JULY 1961 / 50c

AIR FORCE

and SPACE DIGEST

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

THE RESPONSIBILITY IS GLOBAL

USAF Photo By Al Sherman

Gen. Thomas D. White
Chief of Staff • 1957-1961

Gen. Curtis E. LeMay
Chief of Staff • 1961-

ARMA

PRODUCING ALL-INERTIAL GUIDANCE FOR ATLAS

Many successful full-range test flights have proved the reliability and accuracy of the Arma inertial guidance system now in full production. Other advantages—salvo firing, immunity to jamming, low cost, a minimum of ground support equipment—are inherent in inertial guidance. Currently at Arma, company-funded research programs are studying smaller, super-sensitive devices for navigation and satellite instrumentation.

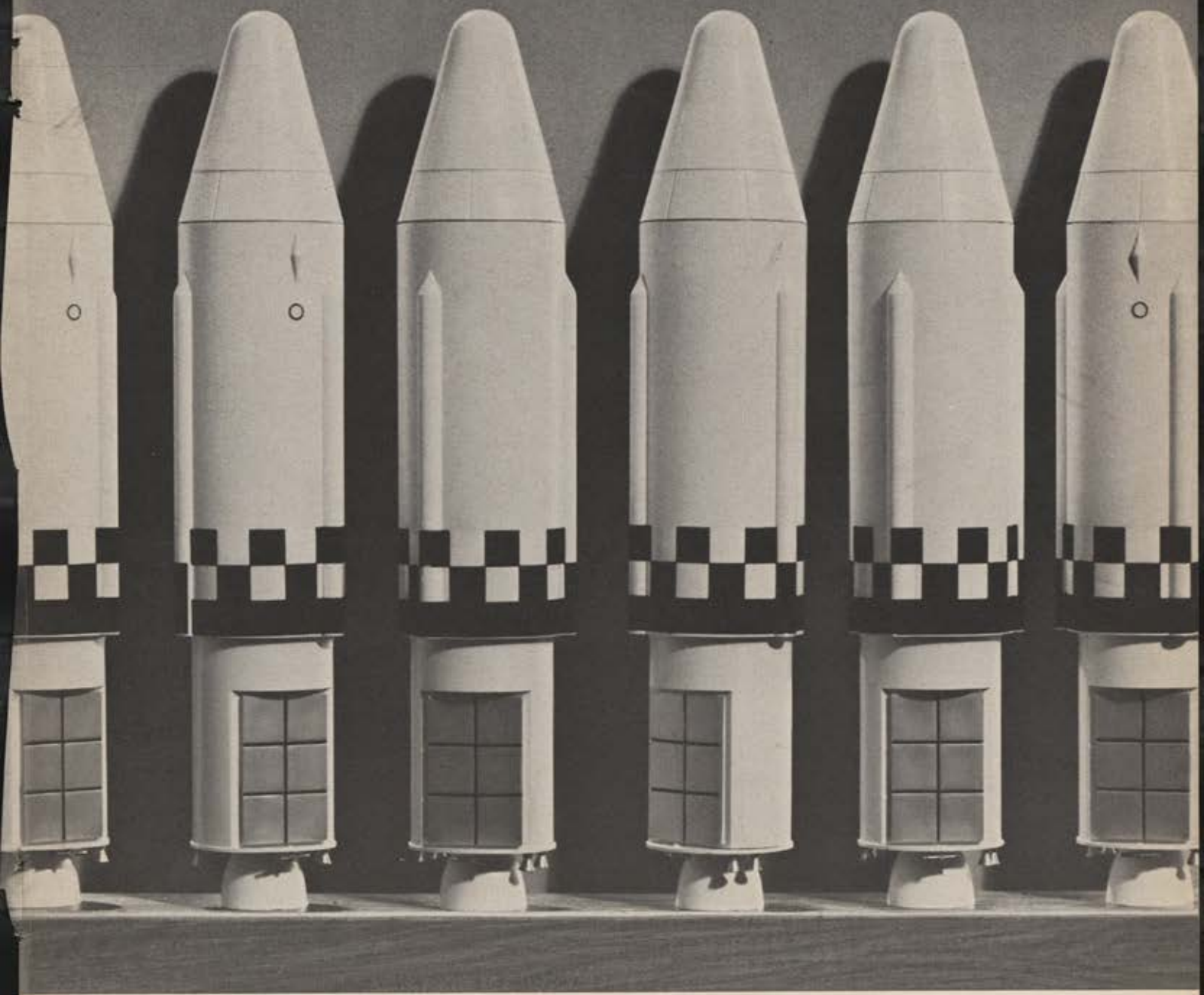
ARMA, Garden City, New York, a division of American Bosch Arma Corporation . . . the future is our business.

8059

AMERICAN BOSCH ARMA CORPORATION

AGENA B:

America's off-the-shelf satellite



Down the production line at Satellite Center, U.S.A.* move the Agena B satellites now being used in many of the nation's major space programs. The Agena B proved its reliability in the trail-blazing Discoverer program. It is easily adaptable to a wide range of payloads and missions. And its powerful start-and-stop rocket engine can maneuver it precisely to any orbit. The Agena B is built by Lockheed. Major subcontractors: General Electric, Bell Aerospace, and Philco.

LOCKHEED

*MISSILES & SPACE DIVISION • SUNNYVALE, CALIFORNIA

Garbed like surgeons, Hughes engineers and technicians assemble accelerometers in this "clean room." Here, the air is a thousand times freer of dust than an air-conditioned office. In fact you literally "taste" the clean air!

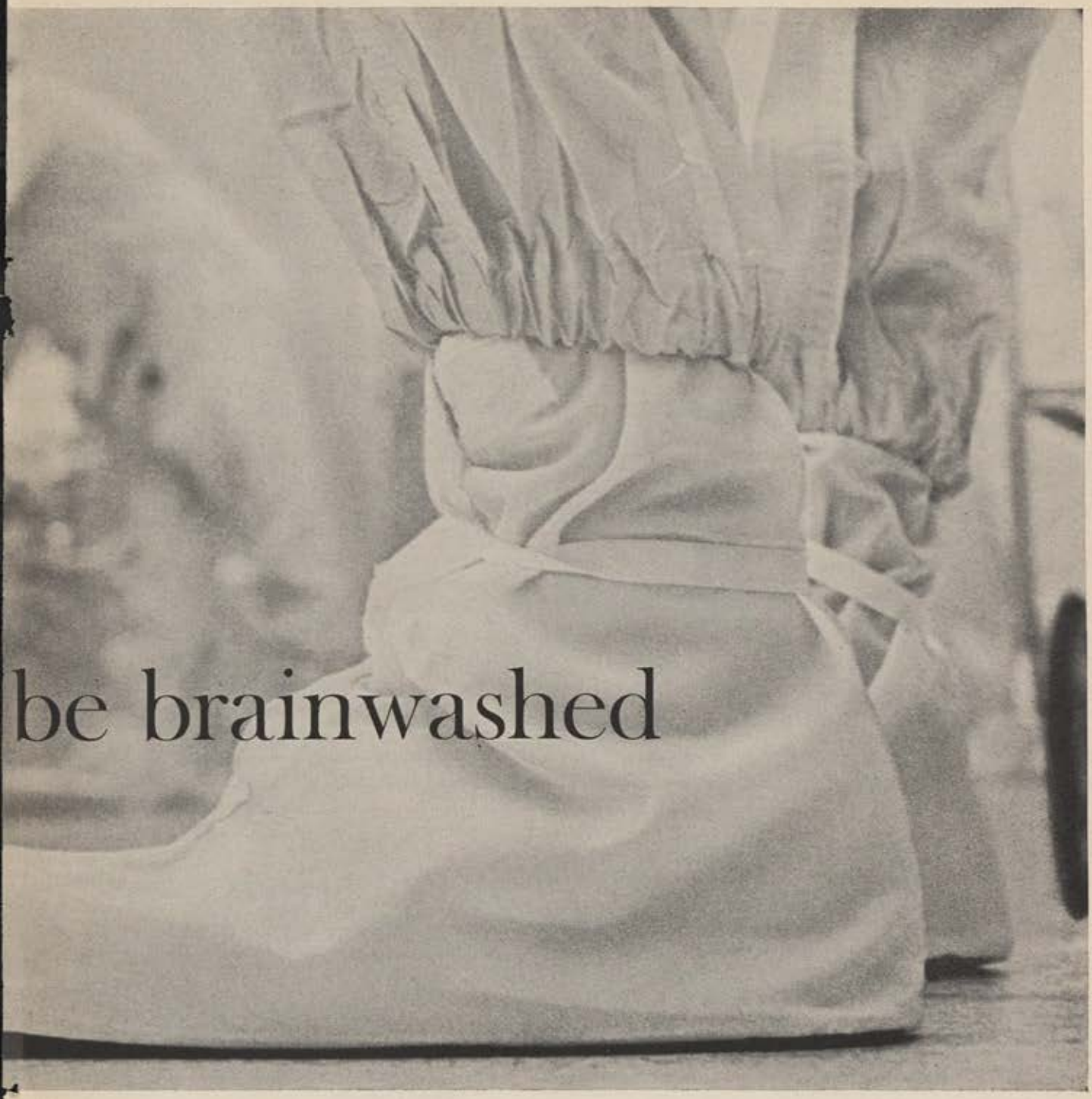
Accelerometers built in this room are so sensitive they can measure movements we cannot see. In missile inertial guidance systems they can sense acceleration of .003 of an inch per second per second.

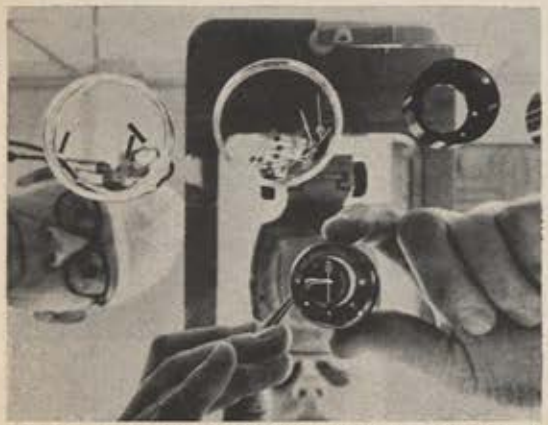
But a tiny speck of dust between their micro-finished surfaces could make them useless for the "mind" of a missile.

This type of accelerometer combined with gyroscopes and advanced electronics results in an inertial guidance system which is completely self-controlled—it cannot be "brainwashed." It needs no commands from the ground. It is invulnerable to "jamming" which might throw it off course.

Hughes is now applying its complete systems experience to all pertinent areas of creating inertial guidance systems: inertial components, computers, platforms, support equipment, advanced systems studies.

Hughes inertial guidance systems "marry" the latest developments in *both* electronics and mechanics. With this effort Hughes adds another facet to its broad scientific and production capabilities. This experience may be useful to you. We may have the answer to your problem. The result could be profitable for both of us.





Close-up view of an accelerometer being assembled in the Hughes dust-free "clean room."

Creating a new world with electronics

HUGHES

HUGHES AIRCRAFT COMPANY

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

AIR FORCE

and SPACE DIGEST

AIR FORCE Magazine and SPACE DIGEST are published monthly by the Air Force Association. Printed in U.S.A. Second class postage paid at Dayton, Ohio. EDITORIAL CORRESPONDENCE AND SUBSCRIPTIONS should be addressed to the Air Force Association, 1901 Pennsylvania Ave., N. W., Washington 6, D. C. Telephone, FEderal 8-6575. Publisher assumes no responsibility for unsolicited material. CHANGE OF ADDRESS: Send us old address and new address (with zone number, if any) to Air Force Association, 1901 Pennsylvania Ave., N. W., Washington 6, D. C. Allow six weeks for change of address. Send notice of UNDELIVERED COPIES on Form 3579 to AIR FORCE Magazine, 1901 Pennsylvania Ave., N. W., Washington 6, D. C. SUBSCRIPTION RATES: $5.00 per year, $6 per year foreign. Single copy 50 cents. Association membership includes one-year subscription: $6.00 per year (Cadet, Service and Associate membership also available). ADVERTISING CORRESPONDENCE should be addressed to Sanford A. Wolf, Director of Marketing, AIR FORCE Magazine and SPACE DIGEST, 501 Madison Ave., New York 22, N.Y. (PLaza 2-0235). New England office: Morley L. Piper, Resident Manager, 428 Essex St., Hamilton, Mass. (HOward 8-4600). Midwest office: Paul J. Jones, Suite 1310, 105 S. LaSalle St., Chicago 3, Ill. (STate 2-1265). West Coast office: Harold L. Keeler, Sales Manager and William H. McQuinn, 625 S. New Hampshire Ave., Los Angeles 5, Calif. (DUnkirk 5-1436). European representative: Brayton Nichols, 151 Fleet St., London E.C.4, England.

