, it would be impossible for crew members to survive an ejection from the plane. Instead, the F-111 will have an elaborate system for jettisoning the crew in an emergency. An "exploding wire" device will literally cut the crew pod away from the rest of the plane, taking along a portion of the wings and fuselage to provide initial stability. A 50,000-pound-thrust rocket motor will propel the pod clear of the aircraft. Firing of the rocket will also release radar chaff and switch on a transceiver radio and flashing beacon to help rescuers locate the pod. Then a small drogue chute will pop out to stabilize and slow down the pod, followed by a larger chute to lower it gently to the ground. The system also provides for underwater ejection. If the plane is ditched and sinks, the rocket motor will not be actuated, but the crew pod will separate at a preset depth and float to the surface.



NEWS NOTES . . . Joe Walker, NASA's X-15 pilot, topped Maj. Bob

White's altitude record July 19, reaching 348,000 feet (sixty-six miles). Major White's mark was 314,750 feet. The July 19 record wasn't expected to last long, though, for the X-15 is being launched on a new series of tests with a goal of 400,000 feet. . . . TAC's 1st Air Commando Wing has two new squadrons, equipped with the Douglas A-1E fighter, once known as the Navy AD-5. Lt. Col. Gene O. Mueller commands the 603d and Capt. John R. Datte the 604th. . . . Northrop's F-5A Freedom Fighter made its first flight at Edwards AFB, Calif., July 31. Starting with the fifth production aircraft, the F-5A will be equipped with two 20-mm. nose cannon. . . . In Long Thrust VIII late in July, MATS flew an infantry battle group of 2,840 men and almost ninety tons of equipment from Forbes AFB, Kan., to Rhein-Main, Germany, and a comparable force back home in less than seventy hours. It required only thirteen EASTAF C-135s, flying a total of forty-four missions. . . . When an earthquake leveled the city of Skopje, Yugoslavia, July 27, C-130s of USAFE's 322d Air Division airlifted a 120-bed Army hospital, supplies, and relief personnel totaling 266 tons within twenty-four hours to care for injured and assist in recovery operations. . . . USAF's rate of major aircraft accidents dropped to 4.5 for the first six months of 1963, well under 1962's record low of 5.7. . . . The third Minuteman flight at Ellsworth AFB, S. D., became operational late in July, making thirty missiles ready there.



STAFF CHANGES . . . Maj. Gen. Jack J. Catton, from Commander, 823d Air Div., SAC, Homestead AFB, Fla., to Commander, 821st Strategic Aerospace Div., SAC, Ellsworth AFB, S. D. . . . Brig. Gen. Roger M. Crow, from Commander, 821st Strategic Aerospace Div., SAC, Ellsworth AFB, S. D., to Deputy Director for Operations, J-3, The Joint Staff, Office, JCS, Washington, D. C. . . . Brig. Gen. Howard A. Davis, from Commander, 72d Bomb Wing, SAC, to Commander, 57th Air Div. SAC, Westover AFB, Mass. . . . Brig. Gen. John N. Ewbank, Jr., from Inspector General, to Assistant Deputy for Operations, Hq. TAC, Langley AFB, Va. . . . Brig. Gen. John T. Fitzwater, from Chief, the USAF Group, Joint Military Mission for Aid to Turkey, to Assistant Deputy for Plans, Hq. TAC, Langley AFB, Va.

Maj. Gen. Alvan C. Gillem, II, from Commander, 57th Air Div., SAC, Westover AFB, Mass., to Commander, 823d Air Div., SAC, Homestead AFB, Fla. . . . Brig. Gen. David M. Jones, from Deputy for Systems Management, to Vice Commander, Hq. ASD, AFSC, Wright-Patterson AFB, Ohio. . . . Brig. Gen. Hubert S. Judy, from Commander, Montgomery ADS, ADC, and NORAD (CONAD), Gunter AFB, Ala., to Commander, 32d

(Continued on page 40)



Man, carrying MAN-CARRYING engine ...and that's not double-talk

As a matter of fact, though, it usually works the other way 'round, with the engine carrying the man. But this emphasizes the light weight—130 pounds, ready to run—of Continental's new 250-hp T65-T-1 turboshaft engine. The engine is being developed for light observation helicopters, and meets all Military and FAA requirements. It is compact—40 inches long by 19 wide by 18 high. Unusual design simplicity makes for maintenance ease as well as for the operating reliability for which Continental turbines are noted—reliability proved in more than 5,000 J69-series turbines in military use.



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But as the United States progressed first into the missile age and then into the space age, urgent requirements arose for huge, intricate, frequently unmanned machines capable of carrying out fully automatic missions in strange new environments. The job of designing, engineering, producing, and testing a single weapon or space system thus became one of integrating all of the system’s innumerable elements at the same time and ensuring that they all work harmoniously toward the same final goal.

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ASW CONTINUED

ADS, ADC, and NORAD (CONAD), same base. . . . Brig. Gen. Kyle L. Riddle, from Assistant Deputy for Operations, to Inspector General, Hq. TAC, Langley AFB, Va. . . . Maj. Gen. James B. Tip-ton, from Commander, Washington ADS, ADC, and NORAD (CONAD), Fort Lee AFS, Va., to Director, Joint Test and Evaluation Task Force, US Strike Command, MacDill AFB, Fla.

PROMOTIONS. . . . Seven brigadier generals have been confirmed for promotion to the rank of major general. They are:

Brig. Gen. Abe J. Beck, Inspector General, Hq. SAC, Offutt AFB, Neb. . . . Brig. Gen. Robert H. Curtin, Director of Civil Engineering, DCS/P&R, Hq. USAF. . . . Brig. Gen. Bertram C. Harrison, Deputy Inspector General, Office, TIG, Norton AFB, Calif. . . . Brig. Gen. Henry C. Huglin, Asst. CoS, Hq. NORAD (CONAD), Ent AFB, Colo. . . . Brig. Gen. Joseph T. Kingsley, Special Assistant for Military Assistance Affairs, Office, JCS, Washington, D. C. . . . Brig. Gen. William S. Steele, Deputy Director, Military Assistance, Office, Assistant Secretary (ISA), OSD . . . Brig. Gen. John W. White, Commander, AF Special Weapons Center, AFSC, Kirtland AFB, N. M.

Nineteen colonels have been confirmed for promotion to the rank of brigadier general. They are:

Col. Royal B. Allison, Director of Plans, Hq. USAFE. . . . Col. William C. Bacon, Commander, 12th Strategic Aerospace Div., SAC . . . Col. George S. Boylan, Jr., Deputy Director, Aerospace Programs, DCS/P&R, Hq. USAF. . . . Col. Thomas P. Corwin, Commander, AF Accounting and Finance Center, Denver, Colo. . . . Col. William T. Daly, Commander, 464th Troop Carrier Wing, TAC, Pope AFB, N. C. . . . Col. Russell E. Dougherty, Assistant Director of Plans for Joint and NSC Matters, DCS/Plans and Operations, Hq. USAF.

Col. Stebbins W. Griffith, Deputy Chief of Staff, J-2, Hq. NORAD, Ent AFB, Colo. . . . Col. Ernest C. Hardin, Jr., Military Assistant to Secretary of Defense . . . Col. Fred J. Higgins, Staff Judge Advocate, Hq. AFLC, Wright-Patterson AFB, Ohio. . . . Col. James H. Isbell, Commander, 2d Air Reserve Region CONAC, Andrews AFB, Md. . . . Col. Oris B. Johnson, Assistant DSC/Operations, Hq. USAFE. . . . Col. Andrew S. Low, Jr., Staff Officer, Office of Assistant Director for Strategic Weapons, DDR&E, OSD. . . . Col. William J. Meng, Deputy Commander, Tactical Air Reconnaissance Center, TAC, Shaw AFB, S. C. . . . Col. William L. Mitchell, Jr., Deputy ACS/Operations (J-3), MAC, Vietnam.

Col. Robert H. McCutcheon, Staff Director, Directorate for Procurement Policy, Office, Deputy Assistant Secretary (Procurement), OASD (Installations & Logistics), OSD. . . . Col. Robert W. Paulson, Assistant Chief of Staff, J-6, Hq. Strike Command, MacDill AFB, Fla. . . . Col. Luther H. Richmond, Staff Plans Officer, Plans and Policy Division, Hq. SHAPE. . . . Col. James T. Stewart, Director of Science and Technology, DCS/R&D, Hq. USAF. . . . Col. Howard J. Withycombe, Commander, 3560th Pilot Training Wing, ATC, Webb AFB, Tex.

RETIRED. . . . Maj. Gen. John M. Breit, Brig. Gen. James O. Guthrie, Brig. Gen. Felix L. Vidal.—END



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THE QUIET MEN AND THE MINIATURE REACTOR One of man's strongest motivating forces is his need to know. It is part of the sense of wonder in a child's eyes—an inborn desire for the answers that will add up to maturity. It is also a source of inspiration for the research scientists of America's aerospace industry.

Today—quietly—certain of these specialists are advancing down the byways of nuclear research, through the unknown realm of the universe, and into the very cosmos where facts and philosophy blend. Along the way, they find more new questions than answers. But already their answers are bearing fruit—for example, miniature new SNAP reactors from NAA's Atomics International Division, with myriad uses on earth, in space, and on the moon.

Research scientists like these are the explorers of the new Age of Space. Seekers for the headwaters of knowledge. Trail breakers whose unerring sense of direction can lead mankind to new plateaus of well-being.

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Welding into a purposeful whole all the skills, dedication, scientific and sociological disciplines, geography, and people that make up the United States Air Force is a monumental task. Each of us should pause from time to time to look beyond the demands of the aerospace profession to the concept of military life as a vocation in the true sense of the word . . .

'TOTAL DEDICATION OF THOUGHTFUL MEN'

By the Hon. Eugene M. Zuckert

SECRETARY OF THE AIR FORCE

EACH year the Air Force Almanac issue of AIR FORCE/SPACE DIGEST conveys the full sweep and flavor of the infinite variety of Air Force responsibilities and activities.

I am constantly impressed that so many disparate parts can be welded together into a cohesive and purposeful whole—the range of military tasks, of hardware, of scientific and sociological disciplines, of geography, of people, that is covered in the all-encompassing phrase—the United States Air Force.

Our job is not an easy one. That goes without saying. But it is made easier by the strong twin threads of professionalism and dedication that run through the fabric of the Air Force. The dedication is accepted without question. The professionalism, the personal obligation to improve oneself, the ability to relate one's own part to the whole, is often lost or diluted in the daily pressure of the job. Each of us should stop from time to time, step back from the job and look beyond to the demands of the profession. Look beyond, to the concept of military life as a vocation in the true sense of the word.

Two thoughtful officers addressed themselves to this question in this magazine recently, in the July issue.

Maj. Paul L. Briand, Jr., and Capt. Malham M. Wakin, both members of the faculty at the Air Force Academy, put it extremely well in their article "The Vocation of Arms," when they wrote:

"If the military wishes to ensure for itself the dignity and prestige which it rightly deserves because of its very purpose for being, then it must assume certain responsibilities. It must squarely face the issue of vocations as any thinking human being must in any type of work. It must be convinced that the values at stake are worth a total commitment. If it wishes to merit the respect of others, it must first respect itself; and internal respect for the military way of life begins when all servicemen view it not as a job, not as a profession, but as a vocation. . . .

"If the American way of life is really more important than life itself, then the military life is, indeed, a noble calling. The vocation of arms deserves the total dedication of thoughtful men and the respect of free men everywhere."

I am glad the Air Force has officers who can think and write this way. I am certain others will emulate them. This magazine provides both an outlet and a source for such creative activity.—END



We pay plenty of attention to the need for modern weapon systems and how to get the most for our money. But we neglect to apply the same degree of management to a resource money can't buy — the skilled men we must have to run our weapon systems. In a vital, timely message, the Air Force Chief of Staff discusses the problem — and how it must be resolved . . .

ACTION to meet the Air Force's growing requirement for professional competence is one of the most critical tasks facing us today. Presenting the case for approval and support of the personnel measures involved in that task claims a major share of attention and effort.

The need for continuing emphasis on this effort has resulted in large degree from a tendency over the years to devote overriding attention to weaponry. We have been told that muskets ended the era of armored knights, that machine guns stabilized the fronts of World War I, and that the airplane has added a new dimension to warfare. The implied assumption has been that people to service and employ those weapons would always be available.

To carry that false assumption into the aerospace age could create a fatal blind spot in the public outlook toward our requirement for skilled and experienced people. We must, therefore, state the case for professionalism clearly and often to guard against that possibility.

The Eight-Point Program . . .

That is why we are emphasizing the importance of actions proposed in our Eight-Point Program—a program that is designed to increase the retention rate of people in technical, specialized assignments. These are measures that should complement the pay increase. We learned from experience in 1958 that a pay increase by itself will not solve all our problems of at-

tracting and retaining the kind of people we need.

The Eight-Point Program's important influence on retention is indicated by the fact that it affects family interests and the prospects that are offered for career advancement. In the area of family interest, the program applies to housing, family separation, dependent medical care, retirement, and fringe benefits. It seeks improvement of career-advancement prospects through actions that affect educational opportunities, the annual output of Academy graduates, and promotion.

After scanning this list of problem areas a first reaction may very well be that they are routine items that we can live with for a long time. That reaction may even be accompanied by a tendency to shrug it all off with the suggestion that we seek piecemeal gains by submitting our proposals as matters of routine.

That is precisely the point of view that we have to overcome—the point of view that routine personnel management practices can be depended on to bring the essential increases in the skill and experience of our people while improvements in aerospace hardware are being advanced as a matter of first priority.

Our most urgent problem is the retention on a career basis of junior officers and certain first-term airmen with specialized and technical skills. In the scientific and engineering field our over-all officer retention rate for FY 1963 was fifteen percent. The retention rate for some skills in that area was only seven percent.

EIGHT WAYS TO KEEP THE MEN WE NEED

By Gen. Curtis E. LeMay

CHIEF OF STAFF, US AIR FORCE

On the airman side of the picture we needed 17,000 reenlistments in technically skilled fields during fiscal year 1963. We obtained only forty-one percent of the needed input.

This failure to achieve 100 percent of our reenlistment objectives results in a lack of continuity and a pyramiding of training costs.

In accounting for military defeats our historians have traditionally described the losers as being outnumbered, outgunned, or outranged. In the unfolding era of aerospace operations, future historians could very well be justified in describing a future loser as being outskilled.

That would be an inexcusable fate for an aerospace force that obtains its people from the manpower reservoir of the most technically advanced nation in the world. The mere fact that it would be inexcusable does not remove it from the realm of possibility. Safeguards against that possibility are imperative. Those safeguards must take the form of action to make the appeal of an Air Force career reasonably competitive with the civilian careers that are open to people with similar ability.

1. Provide Adequate Housing

None of the actions we are advocating can contribute more to the well-being of our people than the provision of family housing. That has been a priority project in the Air Force for many years. Through this effort we have achieved an increase from 30,000 units

in 1947 to a count of 156,505, of which ninety-three percent are adequate. We have a long way to go, however, to meet the present need for more family housing and BOQs near Air Force facilities.

In areas where the Air Force is conducting operations that will extend over a long period, our programs call for government-built housing. We have proposed leased housing as the best answer in areas where operations are under way for short or indeterminate periods.

Prospects for the future are promising if we sustain the family housing effort at all levels of command. Continued efforts must also be applied to improve the on-base housing facilities for bachelors who comprise an important segment of the Air Force.

Our approach to this housing problem is spurred by two considerations. Improved living conditions will naturally do much to boost the morale of Air Force families and increase for them the attractiveness of an Air Force career. It also will increase the effectiveness of our operations by giving our people comfortable living quarters close to their duty areas.

2. Keep Families Together

In our efforts to increase the incentives of an Air Force career, there is a clear necessity to guard against undue family separations. Airmen and officers have consistently reported that separation from their families for reasons other than military necessity is an undesirable feature. We know that the adverse reaction to this hardship has been a major factor in causing Air Force families to decide against a service career. The unfavorable impact of the dependents' travel ban resulting from the Berlin buildup in 1962 was reported by seventy-five percent of our officers who were surveyed on that point. These are the considerations that provide the basis for our position that military dependents should be allowed to accompany their sponsors on all overseas assignments unless military necessity makes the ban on travel unavoidable.

Unlike a hot-war situation, which imposes hardship over a relatively brief interval, an era of international tension imposes intermittent hardship over an extended span of years. That factor further underscores the importance of keeping family separation to a minimum.

3. Strengthen Medical Care

In their outlook toward an Air Force career, our officers and airmen very naturally are concerned with the provisions for dependent medical care. Prolonged family separations and continued adjustments to new climates and conditions accent the importance of that care. Present provisions are inadequate as a result of limitations on dental care for dependents.

Now authorized only to relieve pain and suffering or in remote areas of assignment where civilian facilities are not available, the dental care provided falls far short of normal family requirements. The legislative

(Continued on following page)



Air Force personnel, whose work often involves painful family separation, are increasingly concerned with provision of adequate medical and dental care for their dependents.



Chipping away at fringe benefits, such as the savings and conveniences represented by BXs and commissaries, is penny-wise-pound foolish. The "fringes" are important to morale.

program which the military departments have developed to correct this situation merits support as a major step toward improved retention.

Increases in the number of retired personnel over the next several years will also require expansion of facilities for medical treatment. A Department of Defense committee studying this problem is expected to submit its recommendations to the military departments and DoD in November. Prompt and effective action on these recommendations will be needed to fill another gap in our measures to improve retention.

4. Assure Retirement Pay

Retention is influenced to a far greater degree by the assurance of retirement benefits than by the here-and-now compensations of an Air Force career. It is, therefore, extremely important that this major career incentive be maintained intact with effective safeguards against erosion.

5. Don't Infringe on Benefits

Where fringe benefits are concerned, a lot of our people will insist that about all that remains is the memory. This exaggerated view has resulted from their observation of steady attacks on commissary and base-exchange privileges. We have strongly recommended active support in retaining these benefits. Not only do commissaries and BXs permit a small financial saving, but they also save travel time. Even more im-

THE MEN WE NEED CONTINUED

portant, those facilities will help assure some of our people who are regularly on a seventy- to eighty-hour week that their services are appreciated and that the matter of their convenience is being considered.

6. Encourage Educational Effort

Through expanding educational opportunities within the Air Force we are meeting two related objectives. One is to accomplish the technical and professional upgrading required for the efficient operation of an aerospace force now—and over the coming years. The other is to provide incentive, competitive with industry, for officers and airmen who want to attain higher levels of education.

Forecasts indicate that the national production of scientists and engineers over the period up to 1972 will fail to meet the needs of our civilian economy alone. That outlook further underscores the need for our in-service program.

The Educational Requirements Board that we established in 1959 has identified shortages of more than 11,000 officers with the education needed in technical fields, and a shortage of 20,000 in other fields. We cannot meet these requirements through the Air Force Reserve Officers Training Program or through officer training schools. This means that we will have to enter about 4,500 officers a year in a combination of selected educational programs to meet this requirement by 1972.

One approach to this task is to take the education to the people who need it most, but who cannot be spared from operational assignments to take courses as resident students. Our Minuteman capsule education program for Launch Control Officers represents a profitable application of that method. By 1965 we will have 860 young officers enrolled in technical degree programs while performing full military duties.

We are planning to achieve further gains in the field of technical education by expanding the Air Force Institute of Technology's Resident School of Engineering. AFIT's target student load capacity of 1,000 has been established to meet our specialized educational needs, particularly in the Air Force Systems Command. Although we could not obtain a "go ahead" on that expansion last year, a second effort to secure approval is under consideration.

Technical education is only part of our requirement. We must develop in our people the competence to manage and use our weapons and forces in an international situation of growing complexity. To meet this need we have established combination programs in our professional military schools. Through arrangements with the George Washington University and our War College and Command and Staff Schools, about 450 officers a year will earn either bachelor's or master's degrees in international and military affairs.

In our off-duty and Operation Bootstrap education programs we have assigned priorities to ensure preference for enrollment in courses most important to our needs. About 800 officers and 300 enlisted men

(Continued on page 50)



Aircraft carriers won't stand still for it.

Obviously, they aren't built to stand still, even though that would be the ideal solution to the problem of rough landings.

By specifying Bendix® struts for your aircraft, whether it is carrier- or land-based, you get landing gears which meet the highest requirements, with special emphasis on reliability, durability and economy.

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Bendix Products Aerospace Division





Into the foreseeable future, the Air Force will continue to need a cadre of superiorly educated junior and senior officers, to meet the aerospace arm's complex requirements.



The technically skilled airman requirement continues to be critical, pyramids training costs, often restricts Air Force project continuity.

are earning degrees through this effort every year. Our records show that more than 360,000 correspondence courses offered by the USAF Extension Course Institute and the US Armed Forces Institute were used by Air Force personnel in one year.

Under the Airmen Education and Commissioning Program, more than 400 airmen are now working toward college-level degrees and Air Force commissions. About seventy percent are seeking degrees in the scientific and engineering fields.

This over-all education program is a vital effort. It inspires retention by challenging and rewarding our people. It builds toward a level of education that is an absolute requisite for success and progress in aerospace operations. This program represents more than an opportunity to the individual and an aid to retention. It is a national asset that enriches the country.

7. Increase Academy Enrollment

In our Air Force Academy we have a source of commissioned officers that combines the major advantages of top professional standards coupled with an eighty-five percent retention rate, which is higher than we have been able to achieve from nonacademy sources. To obtain full benefit from this source, the Air Force has sponsored a legislative proposal to increase authorized strength at the Academy from 2,500 to 4,400. That proposal is now receiving active consideration. Its enactment would enable us to obtain about

THE MEN WE NEED CONTINUED

thirty percent of our over-all annual regular officer input from the Air Force Academy.

8. Open the Promotion Path

Keeping alive the prospects for field-grade officer promotion over the past four years has been a major concern, and we have succeeded only through temporary congressional authorizations to exceed grade ceilings for majors and lieutenant colonels. As a permanent solution to the Air Force officer grade problem, Department of Defense Legislative Item 88-8, which went to Congress in March 1963, proposes a common field-grade authorization for all the services that would bring the Air Force to a level comparable to the Army and Navy. With this new authorization, the Air Force will offer increased career opportunities by providing a more favorable promotion opportunity to its officers.

The airman side of the promotion picture, between fiscal year 1962 and 1963, has shown a ninety percent increase in opportunities for advancement to the grade of master sergeant. Although promotion quotas for airmen have now leveled off, we are attempting to prepare the way for further increases through the proposed airman program that is being reviewed by DoD. In that proposal we are requesting relief from limitations that apply to the top six grades, year-end strength, and the budgetary area.

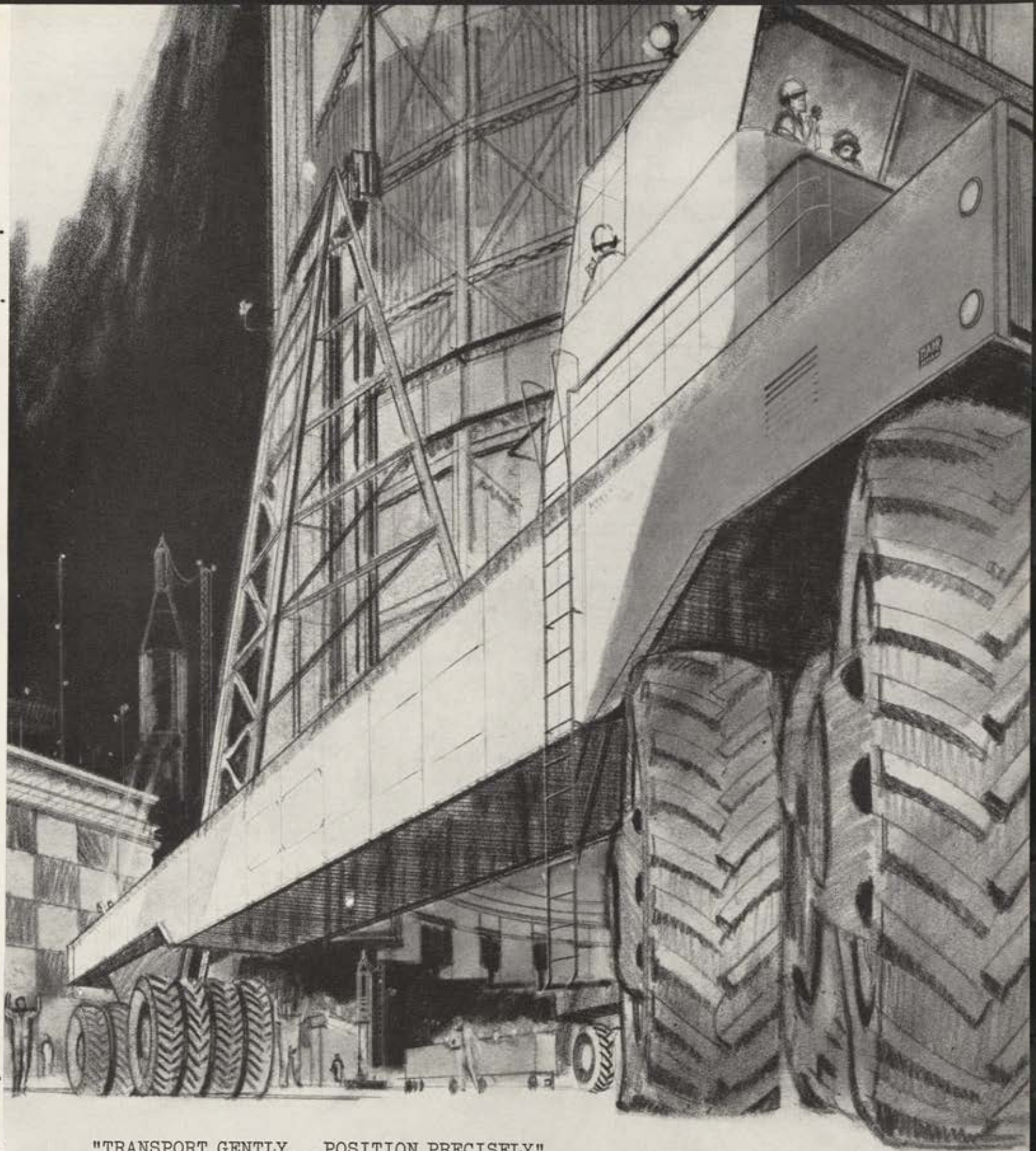
We in the Air Force recognize that this Eight-Point Program is not the complete or final answer to the problem of retention. It includes, however, the measures that are needed now to offer continued attraction to high-caliber people and to retain them in critical specialized fields.

The career incentives to be provided by the actions I have outlined are by no means the only factors that affect our ability to develop and maintain a professional force. Pride of service and a strong sense of mission weigh heavily in our favor. Aerospace operations, by their very nature, keep our people close to the frontiers of scientific progress. Those operations provide interests, challenges, and satisfactions that have sustained aircrews, missile crews, and our people in supporting elements at amazing levels of concentration and effort.

The merit of their performance has been demonstrated repeatedly in their response to crises in Berlin, Korea, Lebanon, Vietnam, and Cuba. They are justifiably proud of the Air Force's vital defense mission in the expanding medium of aerospace.

We are not presenting the retention problem as a record of failure. With all the difficulties experienced, we have the most professional and powerful Air Force in the world.

The important thing to consider is that retention stretches ahead of us as an increasingly important problem in the future. It will demand a better solution than we have found up to this point. That solution will be an indispensable step in developing and employing aerospace forces that can maintain our strategic advantage.—END



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How to move a space launch vehicle from assembly and checkout to the launch complex ready for firing. In solving mobility problems such as this, Clark Equipment Company applies more than 60 years' experience in power transmission, material handling and transportation equipment development and manufacture. Only Clark has this unity of demonstrated capability. Invite Clark Equipment Company to participate in an operations analysis, product or systems development approach to your mobility problem. Write or call Manager, Clark Development Division, Clark Equipment Company, Battle Creek, Michigan.

CLARK
EQUIPMENT

The Air Photographic and Charting Service, a subcommand of MATS, covers the world in its continuing effort to document in pictures the global activities of the US Air Force. Each year APCS's best pictures, both color and black-and-white, are accorded special recognition . . .

FILMING THE FACE OF THE AIR FORCE



APCS color runner-up is a production still shot taken during filming of a motion-picture special film project at the USAF Aerospace Research Pilot School, Edwards AFB, Calif., and shows Lt. James Knight, a student at the school, with a star sphere. The striking picture was made by civilian photographer Kenneth L. Hackman of APCS's 1352d Photo Group.

FROM Cape Canaveral to Kwajalein, from Vandenberg AFB to Vietnam, the significant global assignment of the Air Photographic and Charting Service, a subcommand of the Military Air Transport Service (MATS), is the documentation on film of US Air Force activities ranging from missile launches to combat coverage, and including complex engineering still pictures and motion picture films.

APCS, commanded by Brig. Gen. Robert W. Hall, is headquartered at Orlando AFB, Fla., and includes in its proud professional ranks some 5,000 military and civilian personnel operating both from Orlando and from sites around the world.

Each year, from the thousands of pictures its photographers produce, APCS selects—and it's a hard job—the "Best Photos of the Year" in color and black-and-white categories. The winners and runners-up are featured on the front cover of this Air Force Almanac issue of AIR FORCE/SPACE DIGEST and on these pages.

The color winner, reproduced on the cover, is entitled "Sunrise on the Pad," and strikingly captures the space-age mood. This photograph of an Air Force Thor-Agena on the pad at dawn at Vandenberg AFB, Calif., was shot by A2C Gary Lloyd, a member of APCS's 1369th Photo Squadron. He used a C-6 camera with a setting

of f5.6 and exposure of 1/5 second.

At left, on the opposite page, is the color runner-up, a photo showing Lt. James Knight, USAF, studying celestial navigation at the USAF Aerospace Research Pilot School, Edwards AFB, Calif. It is a Kodachrome production still shot taken by civilian APCS photographer Kenneth Hackman. Mr. Hackman used

a Hasselblad camera set at f4 at 1/25 second.

Top black-and-white entry, also by Mr. Hackman, reproduced in the upper right corner of this page, depicts elements of the Army's 5th Infantry Division (Mechanized) from Fort Carson, Colo., marching to board a MATS C-135 transport at Stapleton Air Field, Denver, Colo., for airlift to the Carolinas and participation in last year's Swift Strike II maneuvers. Mr. Hackman used Tri-X film in a Rolleiflex camera equipped with a K-2 filter. His exposure setting was f16 at 1/500 second.

The black-and-white runner-up, shown bottom left on this page, was shot by A1C Alton G. Gaston, a member of APCS's 1365th Photo Squadron, and captures the image of T-28s en route to the bombing and gunnery range at Eglin AFB, Fla., site of the Special Air Warfare Center. Airman Gaston used Plus-X film in a KS-6 camera, with a setting of f11 and 1/50 second.

AIR FORCE/SPACE DIGEST, cognizant of the day-to-day contribution of APCS photographers to the documentation of USAF's global assignment, is pleased to salute again this year the high professionalism symbolized by these—and so many other—APCS pictures.—END



Winner of top honors in the Air Photographic and Charting service competition for black-and-white pictures and named "Photo of the Year" for this category is Kenneth L. Hackman's dramatic shot of 5th Infantry Division troops from Fort Carson, Colo., marching toward a MATS C-135 for airlift to Swift Strike II exercise last year. Mr. Hackman, an APCS civilian employee with the 1352d Photo Group, also won runner-up honors in the color competition.



Black-and-white runner-up photo shows a trio of Special Air Warfare Center T-28s on their way to the bombing and gunnery range at Eglin AFB, Fla. The picture was made by A1C Alton G. Gaston of APCS's 1365th Photo Squadron.

The DC-9 jetliner can improve the profit picture for airlines wherever routes from 100 to 1500 miles are presently being serviced *by any other airliner*.

First, it promises the same "jet attraction" which brought passengers flocking to the Big Jets when they were introduced. And it has the ability to operate profitably with fewer passengers than any of today's scheduled jetliners.

Airline key to small cities...Douglas **DC-9**



Second, it is designed for unsurpassed reliability and minimum maintenance. Every component has been carefully selected and tested for simplicity as well as efficiency. Jet engines are derated for long life and dependability. Highly accessible servicing areas assure quick turn-around and high productivity.

Third, it will be welcome at small city airports because its noise level will be lower than that of any jet transport now in service.

The DC-9 will carry from 56 to 83 passengers, operate from 5000 foot runways and cruise at 560 mph. It offers jetliner speed and luxury on short route segments where more than 60% of all passenger miles are now flown.



Against the hoped-for day when the Air Force gets the green light for blue-suit stick time in space, a brainy, highly motivated, and skillful band of airmen is learning spaceflight techniques that range from controlled reentry to energy management. They're learning these skills at Edwards AFB, Calif., site of the . . .



Artist's conception shows a pilot nearing 120,000 feet in rocket/turbojet-powered Lockheed NF-104A during a zoom climb down the high-speed corridor at Edwards AFB. He has begun to use the X-15-type reaction control system, which exhausts propellant from wingtips and nose.

USAF Aerospace Research Pilot School

TOUGHEST FLYING SCHOOL IN THE WORLD

By J. S. Butz, Jr.

TECHNICAL EDITOR, AIR FORCE/SPACE DIGEST

SHORTLY after first light on a morning not long ago, a loose formation of F-104As circled high above Rogers Dry Lake, sixty-five miles northeast of Los Angeles. On command, one dropped out of formation and turned leisurely down toward the broad expanse of the dry lake bed.

At 20,000 feet, the pilot began to break, one after another, the most sacred rules of F-104 flying. With practiced deliberateness he pulled the throttle back to idle and killed his power. He extended the speed brakes full out, nearly doubling the aircraft's drag and killing the lift over most of its stubby wings.

Raising the nose he killed off speed, and when the indicated airspeed reached 330 mph, the pilot dropped and locked his landing gear. As the drag-heavy '104, with its lift power hobbled, began to drop "like a

rock," the rate-of-climb needle circled around to the negative side and banged to a stop, indicating that the rate of descent was more than 6,000 feet per minute.

Turning the '104's long nose down to a dive angle of about thirty degrees, the pilot double-checked his course to see that it lined up with his target—the 15,000-foot-long main runway at Edwards Air Force Base. He fixed his eyes on a small patch of green foliage, his first aiming point, 500 feet from the edge of the runway and 5,500 feet from the prescribed touchdown point on the runway.

During the next few seconds, as the Rogers Lake bed accelerated its upward rush, he held the gunsight on the aiming point while adjusting his speed brakes to maintain 340 mph indicated airspeed. If the rate-

(Continued on following page)



Class No. 1 graduated at the Edwards AFB school is shown above with the school's first commandant, Lt. Col. Robert M. Howe, at left. Others, from left, are: William Schweikhard, an AF civilian instructor; James McDivitt, Thomas McElmurry, Frank Borman, and Robert Buchanan. Latter two are now in NASA Astronaut program. Schweikhard, who is nonrated, went through academic portion of the course and rode as passenger in dual-place aircraft through all the training maneuvers, which pilots say is rougher than the piloting. The school is going to accept a number of non-rated students to study some of the problems of training crewmen as well as pilots for future aerospace vehicles.



Capt. James S. McIntyre, a student at the Aerospace Research pilot course, uses a training aid as he reviews basic considerations in a satellite-interception problem during space-navigation phase of academic program.

of-climb gauge had still been functioning, it would have shown that the rate of descent was just above the 15,000-feet-per-minute mark.

As the dive stabilized, the pilot concentrated on his aiming point and the whirling altimeter needle, oblivious to the fact that, as he approached the most crucial part of his piloting task, the tension was driving his pulse and respiration rate up to more than twice normal. His heart was beating 170 times a minute. He was taking one breath every two seconds, and beginning to sweat in the light flying suit. Precisely at 1,400 feet altitude, less than six seconds from the desert that seemed to be climbing into the cockpit, he began a smooth pullup. Automatically, his attention shifted to the accelerometer, the only gauge that could guide him in completing the "landing." Steadily he increased back pressure on the stick until the accelerometer showed two Gs, and he held it without a waver.

The '104 rounded into its flare and the pilot picked up his second aiming point, a large white stripe on the edge of the runway. As the nose came up over the horizon, he held five degrees on the angle of attack indicator and the '104 dropped to the runway, with its tires streaking smoke as they smacked down in a 195-mpH touchdown.

TOUGHEST SCHOOL _____ CONTINUED

Throttleable, 6,000-pound-thrust Rocket-dyne AR-2 rocket engine is mounted in large fairing on tail of the Lockheed NF-104A. Each wingtip has been extended 24 inches.



Col. Charles E. Yeager, the first man to fly faster than sound, commands the Aerospace Research Pilot School at Edwards AFB, Calif. The school is training the reservoir of engineer/pilots who will form the nucleus of the first military spacecrews. Yeager's command is in the process of proving that spaceflight is not only possible but will one day be as routine as supersonic flying today.

The pilot relaxed and eased in his seat as he gently pushed the throttle forward and ran along the ground for five seconds, waiting until the J79 turbojet ran up to full power. As the engine rpm nudged 100 percent he lifted into an easy climb to return to altitude. He logged ten more such landings that morning, along with his fellow students from the Aerospace Research Pilot School who were flying the other aircraft in the F-104 formation.

Some of the landings were of the straight-in dive type. Some used circling X-15 style approaches. But all were extremely rapid and the '104s consistently were hobbled until they could develop little lift. Obviously this training had little to do with normal airplane flying. Its purpose was to expose the students to exactly the same landings they would have to make in any type of advanced reentry vehicle or aerospace craft under consideration by the USAF.

Just a few years ago this highly unorthodox, "space vehicle" flying was considered far too hazardous for any but the most experienced test pilot to attempt as an experiment, much less for sizable groups of Air Force personnel to perform routinely. It required quite a selling job to convince the Air Force that such

(Continued on page 59)

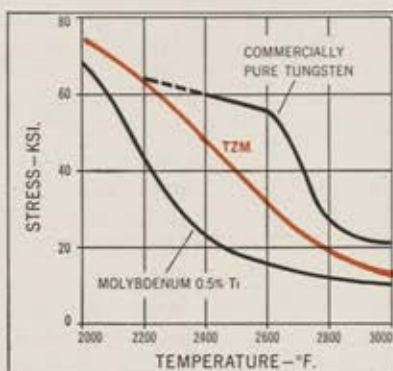
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At 2200F, for example, the



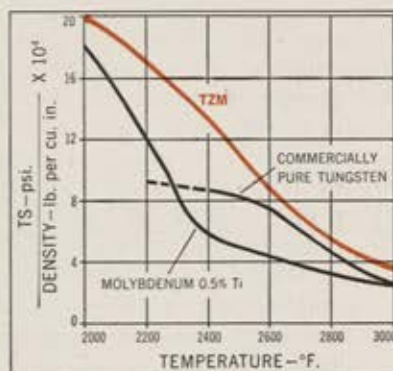
SEE THE STRENGTH—Here's how the short-time tensile strength of Climelt TZM compares with two other uncoated refractory metals.

strength of "superalloys" based on iron, nickel, and cobalt is almost zero. Even unalloyed molybdenum, on the forefront

just a few years ago, has a strength of only 13,000 psi at this temperature. But TZM tensile is guaranteed for 50,000 psi at 2200F. Useable strength goes considerably beyond.

On a strength/density basis, TZM is equivalent to commercially pure tungsten between 2600F and 3000F . . . is considerably better than tungsten at low temperatures. Where oxidation is possible at these high temperatures, TZM can be coated to continue its strength and stability.

Workable, weldable TZM sheet with guaranteed reproducible properties is available NOW . . . in thicknesses from 0.010" to 0.187" . . . in widths to 20" . . . in lengths to 36". Climax Bulletin CMX-S-TZM-1 gives detailed specifications, is



SEE THE WEIGHT—Here's how the strength/weight ratio of Climelt TZM compares with two other uncoated refractory sheet materials.

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CORPORATION

"routine" operations were feasible, desirable, and could contribute materially to the future of the service.

A small group of persistent instructors at the Experimental Test Pilot School—Majs. Frank Borman, Arthur Torosian, Robert S. Buchanan, and Thomas McElmurry—can claim a good share of the credit. They fathered the idea of creating a school in which every feasible facet of space-vehicle operations would be taught through the use of high-performance aircraft, simulators, and an intensive academic course.

This organization exists today in the form of the Aerospace Research Pilot School, which certainly has a strong claim for teaching the world's most difficult flying. In many respects the school's curriculum, including the landing described above, is more difficult than either X-15 flying or NASA's Astronaut training program. The school's main accomplishment in its short history is to remove any doubt that large groups of properly trained pilots can transition into space-vehicle type flying. It has shown that pilots can perform space-vehicle piloting tasks more precisely than previously supposed. And with sufficient practice, even the most difficult maneuvers such as straight-in dive landings can be performed routinely without any more strain on the pilot than conventional supersonic aircraft operations.

Today, the school has a firm future with the Air Force and has been assigned two vital missions. These are:

- To train a group of select pilots to fly and understand the full gamut of advanced vehicles now being proposed. In the immediate future this reservoir of trained personnel is to participate in the development of advanced vehicles in the role of pilot/engineer consultants. They also are prepared to plan and conduct flight tests and evaluations of research, experimental, and production-type aerospace vehicles.

When the time comes this reservoir will form the nucleus of an operational force, serving both as training cadre and as a source for initial flight crews.

- To determine the practical limits of pilot capabilities so that the design of advanced vehicles (especially the first generations) can be kept as realistic and efficient as possible. The large population of students passing through the school should provide conclusive evidence on the practical limits of performance and precision requirements for the operational space-vehicle pilot. These practical limits are of great importance in long-range planning and vehicle design. For instance, it makes considerable difference in the design of recoverable boosters and aerospace-plane-type vehicles if large amounts of automatic equipment must be provided to assist the pilot during the rapid flight into orbit.

Another example of the school's research function is establishing the lower limits of acceptable landing performance for glider-type, reentry vehicles. A few years ago there was great uncertainty regarding this limit.

The X-15 was the only current aircraft designed to land in the same manner as these planned reentry vehicles, with no power and very low lift. Normally,

the X-15 lands with a lift/drag ratio of about 4.0, a wing loading of about seventy pounds per square foot, and a touchdown speed around 200 mph. At one time it was predicted generally that the X-15's rate of descent and landing was about the most rapid and unforgiving that a man could handle. A number of experts called X-15 landings "controlled crashes" and predicted the program would get into trouble.

These opinions are among the "myths" dispelled both by the X-15 program and activities at the new research pilot school. The F-104 landing described at the beginning of this article was considerably hotter than any X-15 landing. The aircraft had been "dirtied-up" until its lift/drag ratio was only 2.8, and it had a high wing loading of eighty pounds per square foot. Talk of landing such a vehicle was regarded as completely unrealistic as little as three years ago. Today, it is "routine."

Naturally, it is going to take considerable flight evidence before an operational space vehicle is designed to land "hotter" than the X-15. But in the long run this is the kind of information that only the school can provide. And this is the kind of information on which superior space vehicles are built.

An important case in point involves the firm Air Force objective to eliminate Mercury-style recovery operations and develop reentry vehicles which can return to a designated airfield and land on a runway. Such landings require lifting power, a relatively high lift/drag ratio. However, a high lift/drag exacts heavy penalties for it involves relatively large lifting surfaces, low payload, high structural weight, and low internal volume for any given vehicle gross weight. Any proof that the minimum allowable lift/drag ratio for landing can be lowered from 4.0 to 3.0 is of great importance for it widens the planners' choices and substantially raises the payload efficiency possible with a glide-type, self-recoverable, reentry vehicle.

Examples of the research contributions possible for the new school are almost endless. It seems inevitable that the school will write the manual for the piloting techniques of future operational aerospace vehicles which unquestionably will have high acceleration rates, a very high speed, low reaction times, marginal stability, and poor lifting characteristics. The school also will play a key role in the development of flight displays, control arrangements, and systems to support the pilot during a variety of stresses.

The Aerospace Research Pilot School began operations officially on October 12, 1961, with the first class of five students. All five, except for an Air Force civilian instructor, were top-rated pilots, having graduated one or two in their class from the test pilot school. All of them had advanced degrees, and there was one Ph.D. in the group. This first class had the responsibility of checking the curriculum and setting up the school as well as attending it. Some of them served as instructors for the follow-on classes. To date twenty-five men with similar qualifications have graduated in three classes.

The school setup has changed somewhat for the
(Continued on following page)

fourth class, which began July 1. There weren't enough qualified applicants to restrict the student body to graduates of the test-pilot course, so a one-year "combined" course has been started. It still carries the name of the Aerospace Research Pilot Course, but the first six months (Phase I) is basically the old test-pilot curriculum.

Present requirements for attending the school are expected to hold indefinitely. An applicant must have: a degree in either engineering, the physical sciences, or mathematics; at least 1,000 hours in late-model aircraft; be under thirty-three years of age, preferably younger; and carry high recommendations from his commanding officer.

Medical requirements are approximately the same as for the Astronaut program. Each applicant must pass an exhaustive week-long physical and psychological examination. These requirements have been influenced strongly by experience in the X-15 program, which showed that there are wide ranges of "normal" behavior for flight crews under stress. Pulse rates of 170 and respiration rates of thirty breaths per minute no longer are considered abnormal.

In Phase I the student receives a thorough grounding in the fundamentals of performance-verification flight testing and stability and control-type flight testing. He learns to plan tests, fly the tests, analyze test data, and prepare a report. He receives a concentrated course in all of the engineering subjects involved in such tests. He becomes intimately acquainted with the way in which aircraft design affects the stability and control derivatives and how these in turn determine flying qualities.

The aircraft used in this portion of the course are the Lockheed T-33, the Northrop T-38, and the Martin B-57. Instruction is split about fifty-fifty between the classroom and practical experience. Almost an hour a day is devoted to physical training.

In Phase II the student moves on to the study of hypersonic aerospace vehicles, including those that reach orbital speed. Very strong emphasis again is placed on academic work. The aim is to give each man a comprehensive theoretical background and a working knowledge of all phases of vehicle design, instrumentation, operation, and testing, as well as the use of computers for data reduction and flight planning.

Piloting very-high-speed aerospace vehicles falls into three distinct phases: (1) the boost into orbit or into a ballistic trajectory; (2) operations in orbit or at very high altitudes where aerodynamic control surfaces are not effective; and (3) the reentry and landing. Each phase has its own particular problems and requires the mastery of separate techniques. No one training aircraft or ground-based simulator today is able to cover the complete range of piloting problems so the school uses several aircraft and flight simulators in its training program.

The Boost Phase

The main objective of the boost phase is to deliver vehicles to their operational station. Such deliveries

are precision flying jobs, whether a vehicle is placed in orbit, sent around the world once in hypersonic glide trajectory, or propelled nearly straight upward in a ballistic path to great altitudes.

To make a precision delivery the pilot must control his vehicle within very close limits while it is under power. At very high speeds and altitudes he loses control of his flight path after the powerplants stop.

Flying training for the boost phase now is conducted in the Lockheed F-104A which has a maximum zoom altitude of about 90,000 feet. As this magazine reaches its readers, a much more desirable trainer, a modified '104, the NF-104A, is scheduled for delivery. In addition to the standard General Electric J79 turbojet, the NF-104A is equipped with a Rocketdyne AR-2 liquid-fuel rocket engine that can be throttled from 100 percent to fifty percent thrust—from 6,000 to 3,000 pounds. The rocket boosts the new trainer's maximum zoom altitude to more than 120,000 feet.

Boost flying requires what technically is termed "energy management." The pilot must follow a precise climb schedule, which calls for him to adjust speed and climb angle to a particular value at each altitude as he moves upward. For some extremely maneuverable vehicles he might be required to adjust power settings as well. The energy-management climbs taught at the school are characteristic of those that might be flown in a suborbital spacecraft or in an air-launched orbital vehicle, such as the second stage of a two-stage aerospace plane.

In a typical NF-104A energy-management training flight the pilot will cruise out at subsonic speed and at 35,000-foot altitude to a point about 115 miles east of Edwards. Turning back toward the base he will accelerate to Mach 2. When fifty-seven miles out he will ignite the rocket, climb to 40,000 feet, accelerate to about Mach 2.2, and execute a three-G pullup about thirty-five miles from the Edwards runway. After the pullup he will hold a climb angle of sixty degrees.

Then he will concentrate on the major objective. To get a high mark for this flight his maximum altitude must be 120,000 feet, not more and not less, and he must fly through it at a Mach number of .74. This probably will require adjustments to his climb angle and rocket engine power. To complicate the adjustments, the turbojet will flame out at about 80,000 feet and must be shut down. The rocket engine will stop shortly before the maximum altitude is reached and the aircraft will then begin its ballistic flight. Recorders in the airplane and radar tracking from the ground will provide a permanent record for judging the pilot's performance in all phases of the flight.

After going over the top, the aircraft will begin a sixty-degree dive, and the recovery is a three-G pullup at about 40,000 feet. It takes place over Edwards AFB so that a glide landing is possible if the turbojet fails to relight.

Simulators also are an important part of boost training. The large Navy centrifuge at Johnsville, Pa., is the most realistic one available to the school. A cockpit equipped with normal aircraft controls and instru-

(Continued on page 63)



on target with airlift power...and helping provide the increased mobility a modern Army needs by advancing the state of the turboprop art. Soon the USAF C-130 will carry larger payloads over longer distances, because air-cooled turbine blades will make its Allison T56 turboprop engine more powerful and efficient. Thus our defense posture is more flexible, our airlift capability geared to today's tactical requirements, our Army better able to carry out its mission, because another Allison program is on target.

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mentation is mounted on the centrifuge arm. As the pilot moves the controls in this cockpit he actuates a computer which adjusts the centrifuge motion so that he experiences exactly the same accelerations that he would in flight. This elaborate facility makes it possible for the students to "fly" many energy-management trajectories and to achieve a high proficiency before making actual airplane flights.

Such facilities also make it possible to simulate the boost phase for all types of vehicles, including large rockets such as the Titan III. Simulator experiments have shown that a pilot could fly a space vehicle, propelled by a Titan III, into orbit with remarkable precision. The only drawback is that a human pilot requires the use of slightly more fuel than an automatic guidance system.

High Altitude and Orbital Operations

A host of activities fall into this category, including rendezvous and docking, space navigation, orbit changes, and attitude control above the atmosphere. Most of them are studied at the school through the use of simulators. An orbital-rendezvous simulator is available in which the terminal and docking phases may be accomplished on instruments or visually by the pilot watching his target. Today, the school opinion seems to be that a computer guidance system will be needed to bring two vehicles to within two or three miles of each other and then a human pilot could complete the rendezvous visually.

The school has a reaction-control simulator which is mounted on an air bearing. In this simulator a student may practice controlling space vehicles for long periods. Flight training of this type will be possible when the NF-104A becomes available. It has an X-15 reaction control system, and the pilot must use it for a couple of minutes during each energy-management climb. For a brief period on these flights, the pilot operates in zero gravity.

The space-vehicle piloting interest of NASA and the Air Force overlap more in this area than in any other. The basics of all types of orbital operations for men and machines vary little, and the Air Force will be able to learn a great deal from Projects Gemini and Apollo. The question is whether the rate of learning will be adequate.

Reentry and Landing

The first critical part of reentry occurs when a vehicle bores deep enough into the atmosphere that aerodynamic forces begin to move it about and subject it to high G loads. The pilot must hold the vehicle's attitude precisely with the reaction-control system as this point approaches. If the vehicle is not in the correct attitude, usually with the nose moderately high and the wings level, it can be overstressed and overheated.

Students at the school will get their training on this point in the NF-104A and in several simulators, including the centrifuge at Johnsville.

The next phase of the reentry is the deceleration and glide approach to a landing. The NF-104A is of some value here, but variable-stability aircraft are the most important. These are Convair F-106 and McDonnell F-101 fighters equipped with special control systems that can be adjusted to give them the flight characteristics of any of a wide variety of space vehicles, with all types of poor stability and lifting characteristics.

Final approach and landing training is given in the F-104, as described, and in the F-106. The trainer F-106 is relatively easy to land because its wing loading is low, about forty-five pounds per square foot, and its lift/drag ratio, when trailing a drag chute, is around 4.0. Using these two trainers it is possible for the students to see exactly how variation in wing loading and lift/drag ratio affect space-vehicle landings.

New Equipment

Three important new items of equipment have been requested by the school to improve the quality of its instruction. The first has been authorized, is under development by Link, and is due to be in operation by next July. It is a very advanced moving-base static simulator. The simulator cockpit is suspended by a mechanism that allows it to move in all three directions and rotate about all three axes. A large hemispherical screen out in front of the cockpit provides the pilot with a visual display of rendezvous and all other types of space operations from boost through reentry. This powerful training tool will be able to simulate everything about spaceflight except the actual acceleration forces.

The school has requested money in the FY 1965 budget for the construction of a large centrifuge which would be more versatile and advanced than the one at Johnsville. The request has not yet been approved.

The school also is pushing for an Advanced Aerospace Trainer, with much better performance than the NF-104A. This trainer would be in the X-15 class, with a maximum altitude of around 300,000 feet and a speed of possibly Mach 7 for a very brief period. Lockheed, North American, and Northrop have made preliminary proposals. However, a decision on this request has not been made by higher command.

The Aerospace Research Pilot School is established as the USAF's most advanced flight training organization and the source for military spacecrews. Despite its short history, the school's unusual curriculum and its graduates already have earned a reputation for excellence outside the service. Training activity has been increased with thirty-six new students scheduled to begin the course each year.

There is one source of discontent and gloom, however. Men who train to fly in space inevitably want to fly in space. No group in the Air Force wants "stick time" at orbital speeds more than these men from Edwards. And until this stick time is available, the Aerospace Research Pilot School can never completely come into its own either as a research organization or as a supplier of spacecrews.—END



Gen. Thomas S. Power is Commander in Chief of SAC and Director of the Joint Strategic Target Planning Staff. He has headed SAC since 1957 and earlier was SAC Vice Commander and Commander of ARDC, now Systems Command. A B-24 pilot in North Africa and Italy in World War II, he later directed the first large-scale fire bomb raids by B-29s from Guam on Japan.

The Strategic Air Command—the most powerful deterrent force the world has ever known—continues to keep its overwhelming force of bombers and intercontinental missiles constantly ready . . .

STRATEGIC AIR COMMAND

NEVER in the history of the Strategic Air Command has the presence of SAC's nuclear deterrent been more dramatically sensed in the turn of world events than during the past year.

President Kennedy testified to this after presenting the Strategic Air Command a plaque for its outstanding record in flying the first airborne alert in the history of airpower during the Cuban crisis.

Standing on the ramp at Offutt AFB, Neb., SAC headquarters, on the twenty-first anniversary of the Japanese surprise attack on Pearl Harbor on December seventh, President Kennedy told the world.

"Living on this base, flying from this base, men have helped maintain the security and peace for fifteen years, and it is my strong belief, a belief which has been strengthened by this morning's visit, that peace and security can be maintained directly with the will and the courage of the people of the United States and the strong right arm which is the Strategic Air Force."

In these brief words, the President called appropriate attention to the deterrent impact of a mixed force that carries in its bomb bays and missile warheads between eighty and ninety percent of the nuclear firepower of the free world, as measured in TNT equivalents—a force which, in effect, forms a strategic umbrella under which the free world can deal with communism with relative freedom of action in a manner of our own choosing.

SAC in Action

While SAC's exceptional state of readiness is a continual way of life in the command, an open crisis does allow even greater readiness because routine training can cease. The Cuban crisis was such an instance.

It should be of interest, then, to examine just how SAC reacted to the President's policy of confrontation and just what role SAC played in the events that began unfolding near the end of last October.

Prior to that time, as was normal, at least fifty percent of the bombers and tankers were on a ground alert, as was a considerably higher percentage of the ICBMs. Airborne alert training was in progress, as it has been for two years. The airborne command post was in the air—as it is continuously twenty-four hours a day. Also, as usual, SAC bombers and tankers were deployed at bases all around the globe.

So before the crisis broke, SAC was at its regular peacetime readiness. That is: Within the warning time that could be given by the Ballistic Missile Early Warning System, half of SAC's combat aircraft could be in the air, safe from enemy missiles, and on the way to their positive-control points. Our missiles, secure under tons of concrete, could ride out any surprise attack and still retaliate under presidential orders. SAC could withstand any surprise attack and still strike back to inflict damage to Communist targets that would be unacceptable to the Soviets.

SAC's Aerial Watchdogs

On October 14 of last year, the Joint Chiefs of Staff directed SAC to begin reconnaissance photography. Four hours after the order arrived, the first high-altitude reconnaissance aircraft was en route. Between daylight of October 14 and 25, SAC reconnaissance planes flew repeated missions over Cuba, obtaining uncontested photographic evidence of the presence of offensive weapons on the island.

On the twenty-fifth of October, SAC began a new phase in the gathering of information about the Cuban weapons buildup. On that day the Commander in Chief, Atlantic, requested SAC's help in locating Soviet surface shipping.

For this project in support of CINCLANT, SAC RB-47s and KC-97 tankers flew over a great rectangle covering some 825,000 square miles of the Atlantic north of Cuba between Bermuda and the Azores. On

surveillance missions hundreds of visual and radar sightings were made, from very high altitudes to as low as 300 feet. Initial contact with the Soviet ships was made within hours by B-52 aircraft flying airborne alert missions.

On October 27, an RB-47 participating in the sea search crashed on takeoff at Bermuda. That same day a pilot of the 4080th Strategic Reconnaissance Squadron, Maj. Rudolf Anderson, Jr., was killed when his reconnaissance aircraft was destroyed on a mission photographing Cuban missile bases (see *AIR FORCE*, December '62). Major Anderson was this country's only fatality over Cuba during the crisis. He was awarded the Distinguished Service Medal posthumously for his heroic service.

(On November 28, ten pilots of the 4080th Strategic Reconnaissance Wing were awarded the Distinguished Flying Cross for their part in the United States military reconnaissance.) Earlier the 4080th Strategic Reconnaissance Wing had been awarded the Air Force Outstanding Unit Citation by President Kennedy.

Airborne Alert — A Reality

While SAC's reconnaissance crews and aircraft were supporting the Cuban quarantine, other SAC aircraft and men were hard at work performing SAC's primary mission: preventing a nuclear war.

At the first danger signs, SAC had begun preparations to increase its readiness when ordered. So there was no delay on October 22 when President Kennedy announced the Cuban quarantine.

Immediately, SAC's battle staff went on twenty-four-hour duty. All leaves and temporary duty were canceled and personnel called back to home bases. Armed alert force aircraft were moved from MacDill and Homestead Air Force Bases in Florida, and the B-47 medium force was dispersed to scores of widely separated, preselected military and civilian airfields. Most significant, the Strategic Air Command launched the first massive airborne alert in the history of airpower. All SAC bombers were armed with nuclear weapons during the crisis.

While exact details of SAC's bomber employment are still classified, the general outline of action has been released. In a matter of hours SAC sharply increased its normal fifty percent ground alert until all



Communications specialists at work on part of the extensive equipment aboard a SAC airborne command post. One of the specially modified KC-135s is aloft at all times.

combat aircraft were ready for action. To mount the airborne alert, B-52 bombers took to the air on twenty-four-hour missions designed to keep them within reach of potential targets at all times. As the bombers returned to their support bases, others took their places in the air. This airborne alert guaranteed the survival of a large part of SAC's strike aircraft even under conditions of no warning.

From its beginning on October 22 to its end on November 21, when routine airborne alert training was resumed, the airborne alert set some remarkable
(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. David Wade
Commander

8th Air Force
Hq., Westover AFB, Mass.
Lt. Gen. Joseph Nazzaro
Commander

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

1st Strategic Aerospace Division
Hq., Vandenberg AFB, Calif.
Maj. Gen. Selmon W. Wells
Commander

7th Air Division
Hq., High Wycombe, England
Maj. Gen. Charles M. Eisenhart
Commander

3d Air Division
Hq., Andersen AFB, Guam
Brig. Gen. Harold W. Ohlke
Commander

16th Air Force
Hq., Torrejon AB, Spain
Maj. Gen. James B. Knapp
Commander



The klaxon sounds and this SAC alert crew streaks for its B-52 Stratofortress, still the mainstay of the nation's deterrent force. Missiles under wings are Hound Dogs.



Maintenance men check the intricate electronic systems for a solid-fuel Minuteman ICBM. First Minuteman wing, with 150 missiles, was declared operational this summer.

STRATEGIC AIR COMMAND

CONTINUED

records. SAC bombers and tankers on airborne alert flew 48,532 continuous hours. Under constant positive control, airborne alert aircraft flew 20,022,000 miles and transferred approximately 70,000,000 gallons of fuel in 4,076 aerial refuelings.

Although missions were frequently flown under conditions that required the highest level of professional ability, all of the sorties were flown without a single accident other than the RB-47 crash in Bermuda.

Missiles Make Their Debut as a Deterrent

The Cuban crisis was the first confrontation of Communist aggression by the free world in which intercontinental ballistic missiles played a significant role.

Among the strategic forces faced by the Soviet Union on October 22, 1962, was a growing ICBM armada of close to 200 operational missiles, all capable of reaching Soviet targets. When SAC aircraft forces were placed on increased alert, our combat missiles were nearly 100 percent ready and manned. Widely dispersed, most of them in hardened sites, they were prepared to absorb a first strike and retaliate under presidential order.

Highlights of July 1 — June 30

Besides the extraordinary activities within SAC because of the Cuban crisis, the regular program of refinement and improvement of SAC's retaliatory capability continued during the past year.

Many events of the period were significant milestones marking either the end of long-standing programs or the beginning of new programs that would sustain or augment SAC's deterrent force.

Some of these events were:

- Conclusion of the Atlas-Titan ICBM Construction:

By the end of 1962 all programed Atlas-Titan I ICBM sites were operational. Together these heavyweight, liquid-fueled missiles amount to almost 200 long-range combat-ready weapons.

- **First Minuteman ICBM Wing Placed on Alert:**

In the summer of 1963, the first complete wing of 150 Minuteman missiles at Malmstrom AFB, Mont., was declared operational. These are the vanguard of a scheduled force of over 800 Minuteman missiles, the bulk of which are now under construction. This solid-fuel, highly reliable missile will soon be the mainstay of the SAC ICBM force.

- **Expansion of the Airborne Command Post System:**

The Air Force increased SAC's airborne command post this year with the addition of more specially modified KC-135 aircraft and B-47 aircraft. In operation since February 1961, the system reinforces the ability of the SAC Commander in Chief to contact his forces anywhere in the world under any circumstances.

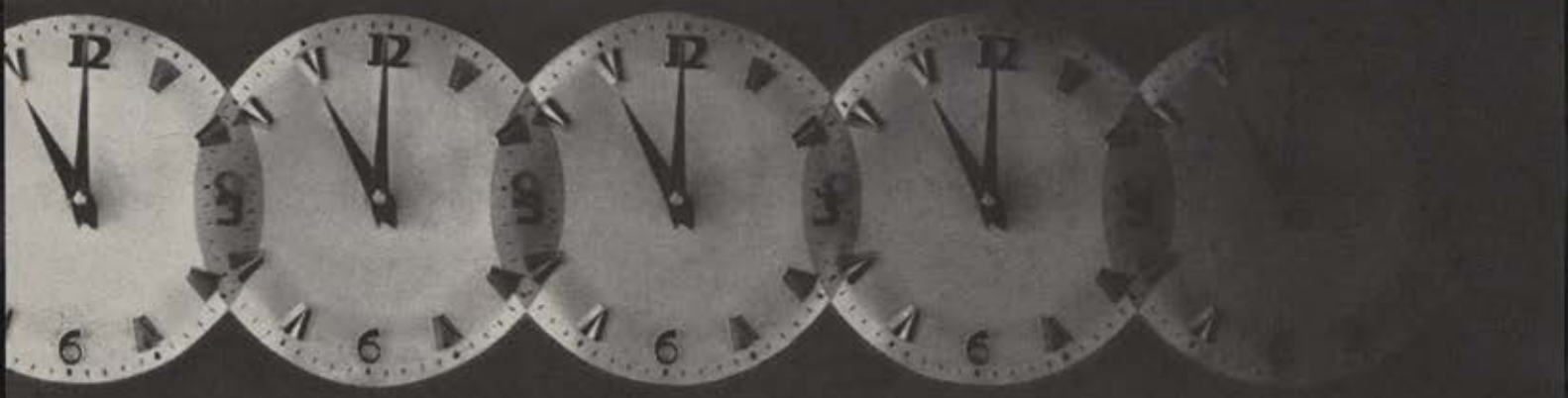
- **Beginning 465-L Installation:** First construction was begun at SAC headquarters on a new command-and-control system, called 465-L, that will increase tremendously the speed and efficiency with which information is passed to SAC commanders for their use in command operations.

- **Minuteman Education Program Begins:** An example of SAC's current preparation for the systems of tomorrow can be found in the Minuteman Education Program. This year, facilities were completed and class-work begun at Malmstrom AFB, Mont. The Minuteman Education Program, planned for all six programed wings, placed Minuteman crewmen in an intensive course of study leading to a graduate degree in fields which will be of great value to the Air Force of the future.

(Continued on page 68)

TIME

The disappearing element
in an anxious age



In an era when it becomes paramount to detect and arrest vehicles traveling at thousands of miles per hour anywhere in the universe, elimination of subsystem delays in Command and Control system operation can be the most positive assurance of survival. Philco innovations in Realtime Computers, Radar and Nano-second Switches, contribute to the ultimate goal—Realtime reduction of the detect-to-arrest interval. Command and Control is one of the proven and growing capabilities of the new Philco, where the vast resources of Ford Research and Development are accelerating innovations in electronics.

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A SAC Titan II ICBM, balancing on its tail of flame, begins its skyward climb during a test launch. The liquid-fueled Titan II is fired from concrete silos.



Capt. Herb Doby of the 341st Strategic Missile Wing, Malmstrom AFB, Mont., here is operating one of the two Minuteman Missile Consoles in launch control facility located near Great Falls, Mont.

Fifty feet under the Montana prairie, protected by tons of steel and concrete, a two-man Minuteman Missile Combat Crew prepares to go on strategic alert. Each crew, sealed in, monitors 10 remote missile launchers.



Under Minuteman alert conditions, the missile combat crew members have adequate time to continue their educations while performing their assigned duties in remote, isolated underground launch control centers. Formal classroom work is held at the support base.

The special courses, conducted for SAC by the Air Force Institute of Technology, are part of the regular duties of combat crewmen. The individual officer thus is able to continue his education and receive an advanced degree. The Air Force will benefit from his increased knowledge throughout his duty assignments.

At Malmstrom, for example, 160 officers were well on their way to an advanced degree in aerospace engineering by early summer. As other Minuteman wings become operational, launch crews will have an opportunity to participate in programs leading to degrees in Engineering, Industrial Management, and Business Administration—all areas in which the entire Air Force has a continuing requirement for highly trained officers.

- **Titan II Operational:** The Titan II became operational in June of this year. This giant missile is the heavyweight of SAC's ICBM force, weighing in at about 150 tons. Titan II uses storable propellants, has an all-inertial guidance system, and can be launched directly from its silo with the heaviest payload, over the greatest range, of any ICBM in our inventory.

- **Tanker Single Manager:** For the second year the Strategic Air Command has acted as a "single manager" tanker service for the Air Force. In addition to its own massive refueling requirement, in fiscal year 1963, SAC flew 1,078 tanker sorties to refuel TAC fighters in training. SAC is already scheduled for over a thousand next year.

- **Foreign NATO Officers Scheduled to be Added to Joint Strategic Target Planning Staff:** A historic decision affecting the targeting of both missiles and aircraft was made in the spring of 1963 when an agreement was made at Ottawa, Canada, to have four NATO nation officers added to the JSTPS at Offutt AFB. The Joint Strategic Target Planning Staff is a Joint Chief of Staff activity now made up of officers of the US Air Force, Navy, Marines, and Army, who develop a single integrated operational plan (SIOP) for initial US retaliatory strikes in case of global war. The group operates under the direction of Gen. Thomas S. Power, Commander in Chief of the Strategic Air Command.

Summary

This summary of SAC's activities during the past year reemphasizes that the free world has enjoyed another year of peace free from all-out nuclear war. SAC has done its share toward the maintenance of this peace by keeping its overwhelming force of bombers and intercontinental ballistic missiles constantly ready.

Such a powerful deterrent force must be maintained into the future, and SAC stands ready to accept its assignments, whether the weapon system is aircraft, spacecraft, or any other system produced by science and industry. It is important to remember that there will be a continuing need to retain the priceless adaptability of a skilled pilot at the controls—the mixed-force concept, whether applied to aircraft and missiles or to space systems, must endure.—END

THE SPACE AGE IN PERSPECTIVE



SPACE

DIGEST

VOLUME 6, NUMBER 9 • SEPTEMBER 1963

Mixed Hopes for the Military Space Mission

By William Leavitt71

This has been a summer of discontent for space-program planners. The National Aeronautics and Space Administration is bereft of its "blank check," and the Department of Defense and the Administration are buffeted with charges of overconservatism in planning for military uses of space. Congress is restive on the issue, and out of the ferment may emerge new military space efforts.

"Minority Report" on the Moon Project

From the House Committee on Science and Astronautics

Report on the Fiscal Year 1964 NASA Authorization Bill76

A group of House space committee members takes public issue with the Administration on the national-security potential of Project Apollo and calls for a review of the national space effort, with a view to added emphasis for military space.

Speaking of Space

By William Leavitt80

In the afterglow of the partial test-ban treaty, there is much talk of a joint US-Soviet moon-exploration program. There's a good argument for proposing such an effort to the USSR. What better way to gauge the true extent of Soviet desire for a lessening of tensions, since Russia would have to give more than she got?



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Under the pressures of congressional restiveness over the high costs and marginal military significance of the moon-landing program, space planners seem to be giving some additional attention to defense-oriented efforts, giving rise to . . .

Mixed Hopes for the Military Space Mission

BY WILLIAM LEAVITT

Associate Editor, AIR FORCE/SPACE DIGEST

FOR THOSE charged with the planning and execution of national space programs, both civilian and military, this has been a summer of discontent.

Money troubles, management problems, and a growing drumbeat of criticism plague the National Aeronautics and Space Administration. "Blank check" is no longer the rule on Capitol Hill for NASA appropriation requests. The Department of Defense is under attack for its record of conservatism on the military potential of space. And the Administration, which after all is the basic architect of space policy, is fighting off charges ranging from accusations of technological leaf-raking in connection with the moon program to blind ignorance of the dangers inherent in Soviet development of viable military space capabilities while US efforts concentrate on peaceful purposes.

Out of this ferment, there is at least the hope that there will emerge a reevaluation of the overall space effort and a consequent increase in the priority of military space development. The Air Force can be expected to play a prime role in the implementation of such new policies as may develop, for it is the principal repository of defense aerospace research and development skill.

But it must be emphasized that, at the moment, reevaluations of military space development are still mostly in the thinking and discussion stage, that at the highest levels in the Administration they must compete with hopes for *detente* with the Soviet Union (see *"The Hazards of Euphoria," "Speaking of Space," August '63*), and that so far as can be seen from released budget figures, major funding increases have not yet materialized on the military space side. It is a time-honored rule in Washington that no program is truly alive until it is reliably read in the budget, and the military space budget is not much bigger than last year.

A major reason for the slowly increasing Administration attention to the nagging problem of military space development has been the chorus of congressional concern with the security aspects of space. A number of representatives and senators have openly taken issue with the Administration's pronouncements that "fallout" from the NASA space effort, particularly the moon program, would provide needed military space capabilities that could be used if the situation warranted. For example, a Republican "Minority Report" (see page 76) issued in July as an element of the House Space Committee's NASA authorization bill report to the full House, and signed by six Republican members, sharply criticized overemphasis on nonmilitary space programs and called for more attention to military space planning and funding.

The House Space Committee "Minority Report" was mild in comparison with a mid-July speech by Sen. Barry Goldwater, Republican of Arizona, who charged bluntly that "by choice of official policy, so far, we are choosing to relegate the military function of space to a secondary position." The Arizona Senator asserted that "we have

(Continued on following page)



SEN. GOLDWATER



SEN. CANNON

delayed and debated to the point where it must be said that the United States today has no fully defined and effective military space program at all."

The Senator, whose utterances attain increased significance for the Administration in proportion to his current GOP presidential-nomination prominence, said further that "we have a flotsam and jetsam program of floating theories, scattered projects, and floundering follow-throughs. We have, in fact, policy declarations stating that we will not orbit weapons of mass destruction in space unless forced to do so by the hostile action of others. In short, we say that we will not utilize the military potential of space until such time as it may be too late."

The barrage of congressional criticism cannot be dismissed lightly as partisan. Democrats too, including Senators Thomas Dodd of Connecticut, Howard Cannon of Nevada, and John Stennis of Mississippi, have spoken out on the need for viable military space developments, as have a number of House Democrats, including, among others, Olin Teague of Texas, Emilio Daddario of Connecticut, and Melvin Price of Illinois, who is chairman of the House Armed Services subcommittee on military research and development.

Against this background, the Administration may be expected in future weeks to defend the content and pace of current military space programs, and collaterally to soften its old chant that the NASA moon program will provide the needed defense "fallout." This latter change has already showed itself in the negotiation line being taken by DoD in its dealings with NASA. Where before DoD talked "fallout," now it complains openly that NASA "inner-space" programs such as the two-man Gemini manned orbital program really won't serve defense purposes too effectively. For example, in one of his last public statements as Special Assistant for Space to Director of Defense Research and Engineering, Dr. Laurence Kavanau was quite critical of the military utility of NASA's Gemini two-man orbital program.

This statement by Dr. Kavanau was in startling contrast to Defense Secretary Robert McNamara's earlier suggestions that the Gemini and Dyna-Soar programs might be duplicative and that perhaps the Air Force could get needed spaceflight experience in Gemini, with Dyna-Soar eliminated.

The DoD tack is evident in the backing and hauling that, behind the scenes, attends NASA-DoD negotiations on the orbital space station proposals, which are beginning to stand a serious chance of being funded, but probably not until

fiscal year 1966. NASA has some manned space station study contracts under way, and so does DoD, through the Air Force. But a major current rub, at least from the NASA point of view, is that DoD appears to be insisting on applying the "program definitization" approach of Director of Defense Research and Engineering Dr. Harold Brown to the space-station studies. NASA, increasingly interested in space stations, sees no sense in planning rigidity in the study stage. At this writing, the most that's been achieved in negotiations is willingness to exchange information between DoD and NASA.

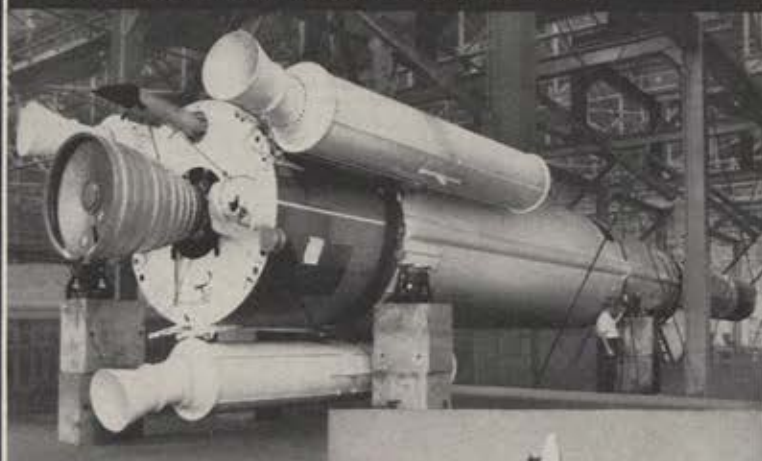
The DoD argument that its criteria should be met by NASA in NASA's orbital station studies is heavily based on this year's bizarre Gemini Program Planning Board agreement which contained a crucial paragraph to the effect that neither NASA nor DoD would proceed with near-earth-manned-orbital programs without the concurrence of the other. At the time of the agreement, it was widely believed that DoD was going to allow a sizable Air Force participation in Project Gemini and that there would be decent funding forthcoming from DoD. But that seems to have fizzled more than somewhat, and current thinking is that the Air Force will play a much smaller role than earlier anticipated in the Gemini program, possibly limited to a few flights quite late in the Gemini operational phase. This, measured against the continuing questionable status of the Dyna-Soar program, presents rather a poor prospect that the Air Force will get the manned operational orbital experience it needs and wants through participation in ongoing programs.

But congressional pressures for more attention to military space developments will undoubtedly have their eventual effect on DoD and the Administration, and the logical focus of the effect will likely be in the orbital-space-station field. In view of the heavy involvement of NASA in the Apollo program, which, despite House and Senate cuts in the NASA authorization bills, is still a going operation, and, in order to answer congressional charges of neglect of the military side of space, it is probable that the Administration will decide to press ahead with a viable small (four- to eight-man crew) space station concurrent with the moon program. The manned space station project will probably emerge as a joint or cooperative DoD-NASA program, but it will most likely be a DoD-managed affair, with the Air Force as prime agent for DoD.

(Continued on page 75)

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Photo left shows bird in flight with solid boost added by strapped-on Thiokol motors.



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New booster reliability for an improved Thor Standard Launch Vehicle. It's delivered by Thiokol's "off-the-shelf" solids. The XM-33's, strapped to the side of the Douglas developed Air Force Thor, have a successful, versatile, and reliable flight record—with Little Joe, Trailblazer II, Scout, Blue Scout, and other research vehicles. Truly a "work horse" propulsion unit, the XM-33, with its flight-proven design concepts and components available on a quick delivery basis, joins the

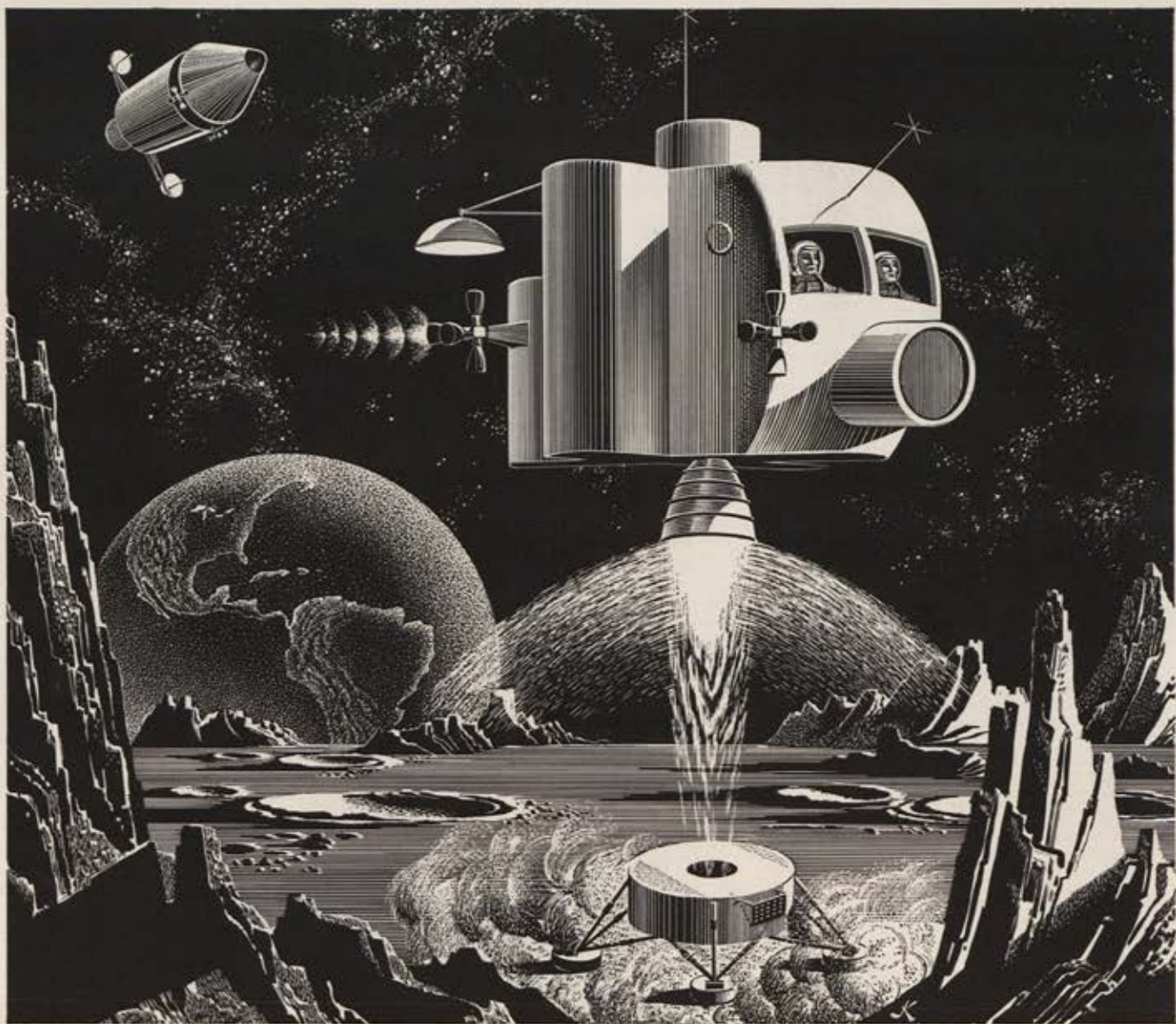
similarly proven Thor to provide a significant increase in payload capability in minimum time, at minimum cost.

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Engineering Opportunities on LEM at Marquardt

Marquardt's increasing capability in reaction control systems is evidenced by the company's appointment by Grumman Aircraft Engineering Corporation to provide the critically important reaction control propellant system and thrust chamber cluster assemblies for the National Aeronautics and Space Administration's Apollo Lunar Excursion Module. LEM—the first U. S. vehicle that will operate exclusively in space—has created a number of exceptional career opportunities for engineers. Other programs recently awarded to Marquardt include: the reaction control engines for the Project Apollo Service Module; the ullage rocket engines for the Saturn IV B; and the reaction control system for Syncom II.

These expanding programs, coupled with continuing company-sponsored research and state-of-the-art contracts, are responsible for the new assignments now open at Marquardt. A limited number of ground-floor opportunities presently exist for experienced engineers and scientists who want to join a dynamic company, well diversified in reaction control systems, electronics, airbreathing propulsion, and aerospace research.

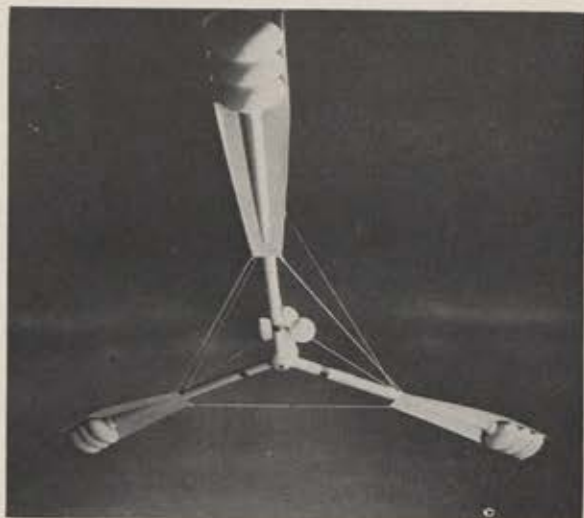
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AN EQUAL OPPORTUNITY EMPLOYER



One of the many ideas for a US manned orbiting space station, this is a Republic Aviation Corp. conception of a 36-man station, boostable into a 200-mile orbit by a Saturn C-5 rocket. Living, laboratory, and service quarters are at the ends of the spokes.

It is sad that valuable time is being wasted in the round of negotiations between DoD and NASA over the crucially needed manned space station project, but that is the way of the bureaucratic and political world. It must be said, though, that thanks to the existence of the National Aeronautics and Space Council and a few other policy groups such as the Aeronautics and Astronautics Coordinating Board, there are at least some shops where policy can be hammered out. It is a slow and painful process, and there is no doubt that the high cost of space technology, which is beginning to be used as an argument against NASA programs, continues to be a negative factor in the DoD military-space decision-making process. The old DoD "fallout-from-NASA" argument reflected this reality. But the argument didn't sell.

In many ways, the national space effort is at a new crossroads.

In the six years that have passed since the Russians startled us with the sophistication of their "oxcart economy," this country has made sizable advances in space technology, has expended funds that would have seemed incredible in the mid-fifties, has achieved viable demonstrations of man's ability to traverse space, and of the usefulness of weather, observation, and communication satellites, and, of course, has proposed to go to the moon.

Now, the question the Administration has to ask itself and answer is whether its enthusiasm for the utilization of space as a spur to science,

general technology, and the economy is going to be expressed in the defense area with the same vigor.

The logical answer to the question is easy to arrive at—yes. It is the implementation that is so complex. For one thing, the sizable investment made in the buildup of NASA to date cannot be shunted aside, even if many people still argue that the buildup was ill-advised in the first place, and should have been done instead in DoD. That is all water over the dam now, and it is worth quoting on this point the comment of one highly placed space official that those who advocate expansion of military space developments aren't going to achieve their purposes, right as they may be, by knocking the other fellow, *i.e.*, NASA. This is sage counsel, not only for some Air Force people, but also in the other direction, for some NASA people too. The comment is beginning to attain significance for people in DoD too, now that DoD's at least partial acceptance of the logic of using military space potential is evolving. Now is scarcely the time for empire building—the perennial handmaiden of politics in the capital. Something is going to have to give here and there in the present space program, if we are to have added emphasis on military space capability. NASA will have to learn to live with that particular political-budgetary reality, just as other agencies, including the Air Force, have had to learn to live with new conditions. And NASA must not look under the bed for Air Force plots every time the defense significance of space is discussed publicly.

It is hard to put down with exactitude the extent of the Administration's and DoD's current acceptance of the military utility of space. On the unmanned side, there is little doubt now that the oft-discussed communications, weather, and surveillance functions are considered viable and significant. From all indications the early-warning satellite concept represented by the Midas program has been downgraded. Surveillance, apparently, has been most fruitful, and one may register the hope that it will in no way be compromised by optimism vis-à-vis the Soviet Union, or fears that surveillance is provocative and inappropriate in the current international climate. It is unlikely that the Administration will give up such a valuable tool as spaceborne surveillance, especially in view of increasing interest in space surveillance as a possible instrument of arms control. Such special techniques as nuclear-blast radi-

(Continued on following page)

ation detection now has attained increased importance because of the partial test-ban agreement reached with the Soviets, which bars nuclear testing in space; there have been announcements that nuclear-test detection satellites developed in DoD's Advanced Research Projects Agency Vela Hotel program will be orbited this year.

In all, the open acceptance of the military utility of space appears to be still confined mostly to unmanned passive satellites, while major decisions on the manned side are still to be taken. An important indicator of how far DoD is willing to go on the manned side will be the outcome of the current DoD-NASA manned orbiting space station negotiations discussed above. A high-priority DoD-managed, decently funded program, budgeted for in fiscal 1965, would be a strong sign that DoD is eager to press forward rapidly, and would provide the Air Force with a focus for its development of manned orbital operational experience. But, as noted, the chances are that project funding will probably be delayed until fiscal year 1966, because of DoD-NASA negotiation trouble and Administration desires not to appear profligate the year before the presidential elections. Having originally decided to press for a moon-landing program, the Administration, in planning for an earth-orbiting program, will have

to explain to the public the purpose of additional spending for a close-orbital manned space station. The explanation will have to be in terms of developing military operational capability in near space. Such a public statement by the Administration may also lay it open to propaganda attacks by the Soviets, but we have lived with that vexation for eighteen years. Yet the advantages of a viable manned space station project far outweigh its international public-relations disadvantages. Certainly the domestic political plusses that would accrue to the Administration if it did press forward soon with the manned space station would be sizable if the defense aspects were admitted and stressed candidly from the outset. Such statements would do much to offset congressional criticisms of overemphasis on nonmilitary space programs. For a politically minded Administration, as this one certainly is, this would be a definite plus.

The acceptance of the military mission in space is in the embryonic stage. Beyond the now-acknowledged passive, unmanned operations, no bold programs for investigating the utility of military man in space are discernible. But it is at least a hopeful sign that the idea is no longer considered laughable or subversive, and that it is beginning to stand a chance of being tested. Perhaps before the end of this decade.—END



'Minority Report' on the Moon Project

"The major effort of this nation to achieve superiority in space is the Apollo or moon project. We support that project . . . because there is no other comparable program to develop space techniques at this time. However, we have grave reservations concerning our national space posture and specifically the emphasis of this nation on nonmilitary space programs. The full Committee report speaks to the 'national security' aspects of space. The full Committee is to be complimented on its statement of this most vital subject. We do wish to amplify it with respect to the military importance of inner space.

"The crux of the argument falls on the distinction between the areas of space surrounding earth to a distance of 100 to 500 miles, called inner

space, and the far reaches of space hundreds of thousands of miles away, called outer space. Exploiting either of these vast areas will result in much knowledge which could be employed in exploiting the other in addition to adding substantially to national scientific know-how. However, the result of the manned moon landing will be largely prestige, while the result of achieving supremacy in inner space will be the ability to introduce or prevent the introduction of nuclear-armed satellites, together with the other significant national security factors such as the possibility of influencing or controlling the command-and-control systems of a potential enemy, or of preventing such influence or control of our command-

(Continued on page 79)



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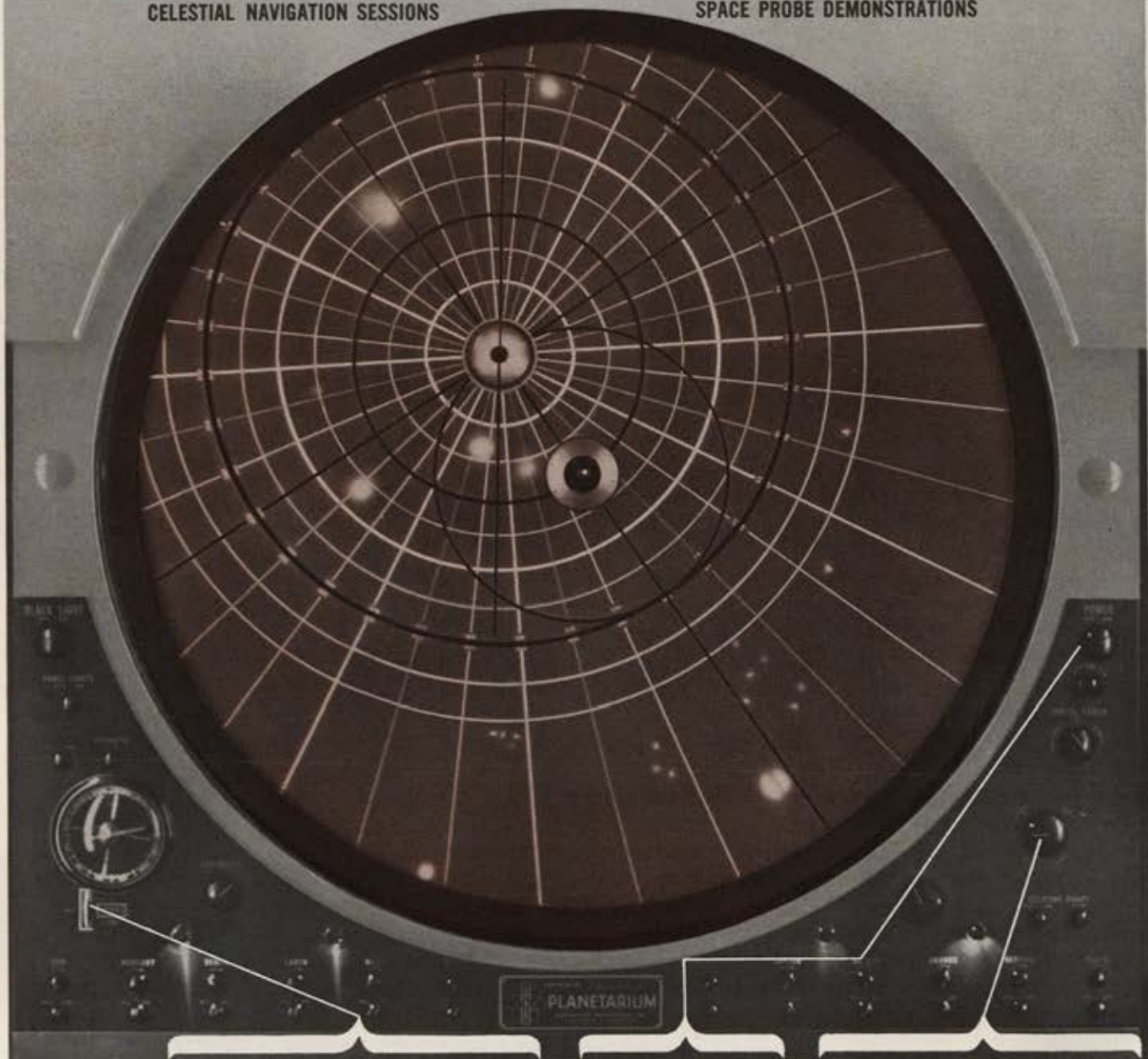
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A simulated view of three Astronauts en route to the moon. How much actual militarily significant "fallout" there will be from the NASA Project Apollo manned lunar-landing-and-return program is a question raised with increasing frequency and force in Congress. Such congressional restiveness was expressed in the recent "minority report" attached to the House space committee's fiscal 1964 NASA authorization bill report, text on this and preceding page.

and-control systems, as well as communications, reconnaissance, and surveillance capabilities.

"If the Russians orbit a military space platform, even if it were not employed militarily, they could use the two- to four-year leadtime to press their advantage at the bargaining table. Given an absolute weapon superiority, it is possible for a nation to implement its policies for peace or war on its own terms.

"The present announced goal of this nation is to develop space for peaceful purposes and assure that we are not preempted in this new dimension. The determination to proceed with the moon shot indicates that this goal refers in large part to outer space. This is a noble ambition, but we believe it ignores the main thrust of the Soviet space aim, which is to dominate inner space through ability to exercise control over the surface of the earth.

"Every indication leads a prudent man to the belief that the Soviet goal in space is no different from Russian goals in other media; namely world domination.

"Clearly, the direction and emphasis, as between NASA and DoD, of our national space program are determined by the President. We suggest that the emphasis as indicated by a military space request of slightly more than \$1.5 billion for fiscal year 1964, as opposed to a NASA request of \$5.7 billion, has not properly reflected the national security aspects of space exploration.

"What course should be taken if we are to concern ourselves with national security aspects of space? We suggest that the first step without

which no other step could be taken is for this government, through an urgent note sounded by the Congress, to establish immediately a top-priority congressional committee, with military and civilian experts attached thereto, as for example, a select committee of the House of Representatives, composed of members from both the Armed Services and Science and Astronautics Committees, to reevaluate, reappraise, and, if the facts warrant, as we sincerely believe they will, redefine our national goals in space and then take prompt action to achieve revision of the emphasis, approach, and allocation of funds in our civilian and military space programs. Until such a report is submitted and this question has been fully aired, current civilian programs should move ahead at a reasonable rate.

"Any problem of such complexity and uncertainty is subject to multivariied interpretations. It would be excellent if we could wait until all the facts were in. But all the facts are never in, and national security must not wait. We know that every member of Congress is vitally concerned with national security. We claim no secret intelligence or special knowledge. Our one purpose is this statement to emphasize our concern—indeed, alarm, about the logic of our space goals. We dare not, in good conscience . . . fail to raise these serious questions. . . ."

—REPS. RICHARD L. ROUDEBUSH, THOMAS M. PELL, DONALD RUMSFELD, JAMES D. WEAVER, EDWARD J. GURNEY, JOHN W. WYDLER. From "Additional Views on H.R. 7500 [NASA Authorization Bill]"—included in House Report 591.

Speaking of SPACE



BY WILLIAM LEAVITT
Associate Editor, AIR FORCE/SPACE DIGEST

More Quid Than Quo

WASHINGTON, D. C., AUGUST 15

In the mild afterglow of the partial test-ban treaty and in the face of recent announcements by the National Aeronautics and Space Administration of limited space data-exchange agreements with the Russians, there is increasing discussion of a joint US-Soviet moon expedition.

For example, during the Senate debate on the NASA authorization bill for fiscal year 1964, Sen. Joseph Clark, Democrat of Pennsylvania, who is dubious about moon programs as a drain on funds and energies that he feels could be better used for earth-bound social purposes, remarked that "if the conquest of space is a legitimate scientific objective . . . if the international climate permits, it should not be a race between nations; instead, it should be a cooperative venture by all humanity."

"I wonder," declared Senator Clark, "whether we should suggest to the Soviets a program of matching grants—one similar to the great number of matching grants between the federal government and the several states. Why not say to the Soviets, 'If you put up a dollar, we will put up a dollar.' In short, why should not both go to the moon together?"

The Senator added that "at a time when the international atmosphere is for the moment improving, there seems good ground to believe that further steps toward the amelioration of tensions would be met receptively within the Soviet Union. If we could achieve that result, we could then turn to more immediate tasks on earth."

There is a good argument for not rejecting Senator Clark's suggestion out of hand. If anything should indicate an honest desire by the Soviet Union to lessen tensions, it would be a willingness to participate in a truly cooperative moon expedition with the US. For in doing so, the Soviet Union would have to make some real *quid*

pro quo concessions, and they would have to be more *quid* than *quo*. She would have to give more than she gets.

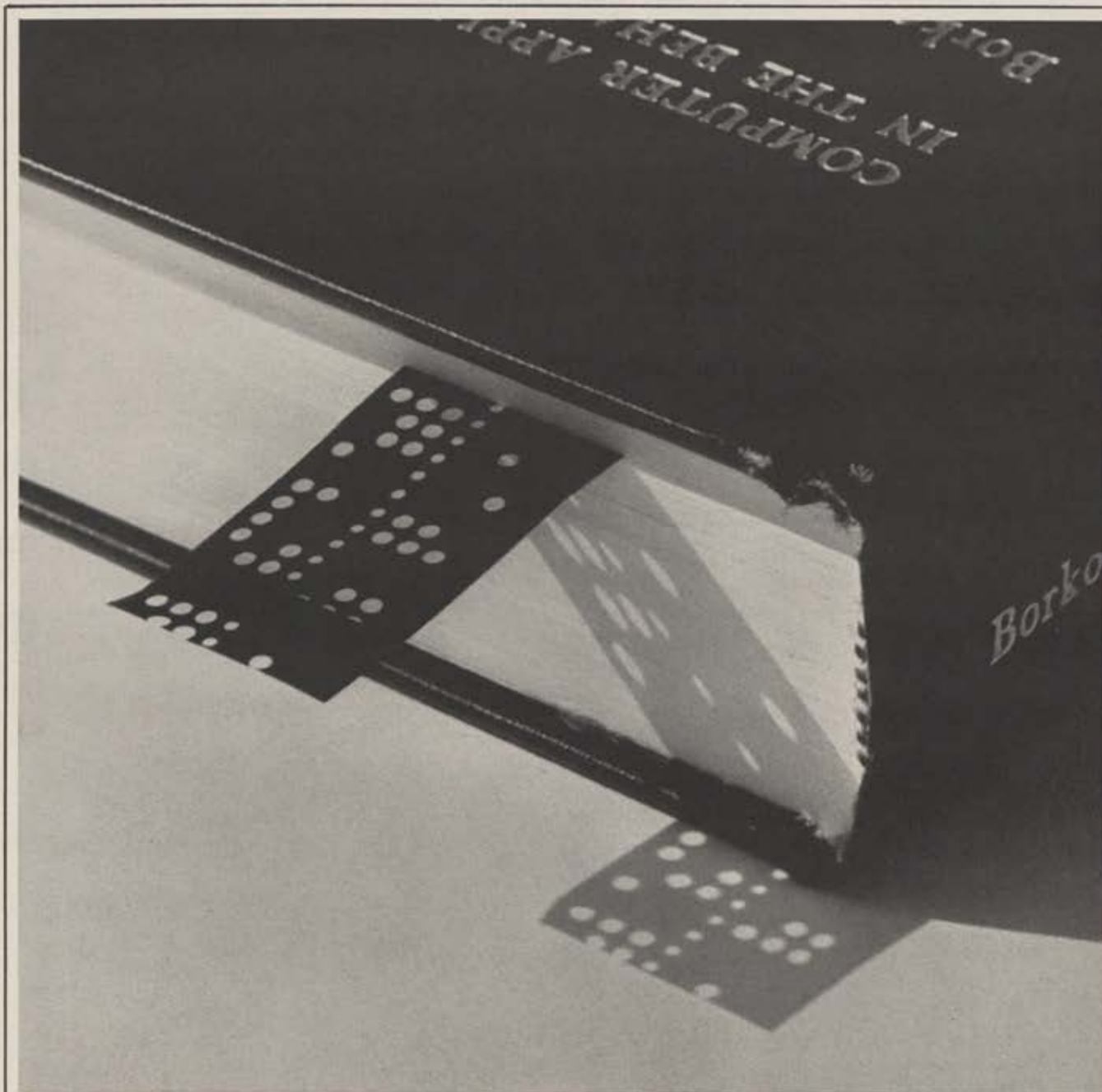
In a truly cooperative program, there could be no USSR concealment of rocket-thrust information, life-support systems, launch and landing sites, training methods, and the like. And the Soviets would have to give up the propaganda advantages gained as a result of her astronautical achievements since Sputnik. In exchange, she would get not much more than she has already attained from US manned spaceflight programs, that is, virtually all data extracted from the US program thus far.

In short, the Soviets would, to a considerable degree, have to open their society, at least those technical and military aspects of their society that, in the large, have been closed to the world since long before the phrase was found to describe this unhappy state of affairs. Once breached, such an opening could not easily be closed again.

It would have to be an all-or-nothing initiative by the Soviets, and unless the Soviets are truly sloughing off their aggressive aims, it is a hopeless prospect. Proposing the idea publicly, with the conditions listed above, might help clear the international air and demonstrate whether the current Soviet peace offensive is "for real" or has very definite limitations.

There are, though, important conceptual hazards in the international cooperation business, especially with respect to the Soviet Union. This writer recalls a seminar he attended earlier this year where the same subject of cooperative US-Soviet space programs was discussed at some length. There were two schools of thought. One held that it was the idea or climate of cooperation that was most important, that if you could only get a group of American and Soviet scientists working together on a project, this fact of itself would tend

(Continued on page 84)



Information Retrieval

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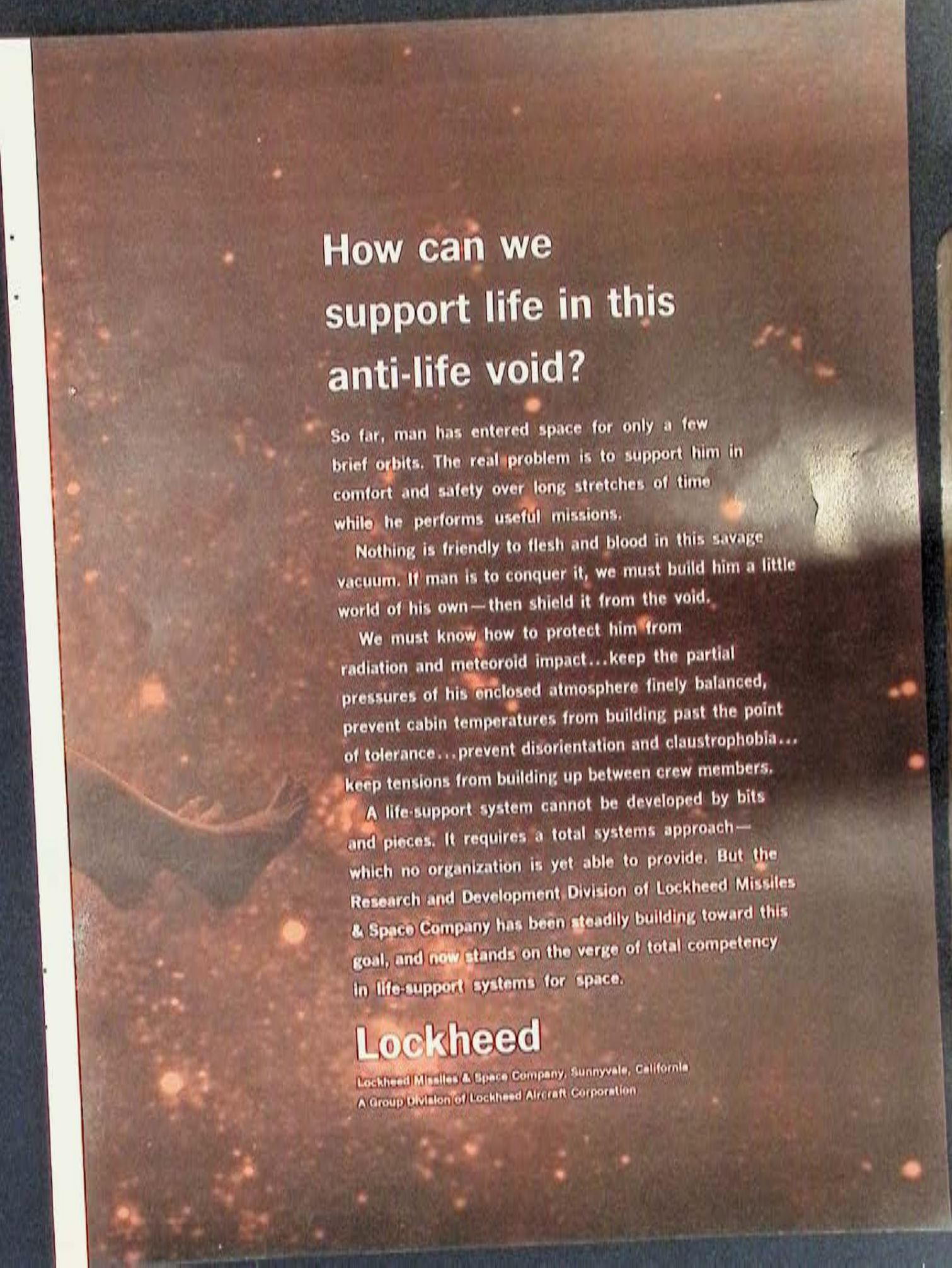
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positions have been created on several of these major projects. Human factors scientists, operations research scientists, systems-oriented engineers, and computer programmers interested in joining this rapidly expanding technology are invited to write Mr. A. I. Granville, Jr., SDC, 2423 Colorado Avenue, Santa Monica, California. Positions are open at SDC facilities in Santa Monica; Washington, D.C.; Lexington, Massachusetts; Paramus, New Jersey; and Dayton, Ohio. An SDC brochure on information retrieval also is available. Requests for this new brochure should be sent to Mr. Granville at Santa Monica. "An equal opportunity employer."

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to create for the participants a new sort of self-identification as members of the cooperative team—and that this was the true path to cooperation. Stripped of political realities, this might be valid. Indeed, it represents, to a considerable degree, a belief that scientists can communicate and thus adjudicate East-West differences because Communist and democratic mathematics and physics are the same. This argument has it that the true path to cooperation and world peace is via communication between scientists who have more in common as scientists than they have differences as citizens of opposing social systems.

The other school of thought at the seminar claimed that the fact of the existence of a cooperative group could not guarantee that its participants would truly cooperate, that true cooperation between nations requires mutual political consent. This latter argument is of course gloomier and less facile. But to this writer it is a more accurate picture of reality.

During the seminar, there was a "how many angels can stand on the head of a pin" argument over possible ways to implement joint Soviet-American cooperative space ventures. One discussant said we could avoid political problems and assuage Soviet suspicions of espionage by, for example, providing the scientific payloads while the Soviets provided the thrust power—each thus providing a basic element, in this case, for a planetary probe. He assured the seminar that technically this was quite feasible. Maybe it is, but where is the advantage, and can one call such a hybrid a cooperative program?

These points should be considered in the development of any US offer to embark on major space cooperation projects with the Russians. It would be foolhardy to make a shibboleth of either the so-called universality of science or the worth of one small step at a time. In some situations, particularly in dealing with the Soviet Union, giant steps are the only ones that get anywhere. It is the Soviets who have to take the giant steps.

Shape of Things to Come

In the context of the partial test ban, which so many observers are foreseeing as the beginning of a new and easier era, it is interesting to examine the view of Prof. Zbigniew Brzezinski, Director of the Research Institute on Communist Affairs at Columbia University. Writing in the British quarterly, *Survey*, Professor Brzezinski makes some points that have particular relevance

to space technology as an advanced military tool.

Commenting on what he considers may be the evolution toward some eventual world order, where opposing units might live in peace even if they didn't particularly like one another, he writes:

"Precisely because this process is so tenuous, so delicate, so easily reversible (as mankind's history shows), it is important that no sudden imbalances interfere with its consolidation—either through the achievement of a fundamental military superiority by the side desiring revolutionary change and hence the side more likely to use this military superiority to its advantage, or through the one-sided disarmament of the more *status-quo* oriented power—which would have the identical effect. Indeed, one may wonder whether even joint disarmament may not be dangerous, especially if it took place at a time when the differences dividing the two sides were still acute. Removing the mutual restraint of fear would leave the field open to the still dominant passion of hatred."

The Professor adds: "The situation will doubtless be further complicated by the acquisition of nuclear weapons by some second-rate powers, although the actual military significance of that should not be overestimated, since by then the gap between them and the United States will have widened further, with the latter two powers possessing spaceships, neutron bombs, death rays, etc. First-generation atomic bombs and old-fashioned means of delivery are not likely to alter the basic military polarization of the world. Coexistence is thus likely to remain tense, but without a cataclysmic confrontation. . . ."

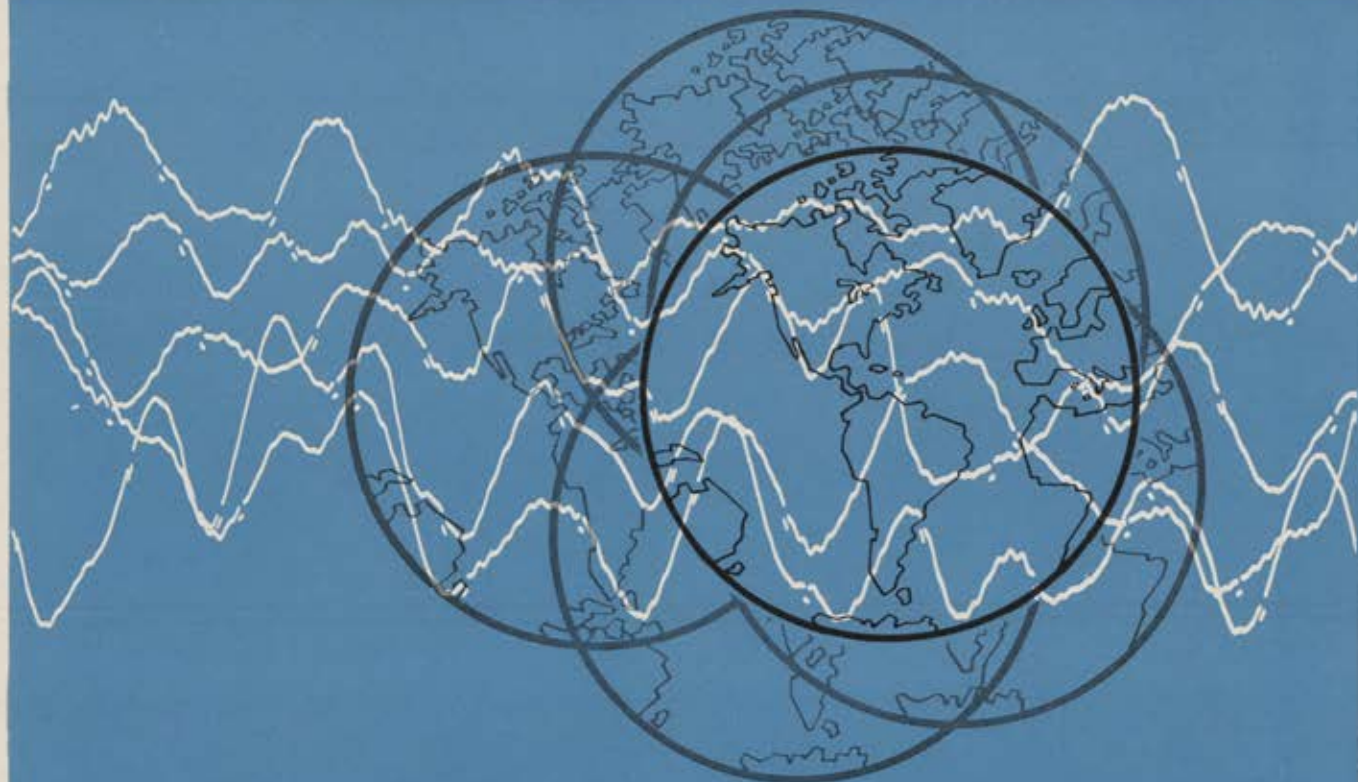
Which is a scholarly way of saying that politics rule technology, not vice versa.

Scientific-Technological Manpower

Approximately half a million Americans are working as scientists in some capacity, nearly a million are engineers, another million are technicians, and a quarter of a million are teaching science and mathematics in secondary schools, according to *Profiles of Manpower in Science and Technology*, a new survey released by the National Science Foundation.

These groups, the report says, comprise some 3.6 percent of the civilian labor force in 1963, as compared with 1.5 percent in 1940. Projections indicate that the percentage will rise to some 4.7 percent in 1970.

(Continued on page 88)



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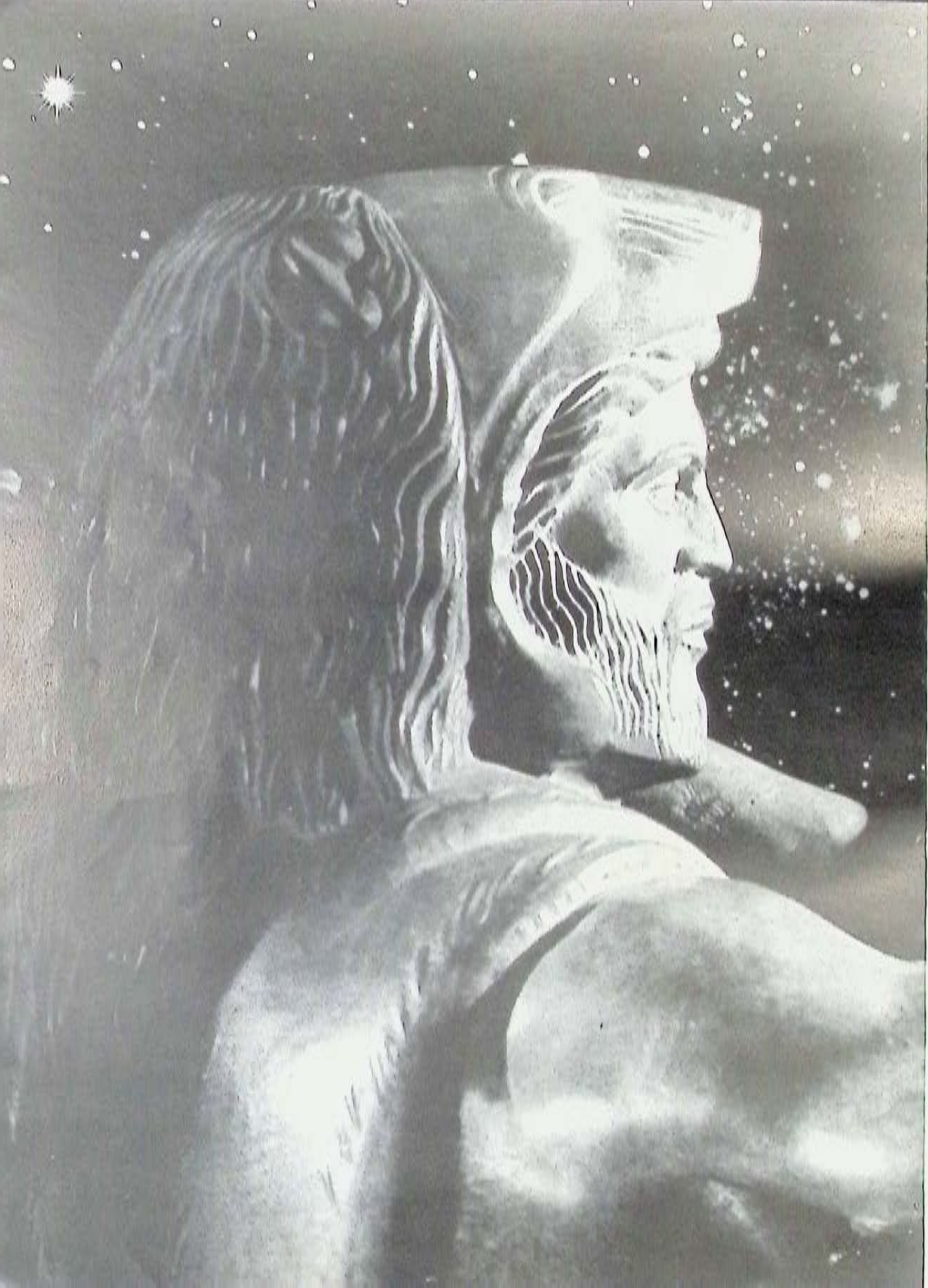
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Some other interesting figures are given in the report. Women now comprise some twelve percent of the scientists, but only one percent of the engineers, while at the same time filling some thirty percent of the science-mathematics instruction force in the secondary schools.

A number of other aspects of current scientific-technological manpower are presented in *Profiles*: historical perspective, gains and losses, breakdown by field of specialization, type of work, and sectors of the economy, age, and geography.

For information on availability of the report, write to National Science Foundation, Washington 25, D. C.

Why Not Mercury?

We might find on Mercury a space-fuel treasure house and life, suggests Dr. Dandridge M. Cole, General Electric space programs analyst and one of the most provocative of space-age thinkers. Dr. Cole writes in the summer 1963 issue of Challenge, the magazine of General Electric's Missile and Space Division, that the significance of Mercury—closest planet to the sun—has not been appreciated as an important space-exploration target. Following, slightly condensed, is Dr. Cole's thesis, reprinted with permission of Challenge:

• • •

Mercury is at least as interesting as the other astronomical objectives listed and in some respects is of unique interest.

It has been concluded by some scientists that the dark side of Mercury is the coldest spot in the solar system since it is never exposed to solar heating, and the planet's very tenuous atmosphere would serve as an ineffective medium for convective transfer of heat from the hot side.

Mercury is the only planet in the solar system exhibiting this behavior. Even by traveling all the way to Pluto we could not investigate the characteristics and effects of such a giant "deep freeze." Because of this deep freeze and a surface gravity approximating that of Mars, it is possible that the dark side of Mercury represents the greatest storehouse of light elements in the inner solar system (outside the earth). This would have great significance for the logistic supply of future manned bases or colonies, as well as its basic scientific interest. Important discoveries might also result from the permanent shielding of the cold side from types of solar radiation other than thermal.

The hot side of Mercury undoubtedly includes

the hottest solid surfaces on any of the planets, as well as possible large accumulations of hot liquids, which could not exist in the molten state anywhere else in the solar system. Unusual effects might also have resulted from constant exposure to other forms of high-intensity solar radiation.

The twilight zone of Mercury is also unique in the solar system and could contain many surprises for our scientists. Because the orbit is quite elliptical and the spin rate is constant, an apparent wobbling occurs with respect to the direction of the sun. Thus, some forty percent of the area of the planet passes through alternate light and dark periods comprising a "day" of eighty-eight earth days in length. This is somewhat similar to the situation at high latitudes on the moon, where the "day" is twenty-eight days long and the sun never rises high in the sky.

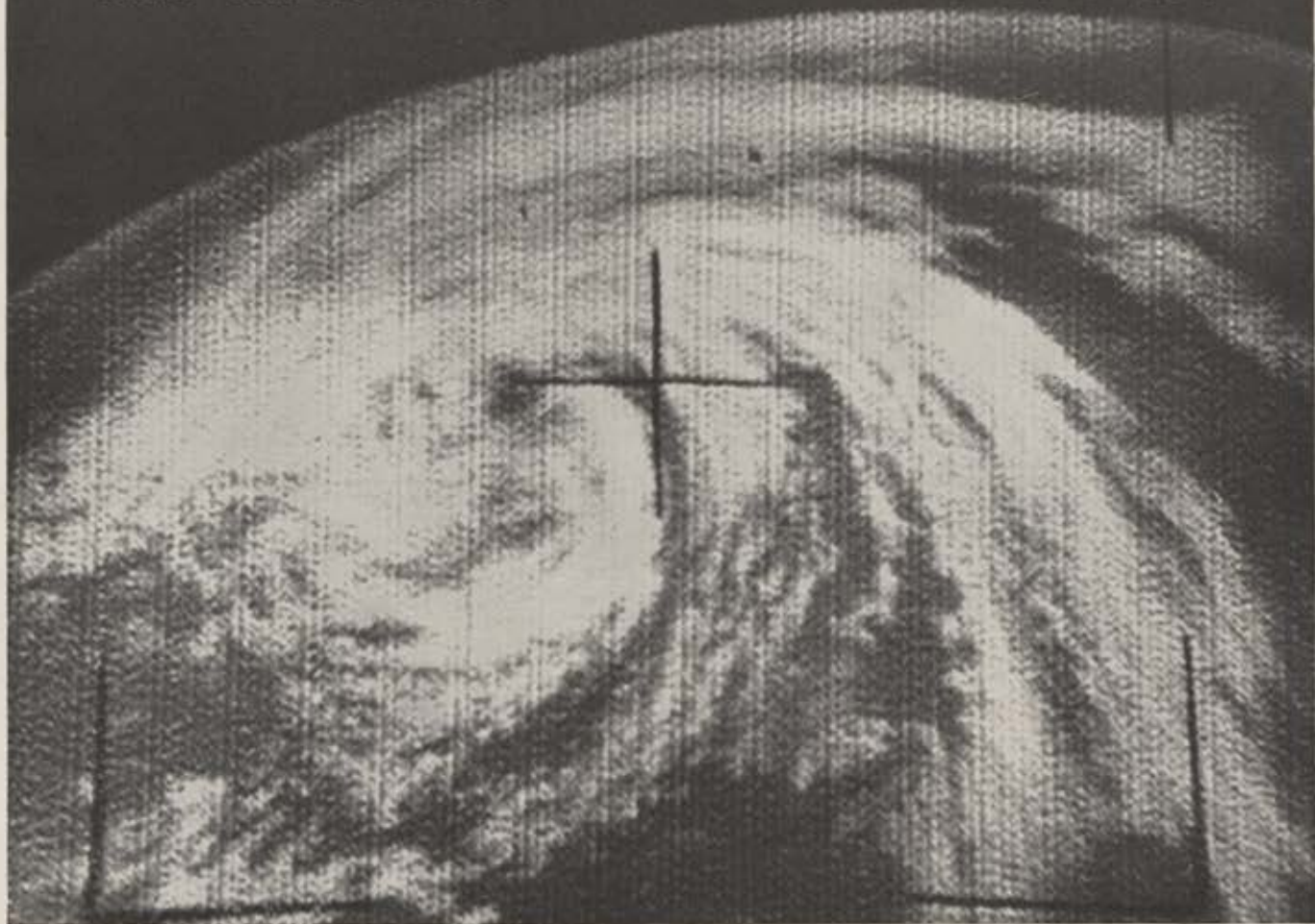
The twilight zone of Mercury is of particular interest because of the cyclic changes in temperature, the moderate average temperature (particularly a few feet below the surface), and the possibility that in past ages—if not now—frozen gases from the cold side were melted during the periodic warm spells and formed both liquid water and an atmosphere of light gases. Since this appears to be a good description of a prebiotic environment (atmosphere, solar energy, liquid water, moderate temperature, etc.), the possibility that life might have evolved there should not be excluded. The possibility that a migratory type of life developed in the twilight zone and follows the sun in such a way that only the optimum percentage of the solar disc is visible is an example of the type of exciting discovery that could be made in this unusual environment.

Note that the terminator (line between day and night) velocity is about 1.5 miles per hour, and thus forms of life similar to earth animals could maintain the average migration velocity required to hold the desired distance from the terminator. Presumably, Mercurian life would have to be of the encapsulated, closed-cycle, symbiotic form rather than the open-cycle earth form. (See I. M. Levitt and D. M. Cole, *Exploring the Secrets of Space*, Prentice-Hall, 1963.)

There are two major aspects of the exploration of Mercury which have received little or no attention in the very brief consideration generally given to this fascinating planet. One is the possibility of finding large quantities of frozen light elements (particularly the life elements—carbon, oxygen, hydrogen, and nitrogen) on the dark side. The

(Continued on page 93)

HOW WEATHER SATELLITE PHOTOS LIKE THIS ARE IMPROVING DAILY FORECASTS FOR YOU



TIROS SATELLITE PHOTOGRAPH of a typhoon in the Pacific Ocean shows huge pinwheeling system of white clouds. Photo was taken from a height of 450 miles; cross in center and angles at corners are reference points.

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With the help of fast, dependable Bell System communications, military experts benefit from the nation's progress in the techniques of collecting, studying and distributing weather information.

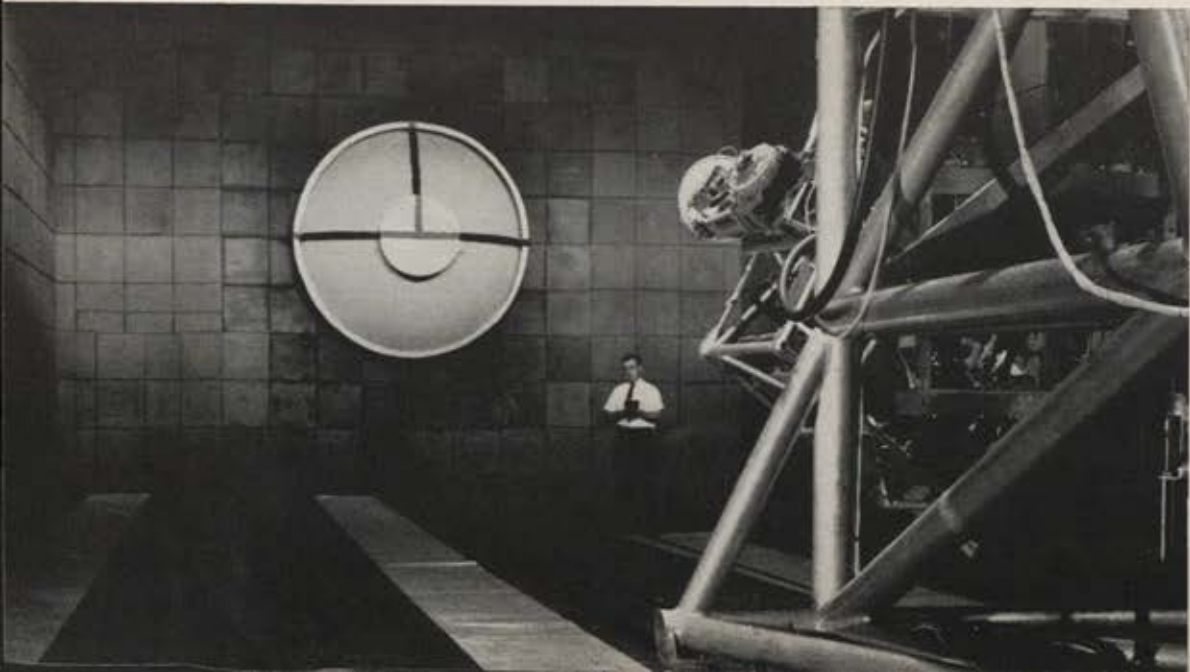
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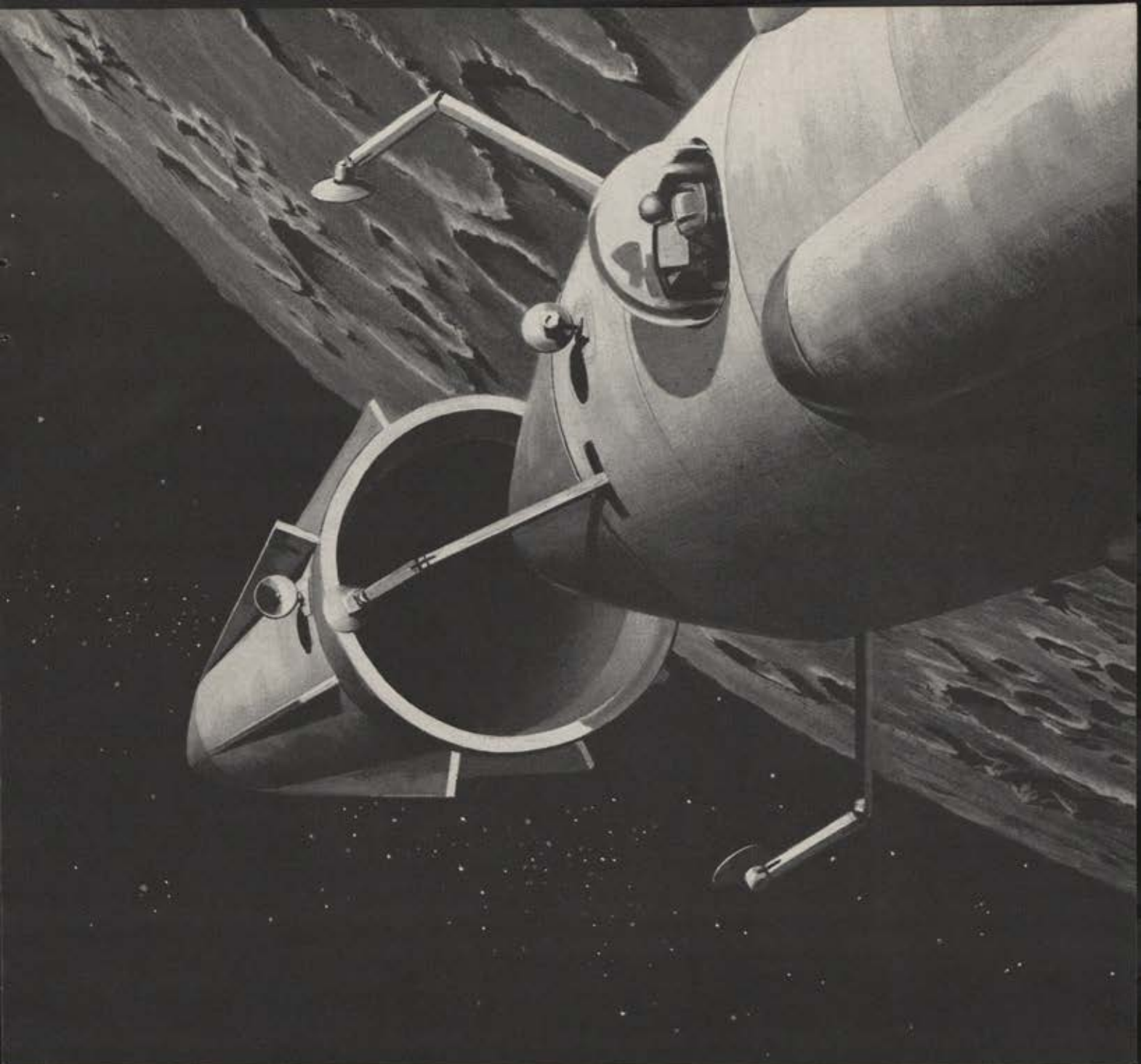
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Top illustrations (left to right): Landing, Rendezvous, Docking.