—US Air Force Photo

Gen. Curtis E. LeMay (*see cover and "Aerospace World," page 26*), an officer who has become almost a legend in his own time, this month takes over as Chief of Staff of the US Air Force, succeeding Gen. Thomas D. White, to whom Senior Editor Claude Witze bids, for all of us, farewell on page 105. General LeMay assumes his vital post at a critical time—a time of close examination by the national leadership of our hazardous position in the world. In this issue, you will find two particularly cogent contributions to the dialogue of this examination. Our Special Report, "The Truth About Conventional Forces" (*see page 39*), points out the fact, hard to accept even in some of the most intellectual circles, that there can be no retreat into the past in the planning for nuclear-space age defense. The Essay, "Deterrence: Everybody's Concept" (*see page 49*), is a closely reasoned discussion of the real meaning of the much-bandied-about word, "deterrence." What has deterrence meant since the end of World War II? our essayist asks, and how has its meaning and significance been distorted to serve theories which are more often than not irrelevant in an age of ICBMs and space satellites?

Our effort each month is to present ideas and provoke thought. We think you will be interested, for example, in Technical Editor Sam Butz's analysis of what it will take by way of hardware, personnel, and management to implement President Kennedy's call for a national commitment to US man on the moon.

We commend to you, too, the material in SPACE DIGEST, where we continue our endeavor to bring to you each month the best in current thought on the socio-political-economic impact of the Space Age. Good reading!—W.L.

DEPARTMENTS

VOLUME 44, NUMBER 7 • JULY 1961

An Editorial

Let's Ban the Ban

Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

PRESIDENT Kennedy found his interview with Premier Khrushchev in Vienna a sobering experience. There was no loss of temper, he told the nation upon his return, and there were no threats or ultimatums. But he repeated that the meeting was somber. Progress? None was either achieved or pretended, although the two K.s did agree that an effective cease-fire is essential in Laos. But even while the President was speaking the Soviets were egging on their rebel allies in that country, and the next day Padong fell to the Reds. It is evident that Mr. Khrushchev, who has described himself as the locomotive of history, has no intention of either slowing down or being switched onto a siding.

Of the other issues discussed in Vienna the tinderbox is supposed to be Berlin, but anyone even halfway familiar with the vagaries of Russian negotiations would hesitate to make book on it. Our opponents are masters at the art of distracting attention. The very fact that this technique is a favored Kremlin ploy lends, in our opinion, more than passing importance to the major issue on the Vienna agenda that does not involve somebody else's geography. The sum of what was said about the negotiations on a nuclear test ban apparently is that Russia no longer wants an agreement in this area, if it ever did.

A workable nuclear test agreement, obviously bogged down in the Geneva conversations and not made more likely in Vienna, is a cherished ambition of Mr. Kennedy and several prominent members of his Administration. After all, if achieved, it would be a basic first step toward the genuine disarmament or arms control program they hope is possible. During the presidential campaign Mr. Kennedy may even have created his own quandary of today by announcing that he, if elected, would make one last effort to get something fruitful out of the Geneva meetings, which have been under way since 1958.

Well, he has had his try and it has been rebuffed. It fell just as decisively as did Padong. This could have been anticipated, we believe, from the facts as recorded by the Atomic Energy Commission in its annual report to Congress for 1960. AEC made it clear that it is almost impossible to contrive an effective control system—basic to a test-ban agreement. The United States suspended tests with the start of the Geneva talks in October of 1958, a step that was billed as not necessarily halting our technological progress on nuclear weapons but which certainly had that effect. For all practical purposes our development of improved nuclear weapons stands at the 1958 level. This is a unilateral ban, self-imposed, unpoliced. AEC did not say so, but there is real national peril in the probability that Russia has made substantial nuclear progress and better weapons while we have been leaning on hope.

Military observers have been present at all of the negotiations to date, but there appears to have been a minimum reliance on US military intelligence and judgment. There is no record, to our knowledge, of the views of the Joint Chiefs of Staff. If they are known, they have not been made public. The late Thomas E. Murray, an AEC member for about seven years, has written that "if the Joint Chiefs of Staff were asked—and the American people are entitled to pose this question—whether our test policy is endangering our over-all national defense position, their answer would be yes." The reference here, of course, is to our failure to press on with improved nuclear weapons. Another aspect of the matter is our evident policy determination to prepare a deterrent force of ICBM capabilities while defense against ICBMs remains a major mystery. Further nuclear tests are essential for intelligent research work designed to solve this mystery. It is clear that a breakthrough in this area alone, which the Russians could achieve while we observe our self-imposed discipline, could be the most important development since the perfection of the ICBM itself.

Likewise, our future deterrent force will rely heavily on Polaris and Minuteman. Each of these has a much smaller warhead than Atlas or Titan, a situation which could conceivably be corrected through further research and testing.

It is mid-June, at this writing, and indications are that the United States has not abandoned hope of an agreement, despite Russian intransigence. Russia, by its own statement, now considers that communism is on top in the world struggle and there no longer is any reason to negotiate seriously with us on arms limitation, test bans, or anything else. In the face of this President Kennedy is determined to continue the test-ban talks, undoubtedly for the purpose of making it clear to all the world that the USSR, and not the US, is responsible if they fail.

This is not a situation that we can live with as freedom continues to fall back on a dozen fronts from Havana to Hanoi. If it turns out further that the enemy has not been wasting these three years, that he has developed and produced a Sputnik of the weapon world for his arsenal, we will know why our announced determination to fight did not deter him. Mr. Kennedy is the man who must make up his mind when and whether we will end the moratorium on nuclear tests. The peril of delay is not just the peril to hopes of future agreement with Mr. Khrushchev. The real problem is whether we are heading for the day when a Summit Conference to determine the fate of the world may not even include the United States on the list of conferees.—END

He solved this puzzle by taking it apart!

Like oil and water, extreme precision and "complete" mobility resist combination in tracking radar antennas. Designing for one of these characteristics "automatically" precludes the other. *That* was this AMF Engineer's puzzle—to put *both* precision *and* mobility in an antenna for duty with the Marine Corps.

He solved the puzzle, literally, by taking apart the solution—AMF's TPQ-10 antenna—into 10 rugged, portable, submersible, precision-fabricated packages. TPQ-10 is designed for helicopter transport. Each component can be dropped in water; it will come up for more. The packaged antenna on its pallet can be dropped on land from 3 feet without impairing precision.

Each component can be *picked* up—the largest weighs 425 lbs.—and can be handled by 3 men. A crew of 6 can put TPQ-10 together in 20 minutes with one standard wrench.

Among the design innovations that solved the puzzle is a "piggyback" gear arrangement that puts both azimuth and elevation drives in one package. Result: almost half the parts and weight of separate components. Precision fabrication is typified by the reflector arms, held to a .005" deviation over 45 inches!

(For unclassified information on early warning and radar antenna systems, write Dept. CS 1, address below.)

Single Command Concept

Solving puzzles with next-to-impossible conditions is AMF's business. AMF's imagination and skills are organized in a single operational unit offering a wide range of engineering and production capabilities. It accepts assignments at any stage from concept through development, production and service training, and completes them faster... in

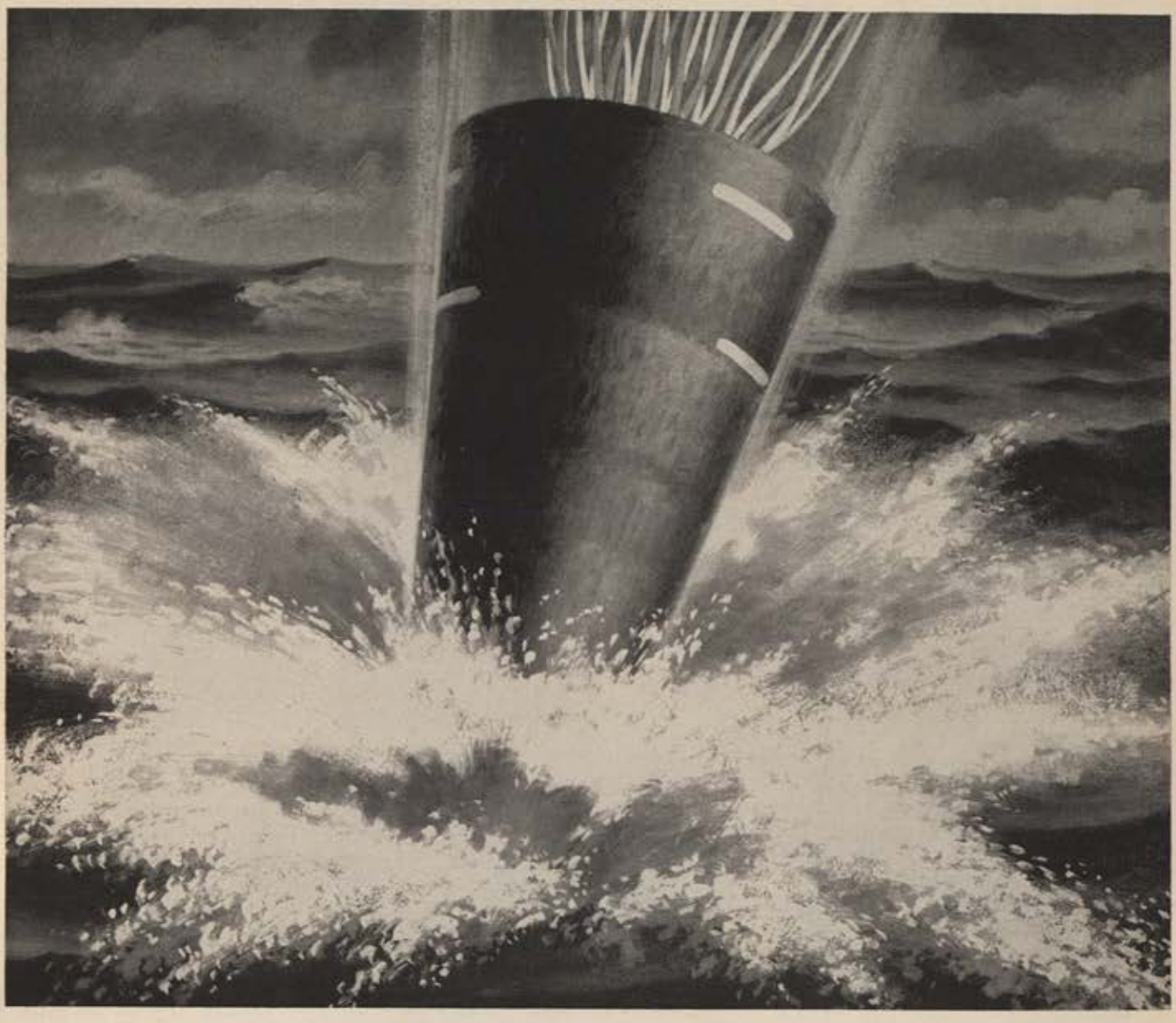
- *Ground Support Equipment*
- *WeaponSystems·UnderseaWarfare*
- *Automatic Handling & Processing*
- *Range Instrumentation · Radar*
- *Space Environment Equipment*
- *Nuclear Research & Development*

GOVERNMENT PRODUCTS GROUP
AMF Building, 261 Madison Avenue
New York 16, N. Y.

AMF

In engineering and manufacturing AMF has ingenuity you can use...

AMERICAN MACHINE & FOUNDRY COMPANY



How the ocean grew "ears" to pinpoint missile shots

A quarter of the world away from its launching pad an experimental missile nose cone splashes into the ocean.

How close has it come to the target?

Where can it be found, recovered and studied?

To answer these questions quickly and accurately, Bell Telephone scientists have developed a special system of deep-sea hydrophones—sensitive "ears" that hear underwater. Its name—the Missile Impact Locating System, or MILS for short. MILS, produced by Western Electric, manufacturing and supply unit of the Bell System, involves two types of networks.

- One is a Long Distance network which monitors millions of square miles of ocean. The nose cone releases a small bomb which sinks and explodes at optimum depth for transmission of underwater sounds. Vibrations are picked up by hydrophones stationed at optimum depth and instantly carried by cables to ground stations. Since the vibrations take longer to reach some hydrophones than others, time differences are measured to compute the location of the nose cone.
- The other is a "bull's-eye" network which monitors a restricted target area. This network is so sensitive that no bomb is needed. It can detect the mere splash of an arriving nose cone and precisely fix its location.

MILS is now operating in both the Atlantic and the Pacific test ranges. It was installed by the U. S. Navy with technical assistance from Western Electric.

It's still another example of how the universe of sound—below the sea, above the earth, in outer space—is constantly being explored by the Bell Telephone System.

BELL TELEPHONE SYSTEM

AMERICAN TEL. & TEL. CO. / WESTERN ELECTRIC CO. / BELL TELEPHONE LABORATORIES / 21 OPERATING COMPANIES

Chronic American Disease

Gentlemen: The US Public Health Service defines chronic diseases as "diseases which are of long duration and normally leave a disabling residual."

The recent Cuban fiasco has once again produced an outbreak of an American chronic disease—blabbermouthitis. The symptom of this strange American phenomenon is the apparently mad rush for everybody and anybody who might be listened to as "being in the know" to say something about some disaster or internationally embarrassing incident which has just occurred. Further, people with blabbermouthitis say things without the slightest regard to the effect it has on our relations with others in this "cold-war" world. They say things which add grist to the Russian propaganda mill. They say things which could gravely compromise the efforts of our friends to hang their support of this country on some rationale of the intricacies of diplomacy and international protocol. In short, they say things which cause this nation great harm.