Left: Raytheon's Prototype Rendezvous Radar installed in the Martin Marietta Company's Closure Test and Training Facility.



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Logistics System, Mars Excursion or Command Module, Satellite Inspectors, and Manned Space Stations. Variations of the system are now being tested for particular missions.

For additional information — or a discussion of how the same Raytheon integrated system capability can be applied to your requirements — contact Neil A. Montone, Director, Marketing, *Space and Information Systems Division, Raytheon Company, Bedford, Massachusetts.*

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LITTON INDUSTRIES GUIDANCE & CONTROL SYSTEMS DIVISION
WOODLAND HILLS, CALIFORNIA SALT LAKE CITY, UTAH DULUTH, MINNESOTA BEVERLY HILLS, CALIFORNIA

other is the possible value of even a tenuous atmosphere in decelerating a spacecraft prior to landing.

Because little is known positively regarding the atmospheric pressure on Mercury except that it must be very low, even compared to that of Mars, it is generally assumed to be of no practical consequence in relation to spaceflight. This may not be the case.

Estimates by Dollfuss of the atmospheric pressure at the surface of Mercury lead to a value of one to three millibars, corresponding to pressures at earth altitudes of 130,000 to 150,000 feet. While this might be considered essentially a vacuum for most practical purposes, it could play a significant role in the deceleration of spacecraft.

Vehicles reentering the earth's atmosphere undergo most of their deceleration above 200,000 feet (even the relatively high-density capsules recovered to date). Because of the low gravity of Mercury, the atmospheric density would change more gradually with altitude than for the earth. There should be a crossover point at some distance from the planet where the density would be higher than for a corresponding distance from the earth. Consequently, reentry deceleration could be more gradual with lower peaks in the deceleration and heating curves. Thus, we should consider the possibility of atmospheric braking for Mercury landing spacecraft, manned or unmanned, at least until better data can be obtained on the properties and extent of the atmosphere. . . .

It should be noted that the propulsion requirements (total velocity change) for missions beyond earth orbit involving fly-by probes, such as the Mariner II Venus probe, range from 40,000 to 46,000 feet per second and involve only secondary differences. Thus, other factors such as guidance, time in space, communication distance, launch window availability, etc., should be considered. However, these factors also are found to involve the same general degree of difficulty (with the exception of the moon) except for the question of availability of launch windows. Here Mercury is highly favored, since launches could occur several times a year compared to every eighteen months for Venus and twenty-six months for Mars. Thus, a Mariner-type probe to Mercury should be seriously considered.

In addition to the single planet fly-by trips . . . a number of studies have been made of possible Mars-Venus fly-bys, particularly in the 1970-1980 period. However, no studies have been publicized of the equally interesting Venus-Mercury or Mars-

Mercury two-planet fly-bys, and the possibility of a three-planet fly-by. Such trips would potentially provide two or three times the data from a single fly-by, with only slightly greater velocity, hardware, and flight-time investments.

Total velocities for soft landings again are spread through a small range, from 45,000 for Mars and Venus to 49,000 fps for the moon.

It is in the return velocities that the large differences occur. This would be of major importance for manned exploratory vehicles, but possibly of considerably less importance during the later phase of manned bases or colonies. A more important question in the later base-colony phase might well be the availability of sources of rocket propellants. It might well be that the cold side of Mercury would be a better source of propellants than could be found on either the moon or Mars.

Venus is still too much of an unknown quantity to decide definitely against ever establishing manned bases on its surface. However . . . the return and round-trip velocity requirements are greater for Venus than for Mercury because of the higher escape velocity of the former.

For the total round-trip velocity required, Mercury falls between Mars and Venus. Considering the other factors discussed here, including the fascinating possibilities connected with the twilight zone, Mercury should place higher on the list of astronautical priorities than Venus and almost as high as Mars.

Space Capsules

The August *Atlantic Monthly* has a provocative Atlantic Extra section on the space theme, with articles by RAND Corporation's political scientist, Dr. Alton Frye (a previous *SPACE DIGEST* author quoted in this column last month), NASA's articulate space scientists, Drs. Robert Jastrow and Homer A. Newell, Itek Corporation president Franklin A. Lindsay, and Prof. N. J. Berrill, McGill University zoologist.

The four pieces treat, respectively, military risks inherent in our national space policies, scientific benefits attainable through vigorous efforts in space exploration, military-political potential of space technology, and the search for extra-terrestrial life.

Scope, Inc., of Falls Church, Va., has developed for the Air Force a "conditioned-reflex" machine which can "learn" to recognize photographs of aircraft, people, and many other items. The de-

(Continued on following page)



The world-famous "Voice of Mercury Control," Lt. Col. John A. "Shorty" Powers, USAF, has completed his assignment as Public Affairs Officer, NASA Manned Spacecraft Center, Houston.

Colonel Powers will be succeeded as Manned Spacecraft Center Public Affairs Officer by Paul Haney, former Washington, D.C., newsman who has served in NASA information slots since 1959.



vice, called Conflex I, is a desk-console-sized "black box" and consists of three major elements: a sensory field, discrimination cells, and a memory device. Photo-conductive cells in the sensory elements transmit electrical signals geared to particular test patterns presented to the systems. Patterns are "memorized" by the machine.

According to its developers, Conflex is capable of recognizing some 4,800 different previously learned patterns, including pictorial displays, numbers, letters, and geometric designs with 99.9 percent accuracy. Its capabilities can be expanded by adding more memory units. The development is part of Air Force Systems Command's Aeronautical Systems Division's bionics research program—which is a broad-scale effort to apply knowledge of intelligence and other functions of living organisms to the development of machines.

The destructive potential of laser beams in antimissile applications is pooh-poohed in an article, "The Myth of Laser Death Rays," by Prof. Hans Thirring, retired head of the theoretical physics department at the University of Vienna.

Writing in the June 1963 *New Scientist*, Dr. Thirring asserts that power requirements would be so fantastic as to preclude practical application of lasers against warheads. "With masers and lasers," Dr. Thirring says, "we can transmit either microwaves or light rays in the wave-length band between, say, a tenth of a millimeter and a few tenths of a micron. These are not mysterious rays at all and do not belong to the penetrating class of high-energy radiation like X-rays and gammas. They cannot, therefore, do any harm to a nuclear

warhead contained in a metal cover, unless their intensity is strong enough to melt the capsule. The dream of achieving such an effect was obviously inspired by the reports of holes drilled in razor blades and [in] diamonds by laser beams. Certainly the power flux of the order of 100 megawatts per square centimeter attained in these experiments would suffice to vaporize the bomb if the entire surface of the bomb were exposed to such an intensity.

"But we must not forget that the extremely high flux was not the result of high power transmitted by the laser beam but only of the possibility of focusing it on an extremely small area. The holes drilled into a steel blade by a focused laser beam have diameters of about a thousandth of an inch or less. Moreover, these holes are conical and would not pierce the mantle of the bomb.

"Yet even such superficial damage could not be inflicted because there are certainly no lenses attached to the warhead to focus a laser beam. Therefore, destruction of the missile by a laser beam would be feasible only when the total energy hitting it—that is, the power flux summed over the surface of the missile and multiplied by the time of irradiation—would suffice to melt it."

Dr. Thirring presents estimates of the enormous power required and adds: "Quite independent of the problem of supplying so much energy to the beam is the difficulty of aiming at the missile and hitting it." He concludes that "even with the extraordinary progress made by the invention of the laser, the missile-destroying weapon beam is still a dream, far away from realization."

While he is pessimistic on the future usefulness of the laser as an antimissile weapon, Dr. Thirring is sanguine about its potential as a communications medium, for power transmission, and as an antipersonnel weapon for blinding or dazzling enemy troops. The human retina would provide the focus at the target, and the victim could suffer retinal burns in much the same manner as a careless direct viewer of the sun would suffer retinal damage, as we were all warned during the recent solar eclipse.

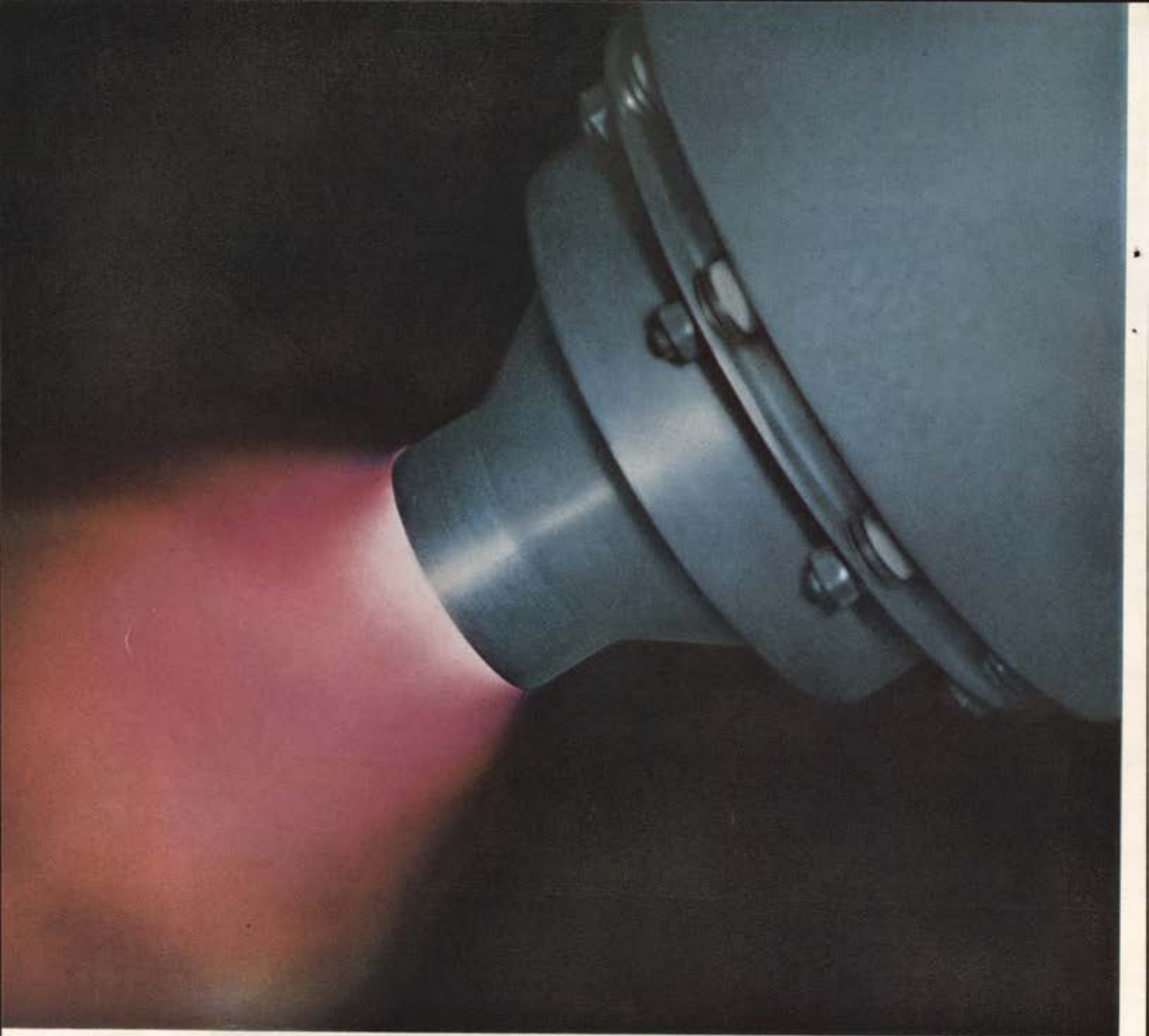
"Power from Isotopes" is the name of an informative twenty-two-page booklet describing various advances in the use of nuclear energy for auxiliary and primary power systems. Written by the Martin Company's Robert L. Mead, the booklet is available free of charge from the US Atomic Energy Commission, Division of Technical Information Extension, Educational Materials Section, P.O. Box 62, Oak Ridge, Tenn.—END



New power for space will come from America's first liquid-hydrogen engine, the RL-10. This upper-stage powerplant is being developed by Pratt & Whitney Aircraft for NASA's Marshall Space Flight Center. The RL-10 is designed to stop and start in deep space, with advanced models offering throttle control of power. Pratt & Whitney Aircraft provides design and manufacturing leadership in power for many applications, in and out of this world.

**Pratt &
Whitney
Aircraft**

**U
A**
DIVISION OF UNITED AIRCRAFT CORP.
EAST HARTFORD, CONN.



The one-piston, no-cylinder space engine that runs for a year on a pound of gas

This is the Republic pinch-pulse plasma engine. It is just 9 inches long and weighs 5 pounds.

Its "piston" is an invisible magnetic squeeze. Many times each second, it drives a small volume of ionized gas (plasma) through a narrow exhaust tube at high velocity. Each pulse of the piston accelerates the engine forward.

It may be powered by energy from the sun, nuclear reactors, or silver-cell batteries. This power is stored in a bank of capacitors and discharged into the plasma chamber at precisely timed intervals. With this controlled pulse rate, the engine has variable thrust and specific-impulse values. It can stop and start on command. Its simple design and construction make it intrinsically

reliable. And it has already undergone extensive tests.

Complete with controls, fuel supply, test instruments and electrical power source, the engine system has been operated in an environmental test chamber simulating actual conditions of space. Control information is telemetered into the test chamber.

This pinch-pulse plasma engine was built by Republic under contract to the Office of Naval Research. It is the prototype of a family of engines for satellite propulsion, stabilization, attitude control and rendezvous-and-docking in orbit.

One day its descendants will drive ships out beyond orbit . . . deep into the black vacuum of space.

REPUBLIC
AVIATION CORPORATION
FARMINGDALE, LONG ISLAND, NEW YORK

Last October, during the Cuban crisis, TAC was mobilized in its entirety as a combat force, poised for immediate response to any contingency. As the cold war continues, this capability becomes increasingly vital . . .

TACTICAL AIR COMMAND



Gen. Walter C. Sweeney, Jr., has been TAC Commander since October 1961. Earlier he was Commander of SAC's 8th and 15th Air Forces. In 1954 he led a trio of B-47s on history's first non-stop jet-bomber flight across the Pacific. He served in the Pacific in World War II, in B-24s and B-29s, and took part in the first B-29 low-level attack on the Japanese homeland.

THE TRAUMA of Cuba can be regarded in one sense as a blessing in disguise. It proved conclusively that the importance of tactical airpower is increasing. On the night of October 22, 1962, President Kennedy told the nation and the world the sobering facts about the gravest threat to global security since World War II. At that moment, on advance operating bases in the southeast and in the air over the Caribbean, the Tactical Air Command was ready and waiting.

This incident, coming as it did during a period of accelerated growth and adjustment, constituted more than a severe test for TAC's readiness and mobility—it was a unique experience. It marked the first time in its seventeen-year history that TAC was mobilized in its entirety as a combatant force poised for immediate response to any contingency.

In the past—Korea in 1950-53, Lebanon and Formosa in 1958, and Berlin in 1961—TAC has contributed strike forces, reinforcement elements, and general support to overseas combatant forces. This time, however, TAC was the major air-striking element of the unified Atlantic Command. Furthermore, Gen. Walter C. Sweeney, Jr., Commander of TAC, assumed the role of Commander in Chief of Air Forces, Atlantic Command. This made the transformation complete: TAC's total resources were committed in a combatant posture under the operational direction of a unified theater commander.

On this basis, it is logical to say that fiscal year 1963 was the brightest point in TAC's history, which has been marked by fluctuating fortunes but always characterized by determined efforts to fully exploit the inherent flexibility of tactical airpower. Oddly enough, the Cuban situation was not without a quaint twist of fate for TAC.

Prior to the October crisis, TAC was busily engaged in the important business of perfecting its partnership with the Army in the United States Strike Command which was established in 1961. Suddenly, with a quiet

shifting of gears, TAC moved into the Navy's Atlantic Command, demonstrating a remarkable flexibility of command structure that matches its weapon system versatility.

Even now, little can be said about what TAC did or could have done in the Cuban crisis. However, it is no breach of security to recall that TAC assembled one of the most powerful air-superiority, close-air-support, and airlift forces ever amassed. More precisely, some 1,000 aircraft, 15,000 men, and thousands of tons of equipment were on station when the naval blockade was set on October 24, and TAC supersonic reconnaissance aircraft flew a constant vigil over Cuba, providing much of the intelligence on which presidential decisions were based.

While Cuba was the focal point of FY '63 for TAC, it only slowed the momentum of essential actions within the command designed to improve and update weapon systems, professional skills, techniques, tactics, command and control, organizational procedures, and resources management. If one basic theme can be ascribed to FY '63 it was General Sweeney's mandate to improve TAC's ability to provide across-the-board support for the Army. It was not a new injunction, but a firm reminder of an edict handed down when General Sweeney assumed command of TAC in October 1961.

Since that time more than forty projects have been initiated and developed specifically to increase the Army's mobility and strengthen TAC's firepower support capabilities. These range from the modification of the F-105 to increase its close-air-support talents to the assignment of Forward Air Controllers and Air Liaison Officers to the eight divisions assigned to USSTRIKE. No area of close support has been overlooked.

One of the most significant advances during FY '63 was in airlift support for the Army. This involved not only a programed authorization for more C-130 airlift squadrons, but development and refinement of new

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uses of the versatile turboprop aircraft. The novel and highly effective ground proximity "extraction method" of delivering supplies to remote frontline Army positions was introduced.

Simply stated, this technique permits the off-loading of cargo pallets from C-130s flying a few feet off the ground by engaging a trailing hook with a ground-anchored arresting cable. The same principle holds for extracting cargo from aircraft rolling along hastily prepared strips. Payloads upward of 20,000 pounds have been delivered in tests conducted under realistic conditions. The eventual use of the extraction method for the delivery of combat troops is considered highly feasible.

The extraction delivery development was part of an extensive effort to upgrade assault airlift capabilities. Other programs of equal importance included high-speed, low-level navigation, all-weather troop and equipment delivery, new formations to increase delivery speed and efficiency, and more effective command-control systems to ensure more immediate response to airlift needs.

Symbolizing the over-all effort was the establishment in January of the Directorate of Airlift within the Deputy for Operations. Its purpose is to coordinate and control all airlift activities and to provide the Commander with positive control during routine TAC

operations and to ensure rapid reaction to contingency requirements.

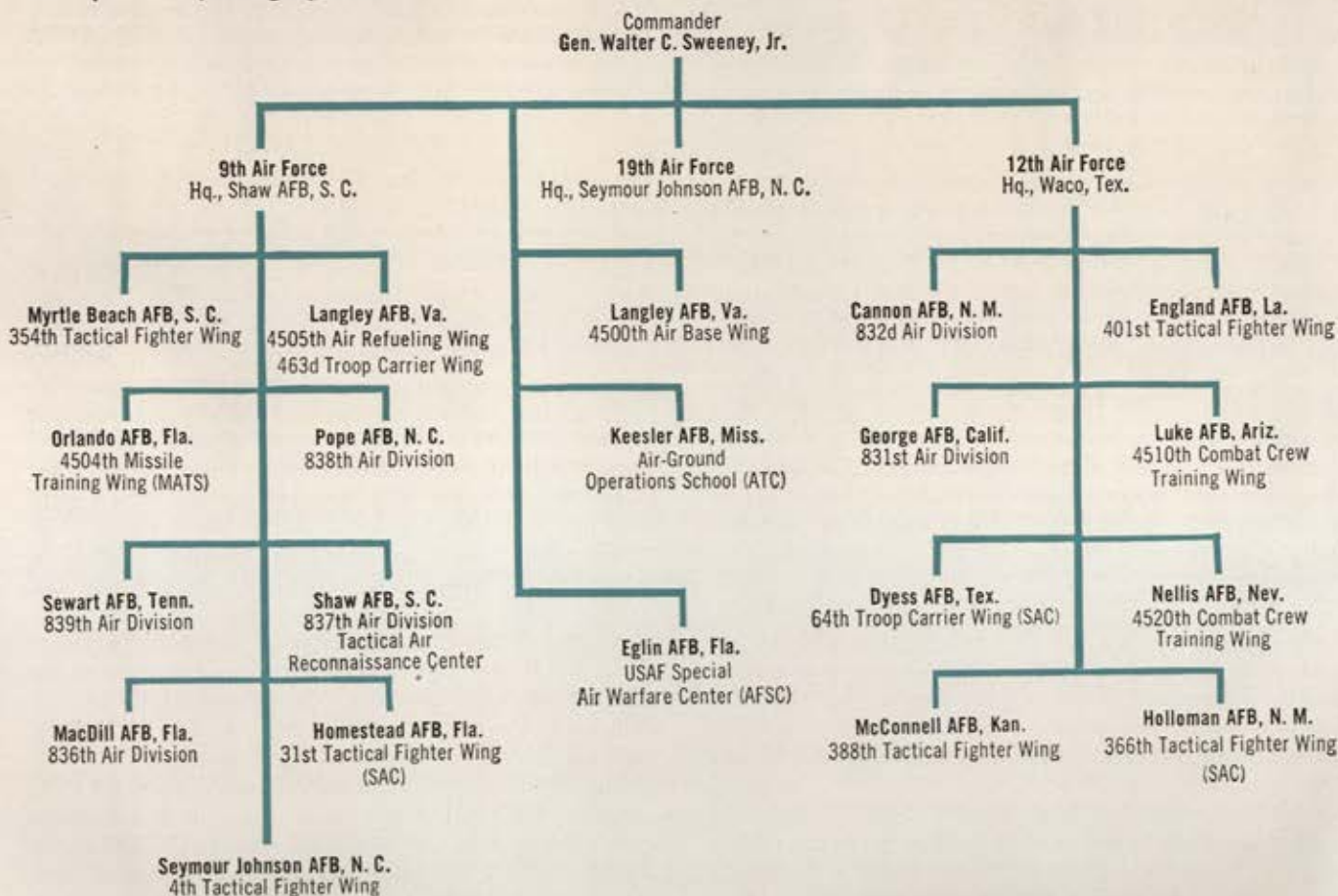
In the field of weapon systems refinement, there were a number of significant developments in FY '63. The F-105F, a two-seat version of the F-105 with added power and maneuverability, came off the production line; and the first F-4C multipurpose tactical fighters entered the TAC inventory. These aircraft will greatly enhance TAC's over-all limited-war posture by ensuring maximum flexibility and versatility across the full spectrum of tactical air warfare.

Similarly, TAC accelerated efforts to obtain improved nonnuclear weapons designed to emphasize versatility, simplicity, and maintainability; and plans were advanced to assign munitions squadrons to all TAC fighter wings. Action was taken to obtain better penetration aids to increase the attack certainties of fighters while improving the survivability factor in a sophisticated defense environment.

In this same vein, TAC's firepower training cycle continued at an accelerated pace, including an intensified effort to perfect nighttime tactical fighter action. The Avon Park Range in Florida, reactivated and kept busy during the Cuban crisis, the Indian Springs Range in Nevada, and other TAC target facilities were heavily taxed throughout the year. Traditional attack techniques were refined and sharpened, and new tactics

TACTICAL AIR COMMAND

Headquarters, Langley AFB, Va.





President Kennedy, shaking hands with 19th AF's General Preston, and General Sweeney congratulate TAC personnel at Homestead AFB, Fla., after last fall's Cuban crisis.

were developed to meet the challenge of improved and hardened defense positions—and to ensure optimum effectiveness against frontline targets in response to the Army's need for fast, precise, and destructive air fire-power support.

Mindful of the vital need for quick response in close air support, TAC proposed a new air strike request system to expedite the Army's requirements for immediate close air support. Basically, the new system—Direct Air Support Center—provides a direct communications link between the battalion and the air commander who can fill the request. In short, the DASC closes the time gap and enables TAC to respond to Army air strike requests within a matter of minutes with the precise measure of necessary force.

While major effort was devoted to upgrading TAC's tactical fighter and airlift elements, other phases were by no means neglected. In fact, the Special Air Warfare program within TAC enjoyed mounting emphasis, with the evaluation of the 1st Air Commando Group to wing status to keep pace with accelerated growth of the Special Air Warfare Center. Also, the procurement of Marine AD-5 aircraft (designated A-1E) and the successful testing of the jet-assisted YC-123 all-purpose transport in Vietnam were valuable dividends from SAWC. Meanwhile, the 1st Combat Applications Group continued to develop, examine, test, and refine new ideas and weapon system proposals to further improve the over-all quality of the Command's special air warfare forces.

Mobility, always a key concern in TAC, was steadily improved with constant practice and increased use of KC-135 jet tankers from SAC's single-manager fleet. During FY '63 a total of 300 tactical fighters were rotated to European and Pacific theaters and returned under the routine program of support for overseas tac-



How close can close air support get? The F-105 is taking part in Exercise Coulee Crest, a 40,000-man joint Army-Air Force operation held last spring in Pacific Northwest.

tical air forces. In April, however, something new was added: For the first time eight tactical fighter squadrons crossed the Atlantic with in-flight refueling provided entirely by KC-135s. This was an interesting preview of the future, when TAC's aging KB-50J fleet is phased out and all in-flight refueling will be accomplished with the jet-tanker force.

A typical exercise in force mobility was executed by the 352d Tactical Fighter Squadron, which flew non-stop from its Myrtle Beach, S. C., base to Alaska to participate in Exercise Red Oak. In a different manner, but equally convincing, the 31st Tactical Fighter Wing demonstrated remarkable mobility and flexibility. It managed a cross-country home-base movement, deployed an F-100 force to the Pacific, maintained the capability to support a Composite Air Strike Force, continued a high state of combat readiness, participated in two major exercises, and quickly responded to the Cuban crisis, all in a brief and continuing time period. For this achievement, the 31st received the 1962 Air Force Outstanding Unit Award—its second in ten years.

Tactical air reconnaissance gained great prominence during the Cuban crisis. The excellent performance of the 363d Tactical Reconnaissance Wing, underscoring the vital importance of this TAC function, led to the establishment of the Tactical Air Reconnaissance Center at Shaw AFB, S. C., early in 1963. The TARC will be the hub of accelerated efforts to strengthen reconnaissance operations by developing better techniques, improved cameras, side-looking high-resolution radar, airborne television and infrared equipment, and accurate position-recording sensors.

Despite the unscheduled intrusion of the Cuban situation and the resultant tabling of many plans and
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programs, TAC's intensified training cycle of joint and unilateral exercises was little affected. While the actual number of joint exercises conducted in FY '63 was somewhat below previous years, the basic character of routine maneuvers was significantly altered to ensure greater realism and a more positive evaluation of effectiveness.

For instance, last summer's Swift Strike II, the annual air-ground simulated war involving a blend of Reserve and Regular forces, was expanded in size and context. Most notable change was the doctrine of unfettered "free play" between the opposing forces; also, the extensive use of special warfare ground and air components, including civilian "partisans," was a marked departure from previous Swift Strike operations.

Billed as the largest exercise since World War II, Swift Strike II lived up to its advance reputation. More than 70,000 Army and Air Force personnel and nearly 700 aircraft played the no-holds-barred mock war over some 5,500 square miles of rugged terrain in the Carolinas. With an increased element of tactical air firepower and guerrilla warfare, Swift Strike also provided impressive tests for the tactical delivery of Army airborne forces. More than 4,000 troops were dropped into the combat zone in a historic operation; day-night airlift missions were flown; and all actions were taken with maximum emphasis on the free play of commanders in meeting tactical contingencies.

An equally important joint exercise, and only slightly smaller in scale, was Exercise Coulee Crest in May of 1963, ranging over one million acres of Central Washington territory. One innovation set this maneuver apart from the past and signaled the start of a highly significant scenario change for future joint war games. Prior to the start of ground action, TAC fighters engaged in extensive "softening-up" missions to set the scene for the realistic confrontation of ground and air forces to follow. Involving more than 40,000 Army and Air Force personnel, more than 100 tactical fighters and reconnaissance aircraft, a large force of C-130 airlift transports, and the major elements of two infantry divisions, Coulee Crest was a highly successful test of many new and bold joint operations techniques.

The intensity of the action can best be described by the fact that during the softening-up period, Blue and Red air forces flew upward of 150 sorties daily. Later, when ground action was joined, sortie volume increased. On May 12, for instance, Blue air claimed the destruction of 135 tanks, 149 trucks, and seventy-five miscellaneous vehicles; Red air countered with claims of ninety-one tanks, 189 trucks, and 280 assorted vehicles.

Throughout FY '63, the emphasis was on quality rather than quantity in the planning and conduct of training exercises. And despite the overriding significance of such maneuvers as Swift Strike II and Coulee Crest, other smaller exercises were equally important. Among these were Fraternidad, Banyan Tree IV, and Tidal Wave, vital tests of quick response to overseas contingencies; the Long Thrust series and Sunday Punch, supporting European defense forces, continued unabated; Diamond Lil, Red Oak, and Timberline were

similar deployments to augment Alaskan Command forces; and the Quick Kick operations with STRICOM and the Atlantic Command further tested TAC's mobile flexibility. The year also had the usual share of augmentation and no-notice exercises.

Aside from these continuing exercises, the steady development of new techniques and further improvement of proven procedures, and the all-important Cuban interlude, TAC continued to press forward in other vital areas. In South Vietnam the Special Air Warfare units of TAC chalked up impressive gains; new bases—MacDill and Hurlburt, both in Florida—were woven into the expanding network of TAC bases, with McConnell AFB in Kansas joining the family at the start of FY '64; three new tactical fighter wings were activated quickly and smoothly and began to contribute to TAC's ever-stronger combat posture; and perhaps as important as anything else, TAC's flying safety record improved steadily.

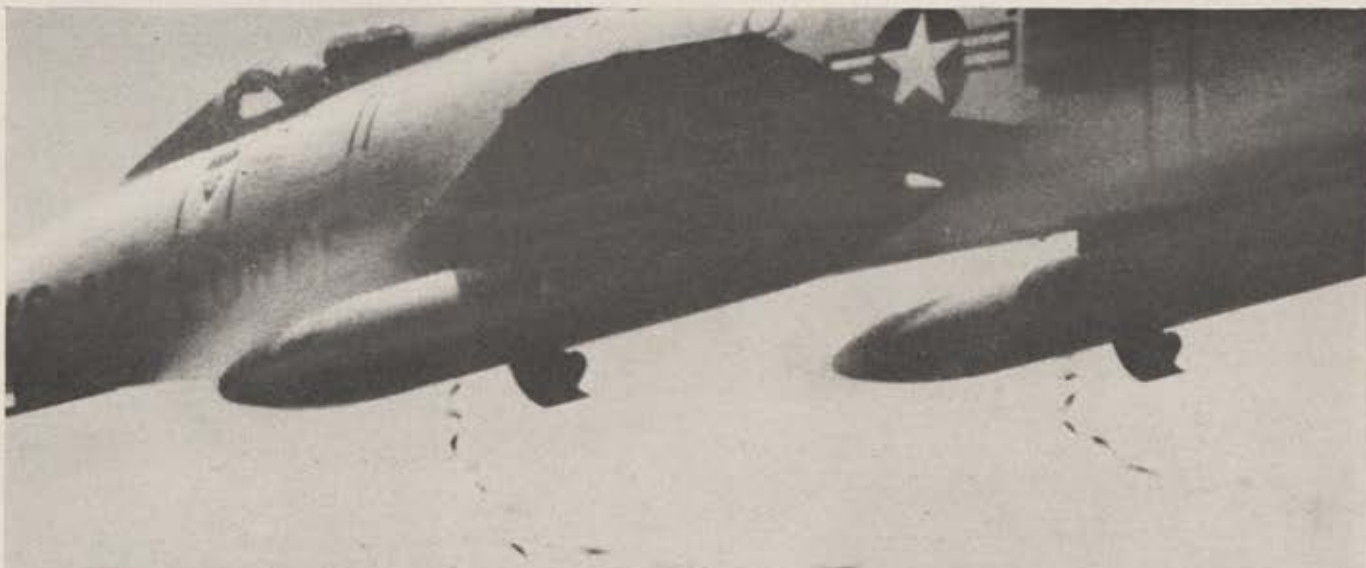
This last point, of increasing concern in an age of vastly higher speeds and more complex weapon systems, was emphasized by these safety awards. The 354th Tactical Fighter Wing won the coveted Colombian Trophy for outstanding safety achievement during the year 1962, and the Air Force Missile Safety Award; the 314th Troop Carrier Wing was awarded the USAF Flying Safety Award for a remarkable safe-flying record.

Internally, Headquarters TAC underwent extensive reorganizational change with the establishment of new directorates within the Deputy for Operations. The six directorates, reflecting the steadily increasing operational responsibilities of TAC, are Fighter/Reconnaissance/Tanker, Operations Services, Command Control, Requirements, Operational Plans, and Airlift. The move was instituted to provide stronger control over TAC resources in the development, refinement, and execution of operations throughout the world.

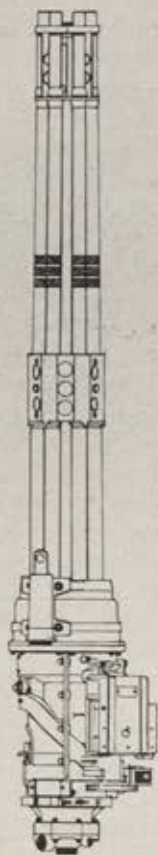
Among the highlights of the year were the citations received by TAC units and personnel for valorous, dedicated service in South Vietnam and during the Cuban emergency. Typifying the professional integrity and personal courage of TAC men in Southeast Asia was Lt. Col. Miles M. Doyle, who was given the Aviator's Valor Award by the American Legion. From Cuba came the Outstanding Unit Award for the 363d Tactical Reconnaissance Wing and upward of 200 Distinguished Flying Crosses and Air Medals for its men.

All of which points plainly to one clear fact: The importance of tactical airpower is increasing rapidly and Tactical Air Command is keeping pace with the swift movement of events and, in most cases, staying ahead.

Proof of this can be found in the impressive results of Project Fullscope, a maximum-effort test and evaluation of TAC's fighter weapon system under extremely realistic conditions at the Air Proving Grounds early in 1963. Any doubt about the speed, flexibility, and over-all efficiency with which TAC can provide precision close air support, interdiction, and air superiority support for ground forces is quickly dispelled by one look at the documentary films that came out of Fullscope.—END



FASTEST GUN



Firing 20mm projectiles at the astounding rate of 100 rounds a second, General Electric's M61 Vulcan is Top Gun. Newly holstered, as an externally mounted airborne gun system called VULPOD, it is designed to meet USAF armament-versatility requirements for close support firepower on the F-100, F-105, and F-4C.

Since 1956, General Electric has produced over 2,700 Vulcans for supersonic fighters and bombers flown throughout the Free World. Adapting its revolving six-barrel principle from the famous Civil War Gatling, successive generations of the Vulcan have bettered each of the original requirements for *reliability, firing-speed, and accuracy*: in a continuing series of over 200 systems tests, the M61 has demonstrated a 97.8 percent probability of firing a complete 1000-round complement; is rated at over 6,000 rounds per minute (tested up to 7,200); has a verified dispersion of under 6 mils.

The VULPOD takes more than its name from the performance-proved Vulcan. By incorporating guns identical to current USAF applications, the VULPOD program takes full advantage of the Vulcan Gun's in-place, worldwide inventory—extra evidence of the *Accent on Value* at G.E.'s Missile and Armament Department, Burlington, Vermont.

AEROSPACE AND DEFENSE GROUP

GENERAL  ELECTRIC

With confidence in its current capability but concern for the future, ADC continues to fill its role as a vital element of USAF's counterforce capability . . .

AIR DEFENSE COMMAND



Well-traveled Lt. Gen. Herbert B. Thatcher, named Commander of Air Defense Command in August, succeeding Lt. Gen. Robert M. Lee, has spent virtually as much time overseas as in US since graduating from US Military Academy in 1932. An ETO bomber wing commander in World War II, he was Chief of Staff to the UN Command in Korea before taking over at ADC.

AIR FORCE responsibilities in aerospace defense are carried out by the dually oriented Air Defense Command. ADC is both a major command of the Air Force and the USAF Component of the US-Canadian North American Air Defense Command (NORAD).

From his headquarters in Colorado Springs, ADC's Commander, Lt. Gen. Herbert B. Thatcher, reports to the US Air Force Chief of Staff as a major air commander, and to the Commander in Chief, NORAD, as a component commander of that joint international command.

The ADC mission is to organize, train, and equip all US Air Force aerospace defense forces so that they are combat-ready and responsive to the operational needs of CINCNORAD. In short, ADC provides; NORAD employs.

Approximately seventy percent of aerospace defense resources available to NORAD are ADC-supplied. These include some 110,000 military and civilian personnel, a capital investment of nearly \$8 billion, and an annual operating budget of \$1.3 billion.

ADC's early-warning systems, command-and-control systems, and air-defense weapon systems extend from the Arctic to the Rio Grande and for several hundred miles off both coasts. In addition, military and civilian sensor stations in ADC's space-surveillance network (the USAF Spacetrack System) are located in the United States and at strategic points around the world.

The ADC job is to provide and maintain an area defense in depth against both the space threat and the manned bomber threat.

ADC air-defense ground environment and air-interceptor forces are managed and controlled through a nationwide field organization of five air divisions which, in turn, direct air-defense actions of fifteen air-defense sectors. Space-surveillance operations are conducted through a single aerospace defense division with a global mission responsibility. A separate, non-

tactical air division in Florida directs ADC's weapons test and combat-crew-training responsibilities.

In recent years, ADC has been faced with the difficult and expensive task of building and refining a detection and tracking capability in space, while still maintaining and improving defenses against the manned bomber. The threat of ballistic missiles has been added to the manned and unmanned air-breathing offensive weapon threat. Survival demands a defensive capability against both threats.

In its continuing efforts to achieve such a dual capability, the Air Defense Command — during the year ending July 1, 1963 — witnessed a number of significant events:

ADC air-defense forces were tested under realistic conditions during the Cuban crisis. Interceptors and aircrews were swiftly deployed to the southeastern US to augment air-defense forces in that area, while others dispersed to civilian and military bases in less critical target areas. ADC combat-support transport aircraft airlifted personnel and equipment to the scene, and ADC established a NORAD forward command post at Key West to provide close-up air-defense surveillance and interceptor command and control. Increased air-defense operations in response to the Cuban threat were carried off smoothly and effectively. A higher combat-mission rate, a higher combat-ready rate, and a low-accident rate characterized ADC's actions in the Cuban crisis.

In April 1963, major realignment of the command's ground environment was ordered. Under "Project Six and Seventeen," six of ADC's twenty-one Semi-Automatic Ground Environment (SAGE) direction centers and seventeen long-range radar stations were ordered closed. The realignment moves are aimed at removing air-defense warning-and-control facilities from locations near likely target centers. In addition to increasing survivability, the organizational changes will effect substantial dollar and manpower savings.

Closely associated with the "Six and Seventeen" realignments, two ADC Air Divisions were inactivated July 1, 1963: the 32d Air Division headquartered at Oklahoma City and the 64th Air Division headquartered at Stewart AFB, N. Y. Command functions of these air divisions are being absorbed within the remaining five SAGE Air Division field organizations.

In moves announced in March 1963, ADC shifted a number of fighter-interceptor units to new operating base locations away from potential target centers to enhance survivability. In related actions, two interceptor units were disbanded and their aircraft and crews redistributed within the command to offset aircraft losses suffered through normal attrition. There have been no new interceptor aircraft delivered to the command since ADC took delivery of the last production model F-106 and F-101 in 1961.

Early in 1963, ADC added two squadrons of F-104 Starfighters to its Century series interceptor force of F-101, F-102, and F-106 supersonic aircraft. The F-104s were obtained from Air National Guard units in exchange for ADC F-102s. Based in southern Florida and west Texas, the two F-104 squadrons provide an interceptor capability to meet air-defense requirements in the southeastern United States.

In June 1963, USAF announced a long-range permanent fighter-dispersal program to permit ADC combat-ready interceptors and aircrews to disperse from home bases on a continual rotational basis to non-target civilian and military airfields. The dispersal program will provide greater survivability from missile attack. Permanent support personnel at the dispersal bases will include Air Force Reservists.

ADC's two Texas tower radar stations off the East Coast were closed early in 1963. Rapid technological advances in shore-based and airborne early-warning-and-control systems coupled with underwater structural problems encountered by the three-legged Texas tower platforms prompted the closures.

ADC's fleet of airborne early-warning-and-control aircraft operating from Otis AFB began on-station operational tests of a new compact airborne semi-automatic command-and-control system. The new system, known as ALRI, for Airborne Long Range Input (to SAGE), is a seaward extension of the nationwide air-defense Semi-Automatic Ground Environment Command and Control system. The new airborne

system promises a superior airborne warning-and-control capability than was possible with the previous manual input system.

Offshore airborne early-warning-and-control coverage was extended farther south along the eastern seaboard with the establishment in July 1962 of an ADC RC-121 "Warning Star" Airborne Early Warning and Control Squadron at McCoy AFB, Fla. Like its sister units operating from Otis AFB, Mass., and McClellan AFB, Calif., the McCoy-based RC-121 unit flies long overwater airborne radar surveillance to extend the Air Defense Warning and Control networks far out to sea. This unit played an important air-defense role during the Cuban crisis.

To further extend its early-warning-and-interception capability, ADC took over on July 1, 1963, the radar stations and fighter-interceptors stationed in Iceland. MATS had previously controlled these forces.

In September 1962, the Bomb Alarm System built and operated for the Air Force by the Western Union Company was turned over to ADC. This nationwide system links some 100 metropolitan and strategic centers to the NORAD Combat Operations Center in Colorado Springs through pole-mounted sensors responsive to nuclear detonation. In event of a nuclear attack, the system would instantaneously confirm the attack and flash the precise impact area to the NORAD Combat Operations Center for relay to key military, government, and civil defense posts in this country and in Canada.

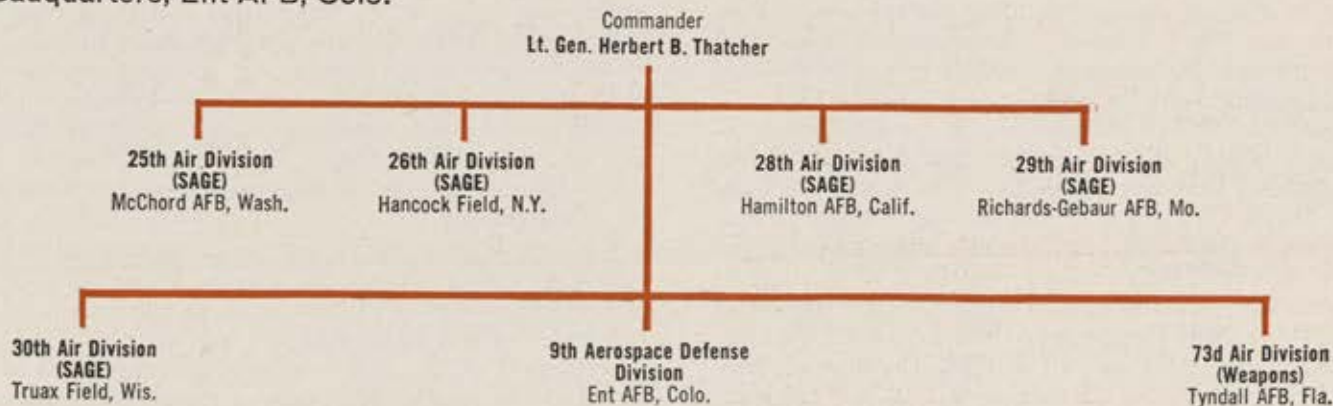
In late 1962, nuclear power was harnessed to the air-defense mission with the turnover to ADC of the first Air Force nuclear power reactor at ADC's remote radar station at Sundance, Wyo. The radar site receives electric power and heat from a PM-1 (Portable Medium Number One) nuclear reactor. The reactor will operate for two years on energy contained in a nuclear energy core no larger than a fifty-five-gallon oil drum.

A new air-defense communications trouble-shooting checkpoint known as the Communications Outage Restoration Section (COORS) Center was activated by ADC in August 1962 at Ent AFB to serve NORAD. The COORS Center permits a central checkpoint for some 10,000 communication circuits in the 16,000,000-mile air-defense communication network feeding into the NORAD COC at Ent AFB. The Center immedi-

(Continued on following page)

AIR DEFENSE COMMAND

Headquarters, Ent AFB, Colo.





Scramble! An Air Defense Command pilot and his radar operator dash with blurring speed to their "ready-to-go" F-101B Voodoo supersonic interceptor in defense exercise.



Capt. William Bingham checks the latest information on orbiting objects with display board in ADC's Spacetrack Center. Photo was taken through a transparent globe.

ately spots communication trouble points and directs "fix" action to bring circuits back into operation.

In June, the Pine Tree radar site at Lowther AS, Quebec—the last of eleven Pine Tree sites previously manned by ADC personnel—was transferred to Canada as part of a three-part US-Canadian agreement. Through ADC the US Air Force had earlier transferred sixty-six F-101Bs to Canada. In return Canada assumed operations and funding for the eleven Pine Tree sites. The third part of the arrangement involved procurement in Canada of F-104 aircraft to meet Canadian commitments to NATO.

Early in 1963, ADC ground-radar and fighter-interceptor forces took part for the first time in a Strike Command joint war games exercise—Operation Coulee Crest. This was a twenty-two-day mock war conducted in the Pacific Northwest. It included participation by over 2,000 ADC personnel.

Perrin AFB, whose mission is combat-crew training in the F-102 Delta Dagger, was shifted from Air Training Command to ADC on July 1, 1962. The new arrangement permits closer integration of ADC's F-102 combat-crew-training requirements. Perrin AFB is part of

ADC's 73d Air Division with headquarters at Tyndall AFB, Fla.

During the year excavation work was essentially completed on the NORAD hardened Combat Operations Center being built by USAF beneath Cheyenne Mountain near Colorado Springs, and construction started on the underground building facilities. Design and testing of command-and-control-systems equipment for the new COC is well under way. When completed, the underground COC will house the terminal elements of all NORAD aerospace defense command-and-control systems.

One-third of ADC's fighter-interceptor forces are now being maintained on instant alert, requiring a seventy-five-hour work week for combat crews. In addition, a program is in motion to rotate a portion of the interceptor force to dispersal bases. This action will permit the dispersal deployment of about a quarter of the active interceptor force for extended periods of time.

A Back-up Interceptor Control (BUIC) capability is under development to ensure an alternate command-and-control system to back up unhardened SAGE direction centers should they be lost. A manual back-up interceptor-control system to SAGE is now in-being.

While most of these developments are related to ADC's improved capability against the air-breathing threat, the command's capability in space continued to improve as new space-surveillance facilities and sensors were added to the global network serving the ADC-operated Air Force Spacetrack System which serves the multiservice NORAD Space Detection and Tracking System (SPADATS). A new optical sensor is under development.

The third station in the three-station BMEWS network is nearing completion at Fylingdales, England. This joint British-US BMEWS facility will provide missile-attack warning to the United Kingdom and—through BMEWS—to the US and Canada.

To counter the bomber threat and provide greater area defense in depth, a thorough study of the entire problem of modernizing our manned interceptor force is being made at the Department of Defense level.

Summing up, the aerospace defense picture looked like this as the year drew to a close:

ADC 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 air-defense functions—detection and identification—were being performed against the ballistic missile and space threat. The remaining two functions—interception and destruction—remained matters of urgent priority.

With confidence in its current aerospace defense capability, but with concern for the future, the Air Defense Command continues to fill its role as a vital element of USAF's counterforce capability, as a significant part of the national deterrent effort, and as the force that must ensure survival should deterrence fail.—END

NEWS from DEI

SHOWCASE FOR PRE-DETECTION TELEMETRY AT ATLANTIC MISSILE RANGE

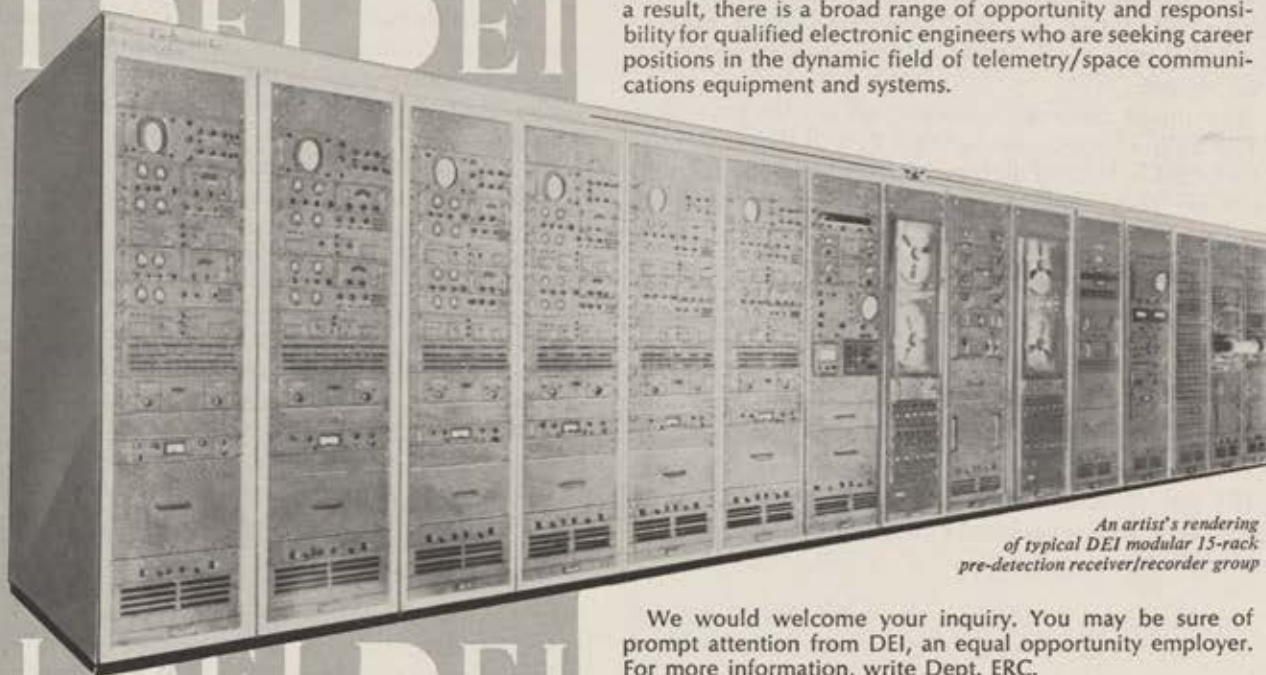
At the Atlantic Missile Range, the U.S. Air Force will install over the next several years the most advanced telemetry complex yet available . . . employing throughout pre-detection receiving and recording systems designed and built by Defense Electronics, Inc.

This SHOWCASE OF PRE-DETECTION TELEMETRY will be used to monitor, record and playback all telemetry data from existing as well as all future missile and space programs . . . with assured reliability, flexibility and economy . . . and with minimum effort.

It will be the first large-scale application of the "pre-d" concept, for which DEI is the recognized industry leader.

The many telemetry pre-detection receiver/recorder systems to be installed by DEI will allow the Atlantic Missile Range complex to record the original space data before it is detected and demodulated. Later, other sophisticated electronic components can make **repeated** use of the "assured data" for varied scientific applications.

Defense Electronics, Inc., one of the largest producers of ground station telemetry receiving equipment in the country, has enjoyed unprecedented growth in the past three years. As a result, there is a broad range of opportunity and responsibility for qualified electronic engineers who are seeking career positions in the dynamic field of telemetry/space communications equipment and systems.



*An artist's rendering
of typical DEI modular 15-rack
pre-detection receiver/recorder group*

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Ever alert to the demands of the tense international situation, USAFE during the past year continued to contribute significantly to US strength in meeting our commitments in Europe . . .

UNITED STATES AIR FORCES IN EUROPE



Lt. Gen. Gabriel P. Disosway became Commander in Chief of USAFE in July of this year, replacing Gen. Truman H. Landon. He had earlier been DCS/Operations at Hq. USAF, and Vice Commander of TAC. A veteran military flyer, he was graduated from West Point in 1933. He served in the Far East in World War II and held training and personnel posts after the war.

REALIGNMENT of tactical operational responsibilities, consolidation of air transport functions, and a change of command were key developments in the United States Air Forces in Europe (USAFE) during a year highlighted by a visit of President John F. Kennedy to America's largest overseas air arm.

Command planning centered in a change which, when fully effective on October 1, will divide control of USAFE's tactical fighter and reconnaissance units between Third Air Force, with headquarters at South Ruislip, England, and Seventeenth Air Force, at Ramstein Air Base, Germany.

This reorganization will return Third Air Force to an active operational role by restoring its jurisdiction over USAFE bases and units in the United Kingdom which, since July 1, 1961, have been under Seventeenth Air Force.

Meanwhile, centralized responsibility for intratheater air transport operations has been vested in the 322d Air Division (Combat Cargo), USAFE's air logistic arm, which assumed control of four air transportation bases in addition to its headquarters base at Evreux, France.

In the change of command in July, Gen. Gabriel P. Disosway became USAFE's new Commander in Chief. He succeeded Gen. Truman H. Landon, who retired after a long, distinguished career which included two command assignments in USAFE. General Disosway came to USAFE from the Pentagon, where he had been USAF Deputy Chief of Staff for Programs and Requirements.

As the command continued its day-by-day mission of maintaining combat-ready airpower for Western defense, general interest at midyear was focused on President Kennedy's visit to Wiesbaden, Germany.

The visit on June 25 and 26 was the first by any American President to the USAFE headquarters area. It was part of the President's state visit to West Ger-

many which included a review of units of the United States Army, Air Force, Canada, and West Germany, at Hanau, and official visits in Bonn, Frankfurt, and West Berlin.

In greetings to West Germans, President Kennedy reaffirmed America's determination to stand by its commitments to the North Atlantic Treaty Organization and to keep its forces in Europe as long as wanted or needed.

"... The United States is here on this continent to stay," the President told a welcoming crowd at Cologne. "So long as required or desired, our forces and commitments will remain. For your safety is our safety, your liberty is our liberty, and any attack on your soil is an attack upon our own."

Activities in Wiesbaden, hub of USAFE interests in an area embracing fifteen nations and a quarter of the globe, highlighted command relationships and responsibilities in NATO. They also gave historical perspective to the fifteenth anniversary of the Berlin Airlift, the massive operation which first spurred USAFE's growth from a small post-World War II occupation air force.

President Kennedy's departure by air from USAFE's Wiesbaden Air Base on June 26 was on the exact anniversary date and from the same base where the Airlift was inaugurated. His air route to West Berlin was the same as that flown fifteen years before by thirty-two US Air Force transports in the first sustained effort of the now historic airlift.

Within USAFE, other developments and accomplishments during the year had significant bearing upon the over-all command picture.

Ending the augmentation cycle set in motion by the Berlin crisis of 1961, the 366th Tactical Fighter Wing was scheduled for deployment to the United States in July. This wing, formed in USAFE, had been operating from bases in France with F-84F aircraft brought to Europe by Air National Guard units.

Still in the future, the change affecting tactical operational responsibilities will give Third Air Force control of Toul Air Base in France as well as USAFE installations in England. In addition to its new role, this major USAFE subcommand will continue to function as the point of contact in the United Kingdom for all matters concerning the Air Force.

Under the same change, USAFE will assume direct control of the 86th Air Division (Defense), in Germany, and the USAFE Weapons Center at Wheelus Air Base, Libya. These activities have been under Seventeenth Air Force.

A major effect of this reorganization will be the direct alignment of air defense functions under Headquarters USAFE. At present, the 65th Air Division, with air defense responsibilities in Spain, operates under USAFE. Now both the 86th and 65th Divisions will be USAFE subcommands.

Reorganization of the 322d Air Division was completed in April with the activation of the 317th Troop Carrier Wing at Evreux. The new wing assumed responsibility for all intratheater airlift operation. This reorganization freed the division from this responsibility and now permits it to exercise a more active control of the organization's other activities.

Among these is the operation and maintenance of widely scattered transport facilities in France and Germany. This includes Rhein-Main Air Base, Frankfurt, Germany, a major MATS overseas APOE; Tempelhof Central Airport in West Berlin; Dreux Air Base, France; and Chateauroux Air Station, France, a major logistics depot and the home station of the 1602d Air Transport Wing (MATS). It may be noted in passing that Tempelhof provides a vital link with the outside world for the beleaguered city of Berlin.

These various functions are integrated with USAFE mission responsibilities covering an area of six million square miles extending from the British Isles and Scandinavia through Western Europe, North Africa, and the Middle East as far as India.

Primarily, USAFE's mission is to train and equip combat-ready units pledged by the United States to NATO. In addition, the command provides tactical and logistic support for all US and NATO forces in Europe, assists air forces of other NATO members in developing their combat capability, carries out Air

Force responsibilities in the Military Assistance Program in the European area, provides command-wide aeromedical service, and operates air search and rescue missions from the North Atlantic to the Indian Ocean.

USAFE's inventory of more than 1,000 tactical aircraft is the largest single force committed to NATO. It covers the four classic functions of airpower: strike, defense, reconnaissance, and transport. The greatest number of aircraft as well as missiles support USAFE's strike capability. This mixed force is in an around-the-clock alert posture.

Strike aircraft include the F-100 Supersabre, the F-101 Voodoo, and F-105 Thunderchief. The TM-76 Mace surface-to-surface missile provides the tactical missile capability.

For its air-defense role, USAFE employs the F-102 Delta Dagger supersonic all-weather interceptor. Squadrons of both the 65th Air Division in Spain and the 86th Air Division in Germany are backed by radar ground environments for air surveillance and intercept control.

USAFE's reconnaissance wings, stationed in England, Germany, and France, are equipped with all-weather RB-66 and RF-101 aircraft.

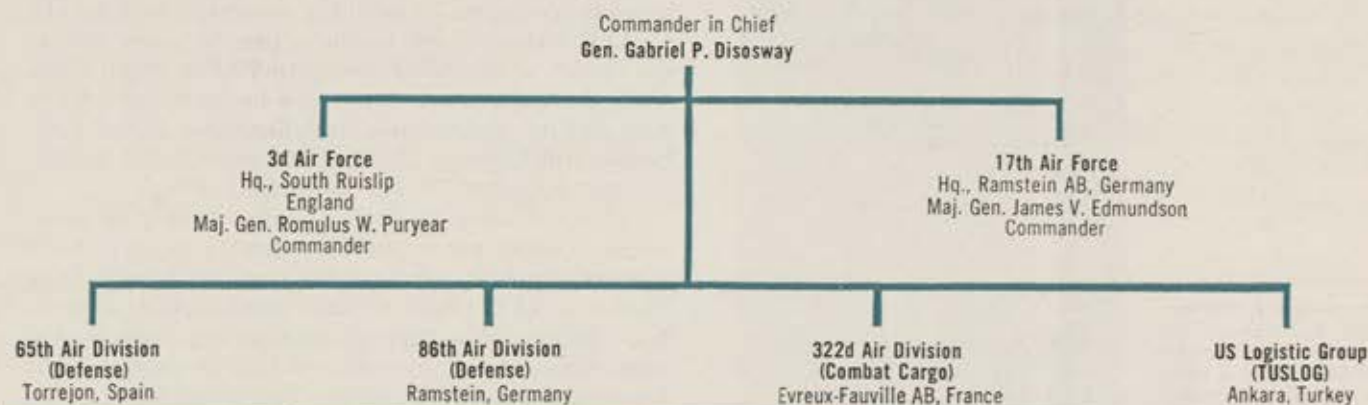
The backbone of the USAFE's airlift force are the C-130 Hercules and the C-124 Globemaster, which are used by the 322d Air Division for intratheater air-transport operations. They are used for routine logistics support operations requiring air transport, aeromedical evacuation, and numerous special missions in support of the DoD's mission in the European area. However, one of the most important functions is to provide the tactical airlift in support of joint operations with the Army. Consequently, much of the 322d airlift capability is committed on a continuous basis to USCINCEUR for training in air-drop and air-landed transport operations.

In addition to the air transport attached to USAFE on a regular basis, the Air Force has assigned two troop carrier squadrons to the theater on a rotational basis. One squadron comes from MATS and the other from TAC. Other air transport resources can be made available to USAFE from sources in the United States to meet all USAFE contingencies. Subject to the approval of Hq. USAF and the JCS, these squadrons can

(Continued on following page)

UNITED STATES AIR FORCES IN EUROPE

Headquarters, Lindsey AS, Wiesbaden, Germany





RB-66 Destroyer approaches tail drogue of a KB-50 tanker before hooking up and taking on 5,000 pounds of fuel. Such a refueling normally takes less than 7 minutes.



On alert around the clock, in all types of weather, USAFE F-105 tactical fighter crews fly daily patrol from Bitburg AB in Germany's Eifel mountain area. F-105 carries either nuclear or conventional arms.



A deterrent to war at points along the Iron Curtain is the all-weather Mace tactical missile, which is a vital part of the European command's strike force.



Supersonic F-100 tactical fighters on rotational duty with USAFE fly by a minaret during practice run at Incirlik AB, near Adana, Turkey.

be called upon to carry out any mission assigned to USAFE. This arrangement permits a greater amount of flexibility and concentration of resources in the right place and right time to meet DoD commitments.