Oh, come on now, some will say. Don't the Russians fiddle around in other people's backyards? If the Russkies can do it—so can we, right? Well, we will be among the first to admit to this situation—but—we say—the big difference is that the Russians *don't talk about it!* How many Russians have displayed blabbermouthitis over their paradrops in Laos? The Reds are not alone in believing that old saw about silence being golden. How many Belgians have blabbed all over the place in defense or comment on their activities in the Congo? The point? The point is that it looks as if everybody in the world, except the Americans, believes that if you ignore all references to a situation, the problem just doesn't exist. Proof? We haven't seen any discussion of the Belgian Congo or the Russian Laos problem by the Belgians or the Russians. But—WE have a problem in Cuba, WE have a problem in Formosa, and WE have that little problem of the U-2. The more we talk the greater our problem becomes and the more material we give the Communists for probing, questioning, and propaganda.

Mr. K. made the statement that he had absolute proof of US meddling in Cuba. Well, Mr. K.s statement is not so startling. Anybody could get the same proof and he didn't have to be a Red agent either. How about newspapermen who gave all the details (and pictures yet) of anti-Castro activities in Florida? How about the recent statement made by a member of Congress to the effect that the anti-Castro forces just could not get to Cuba without the help of the United States Navy? How about the sensational reports (it's news, brother) of CIA activities right down to the borrowing of American officers to help train the Cuban refugees? Intelligence? Heck no, brother—all Mr. K. has to do is read up on who has blabbermouthitis. We say that Mr. Stevenson is in one helluva spot when he tries to get us off the hook and then reads that some blabbermouth who is "in the know" has just sunk the barb in a little deeper.

Do we ask for censorship? No, we don't. What we do ask is that every newspaperman, every congressman, every member of the Executive Department, every member of the armed forces, and every government employee take stock of himself and his responsibilities to his country. The U-2 incident and the more recent Cuban fiasco are classics in the art of stumbling over yourself to say something when you ought to shut up. The damage done by the blabbermouths in these instances is irreparable. Unless the blabbermouths resist the temptation to just have to say something of importance, they may well push us all over the brink and into the war we are trying so hard to avoid.

Lt. Col. R. W. Dorff
New Baden, Ill.

Accident Prevention

Gentlemen: I wish personally to compliment you on the fine coverage, well planned layout, and forceful manner in which you have presented our material ["A Special Report on USAF's Safety Program," May '61] to the aviation reading public.

Although the 1961 USAF aircraft accident picture has been rather grim and spectacular to date, statistically speaking we are close to last year's record low rate, a rate that is taking extreme effort to reachieve; and that is as it should be.

We appreciate this opportunity to get our message to your readers. We feel that this strongly supports our over-all objective of preventing accidents and of conserving our total USAF combat capability.

Maj. Gen. Perry B. Griffith
Deputy Inspector General
for Safety, USAF
Washington, D.C.

Rescue Workers

Gentlemen: Thank you for the two-page spread on air rescue ["Dry Run for a Wet Job . . ."] in the May issue of your fine magazine. It is an excellent presentation of the new dimension in rescue.

Having subscribed to your publication and been a member of AFA since the spring of 1946, may I offer my appreciation for your efforts to keep the public informed and the military abreast of the aviation and missile industry. You have truly filled a need, and if your publication did not exist the vacuum created would be insurmountable due to piecemeal reporting.

Congratulations on your Fifteenth Anniversary in helping to keep the USAF going farther, faster, and safer to deliver more bang for the taxpayer's buck!

Maj. John A. Nydegger
Hq. Air Rescue Service, MATS
Orlando AFB, Fla.

Job of Recruiting

Gentlemen: The article entitled "Persuaders in Blue" in your May issue effectively explained the job of the Recruiting Service and the individual recruiter. It should perform a real service in explaining to the general public that the Air Force Recruiter is not in the market for just "warm bodies." It also serves to explain what a complex job the recruiter has.

Our task here at the Recruiting School is to train officers and NCOs

(Continued on following page)

from a variety of career fields to become skilled recruiter salesmen. Your article will be valuable to us in indoctrinating incoming students.

Lt. Col. David T. Mold
3275th Technical School
Lackland AFB, Tex.

Refueling Line

Gentlemen: Your magazine was enjoyed while I was on active duty. Now that I have been put out to pasture, as far as the Air Force is concerned, I practically worship each page of AIR FORCE because the articles serve as a refueling hose which supplies me with the high-octane, current activities of the service. To me, this opportunity to march beside, if not with, the Air Force is very worthwhile.

The retired officer, in his own community, is sort of automatically looked upon as the expert in his field. It is unfortunate that many of these officers who were in the Air Force can talk by the hour of the B-17 and the P-51, but they only have the newspaper-headline ideas of what their old outfit is doing today.

I've attempted to interest a few of the old-timers in your magazine, and after a short look-see they comment that it's way "over their heads." They know what USAF means but the majority of the other initial combinations commonly used today are Greek to them. Your Missile and Space Glossary was splendid. Why not print a glossary of "initials" in each issue?

Part of a page showing the fairly new NCO ranks would be interesting to the old-timers.

Can't we do something to help these "experts" catch up with the current Air Force?

I happen to be in my fiftieth year as an active pilot, with ratings on all conventional types, plus gliders, autogiros, helicopters, and jets—maybe I'm prejudiced.

Col. Harry D. Copland
USAF (Ret.)
Fort Lauderdale, Fla.

Now ALFA

Gentlemen: A short complimentary note to congratulate you on the splendid April and May issues. I thought they were great.

In particular, the run-down of highlights of US space projects, pages 118 to 135, is especially valuable for reference purposes. . . .

I do have one correction. On page 159 of the April issue, Weapon Able lists AVCO as prime contractor. This is incorrect and has been incorrectly given in most roundups of missiles. AVCO has no part in the Weapon Able program. Incidentally, it is now known as Weapon Alfa, in accordance with the change in the phonetic alphabet, and was developed by Naval Ordnance Test Station, China Lake, Calif. . . .

F. C. Durant, III,
AVCO Corporation
Wilmington, Mass.

Undeserved End

Gentlemen: The aircraft pictured in the March issue of AIR FORCE Magazine on page 115 was not "reclaimed from USAF's vast scrap heap at Davis-Monthan AFB," but was donated to the city of Mt. Clemens, Mich., by Selfridge AFB. This particular aircraft was flown by my squadron until just prior to turning it over to Mt. Clemens. As you are well aware, the F-86L is still in widespread use throughout this country by the ANG and by the AF abroad.

The "playground" referred to in the caption is a lot in a near-slum area of the city (note the condemned building in the background). Two weeks after the aircraft was towed into position, it was stripped of all removable panels and parts, the canopy and windscreen were smashed, and the plane in general was defaced. A short time ago the aircraft disappeared. Later I discovered the aircraft had been cut up and scrapped by the city.

Is this a fitting tribute to an aircraft that served its country so well, and the countless men who died flying her?

Capt. James F. Stech
Selfridge AFB, Mich.

Holland Invasion

Gentlemen: I would like to contact former veterans of the United States Air Force who were stationed in England and participated in the Invasion of Holland on September 17, 1944 and thereafter, for the purpose of researching for a book based on this operation.

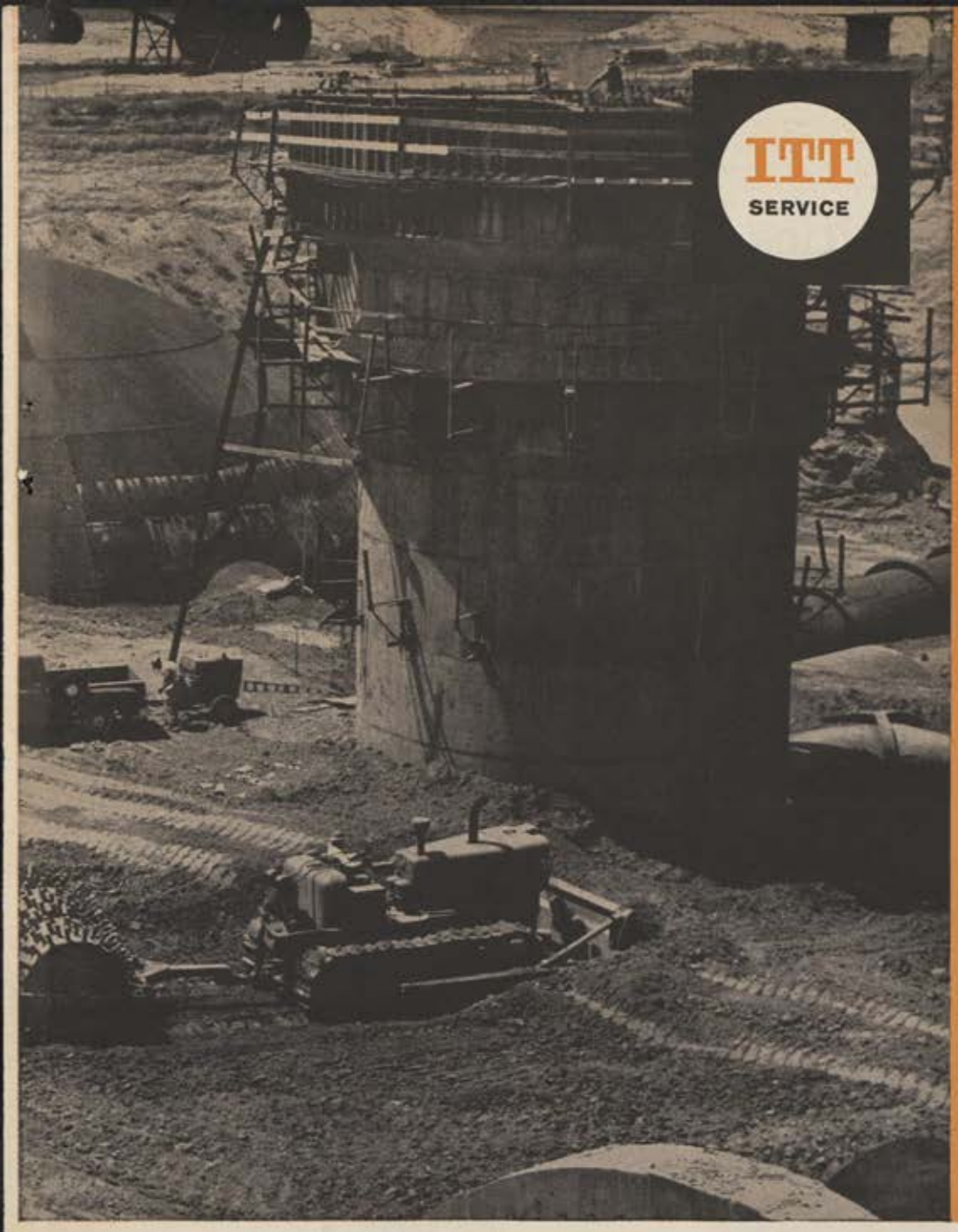
Clarence F. Montgomery
686 Buttonwood St.,
Long Branch, N.J.

UNIT REUNIONS

356th Fighter Group—July 21-23, 1961
Reunion will be held in Akron, Ohio.
Contact: Walter C. Lampe
19608 Arrowhead Ave.
Cleveland 19, Ohio

388th Bomb Group (H) Association—July 21-23, 1961
Reunion will be held at Summit Hotel, Uniontown, Pa. Anyone who served with this outfit in England during World War II, in the Eighth AF, 3d Air Div., 45th Wing, may attend.
Contact: Edward J. Huntzinger
863 Maple St.
Perrysburg, Ohio

Federal Electric Corporation President, J. W. Guilfoyle (on left), inspects typical underground passageway during initial phase of the complex's activation by FEC.



reporting from TITAN base T-4

...to military system managers

. . . operational readiness of the TITAN system has been assured by Martin Company's comprehensive planning for electronic technical support.

. . . the hard base TITAN complex at Larson AFB, Moses Lake, Washington, is now being activated by Federal Electric Corporation, Service Associate of International Telephone and Telegraph Corporation.

. . . TITAN prime contractor, the Martin Company, is calling on FEC for:

- Installation and test of Martin furnished TITAN ICBM's and ground equipment
- Interim operation
- Support services for other contractors on the site
- Assistance to Martin in turning the complex over to the Air Force

. . . this company was chosen to activate TITAN Base T-4 because:

ITT Service demonstrated to Martin system managers that its management, operation, maintenance and support would be effective, economical, and instantly responsive to program needs.