As one of the major links in USAF's worldwide concept of tactical airpower, USAFE has many additional squadrons "on tap" in MATS and TAC in the United States. These squadrons can be called upon at any time to carry out any part of the USAFE mission, giving the command great flexibility and power. Rotational tactical fighters are currently deployed to Spain, Italy, and Turkey.

For control of these complex mission aspects, responsibility currently is divided among five subcommands. In addition to the 65th Air Division, the 322d Air Division, and the Third and Seventeenth Air Forces, these include The United States Logistics Group in Turkey (TUSLOG), with headquarters at Ankara, Turkey. This organization is responsible for support of US forces and agencies in Turkey, Greece, and Crete, in addition to other adjacent areas in Europe, Africa, and Asia.

As a component of the United States European Command (EUCOM), composed of the United States Army, Navy, and Air Force in the European area, USAFE is responsible to the EUCOM Commander (CINCEUR). USAFE's NATO missions are directed by the Supreme Allied Commander, Europe (SACEUR).

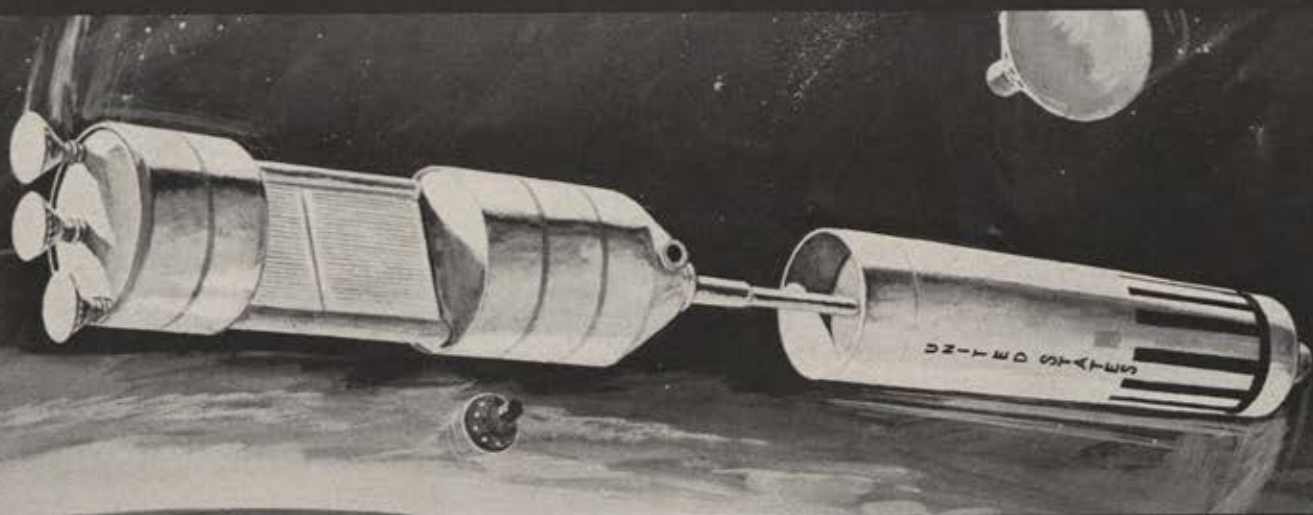
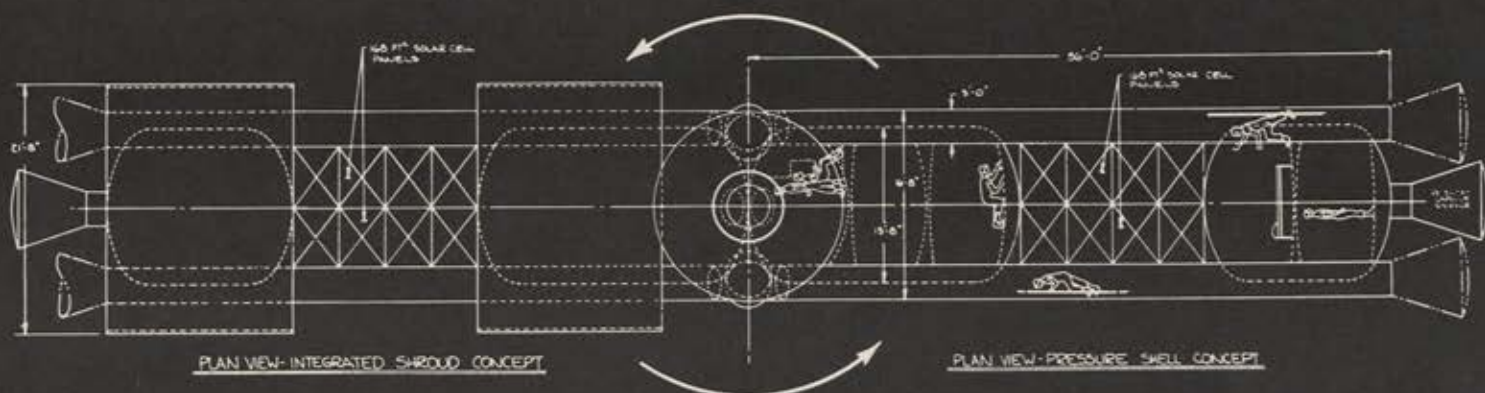
Operationally, the greater part of USAFE's airpower is earmarked for the Fourth Allied Tactical Air Force, which includes units of the French, Royal Canadian, and West German Air Forces. The USAFE Commander in Chief has the dual responsibility of commanding 4th ATAF, which is located in the same building at Ramstein Air Base as Seventeenth Air Force.

Other USAFE aircraft would be assigned in time of war to the Fifth Allied Tactical Air Force, composed of Italian and US air units; and the Sixth Allied Tactical Air Force, composed of Greek, American, and Turkish forces. One USAFE squadron, which is under the operational control of the Royal Netherlands Air Force, would be committed to the Second Allied Tactical Air Force, composed of NATO forces in SHAPE's Northern Command.

To help maintain combat proficiency, USAFE's tactical force participates in realistic exercises and maneuvers sponsored by both the command and NATO. USAFE elements, for instance, played a key role in the victory of 4th ATAF over 2d ATAF in Royal Flush VIII, the tactical reconnaissance competition held in May at RAF Wildenrath. In this exercise British Canberras and German, Norwegian, and Danish F-84Fs competed against US RB-66s and RF-101s.

Other recurring exercises are Checkmate, an international maneuver directed by NATO to perfect the defense capability of land, sea, and air forces; Long Thrust, a NATO field exercise in which US pilots fly both fighter close-support and reconnaissance missions; Grand Slam, a combined NATO Central Army Group and 4th ATAF exercise; and Wind Drift, a joint

(Continued on page 111)



What form will the nation's first earth orbiting space station take?

Experienced Grumman design and development engineers continue to investigate all types of space station concepts—from Zero G nonrotating to rotating types. All this design effort results from the basic study of the many uses that space stations might have. As an example, earth orbiting space stations might conceivably be a twin-bladed configuration as shown above, or a multiple canister type, shown below. ■ Whatever the final design may be, the mechanical and human problems involved are enormous, demanding unique capabilities for integrating the most complex components. At Grumman, this capacity for integration is in the hands of an experienced hard core of engineers who, with free exchange of ideas in design and development, provide total systems in space technology.

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Bendix-Pacific Division



maneuver involving the United States Army and Air Force.

Combat proficiency is also aided through the command's combat-readiness program, which includes operational readiness inspections. In these, units on mock wartime alert perform all tasks short of firing at the enemy. At Wheelus Air Base, the USAFE Weapons Center provides range facilities for live gunnery and rocket and bombing training on a continuous basis.

Interallied training is provided by the Squadron Exchange Program sponsored by Allied Forces, Central Europe. Under this program, USAFE detachments of four to twelve pilots with aircraft and support personnel operate for two-week periods from the bases of fellow NATO members. Similarly, NATO detachments use facilities of USAFE bases.

USAFE accomplishments during the year included opening of a new theater in India. Following an airlift by C-135 Stratolifters from Rhein-Main Air Base in support of India's defense effort against the Chinese Communists in the Himalayas, the 322d Air Division sent twelve C-130 transports and supporting personnel on extended loan to the Indian government.

The Congo, Iran, Morocco, and Libya added other milestones to the 322d's operational scope. The Congo airlift requested by the United Nations rounded out its third year as the longest transport operation, in miles flown, in the history of the Air Force.

In September 1962, twenty-eight C-130s responded after a major earthquake in Iran with an airlift of 1,000 tents, 10,000 blankets, and a 100-bed mobile hospital, staffed with eighteen doctors, twenty-two nurses, and a preventive medicine team.

Airlift response to a major flood in Morocco in January came ten years after the command's first humanitarian mission, rounding out a decade of assistance in twenty-five disasters in twenty countries. In the Morocco emergency, the 322d airlifted 732,488 pounds of supplies, as well as equipment, medical teams, support personnel, and helicopters for search and rescue.

A highlight of this operation was the first long-range mercy flight by a T-39 Sabreliner, carrying typhoid vaccines and injection devices a distance of more than 1,500 miles in three and a half hours.

Humanitarian operations in Libya were staged out of Wheelus Air Base in response to an earthquake disaster in the Barce area.

USAFE covered additional thousands of miles through participation with the Atlantic Air Rescue Service and the Air Force Communications Service in the contingency recovery network for two successful Mercury flights. C-130s supported lookout posts extending from Morocco and Kenya to the Indian Ocean.

Many awards and honors were won in other fields. These included:

- Presentation to General Landon of wings by the German Air Force, making him the first American to become an honorary member.

- The Armed Forces Radio Station at Torrejon Air Base, Spain, won first place, Air Force-wide, in the American Heritage Contest.

- The 7410th Explosive Ordnance Disposal Squad-

ron, with forty detachments in USAFE, won the Air Force Outstanding Unit Award.

- The *Hahn Hawk*, USAFE newspaper published at Hahn Air Base, Germany, won first place, worldwide, in Class III in the Air Force newspaper contest. The *Tabulator*, Tempelhof Central Airport, was second in Class I.

For the outstanding record in community relations activities, given top priority in USAFE, TUSLOG received the 1962 Commander in Chief's Community Relations Award. Second and third places went to the 65th Air Division, Torrejon Air Base, Spain, and the 20th Tactical Fighter Wing, RAF Station, Wethersfield, England.

Helping to make community relations synonymous with USAFE, three versatile bands known as the command's "Musical Ambassadors of Good Will" continued activities which, in 1962, included 540 performances in sixteen countries before audiences totaling more than four million people.

Meanwhile, community relations programs at bases throughout USAFE took various forms, ranging from "host nation" to people-to-people activities. In the Wiesbaden area, General Landon was host to a reunion of surviving members of Germany's famed 1st Fighter Wing of World War I. This unit was commanded by Capt. Manfred Baron von Richthofen, the "Red Knight" of the air.

While taking stock of these achievements, USAFE rounded out its eighteenth year. It was formed on August 7, 1945, from the World War II United States Strategic Air Forces. As it completed its various occupation tasks, such as the disposal of surplus Air Force property, it dwindled in size until it numbered only about 15,000 men.

Then the ominous forces engulfing the nations of Eastern Europe under Communist pressure forced the Western Powers to review the missions of their occupying forces. In 1947, EUCOM was organized, with Gen. Lucius D. Clay as Commander in Chief and Military Governor of Germany. In October, then-Lt. Gen. Curtis E. LeMay was made USAFE Commander in Chief.

When Soviet aggression against Berlin resulted in the blockade, General Clay gave orders to institute the Berlin Airlift. General LeMay set the lift in motion from Wiesbaden Air Base, and thereafter the operation developed into a joint effort of men and aircraft from USAFE, the British Air Force of Occupation, and flying units of the US Navy. French military forces and US Army provided ground support. Maj. Gen. William H. Tunner was commander of the Airlift Task Force which eventually brought an end to the blockade.

Thereafter, USAFE's stature changed rapidly. Its new mission took precise shape after establishment of NATO in April 1949 and an Allied Defense Organization late in 1950. The Korean conflict further spurred NATO defense plans, and, in January 1951, USAFE began a tactical buildup that led eventually to its continuing position today as the largest contributor of combat-ready airpower to the NATO defense alliance.

—END

The year just past has seen vital changes in the conduct of the fighting in Vietnam. This combat action for international stakes has been PACAF's top-priority matter this year . . .

PACIFIC AIR FORCES

A SUDDEN enemy night attack on a military outpost in the Mekong River Delta area brings a Vietnam Air Force (VNAF) C-47 flare aircraft to the scene. Brilliant one-million-candlepower parachute flares, dropped by the "Gooney Bird," turn the dark night into day while B-26 light bombers or T-28 tactical fighters lock onto the Viet Cong attackers with the full fury of demolition and antipersonnel frag bombs, rockets, and .50-caliber machine guns. The enemy retreats and the outpost is saved, as most other outposts receiving night close air support in the past eight months have been saved.

In the south central plains, a pair of T-28 or A-1H tactical fighters called in by Army of Vietnam (ARVN) ground forces and directed on target by a VNAF L-19 Forward Air Control spotter, rips apart a jungle pocket concealing a battalion of Viet Cong regulars.

In the far north, a large Viet Cong division headquarters, locked in terrain almost inaccessible from the ground, meets the fury of an eight-plane T-28 dive-bombing assault. Secondary explosions blast skyward.

A military freight train, puffing on the single-line track northward from Saigon, or a military truck and troop convoy churning dust along the road between Bien Hoa and Pleiku, proceeds without fear of deadly ambush. Riding "aerial shotgun" overhead is a pair of T-28s and the VC, one-time artists in ambush, leave things alone when airpower is around.

Small groups of Royal Vietnam Army Special Forces, operating deep in Viet Cong areas never before penetrated and without land lines of supply, are completely sustained from the sky in pinpoint paradrop missions by VNAF C-47s and USAF C-123s. The courageous Rangers have aerial firepower support no farther away than a radio call to the nearest Air Support Operations Center (ASOC).

All this was not so a year ago. Now it is.



Pacific Air Forces' new Commander in Chief is Gen. Jacob E. Smart, succeeding Gen. Emmett O'Donnell, who retired July 31. A 1931 West Point graduate, General Smart served three tours at top Hq. USAF levels, most recently as Assistant Vice Chief of Staff from 1955 to 1959. He later was TAC Vice Commander and commanded US forces in Japan before assuming his present post.

One could go on and on, through dozens of guerilla air tactics that have been evolved, refined, and employed effectively this past year—adaptations to COIN of USAF tactical air concepts and doctrines. Call the action in Vietnam what you may, COIN, little war, brush war, civil war, it is combat action and the stakes are international.

This has been one of the top-priority items and responsibilities on the PACAF agenda this year—assisting the Vietnamese in building a first-class, hard-hitting, professionally competent, tactical air force, and instructing Vietnamese officers and airmen in the multiple, complex specialties which must go into tactical air/ground warfare.

That this effort has paid off handsomely is a matter of record. Rapid on-target reaction time with flexibility and versatility in tactical deployment has reached a high peak. Centralized air operations through a Tactical Air Control System (TACS) and a Joint Air Operations Center (JAOC) is an accomplished fact. From a monthly average of 150 strike sorties in January 1962, the VNAF is now tallying 1,200 to 1,500 a month—with the curve still rising. And the VNAF has now emerged as a decisive element in the joint forces, credited with an attrition of enemy manpower and resources that is significantly altering the military balance and the course of the war.

This PACAF endeavor represents one end of the spectrum of airpower in the Pacific. The rest of the spectrum pinpoints on the runways of some dozen air bases in the Philippines, Okinawa, Japan, and Korea, where combat-ready F-100 Supersabres, conventional and nuclear-capable F-105 Thunderchiefs, twin-jet B-57 Canberras, and RF-101 Voodoos comprise the business end of PACAF's mobile strike force—a force ready for any offensive or defensive contingency that may erupt along the arched Bamboo Curtain from Northern Japan and Korea to Southeast Asia.

Also along this spectrum lies a vast array of air-power-supporting elements. These include a combat cargo fleet of C-130, C-124, and C-123 transports, weather reconnaissance RB-50s, and KB-50 in-flight-refueling tankers. At scattered bases along the 8,000-mile line which separates the free and the Communist world in the Far East, F-102 air-defense fighters scramble on radar-controlled missions to patrol the skies against possible intrusions from the Red mainland.

Operating literally under the enemy radar screen, time is one of the most vital factors in operational planning and execution. In case of enemy attack, very short warning at most will be available. Quick reaction, therefore, is an absolute requirement and like the US Air Forces in close proximity to the enemy in Europe, and our Strategic Air Command, many PACAF crews are on stand-by alert adjacent to their aircraft at all times.

As a major Air Force Theater Command, PACAF looks to Hq. USAF for administrative and logistical support and for all matters pertaining to doctrine, training, and operational readiness. It receives from USAF forces and resources required to carry out its operational tasks, as well as those resources needed to perform emergency tasks.

As the Air Force Component Command in the Pacific, PACAF comes under the operational control of the Commander in Chief, Pacific Command (CINCPAC).

Internally PACAF has five major subordinate elements. Most of the command's offensive, reconnaissance, and defensive forces come under Fifth Air Force, which turned in a brilliant record in the Pacific in World War II and Korea, and now has a responsibility for limited and general wars. Five subordinate units report directly to the Commander, Fifth Air Force.

Thirteenth Air Force, which became famous as the jungle air force in World War II, is headquartered at Clark AB, Philippines. It maintains forces for tactical air offensive operations, the air defense of the

Marianas, Philippines, Taiwan, and Southeast Asia, and any contingencies in Southeast Asia. The Air Force role in Vietnam comes under Thirteenth Air Force's recently established 2d Air Division there.

PACAF's intratheater airlift forces are assigned to 315th Air Division of "Korean Airlift" fame. This combat-cargo organization which came into being during the Korean conflict is headquartered in Japan. Its units, spread throughout WestPAC (including Southeast Asia), provide intratheater airlift for all US military forces in PACOM.

In Hawaii, PACAF Base Command provides logistic support and housekeeping for PACAF bases in the central Pacific and to other commands such as SAC, MATS, and TAC, which use these bases in a tenant status.

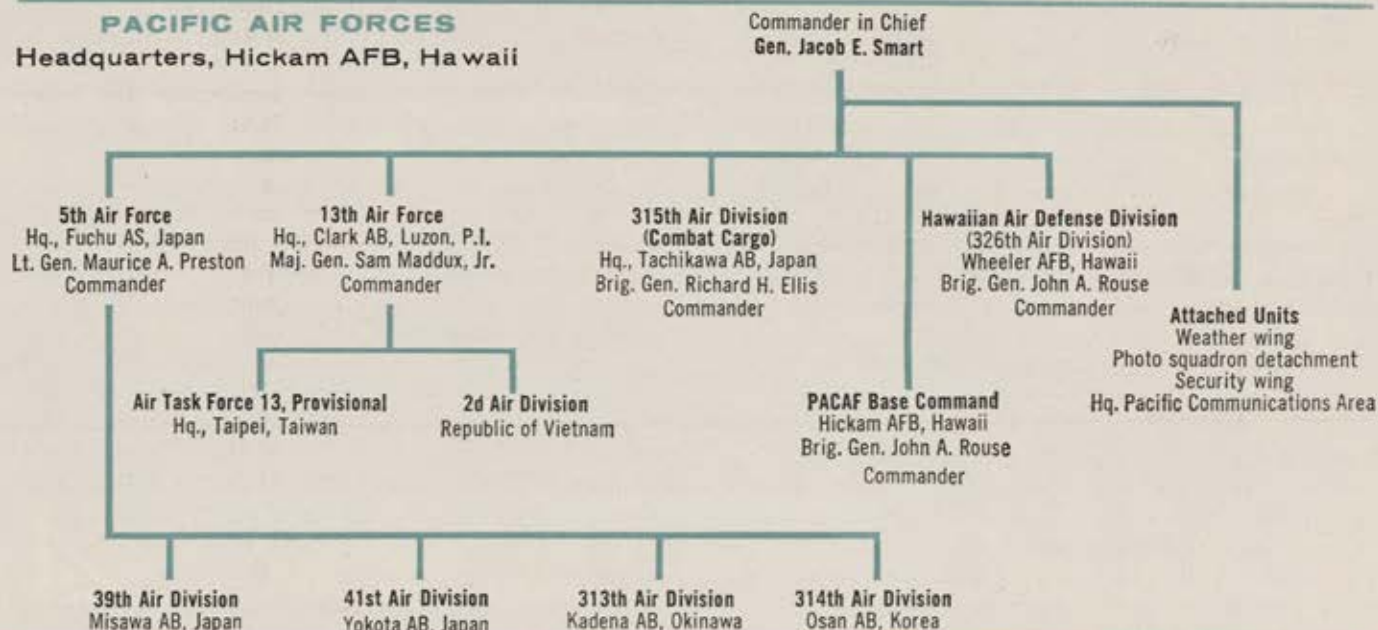
Also in Hawaii is the Hawaiian Air Defense Division which has operational control over the Air National Guard (ANG) F-102 Delta Darts. With headquarters located at Wheeler AFB and jet interceptors operating out of Hickam AFB, the division is responsible for the air defense of the Hawaiian Islands.

This, then, is the structure of a command where big distance is the norm and the geographical limits encompass over forty percent of the earth's surface.

The PACAF mission is of no less magnitude than the area it covers. In all-out war PACAF forces would conduct offensive air operations designed to eliminate or degrade the enemy's capability to attack the PACOM area; and would conduct air-defensive operations in protection of the land areas of the Pacific Command and the western approaches to the US. In addition, PACAF tactical air units would perform a wide variety of theater missions, including joint air/ground operations, reconnaissance, and airlift in conjunction with US forces and those of our Pacific and Asian allies.

All of PACAF's operational units are on a mobile combat-ready basis to deal with any contingency in the Pacific. These forces are designed primarily to deter overt aggression, but failing this, to conduct

(Continued on page 115)





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a variety of air operations that will bring hostilities to a rapid termination. In the event of expanded overt aggression short of general war, PACAF units would be augmented by deployment of US-based Composite Air Strike Forces or Strike Command units.

Not so well known, but extremely effective, is PACAF's continuous program of cooperative training and operations with the air forces of our Asian allies. These air forces complement the PACAF offensive and defensive capability. Collectively the combat air units and equipment of our SEATO and ANZUS partners outnumber those of PACAF, which is all to the good in an area alliance. The objective of this program is a higher degree of operational standardization and a closer alignment of concepts, doctrines, and procedures so essential in a joint alliance against Communist aggression in the Far East.

Realistic practice in close cooperation occurs with frequency. For example, in late 1962, PACAF and the Japan Air Self Defense Force conducted a week-long joint "Operational Readiness Inspection" (ORI). Shortly thereafter a similar ORI was held in connection with the Philippine Air Force.

In February 1963, the PACAF and the US Army elements joined with the Republic of China's Army and Air Force in a five-day joint airborne training exercise called "Tien Bing III," or "Sky Soldier III." The combined air/ground operation, staged in southern Taiwan (Formosa), was designed to provide training in defensive operations against an "invading force." USAF tactical air elements provided by PACAF included C-130 and C-124 transports for paratroop and heavy-equipment drops and jet-strike aircraft for close air-support and interdiction tasks. The exercise was lauded by top US and Chinese officials as a "reassuring demonstration of the readiness and ability . . . to defend Taiwan."

In April 1963, the annual United States-Asian Fighter Weapons Conference, better known as "Flying Brothers," brought together at Clark AB, Philippines, the aircraft and pilots from the Air Forces of Thailand, Philippines, United States (Air Force and Navy Air), and the Republics of China and Korea. Also attending and participating in meetings, briefings, and joint air discussions on "Tactical Airpower in COIN Operations" (the 1963 theme) were Air Force observation teams from the Republic of Vietnam, Australia, the United Kingdom, Japan, Indonesia, and Cambodia.

Then again in the SEATO maneuvers of June 1963 (Exercise Dhanarajata), fighter, bomber, and transport units from the Royal Australian Air Force, Royal New Zealand Air Force, Royal Air Force, the USAF, and the Royal Thailand Air Force made up the Air Component Command (ACC) of the air/ground exercise. Under a joint staff of 300 air officers from all nations, the ACC flew 692 combat-strike sorties and 485 intratheater airlift sorties in four days to gather praise from SEATO commanders for the outstanding and successful performance of the air mission.

The summer of 1963 marked the first decade of the Korean Armistice. The maintenance of an uneasy truce throughout the past ten years has been an un-



First of PACAF's force of F-105 Thunderchief fighters touches down at Kadena AB, Okinawa, after transpacific flight early in 1963. The F-105s are replacing F-100s.



Farmers on Taiwan pause in their fields to watch as US and Republic of China paratroopers jump from PACAF C-124 Globemasters during "Sky Soldier III" training.

glamorous task and responsibility of the United Nations Command there and the ready combat units at its command. The deterrent effect of instant airpower capability in that restless geographical area has been significant in achieving a decade of *status quo* along the thirty-eighth parallel—a capability made up of combat-ready units of the Republic of Korea Air Force and PACAF all-purpose tactical air-strike weapons at bases in the ROK and nearby Japan.

During the past year, airpower in the Pacific received a significant boost with the beginning of the conversion of two fighter wings (one in Okinawa and one in Japan) from F-100 Supersabres to the longer-range, all-weather, all-purpose, supersonic F-105D Thunderchiefs. The long transpacific flights, made in elements of twos and fours with in-flight refueling, are being accomplished by PACAF operational pilots.

Equipment reinforcements to the Vietnam Air Force and the USAF instructor-adviser pilots and technicians assigned there, brought in additional B-26 light bombers, T-28s, and USAF C-123 assault transports.

Force modernization in PACAF proceeded in many echelons during the year, ranging from combat aircraft to electronic and radar gear and base and flight facilities.

All in all, for the more than 70,000 airmen and officers of PACAF and for those of our many allied Air Forces in the Far East as well, it was a year of proud accomplishment and significant progress in providing the free world more effective airpower in-being in the Pacific and the Far East.—END



Gen. Joe W. Kelly is in his fourth year as Commander of the Military Air Transport Service, a post elevated to four-star status earlier this year. With more than 9,000 hours to his credit, he is personally guiding MATS into the jet age, having flown the first C-135 from Boeing's Renton plant in 1961, and now looks forward to flying MAT's C-141 StarLifter next spring.

Airlift and a variety of technical services encompassing the globe underscored the role of MATS during the past year as a combat-ready, flexible instrument of national policy . . .

MILITARY AIR TRANSPORT SERVICE

THE ROLE of the Military Air Transport Service as a combat-ready, flexible instrument of national policy was underscored during the past year by airlift and Air Force technical service operations encompassing the globe.

Bolstered with new jet-engine cargo-transport and long-range utility aircraft acquired under the current modernization program, MATS crews flew literally from pole to pole providing military and humanitarian airlift vital to the interests of the United States.

Headquartered at Scott AFB, Ill., under command of Gen. Joe W. Kelly, MATS is responsible for providing D-day-ready airlift, aeromedical evacuation, and specialized technical services including Air Weather, Air Rescue, and Air Photographic and Charting Service to US combat forces on a global scale. More than 87,000 personnel make up the MATS work force, including more than 3,000 US Navy personnel.

Key phrase in describing MATS operations during the past year might well be "instant reaction, around the clock, around the world."

In logging almost a million hours of flying during the past year, MATS aircrews performed a wide variety of missions. Operations ranged from emergency airlift of US forces during the Soviet missile crisis in Cuba to transoceanic mercy flights, from training maneuvers with the Army and Marine Corps to airlift and technical support for the US space effort.

There was strong emphasis during the year on the perfection of combat employment tactics of formation and single-aircraft airdrop of Army paratroops and their battle equipment, thus enabling MATS to operate through the full spectrum of combat airlift from the loading of aircraft at US bases to the airdrop and landing of troops and gear in combat areas.

In a twelve-month period, MATS flight crews flew more than 6,680 hours to airdrop more than 42,800 Army combat paratroopers and 533 tons of battle equip-

ment. Only 3,345 hours had been flown the previous fiscal year in airdrop training.

Even greater emphasis on this phase of training is planned for the current fiscal year for which more than 13,000 hours have been programmed.

Douglas C-124 Globemasters and Lockheed C-130E Hercules aircraft will carry the troopers.

FY 1962-63 has been indeed a busy year for MATS.

The work-filled days of the Cuban crisis last fall—the six-week period covering October and the first two weeks of November—saw a dramatic display of the versatility of the MATS force to respond to immediate requirements levied by the Joint Chiefs of Staff.

As October began, MATS C-124 Douglas Globemasters and C-133 Douglas Cargomasters were engaged in the airlift of relief supplies and equipment—tents and medical supplies—from Germany to Iran. This was Project Ida, a humanitarian airlift following the worst earthquake in Iran's history. When the lift was completed a full US Army field hospital had been airlifted to Teheran and hundreds of Army medical personnel deployed to the stricken area.

The first of October also marked the beginning of Long Thrust V, a transatlantic troop lift exercise for the US Army. This involved airlift of more than seventeen tons of equipment and 1,362 troops to Europe from McConnell AFB, Kan., while 38.9 tons and 1,133 troops were returned to the United States. The Long Thrust series, now conducted four times annually, continued through the year with Long Thrust VI and VII conducted from Forbes AFB, Kan., to Rhein-Main AB, Germany. Long Thrust VI in January 1963 air moved 1,384 troops and thirty-seven tons of cargo and Long Thrust VII, in April 1963, airlifted 1,503 troops and twenty tons of cargo. In each case, a near-equivalent number of troops and cargo were returned to the US.

Meantime, MATS aircraft in Europe for Long Thrust V were used to speed almost 300 tons and more than

4,900 troops from France and Germany to Greece in Southern Express, first NATO mobility test in that area of the Continent.

Still again, beginning on October 1, MATS aircraft were engaged in airlift exercises for Army troops within the US. Using both Boeing C-135 Stratolifter jets and piston-engined transports, MATS crews flew 308 missions to move more than 12,000 troops and 2,000 tons of cargo in a nine-day period.

As Long Thrust V ended, MATS was off on another precedent-setting airlift for the Army. Called "Rotaplan," the operation took place between October 15 and 19 to test the rotation of Army units between the US and Europe. The lift included the movement of more than 1,500 men and their dependents and equipment to Europe while 2,000 personnel, including 400 dependents, were flown back to the US.

(In a second Rotaplan in April 1963, 1,740 passengers were airlifted to the Continent and 1,400 passengers and forty-two tons of cargo rotated to the US.)

Then, on October 10, the first all-jet military airlift into the Congo was begun. Four aircraft flying nineteen missions carried 16.6 tons of cargo and 1,232 United Nations troops from Stockholm to the Congo and return. The route was 4,900 statute miles each way with the aircraft flying nonstop in an average of ten hours.

Back home, additional special missions took shape as the Cuban crisis began its buildup.

To meet the challenge, MATS surged to a flying rate well above the normal peacetime training rate. This meant an increase of flight time for crews, doubling of maintenance shifts, and an even closer watch on aircraft utilization.

The first MATS Cuban contingency mission took off on October 17 with the airlift of conventional ammunition and support equipment for the Tactical Air Command and its Composite Air Strike Forces into Florida bases.

Four days later, on October 21, the first Marine Corps deployment in MATS history was launched to fly combat Leathernecks and battle gear from Cali-

fornia to the Southeastern United States and Guantanamo Bay in Cuba. From then until the end of October, thousands of US troops and thousands of tons of cargo were airlifted by MATS in hundreds of sorties.

MATS suffered its only casualties of the Cuban operation on October 23 when a C-135, loaded with ammunition, was lost, killing all seven crew members when it crashed at Guantanamo while making a landing approach.

This was the only MATS accident attributable to the Cuban emergency in more than 118,000 hours of flying over the crisis period.

MATS personnel who gave their lives in the nation's defense were: Capt. James F. Bailey, 33, aircraft commander; Capt. John Baird, 30, first pilot; 1st Lt. Jack F. Douberteen, 24, copilot; Capt. James E. Connard, 29, navigator; 1st Lt. Hal P. Hogge, 25, navigator; TSgt. Lester C. Elliot, 33, flight engineer; and SSgt. Booker T. Rigsby, 26, loadmaster.

As the Cuban crisis reached its peak, the airlift force was working at full military power. Key personnel kept within ten minutes of their duty stations. Traffic, maintenance, inspection, and operations personnel on the flight line had no breathers. Their job was to keep the force in flying condition.

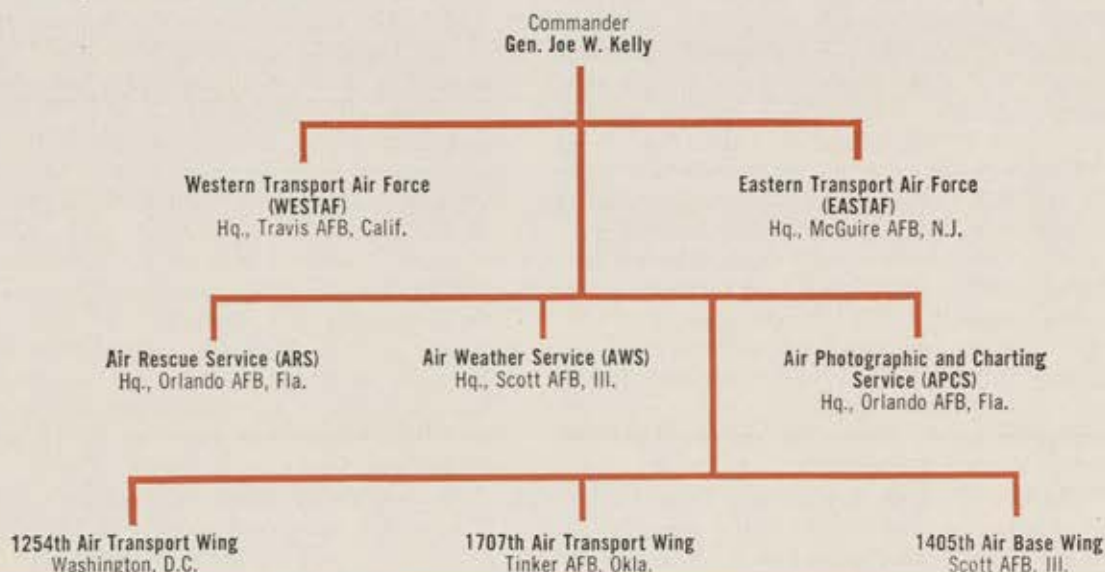
Then came the next unexpected requirement: Airlift to India more than 1,000 tons of arms, ammunition, and equipment from the US and Europe to bolster the defense of that nation against an invasion by Communist China. Taking off from McGuire AFB, N. J., and Travis AFB, Calif., the big Boeing C-135 jets of the MATS airlift force flew to pickup points, unloaded guns and ammunition, and sped to Calcutta's Dum Dum airport, at more than 500 miles per hour. The big jets flew approximately forty-five of the 12,000-mile missions and were back at home stations within two weeks.

But more special missions were yet to come. On November 5, a rush airlift arose for communications and electrical gear to Bolivia. Using C-124 and C-133 transports, MATS completed the job in three days.

(Continued on following page)

MILITARY AIR TRANSPORT SERVICE

Headquarters, Scott AFB, Ill.





Army copter moves down the ramp of a C-124 during last year's Swift Strike II. During the war game MATS moved 15,000 tons of cargo for the Army.



The way MATS met the heavy demands of the Cuban crisis amply demonstrated the command's versatility. Shown, Marines debarking from MATS C-135 Stratolifter at Guantanamo Bay.

Humanitarian airlift is vital part of MATS mission. Here Air Rescue helicopter helps during this year's evacuation of flood-stricken Moroccans.



MILITARY AIR TRANSPORT SERVICE

CONTINUED

In the Congo, from November 7 to 17, MATS was flying another United Nations transfer. This time it was from Dublin, Ireland, to Leopoldville and involved eight Douglas C-118 Liftmasters and one C-133 flying twenty-nine missions in all.

Then, on November 13, came the first of two totally unexpected airlifts. The first was to Venezuela where Communist agents had sabotaged the Creole Petroleum Company. The loss in oil revenues to the government of Venezuela was mounting to millions of dollars a day. The State Department called on the Air Force to airlift in big generators, switch gear, and other replacement items. C-133s, the largest military cargo aircraft in regular use in the world, delivered the goods.

The second call, also in November, was for another humanitarian airlift. The island of Guam had been hit by a 175-mile-per-hour typhoon. Within two hours after alert, the first C-124s and C-135s were airborne with blankets, tents, field kitchens, and medical supplies. At the end of the emergency more than 600 tons of relief gear had been delivered and more than 700 refugees air evacuated to the US mainland.

Yet, even before Guam-relief aircraft were all airborne, another call for help arrived. This time it was for airdrop cargo aircraft to aid an American scientific expedition spending the winter on an ice island 300 miles south of the North Pole. When the lift was completed C-124 aircraft had flown more than 156,000 pounds of aviation and diesel fuel to the scientists on an 1,800-mile flight from Elmendorf AFB in Alaska.

At the other end of the world, C-124s were busy with resupply of scientific stations in the Navy's Antarctic operation Deep Freeze.

That operation, which has been supplied by MATS for the past seven years, last fall included ninety-five airdrops, with six directly over the South Pole. Typical flights on Deep Freeze in 1963 included 2,300-mile round-trip flights from New Zealand to the Antarctic continent.

MATS, which was organized from Air Force and Navy air transport units on June 1, 1948, at Andrews AFB, Md., has rewritten the history of mass airlift almost since the day of its activation. The first major operation of the fledgling airlift force began scarcely a month after its founding when it was given the task of providing a large amount of the US men and equipment used in the Berlin Airlift. Since that gigantic movement of food, fuel, and other necessities of life lasting fifteen months, and totaling an airlift of some 2,500,000 tons of cargo by all participants, MATS has annually performed scores of humanitarian airlifts and thousands of missions for emergency military actions, special exercises, and US interests on a global scale. At the same time MATS has maintained an outstanding flying safety record and three times has won the USAF award for the lowest accident rate in the Air Force.

A sampler of these international airlifts includes Korea—the transpacific airlift of 1950-53—when men
(Continued on page 121)

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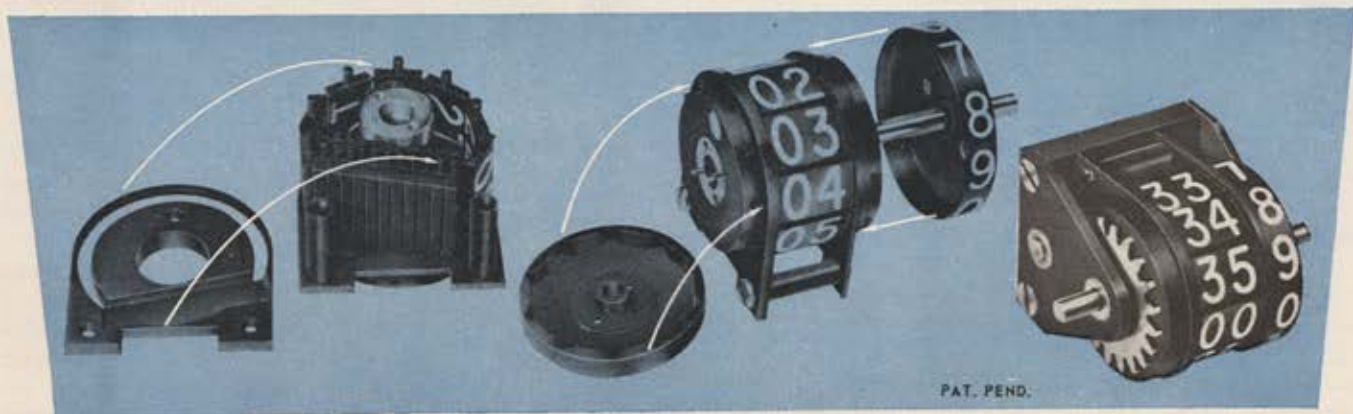
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and supplies were airlifted to the battle theater and more than 62,000 combat casualties were air evacuated to the US; Operation Safe Haven, begun in 1956, to airlift more than 14,000 Hungarian refugees from Germany to the United States; Lebanon in 1958, the air delivery of 5,500 tons of cargo and more than 5,400 US Army troops from Europe to the Middle East; Taiwan, also in 1958, when elements of the Tactical Air Command's Composite Strike Force and a squadron of Lockheed F-104 Starfighter tactical fighters were moved by air from the US to Formosa during a crisis in the Chinese straits; the Amigos airlift of 1960, when seventy-seven missions were flown from the US to Chile carrying aid to victims of an earthquake; and the Congo airlift, now in its fourth year, in support of the United Nation's peace force, a global mission that has taken MATS aircraft from Canada to India to airlift troops and cargos from more than twenty nations.

More recently, in addition to activities of the Cuban crisis time span, MATS airlift forces have continued to provide airlift for a variety of exercises, special missions, and humanitarian airlifts while maintaining logistic airlift supply to US forces overseas.

Operation Back Porch is an example. Executed during May through July of 1962, the mission involved airlift of high-priority electrical and mechanical equipment to South Vietnam for a communications network.

Almost three and a half million pounds of equipment was flown to southeast Asia, marking the mission as one of the largest single cargo handling operations in MATS history. Meantime, from April through August 1962, a team of C-124 Globemasters toured the world airlifting Lt. Col. John Glenn's space capsule *Friendship VII* to public exhibits in twenty-three countries. More than 4,000,000 spectators viewed the touring capsule before its delivery to Seattle, Wash., in early August, for display at the Seattle Fair.

In the US, Swift Strike II was conducted during July and August of 1962. Cited as the largest combat airlift of US forces ever undertaken within the continental limits of the US, it was carried out from thirty-two bases across America to deliver forces of the US Strike Command to maneuver areas in North and South Carolina and return.

MATS crews flew the final missions marking the end of the most recent Berlin crisis of 1961-62. Taking off from bases in the US last summer, cargo transports of the command set down in Europe to re-deploy personnel and aircraft of federalized Air Force Reserve and Air National Guard units back home for demobilization. The airlift, called High Top, included transport of more than 8,000 men who had served in Europe since November of 1961 following callup of the Reserve Forces for the Berlin buildup.

On another continent, in Morocco in January 1963, C-124s flew from Chateauroux, France, to bring medical aid and relief supplies following a flood which destroyed thousands of homes.

Back home, MATS units flew to the far north in January of 1963 on Exercise Timberline, the annual

Air Force-Army cold-weather combat-training exercise in Alaska maneuver areas. Airlift was provided for troops from as far away as South Carolina for the exercise, near the Arctic circle.

On March 15, 1963, a food airlift was set up by the MATS base at Lajes in the Azores to aid the people of Santa Maria Island, whose food shipments had been cut off as the result of six weeks of sustained high winds and inclement weather. The mission, performed by a MATS C-124 diverted to Lajes Field while en route to Europe, included 9,700 pounds of potatoes, onions, and fruit. Santa Maria, which has no natural harbor, cannot receive ocean shipments except in calm seas.

Again the Azores—in a people-to-people airlift, MATS aircraft flew in gifts from the American people to the people of Portugal. Included were seeds, plants, game birds and eggs. Then, on June 1, 1963, breeding stock, two Holstein bulls and eight pigs, were airlifted to the island by Air National Guard aircraft flying a MATS mission.

In May 1963, exercise Coulee Crest was conducted with STRICOM forces in the Yakima, Wash., area. The maneuver included more than 875 MATS missions airlifting more than 6,000 Army troops and 7,000 tons of equipment.

In Europe, MATS C-124 aircraft on rotational duty at Rhein-Main AB operated special missions and training flights to Tempelhof Airport in West Berlin and joined with US Army troops in Europe on parapod training exercises.

As the fiscal year ended, MATS commanders rated flying proficiency tops despite added requirements for formation drop training, aerial delivery training for personnel and cargo drops, and a large increase in the number of student personnel.

Meanwhile, MATS's fifteen-year pride in flying the US flag to every part of the world became visible fact during the past year, when, at the direction of General Kelly, the US flag was painted on the vertical tail sections of all aircraft in the MATS airlift force.

The MATS mission is not confined to long-range airlift for US forces and combat airdrop training. The command is also charged with the essential operations of Air Weather Service, Air Rescue Service, and the Air Photographic and Charting Service.

Biggest of these is the Air Weather Service, also headquartered at Scott AFB. Using a force of some 11,500 specialists, AWS maintains a global network of weather observing and forecasting stations at 388 detachments in twenty-seven countries. Operating from major stations on the US east and west coasts and in Germany and Japan, AWS collects its data by aircraft flights and localized weather reports that, by means of electronic computers, can provide full weather flight information from any part of the world in less than half an hour. The AWS mission ranges from hurricane hunting to checking high-altitude radiation counts and has been continually modernized in this space age to provide weather recon-

(Continued on page 124)

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/ Celestial guidance units / Celestial navigation systems / Ceramic dielectric materials / Ceramic products Ceramic rectifiers Do4-Do5 / Character display equipment Checkout equipment / Choppers, Solid state / Circuit bo ards / Circular connectors / Circulators, Microwave / Clos ed-loop radar test sets / Coaxial cables / Coaxial circula tors / Coders / Coherent mobile target indicator / Collision warning and avoidance ay equipment / Combat oles / Combat surveillan nd and data handling eq d intelligence informatio Command systems, Sat munications satellites s ns systems and equipm d state / Computer-prog Computers and systems Countermeasures equip Counters, Pulse video / C stats / Cryptographers lines / Depth control eq Detection devices and s ilifiers / Differential amp Direct readout display e ng storage tubes / Dom etectors / Doppler navi ccelerometers / Acousti apter cables / Aerologic lay equipment / Aerosp lense equipment / Air d nse systems, Infrared / A traffic control / Air/Air uipment / Aircraft instru rating consoles / Air/Sp ontrol systems / Air-to-s / Air-to-air missiles / A ir-to-ground ranging rad les / Analog devices / A etic / Antennas / Anti- tellite defense equipme quipment / Artillery tac ASW equipment / Audio ual systems / Backward- tic missile decoys / Bal and rejection crystal fil ters / Benches, Test / Bioinstru mentation packages / Boost intercept ballistic missile sys tems / Boules / Bridge consoles (ship control) / Broadband microwave antennas / Buoys, Underwater sound source Business training programs, VIDEOSONIC* / Cable, CON TOUR* / Calibration sets / Capacitor silicon diodes / Cargo vehicles electronic systems / Cartridge rectifiers / Cathode ray processing equipment indicators / Cathode ray tubes C-band backward-wave oscillators / C-band forward-wave amplifiers / Celestial guidance units / Celestial navigation systems / Ceramic dielectric materials / Ceramic products Ceramic rectifiers Do4-Do5 / Character display equipment Checkout 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navigation systems / Infantry tactical weapons / Infrared devices and equipment / Infrared systems / Instrumenta tion / Integrators / Intelligence systems / Interceptor fire control systems / Intervalometer computers / Joule-Thomson cryostats / Keyers / Ku-band amplifiers and oscillators / Landing systems, Aircraft pable beacons / Dropp rs / Drum memory devi d test equipment / Echo ounding sonar / Edgeb nectors / Educational a astomers / Electrical pr trodes, Welding / Elect Electromechanical devi lectronic equipment (G etronic systems / Electr onic equipment / Electro-opt experimental communica Experimental satellites acilities services / Facs ng units / Facsimile hi canning / Feed horn as ed systems, Antenna / F nts and devices / Ferrit Ferrous materials / Fil uits testers / Filters / Fir ire detection equipment light control, Automatic Foam plastics / Formed cuit connectors / Fuzes accelerators / Gates / G ar boxes, Precision / Ge rs / Germanium casting Germanium diodes / Gr ound 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Lunar / Large-scale general purpose computers / Lasers / Launch control, Bal listic missile / L-C filters / Lenses / Light beam displa ys / Linear amplifiers / Liquid propulsion systems / Liqu id transfer systems / Logistic information processing equipment / Logistic lunar and planetary systems / Lo ng-range navigation systems / Low-altitude air defense Low-frequency equipment / Machine tool control com puters / Machine tool controls / Magnetic devices / Ma gnetic materials / Maintenance equipment / Mainte nance handbooks / Manip ulators, Remote hand derwater / Manned hy s / Map displays equip as / Mapping radar / M ker beacons / Maser a terials, Non-metallic / M Optical products / Me ment / Medium-range c ulators, Remote hand derwater / Manned hy s / Map displays equip as / Mapping radar / M ker beacons / Maser a terials, Non-metallic / M Optical products / Me ment / Medium-range c RON* tubes / Meteor burst al equipment / Meteorologic icrominiature connectors / M mputers / Microminiature re ors / MICROSEAL* diodes rs / Microwave devices / Mid ic missile systems / Military e systems / Military data han ary information computer sy sure fittings / Minibuoy / Mir tance indicators, Missile / M d associated items / Missiles vehicles / Mixers / Mob T* Manipulators / Modi time standards, Naviga rocessing equipment in t equipment / Multimet star tracker display equ microwave lens / Nano n rectifiers / Naval tacti gation systems and eq uipment / Neutron linear electron accelerators / Noise generators / Non-ferrous metals / Non-inertial guidance systems / Non-metallic materials / NPN transistors / Nu clear environment handlers / Nuclear powered electric propulsion / Numerical controls / Oceanographic instr umentation, Sonar / Offense weapons / Offensive syste ms, Space vehicle / Omnidirectional antennas / Optical equipment / Orbiting vehicles / Oscillator tubes / Oscil lators / Oscilloscopes / Packaging, Space environme ntal / Panoramic indicators / Panoramic type re ceivers / Parabolic reflector antennas / Para

553 ways to create a new world with electronics

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etection devices, Infrared coolers / Penetration detection devices / Personnel control equipment / Phase matching short range measuring amplifiers / Phase shifters, Microwave / Photo cell infrared sensitive materials / Photons / Photographic storage cctors, Connectors / Pin oil automatic pilot controlling vehicles / Plastic NP transistors / Pods, Aitors / Polycrystalline silicon emitting/receiving equipment, Aircraft / Power sources / Preamplifiers / Precision welding equipment / Printed circuit boards / Printed circuit connectors / Probes, Space / Processing equipment / Production aid devices, VIDEOSONIC* / Projection equipment / Propulsion systems / Pulse application oscilloscopes / Pulse Doppler radar / Pulse forming networks / Pulse modulators test equipment / Pyrotechnic launchers / Quartz crystals / Quick-disconnect circular connectors / Racks, Aircraft maintenance / Radar components and systems / Radiation dosimetry devices / Radiation facilities / Radio communication equipment / Radio receivers / Radiographic inspection linear electron accelerators / Radiometers / Radomes / Reactors, Electromagnetic / Receivers / Reconnaissance equipment and systems / Recorders / Recording systems / Aerospace instrumentation / Rectangular connectors / Rectifiers / Re-entry vehicles power systems / Relay systems / Relays, Solid state / Reliability devices test equipment / Remote control equipment / Remote handling systems / Resin dielectric materials / Retrieval / RF amplifiers / Rocket assist torpedoes / Rocket cketts, Underwater / Roll control equipment / Rotas / Roving vehicles and safety equipment, Flight / Ss, Radar / Satellites and a backward-wave oscillator forward-wave amplifiers radar / Search-rescue equipment, Infrared / Seeker intelligence sensors / Semiconductors / Sensitivity checkers / Sensor assemblies / Servos communications equipment

directional and omnidirectional antennas / Shields, Connector / Ship and marine equipment / Shipping cases, Missile / Shoran / Short-range navigation systems / Short-range precision radar / Sights, Computing / Signal analyzers / Signal data converters / Signal generators / Signal processors / Silicon diodes / Silicon rectifiers / Silicon transistors / Single sideband crystal filters / Single sideband radio communication receivers / Situation display units / Solar cells / Solar-power ed propulsion units / Solid state devices / Sound equipment, Underwater / Space vehicle components and systems / Space vehicles / Spaceborne radiometers / Spaceborne surveillance systems / Space-to-space intercept satellite defense systems / Space-to-space missiles / Spectrophotometer cells / Stability augmenters, Aircraft / Stabilization components, Missile / Stabilization data generator test sets / Star tracker display equipment / Star trackers / Sterilization linear electron accelerators / Storage tubes / Strategic offense weapons / Subassemblies, Radar / Submarine ASW equipment / Subminiature module assemblies / Surveillance equipment / Survivor location techniques, Air traffic control / Switchboards, Ship / Switches, Microwave / Switching devices, Communications / Synthesizers, Microwave / Synthetic array signal processing radar / System test consoles / Tactical equipment and systems / Tape cable connectors / Tape controls, Industrial automation / Tape recorders / Tape-programmed test equipment / Teaching aid devices, VIDEOSONIC* / Technical manuals / Telemetry equipment / Temperature measuring devices / Terminal boards / Terminal equipment / Terminal intercept ballistic missile systems / Terrain avoidance guidance systems / Terrain avoidance instruments, Aircraft / Terrain avoidance radar / Test equipment / Test sets / Testing infrared materials / Thermal design and control, Aerospace vehicles / Thermal imaging devices, Missile / Thermoelectric

coolers, Peltier / Thermoplastics / Thermosetting plastics / 3-D radar / Thyatron modulators / Time delay radar / Time standards / Frequency dividers / Timing systems, Missile / TO NOTRON* tubes / Tool control computers, Machine / Tool kits / Torpedoes / Tracking and target analysis computers / Tracking computers / Tracking equipment / Tracking feeds, Microwave / Tracking loop test sets / Tracking stations, Satellite / Training aid devices, VIDEOSONIC* / Training aids / Trajectory computer ring devices, Missile / Transducers, Computer / Transistors / Transmission equipment / Receiver / Transponder beacons / Transponders / Transport vehicles electronic systems / Transportable transmitting/receiving equipment / Transportation equipment, Ground / Traveling-wave parametric amplifiers / Traveling-wave tubes / Tube rese arch / Tubes and tube devices / Tunnel diode parametric amplifiers / Tunnel diodes / Twin jack screw polarizing connectors / Twin pivot printed circuit connectors / TYPOTRON* Tubes / UHF equipment / Umbilical connectors / Undersea warfare equipment / Underwater equipment / Vacuum gauge and control tubes / Vacuum measuring equipment / Vacuum tubes, Telemetry / Vane / Vehicle control systems / Vehicle / Vessel position / VHF equipment / Video indicators systems / VIDEOSONIC, Infrared / Viewing ocoders / Voice compressors / Voice digitizers / Voltage regulator diodes / Voltmeter oscilloscopes, Digital / Voltmeters / Warheads / Warning equipment, Underwater / Waveguide components / Waveguide coupling units / Waveguides, Flexible / Weapons, Air defense / Weapons, Strategic offense / Weather intelligence systems / Welding equipment / Welding heads / Wideband scanning feed systems, Antenna / Wire communications / Wire repairing stations, Mobile / Wiring assemblies / Worldwide networks / X-band backward-wave oscillators / X-band beacons, Tactical / X-band forward-wave amplifiers / Zener Diodes

These 553 aspects of Hughes capability cover the spectrum of advanced electronics. From accelerators to zener diodes. From microelectronics to radar for our Navy's carrier Enterprise. From the oceans' depths to deep space. ■ Here is breadth in depth. Research programs to probe the nature of matter. Development activities to turn new knowledge into useful paths. Productive capacity to build dependable hardware. Support services to keep these systems and products working dependably. ■ Over 29,000 people, including 5,300 engineers and scientists, are today at work at Hughes. Working for NASA in space, for the armed services in the maintenance of free world defense and for all of us in the betterment of human life—they are helping to create a new world with electronics.

Creating a new world with electronics

HUGHES

HUGHES AIRCRAFT COMPANY

naissance information to the Mercury and Discoverer programs and to US missile ranges.

The Air Rescue Service, headquartered at Orlando AFB, Fla., is responsible for search and rescue missions of US flyers around the world. In addition to the rescue of downed aircrews and humane service in the wake of natural disasters, ARS also has responsibility for recovery of Astronauts and "space hardware" returning to earth outside the primary impact zones. ARS pararescuemen—trained parachutists, medical technicians, and experts in survival—have added underwater swimming skills to aid in capsule and Astronaut recovery at sea.

It is estimated that personnel manning the eleven ARS squadrons, more than sixty detachments, three rescue centers, and five reserve rescue squadrons, have saved more than 8,500 lives and aided 53,000 people since 1946.

MATS aircrews and technicians from all three technical services flew to key positions around the world in mid-May in the global effort backing the twenty-two-orbit flight of Astronaut Gordon Cooper. As Major Cooper soared on his 600,000-mile track around the earth, MATS rescue aircraft were at the ready in six widely separated areas—Panama, Peru, the Ascension Island, Mauritius Island, Tahiti, and Singapore.

Earlier, in May 1962, MATS pararescuemen dropped into the Atlantic to assist Astronaut Scott Carpenter and save the *Aurora Seven* space capsule from sinking into the sea.

The mission of the Air Photographic and Charting Service, also headquartered at Orlando AFB is to furnish the Air Force with documentary photographic air and ground geodetic services.

APCS' film products run from simple documentation by still black-and-white pictures through aerial photography to sequential engineering photography and motion pictures—plus combat documentation in Vietnam. The more than 5,000 military and civilian personnel of APCS operate from twenty-four permanent locations and dozens of other temporary sites throughout the world.

Some specific APCS services include production of research and training films and studies of gravity and astronomy for long-distance measurements of the earth necessary for missile-guidance systems.

Nineteen-sixty-three saw the end of a three-year project that took APCS men across nearly one million square miles of South America. The job was a 1,700-mile-long aerial electronic survey network starting in Venezuela, stretching through Surinam and the Guianas, and ending in northern Brazil—the longest overland measurement ever attempted as a single project.

At Cape Canaveral APCS successfully filmed—for the first time from the air—the liftoff of a man-carrying Mercury capsule. At the same time APCS documentation photographers displayed their skill in projects like "Full Scope," the Tactical Air Command's tactical weapons effects test. Film from cameras located near targets have given planners a new,

more accurate insight on the effect of the close-support weapons in the Air Force arsenal. And improved coverage of subsequent TAC weapon tests is assured from development work now in progress by APCS photo technicians.

The MATS aircraft inventory ranges from the most modern cargo jets to single-engine helicopters. During the first thirteen years of its history, MATS depended on propeller-type aircraft in flying global missions. Such types, still on duty, include the workhorse of the force, the Douglas C-124 Globemaster, introduced to MATS in 1950, the Douglas C-118 Liftmaster, acquired in 1952, the Lockheed C-121 Superconstellation, on duty since 1953, and the Douglas C-133 Cargomaster, put into operation in 1958.

Modernization of MATS into an all-turbine powered airlift force began on June 9, 1961, with the delivery of the first Boeing C-135 Stratolifter, the first pure jet transport, to the airlift force. MATS now has forty-four of these aircraft in operation. In mid-1962 a new turboprop aircraft, the Lockheed C-130E Hercules, began phase-in. While not as speedy as pure jets, the C-130Es have extra-long-range, short-field-landing-and-takeoff abilities and can fly heavy loads. These aircraft will serve MATS during the next several years until delivery of the Lockheed C-141 StarLifter, an all-purpose jet cargo transport designed especially for the kind of jobs MATS must do.

Delivery of the first StarLifter is scheduled in late 1964. These high-wing jets will sit low on the ground with a cargo floor at truck bed height for swift loading. Special wide swinging doors will admit bulky cargo such as missiles, tanks, or trucks. The C-141 will be fast, long-range, and have short-field-takeoff-and-landing characteristics. It is expected to replace most of the piston-engine transports now in use to make MATS truly a modern global airlift force by 1968.

In addition to the 500 long-range cargo transports used by the MATS airlift force, the command has some 500 additional aircraft designed for specialized operations. They are the Convair C-131 Samaritan, used primarily as a flying "hospital ward" between military hospitals in the United States; the Lockheed VC-140 JetStar, with aft-mounted jets, used for short-range administrative flights; the veteran Grumman HU-16 Albatross amphibian used by MATS Air Rescue Service; the Boeing WB-47 Stratojet used for weather reconnaissance and hurricane hunting by MATS Air Weather Service; the Kaman HH-43 Huskie, a twin-rotor, turbine-powered helicopter for Air Rescue Service; and the Boeing VC-137 jet transport assigned to the 1254th Air Transport Wing, Washington, D. C. This military version of the Boeing 707 is used to fly the President and Vice President, other top government, military officials, and international guests. It can fly above 40,000 feet at more than 600 mph.

The presidential aircraft, Air Force No. 1, painted
(Continued on page 127)

VSTOL *Navigation*



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Computing Devices of Canada proudly meets the challenge posed by the complex navigational problems of VSTOL aircraft with its new PHI-100 Series of dead-reckoning navigation systems.

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blue, white, and gold, set a nonstop speed record of eight hours, thirty-five minutes, and forty-two seconds from Washington to Moscow on May 19, 1963. Along the way the big jet, carrying a ten-man US delegation to the Russian capital, captured fourteen other air records. Returning to the US the fan-jet aircraft made the 5,000-mile journey in just under ten hours.

But MATS airlift capability is not limited to full-time military aircraft alone. Since 1960, when MATS was given responsibility for supervision of training and inspection of selected Air Force Reserve and Air National Guard units, the command had made use of a reserve augmentation force of some 41,000 personnel and hundreds of aircraft.

Units which have a wartime mobility assignment to MATS include fifty-nine Air Reserve units with more than 7,000 personnel manning troop-carrier, air-rescue, air-terminal, aeromedical-evacuation, and casualty-staging units. There are also 194 Air National Guard units with almost 24,000 personnel trained for air-transport, aeromedical-transport, and Air Weather Service functions.

Finally, MATS also has more than 8,000 mobilization-day assignees, individual Air Reservists, not assigned to any Reserve unit but assigned for training on an individual basis at active-duty offices at MATS organizations throughout the US.

These units and personnel give the command added capability to expand its forces at extremely short notice.

Their services are used throughout the year, as, flying special missions almost every week end, air-crews of the Air National Guard and Air Force Reserve cover the globe on MATS business.

Straight air logistics, the airlifting of military passengers and cargo to and from overseas, was for many years a primary function of MATS. In the past three years, however, as the result of military aircraft being committed more and more to special missions, exercises, and contingency tasks, a large portion of this work has been assigned to civilian air carriers under contract to MATS.

Where, in fiscal year 1961, approximately thirty-one percent of purely logistic missions were flown by commercial contract carriers, in 1963 the figure rose to fifty-three percent.

These commercial airlift missions are flown by aircraft of the Civil Reserve Air Fleet (CRAF). The CRAF, established in 1952, consists of civil air carriers whose aircraft and crews, by contract, would become available to the Department of Defense as augmentation airlift for emergencies and would operate under MATS operational control during a national emergency.

CRAF membership varies, but currently fluctuates between twenty-two and twenty-five US airlines, with the actual number of aircraft allotted for possible emergency service at around 345 passenger and cargo aircraft.

Although the vast majority of the CRAF aircraft was once piston-engine aircraft bordering on obso-

lescence, DoD and USAF contractual policies over the past thirty-six months have encouraged modernization of the Civil Reserve Air Fleet so that now the entire passenger fleet consists of long-range turbine-powered aircraft and the cargo fleet has twenty-four turbine-powered aircraft with an additional thirty jet cargo aircraft programed to enter CRAF in fiscal year 1964.

In recognition of MATS's work in contracting with civil carriers, the Department of the Air Force for the first time this year awarded the Brig. Gen. Nelson S. Talbott Procurement Management Efficiency Trophy to a major air command.

The semiannual award, which is presented to the procurement activity making the greatest contribution to professionalism in central procurement management, was made to MATS for work from October 1962 to March 1963.

The award citation noted that . . . "After a 1958 study of MATS's military role disclosed that the national . . . air-cargo capability was economically and militarily obsolescent, MATS did an exemplary job of developing commercial augmentation airlift and procurement policies and practices tailored specifically to the Department of Defense long-range requirements, and committed to meet all levels of emergency conditions. In the development of contracts for fiscal 1964, carriers committed thirty-eight modern aircraft for the airlift program . . . and the contractual agreements effected by MATS resulted in the development of a modern commercial air-cargo capability. . . ."