ITT SERVICE

FEDERAL ELECTRIC CORPORATION

Service Associate of International Telephone and Telegraph Corporation

Paramus, New Jersey

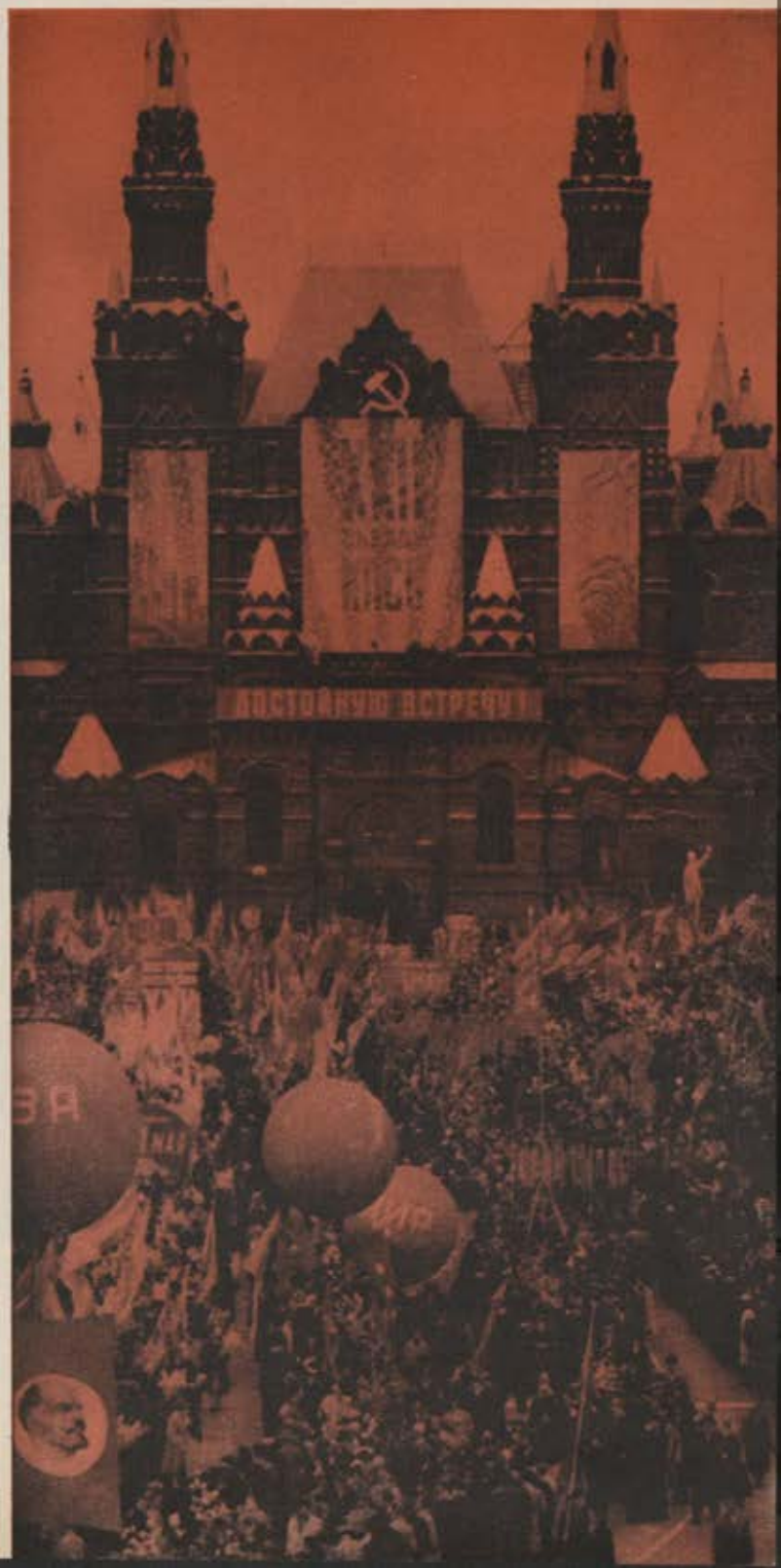
almost all major cities are defended with systems

that depend on Sperry electronic tubes

SPERRY

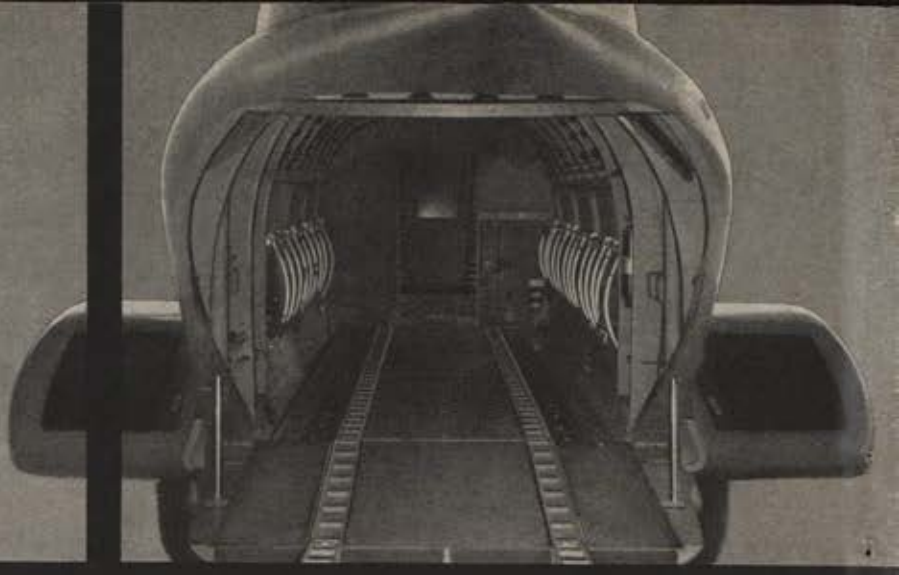
ELECTRONIC TUBE DIVISION

SPERRY RAND CORPORATION
GAINESVILLE, FLA.
GREAT NECK, N. Y.



BOEING-VERTOL 107...

THE WORLD'S ONLY "MISSION MODULE" HELICOPTER



BUILT-IN CARGO LOADER PERMITS IMMEDIATE CONVERSION FOR OTHER MISSIONS

"Mission module" design of the new, twin turbine-powered, Boeing-Vertol 107 means this truly versatile helicopter can perform a wide range of military assignments—without costly or time-consuming conversion. A change from cargo mission to minesweeping can be made readily because of basic aircraft design.

In addition, an integrated loading system can be built into this *first* all-mission, all-service helicopter. With the new system one man working alone can unload up to two tons of military cargo in three minutes or less. Even under demanding field conditions, loading can be completed in as little as eight minutes. The fully integrated system makes use of the Boeing Vertol 107's straight-in rear loading ramp. It includes recessed rollers and cargo beams which, when stowed inside the 107, serve as guides for vehicle wheels. A built-in hydraulic winch speeds loading, while the nose-up ground attitude permits fast gravity or taxi unloading. The loading system does not interfere with use of the Boeing Vertol 107 as troop transport, and troop seats can be quickly stowed along the fuselage sides to permit other "mission module" use—for ASW, land or sea rescue, medical air evacuation, missile site support.

The Boeing Vertol 107's capability to perform many missions such as these makes it the logical choice for today's flexible and alert Armed Forces.

VERTOL DIVISION
MORTON PENNSYLVANIA
BOEING

What's New With ★ RED AIRPOWER

Here's a summary of the latest available information on Soviet air intelligence. Because of the nature of this material, we are not able to disclose our sources, nor document the information beyond assurance that the sources are trustworthy.

Soviet estimates of the reconnaissance potential of satellites run very high. Russian journals report that satellite-borne cameras can distinguish objects on the ground about sixteen inches in diameter from an altitude of 1,000 miles. If this claim is true, then there can be no further doubt about the military usefulness of reconnaissance satellites.

While no detailed technical explanation has been given by the Russians of how this fine resolution is to be achieved, it is not considered beyond belief by Western optical experts. The first requirement of such a satellite camera is that it be long, because it would have to have a focal length in the neighborhood of forty feet. Second, it would need an extremely good attitude stabilization system to provide a motionless platform from which to photograph. Equipment would also be needed to isolate the camera from any vibrations created by the stabilizing mechanism. High-quality film and excellent optics would also be a necessity.

There is little doubt that the Soviets have the rocket power to put up a forty-foot satellite of rigid construction which contains the necessary systems. In the field of optics the Russians exhibited little competence before World War II. But the war brought them a chance to correct this deficiency quickly in the same manner that they brought themselves up to date in aeronautics and rocketry.

Practically the entire German optical industry and its most skilled technicians and researchers were captured in Eastern Germany. Many plants such as the Zeiss factory in Jena now produce a great deal of optical equipment for the Soviets. German experts were also taken to Russia to improve the industry through teaching. In the last few years, US experts have reported that the quality of Russian optical research has been improving at an impressive rate.

• • •

The Russians have a 400,000-pound-gross-weight helicopter in the "project" stage, according to persistent reports in the Russian technical press. Its passenger or cargo bay could accommodate thirty-five passenger cars or eight heavy trucks. Apparently the aircraft's turbojet engines would be mounted on the rotor blades.

• • •

The Soviet government has submitted to the Fédération Aéronautique Internationale the bare minimum of information necessary to have Yuri Gagarin's orbital flight recognized as a world record. The rocket used on the flight was said to have six engines and develop twenty million horsepower.

This information is next to meaningless because no clue was given as to how many stages the rocket had, whether all of the engines were in the first stage, etc. It is impossible to translate the horsepower figure into a conventional-thrust rating for the engines without this sort of data.

The Soviet report to the FAI was a universal disappointment to the world's aviation leaders who are joined together in that organization. Most of them now seem resigned to the conclusion that the Soviets do not intend to share their experiences in the conquest of space—man's greatest adventure.

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One concrete bit of information was presented to the FAI. The launching is said to have taken place from facilities near the town of Baykonur, located in the middle of the central desert of Kazakhstan. This desert covers more than 200,000 square miles. It is one of the most desolate and least populated regions of the USSR.

Baykonur is a small town at the dead end of a railroad spur line about 375 miles long. The spur extends westward from the north and south main line that is the only railroad through the desert. The Aral Sea lies about 225 miles to the southwest of Baykonur. Baykonur and the four or five other small communities located on the railroad spur are all mining towns.

One of the world's largest uranium fields lies a few hundred miles to the south. Gagarin's landing place was listed as a farm field near the village of Smelovka in the Saratov district which is about 400 miles southeast of Moscow.

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Magnetohydrodynamic (MHD) electric-power-generating plants are of "immediate practical interest" for industrial use in the Soviet Union, say Soviet technical journals. Plants producing 450,000 kw are planned now.

The Russian devices described are very similar to those being studied by virtually every US manufacturer of power-generating equipment. The great attractiveness of the magnetohydrodynamic plant stems from the fact that its efficiency would be close to sixty percent. Conventional steam power plants are a little over forty percent efficient. Another advantage of the magnetohydrodynamic units is that they will be very small compared to either the steam or hydroelectric plants of today.

Almost any fuel can be used to heat the "boiler" in an MHD unit. Nuclear reactors, coal, natural gas, and oil are all practical. The "boiler" is used to heat a gas stream to a high temperature so that the atoms shed an electron and ionize. The hot, high-speed stream is then able to conduct an electric current. It is channeled down a rectangular duct. Heavy coils are used to impose a strong magnetic field across the duct. When this field is cut by the ionized gas, a strong voltage is generated in the coil system.

Most commercial power experts see the MHD system as the power plant of the future. Its high efficiency and lack of rotating machinery will eliminate all competition.

Militarily, the system also has great potential. It should be possible to break down large units into a few modules and carry them by air. Some estimates indicate that units producing 1,000,000 kw would fit into a cube only thirty feet on a side. This compares to steam power plants of the same capacity which usually cover several acres of ground.

If military power requirements continue to increase as they have in the past, MHD units of this size will soon become necessary.—End

AIRPOWER in the news

Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

McNamara's Open Door

WASHINGTON, D.C.

It was the roughest Washington winter within the memory of most of us, spring had few of its usual virtues, and summer has limped in. One day the furnace was running, and the air-conditioner took over on the next. Then back to the furnace. In some respects the New Frontier seemed to respond to the weather and there isn't any place where this is more evident than in the Pentagon. For all the efforts made by the Kennedy Administration, the issue of the muzzled generals persists with all of the intensity reported in this column last month. It is true that Defense Secretary Robert S. McNamara has said he is honored to be associated with the Joint Chiefs of Staff, who are "intelligent, experienced, dedicated men." He contends that he has tried to continue and expand the policy of his Republican predecessor, Thomas Gates, of establishing a closer relationship with his military advisers. President Kennedy has had the Chiefs over to the White House for a visit and posed with them for the photographers. These things came after there was a deluge of stories in the papers about rising military blood pressure, and a reporter challenged Mr. McNamara to come to the defense of the Chiefs while under fire. This blaze, you may recall, broke out of the smoldering embers when Senator Albert Gore, a Tennessee Democrat, accused the Chiefs of Staff of incompetence. Almost nobody agreed with the Senator. At the same time, it cannot pass unnoticed that the Secretary of Defense did not disagree with him until prodded.

The Economist, an erudite British weekly, says "the burning question now is how far they [the Joint Chiefs of Staff] will be allowed to go in laying down strategy or even in deciding what weapons they need." This is the rub that arises from the conduct of some of Mr. McNamara's highly educated assistants, bolstered by their fellows in the White House and State Department. There is a difference of opinion about this, too. Mr. McNamara says he believes in an "open-door" policy that does not restrict contact and the flow of information between offices in the Defense Department. He says he has suggested to the secretaries and assistant secretaries "an easy and free and informal exchange of views" in the Pentagon. Well, this appears to have been done with so much enthusiasm that the suggestion has tripped over a law and aroused the curiosity of a man named Carl Vinson, Chairman of the House Armed Services Committee and experienced mentor of political appointees. "Uncle Carl" disclosed to one of the service journals that he had written a letter to the Secretary of Defense. The text was not released at the time, but Mr. Vinson indicated he was determined to find out to what extent military leaders and service secretaries are being by-passed in the formulation of Pentagon policy.

"There is a great and valuable pool of intellect and management skill in the present Pentagon civilian administration," said the *Army Navy Air Force Journal*. "But they must learn that military experience and training are indispensable to efficient and effective defense forces and that the advice of war-proven leaders must be sought and carefully weighed if sound conclusions are to be reached. They must learn, too, that morale is the most vital factor in military effectiveness, and that it can not be maintained by downgrading the service leadership in the eyes of Congress and the public.

"There is one bright spot in the picture," the *Journal* added, ". . . the selection of Gen. Curtis E. LeMay to be Chief of Staff of the Air Force. All of the services know General LeMay as an effective, efficient leader who will pull no punches to make and keep his forces combat-ready. They know also that while he is blunt, outspoken, and uncompromising with his subordinates, he will fight to the bitter end for their rights and welfare and to keep their morale high."

This confidence in USAF's new Chief is widely shared. While he has not expressed himself publicly on the current issue there can be no doubt that his short patience with incompetence, in uniform or out, will make itself known when General LeMay is called upon to speak. Until that time Committee Chairman Vinson will continue his classes. The congressman says he is alarmed by the military-civilian break. He has cited the 1958 Pentagon Reorganization Act which is specific in its statement that assistant secretaries of defense are just that and nothing more. It also says that the Secretaries of the Army, Navy, and Air Force are the civilian bosses in their own departments, and that they are responsible to Mr. McNamara alone. There is more to the law. It says that assistant secretaries cannot give orders to military departments unless the Secretary of Defense says so, giving permission in writing and assigning a specific area where it can be done. Now it happens that this part of the law was fathered, in a sense, by Mr. Vinson, and he has no intention of letting anyone get the idea that he didn't sponsor it for a purpose. Mr. Vinson would be irritated if he were to find that an assistant secretary of defense walked directly into a military office, started to give orders and snatched papers out of a typewriter, for example. He would be equally upset if, walking through a Pentagon corridor, he overheard an assistant secretary of defense speaking in deprecatory and insulting terms about three- and four-star generals. This list of hypothetical situations could be expanded to include more possibilities, some of them covered by the existing law, others by the simple codes of courtesy and loyalty.

It is interesting that in his reply to queries from the press Secretary McNamara has pointed with obvious and admiring approval to the example set by Defense Secretary Gates in the previous Administration. It happens that only about a year ago Mr. Gates was a witness on Capitol Hill before the Subcommittee on National Policy Machin-

(Continued on page 19)

THE GRUMMAN GULFSTREAM
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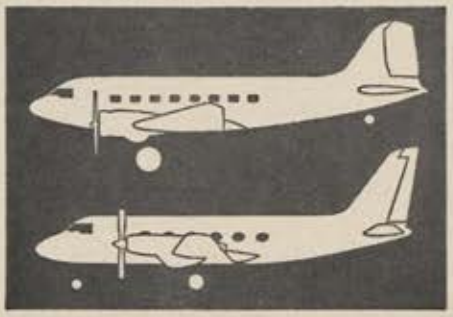
In the illustration, right, you see two airplane silhouettes: the first, a DC-3; the second, a Grumman Gulfstream. Note how closely they coincide in size. The Gulfstream is the modern pressurized, high performance replacement for the DC-3 and other older transports; equivalent to the DC-3 as a work horse transport—and costing even less to operate—the Grumman Gulfstream is a new airplane proved in service by over 60 world-wide corporations and the Federal Aviation Agency. Modernization of our country's airlift capacity for limited or brush fire warfare can be accelerated by the Grumman Gulfstream. And it's available *now*.



Gulfstream compared to DC-3

Facilities inspection

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Air evacuation

handling facilities. With its pressurization system (up to 30,000 feet), it flies above weather and traffic at a cruising speed of 350 mph and is powered by proven turboprop Rolls-Royce engines. An active development program is in progress at Grumman for the installation of the General Electric T64 turboprop engine as an alternate source of power.

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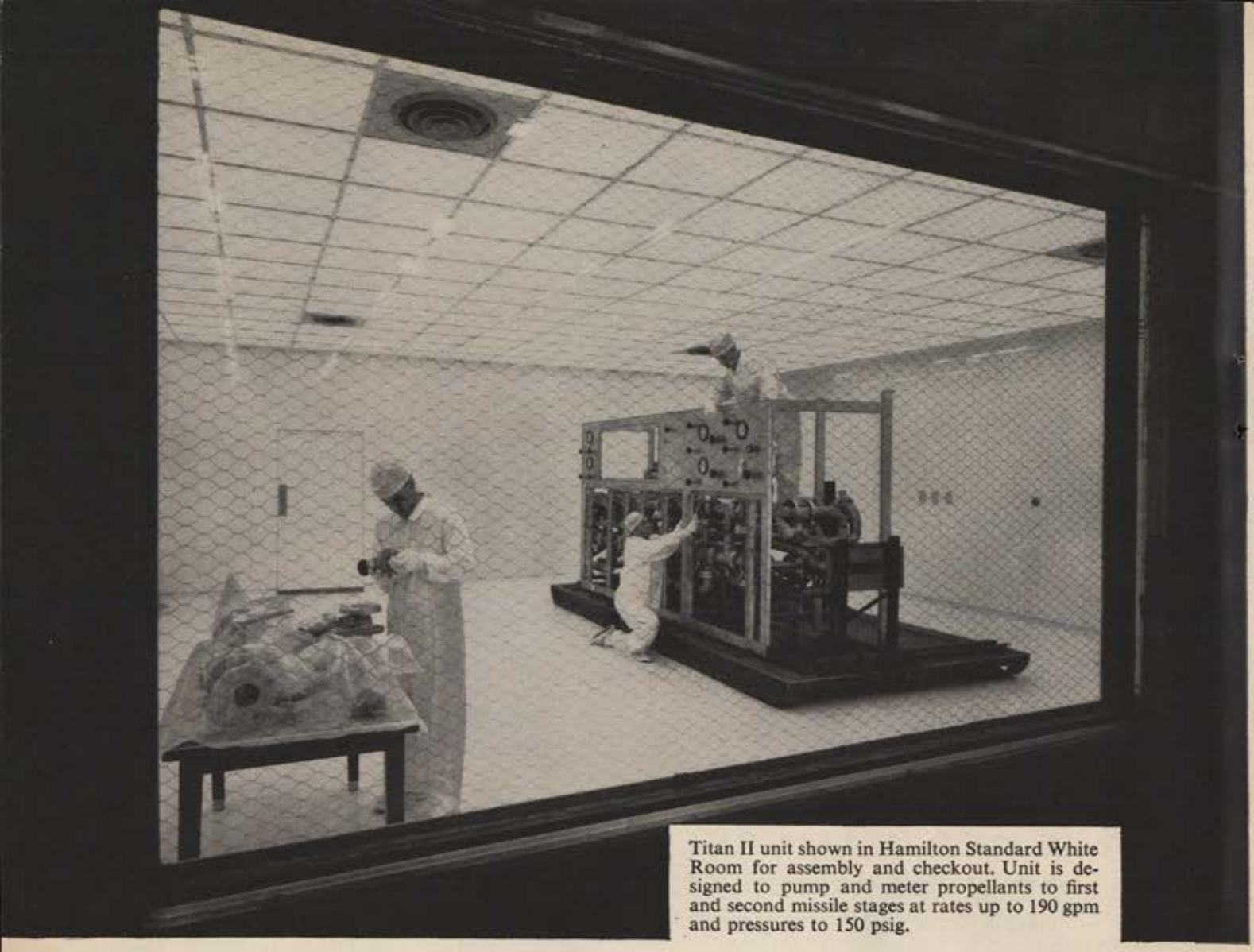

Titan II unit shown in Hamilton Standard White Room for assembly and checkout. Unit is designed to pump and meter propellants to first and second missile stages at rates up to 190 gpm and pressures to 150 psig.

White room for the Titan II propellant transfer system

Development and production of equipment for handling extremely volatile missile fuels—like the propellant transfer unit for The Martin Company's Titan II—demands a contamination-free environment, controlled to within 0.3 microns. Hamilton Standard's new White Room, especially designed for building missile fuel handling systems, even surpasses the exacting requirements of a hospital operating room. It provides 900 square feet of ultra-modern assembly and testing equipment. Detailed construction care and strict control procedures will maintain immaculate conditions . . . always.

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GROUND SUPPORT EQUIPMENT

ery of the Committee on Government Operations, chaired by Senator Henry M. Jackson, of Washington. A few months later Mr. Jackson was Democratic National Chairman and party leader in the Kennedy campaign. At the hearings in June of 1960 Secretary Gates was faced with some quotations from the *Harvard Alumni Bulletin* in which an author said that the Joint Chiefs of Staff have too many vested interests to protect, and that they are "biased heavily toward the *status quo*." There were some further unflattering remarks about the military, suggesting that they interfere with the formation of sound policy and are incapable of coming up with first-class ideas. To all of this, on the stand, Secretary Gates took firm exception. He sounded skeptical that the author could possibly have had experience in the Defense Department, defended the weapon systems programs, and argued that there are strong signs of boldness and imagination in the military. He denied that the Joint Chiefs are "prisoners of a bureaucratic system" with interests to protect and called them the "product of a major responsibility, the military security of the United States. . . ." He summed up his opinion of what was quoted from the *Harvard Alumni Bulletin* this way: "This is ivory-tower stuff created out of first-rate men freed, apparently, of all experience and association with the problems."

At the time, when Senator Jackson's committee and its subject did not attract widespread attention, there was bare mention given to the name of the academic author. His name was Walt Whitman Rostow, now a Deputy Special Assistant to the President. It is reputed in Washington that Mr. Rostow's main interest in the White House lies in the field of defense and foreign affairs. There have been no reports of what Mr. Rostow thinks of Secretary McNamara's characterization of the Chiefs as intelligent and dedicated. And apparently he was not in range of the camera when the President had his picture taken with the military leaders. It would be interesting, for example, to hear the professor discuss his theories with General LeMay but he is more likely to get the opportunity to discourse on them, if it comes, before some congressional committee. Mr. Vinson would be a strong candidate to start this round. Mr. Jackson, with the scholarly air of detachment that surrounds his hearings —they are called studies, not investigations—would provide an impeccable platform. And it would be easy there to refer back to the testimony by Mr. Gates, who had many years of experience in the Pentagon. When he left they said he never was steered by admirals or driven by generals and left with their unbounded respect.

Watch Your Language

If the Pentagon people have any common failing under the circumstances now prevailing it must be that they lack a complete sense of humor. The problems involved with language, for example, provide a laugh a minute if you don't take them too seriously. There is this new word *paramilitary*. You can't find it in your office dictionary, even if you have the big, unabridged one. It can be interpreted as a device to confound soldiers because the prefix *para* is used to denote a device that shields against or protects from, as in *parachute* and *parasol*.

It is doubtful that the originators intended that *paramilitary* ever should be used right in front of *war*. This is because *war* is becoming a dirty word, much as *space* was in the years immediately before Sputnik. It is reliably reported that *cold war* now is taboo in the Pentagon and must be referred to as a "political and technological struggle." And here is another example that sounds impossible, but we checked it out and it really happened: A high-ranking general of our acquaintance submitted for clearance a speech in which he referred to the USAF-NASA X-15 as "The Man o' War of the research aircraft stable." He was told by the Defense Department that it would be much nicer to call it "Seabiscuit" or "Citation." This brand of idiocy is spreading fast, even before the hot weather gets under way. We have heard, for example, *quasiparamilitary* and *simulated quasiparamilitary*. A friend of ours, Willie Wingflap, has wondered out loud how in the world we can beat the Russians in any war, hot or cold, if we also have to provide a defense against this kind of thing.

Advice to New Admirals

Just back from his meeting in Vienna with Premier Khrushchev, President Kennedy has been over to Annapolis, handiest of the service academies, to welcome a new cadre of officers into the armed forces. According to a local newspaper he told the Naval Academy graduates they must be prepared to play a constructive role in the development of national policy. Mr. Kennedy is reported to have drawn a contrast between the chores ahead of the class of 1961 and the class of 1914, which was addressed by Woodrow Wilson. The old-timers, the President claimed, were expected to know mainly about how to handle a ship and organize a landing force. Now, he said, the new Navy officer must prepare to exercise responsibilities far beyond tactics and strategy and make determinations that affect the survival of the country.

A few days earlier Defense Secretary McNamara gave it as his opinion that his policies on public information, which have sounded confusing to a substantial number of observers, will "encourage more open, responsible discussion of the pros and cons of national defense policies and practices." Mr. McNamara added that one of his guiding principles—not issued in the form of a directive—is "the public must be kept informed of the major issues in national defense policy." And "because the most important issues are likely to be the most difficult ones," he said, "the arguments on both sides must be clear, so that there is a consensus of confidence in the ultimate decision." In another one of his principles, circulated to the armed forces for guidance, the Secretary went so far as to warn against overclassification and advised his coworkers: "When in doubt underclassify."