As MATS completed fifteen years of service to the nation on June 1, 1963, President Kennedy congratulated the command with the following letter from the White House:

"To the Men and Women of the Military Air Transport Service:

"The Military Air Transport Service is a vital element of the total United States military force. As such, it has a responsibility for being constantly ready for any contingency during time of emergency as well as time of peace. As a partner of the worldwide security force of our nation, MATS has made significant contributions to our posture of readiness. It has, in addition, added highly important contributions to the welfare of our friends in the free world. Its global airlift capabilities have been tested time after time during periods of strife in all parts of the world. Its vehicles have speeded aid to stricken areas devastated by floods and other forces of nature.

"During times of national crisis, when our nation's security was threatened, the men and machines of the Military Air Transport Service responded effectively in positioning our military forces and equipment to meet these crises.

"I am pleased to congratulate the men and women of MATS on the occasion of their fifteenth anniversary."

JOHN F. KENNEDY

For hard-working MATS people, this was recognition, indeed.—END

Charged with the rapid advancement of aerospace technology and its translation into operational systems, AFSC must constantly look to the future in order to meet tomorrow's needs . . .

AIR FORCE SYSTEMS COMMAND



Gen. Bernard A. Schriever, Commander of the Air Force Systems Command and its ARDC predecessor since 1959, has been in the forefront of USAF development activities for 17 years. A bomber pilot in World War II, he went to Hq. USAF in 1946 as Chief of Scientific Liaison, shifted to development planning in the early '50s and led Air Force missile programs.

FULFILLING its responsibility for the rapid advancement of aerospace technology and its adaptation into operational aerospace systems, the Air Force Systems Command, during the fiscal year ending June 30, 1963, completed turnover of Atlas and Titan I ICBMs to the Strategic Air Command. Additionally, the first full wing of the Minuteman ICBM was deployed operationally and initial turnover of the Titan II ICBM to SAC was made. The end of FY '63 found satellite launchings and recovery techniques developed to the point that successful tests in space became almost commonplace.

This progress in missiles and space systems effectiveness was paralleled by the continuing development of manned aerospace systems.

Basic to these achievements was continued emphasis by Gen. Bernard A. Schriever, AFSC Commander, on effective management of the funds—some forty percent of the Air Force budget—and the resources provided for the development of the varied spectrum of aerospace systems.

Continuing emphasis on the management theme and close cooperation with industry have resulted in economies which have attained increased return for the budget dollar in terms of defense hardware. Many quality improvement, suggestion, and cost-reduction programs operated throughout the command to produce measurable savings. Central supervision of these various programs was established and identified under the title "Purse Strings."

Although ICBM programs continued to move into the operational phase during FY '63, over-all requirements on AFSC have increased rather than diminished in complexity and scope. As of the end of FY '63 the command administered 69,000 contracts that have a face value of \$59.4 billion.

The complexities of weapons, communications, and command-and-control systems of the space age have not diminished the command's involvement in manned

aerospace systems. Exploratory development in this area and important research in human factors of manned systems occupy an important part of the total AFSC program.

While accomplishments during the past year wrote "successfully completed" on many priority AFSC projects that received major emphasis during the preceding years, exploration of new areas of research, refinement and extension of current programs, product improvement, and cost reduction have increased the mission workload.

During the past year many noteworthy events were recorded that illustrate the nature and scope of the many-faceted responsibilities of the Air Force Systems Command role of "Forging Military Spacepower."

● **Aircraft**—The experimental X-15 rocketplane was piloted by Air Force Maj. Robert M. White to the unprecedented height of 59.6 miles on July 17, 1962. For the achievement he became the first pilot of a manned aircraft to earn Air Force Astronaut wings. The flight originated at the Air Force Flight Test Center, Edwards AFB, Calif. The Air Force qualified another Astronaut pilot when Maj. Robert A. Rushworth reached an altitude of fifty-five miles over the Mojave Desert at the controls of the X-15 on June 27, 1963. The X-15 flights are invaluable steppingstones in the acquisition of technology and pilot experience in the nation's progress to the inevitable manned spacecraft of the future that will follow the pioneering space thrusts of aircraft such as the X-15 and the X-20 Dyna-Soar research vehicles.

Members of the X-20 Dyna-Soar pilot team participated in centrifuge tests to aid in crew station development and in accumulating human factors data under simulated flight conditions. A prototype full-pressure suit was used during the tests. The programmed launch vehicle for the Dyna-Soar was changed from Titan II to Titan III with an attendant change in vehicle-design requirements to provide multior-

biting capability. The X-20 accomplished its first captive flight test of its inertial guidance system in late 1962.

Aircraft development and modification to meet the air tactical requirements of counterinsurgency (COIN) and limited warfare was assigned as a lead division responsibility of the Aeronautical Systems Division, Wright-Patterson AFB, Ohio. An example of the ASD program in the COIN area is the modification of the T-28, now used by the Vietnam Air Force. These modifications include a turboprop engine and a changed wing configuration designed to increase armament storage capabilities. The limited warfare capability of free world allies of the United States was further reinforced during the past year by assembly lines that produced modified B-26s specially equipped for the tactical and psychological requirements of COIN operations.

Last year saw development of the USAF C-141 StarLifter, the new long-range, four-engine, jet freighter, advance to the point that the official rollout occurred

in August 1963. The addition of the StarLifter to the Air Force inventory will serve to further compress supply pipelines and reduce the size of high-value item inventories throughout the world.

● **Missiles**—The Atlas ICBM, development testing and launch site construction having been completed, was deployed operationally under Strategic Air Command control with thirteen squadrons in place at eleven bases. The final turnover occurred on December 19, 1962.

The Titan I was delivered to the Strategic Air Command as operational and was deployed at five SAC bases. Turnover completed on September 20, 1962.

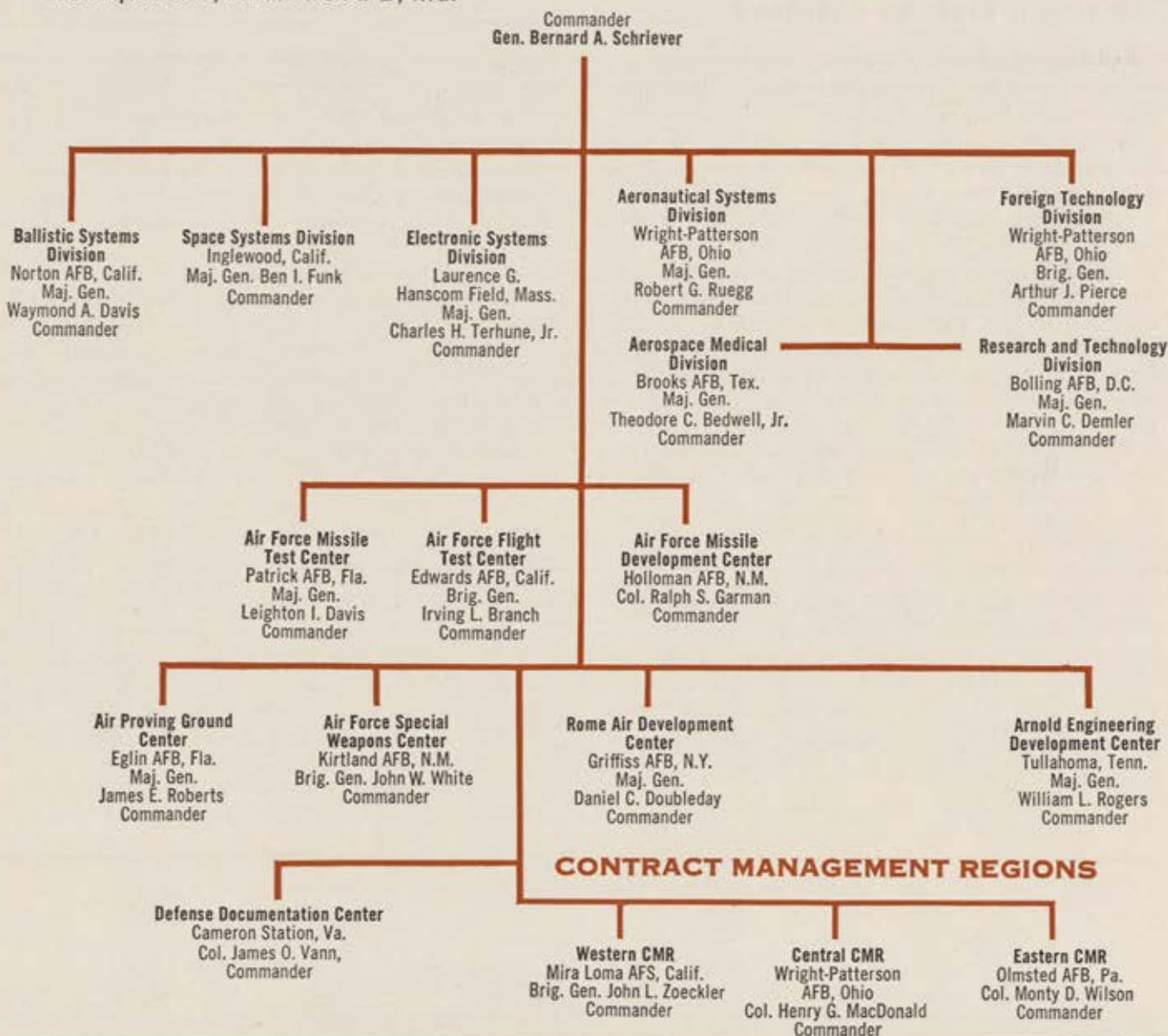
Development and test on Titan II progressed to the point of its initial delivery into the operational inventory on June 13, 1963.

Minuteman solid-propellant ICBMs were delivered to the Strategic Air Command for operational deployment. Initial activation of two flights occurred at Malmstrom AFB, Mont., in December 1962. The end

(Continued on following page)

AIR FORCE SYSTEMS COMMAND

Headquarters, Andrews AFB, Md.





Modified Atlas, carrying special target vehicle and "piggyback pod" for use in Army's R&D Zike-Zeus tests, stands on Vandenberg pad.



Two-million-cubic-foot plastic balloon is inflated at Holloman AFB, N. M., before being released to carry instrument payload to 102,000 feet in six-hour flight to study cosmic rays above earth's atmospheric screen.



Jet fighter pilots, Capt. Jack Lee, left, and Cleyburn McCauley, discuss side reflector that ground radar "sees" when the F-102 lands using new automatic landing system. The three-sided metal reflector is mounted on the nose wheel well cover of the plane.

AIR FORCE SYSTEMS COMMAND

CONTINUED

of FY '63 found the complete wing operational at Malmstrom and operational activities of two flights effected at Ellsworth AFB, S. D.

• **Testing**—In June 1963 the reliable Air Force Thor made its 200th flight on the Pacific Missile Range bearing a scientific payload.

ANNA, the triservice geodetic research satellite, orbited from the Air Force Missile Test Center, Patrick AFB, Fla. Instruments carried aloft in the satellite provided data to determine the center of the earth's mass and took measurements of the strength and direction of its gravitational field. Two weeks later a 1.5-pound tetrahedral radiation satellite orbited and relayed data on the Van Allen radiation belt.

Thermoelectric converters for absorbing solar energy and converting it into electric energy underwent an orbital test flight from Vandenberg AFB, Calif.

A unique test facility was completed at the Air Force Special Weapons Center. Mounted on 360 tons of concrete and ten tons of imbedded steel, the facility will simulate shocks created by nuclear explosions.

Last year the Space Systems Division probed space with more than sixty separate experiments embracing more than a dozen major areas. Experiments were carried either as primary or piggyback on Atlas as well as Thor-boosted Agenas launched from Vandenberg AFB and USAF launch facilities at Pt. Arguello, Calif.

The Arnold Engineering Development Center's wind tunnels and high-altitude rocket test cells engaged in test programs that provided aerodynamic and propulsion data for high-priority space systems such as the X-20 Dyna-Soar, the Agena satellite vehicle, Apollo, Gemini, Saturn, Syncom, Surveyor, and the Titan III space booster, in addition to continuing work on such programs as Minuteman, Titan, Polaris, and future aerospace systems. At the center, development tests were continued on air-breathing

engines and rocket engines which power operational aircraft and missiles.

• **Aerospace Medicine**—The Clinical Sciences Division of the School of Aerospace Medicine, Aerospace Medical Division, Brooks AFB, Tex., completed evaluation of thirty-two Astronaut candidates for NASA. Also completed was the evaluation of a group of applicants for the USAF Aerospace Research Pilot Course, Edwards AFB, Calif.

In August, an eighteen-month research project was begun at the School of Aerospace Medicine to determine the best training techniques to avoid certain cardiovascular reflex deterioration resulting from lack of use during prolonged spaceflight.

• **Space**—The Air Force Systems Command provides a large part of support given the National Space Program by the Department of Defense, the Air Force providing more than ninety percent of the space resources of the DoD. The Space Systems Division of AFSC has supervised the launching for NASA of all the Astronauts who orbited the earth in the Mercury project—and will do the same for Project Gemini. It has launched more than ninety percent of the United States satellites and space probes in 1962, including Ranger IV, the first spacecraft to reach the moon, and the Mariner II Venus space probe for NASA.

In May 1963, the first stage-one engine for the Gemini program was accepted by the Air Force from the Aerojet-General Corp. This event was one of the recent milestones in the continuing support of the National Aeronautics and Space Administration by the Air Force Systems Command. To illustrate the extent of such support, the face value of contracts administered for NASA by AFSC's Western Contract Management Region alone increased from \$450 million in July 1961 to \$1.2 billion as of March 1963.

The most dramatic example of Air Force and NASA cooperative effort came on May 16 when an Air Force

(Continued on page 133)



All-weather flight management. Routine operation in any weather has long been the goal of aviation—and a prime engineering target at Sperry. We have devoted years to the problem—refining techniques, merging the technologies involved, closing the gap. □ Latest Sperry systems for military and civil needs include: (1) windshield projections of flight and command data, with Beacon-Vision runway displays; (2) automatic pilots many times more reliable than current standards; (3) high-accuracy radio altimetry for automatic flare and landing; (4) automatic throttle and speed controls; (5) instrument and autopilot comparator-monitors; (6) new two-axis Flight Directors for extended path and flare; (7) world-standard Gyrosyn® Compass and vertical gyro systems. SPERRY PHOENIX CO., Phoenix, Ariz.

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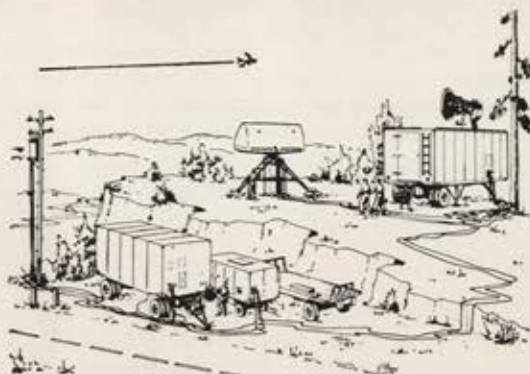
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SYSTEMS
CAPABILITIES**



Systems project managers can save time and money, and achieve operational hardware faster, by working with Reeves' experienced design and production teams.

Reeves' comprehensive experience in the fields listed has resulted in many pioneer achievements. This experience, combined with extensive, smoothly operating production and test facilities, permits us to take on major assignments.

A review of what Reeves has done, is doing, and can do, will demonstrate the unique character of our capabilities . . . for systems, subsystems, assembly and component development, engineering, production, supply and field service. Data file 209 on request.



FOR EXAMPLE: TRACKING RADAR SYSTEMS

Reeves' achievements in tracking radar cover a broad spectrum. In the long range field, Reeves Verloort® . . . Very Long Range Tracking Radar . . . is among the most accurate systems available. Field-proven in satellite programs, Verloort installations perform consistently at ranges of 5,000 miles and better.

Another unusual Reeves' development, the Radar Bomb Scoring Central (AN/MSQ-35), acquires, tracks, and records the flight of aircraft and release of bombs on practice missions. With provision for skin, beacon, and optical tracking, the Central produces continuous plots of aircraft position and bomb trajectory, in horizontal and vertical planes. Maximum range, 100 miles at altitudes up to 300,000 ft.

These complete systems have been designed for compact housing in air-transportable vans for field service. They typify Reeves' comprehensive capabilities for systems' production, from concept to delivery of operational hardware.



REEVES INSTRUMENT CORPORATION A Subsidiary of Dynamics Corp. of America, Roosevelt Field, Garden City, N. Y.

Systems engineering...management...production...field services

Atlas boosted Air Force Maj. Gordon Cooper into an orbital journey that lasted thirty-four hours, twenty minutes, and thirty-one seconds during twenty-two orbits of the earth. On May 21, 1963, ceremonies at the White House commemorating Major Cooper's flight included presentation of NASA awards. Among those given was a NASA Medal for Outstanding Leadership to Maj. Gen. Leighton I. Davis, Commander of the Air Force Missile Test Center, for management of DoD range support given the Mercury program, and a Group Achievement Award to Maj. Gen. Ben I. Funk, Commander of AFSC's Space Systems Division in recognition of the Division's work in managing the development of the Atlas booster used in the Mercury project.

Holloman AFB has been designated as the location of the Air Force Systems Command's Ballistic Missile Reentry System Data Center. The Center will augment and centralize the reduction, correlation, analysis, and storage of data acquired as a result of atmospheric reentry test programs conducted at the White Sands Missile Range. Organizationally, the office will be under the Air Force Missile Development Center at Holloman AFB.

• **Command and Control**—During the past year the command's Electronic Systems Division, L. G. Hanscom Field, Mass., turned over to the Air Defense Command ballistic missile early-warning sites at Thule, Greenland, and Clear, Alaska.

Under a high-priority directive, the Division developed a communications system for South Vietnam and Thailand.

The halfway point was reached in development and construction of an entirely new, semiautomatic command-and-control system for the North American Air Defense Command. Called 425-L, the new system will provide increased capability for defending North America against aerospace attack in the missile age. Concurrent with construction of an underground site for the system in Cheyenne Mountain, ESD has established an experimental engineering facility throughout the system, designated and trained the men to man it when it becomes operational.

Construction began on ESD's Systems Design Laboratory, a \$10 million experimental facility that will play a key role in the USAF command-and-control effort. Built around an IBM 7030 "Stretch" computer, the new laboratory will permit designers to model complete command-and-control systems, eliminating expensive prototype construction. The laboratory will also allow for modeling of several systems simultaneously to determine their compatibility.

The Division became the computer center of the USAF with the establishment of an Electronic Data Processing Equipment Office which provides a single point of contact for computer manufacturers seeking to do business with the Air Force. This new office, which represents a management step forward in efficient procurement of the Air Force's steadily growing electronic data-processing needs, establishes one prime contact for all USAF computers above the punch-card accounting-machine level.

• **Research**—During the year continuous-wave laser—pumped by a tungsten bulb only—became a reality. Laser (light amplification by stimulated emission of radiation) is a device for producing a coherent light source (a narrow beam that does not spread). Only fifteen watts were used to stimulate the laser, marking the first time a solid-state laser was operated at such a low power level. Applied research on laser technique continued with further investigation of the unknown limits and potential applications of this technological breakthrough in communications and other areas.

• **Management**—The Research and Technology Division, Bolling AFB, Washington, D. C., became fully operational on July 26, 1962. The division, through seven major laboratories, plans and manages the AFSC exploratory development and advanced development programs. Establishment of this division helps fulfill the need for increased "in-house" research capability. The division creates a broad base of research and technology for timely application in the development of aerospace weapon and support systems and equipment.

In March 1963, the Department of Defense reconstituted the Armed Forces Technical Information Agency (ASTIA) as the Defense Documentation Center (DDC). The change signified increased responsibilities and provided an opportunity for a systems approach in the handling of scientific and technical documents. The DDC is under the operational control of the Department of the Air Force through AFSC.

During the year the development engineering function within AFSC's three contract management regions was established. The addition of this function is part of a planned program to facilitate the difficult job of managing modern defense procurements.

Progress was recorded in the AFSC procurement program as a result of increased shifts from noncompetitive to competitive procurement and from cost-plus-fixed-fee to fixed- or incentive-price contracts. In one example, the ratio of fixed-price contracts awarded at the Air Force Missile Test Center doubled as a result of an educational program leading to preparation of technical exhibits that reflected greater detailed specifications adaptable to competitive procurements.

Throughout the year principal recommendations from conferees at the major AFSC-Industry Conference held at Monterey, Calif., in May 1962 received thorough followup within AFSC. As a result, much progress has been made toward the conference's objectives which were: (1) to significantly improve understanding of the new and anticipated management environment, (2) to improve AFSC-Industry relationship and understanding, and (3) to arrive at joint AFSC-Industry approaches to systems management within today's and tomorrow's environment.

The Air Force Systems Command during the months and years ahead will continue the evolutionary development of the AFSC system of management to ensure positive and logical control of its activities to the end that assigned programs and resources are managed most effectively.—End



Gen. Mark E. Bradley, Jr., Commander of the Air Force Logistics Command since July 1962, is a 1930 graduate of West Point. In charge of fighter plane production at Air Materiel Command in World War II, he was Vice Commander of USAF from 1953 to 1956 and spent six years at Hq. USAF, lastly as DCS/Systems and Logistics, before being named commander of AFLC.

Better management of the logistical demands of a global Air Force—and at lower costs: These goals continue to be met by the men of the Logistics Command . . .

AIR FORCE LOGISTICS COMMAND

JULY 1, 1963, was the first anniversary of Gen. Mark E. Bradley, Jr.'s becoming Commander of Air Force Logistics Command. It had been a year on which he—and all the men and women of AFLC—could look back with pride.

The major event of the year happened only four months after General Bradley took command. That was AFLC's quick logistics response to the Cuban crisis.

Almost overnight, missiles, aircraft, and their many thousands of spare parts had to be in position in Florida ready for any contingency. The responsibility for getting the equipment in place was that of AFLC. The command had long maintained, "Our policy is instant readiness to support the Air Force in meeting any emergency. Our ordinary peacetime operation is geared to a twenty-four-hour readiness posture."

Now came the command's biggest test of that policy. Lights burned at night in the offices of General Bradley at his headquarters at Wright-Patterson AFB in Ohio.

During the month that followed the Cuban quarantine action, AFLC moved 168,000 tons of freight by air and by truck. LOGAIR—AFLC's contractual, scheduled cargo airlift between depots and bases—flew an additional 685,000 miles. Air Force bases east of the Mississippi were stripped of 600 trucks that were sent to Florida. Civilian truck convoys brought Air Force supplies from the West Coast, driving day and night.

Special Air Force items in use at the time in Japan, the Philippines, and Europe were brought in by MATS (Military Air Transport Service). Altogether MATS provided seventy-six special missions for AFLC.

During the first week of the crisis, AFLC set up a procurement office in Miami. Some 50,000 items for shelter, as well as typewriters, kits, and tires were purchased locally in less than thirty days.

Strategic Air Command was aided in keeping part of its fleet in the air twenty-four hours a day. AFLC procured the spare parts needed, funded for extra supplies of fuel, and speeded up repair of about 130 B-52s,

KC-135s, and B-47s that were in Air Materiel Area depots when the crisis began.

In fact, AFLC's response was so good it brought praise from the nation's top Air Force staff. Gen. William F. McKee, Vice Chief of Staff who knows the score well as a former Commander of AFLC, said that never before had the logistics people been ready and waiting while the other commands got ready.

Gen. Walter C. Sweeney, Jr., Commander of Tactical Air Command, wrote, "Without reservation, I can say that AFLC operated in a highly professional manner in taking the actions necessary to support a most important USAF contribution to our nation."

This statement was in a letter to Gen. Curtis E. LeMay, Chief of Staff of the Air Force, who passed it on to General Bradley with the comment, "It is a pleasure for me to add my commendations for the outstanding job done by you and your people."

After this undertaking, what AFLC did during the remainder of the fiscal year ending last June 30 seemed rather anticlimactic. However, the command did open a new facility and institute three projects expected to provide substantial cost avoidances.

Newark Air Force Station, earlier known as the Heath facility in Ohio, was formally opened December 13, 1962, to provide single-point inertial-guidance-system repair for guided and ballistic missiles and special aircraft. It is also operating the USAF Calibration Program.

Over \$4 million was spent in modifying the old Heath facility, which had been designed for the Air Force's heavy press program. Another \$33 million went for tools and test equipment.

Newark's mission is to provide accuracy, both in the calibration standards used throughout the Air Force and in the Minuteman, Titan, Atlas, and Hound Dog missile guidance systems. The facility also will do work for other services.

Constructed in 1953-54, the Newark building has un-

derground pits, with the two larger areas sixty-five feet deep. The concrete walls of these pits vary in thickness from four to twelve feet, and the floors are fourteen feet thick.

Environmentally controlled clean-room areas for disassembly and assembly of missile-guidance systems and components were constructed within the existing building, as well as a vibration test and centrifuge area.

The clean rooms will provide isolation from other production processing areas with special air-conditioning systems to reduce dust count. With dust, temperature, humidity, and other controls such as special lint-free clothing, these clean rooms are the nearest known to perfectly controlled environment.

Newark's clean rooms are vital to assure the degree of precision demanded by today's complex weapon systems. When technicians are dealing in millionths of an inch, a speck of dust visible only under a forty-power microscope or the weight of a fingerprint could mean the difference between an accurate trajectory or the loss of a missile.

In the area of cost avoidance, Project MINT got under way in September 1962, as a year-long task to reduce and simplify the Air Force supply system, offsetting the explosive growth of items in the space age. Over 1,300 technically qualified employees worked exclusively on it.

By June 1, 1963, the number of different kinds of

items had dropped over a quarter of a million to 1,880,000 from the all-time peak of 2,140,000 in June 1962. It was the first decrease since establishment of the Federal Stock Numbers (FSN) system in 1953.

Project MINT means Materiel Identification and New Item Control Techniques. It has two principal objectives: first, to eliminate unneeded items and correct errors in identification of items; second, to develop better control of new items.

The goal of MINT is inventory savings of thirty percent through a like percentage of reduction in the Federal Stock Numbers and improved support of major air commands. Whenever a single item is prevented from entering the inventory, the taxpayer is saved an estimated \$1,000. Thus it is easy to see why General Bradley, the project's sponsor, expects it to live up to its name and save the taxpayers a mint of money.

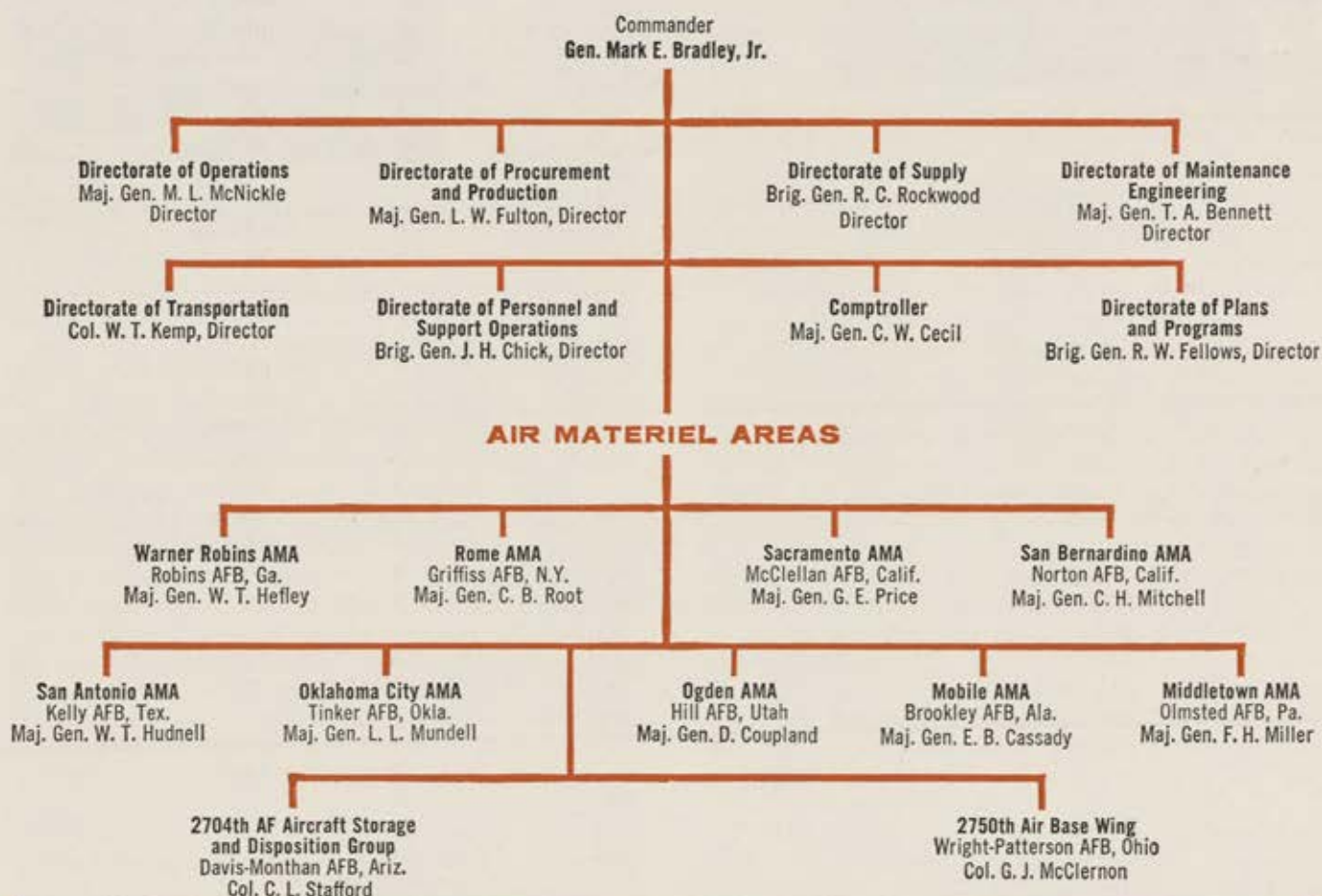
Another project that will bring cost reduction to the logistics area is the improved vehicle management program. Establishment of the Defense Industrial Plan Equipment Center (DIPEC) at Memphis, Tenn., resulted in the transfer to four other AFLC installations of AFLC's functions at Memphis, and the saving of about 310 civilian positions.

Cost avoidance to the Air Force of \$321 million was achieved by a special project during the first eleven months ending May 31. This amount will count toward a Defense Materiel Utilization Program to reduce logistics

(Continued on following page)

AIR FORCE LOGISTICS COMMAND

Headquarters, Wright-Patterson AFB, Ohio





Warehouse storage of supplies and equipment for the Air Force is a basic activity of the Logistics Command. This is the Middletown Air Materiel Area, Pa.



F-105s are lined up at Mobile Air Materiel Area, Brookley AFB, Ala., for their final check before they take off for Pacific Air Forces where the Thunderchief is replacing F-100s on Okinawa and Japan.



Ingots are all that's left when obsolete aircraft are melted down at Aircraft Storage and Disposition Group, Davis-Monthan AFB, Ariz.



Doris Watkins, a civilian employee of AFLC, seems right at home inside a B-52 engine cowl at San Antonio AMA, Kelly AFB, Tex. She's securing a rivet that's being driven in by Mrs. Stella Derouchie.

tics costs by \$3 billion annually for the next five years.

The purpose of the project is to secure the fullest use of supply excesses within the government and remove unneeded items from defense management.

The project involves the Interservice Supply Support Program's transfer of items to other military departments and to the Defense Supply Agency, and intra-service transfers of excess within the Air Force through reclamation, excess withdrawals, and utilization. Reclamation and utilization includes using items for purposes other than those for which they had been bought, and using excess instead of buying new items.

Simultaneously, AFLC stepped up the amount of excess items to be removed from the active inventory. A goal of \$1,667,800,000 was set up for this purpose for 1963. Each of the command's AMAs has been assigned a goal and will be expected to declare as excess property equal to or greater than the goal.

As the new fiscal year started, the 7th and 19th Logistics Support Squadrons, which provide logistics support for special weapons, were transferred to Military Air Transport Service (MATS), effective July 1, 1963, with operational control remaining with AFLC. The squadrons will continue their operations from Kelly AFB, Tex., and Robins AFB, Ga.

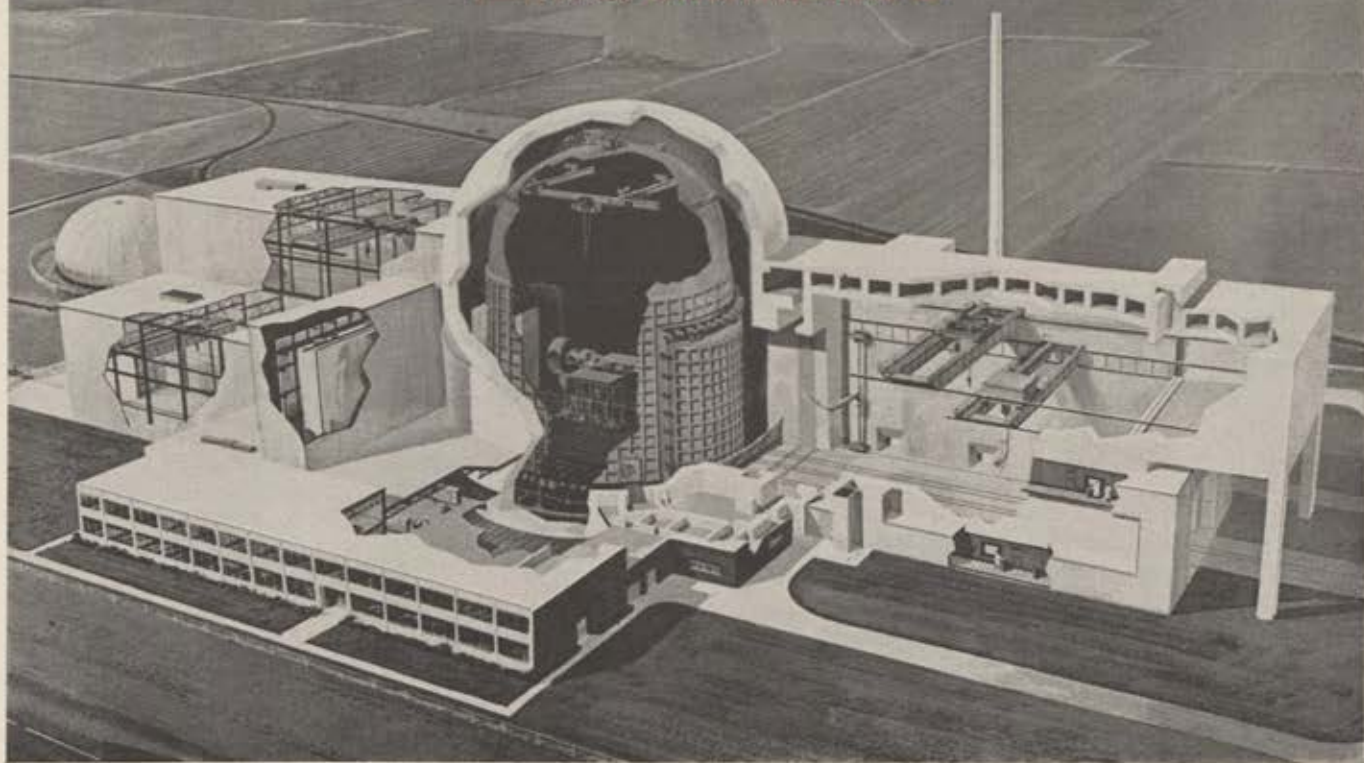
Through the entire year, AFLC provided logistics support for the combat units of the Air Force—its primary mission. AFLC's job is to see to it that all Air Force combat units are properly equipped and ready for instant action at all times, anywhere in the world. Involved are procurement, supply, maintenance, and transportation.

About \$3 billion a year is the amount of AFLC procurement. Supply manages items valued at about \$13 billion. Maintenance processes three million aircraft and engine components annually through AFLC depots, and is conducted by over 50,000 persons, about one-third of the total personnel in the command.

These activities have continued under a long succession of changes in organization and redesignations in name. Air Force Logistics Command was a redesignation of Air Materiel Command in April 1961. Air Materiel Command was organized in 1946, replacing Air Technical Service Command, which in turn traced its organization back to the Materiel Division of the Army Air Corps, established at McCook Field, Dayton, Ohio, in 1926.

For the future, AFLC's aim is to do as well or even better than it did in the Cuban crisis, no matter what emergency may arise.—END

KAISER ENGINEERS



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NASA Lewis Research Center's Space Propulsion Facility is designed to simulate outerspace environment, including high vacuum, cryogenic temperatures, and solar radiation. The facility incorporates capability for testing full-scale nuclear and non-nuclear spacecraft, including nuclear power generation and electric propulsion systems. Kaiser Engineers' assignment — feasibility study, design criteria, preliminary nuclear hazards report, detail design, construction specifications, critical path scheduling. Kaiser Engineers is proud to be a member of the NASA team developing this advanced facility. KE also numbers among its clients the AEC, Air Force, Army Corps of Engineers, Navy Bureau of Yards and Docks, and leading aerospace industry firms.

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Maj. Gen. Kenneth P. Bergquist, AFCS Commander, is experienced in all phases of air operations. A fighter pilot at Pearl Harbor, he also flew bombers in World War II, then was air attaché in Greece during the Greek-Communist war. As DCS/Operations at Hq. ADC in 1951 he helped design US air defense system and later served as Deputy Chief of Staff/Operations at Hq. USAF. He became Commander of AFCS in 1963.

USAF's youngest command, AFCS, now is well on its way to becoming a 50,000-man organization whose members staff the communications outposts of the world in support of USAF . . .

AIR FORCE COMMUNICATIONS SERVICE

CONTINUED emphasis on maintaining its responsiveness to communications requirements of the present and the development of the capabilities to meet future Air Force needs spirited a keyed-up Air Force Communications Service program during the year.

AFCS, youngest of the sixteen major commands (although its forerunner, the old Airways and Air Communications Service, was nearly a quarter-century old), is commanded by Maj. Gen. Kenneth P. Bergquist. Headquarters for the command are at Scott AFB, Ill.

AFCS technicians make up more than 575 units at 500 locations in forty-six of the United States and thirty-six foreign countries.

The command, established in July of 1961, 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 of procedural similarity.

To accomplish its mission, AFCS 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, radio, and digital communications systems. Television, maintenance-expediter, and fire-crash communications facilities are also in 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 T-33s and C-140A JetStars.

Backboning the command's worldwide operation,

from an organizational standpoint, are eleven direct-reporting subordinate headquarters of which two are designated "Areas"—comparable to numbered air forces in strength and responsibility—and five are "Independent Regions"—similar in size and responsibility to air divisions.

The European-African-Middle Eastern Communications Area, commanded by Brig. Gen. George M. Higginson from headquarters at Lindsey AS, Germany, includes subordinate United Kingdom, Central European, Mediterranean, and Spanish Regions.

The Pacific Communications Area, with headquarters at Wheeler AFB, Hawaii, is commanded by Brig. Gen. Norman L. Peterson. Included in this organization are Far East and Southeast Asia Regions.

Independent Regions are:

- Tactical Communications Region at Langley AFB, Va., which is commanded by Col. Francis B. Morgan.
- Alaskan Communications Region at Elmendorf AFB, Alaska, commanded by Col. Harold L. Hughes.
- Eastern Communications Region at Westover AFB, Mass., commanded by Brig. Gen. Anthony T. Shtogren.
- Central Communications Region at Tinker AFB, Okla., commanded by Col. Albert H. Snider.
- Western Communications Region at Hamilton AFB, Calif., commanded by Col. D. S. Woods.

An important part of AFCS's total mission source is contained in thirty-seven Air National Guard and twenty-four Air Force Reserve communications organizations. The command has responsibility for supervising the training of these units and of planning for their successful integration into the command as operating units in any D-day situation.

These units, comprised of some 8,000 personnel, are equipped with mobile communications, radio relay communications intercept, and air-traffic-control facilities, and can be counted on to add their resource-

fulness and dedication to AFCS in time of national emergencies.

In January of this year, the Air Force activated the TAC Communications Region—an AFCS organization, located with Headquarters Tactical Air Command at Langley AFB, Va., and charged with supporting communications requirements of that command.

Its creation was the logical "next step" in the development of AFCS—as planned by Headquarters USAF—to manage Air Force communications and air-traffic-control services.

This move was a command milestone. The new AFCS organization assumed responsibility for operating and maintaining fixed-base ground-communications facilities and air-traffic-control and air-navigational aids which support TAC's operation. The organizational structure of the new region parallels that of TAC at all levels of command.

A few weeks later, on February 27, with activation of its fifth automatic electronic switching center at Andrews AFB, Md., the Air Force completed the world's largest and most advanced data communications network. Called Automatic Digital Network, or AUTODIN, it was conceived as a logistics network primarily for Air Force use. Originally called AF DATACOM (Air Force Data Communications Network), the system was turned over to the Defense Department in February 1963 and redesignated AUTODIN. Although AUTODIN is a segment of the Defense Communications System, the Air Force has been assigned the responsibility of system manager.

These were the latest pages in the more than fifty-year history of the development of communications specifically to support airpower.

AUTODIN links some 300 Air Force, Department of

Defense, and defense industry users into a worldwide system for the high-speed interchange of vital data.

General Bergquist described the system as a "first of its kind, a unique marriage between data-processing devices and communications facilities in a computer-controlled system. Its capability will pave the way for important defense management improvements."

In its present configuration, AUTODIN can transmit 7,000,000 punched cards, or the equivalent of 100,000,000 words daily from punched cards, and perforated paper tape or magnetic tape, with an accuracy that permits no more than one erroneous character in ten million to pass undetected.

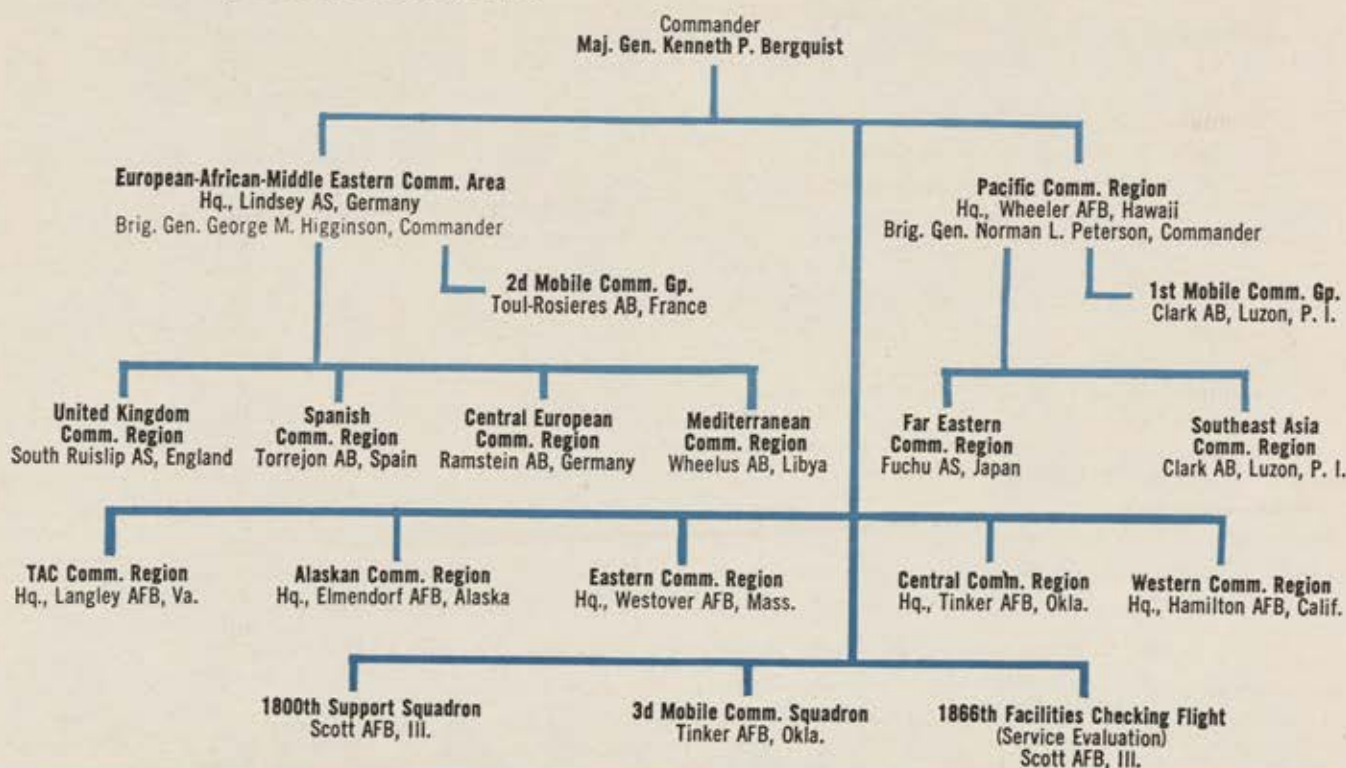
The AUTODIN network is comprised of five automatic electronic switching or message relay centers. They are located at Tinker AFB, Okla.; Gentile AFS, Ohio; Andrews AFB, Md.; McClellan AFB, Calif.; and Norton AFB, Calif.

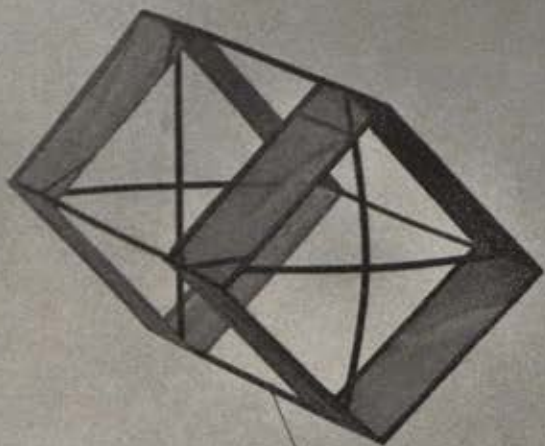
A major change in AFCS/Stateside organizational structure was announced in October of 1962 and the change became effective July 1, 1963. It reduced the number of subordinate echelons in the US from six geographic regions to three. The old six-unit structure, which consisted of a Continental Systems Region in addition to Southeastern, Midwestern, Southwestern, Western, and North Atlantic Communications Regions, was absorbed by three new regions designated Eastern, Central, and Western Communications Regions. Each is equivalent in size and grade structure to an air division. The shortened span of control will result in increased efficiency, manpower economy, and improved management of total resources.

In Alaska, the Pacific, and Europe, AFCS organizations parallel the structure and the geographic area
(Continued on page 141)

AIR FORCE COMMUNICATIONS SERVICE

Headquarters, Scott AFB, Ill.





FLIGHT SUPPORT

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of the responsible commands. The Alaskan Communications Region responds to and serves the Alaskan Air Command, Pacific Communications Area supports the needs of Pacific Air Forces, and the European-African-Middle Eastern Communications Area serves the USAF in Europe in its area of responsibility.

The command on January 8, 1962, completed an emergency message transmission system that can automatically flash top-priority orders from USAF Headquarters to all major air commands around the world. Shortly thereafter, the Air Force Discrete Frequency Plan was implemented, assigning "clear channel" frequencies to AFCS-operated air-traffic-control facilities in the United States.

AFCS in August of 1962 began the acceptance of four new Lockheed C-140A JetStar utility transports. These aircraft will help satisfy, primarily, Air Force requirements for evaluation of mobile navigational aids deployed for contingency operations.

Flight Facilities, and Air Traffic Control, in addition to taking on the all-weather, twin-jet aircraft for its evaluation function, recorded other advances.

In September, initial steps were taken to begin the transfer of AFCS's worldwide flight facility checking mission to the Federal Aviation Agency. The FAA formally assumed responsibility for accomplishing the flight inspection of Air Force navigational aids in Alaska on September 4, and Alaska's 1855th Facility Checking Flight was discontinued on October 1. Flights also were discontinued at Randolph AFB, Tex., and at Tinker AFB, Okla.

To accomplish its "service evaluation" mission, AFCS activated the 1866th Facility Checking Flight (Service Evaluation) on July 1, 1962, at Scott AFB. Similar units will be established in the Pacific and Europe in the near future.

Within the same organizational framework, AFCS traffic controllers in the past two years directed more than 275 pilots to safe landings from flights that almost certainly would have ended disastrously had it not been for the action of controllers. These skilled airmen "saved" more than a full squadron of airlift or cargo airplanes, a squadron of combat bombers, an entire wing of jet trainers, and almost two complete wings of first-line combat fighter aircraft.

Managementwise, December 31, 1962, marked the transfer of functions performed by AFCS's Office of Commercial Communications Management (OCCM) at Scott to the Defense Communications Agency (DCA) and its redesignation as the Defense Commercial Communications Office (DECCO). The transfer concluded the Air Force's role as interim action agency for the DCA in the leasing of private-line communications facilities, and combined this responsibility with that of the management of such facilities by DCA. Since that time AFCS has been given the mission of coordinating with DECCO the leasing of communications facilities for all agencies of the Air Force.

The three emergency mission support organizations assigned to AFCS, the 1st Mobile Communications Group in the Pacific, the 2d Mobile Communications



It's always a tense moment when AFCS controllers in their Radar Approach Control Center (RAPCON) electronically direct an Air Force aircraft after an in-flight emergency.

Squadron in Europe, and the 3d Mobile Communications Squadron in the United States supported every major Air Force maneuver and emergency operation, and every major joint maneuver and exercise held during the last two years, including Cuba. These operations, together with their response to normal and emergency requirements, have involved their members in some 400 deployed operations during AFCS's short existence.

The three mobile communications organizations are equipped with van and trailer-mounted communications, air-traffic-control, and navigational-aid equipment that is transportable by land, sea, or air. Large organizations by comparison with other AFCS units, they are manned by technicians specially trained to move in, install, operate, and redeploy as necessary, for support of emergency air operations anywhere such action might be required. They can, within hours of their arrival, establish the basic communications, air-traffic control, and navigational aids to support air operations anywhere that airplanes can land and take off. If invasion of Cuba had become necessary last year, members of the Command's Mobile Communications Organizations would have been among the first to land and operate in any contingency area.

When it reaches full growth, AFCS is expected to be a 50,000-man organization whose members will man the communications outposts of the world, operating those facilities which tie the globally capable USAF into a precise, coordinated team.

The scope of AFCS's operation is presently worldwide—because the Air Force it supports today operates globally. Tomorrow—with the expanding development of our aerospace forces, the command expects to operate communications and navigational systems in support of these forces.—END

Recruitment and training for the global Air Force is a big order. Last year 310,000 completed technical courses and ATC signed up 100,500 new recruits, building for AF's demands of tomorrow . . .

AIR TRAINING COMMAND



Lt. Gen. Robert W. Burns, who succeeded Lt. Gen. James E. Briggs as Commander of Air Training Command August 1, is in his third tour with ATC, having instructed aviation cadets at Randolph AFB, Tex., from 1934 to 1940 and serving as ATC's Chief of Staff and Vice Commander from 1949 to 1952. A wartime bomb wing commander, he was Chairman of the Inter-American Defense Board in Washington, D.C., before he returned to ATC.

ONE OUT of every three men in the Air Force received training provided by Air Training Command (ATC) during the last fiscal year.

Again, emphasis was on technical types of training as ATC prepared personnel in various technological career fields to meet the requirements of America's aerospace force.

ATC last year provided training for more than 310,000 USAF personnel of whom more than ninety-five percent completed technical courses, again reflecting the big demand for qualified technicians for an effective Air Force in the technological age.

To help meet this demand, ATC last year enlisted 100,500 recruits with more than ninety percent of them entering ATC technical-training courses.

History

Organized in 1943, the Training Command strength was at a peak during World War II. It trained 80,693 pilots in 1944 alone.

By 1949, ATC operated a single headquarters at Scott AFB, Ill., with seventeen active bases. USAF expansion during the Korean conflict brought a boom in training requirements, and subcommands within ATC were reinstituted. The number of ATC bases increased to forty-three.

Following the Korean truce, ATC added and revised training courses to meet technological requirements and mission realignment. By mid-1958, subordinate commands were discontinued, and their responsibilities were assumed by the reorganized command headquarters which had been moved in 1957 from Scott AFB to Randolph AFB, Tex.

Today, Air Training Command, one of the largest educational organizations in the world, conducts training at nineteen bases across the nation. Its mission is

the recruiting and training of officers and airmen to fit the personnel needs of the USAF team.

Recruiting

The USAF Recruiting Service, a major component of ATC, with headquarters at Wright-Patterson AFB, Ohio, has the big job of supplying the Air Force with young men and women.

In accomplishing this mission, Recruiting Service last year had a staff of 1,500 recruiters divided among some 750 offices throughout the United States. Their job was selective recruitment. To obtain the young men and women with qualifications required by the Air Force, they averaged five interviews and tests for each single selection.

The recruiters again were interested in the educational level of the new enlistees. Approximately eighty percent of nonprior-service personnel signed up were high school graduates.

Military Training

ATC's Lackland Military Training Center, San Antonio, Tex., introduces new enlistees to the military. All new recruits without prior military service report to Lackland where all receive the same reception and processing with the 3720th Basic Military School.

At the one base, each young man or woman finds equal opportunity. Last year, they arrived at Lackland in numbers totaling from 4,300 to 11,200 a month.

For most of them, basic military training ends after five weeks. During this period, they learn teamwork and group living and develop a basic knowledge of the Air Force. Their career interests and aptitudes become known, and then the majority are ready for assignment to an ATC technical school. After completion of a tech-



Air Training Command pilot-instructor and his student prepare for a mission in a T-37, ATC's primary trainer. Last year there were 1,300 pilot graduates in the all-jet Training Command student-training program for USAF personnel.

sive three-month training program for college graduates who possess skills needed by the Air Force.

The training program emphasizes military knowledge and abilities necessary for all commissioned officers regardless of career specialties.

In its next fiscal year, OTS has a quota of 6,000 graduates, giving further emphasis to the need for officers educated to at least the baccalaureate level in skills peculiar to the space age.

Meanwhile, one of the best known Air Force institutions, the USAF Officer Candidate School (OCS) closed its doors at Lackland on June 21, 1963, to complete the transition from OCS to OTS as a result of the increasing need for higher-level education. Airmen, however, who obtain college degrees under the Airmen Education and Commissioning Program, may then qualify for OTS entry.

nical school, they will be assigned to jobs in respective career fields with Air Force operational units.

Officer Training School

Lackland AFB also is the home of the Officer Training School which last year added 5,400 college graduates to the Air Force commissioned officer ranks.

Activated in November 1959, OTS provides an inten-

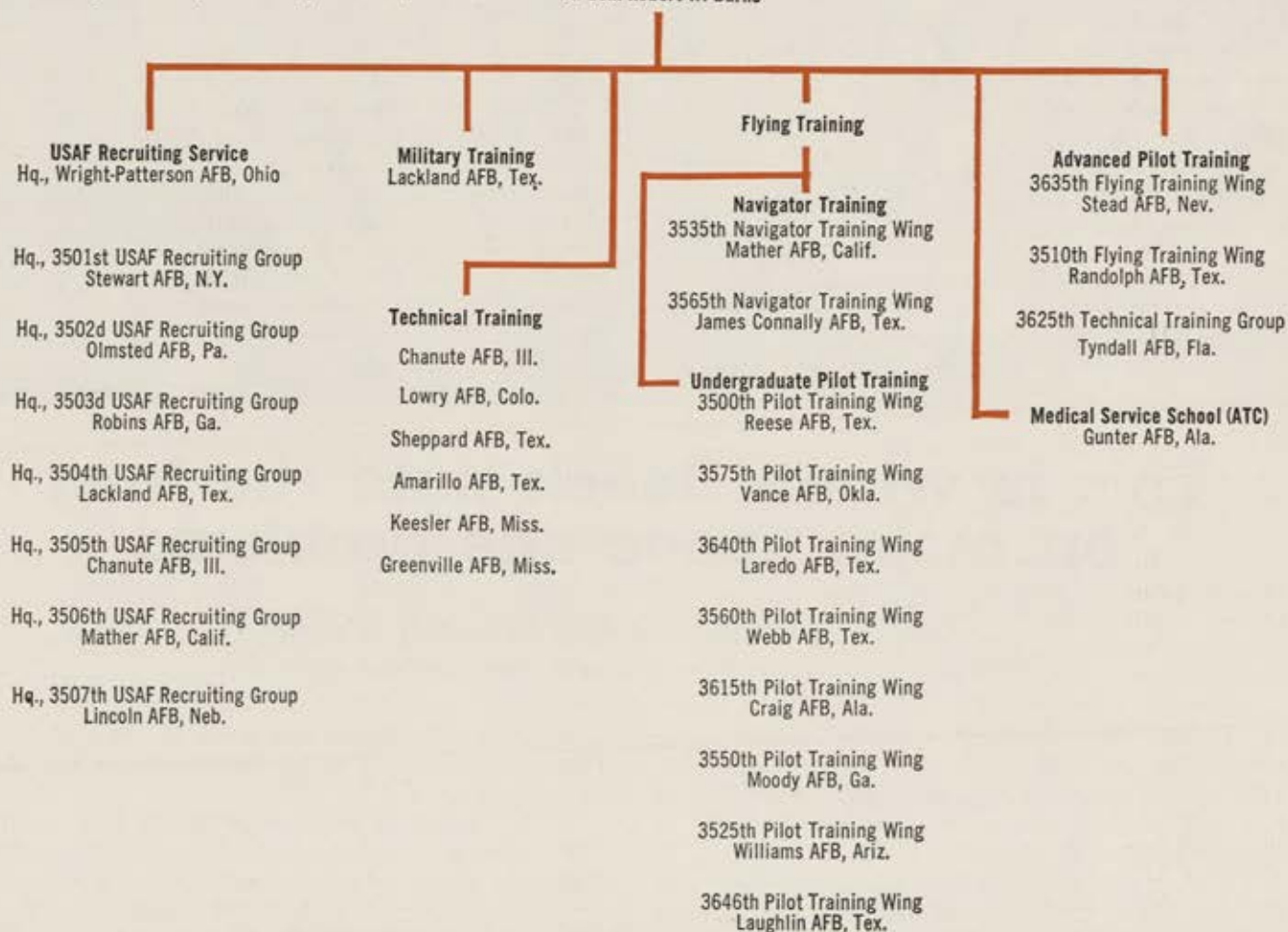
Technical Training

Primary and advanced technical training in nonrated specialties again last year was conducted at six ATC technical training bases. More than 100,000 specialists
(Continued on page 146)

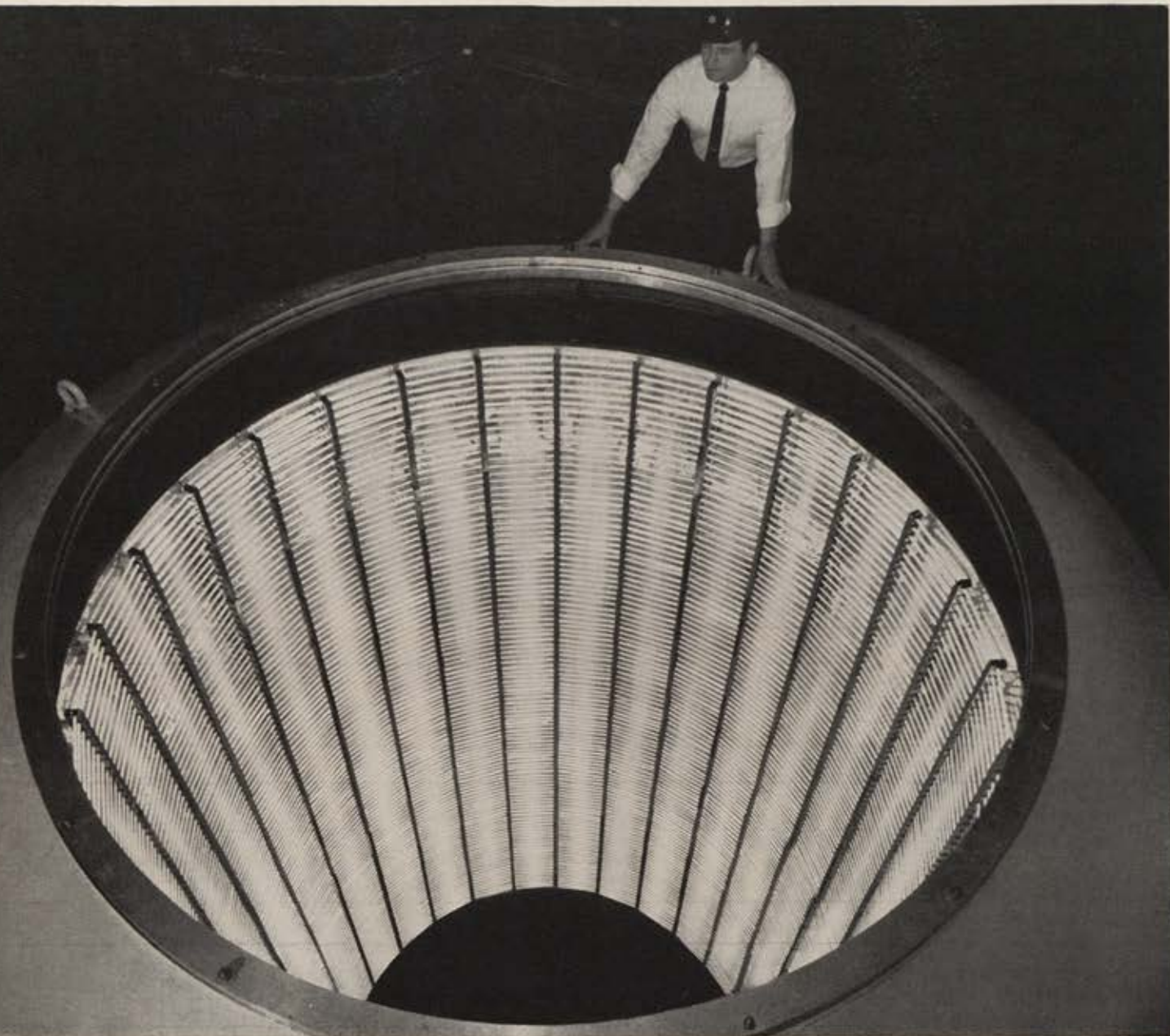
AIR TRAINING COMMAND

Headquarters, Randolph AFB, Tex.

Commander
Lt. Gen. Robert W. Burns



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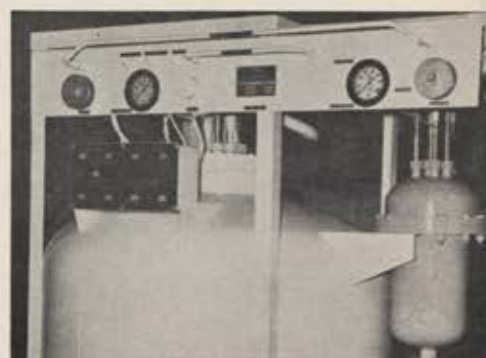
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were graduated in 2,000 courses at these bases. In addition, 200,000 completed technical courses conducted by ATC mobile and field training units at bases throughout the free world.

Technical training bases and some of their courses were:

- **Amarillo AFB, Tex.**—Jet mechanics; airframe repair; guided missile systems; Dyna-Soar (X-20); metalworking; utilities and supply.
- **Chanute AFB, Ill.**—Weather observer; advanced aircraft mechanic specialists; Minuteman, Bomarc, Hound Dog missile training; motorized equipment.
- **Greenville AFB, Miss.**—Personnel administration and firefighting.
- **Keesler AFB, Miss.**—Electronics; air traffic control; missile guidance systems; radio and radar systems; communications operations.
- **Lowry AFB, Colo.**—Armament; photography; special weapons maintenance; Mace, Matador, and guided-air-rocket (GAR) training.
- **Sheppard AFB, Tex.**—Intelligence; conventional-type aircraft mechanic; helicopter mechanic; data processing; transportation; Atlas, Titan (including Titan III), Thor missile training.

Average monthly student load at the six bases last year totaled more than 35,000.

Medical Service School

ATC's Medical Service School, a tenant at Gunter AFB, Ala., graduated 7,000 Air Force personnel from one or more of its thirty-seven advanced medical training courses last year.

The school provides advanced medical training and USAF orientation instruction for physicians, veterinarians, dentists, nurses, medical technicians, and other professional specialists coming into the Air Force, and for apprentice-level airmen ready for advanced training.

Most of the school's graduates are assigned to AF hospitals and dispensaries. Others go on to advanced or specialized training in other commands.