In the light of these approaches by Mr. Kennedy and Mr. McNamara it is difficult to understand the attitude of their appointees toward the simple issue of academic freedom for men in uniform. There is a gag on academic discussion. There are assistant secretaries in the Pentagon who are challenging the usefulness of military journals and impeding their publication of unclassified papers. A prime and publicly discussed example of how this discouragement is exercised is an issue of the *Air University Quarterly Review* that has been hanging on the verge of editorial extinction since the first of the year. The articles had been cleared for publication by the previous Administration, but were resubmitted after the changeover of the Administration. About a half-dozen essays probably will be eliminated and others have been extensively edited.

If there is a sound reason for this it has not been made clear. It appears that there are minor officials who frown on service journals of opinion on the grounds that

(Continued on following page)

some of the writers may challenge approved concepts of the Administration or that they will stir up controversy. The fact that Congress has recognized the need for these magazines to let professional military men exchange views on tactics, concepts, doctrine, and strategy by appropriating money for them, is ignored. It is ironic that this situation has developed at a time when the military mind, as it is referred to by its detractors, is being accused of an inability or disinclination to develop new ideas. The kind of academic discussion involved here is the same kind that does so much to fight the resistance to change. Its imperativeness in an era when technology puts a strain on the best of our intellects probably is greater than at any time in military history.

The jump since World War II into missiles and now into space calls for a lot more research than that expended on the weapon systems themselves. There is an equally vital and demanding requirement for research on concepts and strategies that will exploit these weapons, put them where they will do the most good, and help maintain our deterrent stand. In the field of aerospace power this kind of discussion goes far back of Billy Mitchell or even the Wright brothers themselves. It can be found in the writing of the ancients, and during the Civil War there were arguments on the effectuality of reconnaissance from balloons. If, at any of these points in history, the right of soldiers to discuss and debate had been limited there never would have been any military progress. If Mr. Kennedy and Mr. McNamara mean what they say in 1961, one of the first orders they should give is for the removal of the gag on serious publications.

There are other aspects of this question of academic freedom that are equally crucial. For one, there is evidence that Mr. McNamara's problem in the entire field of public information may have its roots in the effort to stifle military debate. The Assistant Secretary of Defense for Public Affairs, Arthur Sylvester, insists there has been no clamp put on the release of unclassified information. Yet the Pentagon press corps, in its almost daily protests, senses a shortage of news. Of late there has been an increasing tendency to describe this situation in new terms. Freedom of information may not be the issue so much as what the Washington *Star* military reporter called the impossibility "for military or civilian officials to discuss both sides of important issues [with the press] without breaking the rules." This may be the most accurate description of the Defense Department's current disagreement with the newspaper reporters, rooted as it is in the academic issue rather than the more mundane question of the national welfare and military security.

Of course Mr. McNamara, if he recognizes what is going on, has not helped clear the air by citing his own testimony on information policies before the Senate Armed Services Committee. That is where he said we should not tell the people, and thus the Russians, that the Nike-Zeus may not be a satisfactory weapon system. "What we ought to be saying," he declared on the stand, "is that we have the most perfect anti-ICBM system that the human mind will ever devise." Later he issued a statement to the effect that he did not mean to condone any misleading of the American public, but reiterated that our difficulties with new weapons should remain secret. Of possibly greater significance than this rhubarb, however, was what the Secretary said about his plans to tighten up on alleged "leaks," an effort in which he was promised Senate support. Mr. McNamara said he would be glad to have such support and then added: "I propose to move rather silently in this field." He did not make it clear why he will be so quiet amid so much noise.

How to Scare a German

In a refreshingly frank statement, Roswell L. Gilpatric, Deputy Secretary of Defense, has made it plain that there has been no softening of the NATO reliance on nuclear weapons. In the event of an overwhelming attack, even by nonnuclear forces, Mr. Gilpatric said at a press conference, the Western alliance will use its most modern weapons for defense. His statement was an assurance that the New Frontier had not switched policies, and it should quiet the fears of some of our European allies, particularly West Germany, that they might be left naked to Russian blackmail. Why this kind of assurance was not given by the Pentagon many weeks ago will remain a mystery. It may be part of the repugnance sensed this spring to any suggestion that the military forces exist to wield force where it is needed.

If Mr. Gilpatric had spoken out sooner he also might have detracted from the effectiveness of the offer of the United States, made through the Secretary of State, to station five Polaris submarines in the NATO area. On the other hand, by mid-May there was genuine apprehension in West Germany about our intentions. The Minister of Defense in Bonn, Franz Josef Strauss, showed distress over reports from the United States that we were putting new emphasis on conventional weapons in our strategic planning. No matter how much sense this seemed to make to some of our nonmilitary experts, to the Germans it was something close to the suggestion of a betrayal. In a Bonn parliamentary debate Mr. Strauss said "it would give me holy terrors if I were to hear that a conventional attack was to be met only with conventional weapons, regardless of how big it is, how long it lasts, and what its political aim is."

It is not easy to understand that a shift in our policy on the use of nuclear weapons to protect the NATO allies could terrify somebody. Or is it easy? It would not take a genuine subversive, but only an intellectual skeptic, to raise the possibility that the United States could avoid nuclear attacks on its own soil, under some circumstances, if it faced the hordes of Red military with World War II weapons. The New York *Times*, reporting on Mr. Strauss from Bonn, says the West German leader —looking across the Atlantic—"seemed to imply that the danger came from military analysts and theoreticians who were trying to construct an alternative to the strategy of [nuclear] deterrent." This statement, the *Times* pointed out, was published the day after Herr Strauss had a two-hour talk with Henry A. Kissinger, an adviser to President Kennedy on military strategy and, the *Times* said, "a leading exponent of the strategy for attempting to confine any hostilities to limited warfare."

There is no way of knowing whether Mr. Gilpatric stands alone in his recognition of the damage that can be done by "military analysts and theoreticians" in remote places like Bonn. It may be that he was sent forth to repair the damage, if confidence in our determination can be fully restored. When the history of this year is written there will be some strange chapters in it. One of them will be concerned with the emphasis on limited war, balanced on the other side by a move toward an arsenal of mighty ICBMs. There is today no fully budgeted, high-priority manned weapon system under development in this country. That, too, could scare Herr Strauss.—END

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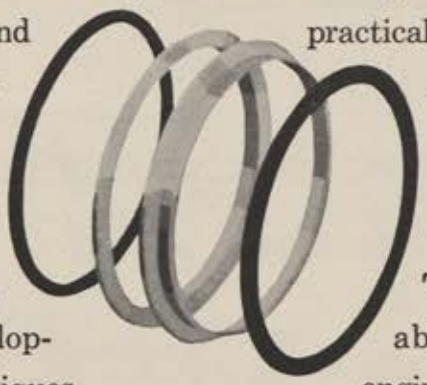

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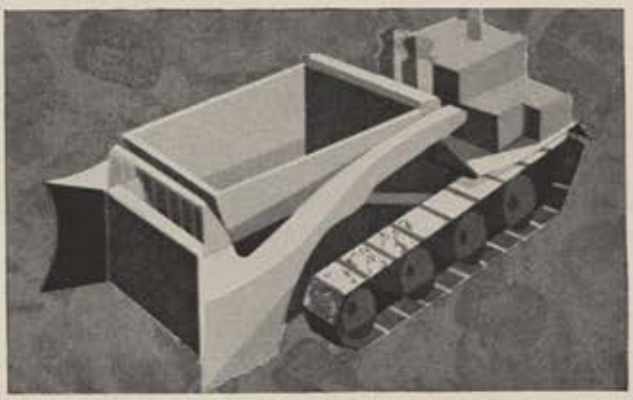

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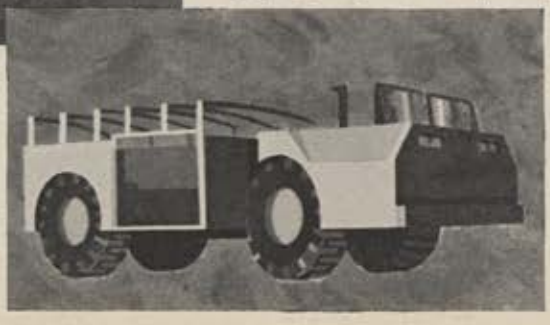

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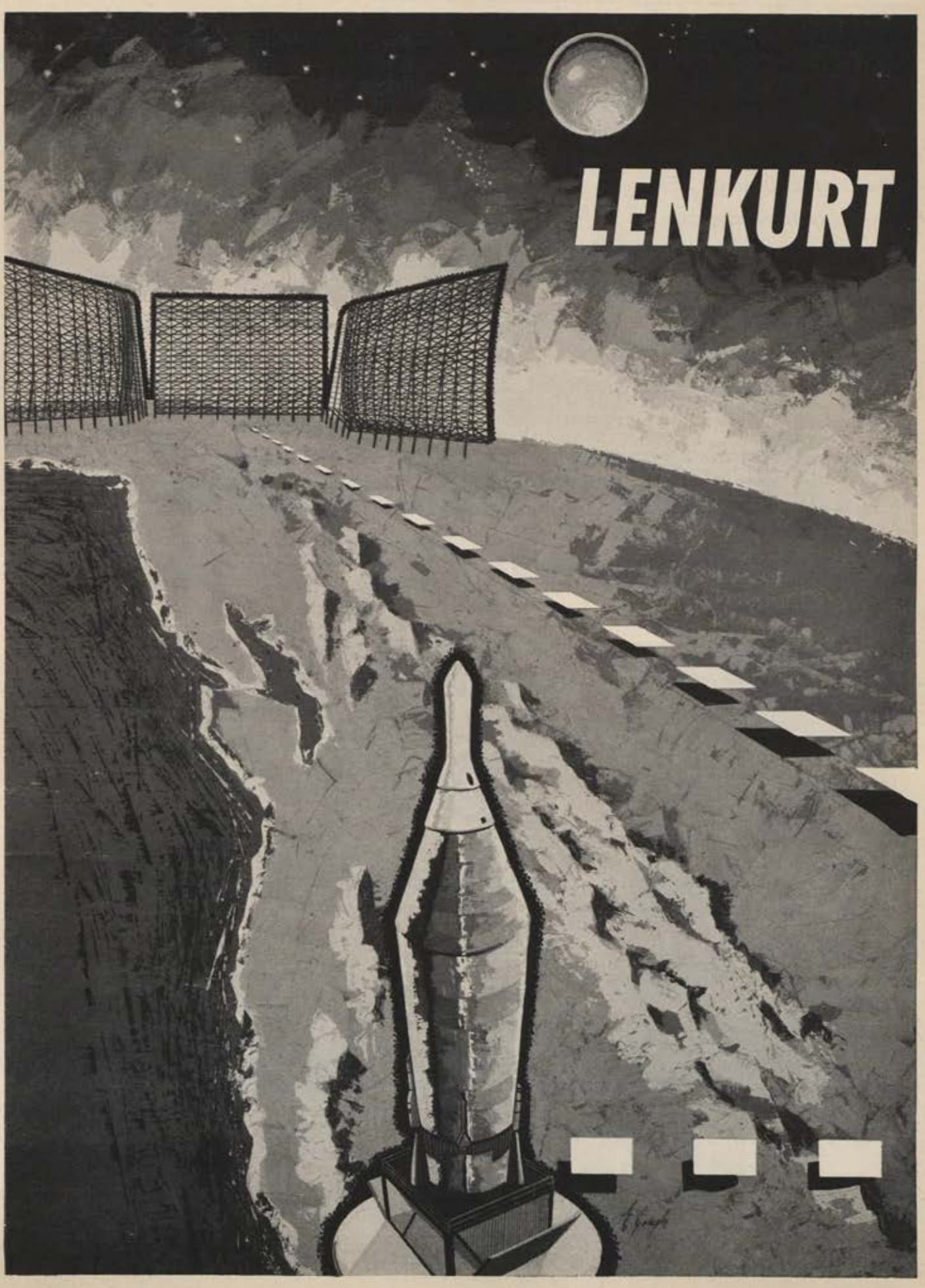
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Convention Registration	3,924
Panorama Attendance	61,962
Program Participants	115
News Representatives	405
United States Air Force	
Secretariat	4
General Officers	71
Colonels	211
Other Officers	201
Foreign Government Representatives	9
US Government Representatives (Other Than USAF)	37
Education	121
Industrial Companies	408
Industrial Representatives	1,796
Presidents and Board Chairmen	131
Vice Presidents	250
Executive Assistants and Consultants	94
Managers	669
Engineering Personnel	132
Purchasing, Sales, and Advertising	229
Other	291
Exhibiting Companies	195

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Panoramic view of the New Philadelphia. This is Philadelphia's Penn Center area from City Hall to 30th Street Station, symbolic of great modernization now under way.