Of the thirty-seven courses, twenty-five were in airman career fields, such as medical technicians and laboratory specialists.

Flying Training

ATC's Undergraduate Pilot Training Program (UPT) in August 1962 graduated its first regular class of student pilots trained in the new T-38 Talon at Webb AFB, Tex. The Talon, first supersonic trainer assigned to ATC, was phased into the UPT program last year at two other ATC flying training bases—Williams AFB, Ariz., and Reese AFB, Tex.

The T-38 will replace the T-33 at ATC's five other UPT bases as the supersonic twin-jet aircraft become available. The T-37 will continue as the primary trainer. UPT bases, in addition to Webb, Williams, and Reese, are Laredo and Laughlin AFBs, Tex.; Craig AFB, Ala.; Moody AFB, Ga.; and Vance AFB, Okla.

These eight UPT bases last year produced 1,300

pilot graduates in the all-jet ATC student-training program for Air Force personnel.

Undergraduate Navigator Training was conducted at James Connally AFB, Tex., and Advanced Navigator Training at Mather AFB, Calif. Twelve hundred student navigators were graduated.

At Stead AFB, Nev., students were trained in the H-19, H-21, and H-43B helicopters. Survival and counterinsurgency training also were provided at this base.

In addition to being the home of ATC headquarters, Randolph AFB, Tex., specializes in instructor training, its pilot instructor courses using T-33, T-38, and T-39 aircraft, and its Instrument Pilot Instructor School (IPIS) using T-38 and T-39 aircraft. Graduates of the pilot instructor courses were assigned as instructor pilots within ATC while IPIS graduates returned to home bases throughout the Air Force as instrument instructors or supervisors.

ATC last year recorded the lowest major aircraft accident rate in its history when the command achieved a rate of 3.6 per 100,000 flying hours. Most of the flying time was by student pilots.

ATC received the annual Daedalian Flying Safety Award for its flying safety record.

Other Activities

Constantly searching for new training techniques, methods, and procedures, ATC last year established a new staff agency within headquarters. Function of this agency, known as Training Development and staffed by educational and training experts, is to investigate and evaluate new training methods, devices, and technologies. It is interested especially in more efficient and economical training.

Programmed instruction preliminary tests conducted by ATC last year indicated that this new teaching method is capable of providing faster and more efficient learning for ATC students in courses used in the test program.

Meanwhile, a program was initiated at Laughlin AFB to test efficiency and economy of a reduced flying-training schedule for student pilots. If test results are approved, the UPT program may be revamped to save training time and money.

ATC was named as one of two major Air Force commands to conduct preliminary tests of the Air Force Mechanized Personnel System. The system was designed to provide managers at all levels with more accurate and timely information through use of electronic data processing. First phase of the system, Personnel Data System Officer, was being tested by ATC at Lowry AFB and Randolph AFB.

Concurrency training in such new weapon systems as the Titan III, TFX, and F-4C was under way. In the concurrency concept, Air Force personnel training begins at the industrial plants before new systems become operational. In this manner, trained crews are on hand when the new system does become operational.

In its over-all mission to select and "Prepare the Man" for an effective aerospace force, ATC was alert to technological changes.—END



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Strategically located at the top of the world, the Alaskan Air Command stands guard at the major aerial gateway to the North American continent . . .

ALASKAN AIR COMMAND



Maj. Gen. James C. Jensen, who succeeded Maj. Gen. Wendell W. Bowman as AAC Commander in August, has had extensive experience in hemisphere air defense since he became Chief, USAF Central Coordinating Staff-Canada, in Ottawa in 1954. In 1959 he assumed command of NORAD's 30th Air Division at Truax Field, Wis., moving to Hq. ADC as DCS/Operations in 1961.

GUARDING a major aerial gateway to the North American continent and the state of Alaska, which is one-fifth as large as the continental US, against possible enemy air attack is the major mission of the Alaskan Air Command (AAC). The air component of the unified Alaskan Command (ALCOM), and the Alaska Region of the North American Air Defense Command (NORAD) commanded by Maj. Gen. James C. Jensen, USAF, AAC protects the nation's largest and fastest-growing state, strategically located at the air crossroads of the world and only minutes by jet from the Siberian coast of the Soviet Union.

AAC does the job with a weapon system comprised of F-102 and F-106 fighter-interceptor aircraft, a network of aircraft-control-and-warning sites scattered from the fog-bound Aleutian Chain to the Arctic coastline and dotting the jagged mountain peaks and tundra of the vast interior, and support personnel operating hardware and facilities at Alaskan air bases and stations.

Maintained at "tiptoe" readiness, round the clock, AAC forces, under the operational control of the NORAD Combat Operations Center at Colorado Springs, Colo., provide a formidable defense shield against any enemy air invasion via Alaska.

One of the smallest major air commands, AAC is charged with a fourfold responsibility:

- Providing early warning of attack on the United States and Canada.
- Providing air defense of Alaska.
- Supporting Strategic Air Command (SAC) forces in Alaska.
- Supporting special projects assigned by ALCOM and the United States Air Force Chief of Staff.

From his headquarters at Elmendorf AFB, near Anchorage, the Commander of AAC directs Air Force activities in a single state. But, the distance across that state from east to west is equivalent to the dis-

tance from Savannah, Ga., to San Diego, Calif., and north to south from the Canadian Border to the Mexican Border.

The potential enemy of the Air Force in Alaska is not only the Soviet Union, separated by only a few miles from the Alaska mainland area at the Bering Straits, but also the deadly Arctic wilderness and weather.

The year ending July 1, 1963, may well be marked as the most significant in the eighteen-year history of the 15,000-man aerospace force. During the period, the command not only performed its vital aerospace mission of providing "Top Cover for America," but also implemented management improvement programs that provided a streamlined, closer-knit command of improved effectiveness.

Highlights of Alaskan Air Command activities in the year July 1, 1962, to June 30, 1963, include:

- The hypersensitive Cuban crisis in October brought the entire command to bristling increased readiness.
- AAC transferred control of the oldest Air Force hospital in Alaska, the 5060th USAF Hospital at Fort Wainwright (formerly Ladd AFB), to the US Army July 1. Air Force medical specialization in Alaska then shifted completely to the largest hospital in the state—the USAF Hospital Elmendorf opened in 1955.
- AAC was awarded top honors, along with two other commands, for significant savings in materiel costs under the USAF Project Money Tree.
- The Alaska Communications Region (ACR), operationally controlled by AAC, completed the take-over of all communications facilities in Alaska by assimilation of the Alaska Communications System (ACS) from US Army control July 1. ACS was founded more than sixty-two years ago and provides telephone-telegraph communications for the state's civilian and military population—including direct distance dialing telephone service for the military.

- During November, AAC supported a joint military effort to resupply fuel oil to an American scientific expedition on the ice island, Arlis II, then located a few hundred miles from the North Pole. More than 150,000 pounds of fuel was airdropped on Arlis by MATS C-124s operating out of Elmendorf on eighteen-hour round-trip missions.

- Operation Santa Claus, the annual AAC community relations program to provide Christmas for 1,250 Eskimo children living near ten of the command's AC&W sites, was conducted during December. The toys and gifts are donations of AAC personnel and their families. They are airlifted to the sites on "Top of the World Airlift" support missions of AAC's 5017th Air Transport Squadron based at Elmendorf.

- AAC aircraft and personnel conducted dozens of successful rescues last year. Typical were two spectacular rescue missions successfully carried out in January. The first was the rescue of two Eskimo seal hunters who had floated for seven days in the Bering Sea on a small chunk of broken pack ice. An AAC transport crew spotted the pair and two command helicopters working as a team snatched the pair from the ice after a daring midwinter flight over the Bering Sea. Later that month, in a two-hour period, a single AAC helicopter rescued seventy-nine Alaskan natives from their flooded village in southeastern Alaska and airlifted them to high ground when unseasonably warm temperatures caused a midwinter ice breakup in the area.

- There were several major exercises supported by AAC during the past year. The largest began late in January when AAC swung into support of the annual Alaskan Command winter exercise "Timber Line," which lasted until late February. Airlift, close air support, and reconnaissance aircraft and crews from across the United States as well as several thousand US and Canadian troops deployed through Elmendorf for the 8,500-man maneuver held in the Tanacross-Big Delta interior area of Alaska. AAC support efforts required round-the-clock activity in sub-zero temperatures to make the giant jet transport and powerful jet fighter missions a complete success.

- Operation Close Look, inaugurated by Maj. Gen.

Wendell W. Bowman, Commander, AAC, from August 1961 to August 1963, was a way of life in AAC during the past year. This and associated management-improvement programs implemented under General Bowman's leadership resulted in substantial improvement in AAC's capability to perform its assigned mission by providing a more streamlined, closer-knit command operating at substantially reduced costs.

Operating under a philosophy of centralized control of all major functional areas, Headquarters AAC staff agencies assumed direct control and functional management of the tactical air defense and primary support units of the command. This resulted in the following major changes of the organizational structure of AAC during the past year:

- Three of the command's remote aircraft control-and-warning sites and the 5070th Defense System Evaluation Squadron based at Elmendorf were phased out on July 1, 1963, without weakening the command's weapon system effectiveness.

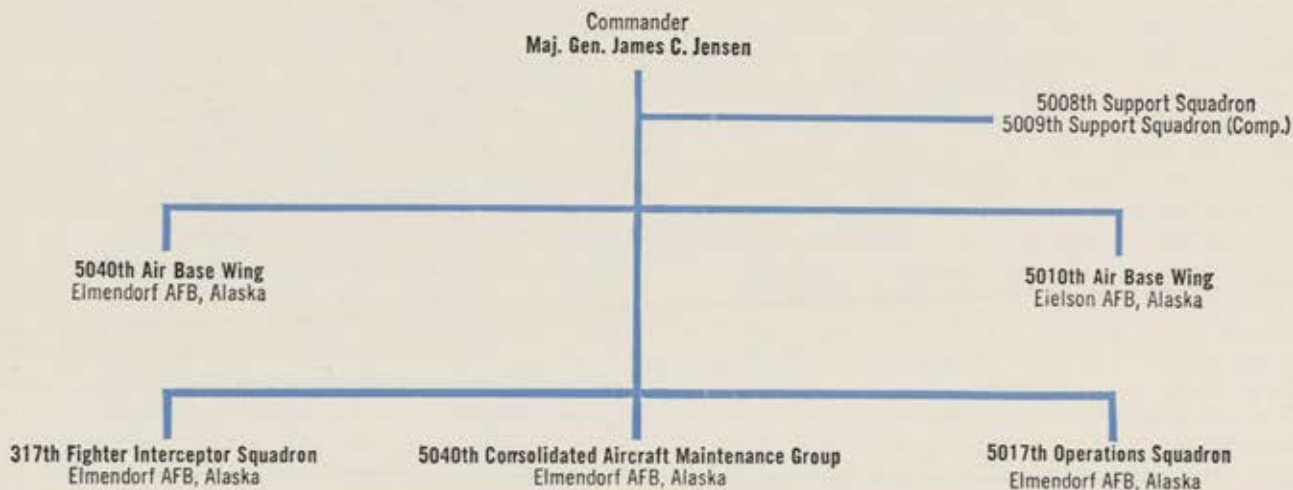
- All comptroller functions in AAC were consolidated under a plan identified as Project Compact. This consolidation resulted in improved efficiency and service—140 of the 462 comptroller manpower positions were eliminated and the command voluntarily reduced its operational and maintenance fund requirements by more than \$8 million last year. By extending data-processing services to all major functional areas, this consolidation provided increased flexibility and capability for the management of units scattered throughout Alaska. AAC personnel arriving PCS in Alaska during the past year received cash for all accrued pay, travel allowances, and family travel pay while their baggage was being unloaded from the plane. Similarly, an officer or airman returning from temporary duty can walk into the Elmendorf Finance Office and receive payment on his travel voucher in fifteen minutes or less. Both have been judged significant contributions to individual morale made possible by Project Compact.

- Personnel activities in AAC were also consolidated at AAC headquarters. This resulted in a similar savings and increased efficiency. The consolidated per-

(Continued on following page)

ALASKAN AIR COMMAND

Headquarters, Elmendorf AFB, Alaska





During Alaska's short summer, when AAC's remote sites can be reached by water, nonperishable supplies are rushed in. Perishable items and mail are flown in by bush pilots.



The helicopter is a particularly handy machine in arctic service. Last winter an AAC helicopter rescued seventy-nine natives from their flooded village.



New sentinel for Alaskan skies is the F-106 Delta Dart, Alaskan Air Command's new weapon now on indefinite tour at AAC bases.

ALASKAN AIR COMMAND

CONTINUED

sonnel units known as the 5007th Support Squadron (Personnel), perhaps the only one of its type in the Air Force.

- The automation of both the Eielson and Elmen-dorf base supply accounts and the creation of a single AAC supply squadron reporting directly to Headquarters AAC resulted in further savings of manpower and Air Force resources.

Throughout the past year, AAC has maintained the gargantuan resupply of more than seventy remote sites and installations located in Alaska. Each summer when the ice goes out Operation Mona Lisa is conducted by AAC. Massive stockpiles—usually a one-year supply—of nonperishable supplies ranging from bulldozers to razor blades are delivered by barge to the sites. The careful planning, supply requisitioning, and phasing of the delivery of these vital supplies by water transportation annually saves countless taxpayer dollars.

Highly perishable and critical supply items and mail are airlifted to the sites by commercial contract carriers and C-123 cargo planes which may well rank as the world's largest bush planes. This "Top of the World Airlift" unit, the 5017th Transport Squadron, enjoyed an enviable flying safety record during this past year despite the hazards endured by landing and taking off from rugged site strips and the hazardous Arctic winter weather.

Eielson AFB, near Fairbanks, AAC's other major installation in Alaska, continued to serve its vital role in the nation's defense. Not only did it serve as a base for F-102 fighters of AAC but also supported SAC operations in the Arctic. In July 1962, the SAC Reflex Action Force at Eielson was reorganized into a strategic wing with a permanent commander—the first in several years.

AAC units at Eielson also supported other vital air-defense and research-and-training activities of interior Alaska. The Alaskan Command Arctic Survival Training School operated throughout the winter months to

train military aircrew members to survive in the Arctic wilderness. The USAF Arctic Aeromedical Laboratory at nearby Fort Wainwright also works closely with the AAC-operated school.

Logistic support was provided by AAC to one of the main links in the North American Air Defense Command's aerospace defense system. The Alaskan Ballistic Missile Early Warning System site, located at Clear near Eielson, places Air Force units in Alaska clearly in the missile age.

Three significant announcements concerning AAC were made in the closing months of the past year.

- First, the Air Force announced in early June that Maj. Gen. James C. Jensen, DCS/Operations ADC since 1961, would assume command of AAC in mid-August. General Bowman becomes Deputy Commander of the Air Force's global communications command, AFCS, at Scott AFB on September 1.

- Beginning in October 1963, installation will begin of electronic equipment that will automate the surveillance/tactical reporting and display tasks of the manually controlled Alaskan NORAD region air-defense operations. This system does not include provision for, and will not change, current weapon control procedures. However, it will improve the command's ability to input, transmit, process, and display air-defense information. Through speed, capacity, and accuracy, the system will greatly improve the manual air-defense capability in Alaska.

- In mid-July, supersonic F-106 Delta Dart fighter interceptors were assigned indefinite duty at AAC bases. During their tour in Alaska—the period is indefinite—the Mach 2 fighters will substantially beef up Alaska's air defense.

Thus, through improved weapons, upgraded command-and-control systems, and strong management-improvement programs planned and implemented during the past year, AAC entered the current year with significantly improved capability to provide "Top Cover for America."—END

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A new name and challenging new responsibilities for what had been called the Caribbean Air Command as our commitments to Latin America continue to increase in importance . . .

UNITED STATES AIR FORCES SOUTHERN COMMAND



Maj. Gen. Robert A. Breitweiser, who succeeds Maj. Gen. Leland S. Stranathan as Commander of USAF Southern Command this month, flew with General Chennault's 14th Air Force in China in World War II. A 1938 West Point graduate, he has served in intelligence duties since 1955, for the past two years in the post of Assistant Chief of Staff, Intelligence, at Hq. USAF.

THE United States Air Forces Southern Command, with headquarters at Albrook AFB, Canal Zone, is the representative of the USAF for operations within Latin America. On July 8 this became the new designation for what had formerly been called the Caribbean Air Command.

The command's area of responsibility includes the land masses of Central and South America and—for certain logistic and training activities—Mexico and the Antilles. As a major air command, it is charged primarily with the responsibilities for assisting and advising the air forces of Latin America so that they can achieve that degree of proficiency and self-sufficiency necessary for them to fulfill the missions assigned to them by their national governments and assist in the over-all defense of the hemisphere if necessary.

The primary mission objective of the command is realized through its operational control of the detachments of the USAF Mission system, which are located in sixteen of the twenty Latin American republics; its operation of the USAF School for Latin America at Albrook AFB; and its supervision of the Air Force phases of the Military Assistance Program within Latin America. Personnel of the USAF Missions work directly with their counterparts in the country air forces and have earned the respect and confidence of their hosts through the performance of their assigned duties. The civil and military needs of modern aviation within Latin America are so closely allied that the Missions often assist in developing commercial aviation, as well as military, and thus contribute directly to the economic development of the host country.

USAF Missions in Latin America, some dating back to 1940, are now active in Argentina, Bolivia, Chile, Colombia, Ecuador, El Salvador, Guatemala, Honduras, Nicaragua, Paraguay, Peru, Uruguay, and Venezuela. In Brazil, the USAF is represented by a section of the Joint Brazil-United States Military Commission.

The USAF School for Latin America at Albrook AFB, established in March 1943, provides instruction in technical specialties to officers and airmen of the Latin American air forces. The curriculum of approximately eighteen courses is based on the actual training needs of the air forces as determined by the Chiefs of the USAF Missions and the Training Office of USAFSOUTHCOM. The courses, modeled after those provided for USAF airmen by the Air Training Command but adapted to meet the specific requirements of the Latin Americans, are conducted by bilingual USAF instructors. Conscious of the unique opportunities resulting from having students representing twelve or more of the Latin American countries living and working together on a USAF base, the school has initiated off-duty programs designed to create an understanding of national differences and to strengthen attitudes of cooperation and hemispheric solidarity.

In addition to its role as a major air command, the USAFSOUTHCOM also serves as the air component of the unified US Southern Command. In that role, the command participates in joint training exercises to test its readiness posture for the defense of the Panama Canal and neighboring installations.

The command is also charged with the responsibility for operating the USAF Tropic Survival School at Albrook AFB, which provides jungle-and-water survival techniques for aircrew members who may be called upon to operate in areas of tropical rain forests and mountains where there are only a minimum of navigational aids and emergency fields. The sixteen US Astronauts underwent this training in June of this year.

The responsibility for the operation of an air-rescue service and evacuation capability covering Central and South America has also been vested in the command, resulting in more than 100 air rescue missions.

During the year, the command's greatest highlight
(Continued on following page)

was the expanding of its mission objectives to include the responsibility for providing air counter-insurgency training for the Latin American air forces. The assignment of Detachment #3 of the 1st Air Commando Wing permitted an extension of the command's civic action projects. The most significant of these was Project Pista, which was implemented in February 1963. This project concerned the construction of an airstrip in a village completely isolated, except by water, from the rest of the country. The airstrip was built by the villagers with hand equipment air-dropped by the Commandos and from instructions broadcast over a loud-speaker system mounted in the aircraft. Project Teacher was developed by the Commando Unit in conjunction with the Panamanian University Women's League. The league

secured volunteer teachers, doctors, dentists, and sanitation experts who were flown by the Commandos to isolated communities in need of such professional services. Both projects were indicative of the willingness of the people to help themselves if the leadership and technical advice were made available.

The more than twenty years of experience gained by the command in working closely with the Latin American air forces and the resulting knowledge of the political, economic, and social institutions of the host countries has given the USAF Southern Command a unique advantage in its new counterinsurgency role and its ability to support the Alliance for Progress. The continued development of mutual trust and confidence is the key for the continued success of the US policies in Latin America.—END

In the space age, aerospace power is no better than the brainpower behind it. Part of AU's mission is to teach USAF officers to out-think and outreason any potential enemy . . .

THE AIR UNIVERSITY



The career of Lt. Gen. Troup Miller, Jr., AU Commander since August 1961, is closely linked to Maxwell AFB. He headed the Air Corps Training Center there in 1941 and, after service in FEAF, became chief of AU's plans division in 1946. He returned as Vice Commander in 1960 after commanding USAFE's Northern AMA and the Arnold Engineering Development Center.

"STRENGTH Through Knowledge," Air University's newly adopted slogan, embodies the command's role as the professional education center of the United States Air Force. Under the command of Lt. Gen. Troup Miller, Jr., Air University adjusted its fiscal year 1963 educational programs to the rapid-fire technological advancements of the aerospace age.

Shortly after World War II ended, Air University was established to assume its role in the defense of the United States. Its purpose was then, as it is now, to ensure that our nation's aerospace power is adequately prepared and correctly employed in any eventuality.

From its modest beginning seventeen years ago, Air University has progressed into a model military educational institution where selected officers are taught to solve intricate problems, to think logically and decisively, to become leaders of the aerospace world

of tomorrow. Specifically, Air University prepares officers for command and staff duties, provides scientific and technical education, and administers the AFROTC program.

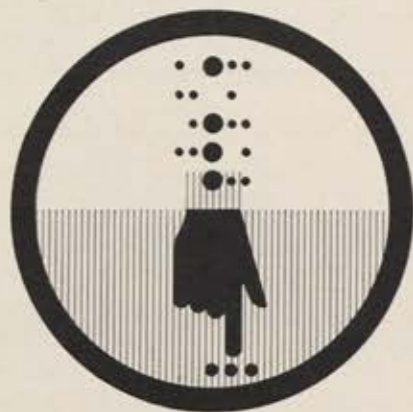
New programs and courses, expanded quotas, and revised curricula highlighted AU's 1963 fiscal year.

Most notable development in AFROTC was the evolution of a basic plan for a two-year AFROTC program to replace the current four-year program. The Secretary of Defense approved legislation to authorize the proposed two-year plan, and congressional hearings on it will take place in the near future. During FY '63, 104,000 Cadets participated in the AFROTC program at 186 units in colleges and universities throughout the nation.

The largest Air War College class in the history of the school (185 students) was graduated in early June.

(Continued on page 157)

for USAF's Pentagon Planners



a General Precision multicomputer aids U.S. Air Force decision making

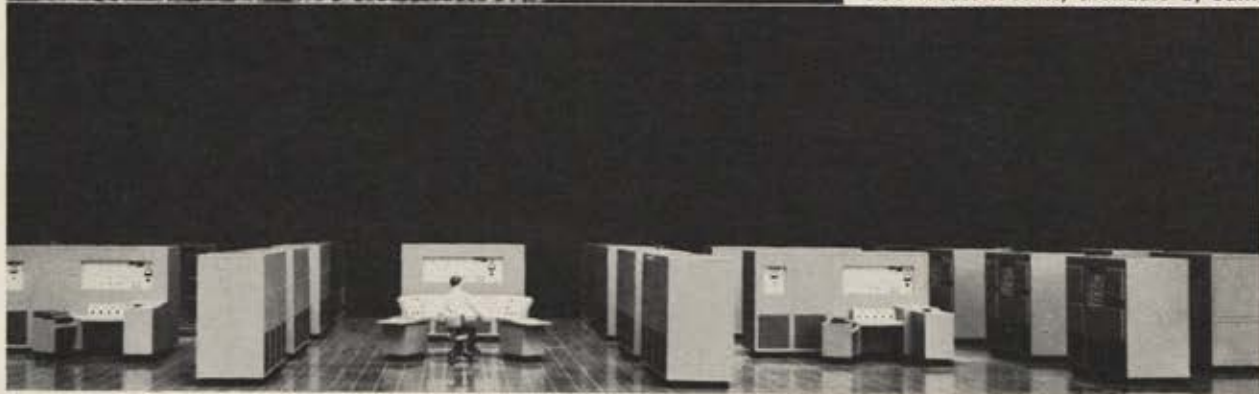


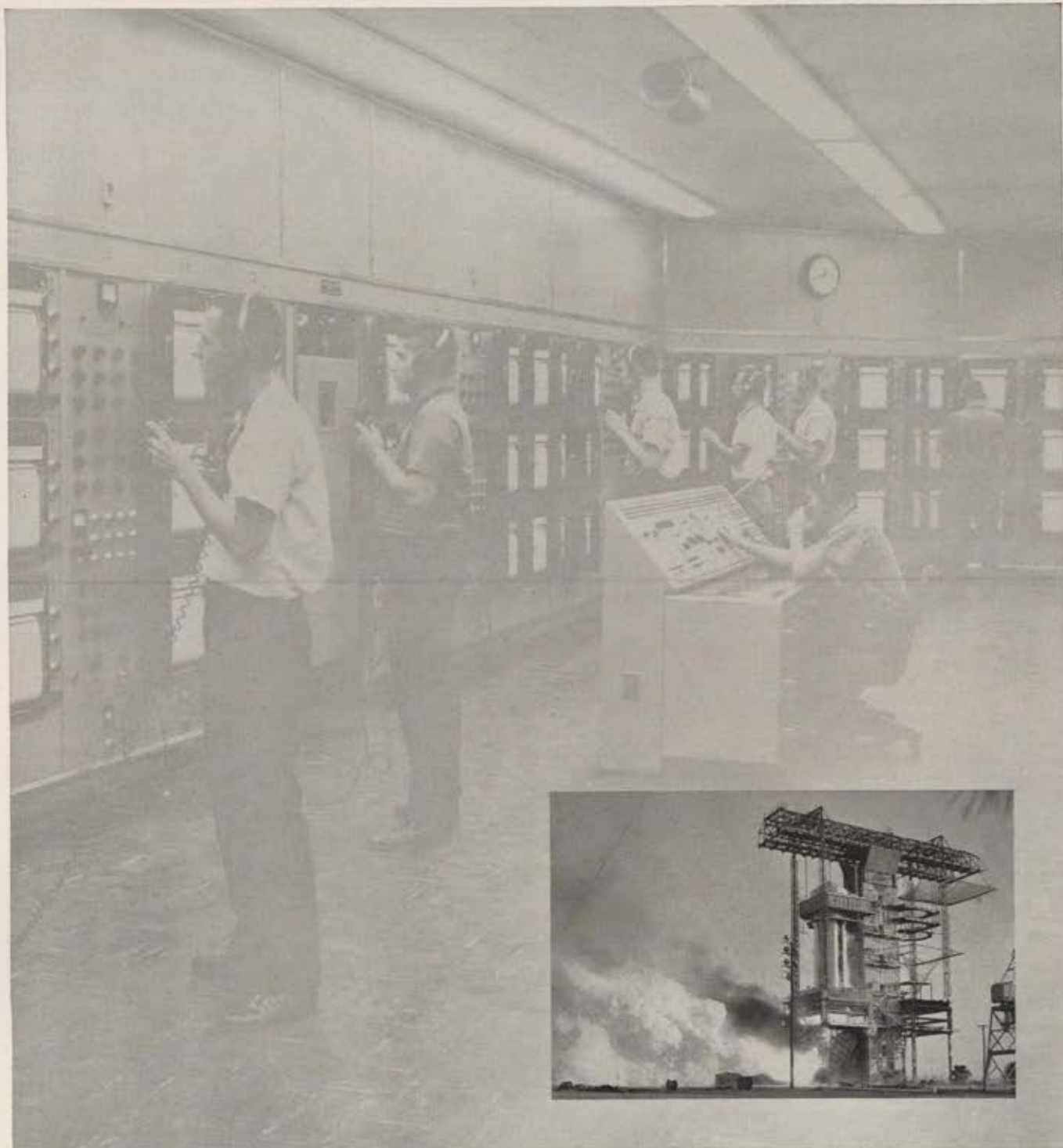
In the near future, a multiple computer system, built by General Precision's Information Systems Group (ISG), will support the decision power of U.S. Air Force operational resources management. To be installed in the Pentagon as a key element in the 473L Command and Control system of the Air Force, this large-scale, solid-state Librascope data-processing system includes a high-speed core main memory, a large random-access memory, and satellite data processors. A Librascope-conceived trunkline organization becomes the efficient input-output interface to data links, operator consoles, and panel displays. Modular design allows nearly unlimited expansion to accommodate future needs. General Precision serves the exponentially growing needs of government, industry, and the defense establishment.

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HUNTSVILLE, ALABAMA...SATURN I BOOSTER IS CAPTIVE-FIRED IN FINAL PREPARATION FOR LAUNCHING. EIGHT H-I ENGINES OF THE FIRST STAGE DEVELOP 1.5 MILLION POUNDS OF THRUST NEEDED TO TEST APOLLO SPACE CRAFT AS PART OF THE UNITED STATES MANNED LUNAR PROGRAM. BEHIND THE SCENES, VITRO SERVICES PROVIDES MAJOR TECHNICAL SUPPORT FOR NASA TEST DIVISION LOCATED AT THE GEORGE C. MARSHALL SPACE FLIGHT CENTER HERE.

Plans call for a quota of 275 for the class of 1964. Sixty seminars at selected bases in the United States and overseas offered senior officers an opportunity to obtain AWC diplomas through the Associate AWC Program.

Class 1962-63 of Air Command and Staff College began on September 4 with an enrollment of 600. Approximately twenty percent of the curriculum was reprogrammed with fewer lectures, seminars, and tests, and increased writing, speaking, reading, and research assignments. The class graduated in mid-June. AC&SC conducted a two-week Counterinsurgency Course for 250 senior officers and civilians in July. This was part of the President's program to have all services initiate special counterinsurgency studies.

Squadron Officer School graduated three classes (2,500 students). Each fourteen-week course consisted of a balance of Communicative Skills, Leadership, International Relations, Command and Staff Techniques, and Weapons Employment. This year SOS introduced a new subject, Unarmed Combative Measures, designed to build confidence from the practice of individual self-defense. The course complements the school's vigorous, competitive athletic program. The "whole-man" concept, initiated in 1951 at SOS and now spreading throughout the Air Force, continued to be the guiding policy for program development.

Some 2,100 students graduated from resident courses conducted by the Air Force Institute of Technology, and 1,300 graduated from civilian institutions under AFIT sponsorship. Three new graduate courses—Space Facilities, Space Physics, and Materials Engineering—began operation at the School of Engineering. And in December, ground breaking took place on the site of the new \$4 million building which will house AFIT's School of Engineering.

Students from all major ZI commands and officers from thirty free world nations participated in the

Academic Instructor and Allied Officer School's programs. Some 1,200 students completed the Academic Instructor Course during FY '63.

Graduates of the various courses offered by Warfare Systems School totaled 730. Responsibility for the conduct of counterinsurgency courses was delegated to WSS in early December. Two three-week courses were conducted during January-June, and two additional courses were scheduled for the last half of the year. Another new course, Space Fundamentals, was developed by WSS for senior officers.

Phenomenal growth continued in Extension Course Institute, the correspondence school of the Air Force. In 1950, ECI's curriculum consisted of sixteen courses, based on existing Army extension courses and administered to a handful of students. From this meager beginning, the curriculum has grown to 108 courses, predominantly in specialized career areas. Average enrollment during FY '63 was 360,000.

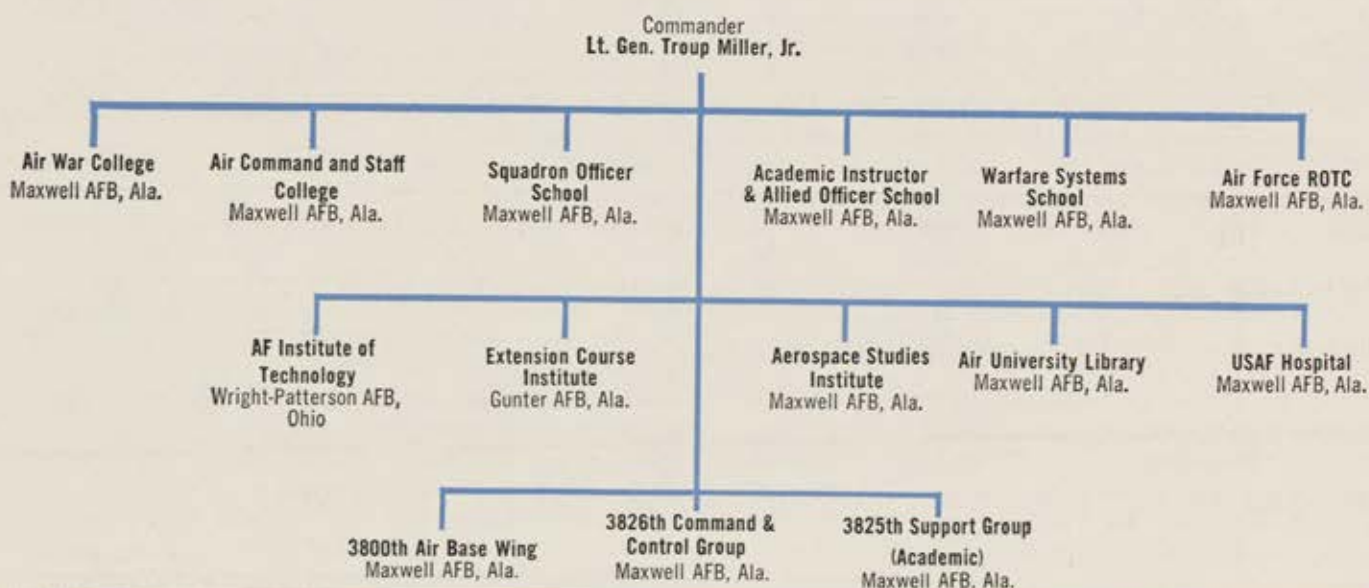
In keeping with the current emphasis on space, the research center of Air University acquired a new designation. Aerospace Studies Institute became the new name of the old Research Studies Institute.

At the beginning of the academic year, the George Washington University Center, Washington, D. C., expanded its scope to afford AC&SC students the opportunity to earn masters' or bachelors' degrees. Previously only AWC students and selected faculty members participated in this program. During FY '63, 246 AU officers, including one major general, qualified for masters' degrees. Four officers qualified for bachelors' degrees.

In this age of space venture and flight, aerospace power is known to be only as potent as the brainpower behind it. By teaching officers to outthink and outreason any potential enemy, Air University continues to contribute to the successful future of the United States Air Force.—END

AIR UNIVERSITY

Headquarters, Maxwell AFB, Ala.



The more than 14,000 Air Force Reservists called to active duty last fall for the Cuban crisis once again demonstrated the truth of CONAC's motto: "Ready Now" . . .

CONTINENTAL AIR COMMAND



Lt. Gen. Edward J. Timberlake, CONAC Commander since July 1962, led a bomb wing in Europe during World War II and commanded the Fifth Air Force in the early days of the Korean War. A 1931 graduate of West Point, where he played varsity football, he was Vice Commander, USAFE, and Deputy Chief of Staff, Personnel, Hq. USAF, before assuming his present post.

WITHIN the past year the Reserve Forces of the Continental Air Command have again proved their worth and demonstrated the truth of their motto, "Ready Now." At the time when Cuba was approaching the boiling point, more than a week before President Kennedy's proclamation on the crisis, eighty crews and aircraft participated in the initial movement of units, personnel, and equipment into the Florida staging area. This was accomplished by the Reservists on voluntary time. Additionally, only a few hours elapsed between the time the President spelled out the position of the United States regarding Soviet influence in Cuba and the moment CONAC's Reservists were on their mark.

More than 14,000 Air Force Reservists—in eight troop carrier wings, twenty-four troop carrier squadrons, and six aerial port squadrons—put aside their civilian tasks and clothes to assume duties as members of the United States Air Force. Even Reserve units that were not actually called to active duty by the presidential order reported to duty stations ready to do whatever was needed.

When the crisis had cooled after Russia agreed to withdraw her missiles, and the Reserve units had been released from active duty, military commanders reviewed the effectiveness of the Reservists and the part they played during this crucial period. The results they found brought praise from the President, the Secretary of Defense, the Secretary of the Air Force, Chief of Staff General LeMay, and the Commanders of SAC, TAC, and CONAC.

What kind of an organization is it that was—and is—Ready Now? CONAC, commanded by Lt. Gen. Edward J. Timberlake since July 1962, is made up of eight subordinate commands with a variety of missions. They are six Air Force Reserve Regions, the Air Reserve Records Center, and the Civil Air Patrol-USAFA.

Regions are the focal points for Reserve activities

within their geographical boundaries. Below the Regions are Reserve Flying Units and sixteen Air Force Reserve Sectors. Reserve Sectors are responsible for all nonflying units.

Management of Region and Sector headquarters is accomplished partly by Reservists and partly by Regular Air Force personnel. All other units subordinate to the Region and Sector headquarters are manned entirely by Reservists.

The Air Reserve Records Center, Denver, Colo., maintains master records on approximately one-third of a million Air Force Reservists and is responsible for all personnel actions affecting these records. The fifteen troop carrier wings and the five air rescue squadrons of CONAC perform the command's flying missions. They have not been restricted to "training flights." Many times these units have been called upon to perform such mercy missions as flying emergency medical equipment to remote places or airlifting badly needed school supplies to faraway places in Latin America. Joint military exercises have also seen the presence of the CONAC C-119 Flying Boxcars and the C-123 Providers.

Until as recently as July 1 of this year, Air Force Reserve units flying the huge C-124 Globemasters were assigned to the Tactical Air Command in the event of a recall to active duty. Now recent changes in plans have directed that these Reserve units and their Globemasters will be assigned to the Military Air Transport Service when or if they are ordered to active duty.

A comparatively new member of the Reserve family is the recovery unit. There are almost 300 of these units—groups and squadrons—throughout the country. Dispersal of our combat aircraft is probable in the event of hostilities, and to cope with this action is the task of the recovery units of CONAC. In the event of an aircraft-dispersal order, these units must be

(Continued on page 161)



Landing strip for a supersonic fighter

Powered by the Bristol Siddeley BS 100 vectored thrust engine, the Hawker P 1154 strike aircraft combines supersonic performance with vertical take-off and land ability. This aircraft is now being developed as a Hunter replacement for the Royal Air Force.

The choice of the BS 100 for the P 1154 follows closely on the success-

ful trials of another Bristol Siddeley powered V/STOL aircraft—the Hawker P 1127. The P 1127, powered by the Pegasus vectored thrust engine, has been flying for more than two years and was the world's first V/STOL strike aircraft. With more than seven years development experience in vectored thrust engines, Bristol Siddeley are world leaders in this field.

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If you know electronic data processing, you know the answer: UNIVAC.

The UNIVAC system referred to is called "ATHENA®." It was the first completely transistorized computer ever delivered—back in May 1957. And it has performed reliably ever since. In fact, no comparable device in our nation's space and missile projects can come close to equalling its performance record: reliability of ATHENA is 3500 hours between failures, nearly a half year of continuous operation.

UNIVAC's ATHENA has inserted Echo, Explorer, Tiros, OSO, Agena, Telstar, Relay and Syncom satellites into orbit from both Cape Canaveral and Vandenberg Air Force Base. Today there are UNIVAC ground guid-

ance systems at all Titan I missile sites. A special Air Force plaque honors UNIVAC for "outstanding efforts and significant contribution to the TITAN ICBM Program."

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ready to service the aircraft and provide for the air crewmen of these planes when they arrive at the locations manned by the personnel of the recovery units. They must be prepared to refuel and repair aircraft to make them ready for further operations if necessary. The units must also be prepared to handle fire, radiation, and aircraft damage when homecoming aircraft are unable to return to their own bases.

In addition, the Reserve has many support-type units, including mobile communications, medical, air terminal, and navigation squadrons among a variety of others.

A relatively little known, but often called upon, unit under the Continental Air Command is the Civil Air Patrol—CAP. Organized and manned by air-minded civilians, the CAP came into being in December 1941 to aid our efforts during World War II. It is a federally chartered, nonprofit organization and an auxiliary branch of the Air Force.

Comprised of more than 2,100 wings, groups, squadrons, and flights, the CAP's primary mission is to further the nation's air and space supremacy through long-range aerospace education and training, and to participate in nationwide search and rescue operations as needed. Composed of more than 76,000 members, the CAP also boasts an inventory of 4,000 light aircraft and 4,000 vehicles of various types. Their search and rescue missions are coordinated by the Air Rescue Service (MATS).

In summary, the primary responsibilities of CONAC are command, logistical, monetary, administrative, and personnel support of all Air Force Reserve units and individual trainees. Special missions include supervision and liaison responsibilities for the Civil Air Patrol, coordination of Air Force plans in domestic and civil emergencies, Air Force representation on Civil Defense Boards, Reserve recruiting for other



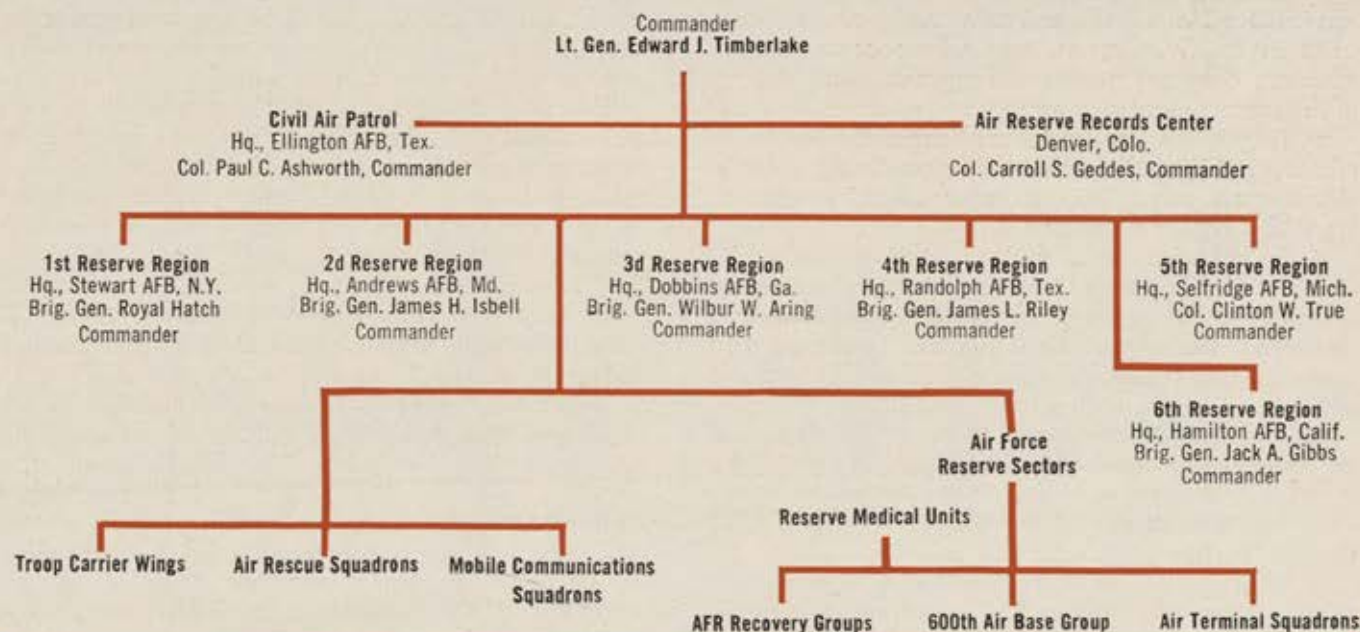
C-119 of the 94th Troop Carrier Wing undergoes major surgery last November while taking part in Sunshade I at Pope AFB, N.C. Eighteen of the unit's Flying Boxcars took part in the joint Air Force-Army training exercises, just one of the year's many activities for Reserve Forces.

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, supervision and implementation of the Air Force program of cooperation with the Boy Scouts of America, and certain added responsibilities delegated in USAF War Plans.

The readiness on which the Air Force Reserve prides itself is brought about only through the constant training of the individual Reservist. To accomplish this end, instruction facilities, both in the classroom and on the job, must constantly undergo revisions to maintain a level of efficiency comparable to the regular establishment. A continuing program of raising the job-skill proficiency of each Reserve airman and officer maintains Reserve units at their peak of "Ready Now."—END

CONTINENTAL AIR COMMAND

Headquarters, Robins AFB, Ga.





Maj. Gen. Brooke E. Allen, Commander of USAF's Headquarters Command since July 1959, logged the first bomber mission of World War II when he took off in a B-17 during the attack on Pearl Harbor, later participated in the Battle of Midway, and flew 350 combat hours in all. He commanded the 6th Allied Tactical Air Force in Turkey just prior to his present tour.

Providing logistic and administrative support and disbursing services for Hq. USAF and acting as housekeeper and host are among the many widely diversified missions of . . .

THE HEADQUARTERS COMMAND

HHEADQUARTERS Command, USAF, during the past year continued its mission of worldwide support. The primary mission is support of Headquarters, USAF, and its special activities and field extensions throughout the world. Command headquarters is at Bolling AFB, Washington, D. C., also the home of the command's 1100th Air Base Wing. Another wing, the 1001st Air Base Wing, operates nearby Andrews AFB, Md., one of the nation's busiest air bases. Flying activities on Bolling AFB—other than helicopters—ceased last year. The command's 1020th Special Activities Wing, formerly based at Fort Myer, Va., was relocated on Bolling. This agency supports the 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 and 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 the command 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 represents the USAF at public ceremonies within the area of the nation's capital. Headquarters Command also operates the USAF Bandsmen's School in support of the Air Force music program. In addition, the command provides direct support to the USAF Band and its components: the USAF Symphony Orchestra, the USAF Drum and Bugle Corps, "The Airmen of Note," "The Strolling Strings," "The Singing Sergeants," and the USAF Bagpipe Band.

- To act as "housekeeper" for airmen on duty within the area of Washington, D.C., and provide housing and dining and other facilities.

One of the major events of the year was the expansion of the 1100th Air Base Wing at Bolling AFB to include the activities formerly accomplished by the 1020th USAF Special Activities Wing.

In addition to providing Comptroller Support for Headquarters Command and its units, the 1100th Support Group at Bolling furnishes accounting and finance support to Hq. USAF and all other Air Force units in the Washington area.

The command continued its pioneering work with retired USAF personnel. In addition to its Quarterly Retired Officers Luncheons, Headquarters Command began an experimental Occupational Counselling Program less than four months after the Air Force Association and the Department of Labor initiated a conference on the subject in December of last year.

Andrews AFB is the home base for President Kennedy's aircraft and the aerial port of arrival and departure for other distinguished foreign and US dignitaries who visit our nation's capital.

The total flying hours for the command in 1962 were 118,045. Headquarters Command's flying safety rate for the same period was 1.7 accidents. During 1962, Andrews AFB's total flight operations exceeded 213,000. For the second consecutive year, Bolling AFB won the National Safety Council's "Award of Honor" for its ground safety record.

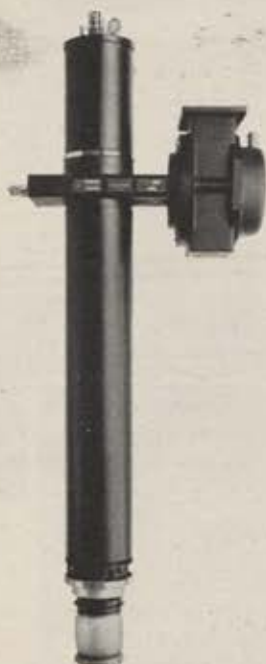
As usual, Andrews AFB was again the scene of "Kid's Day" and Armed Forces Day. Both events had record attendance.

Maj. Gen. Brooke E. Allen is Commander, Headquarters Command, USAF, and his subordinates this year were Brig. Gen. Clair L. Wood, Commander at Andrews AFB; Col. Wilson R. Wood, Commander at Bolling AFB (who was replaced by Col. Frank E. Marek on July 29); Col. Richard D. Vitek, Commander of the 1100th Support Group; and Brig. Gen. Archie A. Hoffman, Commander of the USAF Hospital at Andrews AFB.—END

LITTON ELECTRON TUBES

SHORT, SHORT SUMMARY OF LITTON ELECTRON TUBES,
DISPLAY DEVICES, ACCESSORY EQUIPMENT

1 meter to 4 millimeters milliwatts to megawatts



AMPLIFIER KLYSTRONS

Peak powers to 30 Mw. Frequency coverage in P, L, and S bands. Litton specialties are broadband, both fixed and tunable, and hollow-beam tubes. Inquire about our CW types.



TRAVELING WAVE TUBES Lightweight, compact, reliable TWT's for P, S, C, and X band applications. Powers from 20 mW to 10 kw. Small signal gains from 33 to 70 db. Includes CW and pulse models. Most are PPM focused.



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MAGNETRONS CW and pulse types, cube miniatures and super powers. P to Ku band. Peak powers to 2 Mw. CW powers to 500 W. White noise BARRATRON® types also available.



M-BWO's Compact, voltage-tunable CW oscillators for L, S, C, and X bands. Minimum powers from 150 W at higher frequencies to 200 W at 1000 Mc.

CROSSED FIELD FORWARD WAVE AMPLIFIERS • ELECTROSTATICALLY FOCUSED KLYSTRONS • LASERS Litton has made significant advances in these new devices. Some models are now available.

SWITCH TUBES INJECTRON® high-power beam switching types with 95% efficiency. Fast rise times and low control power. DC collector capabilities to 350 kV at 30 A. Floating deck modulator versions in production.

ACCESSORY EQUIPMENT

Microwave power sources operating from 350 mc to 10,475 mc and in the 12-mm to 4-mm regions use Magnetrons, M-BWO's, and Floating Drift Tube Klystrons. Peak powers to 2000 W, depending on frequency. Litton also offers TWT amplifiers, millimeter wave power supplies, focus coil supplies, water loads, and other tube accessories.



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levels, giving multi-level capability. All openings are sealed against dust. Air suspension holds shock factors to less than 3 "G's". Other highly specialized types of equipment are available as needed. In combination with reliable Diesel-powered tractor units in the hands of skilled, experienced, highly trained and security-cleared drivers, all this adds up to safety, reliability and speed in transit.

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Maj. Gen. Robert H. Warren, Superintendent of the US Air Force Academy since July 1962, was graduated from West Point in 1940, commanded a B-24 group in Europe in 1944-45, and was FEAF Director of Operations during the Korean War. Later he served in high-level Pentagon executive posts, and commanded the Air Proving Ground Center before moving to the Academy.

The Air Force Academy is charged with providing instruction, experience, and motivation so that each Cadet will graduate with the leadership qualities essential to today's Air Force . . .

UNITED STATES AIR FORCE ACADEMY

THE mission of the United States Air Force Academy is to provide 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.

On April 1, 1954, President Eisenhower signed the Act creating the Air Force Academy. On July 11, 1955, the Academy swore in its first class of Cadets at its temporary location at Lowry AFB, Colo. In the latter part of August 1958, the Academy moved to its permanent home—a 17,900-acre site on the east slope of the Rampart Range, eight miles north of Colorado Springs, Colo.

Maj. Gen. Robert H. Warren, the Superintendent, and his faculty and staff are responsible for the academic, military training, physical, and spiritual development of the 2,500 Cadets forming the Cadet Wing.

The required four-year program of instruction totals 187½ semester hours of credit and covers three broad areas—academics, military training, and physical education.

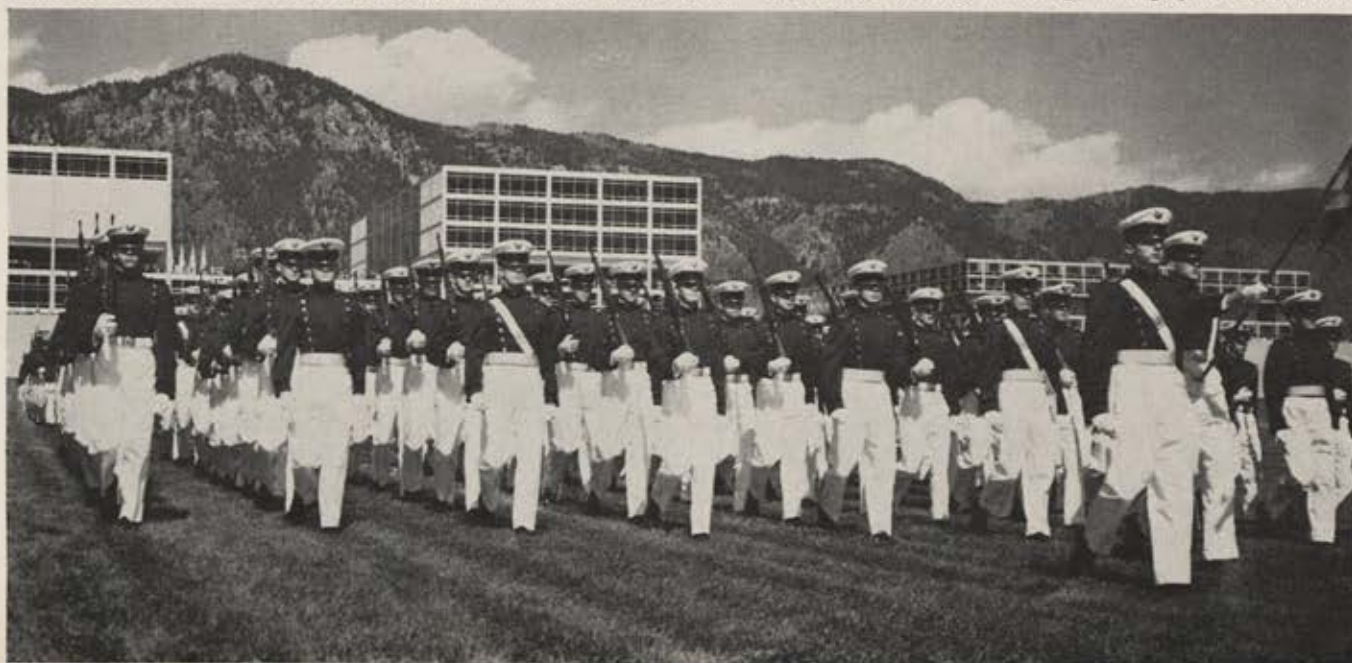
The prescribed academic curriculum under the Dean of the Faculty is neither engineering nor liberal arts but has many elements of each. An even balance is maintained between the sciences and humanities-social sciences.

There are two training programs under the Commandant of Cadets, a program of practical leadership experience and a program of classroom and field study.

The objective of the rigorous physical-fitness program under the Director of Athletics is to develop a Cadet's physical strength, endurance, and coordination.

Gifted Cadets and those with prior college credit
(Continued on following page)

Cadets march proudly in squadron formation during a formal review on the Air Force Academy's parade grounds. In the background are mountains of the Rampart Range of the Rockies. The Cadet Wing at the Academy now totals 2,500 men. Academy's intensive four-year program covers three broad areas—academics, military training, and physical education.





Statue of eagle and fledglings reminds Cadets that "Man's Flight Through Life Is Sustained by the Power of His Knowledge."



Change of command ceremony takes place at graduation parade. Outgoing Cadet Wing Commander turns over sabre to successor.



President Kennedy addressed the Academy's fifth annual commencement in June, presented diplomas to the top 25 graduates.



Secretary of State Dean Rusk addressed Assembly in April. He is shown with Academy Superintendent Warren, right, and ADC Commander, Lt. Gen. Robert M. Lee.

AIR FORCE ACADEMY

CONTINUED

may participate in the Curriculum Enrichment Program. Under this program, they broaden their knowledge and may major in a particular area or areas by transferring college courses previously taken, validating courses in which they already have a skill, by taking prescribed courses at an accelerated rate, or by taking overload courses above the prescribed semester-hour load. The program is designed to challenge the Cadets to advance as fast and as far as their individual abilities permit.

During the past year the Academy continued to maintain its high standards of excellence. In the Graduate Record Area Examinations the scores achieved by the Class of 1963 were superior to any of the previous classes. These tests, which were administered to the graduating classes of 230 schools, clearly demonstrated the high quality of the Academy product. The Academy seniors ranked second in Natural Sciences, first in Social Sciences, and third in Humanities. The number-one Cadet in the graduation order of merit, Sam W. Westbrook, III, was named a Rhodes Scholar. In the fall of 1962, the Academy was granted accreditation by the Engineer's Council for Professional Development, making the Air Force Academy the first of all the various service academies to receive such recognition.

During its 1962-63 intercollegiate athletic season, the Air Force Academy, competing in fifteen different sports, won 112 of its 174 meets. Most impressive was the fencing team which went undefeated for the third consecutive year and placed a high third in the NCAA Fencing Tournament. This tournament marked the first time the Academy had ever been the site of a NCAA meet and also provided the Falcons with two of the seven "All-American" titles earned during the year.

On June 5, 1963, President John F. Kennedy delivered the Commencement Address. Of the 499 graduates, 371 went into pilot training, fourteen entered navigation training, thirty-nine took technical training, and nineteen entered the AFIT Regular Graduate Program. Twenty-nine graduates entered a special seven-months' Master's Degree Program, fourteen majoring in Astronautics and fifteen in International Relations. Ten graduates received special scholarships: one was a Rhodes Scholar, five received National Science Foundation scholarships, three Fulbright scholarships, and one a Woodrow Wilson fellowship. One graduate was given a direct-duty assignment to research and development, one graduate was to go to law school under the Judge Advocate General Program, and five were to go to medical school under the Surgeon General Program. Nine graduates were appointed to other services: five to the Marine Corps, three to the Navy, and one to the Army. One graduate was disqualified for commission because of medical reasons.

The Cadet Chapel is to be completed in the summer of 1963 and dedicated in the fall. The 40,000-seat stadium, built with funds raised from public subscriptions, was dedicated with impressive ceremonies in October 1962. The Colorado Astronautical Research Laboratory, established in October 1962 as a detachment of the Office of Aerospace Research, was renamed the Frank J. Seiler Research Laboratory.

To aid top management in improving the quality and effectiveness of the Academy's mission, General Warren initiated Operation Bottom Dollar in August 1962. This program is a command version of the Air Force-wide operation "Money Tree." It has three objectives: cost reduction, dollar conservation, and management improvement.—END

LEAR SIEGLER INSTRUMENT DIVISION

Leader in Control-Display

Company Wins "Whole Panel" Design Contract

X-15 Pilots "Fly" Aerospace Panel

Lear Explores Possibilities For Tomorrow's Cockpit

Inst. Divn Will Supply Central Control Display For Gemini Spacecraft

AF and Lear Detail Crew Station Design Method

AF Flight-Tests New Cockpit Display Using Lear Indicators, References

AF Commissions 3-Year Study I-D To Design Control-Display For Manned Vehicles Of Future

Two More Displays On Gemini Vehicle

Lear To Design Space Vehicle Crew Capsule

Engineers Turn Knowledge To Critical Re-Entry Problem

Advanced Engineering Staff Assures Continued Technological Advances

Lear Selected For ASW Team

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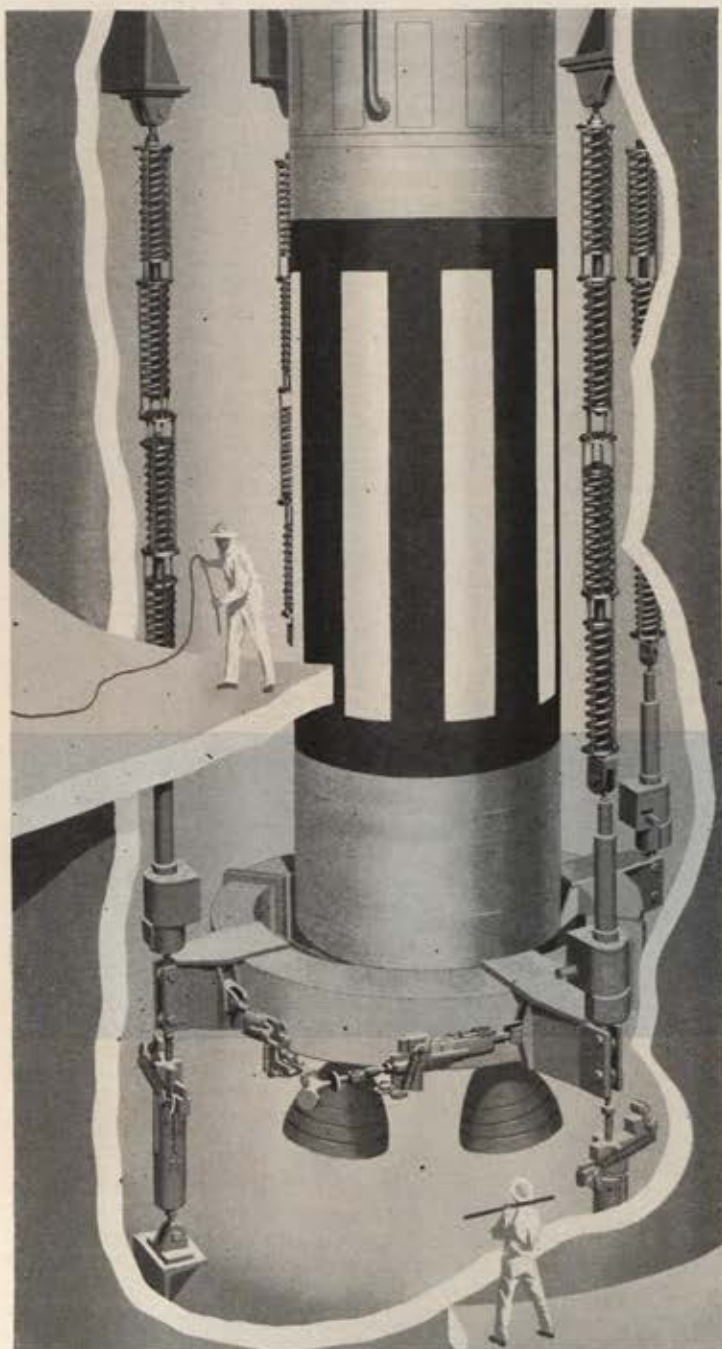
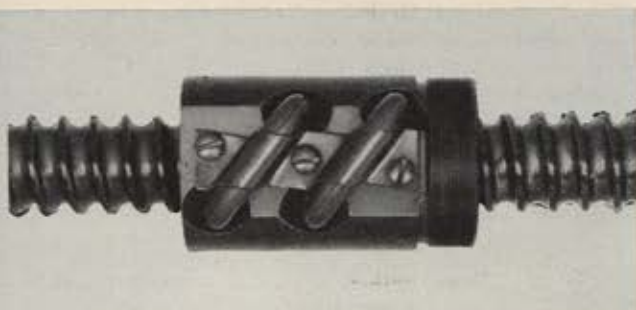


ILLUSTRATION COURTESY OF PRECISION PRODUCTS DIV., WESTERN GEAR CORPORATION

A level bed for Titan II's Beautyrest

While Titan II silos are *hard sites*, each missile is cradled by sixteen giant springs. This system isolates and protects the Titan from ground shock waves following a nuclear *near miss*. As soon as the earth stops its "crazy waltz", four Saginaw Ball Bearing Screws level the war-ready missile and its firing ring. Next — blast off!

The contracts for the Titan Silo Shock Isolation System were awarded to Korfund Dynamics Corporation, Westbury, Long Island — who designed the original shock isolation system — and Precision Products Division, Western Gear Corporation, Lynwood, Calif. Both of these contractors chose Saginaw b/b screws for the equalizing jack assemblies.



The b/b screws used are standard catalog items. They have an efficiency of more than 90% which allows the use of smaller drive motors. Since the system is electro-mechanical, stepless control over the entire length of the screw stroke is achieved without complex metering or control valves.

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Keeping the Air Force's books balanced is a full-time job for the Finance Center, a separate operating agency with 1,314,962 customers in ninety-nine countries or US possessions . . .

AIR FORCE ACCOUNTING AND FINANCE CENTER



Brig. Gen. Thomas P. Corwin was named Commander of Air Force Accounting and Finance Center in March after a year as Vice Commander under Maj. Gen. Paul W. Scheidecker. An ROTC graduate of the University of Maryland, General Corwin has devoted his career to the comptroller field, was Comptroller and Assistant Vice Commander AFSC, before going to AFAFC.

THE AIR Force Accounting and Finance Center at Denver, Colo., is the headquarters for the worldwide USAF fiscal network.

It is primarily a service organization—one whose technical supervision of accounting and finance matters supports the global nature of aerospace power that the United States Air Force represents today.

In carrying out its responsibility for technical supervision of the Air Force Accounting and Finance network, the Center's primary goal is to furnish Headquarters USAF with valid and timely data on dollar obligations and expenditures. Supporting the network, the Center furnishes technical advice and guidance; interprets legislation, regulations, and policies; and motivates compliance by furnishing specific interpretations and clarifications for the progressive resolution of specific operating problems.

Through their major air commanders, field accounting and finance offices report to the Center. It is here that the myriad accounting figures are assembled to give a meaningful report of the financial status of the Air Force—so that important decisions can be made by the Air Staff to cope with the rapidly changing Air Force requirements throughout the world.

The Center's work is a volume one—a constant challenge to administrative management.

Over-all, the Center serves 1,314,962 customers in ninety-nine countries and US possessions. AFAFC's centralized activities include issuing 440,000 checks to more than a million allotment and retired-pay customers; issuing 109,000 savings bonds monthly and another 160,000 bonds quarterly. Some 6,400 reports are processed monthly—producing more than 300 accounting and management reports. These are dispatched each month—183 to Hq. USAF, sixty-four DoD, thirty-four Treasury, ten major commands, eight Bureau of the Budget, and thirty-four other.

Annually, 1.9 million pay records are received, 501,000 of which are examined in detail. From these

pay records, Federal Insurance Contribution Act payments of \$138 million, and federal income withholding tax of \$257 million is computed and paid directly to Social Security Administration and the Internal Revenue Service.

To support this production effort, 1,839 employees—fifty officers, forty-six airmen, and 1,743 federal civil service workers—are employed at the Center. Annual salaries amount to \$12.5 million—\$.8 million to Air Force members and \$11.7 million civilian pay.

The Center made important cost savings during FY '63. Conversion to data processing resulted in equipment savings of \$150,000 and a manpower reduction of forty-nine spaces.

The Center had a key role recommending legislation authorizing accounting and finance officers to issue a single check in favor of banking institutions for deposit to the accounts of individual AF members and civilians. Dollar saving is estimated at \$207,000.

Looking forward to FY '64, the Center will be concerned with these major objectives:

1. Development of the Air Force-wide accrued military pay system.
2. Improved support of the total Air Force mission through responsive financial management data reporting.
3. Provide top service to the worldwide accounting and finance network through constant analysis and refinement, systems improvement, and modernization.

In summary, the management techniques utilized at the Center through quality examination, financial reports compilation, claims adjudication, and advisory services are vital control tools to ensure that Air Force monies are appropriately used and accounted for.

And most important, the Center constantly seeks to accomplish its allotments, retired pay, and claims adjudication promptly and effectively—giving service to Air Force members in the handling of their family responsibilities.—END

One of USAF's separate operating agencies, ACIC has the challenging assignment of providing everything from the latest aeronautical charts to large-scale maps of the moon . . .

AERONAUTICAL CHART AND INFORMATION CENTER



Col. John G. Eriksen, who assumes command of the Aeronautical Chart and Information Center this month, succeeding Brig. Gen. Stebbins W. Griffith, is a 1937 graduate of the US Military Academy. A wartime bomb group commander, he was air attaché in Poland in 1949-51, later served in intelligence posts, recently as Commander of European Security Region.

LANDING men on the moon, orbiting astronauts around the earth, launching missiles to strike targets thousands of miles away, flying routine missions anywhere on the earth's surface, and supporting many special emergency missions are just a few of our nation's aerospace activities that require the USAF Aeronautical Chart and Information Center's (ACIC) publications.

This presents a challenge, not only to the imagination but to the skills of ACIC's technicians who design and produce these cartographic products in support of the ACIC mission.

ACIC's mission is to provide the Air Force with aeronautical charts, air target materials, flight information publications, geodetic missile data, astronomical and geophysical charts and reference materials, and to operate and maintain the USAF Central Print and Index Library and the Department of Defense depository of aerial, radarscope, and ground photography. Organizationally, ACIC is a separate operating agency.

Accuracy is vital to technicians of ACIC. Cartographers in the command's editing sections thoroughly check and edit every assignment at the completion of each major production phase to ensure quality and effectiveness.



In order to fulfill the requirements of its mission, ACIC is organized with a headquarters, a production and distribution plant, a Washington, D. C., office, and units in Europe, the Far East, Panama, and Alaska.

The headquarters and plant are located at the historic Second and Arsenal Sts. site in St. Louis, Mo.

ACIC's Washington, D. C., office performs liaison with the mapping and charting agencies located there, procures source data in support of ACIC production programs, and maintains and operates the Central Print and Index Library and the DoD depository of aerial, radarscope, and ground photography.

The overseas units support aeronautical charting requirements of US commands within their areas of responsibility and produce all flight information publications necessary for safety of military flights within those areas.

Within the ACIC primary mission there are four major program areas of production and related services:

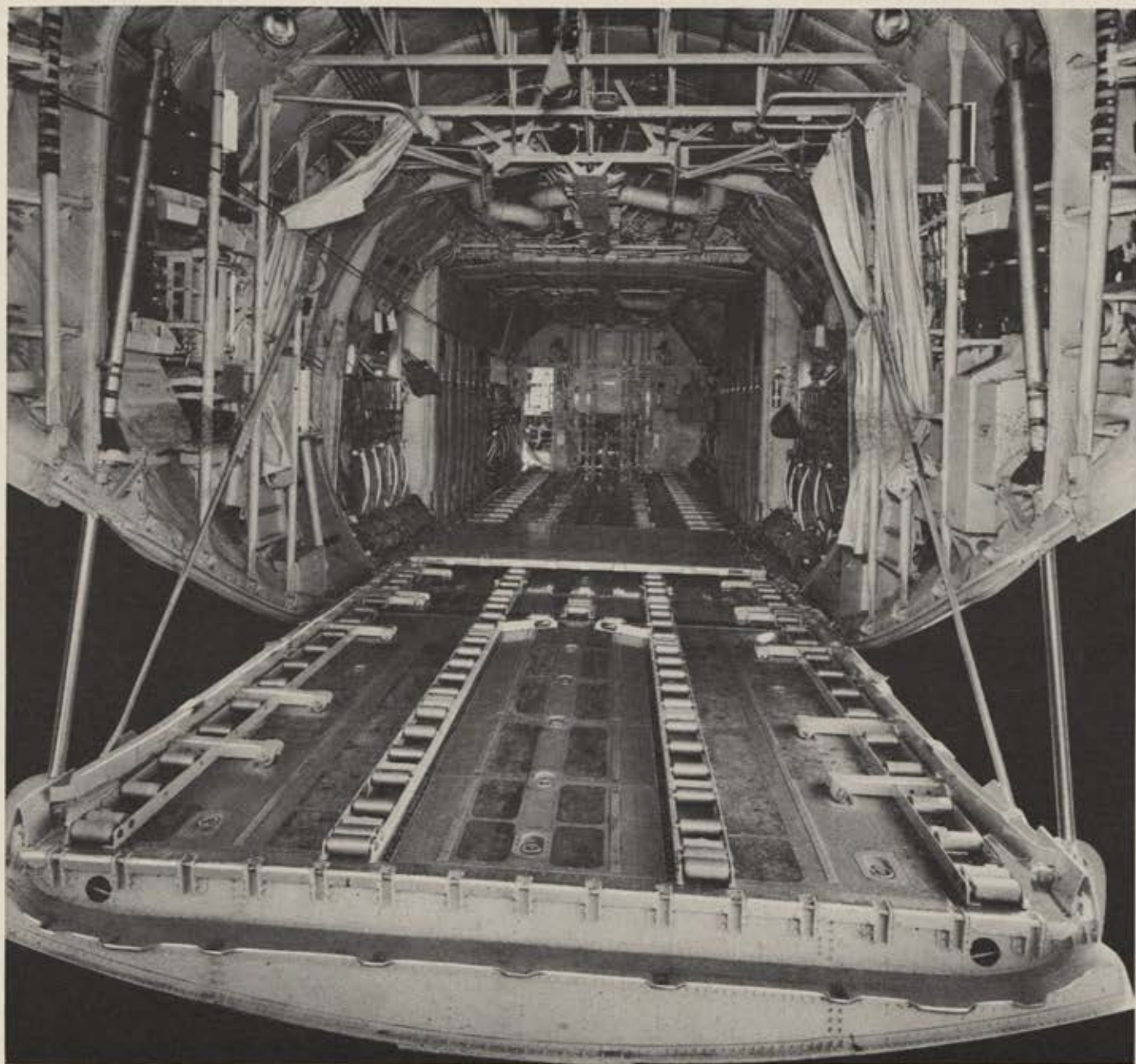
- Air Target Materials.
- Air Navigation and Planning Charts.
- Flight Information Publications.
- Services.

Air Target Materials include 1:200,000 and 1:50,000 scale air target charts and mosaics and missile target data sheets which graphically and textually position potential military objectives for air or missile attack.

Air Navigation and Planning Charts are used for preflight planning as well as in-flight operations throughout the world. These charts include the 1:250,000 scale Aeronautical, 1:500,000 Pilotage, and 1:1,000,000 Operational Navigation Charts as well as 1:2,000,000 Jet Navigation Charts, 1:5,000,000 Global Navigation Charts, and many others.

Flight Information Publications (FLIPs) cover the free world. They include the basis for planning, en-route, and terminal phases of flight and provide com-

(Continued on page 173)

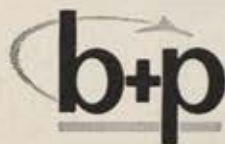


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plete current air-traffic control and air-navigation data for all weather operations of the US military air forces.

Miniaturized cartographic items such as tactical situation displays for the F-106, and aeronautical video mapping plates for ground control of flights are among the many items produced for new weapon systems developed to improve the US military posture and safety of flight.

Early in the development of Project Mercury, ACIC was asked, because of its quarter of a century of experience in charting the earth, to provide cartographic support to the National Aeronautics and Space Administration (NASA). The Mercury Orbit Chart, Mercury Simulator Graphic, Mercury Test Charts, and Mercury Recovery Charts were developed and produced by ACIC. These ACIC products are used by all US Astronauts in both the training and operational phases of spaceflight.

Additionally, ACIC is charting the moon for NASA.

A Lunar Atlas, Lunar Reference Mosaic scale 1:5,000,000 and 1:10,000,000, and several Lunar Aeronautical Charts at 1:1,000,000 scale have been produced by ACIC.

Looking further into the future, ACIC has, with the Air Force Cambridge Research Laboratory and Lowell Observatory, published a *Photographic History of Mars (1905-1961)* and has recently produced a chart of the planet Mars at a scale of 1:35,000,000 for use by our nation's space planners.

As even more sophisticated weapon systems and space vehicles are developed, ACIC will be required to maintain and continually improve its cartographic capabilities to ensure the availability of accurate aerospace charts and other navigational devices necessary to accurately position and operate them. This requires a continuing knowledge of the state of the art and of new aerospace developments before they become operational.—END

A separate operating agency, USAF's Office of Aerospace Research searches for scientific building blocks that will be needed to develop future weapon systems . . .

OFFICE OF AEROSPACE RESEARCH



Maj. Gen. Don R. Ostrander, Commander of the Office of Aerospace Research since September 1962, has been active in USAF research and development for 15 years. A 1957 West Point graduate, he went into missile development after wartime service as an armament officer, was Vice Commander of AFSC's Ballistic Systems Division before taking command of OAR.

THE Office of Aerospace Research (OAR), since its establishment as an independent command in April 1961, has been responsible for the management of research programs in all scientific areas of interest to the Air Force as well as for a limited portion of Air Force exploratory development. With minor exceptions, OAR is not concerned with solving specific military problems. Rather, its mission is to acquire new fundamental knowledge in areas of clear military potential—in a sense, to provide scientific "building blocks" that will be needed for the development of future weapon systems, including systems whose exact nature and function can be only dimly guessed at as of now.

OAR performs its mission through both extramural

(grant, contract) and in-house research. It has ten subordinate elements, ranging from the Latin American Office of Aerospace Research at Rio de Janeiro to the Churchill Research Range on the shores of Hudson Bay, but the bulk of its resources are concentrated in three organizations. One of these, the Air Force Office of Scientific Research (AFOSR) in Washington, D. C., is the principal Air Force agency for support of research by outside investigators. The in-house research is conducted chiefly by two OAR laboratory complexes: the Air Force Cambridge Research Laboratories (AFCRL) at Hanscom Field, Mass., and the Aerospace Research Laboratories (ARL), at Wright-Patterson AFB, Ohio.

(Continued on following page)

The research efforts sponsored by AFOSR during fiscal year 1963 covered a very wide range of topics, from the effects of hypnosis as a mechanism for control of human behavior to the direction of arrival of gamma rays from space. The results of one research effort in the field of mass transfer cooling, recently completed, promise to reduce the heat transfer to re-entry vehicles by fifty percent. Another investigation supported by AFOSR, making use of microchemical techniques for studying the content and composition of ribonucleic acid (RNA) of nerve cell nuclei in the brain, has demonstrated certain changes that occur in connection with the learning process. Understanding of learning in chemical terms may, of course, lead to new ways of influencing mental functions.

An AFOSR-supported team at Johns Hopkins Uni-



At OAR's Cambridge Research Lab, computer research comprises a large segment of the research program. Shown is a specialized computer designed to trace the pathways taken by electromagnetic energy as this energy propagates from a transmitter to receivers located around the earth.

versity discovered a new fundamental particle, the eta meson; and a similar group at MIT, by demonstrating the maser-laser characteristics of III-V compounds such as indium arsenide, has opened the way for technological exploitation of a new class of substances in the development of these highly important devices. Also at MIT, in 1963, OAR Commander Maj. Gen. Don Ostrander helped to dedicate the National Magnet Laboratory, a new facility capable of generating the strongest magnetic fields ever available for research purposes. The construction of this facility was financially supported by AFOSR, and AFOSR will continue to assist its operation.

AFCRL is much the largest element of OAR, with over half the assigned personnel. AFCRL scientists during fiscal 1963 provided much of the data that went into a revised version of the US Standard Atmosphere, and at the same time were analyzing the probable effects of ionizing radiation on Martian life. The design and instrumentation of the Starad satellite, launched to measure the intensity of trapped radiation origi-

nating from the July 9, 1962, Starfish nuclear detonation, was an AFCRL activity. AFCRL likewise developed the high-intensity strobe light and global camera network used in the interagency ANNA geodetic satellite program.

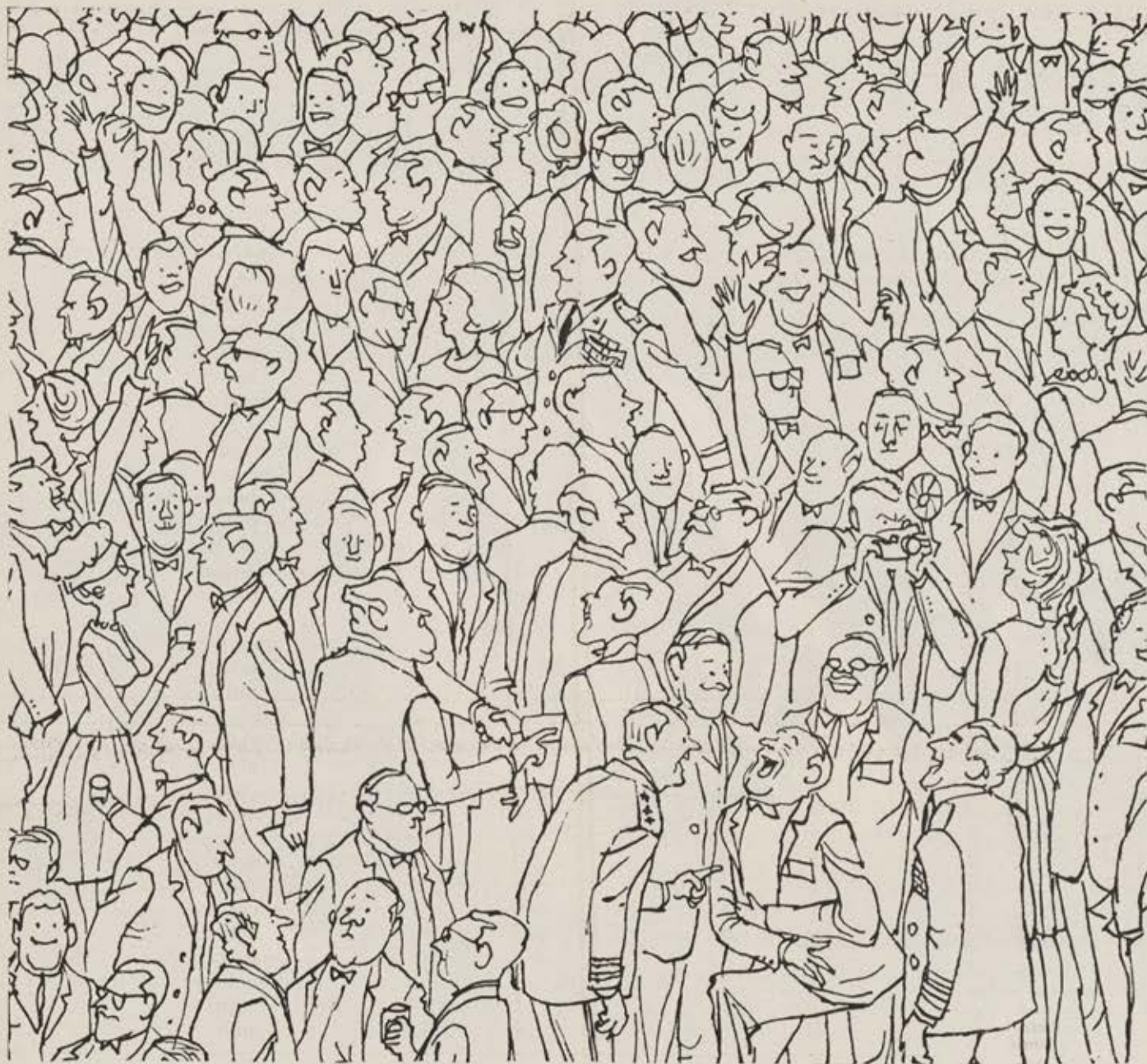
Meanwhile, rocket experiments sponsored either wholly or partially by AFCRL were producing new data on a wide variety of research topics. For example, rockets fired from White Sands Missile Range revealed an unexpected source of soft X-rays which approach the earth from outside the solar system. Other rockets, fired over northern Sweden, produced evidence that noctilucent cloud particles at extreme altitude were of extraterrestrial origin and (surprisingly) were coated with ice or supercooled water.

The upper-atmosphere and space experiments of AFCRL, which are backed by a large program of theoretical work and related laboratory tests, inevitably attract the largest share of public attention. However, they form only one aspect of the AFCRL mission, which also includes significant research in such fields as computation and communication sciences and solid-state materials.

ARL scientists during the same period were investigating such diverse topics as ductile ceramics, hypersonic wind-tunnel techniques, and mathematical physics. One of the fields in which ARL contributions attracted wide attention even outside the Air Force was gas chromatography of metal chelates. Gas chromatography is one of the newest analytical techniques, permitting complete and extremely rapid analysis of a mixture of many compounds. Metal chelates consist of organic groups which are attached to inorganic ions for ease of analysis, and they offer many promising applications in maser development and other technical areas of Air Force interest. What ARL scientists did was to adapt certain metal chelate complexes to chemical separation by the gas chromatographic technique, and the success achieved there inspired the initiation of similar work at industrial and university laboratories.

Still another field of substantial accomplishment was arc physics. Because of the many possible applications of plasma jets, heated by electric arcs, in electrothermal space propulsion, simulation of reentry conditions, and so forth, there has been a rapid growth of interest in this field; but the development of plasma-jet generators has so far been largely empirical in nature. Hence, much fundamental research, both theoretical and experimental, is urgently needed, and ARL is one of the organizations most actively working to meet that need.

It should be added that the specific contributions made to scientific research are not the sole justification for the existence of in-house programs. Equally important is the role of in-house research laboratories in giving the Air Force an independent scientific competence. Thus the ARL and AFCRL staffs also act as a panel of qualified experts to advise Air Force development organizations, and in a much broader sense serve as a necessary link between new science on the one hand and aerospace technology on the other.—END



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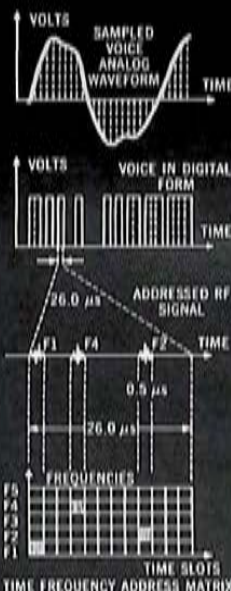
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1963)

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(As of September 30, 1963)



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Hq. Shaw AFB, S. C.



3d Air Force
Maj. Gen. Romulus W. Puryear
Hq. South Ruislip, England



5th Air Force
Lt. Gen. Maurice A. Preston
Hq. Fuchu AS, Japan



1st Reserve Region
Brig. Gen. Royal Hatch
Hq. Stewart AFB, N. Y.



4th Reserve Region
Brig. Gen. James L. Riley
Hq. Randolph AFB, Tex.



8th Air Force
Lt. Gen. Joseph J. Nazzaro
Hq. Westover AFB, Mass.



3d Air Division
Brig. Gen. Harold W. Ohlke
Hq. Andersen AFB, Guam



12th Air Force
Maj. Gen. Fred M. Dean
Hq. Waco, Texas



17th Air Force
Maj. Gen. James V. Edmundson
Hq. Ramstein AB, Germany



13th Air Force
Maj. Gen. Sam Maddux, Jr.
Hq. Clark AB, Luzon, P.I.



2d Reserve Region
Brig. Gen. James H. Isbell
Hq. Andrews AFB, Md.



5th Reserve Region
Col. Clinton W. True
Hq. Selfridge AFB, Mich.



15th Air Force
Lt. Gen. Archie J. Old, Jr.
Hq. March AFB, Calif.



7th Air Division
Maj. Gen. Charles M. Eisenhower
Hq. High Wycombe, England



19th Air Force
Maj. Gen. Henry Viccellio
Hq. Seymour Johnson AFB, N. C.



322d Air Division (Combat Cargo)
Col. Charles W. Howe
Hq. Evreux-Fauville AB, France



315th Air Division (Combat Cargo)
Brig. Gen. Richard H. Ellis
Hq. Tachikawa AB, Japan



3d Reserve Region
Brig. Gen. Wilbur W. Aring
Hq. Dobbins AFB, Ga.



6th Reserve Region
Brig. Gen. Jack A. Gibbs
Hq. Hamilton AFB, Calif.



16th Air Force
Maj. Gen. James B. Knapp
Hq. Torrejon AB, Spain

the OPERATIONAL FORCES

An AIR FORCE Magazine Photochart
(As of August 15, 1963)



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.").

UNITED STATES AIR FORCE RECRUITING SERVICE





B-52

GALLERY OF USAF WEAPONS

AIR FORCE BOMBERS



B-26



B-58 FUELING

B-26 INVADER—stalwart of the Korean War, when its night-bombing runs alternated with day sorties of fighter-bombers to maintain 24-hour-a-day pressure on Chinese Reds, has been recalled to active duty for Air Commando use in guerrilla warfare. The 14 forward-firing .50-caliber machine guns in the B model used in South Vietnam can literally cut through a jungle. Radar equipment makes it potent at night or in bad weather. Air Commandos also employ glass-nosed B-26s accommodating a bombardier-observer in place of 8 nose-mounted guns. **Contractor:** Douglas Aircraft Co. **Powerplant:** 2 Pratt & Whitney R2800-79 engines. **Powerplant/hp thrust:** 2,000 hp. **Dimensions:** span 70 ft., length 51 ft. 3 in., height 18 ft. 5 in. **Bomb load:** 6,000-lb. capacity in bomb bay; can carry rockets on wing mounts. **Armament:** 6 .50-caliber guns in wings, all models; in addition, B model has 8 .50-calibers in nose. **Armament** may be modified to carry cameras on reconnaissance missions. **Crew:** 3 or 4, depending on mission. **Maximum takeoff weight:** 40,000 lb. **Primary using command:** Tactical Air Command.

B-47 STRATOJET—medium-jet bomber, oldest of USAF's three strategic bombers, employed in SAC since late 1940s. First flown in December 1947, it has played important strategic role for 15 years. Production completed late in 1956. Now being gradually phased out as a bomber, it is used also for photo and electronic reconnaissance and has recently been modified for use as WB-47 by Air Weather Service. Also used as drone aircraft (QB-47E). With air-to-air refueling, B-47 can fly intercontinental distances. **Contractor:** Boeing Airplane Co. **Powerplant:** 6 General Electric J47 turbojets. **Powerplant hp/thrust:**

6,000 lb. each engine (7,200 lb. wet). **Dimensions:** span 116 ft., length 107 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, copilot, navigator-bombardier (RB-47H also carries 3 electronics operators in converted bomb bay). **Maximum gross takeoff weight:** 230,000 lb. **Primary using commands:** Strategic Air Command, Military Air Transport Service (AWS).

B-50 SUPERFORTRESS—originally a replacement for B-29 bombers, now used as tanker (KB-50J and K) or in photo or weather reconnaissance (RB-50F, WB-50D). Tankers employ 2 J47-GE-23 jet engines in addition to 4 piston engines for greater speed and altitude. **Contractor:** Boeing Airplane Co.; modifications by Hayes Aircraft Co. **Powerplant:** 4 Pratt & Whitney R4360-35 piston engines; 2 General Electric J47 turbojets on J and K models. **Powerplant hp/thrust:** reciprocating engines, 3,500 hp each; turbojets 5,620 lb. each. **Dimensions:** span 141 ft. 2 in., length 99 ft., height 32 ft. 7 in. **Speed:** over 400 mph with jets. **Ceiling:** about 35,000 ft. **Range:** beyond 2,000 mi. **Cargo capacity:** over 20,000 lb. **Crew:** 6 (10 in WB-50 and RB-50). **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 manned-bomber deterrent strength. Prototype flew in April 1952. Total of 744 B-52s produced from A through H models; production ended June 1962. Later models carry 2 M-28 Hound Dog air-launched nuclear missiles under wings,

in addition to internal bomb load. G and H models are distinguishable from early types by shorter vertical tail, redesigned wing incorporating integral fuel tank. H model has turbofan engines, yielding 12 percent better fuel consumption while eliminating water injection. **Contractor:** Boeing Airplane Co. **Powerplant:** 8 Pratt & Whitney J57-P-19W turbojets. B through E models; J57-P-43, F and G models; 8 Pratt & Whitney TF-33-P-3s, H model. **Powerplant hp/thrust:** up to 13,750 lb. each engine; H model, 17,000 lb. (Hound Dog engines of 7,500-lb. thrust can be used on takeoff.) **Dimensions:** model A-F, span 185 ft., length 156 ft., height 48 ft.; model G-H, span 185 ft., length 157 ft., height 40 ft. 8 in. **Speed:** over 650 mph. **Ceiling:** above 50,000 ft. **Range:** A-F, beyond 6,000 mi.; G, beyond 7,500 mi.; H, beyond 9,000 mi. **Bomb load:** more than 20,000 lb. **Armament:** 4 .50-caliber machine guns in tail, 2 M-28 Hound Dog missiles under wings. **Crew:** 6. **Maximum gross takeoff weight:** ranges from 350,000 lb. in A and B models to 488,000 lb. in H model. **Primary using command:** Strategic Air Command.

B-57 CANBERRA—light bomber, now used primarily for reconnaissance. US version of British Canberra bomber. First US model flew in July 1953, production ended in 1959 with total of 403 built in US in A through E models. **Contractor:** Martin Co. **Powerplant:** 2 Wright J65-5 turbojets, except RB-57D which uses 2 Pratt & Whitney J57-37As. **Powerplant hp/thrust:** 7,200 lb. each; D model, 10,000 lb. each. **Dimensions:** A, B, C, E models, span 64 ft., length 65 ft. 6 in., height 16 ft.; D model, span 106 ft., length 67 ft. 10 in., height 16 ft. **Speed:** over 600 mph. **Ceiling:** over 45,000 ft. **Range:** beyond 2,000 mi. **Bomb load:** 5,000 lb. **Armament:** 8 wing-mounted .50-caliber machine guns or 4 20-mm. cannon, plus 8 5-in. rockets or napalm on wing pylons; RB-57D equipped for electronic reconnaissance, with nose, tail, and wingtip radomes. **Crew:** 2; 1 in RB-57D. **Maximum gross takeoff weight:** 50,000 lb. **Primary using commands:** Pacific Air Forces, Air National Guard.

B-58A HUSTLER—world's fastest nuclear bomber, exceeding Mach 2 at 35,000 ft. One-third the size of a B-52, it carries nuclear weapons and part of fuel supply in pod under fuselage, flies home from mission "clean." SAC B-58 crew won 1962 Mackay Trophy for setting 3 transcontinental speed records on March 5, 1962—Los Angeles to New York, 2 hr. 58.7 sec.; New York to Los Angeles, 2 hr. 15 min. 50 sec.; round trip, 4 hr. 41 min. 15 sec., averaging 1,045 mph for round trip. Another SAC B-58 crew won 1961 Mackay Trophy for New York to Paris flight, averaging 1,105 mph. Two SAC wings fly B-58s—43d of Carswell AFB, Tex., and 305th, Bunker Hill AFB, Ind. **Contractor:** General Dynamics/Ft. Worth. **Powerplant:** 4 General Electric J79-5 turbojets with afterburners. **Powerplant hp/thrust:** 15,600 lb. with afterburner. **Dimensions:** span 56 ft. 10 in., length 96 ft. 9 in., height 29 ft. 11 in. **Speed:** 1,380 mph at 35,000 ft. **Ceiling:** over 60,000 ft. **Range:** intercontinental, with midair refueling. **Bomb load:** nuclear weapon in disposable pod. **Armament:** 1 GE T-71E3 20-mm. Vulcan cannon in tail. **Crew:** 3—pilot, bombardier-navigator, defensive-systems operator. **Maximum gross takeoff weight:** over 160,000 lb. **Primary using command:** Strategic Air Command.

B-66 DESTROYER—USAF version of Navy A-3A, primarily used in USAF for photo and reconnaissance in RB-66A, B, C, and WB-66D versions. Bomber versions B-66B and D have been retired from active inventory. **Contractor:** Douglas Aircraft Co. **Powerplant:** 2 Allison J71-13 turbojets. **Powerplant hp/thrust:** 10,200 lb. **Dimensions:** span 72 ft. 6 in., length 75 ft. 2 in., height 23 ft. 7 in. **Speed:** 700 mph. **Ceiling:** over 45,000 ft. **Range:** over 1,500 mi. **Armament/cameras:** 2 20-mm. cannon in tail of all models; RB-66B, C, full range of camera equipment for day or night photography; WB-66D, special weather reconnaissance gear. **Crew:** 3, except 4 in RB-66C, 5 in WB-66D. **Maximum gross takeoff weight:** 70,000 lb. or more. **Primary using commands:** US Air Forces in Europe, Tactical Air Command.

XB-70 VALKYRIE—Mach 3 intercontinental bomber, of which three prototypes are being built. First model originally scheduled to fly in late 1962 but now may not fly until early 1964 because of design problems. RS-70 reconnaissance strike version has been canceled. Conceived in 1954, B-70 program has been turned on and off several times, now seems likely to end with production of three prototypes. Roughly the size of a B-52, B-70's takeoff weight is 550,000 lb., 70,000 lb. more than B-52, but weight-distributing gear arrangement will enable it to operate from B-52 airfields. **Contractor:** North American Aviation, Inc. **Powerplant:** 6 General Electric YJ93-3 turbojets. **Powerplant hp/thrust:** 33,000 lb. each with afterburner. **Dimensions:** span 115 ft., length 170 ft. **Speed:** more than 2,000 mph. **Ceiling:** about 70,000 ft. **Range:** intercontinental. **Bomb load:** more than 20,000 lb. **Armament:** can be fitted with wide variety of nuclear and conventional weapons, plus electronic counter-measure gear. **Crew:** 4. **Maximum gross takeoff weight:** 550,000 lb. **Primary using command:** Strategic Air Command.

(Continued on following page)



RB-47 AND B-47



RB-66



WB-50



RB-57D



XB-70



RF-84F



F-101B



F-89H

GALLERY OF USAF WEAPONS

AIR FORCE FIGHTERS



F-86D



F-100C

F-84F THUNDERSTREAK—once again the venerable F-84F is gradually being retired from the active Air Force inventory. Originally phased out in 1958, it returned in 1961 when USAF recalled Air Guard fighter units in the Berlin mobilization and was retained by USAF when the ANG was released in 1962. Now one F-84F wing has moved from Chaumont, France, to Cannon AFB, N. M., to convert to the McDonnell F-4C, and other F-84F wings will convert as soon as newer planes become available. Thunderstreaks will be returned to the Guard for use until, in turn, ANG acquires Century series planes. Reconnaissance version, RF-84F Thunderflash, is used extensively in Air Guard. It differs from fighter version mainly in that air intakes are in wing roots rather than nose, which is elongated to carry cameras. **Contractor:** Republic Aviation Corp. **Powerplant:** Wright Sapphire J65-7 single jet. **Powerplant hp/thrust:** 7,200 lb. **Dimensions:** span 33 ft. 6 in., length 43 ft. 4 in. (RF-84F 47 ft. 6 in.), height 14 ft. 4 in. **Speed:** over 600 mph. **Ceiling:** above 45,000 ft. **Range:** beyond 2,000 mi. **Bomb load:** 6,000 lb. of conventional or nuclear bombs, napalm, or rockets. **Armament:** 6 .50-caliber machine guns. **Crew:** 1. **Maximum gross takeoff weight:** 26,000 lb. **Primary using commands:** US Air Forces in Europe, Tactical Air Command, Air National Guard.

F-86 SABREJET—famed conqueror of the MIG-15 in Korea, the Sabrejet has virtually disappeared from the active Air Force, but is widely used in the Air Guard and various models built in the US and elsewhere under license are being flown in several free world countries. Types range from F-86A, first flown in May 1948, to F-86L interceptor employing SAGE data link equipment. **Contractors:** North American Aviation, Inc. (Foreign licensees include Canadair, Fiat, Commonwealth [Australia], and Mitsubishi.) **Powerplant:** F-86A, General Electric J47-1, -2, -9, -13; D, L, GE J47-17, -33; E, GE J47-13; F, GE J47-27; H, GE J73-3E; K, GE J47-33. Canadian-built F-86s use Orenda turbojet, Australian models the Rolls-Royce Avon. **Powerplant hp/thrust:** from 5,200 lb. in earlier models to 9,300 lb. in H model. **Dimensions:** (H model) span 37 ft. 1 in., length 38 ft. 9 in., height 14 ft. **Speed:** over 650 mph. **Ceiling:** above 50,000 ft. **Range:** beyond 1,000 mi. with external tanks. **Bomb load:** 2 1,000-lb. bombs, or 16 5-in. rockets, or combinations, plus 2 additional 1,000-lb. bombs in lieu of fuel tanks. **Armament:** 6 .50-caliber machine guns or 4 20-mm. cannon in nose. **Crew:** 1. **Maximum gross takeoff weight:** 17,000 lb. **Primary using commands:** Air National Guard, NATO and SEATO nations.

F-89 SCORPION—no longer in active USAF inventory, the Scorpion is being flown by Air National Guard interceptor units

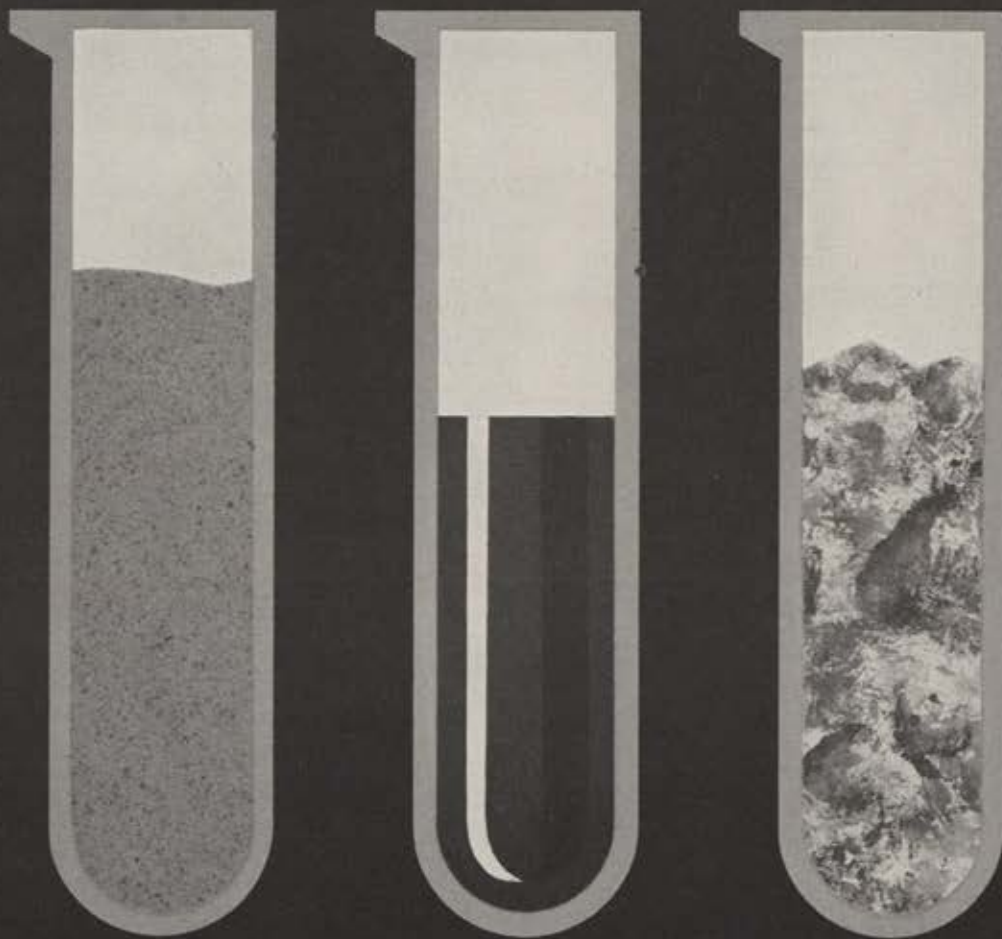
in US northern perimeter states. First flown in August 1948, it has gone through numerous model changes to the H; the J model used in the Guard is actually an earlier model factory-modified to incorporate changes up to the H. **Contractor:** Northrop Corp. **Powerplant:** 2 Allison J35-35 turbojets with afterburners. **Powerplant hp/thrust:** about 15,000 lb. with afterburner. **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. rockets, AIR-2 Genie rocket, or AIM-4 Falcon missiles. **Crew:** 2—pilot and radar observer. **Maximum gross takeoff weight:** more than 40,000 lb. **Primary using command:** Air National Guard (ADC).

F-100 SUPERSABRE—principal weapon system of Tactical Air Command, Supersabre is the first USAF fighter to exceed the speed of sound in level flight. Extremely versatile, and with air-to-air refueling can fly long distances nonstop. Flight of three flew from England to Los Angeles in 14 hr. 5 min. Equipped for buddy-system refueling, from one F-100 to another. F-100D is capable of being zero-launched. F-100F is 2-seat version for use mainly as a trainer. F-100 has been supplied to several NATO countries and to Nationalist China. Production completed in October 1959. **Contractor:** North American Aviation, Inc. **Powerplant:** F-100A, C, Pratt & Whitney J57-7; D, F, Pratt & Whitney J57-21, each with afterburner. **Powerplant hp/thrust:** 16,000 lb. with afterburner. **Dimensions:** (C model) span 38 ft., length 47 ft., height 16 ft. **Speed:** 822 mph at 30,000 ft. **Ceiling:** over 50,000 ft. **Range:** beyond 1,600 mi. without refueling. **Bomb load:** can carry varied mixture of conventional or nuclear bombs, plus napalm, rockets. **Armament:** 4 20-mm. cannon, Sidewinder or Bullpup missiles. **Crew:** 1. **Maximum gross takeoff weight:** 30,000 lb. **Primary using commands:** Tactical Air Command, US Air Forces in Europe, Pacific Air Forces, Air National Guard (TAC and ADC), NATO, Chinese Nationalist Air Force.

F-101 VOODOO—employed in fighter, interceptor, and reconnaissance roles with top speed approaching Mach 2. F-101A and C are tactical fighters, 2-place F-101B is an interceptor. RF-101A and C, USAF's fastest reconnaissance planes until RF-4C arrives, performed with excellent results in Cuba crisis late last year. At low level its 6 cameras take close-up photos at 1,000 mph; at high level it can photograph a 20,000-square-mile area in a single mission. **Contractor:** McDonnell Aircraft Corp. **Powerplant:** A, C models, 2 Pratt & Whitney J57-13 turbojets; B, 2 Pratt & Whitney J57-55s. **Powerplant hp/thrust:** 14,500 lb. each with afterburner. **Dimensions:** span 39 ft. 7 in., length A and C, 69 ft., B, 71 ft. 11 in., height 18

(Continued on page 191)

To Get Better Answers, Faster...



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The results have been beyond expectations. Models of new designs (as small as 1/15 scale) now move quickly

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PROJECT "SKY MAP"



SYSTEMS MANAGEMENT From high in the sky will come accurate plotting of the earth's surface. This will be made possible by Project "Sky Map"—the U.S. Air Force's new AN/USQ-28 geodetic survey and photo mapping system for which the Kollsman Instrument Corporation is systems manager. Designed for use in RC-135A jet aircraft, the system will consist of mapping cameras of advanced design, an extremely precise inertial navigation system, provisions for data recording and supporting electronics. The fastest means ever available for obtaining and compiling geodetic information, "Sky Map" will also be the most accurate. The magnitude of the project is such that only a prime contractor with outstanding technical and systems management qualifications could have been considered. Kollsman has both.

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Systems Management

SYSTEMS MANAGEMENT DIVISION

Kollsman Instrument Corporation



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ft. Speed: Mach 1.8 at 40,000 ft. Ceiling: above 50,000 ft. Range: 2,800 mi. with external tanks. Bomb load: conventional or nuclear bombs carried on rotary bomb door. Armament: A, C, 4 20-mm. cannon, plus 12 rockets and 3 Falcon missiles; B carries combination of Genie and Falcon missiles, plus cannon. Crew: A and C, 1; B, 2. Maximum gross takeoff weight: A, C, 49,000 lb., B, over 50,000 lb. Primary using commands: Tactical Air Command, Air Defense Command, US Air Forces in Europe, Pacific Air Forces, RCAF.

F-102 DELTA DAGGER—world's first supersonic all-weather jet interceptor, and first to incorporate area-rule (coke bottle) fuselage design. All electronic equipment, armament, and fuel carried internally. Radar locks on to target and at right instant electronic fire-control system automatically prepares and fires its weapons. 2-place TF-102A used mainly for transition training. Last F-102A completed April 1958 after about 1,000 of 2 production versions, F and TF, had been built. B model was redesignated and developed as F-106. Contractor: General Dynamics/Convair. Powerplant: Pratt & Whitney J57-P-23 turbojet. Powerplant 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 AIM-4 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—most widely used fighter in free-world air forces. Capable of Mach 2 speeds, it functions in both interceptor and tactical roles. Production for USAF has been completed, but F-104G is being built under the Military Assistance Program in US, Canada, Germany, Belgium, the Netherlands, and Italy, and the F-104J in Japan. Other nations soon to fly the Starfighter include Greece and Turkey. At one time F-104 held world records in both speed, 1,404 mph, and altitude, 103,389 ft. Both have since been exceeded. Models built include the A, an interceptor; a 2-place B; the C, for Tactical Air Command; D, 2-seater for TAC; F, US-built for West Germany; G, of which more than 900 are being built in Europe; TF-104G, 2-seater for Germany; J, being built in Japan; CF-104, produced by Canadair for Canada, Greece, and Turkey; CF-104D, 2-seater built for RCAF; and QF-104, a drone version of F-104A. Contractor: Lockheed Aircraft Corp. Licensees include Canadair, Mitsubishi, and numerous consortiums in Europe. Powerplant: General Electric J79-3, -7, or -11, with afterburner. Powerplant 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: 27,000 lb. Primary using commands: Air Defense Command, NATO, RCAF, JASDF.

F-105D THUNDERCHIEF—all-weather Mach 2 tactical fighter capable of delivering 6 tons of firepower in support of ground forces. Department of Defense is reportedly planning to equip 7 Tactical Air Command wings with F-105D. Earlier F-105B day fighter-bombers are being withdrawn from USAF and assigned to Air National Guard. F-105 bomb bay is longer than that of B-17. In 1 test, it delivered 7 tons of weapons—26 565-lb. bombs—heaviest load ever carried by a single-engine plane. Reconnaissance package can be fitted in bomb bay enabling F-105D to perform strike and reconnaissance duties on same mission. F-105F 2-seat version now being delivered to using units. Contractor: Republic Aviation Corp. Powerplant: 1 Pratt & Whitney J75-19W turbojet. Powerplant hp/thrust: 26,500 lb. with afterburner. Dimensions: span 34 ft. 11 in., length 64 ft. 3 in., height 19 ft. 8 in. Speed: Mach 2.25 at 38,000 ft., 1.25 on deck. Ceiling: 52,000 ft. Range: over 2,000 mi. without refueling. Bomb load: 8,000 lb. of nuclear or conventional weapons in bomb bay, plus 4,000 lb. of bombs, napalm, rockets, or Bullpup or Sidewinder missiles on wing pylons and under bomb bay. Armament: 1 GE 20-mm. Vulcan cannon. Crew: 1; F-105F, 2. Maximum gross takeoff weight: 48,400 lb. Primary using commands: Tactical Air Command, US Air Forces in Europe, Pacific Air Forces.

F-106A DELTA DART—follow-on to F-102 Delta Dagger, incorporates more powerful engine, redesigned tail, fuselage fuel tank, improved electronics, and armament. Under combat intercept conditions the plane flies and fires vertically automatically, employing highly sophisticated electronic guidance and fire-control system developed by Hughes Aircraft Co. System, designated MA-1, operates plane soon after takeoff, flies it through climb and cruise to attack position, detects target, fires at optimum range, and immediately breaks off to seek

(Continued on following page)



F-102A



F-104A



F-105D



F-106A


F-4C

F-5A

**ARTIST'S CONCEPTION OF
SECOND-GENERATION TFX**

other targets. F-106A at one time held world speed record of 1,525.9 mph. 2-place combat trainer version is designated F-106B. **Contractor:** General Dynamics/Convair. **Powerplant:** 1 Pratt & Whitney J75-17 turbojet with afterburner; Pratt & Whitney J57-9 in F-106B. **Powerplant hp/thrust:** 24,500 lb. with afterburner. **Dimensions:** span 38 ft. 3 in., length 70 ft. 8 in., height 20 ft. 3 in. **Speed:** over 1,400 mph. **Ceiling:** over 50,000 ft. **Range:** 1,500 mi. **Armament:** 1 Genie nuclear rocket, plus several Super Falcon missiles in internal weapons bay. **Crew:** 1; F-106F, 2. **Maximum gross takeoff weight:** over 35,000 lb. **Primary using command:** Air Defense Command.

F-4C PHANTOM II—world's fastest tactical fighter in production, destined to become USAF's principal tactical weapon system in period before F-111 (TFX) becomes available. F-4A, on which F-4C is based, set world absolute speed record of 1,606.48 mph in November 1961. (However, a Soviet claim of 1,664.4 mph set by an E-166, apparently a MIG-21 derivative, is pending before the FAI.) USAF plans to equip 14 of Tactical Air Command's 21 fighter wings with 2-man F-4C, the other 7 with F-105D. Reconnaissance version, RF-4C, also being built for USAF. Unusual features of F-4C include variable geometry air inlets, blowing boundary layer control on both leading- and trailing-edge flaps. Capable of carrying twice the weapons payload of the World War II B-17, it employs a wide variety of armament from air-to-air missiles to multiple rocket launching pods, napalm, or nuclear ground-strike weapons. Uses probe and drogue refueling, with provision for "buddy" refueling from one F-4C to another. **Contractor:** McDonnell Aircraft Corp. **Powerplant:** 2 General Electric J79-15s. **Powerplant hp/thrust:** 17,000 lb. each with afterburner. **Dimensions:** length 58 ft. 3 in., span 38 ft. 5 in., height 16 ft. 3 in. **Speed:** over Mach 2.5. **Ceiling:** above 66,000 ft.; has reached 98,000 ft. in 6 min. 11 sec. **Range:** more than 2,000 mi. without refueling. **Bomb load:** more than 12,000 lb. **Armament:** Bullpup, Sidewinder, Sparrow III missiles, rockets, napalm. **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. **Powerplant:** 2 General Electric J85-13 turbojets with afterburner. **Powerplant hp/thrust:** 4,000 lb. with afterburner and water injection. **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:** 2 M39 20-mm. cannon in nose. 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 command:** NATO allies.

F-111A (TFX)—Department of Defense has awarded a contract to General Dynamics Corp. to design and build a tactical fighter of advanced design for both Air Force and Navy. Air Force version, designated F-111A, is expected to weigh about 70,000 lb., heaviest fighter ever built. Navy version, F-111B, will weigh about 55,000 lb. Grumman Aircraft Engineering Corp. is working with General Dynamics on F-111B. Planes are to be developed with high degree of commonality, with 80 percent or more of parts interchangeable. 18 F-111A and 4 F-111B prototypes are to be delivered by mid-1965. Estimates of total number of planes to be procured are 1,500 or more for Air Force, 250 or more for Navy. Plane will feature a variable sweep wing which will extend and retract in different phases of flight, enabling plane to fly at Mach 2.5 at altitude, yet land at only 80 knots. With ferry range of 4,100 mi., it will be able to fly anywhere in the world in one day. It will be capable of operating from rough airstrips, taking off fully loaded in only 3,000 ft. Details of aircraft configuration have not been disclosed. **Contractor:** General Dynamics/Ft. Worth, Grumman. **Powerplant:** 2 Pratt & Whitney JTF-10A-20 turbofans. **Powerplant hp/thrust:** estimated at 20,000 lb. or more each with afterburner. **Dimensions:** Not available. **Speed:** Mach 2.5 down to slow-loiter capability. **Ceiling:** above 60,000 ft. **Range:** 4,100 mi. without weapons. **Bomb load:** capable of carrying all types of conventional and latest nuclear weapons. **Crew:** 2. **Maximum gross takeoff weight:** F-111A, 70,000 lb.; F-111B, 55,000 lb. **Primary using command:** Tactical Air Command.

(Continued on page 195)

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GALLERY OF USAF WEAPONS

AIR FORCE MISSILES

ATLAS

P, C, HGM-16 ATLAS—free world's first operational intercontinental ballistic missile (ICBM), and highly reliable booster for Mercury manned spaceflights. Atlas program was conceived in late 1940s, but considered impractical until lightweight thermonuclear warhead was developed in 1955 at which time Atlas development was accorded high priority. First full-range flight of 6,000 miles achieved with Atlas B November 28, 1958. A month later Atlas payload and vehicle was fired into orbit in Project Score, broadcasting to world a Christmas message from President Eisenhower. Atlas D declared operational in September 1959. D model is on above-ground pad (PGM-16); E model lies horizontal in coffin and is raised for firing (CGM-16); F model is stored vertically in underground silo (HGM-16). Total of 129 D through F models now operational in 13 sites at 11 bases. Atlas program completed, older above-ground missiles now being phased out in favor of Minuteman and Titan II. Atlas D was selected by NASA as booster for Mercury project, successfully launching all 9 Mercury capsules, including 4 manned orbital flights, MA-6 through MA-9. Atlas, combined with Agena upper stage, also used to boost military and scientific payloads into orbit and space. Military launchings, made from Pt. Arguello, Calif., are now classified. Among scientific launchings made by Atlas-Agena B are the Ranger series of moon shots. Atlas D ICBM uses radio-inertial command guidance; in E and F guidance is all-inertial. **Contractor:** General Dynamics/Astronautics. **Powerplant:** North American Rocket-dyne, one-and-a-half stage, liquid fuel. **Powerplant hp/thrust:** about 360,000-lb. takeoff thrust; advanced E and F models 389,000 lb. **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.

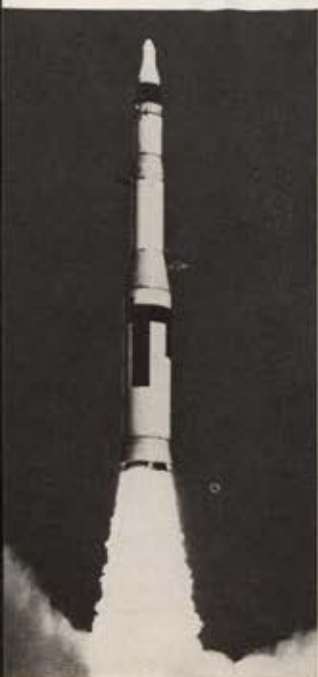
HGM-25 TITAN I & LGM-25 TITAN II—second-generation ICBMs. 54 Titan Is are now operational in USAF, stored in underground silos and raised for firing. Titan I program completed. As with Atlas models, liquid fuel is pumped into Titan I upon alert. Titan II employs storable liquid fuels and

can be fired directly from underground position in silo, thus reducing reaction time to less than a minute. Titan II possesses greatest range and payload of any US ICBM, can hit targets in Red China from US silos. First Titan II squadron of 9 missiles declared operational at Davis-Monthan AFB, Ariz., in June. Titan II will be used as booster for Gemini and 2-man space vehicle, and provides core for Titan III which, with 2 additional strap-on rocket motors, will send Dyna-Soar into orbit and serve as military launch vehicle for other projects in next decade. **Contractor:** Martin Co. **Powerplant:** Aerojet-General. **Powerplant hp/thrust:** Titan I, 300,000-lb. first stage, 80,000-lb. second stage. (Continued on following page)

TITAN II

GUIDE TO NEW MISSILE DESIGNATIONS

The Department of Defense has established a new unified system for designating all forms of military missiles. All current USAF missiles have been redesignated in accordance with the system. The new designations show that the weapon not only is a missile (designated by "M") and the number of the missile within the series but also indicates the target objectives—ground or air—and the point from which the missile is fired: surface, air, or underwater. The Atlas D, for example, is fired from a surface pad (P), toward a ground target (G); it is also, of course, a missile (M), and has been assigned the number 16 in the series. Thus, the Atlas D is now designated PGM-16. The Atlas E, which rests in a horizontal coffin before being raised for firing, is now called CGM-16. The silo-stored Atlas F, in a hardened site, is designated HGM-16. If it were silo-launched, it would bear the prefix letter "L." The Titan II, for example, is LGM-25. Other identifying prefix letters are: "A" for Air; "I" for Intercept; "U" for Underwater.



MINUTEMAN



BOMARC



MACE



GENIE



lb. second stage; Titan II, 430,000-lb. first stage, 100,000-lb. second stage. Dimensions: Titan I, length 98 ft.; Titan II, 103 ft.; each is 10 ft. in diameter. Speed: over 16,000 mph. Range: I, over 6,300 mi.; II, over 10,000 mi. Warhead: nuclear. Maximum gross takeoff launch weight: I, 220,000 lb.; II, 330,000 lb. Primary using command: Strategic Air Command.

PGM-17 THOR—free world's first operational intermediate-range ballistic missile; Thor has since been retired from IRBM role but continues as basic vehicle for a number of space boosters, including Thor-Agena B used by USAF in Discoverer satellite program, and Thor-Able-Star and Thor-Delta boosters for NASA and other scientific efforts. Thrust-Augmented-Thor (TAT) joins basic Thor with three Thiokol solid-propellant rockets to increase total thrust to 330,000 lb., nearly that of Atlas-Agena's 360,000 lb. Contractor: Douglas Aircraft Co. Powerplant: North American Rocketdyne single-stage liquid rocket engine. Powerplant hp/thrust: 150,000-lb. takeoff thrust. Dimensions: length 65 ft., diameter 8 ft. Speed: Mach 15. Range: beyond 1,500 mi. Maximum gross takeoff weight: 110,000 lb. at launch. Primary using commands: Air Force Systems Command, NASA.

PGM-19 JUPITER—IRBM developed by Army for USAF. Was deployed in Italy and Turkey but has since been retired. No current operational use.

LGM-30 MINUTEMAN—principal ballistic missile in SAC, with more than 200 missiles operational, and increasing at rate of 1 per day. Solid-propellant, quick-reaction weapon system, stored in and launched from underground silo. 6 wings with total of 950 missiles are included in program; 200 in wing at F. E. Warren AFB, Wyo., and 150 each at Malmstrom AFB, Mont., Minot and Grand Forks AFB, N. D., Ellsworth AFB, S. D., and Whiteman AFB, Mo. Minuteman C, now in advanced development, will have range comparable to Titan II. Contractor: Boeing Co. Powerplant: 3-stage solid propellant, first stage by Thiokol, second by Aerojet-General, third by Hercules Powder Co. Powerplant hp/thrust: first stage, 170,000 lb.; second stage 65,000 lb.; third stage, 35,000 lb. Dimensions: length 60 ft., diameter 6 ft. Speed: Mach 22. Range: over 6,500 mi. Bomb load: nuclear. Maximum gross takeoff weight: about 65,000 lb. Primary using command: Strategic Air Command.

AIM-10A & B BOMARC—winged interceptor missile, employs rocket booster and 2 ramjet engines to speed it toward enemy aircraft at distances up to 400 miles and altitudes to 100,000 ft. Guided by SAGE control center to proximity of target, then target-seeker and proximity fuze take over. 8 bases in US, 2 in Canada, employ Bomarc A and/or B. Production terminated in 1962. Contractor: Boeing Co. Powerplant: M-10A, Aerojet-General liquid booster of 35,000-lb. thrust, 2 Marquardt RJ43-MA3 ramjet engines with 11,500-lb. thrust each; M-10B, Thiokol solid booster of 50,000-lb. thrust, 2 Marquardt RJ43-MA7 ramjets with 12,000-lb. thrust each. Dimensions: length, M-10A, 46 ft. 9 in., M-10B, 45 ft. 1 in., span 18 ft. 2 in., diameter 2 ft. 11 in. Speed: M-10A, Mach 2.6; M-10B, Mach 2.8. Range: M-10A, 250 mi.; M-10B 440 mi. Warhead: nuclear. Maximum gross takeoff weight: M-10A, 15,500 lb.; M-10B, 16,000 lb. Primary using commands: Air Defense Command, Royal Canadian Air Force.

MGM-13 MACE—air-breathing, surface-to-surface guided missile; improved, much-changed version of Matador. MGM-13A 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. Powerplant: Allison J33-A-41 turbojet and solid-propellant booster. Powerplant 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 1,200 mi. Bomb load: nuclear. Maximum gross takeoff weight: approximately 18,000 lb. Primary using commands: United States Air Forces in Europe, Pacific Air Forces.

AIR-2 GENIE—air-to-air rocket with atomic warhead; unguided; uses solid-propellant engine. ADC operational capability, January 1957. Nuclear warhead estimated at 1.5 kilotons, giving it lethal radius of at least 1,000 ft. Warhead remains inert until armed just before being fired. Negligible fallout demonstrated in actual firing at 15,000 ft. altitude over Yucca Flats, Nev., in July 1957, when USAF personnel positioned directly below showed no ill effects. 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.

(Continued on page 199)

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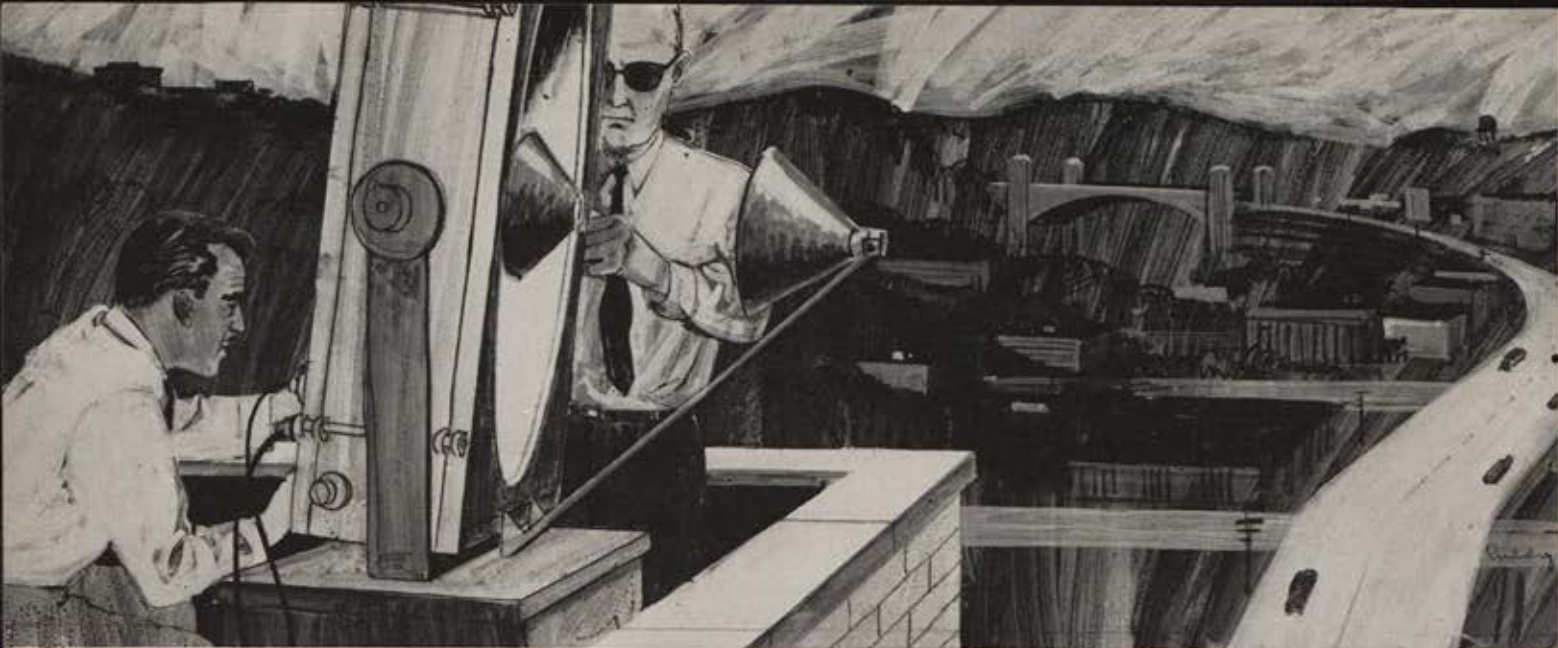
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MISSILES CONTINUED

ment. **Contractor:** Douglas Aircraft Co. **Powerplant:** Aerojet-General Corp. **Powerplant hp/thrust:** about 36,000 lb. **Dimensions:** length 9.5 ft., diameter 17 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.

AIM-4, -26, -47 FALCON—family of supersonic guided air-to-air missiles. AIM-4 includes those formerly designated GAR-3 and -4; -3 with radar homing and -4 with infrared homing guidance. AIM-26 is nuclear-tipped former GAR-11. AIM-47 is new designation for nuclear GAR-9, still under development, once intended for use in defunct F-108. Production completed on GAR-1 and -2. **Contractor:** Hughes Aircraft Co. **Powerplant:** Thiokol solid-propellant rocket motor. **Powerplant hp/thrust:** about 6,000 lb. **Dimensions:** AIM-4, length 6 ft. 6 in., diameter 6 in., span 20 in.; AIM-26, length 7 ft., diameter 11 in., span 20 in. **Speed:** AIM-4, Mach 3; AIM-26, Mach 2. **Ceiling:** above 50,000 ft. **Range:** 5 mi. or more. **Warhead:** AIM-4, conventional; AIM-26, -47, nuclear. **Maximum gross takeoff weight:** AIM-4, 150 lb.; AIM-26, 200 lb. **Primary using command:** Air Defense Command.

AIM-9 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; later versions equipped with radar or infrared. 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. **Powerplant:** Naval Powder Plant solid propellant. **Powerplant 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.