15th Anniversary Convention

Philadelphia • September 20-24, 1961

PROGRAM

Tuesday, September 19

9:00 AM	Worldwide USAF Info Conf

Wednesday, September 20

9:00 AM	Worldwide USAF Info Conf
2:00 PM	AFA Directors Meeting
7:30 PM	AFA Leaders Meeting

Thursday, September 21

9:00 AM	Reserve Forces Seminar
9:00 AM	Arnold Air Society Meeting
10:00 AM	Aerospace Briefing
12:30 PM	15th Anniversary Luncheon
3:00 PM	Aerospace Briefing
3:00 PM	1st AFA Business Session
7:00 PM	Panorama Preview Reception

Friday, September 22

9:00 AM	2d AFA Business Session
9:00 AM	Aerospace Education Seminar
9:00 AM	Aerospace Briefing
11:00 AM	Aerospace Briefing
12:00 N	Aerospace Education Luncheon
12:00 N	Industry Buffet Luncheon
12:00 N	Panorama Open to Registrants
2:30 PM	Annual Symposium
7:45 PM	Awards Banquet

Saturday, September 23

8:00 AM	AFA Honors Breakfast
11:00 AM	Aerospace Briefing
12:00 N	Outstanding Airmen Luncheon
12:00 N	Panorama Open to Public
2:30 PM	3d AFA Business Session
2:30 PM	Aerospace Education Seminar
9:30 PM	Air Force Reunion Party

Sunday, September 24

12:00 N	Panorama Open to Public

Philadelphia's Convention Hall, where Convention will meet.

Everyone is requested to register IN ADVANCE. Credentials will be required to attend meetings and the Panorama during "closed" periods.

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7-61

News,
Views
& Comments

AEROSPACE WORLD

Frederic M. Philips
ASSOCIATE EDITOR, AIR FORCE MAGAZINE

A new boss took charge at the Head Shed this month. He was Gen. Curtis E. LeMay, the famed World War II bomber commander who after the war molded the Strategic Air Command into history's most potent military striking force. Vice Chief of Staff for the past four years, he succeeded retiring Chief of Staff Gen. Thomas D. White on July 1.

General White and General LeMay had worked together at the Air Force summit since July 1957, when they became Chief and Vice Chief. The outgoing Chief, now sixty years of age, served two two-year terms, the distinguished culmination to a distinguished military career *(see page 105)* that began with graduation from West Point in 1920. Linguist, intellectual, combat commander, highly skilled and experienced staff officer, General White led USAF through a difficult period of war-without-war and technological change unprecedented.

His successor is a gentleman who earned a reputation as a hard-as-nails disciplinarian and a bold air fighter against the Germans and Japanese. He led bomber strikes deep into Germany, developed new formation tactics, banned zigzag evasive action in the cause of precision bombing. His two prime rules, first as a Group Commander and then as a Division Commander in the Eighth Air Force, were simple: train hard and smash hard at the enemy. They got results on target in Germany. They also earned the General a second star at the ripe young age of thirty-six in 1943; he became the youngest major general in the entire US Army.

The following year, General LeMay switched his devastating strategic activities to the Far East *(see "Two Special Weapons," page 124).* The target was Japan. The main weapon system at his disposal was the B-29 Superfort, giant in size and technically advanced by wartime standards, but only moderately successful as a tool of war. General LeMay made the difficult command decision to strip the planes down and send them on mass low-altitude fire raids on prime Japanese cities. He gambled his entire B-29 force that enemy antiaircraft batteries, geared to high-altitude '29 strikes, would be caught off guard and unable to depress their guns to fire on his bombers at low altitude. In the first big raid, which reduced Tokyo to smoldering ashes, they couldn't. The tactic continued to succeed against other target cities even after Japanese gunners were fully alerted to it.

Wide World Photos, Inc.

Air Force Secretary Eugene M. Zuckert congratulates Gen. Curtis E. LeMay after he was officially named next USAF Chief of Staff at Pentagon on May 22.

In 1947, after two years of postwar staff duty, General LeMay took command of the United States Air Forces in Europe (USAFE). A year later came the Berlin Airlift, the free world's great air transport victory against world communism. General LeMay was the top air officer at the airlift's inception and through the early hectic months. Maj. Gen. William H. Tunner, veteran air transport officer now retired as MATS Commander, set up a task force with immediate responsibility for the airlift about a month after it began. He guided the effort brilliantly from there on in. General LeMay got the airlift off the ground in the first place.

Then came the assignment heard 'round the world. General LeMay in late 1948 became Commander of SAC. He proceeded to build this two-year-old command from paper deterrent to massively lethal, superbly efficient global fighting team. It was LeMay's SAC, all jet, nuclear capable, trained to a fine edge, that constituted the long arm of deterrence through a perilous decade. Through this entire period, from 1948 until he became Vice Chief of Staff in 1957, General LeMay headed SAC—through changes of equipment, through changes of emphasis, through the twists and turns of the cold war and the US military budget. His own dedication, and his old emphasis on training, developed in the men of SAC a competence and determination to match his own. The *History of the United States Air Force,*

published by AIR FORCE Magazine in 1957, put it this way:

"LeMay became uniquely identified with SAC. Both a leader and a driver of men, he impressed on his command his own single-mindedness of purpose and iron resolution. His insistence on the highest standards of readiness and performance eventually gave the command the élan and pride of service that have always distinguished the great military forces of history."

This, then, was the new Chief of Staff, General White's successor. Named to serve with him as Vice Chief was Gen. Frederic H. Smith, Jr., fighter pilot and fighter unit commander in World War II who had held successive prime commands through the years: SAC Chief of Staff in pre-LeMay 1946, Commander of US Forces in Japan, Commander of the Air Training Command, and most recently Commander of USAFE. He was fifty-three, a year younger than General LeMay.

Behind each of these veteran airmen lay more than three decades of proud accomplishment in the service of their country. Ahead, for them and the service they lead, lay years of growing challenge from a menacing, well armed Communist world with its own eyes now focused on the sky and beyond.

☆

US military aviators rewrote another chunk of the record book this month. New transcontinental, transatlantic, and closed-course sustained-speed marks were established.

Then triumph turned to tragedy for the three-man crew of one record-setting USAF B-58 Hustler.

★ A B-58 flashed from Carswell AFB near Fort Worth, Tex., to Paris in a startling six hours and fifteen minutes on May 26. SAC's new Convair-manufactured bomber, the only bombing plane in the world capable of more than Mach 1, set three speed marks in the nonstop 5,183-mile trip: Carswell-to-Washington in two hours and sixteen minutes, Washington-to-New York in nineteen minutes, and New York-to-Paris in three hours and twenty minutes. The time for the 3,669-mile transatlantic leg was two hours and twenty-five minutes faster than the previous fastest by a Boeing 707 commercial jet. The '58 refueled twice on the way.

The flight commemorated the thirty-fourth anniversary of Charles A. Lindbergh's Atlantic crossing of May 20-21, 1927. Lindbergh and his "Spirit of St. Louis" completed that pioneer nonstop flight in thirty-three and one-half hours. The B-58 record hop helped open this year's Paris International Air Show. Plane and crew—which included pilot Maj. William R. Payne, navigator-bombardier Capt. William Polhemus, and defense systems operator Capt. Raymond R. Wagener—stayed on and took part in the show along with four other '58s.

The oceanic record-setter never came home from Paris. Neither did a three-man crew that itself made history three weeks earlier. Pilot Maj. Elmer E. Murphy, navigator-bombardier Maj. Eugene E. Moses, and defense systems operator Lt. David F. Dickerson manned the plane on June 3 for an aerial performance at the Paris show. Shortly after takeoff, it went into a steep dive, plowed into a farm field and went up in flames. There were no survivors. Major Payne and his crew, who had brought the aircraft from Carswell a week earlier, remained on the ground that day to take part in a television interview. The four other '58s went on with their exhibition of aerobatics. The crash took place out of view of the French audience.

On May 10, the airmen who thus lost their lives had set a new world record for sustained speed. They raced their '58 at an average of 1,302 miles an hour over a closed course of 669.4 miles with corners in Nevada, California, and Arizona. The flight lasted more than half an hour. Major Murphy and his teammates thus won permanent possession of the Aero Club of France's Bleriot Trophy. The award, named for the great French aerial pioneer, was established years ago for the first aircraft to average at least 1,243 mph (2,000 kilometers per hour) for thirty minutes.

With the addition of these new records to speed-payload marks set in January, the young B-58 was a much-honored plane. Sadly, this fresh round of honors was marred by the death of the three men.

★ Across the country in a fastest-ever two hours and forty-seven minutes went a Navy F4H-1 Phantom II jet fighter on May 24. Previous record was three hours seven minutes forty-four seconds, set in 1957 by USAF Lt. Gustav B. Klatt. Phantom crewmen were pilot Lt. Richard F. Gordon, Jr., and radar-intercept officer Lt. (j.g.) Bobbie R. Young. They were the top performers in the twentieth running of the Bendix Trophy Race, but two other McDonnell Phantom IIs were not far behind. Both also bettered the previous mark. Their times were two hours fifty-seven minutes and three hours three minutes. All planes were refueled in the air during the 2,445.9-mile dash from Ontario, Calif., to Floyd Bennett Field, N. Y.

Phantom IIs already held two records—1,216 mph for a 500-kilometer

(Continued on following page)

—US Air Force Photo

Transatlantic record setters. Pilot Maj. William R. Payne, navigator Capt. William L. Polhemus, defense systems operator Capt. Raymond R. Wagener stand before their B-58 Hustler after setting three records in flight from Texas to Paris May 26.

Second '58 crew—pilot Maj. Elmer E. Murphy, navigator Maj. Eugene E. Moses, defense systems operator Lt. David F. Dickerson—and plane with which they set closed-course speed mark May 10. Three weeks later, they crashed, were killed.

—US Air Force Photo

course and 1,390 mph for a 100-kilometer course. This year's Bendix Race was strictly a naval operation celebrating the fiftieth anniversary of naval aviation—"The Golden Year of the Golden Wings." USAF Capt. Kenneth D. Chandler was top man in the 1957 event, last Bendix Race, in a Convair F-102 Delta Dagger. He made it from Chicago to Andrews AFB, D. C., in under fifty-five minutes. An Army Air Corps major named James H. Doolittle won the first Bendix run in 1931. He gunned his Laird Solution from Los Angeles to Cleveland in nine hours and ten minutes.

★ Not to be outshone by these old-fangled aeroplane types, the X-15 edge-of-spacer continued blazing the trail at Edwards AFB, Calif. NASA test pilot Joe Walker took the North American test vehicle to 3,370 mph on May 25. He topped the previous high of 3,074 mph reached by his USAF opposite number, Maj. Robert M. White, on April 21. Pilot Walker now has gone higher and faster than any other non-Astronaut (or Cosmonaut) on record. He ascended to some 169,000 feet, about thirty-two miles, on March 30. Peak height in the April 21 flight was 110,000 feet. Mr. Walker and Major White have been alternating at taking their bird to unprecedented heights and speeds; not so long ago, Major White was both "highest and fastest." Next go-round, the rocket plane should attain a speed of greater than a mile a second, 3,600 mph.

★ On the highest-and-fastest front, also were the helicopters. A USAF Kaman H-43B claimed a world altitude record for choppers carrying 1,000 kilograms (2,205.5 pounds) on May 25. The chopper, piloted by TAC's Capt. Walter C. McMeen, reached 25,814 feet in a flight test area over Connecticut. It took pilot McMeen one hour and five minutes to attain his top altitude. Previous mark was set by a Russian MI-4 'copter that flew to 24,491 feet in March 1960. This is the H-43B Huskie's second time in the winner's circle. It brought a previous altitude mark back from Russia in December 1959 when it reached a height of 29,846 feet, tops for its weight class.

Fastest honors went to a Navy Sikorsky HSS-2 amphibious whirlybird. On May 17, Cmdr. Patrick L. Sullivan and Lt. Beverly W. Witherspoon churned over a three-kilometer Connecticut course at 192.9 mph. A week after that, May 24, they took her over a 100-kilometer (sixty-two-mile) coastal course at 174.9 miles. Both times out, the antisubmarine HSS-2 topped the speed record of 167.09 miles an hour set by a Russian MIL-6 in 1959.

TAC Capt. Walter C. McMeen reached new heights in H-43B chopper May 25.

—US Navy Photo

Navy Lt. R. F. Gordon, Lt. (j.g.) B. R. Young set cross-country mark May 22.

—US Navy Photo

'Copter speed record breakers: Navy Cmdr. P. Sullivan, Lt. B. Witherspoon.

☆

In other major hardware news:

The first Boeing **B-52H** bomber was delivered to SAC on May 9. Powered by extended-range turbofan engines, able to launch the present North American **Hound Dog** air-launched missile and the developmental Douglas **Skybolt** air-launched ballistic missile, the H version of the '52 is a potent weapon system. Gen. Thomas S. Power, SAC Commander, greeted delivery of the first aircraft with the assertion that it "will significantly increase the Command's deterrent ability." Turnover was made at Wurtsmith AFB, Mich. Five other bases were slated for Hs: Grand Forks, N. D.; Kincheloe, Mich.; K. I. Sawyer, Mich.; Minot, N. D.; Homestead, Fla.