ADM-20 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 November 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. **Powerplant:** General Electric J85 turbojet. **Powerplant 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:** up to 400 mi. **Payload:** electronic equipment to simulate B-52. **Maximum gross takeoff weight:** 1,100 lb. **Primary using command:** Strategic Air Command.

AGM-28 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; operational on B-52G aircraft; guidance is inertial. B-52 would carry two Hound Dogs primarily to attack enemy 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. **Powerplant:** Pratt & Whitney J52 turbojet. **Powerplant 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 600 mi. **Bomb load:** nuclear. **Maximum gross takeoff weight:** 9,600 lb. **Primary using command:** Strategic Air Command.

AGM-12 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 powerplant 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 in A model, nuclear in B. **Maximum gross takeoff weight:** 540 lb. **Primary using command:** Tactical Air Command.

M-34 FIREBEE—target drone; can be air- or ground-launched, has parachute-recovery system. Internal electronic system scores how close fire has come to drone. Advanced version is M-34C. **Contractor:** Ryan Aeronautical Co. **Powerplant:** Continental J69. **Powerplant 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 gross takeoff weight:** 1,850 lb. **Primary using commands:** Air Defense Command, Systems Command.

(Continued on following page)



QUAIL

SIDEWINDER



FALCONS



HOUND DOG



BULLPUP



FIREBEE



C-46



C-47



HC-54

GALLERY OF USAF WEAPONS

AIR FORCE CARGO AIRCRAFT



C-97



C-118A



C-119

C-46 COMMANDO—cargo-troop carrier used extensively in World War II, returned to the USAF inventory for use by 1st Air Commando Wing 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. **Powerplant:** 2 Pratt & Whitney R2800-51 or -75 radial engines. **Powerplant 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—the "Gooney Bird" is 31 years old and still a valued workhorse in USAF, other services, other lands. Current inventory of US military aircraft lists 25 variations of basic aircraft from C-47A to TC-47K, plus 9 types of C-117, pushed-up version. In all, Douglas built over 10,000. **Contractor:** Douglas Aircraft Co. **Powerplant:** 2 Pratt & Whitney R1830-90-D. **Powerplant 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 as an administrative command aircraft. Several versions employed in air evac role. HC-54 used by Air Rescue Service. **Contractor:** Douglas Aircraft Co. **Powerplant:** 4 Pratt & Whitney R2000-9 piston engines. **Powerplant 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 lb., 50 troops. **Crew:** 5 or more. **Maximum gross takeoff weight:** 82,500 lb. **Primary using commands:** MATS, other USAF commands.

C-97 STRATOFREIGHTER—now being flown primarily by Air National Guard, C-97 is used as personnel and cargo transport and in KC-97 version as tanker. ANG is acquiring

KC-97s from Strategic Air Command as KC-135 replacements are delivered to SAC. Some are being retained as tankers, others being reconverted to cargo carriers, flying MATS cargo on training missions to Europe and Far East as well as within ZI. **Contractor:** Boeing Co. **Powerplant:** 4 Pratt & Whitney R4360-59 Wasp Majors. **Powerplant 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:** 175,000 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. **Powerplant:** 4 Pratt & Whitney R2800-52 piston engines. **Powerplant hp/thrust:** 2,500 takeoff hp each with water injection, 1,800-hp cruise. **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. **Contractor:** Fairchild Engine & Airplane Corp. **Powerplant:** 2 Wright R3350-85 piston engines. **Powerplant 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 command:** Air Force Reserve (TAC).

C-121 SUPER CONSTELLATION—cargo-troop carrier air evac-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; C-121C now entering service with Air National Guard as aeromedical evac plane, replacing C-119s. **Contractor:** Lockheed Aircraft Corp. **Powerplant:** 4 Curtiss-Wright R3350 turbocompound piston engines. **Powerplant 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-121

C-123 PROVIDER—in use more than a decade, the Provider has demonstrated a new 10-ton STOL capability with addition of a pair of jet engines to supplement its normal powerplant. Already a capable performer in operating from short, unprepared fields to land and evacuate troops and supplies, auxiliary jet power makes it even more useful in Air Commando missions. Modification was tested in South Vietnam with excellent results. High tail assembly and squat landing gear permits tail-ramp loading of combat equipment. **Contractor:** Fairchild Engine & Airplane Corp. **Powerplant:** 2 Pratt & Whitney R2800-99W piston engines, jet engines added for Air Commando operations. **Powerplant 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-123

C-124 GLOBEMASTER—transport; in service since 1950, until recently USAF's largest heavy cargo transport. From Korea to Operation Deep Freeze in Antarctica, 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. **Powerplant:** 4 Pratt & Whitney R4360-63A piston engines. **Powerplant 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 20,000 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-124

C-130 HERCULES—versatile transport, performing a variety of missions around the world. C-130E is kingpin of US Strike Command paratroop and paradrop operations. C-130s are in India, airlifting troops and supplies to and from Chinese border high in Himalayas. RC-130As have performed photo-mapping mission in South America and now are on similar assignment in Ethiopia. JC-130Bs operating from Hawaii have compiled a high average in fielding capsules released from Discoverer satellites. HC-130B & E serve in search and rescue roles; others track storms for Air Weather Service. DC-130As launch and control drone targets for air defense weapon systems. C-130Ds equipped with skis and JATO bottles support operations in Antarctic and other cold regions. More than 500 C-130s have been produced for Air Force, Navy, and Coast Guard. **Contractor:** Lockheed Aircraft Corp. **Powerplant:** 4 Allison T56-7A turboprop engines. **Powerplant 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-130

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. **Powerplant:** 2 Pratt & Whitney R2800-99W piston engines. **Powerplant hp/thrust:** 2,500-hp takeoff 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.



C-133

STORAGE TUBE AVERAGE PERFORMANCE SUMMARY

Type	Dia.	Number Writing Guns	Focus/Deflection Method	Viewing Time (Sec)	Writing Speed (in./sec)	Erase Time (MS)	Stored Res. (Lines/in.)	Brightness (FT-L)	Remarks
H-1010CP20	5"	1	ES/ES	75	1,000,000	50	85	1700	Very high writing speed
H-1027AP20	5"	1	ES/EM	60	150,000	80	75	1500	Potted and shielded 7033
H-1114AP20	5"	3	ES/ES	100	150,000	80	75	1500	Overall length 8 inches
H-1076AP20	5"	1	ES/EM	180	250,000	50	70	700	
H-1042AP20	7"	1	ES/EM	180	250,000	200	70	500	
H-1033AP20	10"	1	ES/EM	300	250,000	200	70	800	Very high tracking accuracy
H-1069AP20	10"	1	ES/ES	180	275,000	350	75	200	
H-1066P20	10"	3	ES/ES	300	250,000	250	60	150	
H-1044P20	21"	1	ES/ES	300	275,000	250	70	65	Bistable storage
H-1055	5"	1	ES/ES	Utilized	150,000	250	70	65	Bistable storage
H-1019	21"	1	ES/ES	Utilized	150,000	250	70	65	Bistable storage
H-1055	5"	1	ES/EM/ES	Utilized	65	180	25	150	Half-tone storage; spot writing speed 40,000 in./sec.
H-1019	21"	1	ES/ES/EM	120	25	400	25	150	Half-tone storage; spot writing speed 40,000 in./sec.

NOTE: The figures tabulated above are averages based upon rated electrode voltages and conditions specified in the data for the particular tube type. For the TONOTRON tubes, resolution in all cases is measured at 50% equilibrium brightness.

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sions: 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-133 CARGOMASTER—giant turboprop transport whose 90-ft.-long cargo hold can accommodate any of USAF's intercontinental ballistic missiles, haul 100,000 lb. of cargo, a pair of 40,000-lb. prime movers, 16 loaded jeeps, or 200 passengers. Both C-133A and B have side-loading doors in forward fuselage, integral ramp in rear; B model has clamshell doors aft. USAF received 34 C-133As and 15 Bs before production was completed in April 1961. Contractor: Douglas Aircraft Co. Powerplant: 4 Pratt & Whitney T34-9W turboprops. Powerplant 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 25,000 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: Military Air Transport Service.

KC-135 STRATOTANKER—grew out of Boeing's prototype 707 commercial transport after Boeing demonstrated feasibility and economy of refueling B-47, B-52, and B-58 at high speed and altitude. More than 600 KC-135s have been delivered to USAF, starting in June 1957. Originally equipped only with flying boom for refueling bombers, KC-135s now employ drogues as well to accommodate probe-equipped TAC fighters. 5 KC-135s are equipped as SAC aerial command posts, each capable of directing SAC's bomber force if its underground post were put out of action. At least one is airborne at all times. In 1961 USAF ordered C-135 transports for MATS, developed from KC-135. 15 C-135As and 30 C-135Bs have been delivered. 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 from Germany to Ft. Lewis, Wash., in 45½ hours. A dozen KC-135s with Pratt & Whitney TF33-5 engines have been purchased by France to refuel its Mirage IV Mach 2 bomber. Contractor: Boeing Co. Powerplant: KC-135A, C-135A, 4 Pratt & Whitney J57-59W turbojets; KC-135B, C-135B, 4 Pratt & Whitney TF33-9 turbofans. Powerplant hp/thrust: J57-59W, 13,750 lb. each; TF33-9, 18,000 lb. each. Dimensions: length, KC-135, 136 ft. 3 in.; C-135, 134 ft. 6 in.; span 130 ft. 10 in., height 38 ft. 4 in. Speed: 600 mph. Ceiling: above 50,000 ft. Range: 5,000 mi.; ferry range 8,000 mi. or more. Payload: 85,000 lb. Crew: 4. Maximum gross takeoff weight: KC-135, 297,000 lb.; C-135, 277,000 lb. Primary using commands: KC-135, Strategic Air Command; C-135, Military Air Transport Service.

VC-137 PRESIDENTIAL TRANSPORT—one VC-137C is in Air Force use as transport for the President, cabinet members, foreign heads of state. It is basically the intercontinental Boeing 707-320B, but with staterooms, berths, conference table, and elaborate communications and electronics equipment. Three VC-137As, comparable to 707-120, also serve as high-level VIP transports. Contractor: Boeing Co. Powerplant: VC-137C, 4 Pratt & Whitney JT3D-3 turbofan engines; VC-137A, 4 Pratt & Whitney JT3 turbojets. Powerplant hp/thrust: JT3D-3, 18,000 lb. each; JT3, 13,750 lb. each. Dimensions: VC-137C, length 152 ft. 11 in., span 142 ft. 5 in., height 42 ft. 5½ in.; VC-137A, length 144 ft. 6 in., span 130 ft. 10 in., height 41 ft. 8 in. Cruising speed: VC-137C, 600 mph; VC-137A, 585 mph. Range: VC-137C, over 5,000 mi.; VC-137A, 3,750 mi. Primary using command: Military Air Transport Service.

C-140 JETSTAR—small jet transport, with eight passengers and 2-man crew. USAF has 16 C-140s—5 C-140As used by Air Force Communications Service in checking navigation aids and communications; 5 C-140Bs in mission support roles; and 6 VC-140Bs for MATS's Special Air Missions Wing. AFCS employs JetStar because it is capable of duplicating high-altitude flight path, approach, etc., of strategic bombers. Contractor: Lockheed Aircraft Corp. Powerplant: 4 Pratt & Whitney JT12 jets mounted in pairs in nacelles on aft fuselage. Powerplant hp/thrust: each 3,000 lb. Dimensions: span 54 ft. 5 in., length 60.5 ft., height 20.5 ft. Speed: 550 mph. Ceiling: 45,000 ft. Range: 2,500 mi. Cargo capacity: 8 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 STARLIFTER—first pure jet aircraft developed from



KC-135



VC-137C



C-140



C-141



XC-142

start as a cargo plane. First flight scheduled to be made around end of 1963 or early 1964, after prototype was rolled out August 22. 4 more aircraft to be available early in 1964 and enough to equip a MATS squadron are to be delivered by mid-1965. At least 132 C-141s are on order. C-141 is first transport designed for use with USAF's new 463L cargo-handling system—a matched family of pallets, forklifts, trucks, and warehouse equipment. Plane's fuselage floor is truck-bed height and, with rollers inset on floor of both truck and plane, cargo on pallets can be loaded and unloaded swiftly, making possible 30-minute turnaround time. Cargo can also be air-dropped at speeds up to 200 knots. Contractor: Lockheed Aircraft Corp. Powerplant: 4 Pratt & Whitney TF33-7 turbofans. Powerplant hp/thrust: 21,000 lb. each. Dimensions: length 143 ft., span 160 ft., height 39 ft. Speed: 560 mph. Range/payload: 3,500 mi. with 80,000 payload; 5,500 mi. with 20,000 lb. Crew: 4. Maximum gross takeoff weight: 315,000 lb. Primary using command: Military Air Transport Service.

C-142 VTOL, STOL TRANSPORT—a triservice operational research vehicle, the C-142 is being designed for both vertical takeoff and short takeoff. Contract let by USAF in spring 1962. First prototype scheduled to fly in 1964. Contractor: Vought/Hiller/Ryan. Powerplant: 4 General Electric T64 turboshaft engines, linked by an interconnecting shaft. Powerplant 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: Air Force Systems Command.

(Continued on following page)



T-28B



T-33

GALLERY OF USAF WEAPONS

AIR FORCE TRAINERS

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 Wing. 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. Souped-up version, designated YAT-28E, being developed for Air Commando test. It features stronger wing to handle more weapons and a pair of M-3 machine guns, Lycoming LTC 4G-3 turboprop engine developing 2,500 shaft hp, and

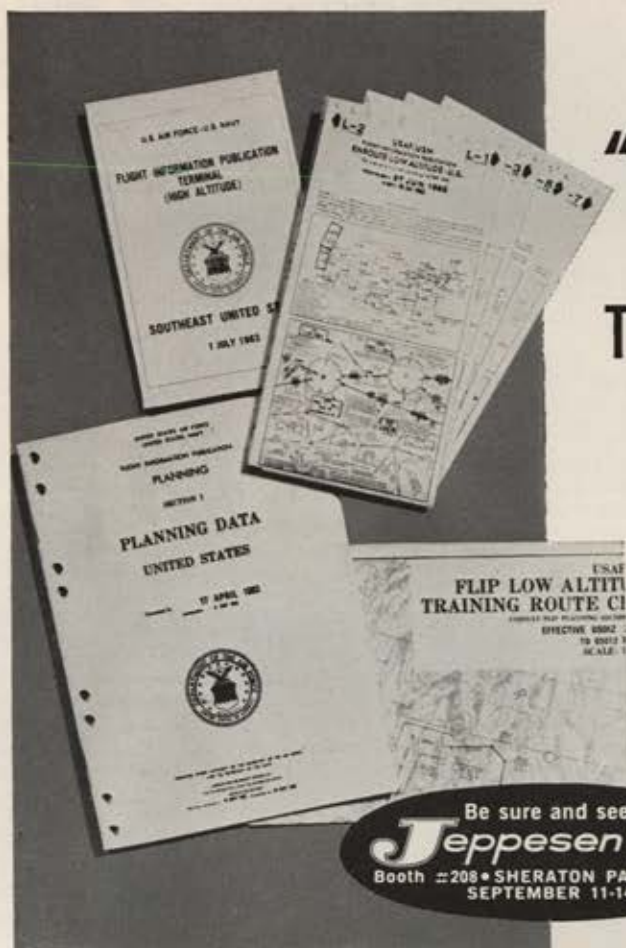
increased fuel capacity. **Contractor:** North American Aviation. **Powerplant:** Wright R-1820 piston engine. **Powerplant hp/thrust:** 1,425 hp. **Dimensions:** span 40 ft. 1 in., length 32 ft., height 12 ft. 8 in. **Speed:** 343 mph. **Ceiling:** 35,500 ft. **Range:** 1,060 mi. **Bomb load:** 2 100-lb. 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 transporting 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. **Contractor:** General Dynamics/Convair. **Powerplant:** 2 Pratt & Whitney R2800-99W piston engines. **Powerplant 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:** 44,000 lb. **Primary using commands:** Air Training Command, Headquarters Command, Continental Air Command.

T-33 SHOOTING STAR—jet pilot trainer; highly versatile 2-place trainer version of F-80; has dual controls, ejection seats; made first flight in March 1948; widely used throughout Air Force for proficiency flying. More than 5,600 T-Birds were built. **Contractor:** Lockheed Aircraft Corp. **Powerplant:** Allison J33-35 turbojet. **Powerplant 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:**

(Continued on page 206)



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TRAINERS

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—highly successful primary jet trainer, with more than 600 in use for pilot training. May find new role in counterinsurgency work. USAF has contracted with Cessna to develop a pair of T-37Ds for test by Special Air Warfare Center. Changes include beefing up wing structure to carry 3,000 lb. of weapons and increasing power to reduce takeoff roll. Engines being considered to replace present powerplant are General Electric J85s of 2,800-lb. thrust or Continental J69-T-39s with 2,500-lb. thrust. Armament: general purpose or napalm bombs, gun pods, or rocket pods would be slung from three points under fuselage and a General Electric 7,600-rpm Gatling gun installed in the nose. One possibility is that charged-up T-37Ds would be made available to Latin American countries as pilot trainers, readily convertible to fighter bombers if needed in counterinsurgency. Following data is for T-37B trainer. Contractor: Cessna Aircraft Corp. Power-

plant: 2 Continental J69-T-25 turbojets. Powerplant 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 8 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 Aviatix Trophy for extraordinary flying skill in the year 1961. Contractor: Northrop Corp. Powerplant: 2 General Electric J85-5s. Powerplant hp/thrust: 3,850 lb. with afterburner. 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. Ceil-



H-43

GALLERY OF USAF WEAPONS

USAF HELICOPTERS



H-19



H-21

UH-1F IROQUOIS—USAF has ordered 25 of this 2,000-lb. payload helicopter for ICBM site support, with option to buy 30 more next year. Also used by Army, Marines. Contractor: Bell Helicopter Co. Powerplant: 1 General Electric T58-8B. Powerplant hp/thrust: 1,250 shp. Dimensions: length 44 ft. 7 in.; rotor span 48 ft., height 14 ft. 4 in. Speed: 138 mph. Ceiling: 12,500 ft. Range: with 800-lb. payload, 250 mi. Payload: 10 passengers or 2,000 lb. Crew: 1. Maximum gross takeoff weight: 8,500 lb. Primary using command: Strategic Air Command.

CH-3C—high-speed twin-turbine cargo or personnel helicopter. USAF has ordered 22 for use as support helicopters supplementing its CH-3Bs. CH-3C features hydraulically operated rear ramp

for straight-in loading of vehicles, 2,000-lb. winch for internal cargo handling, and, like -3B, can operate from land or water. Sister aircraft of Navy SH-3A which holds world's helicopter speed record of 210.6 mph. Contractor: Sikorsky Aircraft Div., United Aircraft Corp. Powerplant: 2 General Electric T58 shaft turbine engines. Powerplant hp/thrust: 1,250 shp each. Dimensions: length 58 ft. 11 in., rotor diameter 62 ft., height 15 ft. 4 in. Speed: 150 mph. Ceiling: 6,700 ft. Range: 800 mi. with 2,400-lb. load. Load: will carry 5,000 lb. or 25 passengers 238 mi. Crew: 3. Maximum gross takeoff weight: 18,000 lb. Primary using command: Strategic Air Command.

UH-13 SIOUX—numerous models of this light three- or four-place helicopter



T-37B



T-38



T-39

are in use in all services as well as in civilian flying. More than 2,000 have been built. UH-13J, latest model in USAF inventory, is used for White House passengers. It is similar to UH-13H except for larger main rotor and cabin expanded to accommodate four rather than three. Contractor: Bell Helicopter Corp. Powerplant: 1 Lycoming O-435-23. Powerplant hp/thrust: 240 hp. Dimensions: length 32 ft. 4 in., rotor diameter 37 ft. 2 in., 35 ft. 1 in. on UH-13H, height 9 ft. 4 in. Speed: 105 mph. Ceiling: 17,000 ft. Range: 200 mi. Crew: 1. Maximum gross takeoff weight: 2,800 lb. Primary using commands: Military Air Transport Service, most major commands.

H-19B CHICKASAW—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. Powerplant: A and C models use Pratt & Whitney R1340-57; B and D use Wright R1300-3. Powerplant 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.

CH-21 WORKHORSE—troop carrier helicopter; first flight April 1952; features well-known "banana" fuselage. Cockpit has side-by-side seating with the pilot on the right. In H-21A 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. HH-21B modified for search and rescue mission. Contractor: Vertol Div., Boeing Co. Powerplant: Wright R1820. Powerplant hp/thrust: 1,425 hp. Dimensions: blade 44 ft., length 52 ft. 6 in., height 16 ft.

ing: above 55,000 ft. Range: beyond 1,000 mi. Crew: 2—student and instructor, tandem. Maximum gross takeoff weight: 11,600 lb. Primary using command: Air Training Command.

T-39 SABRELINER—utility plane-trainer; first flight September 16, 1958; twin-jet featuring sweptback wings, 2 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. T-39A is basic utility trainer and light, fast transport; T-39B fitted with all-weather search-and-range-radar (NASARR) and Doppler navigation system for training F-105 pilots. Contractor: North American Aviation. Powerplant: Pratt & Whitney J60-P3. Powerplant 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, Strategic Air Command, Air Force Systems Command, Military Air Transport Service.

Speed: 140 mph. Ceiling: above 20,000 ft. Range: 300 mi. 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, Military Air Transport Service.

HH-43 HUSKIE—crash-rescue, fire-fighting helicopter. HH-43A employs Pratt & Whitney R-1340 piston engine, HH-43B a Lycoming T53-1 shaft turbine. 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. Powerplant: Pratt & Whitney R1340-48 piston engine, H-43A; Lycoming T-53L-1A turbine, H-43B. Powerplant 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: All major commands.

CH-46B—long-range utility support transport. USAF counterpart of Vertol 107-II commercial model; previously designated HX-2. Amphibious capability. Contract let in June 1962. Contractor: Boeing Co., Vertol Div. Powerplant: 2 General Electric T58-8 shaft turbines. Powerplant 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: 19,000 lb. Primary using commands: Tactical Air Command, Strategic Air Command.

(Continued on following page)



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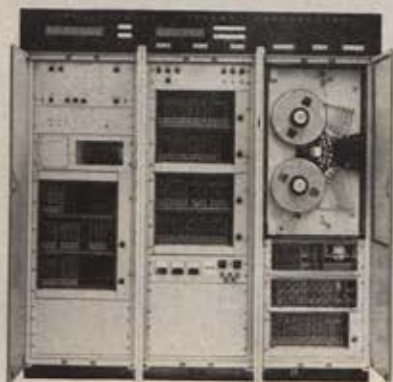


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U-2

AIR FORCE UTILITY AND TEST AIRCRAFT



U-10A



X-15

U-2—high-altitude weather and photo reconnaissance aircraft. Provided photo evidence of Soviet missile buildup in Cuba; one shot down over Cuba, killing its pilot, Maj. Rudolf Anderson, only combat casualty of Cuba crisis. Also destroyed in reconnaissance operations were a U-2 flown by Francis G. Powers over USSR in May 1960 and one by a Chinese Nationalist pilot over Communist China in September 1962. Now used primarily in high-altitude sampling program (HASP) for Defense Atomic Support Agency, operating in various parts of the world. One SAC WU-2 wing, 4080th now based at Davis-Monthan AFB, Ariz., moving from Laughlin AFB, Tex., in July 1963. Earlier models powered by Pratt & Whitney J57 turbojet, later ones—including that shot down over USSR—employ Pratt & Whitney J75-13 adapted to run on low-volatility fuel. Its long range can be further extended by shutting off engine and gliding. **Contractor:** Lockheed Aircraft Corp. **Powerplant:** Pratt & Whitney J57C or Pratt & Whitney J75-13. **Powerplant hp/thrust:** J57C, 11,000 lb.; J75-13, about 20,000 lb. **Dimensions:** length 49 ft. 7 in., span 80 ft., height 13 ft. **Speed:** 500 mph. **Ceiling:** above 70,000 ft. **Range:** 3,000 mi. or more. **Armament:** none. **Crew:** 1; 2 in U-2D. **Maximum gross takeoff weight:** 17,270 lb. (J57C). **Primary using command:** Strategic Air Command.

U-3—low-wing twin-engine liaison administration aircraft, "off-shelf" counterpart of Cessna 310 civil model. Initially designated L-27A. USAF bought 160 U-3As and 35 U-3Bs, latter with better all-weather capability and slightly increased powerplant. **Contractor:** Cessna Aircraft Co. **Powerplant:** A, Continental 0470-M; B, 10470-D. **Powerplant hp/thrust:** A, 240 hp; B, 260 hp. **Dimensions:** length 29 ft. 7 in., span 36 ft. 11 in., height 10 ft. **Speed:** 240 mph. **Ceiling:** 21,500 ft. **Range:** 1,400 mi. **Crew:** 2, plus 3 passengers. **Maximum gross take-**

off weight: 4,990 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. **Powerplant:** 2 Lycoming IGO-540 6-cylinder air-cooled engines. **Powerplant hp/thrust:** 350 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:** 1,700 mi. **Maximum gross takeoff weight:** 7,500 lb. **Primary using command:** Headquarters Command.

U-5A—twin-engine high-wing utility liaison plane, variation of the single engine U-10, being tested for possible Air Commando use. Engines are mounted on wings, providing better visibility and reducing damage to props and engines in operating from unimproved surfaces. **Contractor:** Helio Aircraft Corp. **Powerplant:** 2 Lycoming CO-435. **Powerplant hp/thrust:** 260 hp each. **Dimensions:** length 32 ft. 10 in., span 41 ft., height 8 ft. 10 in. **Speed:** 187 mph. **Ceiling:** 22,000 ft. **Range:** 810 mi. **Crew:** 1, with room for 5 passengers or cargo. **Maximum gross takeoff weight:** 5,725 lb. **Primary using command:** Tactical Air Command.

U-6A BEAVER — liaison-administration; high-wing lightplane produced in limited quantities for Air Force and Army since 1947. Last of 58 U-6As delivered to SAC in July 1963. **Contractor:** de Havilland Aircraft Co. **Powerplant:** Pratt & Whitney R985-AN-3 piston engine. **Powerplant hp/thrust:** 450 hp. **Dimensions:** span 48 ft., length 30 ft. 4 in., height 9 ft. **Speed:** 160 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-10—4-6-place utility transport employed primarily in counterinsurgency missions. A, B, C versions in use. Principal advantage is its ability to fly at

speeds as low as 30 mph, providing excellent visual reconnaissance capability in jungle terrain and facilitating short field landing and takeoff. It can take off over treetops within 500 ft. from unimproved surfaces, land in 400 ft. or less. In addition to those already employed by Air Commandos in US and overseas, USAF has ordered 24 for 4 Air Guard Commando groups. **Contractor:** Helio Aircraft Corp. **Powerplant:** A, B, Lycoming GO-480; C, CSO-540. **Powerplant hp/thrust:** A, B, 295 hp; C, 360 hp. **Dimensions:** length 30 ft., span 39 ft., height 8 ft. 10 in. **Speed:** 150 mph. **Ceiling:** 22,500 ft. **Range:** 800 mi. **Payload:** 1,000 lb.; B and C models have parashoot door. **Armament:** Can be fitted with variety of light armament, cameras, etc. **Crew:** 2—pilot and observer. **Maximum gross takeoff weight:** 4,000 lb. **Primary using commands:** Tactical Air Command, Air National Guard.

A-1E SKYRAIDER—former Navy fighter being adapted for use by Air Commando wing. Two squadrons of A-1Es now being formed. Formerly designated AD-5, carries a one- or two-man crew, and can be adapted to any of a dozen combat or tactical versions, including day and night attack, photo reconnaissance, an 8-passenger transport, or a 4-litter ambulance plane. **Contractor:** Douglas Aircraft Corp. **Powerplant:** Wright R-3350. **Powerplant hp/thrust:** 2,700 hp. **Dimensions:** length 38 ft. 10 in., span 50 ft., height 15 ft. 8 in. **Speed:** 285 mph. **Ceiling:** over 25,000 ft. **Range:** 1,200 mi. **Bomb load:** 4 tons. **Armament:** 2 20-mm. cannon; provision for rockets, napalm, etc. **Crew:** 1 or 2. **Maximum gross takeoff weight:** 19,000 lb. **Primary using command:** Tactical Air Command.

HU-16 ALBATROSS—search-and-rescue amphibian, operational since 1947, has been extremely active around the world since. Formerly designated SA-16. B model slightly larger. 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. **Powerplant:** 2 Wright R1820-76A or B piston engines. **Powerplant hp/thrust:** 1,425 hp each. **Dimensions:** A, span 80 ft., length 60 ft. 8 in., height 24 ft. 4 in.; B, span 96 ft. 8 in., length 62 ft. 10 in., height 25 ft. 10 in. **Speed:** 230 mph. **Ceiling:** 21,500 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 National Guard.

XV-6A—VTOL experimental fighter being built in UK by Hawker-Siddeley as P.1127. US is participating with British and Western Germany in test of nine prototypes; all services joining in US evaluations. First flight scheduled for October. **Contractor:** Hawker Aircraft Ltd. **Powerplant:** Bristol-Siddeley BS.53 Pegasus. **Powerplant hp/thrust:** 18,400 lb. **Dimensions:** length 41 ft. 11 in., span 22 ft. 5 in., height 10 ft. 3 in. **Crew:** 1. No other details available.

X-15—entering a new phase of research flights in hypersonic range up to Mach 8 and altitude of 400,000 ft. under new contract between USAF and North American. Skin to be reworked to withstand heat of 2,400 degrees F compared with 1,200 to 1,400 degrees in current models. Fuselage to be lengthened by 2 feet, and a drop tank added to accommodate 12,500 lb. more fuel, extending

powered flight from 90 seconds to 145 seconds. NASA pilot Joe Walker reached 348,000 ft. (66 mi.) in No. 3 X-15 on July 19, eclipsing Maj. Bob White's record of 314,750 ft. Walker also holds X-15 speed record of 4,105 mph. Neither record was expected to stand for long. Walker's altitude record was 90th flight of three X-15s since program began June 8, 1959. **Contractor:** North American Aviation, Inc. **Powerplant:** Reaction Motors Div., Thiokol Corp., XLR99. **Powerplant hp/thrust:** 57,000 lb. at sea level, 70,000 lb. at altitude. **Dimensions:** (before modification) length 50 ft., span 22 ft., height 13 ft. 6 in. **Speed:** Mach 7. **Ceiling:** 400,000 ft. or more. **Crew:** 1. **Maximum gross takeoff weight:** 32,276 lb. **Primary using agency:** National Aeronautics and Space Administration.

X-19—twin-engine, high-tandem-wing VTOL aircraft; first prototype rolled out in July. Two have been purchased for triservice evaluation. Represents a new concept of flight, employing radial force for lift. 4 propellers, 1 on each wing-tip fore and aft, are tilted vertically for takeoff and landing, swing through 90 degrees in climb, are in normal horizontal position for cruise. Cross-shafting and overrunning clutches connect propellers to engines so that either engine can drive all 4 propellers continuously. Can perform entire mission on 1 engine. **Contractor:** Curtiss Wright Corp. **Powerplant:** 2 Lycoming T55-5 propjet engines located in aft fuselage. **Powerplant hp/thrust:** 2,250 shp each. **Dimensions:** length 44 ft., span 34 ft. 6 in., height 16 ft. **Speed:** 0 to 460 mph. **Ceiling:** 6,000 ft. with load. **Range:** 900 mi. **Payload:** 1,200 lb.; seats 6. **Maximum gross takeoff weight:** 13,000 lb. **Primary using command:** Air Force Systems Command.

X-20 DYNA-SOAR—designed to be first US winged orbital vehicle, to be boosted by Titan III and capable of one or more earth orbits before reentering atmosphere and landing like an airplane. Dyna-Soar, an abbreviation of dynamic soaring, indicative of plane's performance in returning from orbit. Continued development in doubt at this writing; may be combined in some form with Gemini 2-man space vehicle. First flights, initially unmanned, are scheduled for 1966, preceded by test airdrops in 1965. **Contractor:** Boeing Co. **Powerplant:** Titan III booster, Thiokol rocket motor for escape in launch emergency, Sundstrand auxiliary hydrogen oxygen unit for accessory power. **Powerplant hp/thrust:** 2.5 million pounds. **Dimensions:** length 35 ft., width 20 ft., height 8 ft. **Speed:** over 15,000 mph. **Crew:** 1. **Maximum gross takeoff weight:** over 10,000 lb. **Primary using commands:** Air Force Systems Command, National Aeronautics and Space Administration.

X-21—designed to explore laminar flow control which can, in theory, double an aircraft's range and endurance. Two prototypes being built using WB-66D airframes. First plane now conducting flight tests at Edwards AFB, Calif. WB-66 engines have been removed, with nacelles being used to house pumps drawing air from wing surfaces through lengthwise slots. **Contractor:** Northrop Corp. **Powerplant:** 2 General Electric J79-13 turbojets. **Powerplant hp/thrust:** 10,000 lb. **Dimensions:** length 75 ft. 2 in., span 93 ft. 6 in., height 23 ft. 7 in. **Speed:** over 700 mph. **Maximum takeoff weight:** 83,000 lb. **Primary using commands:** Air Force Systems Command, Federal Aviation Agency.—END



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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

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\$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.

9-63



Colin P. Kelly Squadron, N. Y., was named after the WW II Air Force hero. His son, a 1963 graduate of West Point, has been a frequent guest at various Squadron programs.



Pennsylvania's Carl Long, Bill Lunsford, and Jack Gross welcome President J. B. Montgomery to annual Wing Convention.



AFA ON MAIN STREET

By Gus Duda



Sponsorship of an AF Academy Team before Onondaga County, N. Y., high schools is an annual project of the Syracuse Squadron, with fine civic reception.



Mitchel Squadron-sponsored Education Council in New York sponsored outstanding educational programs in Long Island area during past two years.

THE AFA National Convention can logically be considered the end of the AFA year, and it is customary to outline in this space some of the outstanding events sponsored by AFA units all over the nation and acknowledge top individual efforts by AFA leaders. The past twelve months have seen some outstanding projects.

- Among the top unit efforts, the projects of the **Colin P. Kelly Squadron**, Rome, N. Y., ranked high. The squadron featured a mammoth community campaign to build a recreation center and swimming pool for SAC alert crews and their families at nearby Griffiss AFB. Also featured was a community-wide observance of the anniversary of the Bataan-Corregidor campaign.

- **Leigh Hunt**, retiring **Salt Lake City Squadron** Commander, is boasting of the fine programs that made up that Squadron's activity calendar for 1962-63. Educational projects were the feature of the effort.

- Excellent programs which involved the entire community were "run of the mill" with the **Goddard Squadron** in California, topped off with its sponsorship of the outstanding California Wing Convention.

- **Tucson Squadron's** "Arizona Aerospace Days" in February, a three-day event cosponsored with the Chamber of Commerce, was a smash success.

- **Boise, Idaho**, staged a magnificent air show at Gowen Field with an audience estimated at over 40,000. Not a bad figure, since Boise's population is in the neighborhood of 35,000. **Jim Trail**, AFA Board Chairman in 1958-59, was General Chairman.

- **Ogden, Utah**, and **Erie, Pa.**, were other Squadrons sponsoring outstanding public demonstrations, with more than 35,000 turning out for the annual Weber Valley Air Fair in Ogden, under the direction of past Vice President **Dale R. Erickson**, and a similar crowd at Port Erie Airport for the annual Fourth of July Squadron program.

- The **Ohio Wing** arranged a four-day trip in the state by the Air University Briefing Team, during which it appeared before more than 6,000 teachers and students. Wing Commander **Glenn Mishler** and **Akron Squadron's Charles Whitaker** were cochairmen. The **Mitchel, N. Y.**,

(Continued on following page)



Boise, Idaho, Squadron's outstanding program in 1963 was the Idaho Centennial Air Fair, cosponsored with Idaho ANG.



Hudson, N. J., was one of several AFA outfits that sponsored Science Fair projects. Don Strait, AFA Director, is pictured with 1963 exhibit winners.



Gordon Nesler, right, NASA lecturer, is shown with Edward O'Hara, left, and Leigh Hunt, after one of Salt Lake City Squadron's successful community relations events in March.

Squadron, under the direction of Past Commander Sam Hananel, is active in promoting the efforts of the New York Education Council in educational events. The Syracuse, N. Y., Squadron features an annual county-wide tour of high schools by a team from the USAF Academy. The 1st Reserve Squadron, Calif., sponsored its fifth annual Education Workshop at Long Beach State College. And the Utah Wing again presented its fine Intermountain Aerospace Education Symposium.

• The Ak-Sar-Ben Squadron in Omaha, perennial leader in AFA's membership effort, received stiff competition from the Olmsted, Pa., Squadron, which carried out an ambitious campaign under the direction of Past Squadron Commander Oliver R. Johns and Pennsylvania Wing Commander Bill Lunsford, with the assistance of Maj. Gen. Frederic Miller, Middletown AMA Commander. Other spirited membership competition came from the reactivated AFA Squadron at Oklahoma City, where a drive began in late July, and promises to top anything staged so far. Here the leaders were Maj. Gen. Lewis Mundell, Oklahoma City AMA Commander, and Joe Shosid, Fort Worth, AFA Vice President.

Shosid has been active in other areas, with a successful campaign in New Mexico leading to the rejuvenation of the Wing and three Squadrons. Maj. Gen. John W. White, AFSWC Commander at Kirtland, AFB, was of invaluable assistance in New Mexico.

Another great individual effort took place in the South Central Region, under Vice President N. W. "Mike" deBerardinis, Shreveport. He organized five new Squadrons and an outstanding Airpower Council, planned three separate membership campaigns, and carried out an extremely ambitious educational effort resulting in three fine Seminars, with a fourth scheduled for November at Louisiana State University. The latter program promises to become the most important such AFA-sponsored Seminar.

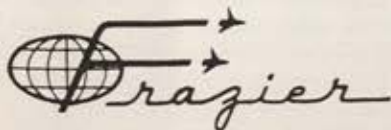
These few examples are indicative of the efforts of our Wings, Squadrons, and individual leaders all across the country. In highlighting them we pay tribute to the countless hours of selfless effort, by thousands of individuals, in dozens of cities from San Diego to Boston, from Seattle to Miami. If in telling of these accomplishments we appear to be boasting of the capability of AFA to tell the aerospace story in the community, it is pardonable. Anyone who had a hand in these—and dozens of other unrecounted projects of importance—can be proud that they have shared in emphasizing the importance of AFA on Main Street, USA.—END



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9-63

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The insurance will be provided by the group insurance policy issued by United Benefit Life Insurance Company to the Air Force Association. However, Guard and Reserve members who are permanent residents of Ohio, Texas, Wisconsin, and New Jersey, will not be covered under the group policy, but will be eligible under individual policies providing similar benefits at the same rate.

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- Waiver of premium in event of total disability,
- Worldwide coverage,
- Full choice of settlement options.

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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 twelve 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 from carbon monoxide, or (4) during any period while the policy is in force under the waiver of premium provision of the master policy.

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(UNDERWRITTEN BY UNITED OF OMAHA)

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Address (please indicate permanent address if paying by allotment) _____

City _____ Zone _____ State _____

Date of Birth _____

Beneficiary _____ Relationship _____

This insurance is available only to AFA members:

- ☐ I enclose \$6 for annual AFA membership dues (includes subscription (\$5) to AIR FORCE/SPACE DIGEST).
- ☐ I am an AFA member.

I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am eligible for this insurance under the category indicated, that I am currently in good health, and that I have successfully passed, within the past two year period, the last physical examination required by my branch of service. (Reserve and Guard personnel not on extended duty must include with this application a copy of their most recently completed SF88.)

Signature of Applicant _____ Date _____

Application must be accompanied by check or money order.

Send remittance to INSURANCE DIVISION, AFA, 1901 PENNSYLVANIA AVE., N.W., WASHINGTON 6, D. C.

50% Additional Indemnity for ALL Accidental Deaths

SCHEDULE OF BENEFITS

DEATH FROM NATURAL CAUSES

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*

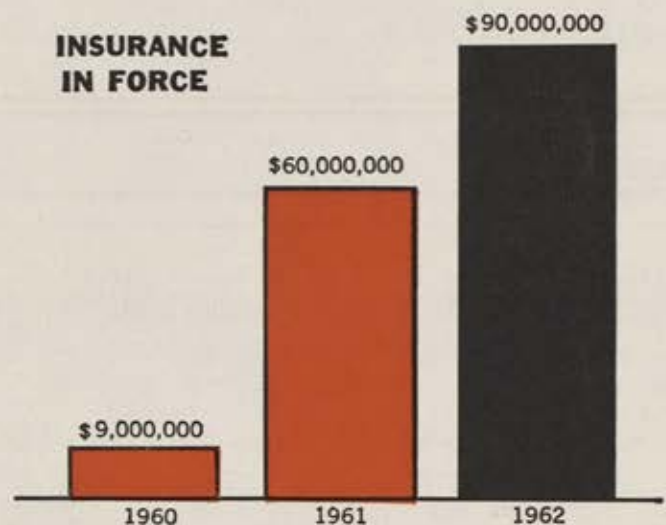
Reserve and Guard personnel must purchase policy prior to age 50; active duty personnel prior to age 60.

ALL ACCIDENTAL DEATHS

Your Age	Amount of Insurance	
	On Flying Status	Not on Flying Status
20-24	\$15,000	\$30,000
25-29	16,500	30,000
30-34	18,750	30,000
35-39	19,500	30,000
40-44	20,250	26,250
45-49	18,750	20,250
50-54*	15,000*	15,000*
55-59*	15,000*	15,000*
60-64*	11,250*	11,250*

Reserve and Guard personnel must purchase policy prior to age 50; active duty personnel prior to age 60.

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Please indicate below the form of payment you elect:

- ☐ Monthly government allotment (I enclose \$20 to cover the period necessary for any allotment to be processed.)
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I ☐ (am) ☐ (am not) currently on flying status.

Category of eligibility (please check appropriate box in each column)

- | | |
|---|--------------------------------------|
| ☐ Active Duty | ☐ Air Force |
| ☐ Ready Reserve | ☐ Army |
| ☐ National Guard | ☐ Navy |
| | ☐ Marine |
| | ☐ Coast Guard |

Guide to Air Force Bases

WHERE THEY ARE LOCATED • THEIR PHONE NUMBERS
WHAT THEIR JOBS ARE • HOW THEY WERE NAMED

ALTUS AFB, Okla., 3 mi. NE of Altus. Phone: Area Code 405, HUDson 2-8100. Heavy bomber, tanker, and Atlas ICBM support base, 2d AF, SAC. Named for city.

AMARILLO AFB, Tex., 14 mi. SE of Amarillo. Phone: Area Code 806, DIamond 9-1511. Technical Training Center; supply and administrative training; jet mechanics and airframe repair schools, ATC; heavy bomber and tanker base, 15th AF, SAC. Named for nearby city.

ANDREWS AFB, Md., 11 mi. SE of Washington, D. C. Phone: Area Code 301, 981-9111. Headquarters Command; Hq. AFSC; Hq. 2d Reserve Region, CONAC; Naval Air Reserve Training Unit. 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, 372-2501. 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, 2 mi. E of Shreveport. Phone: Area Code 318, 425-1211. Hq. 2d AF, SAC; strategic heavy bomber and tanker 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, 634-3000. Heavy bomber, tanker, and Titan ICBM support base, 15th AF, SAC. Formerly Camp Beale, named for Brig. Gen. Edward F. Beale, California Indian agent before the Civil War.

BELLOWS AFS, 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, GRenwood 6-6481. Heavy bomber and tanker 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. NE of El Paso. Phone: Area Code 915, LOgan 6-6711. Heavy bomber and tanker 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. SE of Blytheville. Phone: Area Code 501, LEhigh 2-5667. Heavy bomber and tanker base, 4th Air Division, 42d Strategic Aerospace Division, 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; medical research, education, and training, AFSC. 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 and tanker base, 2d AF, SAC. 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 Air Forces 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 3-1611. Heavy bomber and tanker operational and training 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, 893-3111. Aircraft maintenance and weather schools, Technical Training Center, ATC. Named for Octave Chanute, aviation pioneer and civil 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. Base being deactivated. It will maintain a skeleton crew until about 1964. 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, 382-3811. Reserve training, CONAC. Named geographically.

CLINTON-SHERMAN AFB, Okla., 1 mi. W of Burns Flat. Phone: Area Code 405, Burns Flat, LOgan 2-3121. Heavy bomber and tanker base, 2d AF, SAC. Formerly Clinton NAS.

COLUMBUS AFB, Miss., 9 mi. N of Columbus. Phone: Area Code 601, GENEva 4-7322. Heavy bomber and jet tanker 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, 428-4461. Reserve training, troop carrier, Hq. 3d Reserve Region, CONAC; ADC, joint use. Formerly Marietta AFB, renamed for Capt. Charles M. Dobbins, killed while transporting paratroops over Sicily in June 1943.

DOVER AFB, Del., 3 mi. SE of Dover. Phone: Area Code 302, 734-8211. 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, 989-2300. Heavy bomber and tanker 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 6-0212. Heavy bomber and Atlas ICBM support base, 15th AF, SAC; troop carrier base, 12th AF, TAC; Nike missile battalion, Headquarters, Army. 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., 18 mi. E of Rosamond. 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 AF AUXILIARY FIELD #9 (See Hurlburt Field.)
EGLIN AFB, Fla., 2 mi. SW of Valparaiso. Phone: Area Code 305, 946-9680. 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.

EIELSON AFB, Alaska, 26 mi. SE of Fairbanks. Phone: DRake 7-3107. Alaskan Air Command support base for SAC mission, weather reconnaissance, and air defense missions. Named for Col. Carl B. Eielson, Alaskan air pioneer who flew across the North Pole with Sir Hubert Wilkins in 1928, flew the first US airmail in Alaska, killed attempting to aid an iced-in vessel in the Bering Sea.

ELLINGTON AFB, Tex., 16 mi. SE of Houston. Phone: Area Code 713, HUDson 7-1400. Air Reserve, CONAC. Named for 2d Lt. Eric L. Ellington, killed during training flight near San Diego in 1913.

ELLSWORTH AFB, S. D., 8 mi. NE of Rapid City. Phone: Area Code 605, FILLimore 2-2400. Heavy bomber, tanker, and Titan ICBM support base, 15th AF, SAC; 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.

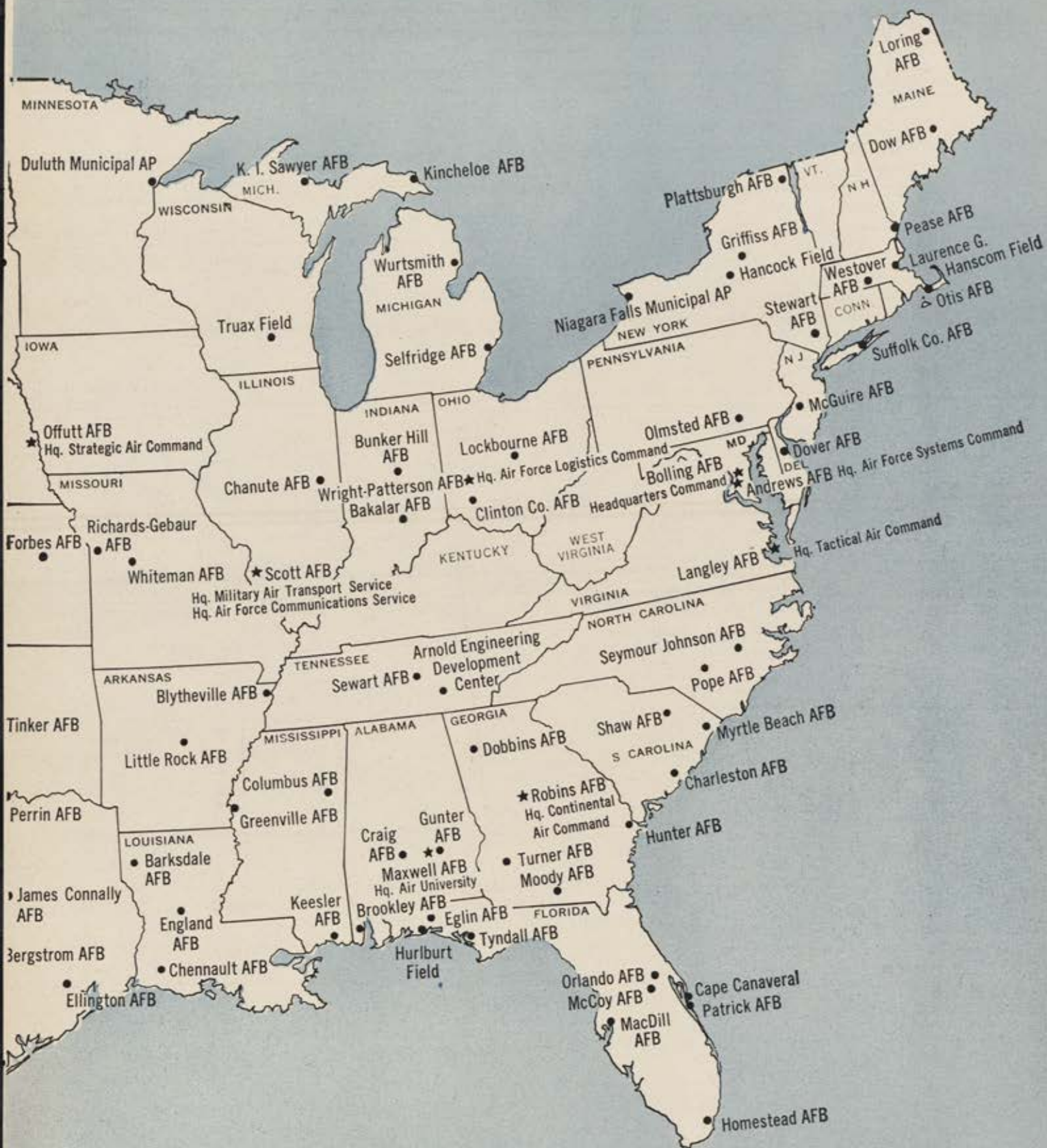
ENGLAND AFB, La., 6 mi. NNW of Alexandria. Phone: Area Code 318, HI 3-4561. Tactical fighter base, 12th AF, TAC. Formerly Alexandria AFB, renamed for Lt. Col. John B. England, WW II ace killed in air crash in France, November 17, 1954.

ENT AFB, Colo., Colorado Springs. Phone: Area Code 303, 635-8911. Hq. NORAD; Hq. ADC. Named for Maj. (Continued on page 220)

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





Major Active Air Force Bases in the United States

An *AIR FORCE* Magazine Map (As of August 15, 1963)

GUIDE TO AIR FORCE BASES

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 7-1212. Heavy bomber, tanker, and Atlas ICBM support base, 15th AF SAC. 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, reconnaissance, and Atlas ICBM support base, 2d AF, SAC. 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., adjacent to Cheyenne. Phone: Area Code 307, 775-2510. Atlas ICBM support base; Minuteman ICBM site under construction, 8th AF, 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, CHapel 6-8611. 831st Air Division, 12th AF, TAC and 329 FIS, ADC (tenant). 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 and tanker base, 15th AF, SAC. Named for city. **GOODFELLOW AFB**, Tex., 2 mi. SE of San Angelo. Phone: Area Code 915, San Angelo 653-2471. USAF Security Service base; tactical fighter base, 12th AF, TAC; fighter-interceptor mission, ADC. 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 772-3431. Heavy bomber and tanker base, 2d AF, SAC; fighter-interceptor tenant, SAC; Minuteman ICBM site under construction.

GRAY AFB, Tex., 6 mi. SW of Killeen. Phone: Area Code 817, KEystone 2-3209. 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 Air Materiel Area, AFLC; fighter-interceptor base, ADC; heavy bomber and tanker base, SAC. Formerly Rome AFB, 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, 272-1210. Extension Course Institute, USAF, AU; training base for USAF Medical Service School, ATC; SAGE Direction Center, ADC; Montgomery Air Defense Sector, 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.

HANCOCK FIELD, N. Y., 5 mi. NNE of Syracuse. Phone: Area Code 315, GLenview 8-5500. Hq. ADC; 26th Air Division; SAGE. Formerly Syracuse AF Station.

HANSCOM FIELD. (See Laurence G. Hanscom Field.)

HICKAM AFB, Oahu, Hawaii, 6 mi. SW of Honolulu. Phone: Honolulu 44-1111. 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 5-5215, east area; TAYlor 5-9711, west area. 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; tactical fighter base, TAC. 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; TAC and ADC tactical fighter base. Named for city.

HUNTER AFB, Ga., 3 mi. SW of Savannah. Phone: Area Code 912, ADam 4-4461. Heavy bomber and tanker base, 8th AF, SAC; tactical fighter base, TAC; fighter-interceptor base, ADC; troop carrier base, EASTAF, MATS; home of 63d Troop Carrier Wing, MATS. Named for Maj. Gen. Frank O'D. Hunter, WW I ace, recipient of DSC, four clusters, past AFA Director.

HURLBURT FIELD (Eglin AF Auxiliary Field #9), Fla., 6 mi. W of Fort Walton Beach. Phone: Area Code 305, OR. 118. TAC base. Home of USAF Special Air Warfare Center (1st Air Commandos), USAF Air Ground Operations School. On Eglin AFB reservation.

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, ATC. Formerly Waco AFB, renamed for Col. James T. Connally of Waco, who was killed 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, GYpsy 5-5611. Fighter-interceptor and air defense missile base, ADC; heavy bomber and tanker 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 the Bell X-2 rocketplane, killed on July 26, 1958, in the 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., borders southern edge of Albuquerque. Phone: Area Code 505, CHApel 7-1711. Research and development base, Hq. AF Special Weapons Center and AF Weapons Laboratory, 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., 23 mi. S of Marquette. Phone: Area Code 906, DICKens 6-9211. Fighter-interceptor base, ADC; heavy bomber and tanker base, 2d AF, SAC; SAGE. Named for Kenneth I. Sawyer, Marquette County Road Commissioner, who died in 1944.

LACKLAND AFB, Tex., 7 mi. WSW of San Antonio. Phone: Area Code 512, OR. 4-3211. Military Training Center, WAF training, 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; troop carrier base, TAC; fighter-interceptor and air defense missile base, ADC. Named for Samuel P. Langley, pioneer aeronautical scientist, died in 1906.

LAREDO AFB, Tex., 3 mi. NE of Laredo. Phone: Area Code 512, RANDolph 3-9121. Undergraduate pilot training, ATC. Named for city.

(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

Ernest Harmon AFB, Newfoundland
Goose AB, Labrador

CANAL ZONE

Albrook AFB
Howard AFB

CRETE

Iraklion Air Station

FRANCE

Camp Des Loges
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

Athens Airport

GREENLAND

Sondrestrom AB
Thule AB

GUAM

Andersen AFB

HAWAII

Bellows AFB
Hickam AFB
Wheeler AFB

ICELAND

Keflavik Airport

ITALY

Aviano AB
Naples Admin.

IWO JIMA

Iwo Jima AB

JAPAN

Fuchu Air Station
Itazuke AB
Johnson Air Station
Misawa AB
Tachikawa AB
Yokota AB

JOHNSTON ISLAND

Johnston Island AB

KOREA

Kimpo AB
Kunsan AB
Osan AB

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

Romey AFB

SPAIN

Moran AB
Torrejon AB
Zaragoza AB

TAIWAN (FORMOSA)

Tainan AB
Taipei Air Station

TURKEY

Ankara Air Station
Cigli AB
Incirlik AB
Izmir Admin.

UNITED KINGDOM

Alconbury RAF Station
Bentwaters RAF Station
Brize Norton RAF Station
Chelveston RAF Station
Fairford RAF Station
Greenham Common RAF Station
High Wycombe Air 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

GUIDE TO AIR FORCE BASES

LARSON AFB, Wash., 5 mi. N of Moses Lake. Phone: Area Code 509, 769-1212. Fighter-interceptor base, ADC; heavy bomber and tanker base, 15th AF, SAC; Titan ICBM support base. Formerly Moses Lake AAB, 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, 298-3511. Undergraduate pilot training, ATC. 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, 274-6100. Hq. USAF Electronic Systems Div. and Office of Aerospace Research for USAF Cambridge Research Laboratories, AFSC. Formerly Bedford Airport, 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, GRower 7-6011. Medium bomber and Atlas ICBM support base, 2d AF, SAC. Named for city.

LITTLE ROCK AFB, Ark., 15 mi. NE of Little Rock. Phone: Area Code 501, YUkon 5-1431. Medium bomber and tanker base, 2d AF, SAC; final phase of Titan II ICBM site under construction. Named for city.

LOCKBOURNE AFB, Ohio, 11 mi. SSE of Columbus. Phone: Area Code 614, TEMple 3-8211. Medium bomber and tanker 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 and tanker 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, 8th 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 836-1411. Hq. Strike Command; tactical fighter and training base, 9th AF, TAC. 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. 341st Strategic Missile Wing, 15th AF, SAC; fighter-interceptor base, ADC; SAGE interim control center; tanker base. Home of nation's first Minuteman. 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; heavy bomber and tanker 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., 12 mi. SE of Sacramento. Phone: Area Code 916, EMpire 3-3161. Heavy bomber and tanker base, 15th AF, SAC; advanced 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, 265-5621. Hq. Air University; Air War College; Air Command and Staff College; Hq. AFOTC Aerospace Studies Institute; Squadron Officer School; Warfare Systems School; Academic Instructor and Allied Officer School. 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 5-1151. Tactical fighter base, 12th AF, TAC; Titan ICBM site under construction, 8th AF, SAC. 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, 855-3210. 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., 18 mi. SE of Trenton. Phone: Area Code 609, RAYmond 4-2100. 1611 ATW, Hq. EASTAF; air transport base, MATS; fighter-interceptor and air defense missile base, ADC; SAGE direction center; air refueling base, 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., 13 mi. N of Minot. Phone: Area Code 701, TEMple 7-1161. Fighter-interceptor and tanker base, ADC; heavy bomber and tanker base, Minuteman ICBM site, 20th AF, SAC mission. Named for city.

MOODY AFB, Ga., 10 mi. NNE of Valdosta. Phone: Area Code 912, EDGewood 3-4211. Undergraduate pilot training, ATC. Named for Maj. George P. Moody, killed while testing AT-10 transitional trainer in Kansas, 1941.

MOUNTAIN HOME AFB, Idaho, 11 mi. WSW of Mountain Home. Phone: Area Code 208, 828-2111. Medium bomber and Titan I base, 15th AF, SAC. Named for city.

MYRTLE BEACH AFB, S. C., 3 mi. SW of Myrtle Beach. Phone: Area Code 803, MYrtle Beach 448-3131. Tactical fighter base, 9th AF, TAC. Named for city.

NELLIS AFB, Nev., 8 mi. NE of Las Vegas. Phone: Area Code 702, 382-1800. 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 AIR FORCE MISSILE SITE, N. Y., 4 mi. E of Niagara Falls. Phone: Area Code 716, 297-4100. Reserve training, air defense missile base, CONAC, ADC. Formerly Niagara Falls Municipal Airport; named for city.

NORTON AFB, Calif., in San Bernardino. Phone:

Area Code 805, Turner 9-4411. Hq. Air Materiel Area, AFLC; Hq. Ballistic Systems Division, AFSC; Deputy, The Inspector General, Hq. Los Angeles Air Defense Sector, 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 support; Atlas ICBM support base. Formerly Fort Crook, renamed 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, 944-5521. 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, 241-2401. Hq. Air Photographic and Charting Service; Hq. Air Reserve Service, MATS; USAF Tactical Missile School, TAC; Air Force Conference Facility; Orlando Contract Management District, AFSC; 1365th Photographic Sq., MATS; MATS NCO Academy; 1381st Geodetic Survey Sq., MATS. Named for city.

OTIS AFB, Mass., 5 mi. NNE of Falmouth. Phone: Area Code 617, LOcust 3-5511. Fighter-interceptor and air defense missile base, ADC; airborne early warning and con-

(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

DISTRICT OF COLUMBIA

Andrews AFB

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

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
Willow Grove NAS, Willow Grove

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

GUIDE TO AIR FORCE BASES

trol, ADC; air refueling base, SAC. Named for Lt. Frank J. Otis, killed in air crash in US, 1937.

OXNARD AFB, Calif., 5 mi. E of Oxnard. Phone: Area Code 805, 486-1631. Fighter-interceptor base, ADC. Named for city.

PAINE FIELD, Wash., 6 mi. S of Everett. Phone: Area Code 206, ELiot 3-1161. Fighter-interceptor base, ADC. Formerly Paine AFB. 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, ULYssez 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 and tanker 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, STillwell 7-2971. Pilot interceptor training (Adv.), ADC. 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, 635-8911. 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 and tanker base, 8th AF, SAC; Atlas ICBM support site. Named for city.

POPE AFB, N. C., 12 mi. NW of Fayetteville. Phone: Area Code 919, 396-4111. Troop carrier base, 9th AF, TAC. Named for 1st Lt. Harley H. Pope, killed making a forced landing in a Jenny in North Carolina, January 1919.

PORTLAND INTERNATL 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; pilot instructor training. 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, 885-4511. 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, DICKens 5-4400. Fighter-interceptor base, ADC; 29th 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 and tanker 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 and tanker 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 car accident in England, August 1956.

SCOTT AFB, Ill., 6 mi. ENE of Belleville. Phone: Area Code 618, ADams 4-4000. Admin. Hq. MATS, AWS, 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, 465-1241. Fighter-interceptor base, ADC; Hq. 5th Reserve Region, CONAC; air refueling base, 2d AF, SAC. Formerly Joy Aviation Field, renamed 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 and tanker 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, 775-1111. Hq. 9th AF, TAC; combat crew training group; USAF Tactical Air Reconnaissance Center. 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., 5 mi. N of Wichita Falls. Phone: Area Code 817, 322-5621. Technical Training Center, ATC; heavy bomber and tanker 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.*)

STEAD AFB, Nev., 10 mi. NW of Reno. Phone: Area Code 702, FRESide 9-0711. Helicopter pilot training school; survival training, ATC. Formerly Reno AAB, renamed for Lt. Croston Stead, Nevada ANG pilot killed in a crash at the base.

STEWART AFB, N. Y., 4 mi. W of Newburgh. Phone: Area Code 914, JOhn 2-1300. Hq. Boston ADS, ADC. Formerly Wings of West Point, renamed 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.

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 and tanker base, 15th AF, SAC; air transport base, MATS; fighter-interceptor base, ADC. Formerly Fairfield-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, 249-5311. Fighter-interceptor base, ADC; SAGE combat center; Hq. 30th NORAD region; Hq.

Chicago NORAD Sector; 327th Fighter Group. 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 and tanker 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. Combat crew training schools for F-101 and F-106 pilots, 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, 866-1611. Hq. 1st Strategic Aerospace Division, SAC; Air Force ICBM launch and missile combat crew training center; Air Force satellite launching 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, 348-0011. Heavy bomber and tanker base, 15th AF, SAC; Atlas ICBM support site. 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 and tanker base, SAC. 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: 7488. Support for Hq., Pacific Security Region, Pacific Communications Area, Pacific Ground Electronics Engineering Installations Agency, Eastern Field Office, Field Representative Far East, Hawaiian Air Defense Command, Pacific Air Force. 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 3-5511. Minuteman ICBM support base, 8th 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, 253-7111. Hq. AFLC; logistics headquarters of Air Force; major research and development center; engineering school; heavy bomber and tanker base; home of Air Force Museum. Formerly separate areas including Fairfield Air Depot, Wilbur Wright Field, and Patterson Field; renamed for Orville and Wilbur Wright, and for Lt. Frank S. Patterson, killed in air crash near base during tests of synchronized machine gun, June 1918.

WURTSMITH AFB, Mich., 3 mi. NW of Oscoda. Phone: Area Code 517, 739-3611. Fighter-interceptor base, ADC; heavy bomber and tanker 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 Rafael
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 AF Missile Site, 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

TENNESSEE

Memphis Municipal Airport, Memphis

TEXAS

Carswell AFB, Fort Worth
Ellington AFB, Houston
Kelly AFB, San Antonio

UTAH

Hill AFB, Ogden

WASHINGTON

Paine Field, Everett

WISCONSIN

General Mitchell Field, Milwaukee

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