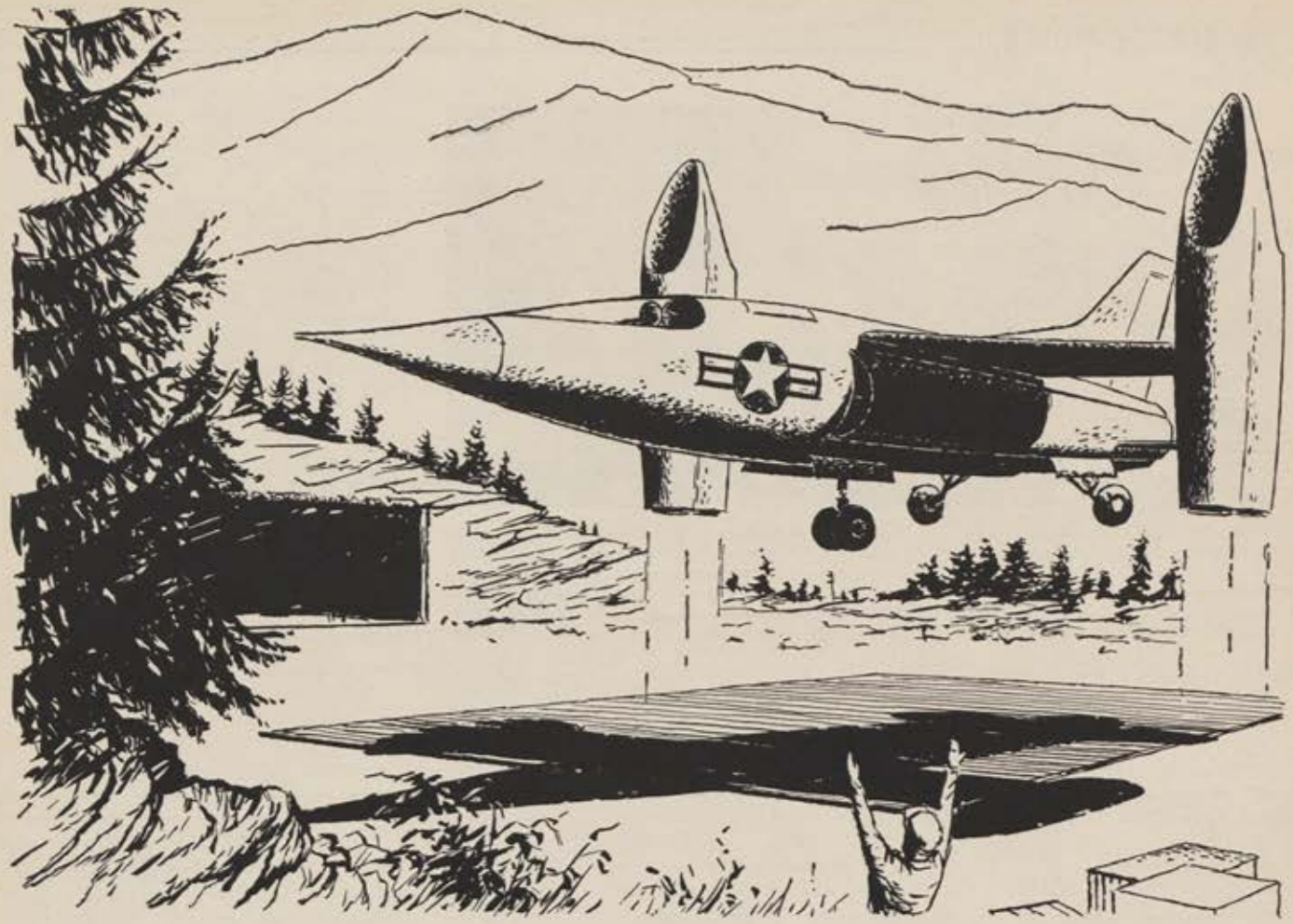
Bomarc-B, advanced model of the air defense missile, went operational at Kincheloe AFB. It was programed for half a dozen other sites. The B model of the Boeing ramjet missile doubles the 200-mile range of Bomarc A, operational for the past couple of years. Successful Bomarc-B testing against drone aircraft has continued for a prolonged period at Eglin AFB, Fla.

For the **Atlas ICBM,** it was a mixed month. May 12 saw the second successful shot in seven launch attempts for the improved Atlas-E at Cape Canaveral, Fla. Previously plagued by bugs in its hydraulic system, the E has greater range and heavier payload than the operational D. This shot also tested the reentry vehicle for the second generation Minuteman ICBM. Across the nation at Vandenberg AFB, Calif., on May 24, a SAC crew blasted an Atlas out over the Pacific range after raising it in its "coffin" storage-launcher. Atlases are stored horizontally in their steel and concrete coffins, then raised and fueled for firing. This is considered a semihardened missile arrangement—as distinguished from a hardened underground silo or a soft, exposed launch pad. A day later, back at the Cape, came the second successive successful E shot. An extra this time was that Army antimissile radar being developed for the Nike-Zeus antimissile missile was able to locate and lock on the missile as it dived for its ocean target area. On the other side of the month's crowded Atlas ledger was a May 20 explosion of a test missile in Sycamore Canyon near San Diego, Calif., where the missiles are produced by Convair. The Atlas burst into flames, exploded, was completely destroyed. There were no casualties and only minor damage to the test stand.

Titan reached the brink of achieving operational status. One of the Martin ICBMs, containing nearly all components of an operational model, roared on a full-range test from the Cape May 23. An announcement said that the next firing of a Titan might be by a SAC crew at Vandenberg, at which point Titan would join Atlas in the free world's operational ICBM armory.

Minuteman, youngest in the ICBM stable, veered off course and was de-

(Continued on page 30)



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Wartime Eighth Air Force made headquarters at Britain's Wycombe Abbey School. School for girls now needs funds. Eighth AF veterans have formed Foundation to meet the need. Here check goes to school faculty member Margaret Boyd. Presenting it, left to right, are three former AAF colonels, magazine publisher James Parton, Flight Safety Foundation vice president Ansel Talbert, book publisher John P. Edmondson, and now-retired USAF Brig. Gen. John S. Allard.

stroyed in its second test shot at the Cape on May 19. In its first shot, the solid-propellant Boeing Minuteman scored a total success after a gratifying, accelerated preshot developmental period. It went several miles on May 19 before the range safety officer pushed its destruct button.

The first Republic **F-105 Thunderchief** tactical fighters to go overseas reached Europe in mid-May. They were assigned to USAFE's 36th Tactical Fighter Wing at Bitburg Air Base, Germany. Underlining their striking range, the planes flew nonstop from Mobile, Ala., a distance of 4,550 miles, refueling along the way. The plane is all-weather, supersonic, has both nuclear and conventional strike potential.

USAF ordered twenty-two more Douglas **Thor** boosters for use in space programs. The free world's first operational missile, poised on site in Britain for two years, the workhorse Thor has launched twenty-nine successful satellites and deep-space probes, continues at this point to be a highly useful piece of hardware.

☆

Wycombe Abbey School is one of the leading private schools for young ladies in Great Britain. It sits quietly on grounds near High Wycombe outside London. When World War II brought the US Eighth Air Force to Britain, the school was politely put out of business for the duration by the British government. Wycombe Abbey School became Headquarters US Eighth Air Force.

Here for the next three and a half years, in the words of a monument erected on the school grounds after the war, "were conceived, planned, and directed the nightly air assaults on Germany which, with those of the Royal Air Force, paved the way for allied victory in Europe."

The years have passed. But the men who led the Eighth Air Force always remembered the schoolrooms and faculty offices where they made the great and awful decisions on the road to final victory in Europe. They remembered, too, the amusing aspects of fighting the greatest war in history from a girls' school. One of the favorite, lasting stories of the days at Wycombe Abbey School: The arriving Americans found a small sign in each room that read, "Ring twice for your mistress."

Recently, Col. Edward D. Gray, former Director of Communications of the Eighth Air Force and now an instrument company vice president in New York, read in a London paper that the school is in serious need of funds. Fifteen years after it reopened its doors to pupils, and almost twenty since it received the Eighth AF, Wycombe Abbey School sorely needed "new buildings, science laboratories, coaching rooms, a gymnasium, and music block."

Colonel Gray, the old communicator, got the word around to a number of wartime comrades. Result was formation of the Wycombe Abbey School Foundation with an impressive membership and this star-studded Board of Trustees: Lt. Gen. James H. Doolittle (USAF Ret.), former Commanding General of the Eighth Air Force; Gen. Carl Spaatz (USAF Ret.), former CG, United States Air Forces in Europe; Lt. Gen. Ira C. Eaker (USAF Ret.), initial Commander, VIII Bomber Command and later Commander in the Mediterranean; Maj. Gen. Fred L. Anderson (USAF Ret.); and Brig. Gen. John S. Allard, former Eighth Chief of Staff. Treasurer and one of the prime activists in the group is Col. John P. Edmondson, USAFR, Vice President of a New York publishing firm.

Objective of the Foundation is support of Wycombe Abbey School as well as other schools and educational groups. A check for 1,000 pounds sterling (about $2,800) has now gone to Wycombe Abbey School. A second donation was made to the AFA-affiliated Space Education Foundation. The group's hope is that it has just begun to donate.

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ELSEWHERE IN THE AEROSPACE WORLD:

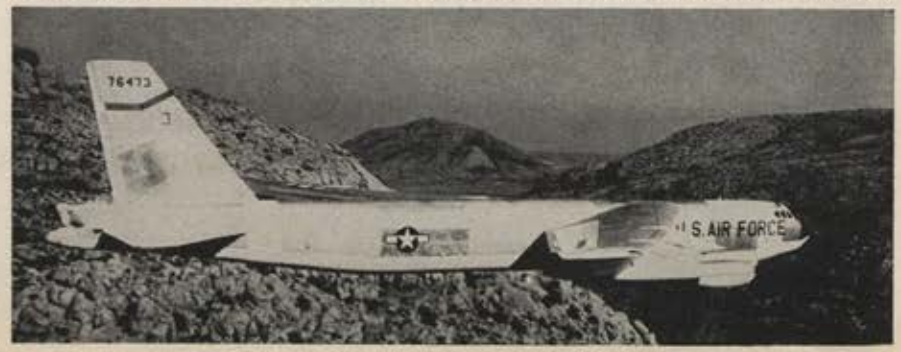
The US renewed its offer to place five Polaris submarines at the disposal of NATO.

Brockway McMillan was named Assistant Secretary of the Air Force for R&D, the post held by Courtland D. Perkins in the Eisenhower Administration.

Navy Cmdr. Malcolm D. Ross, famed balloonist, left the office of

(Continued on page 32)

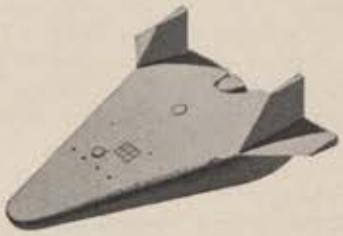
First Boeing B-52H was turned over this month to SAC at Wurtsmith AFB, Mich. Plane has increased range, weapon capability, was termed by SAC Commander Gen. Thomas S. Power a significant addition to free world deterrent strength.



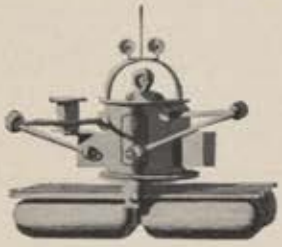
Lunar VTOL Vehicle. A rocket-propelled craft designed to collect lunar ore specimens.

Nuclear Space Ship. An unconventional design by Douglas with living quarters around the ring at the bottom. On landing, it would ease down, ring first.

Nuclear Space Ship. A Douglas design for a space ship with crew quarters and control rooms in the nose, nuclear reactor in the rear.



Supply and Escape Vehicle. A compact re-entry vehicle to supply orbiting space stations or to return crews to earth.

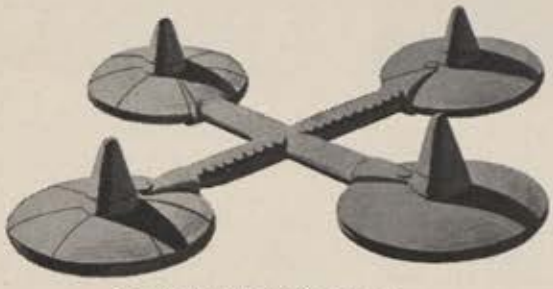


Lunar Service Vehicle. Travels like a "swamp buggy" on inflated rollers. Mechanical arms provided to handle outside chores.

Nuclear Space Ship. A future, medium-thrust, nuclear-electric space ship for one-year interplanetary round trips (Martian and Venusian).

Douglas Thor. Designed as a military IRBM, this dependable missile is the workhorse of the Space Age.

Lunar Cargo Handlers. Would load lunar ore samples into containers to be towed back to earth by rockets.



Space Observatory. Sections of this Douglas-designed space station would be sent into space in rockets and be joined together in orbit.

Saturn. First U.S. vehicle designed to put tons of payload into orbit . . . or onto the moon. Douglas-built second stage is as tall as a 4-story building.

Lunarmobile. Donut-shaped exploration vehicle to use rocket power in space and tractor treads on the moon's surface.

Eleven ways to outwit the law of gravity

When the Space Age dawned, Douglas was ready with specific proposals for space equipment either completed or in advanced stages of development. (Some appear above.)

These Douglas proposals were based on *realistic* estimates of the capabilities of men and materials. They are the valued dividends of the company's considerable experience, gained from the design and production of 30,000 missiles and rockets. These include the Douglas *Thor*, an IRBM which has been totally successful in 86% of its tactical and space firings over the past two years.

Today, Douglas looks ahead to other exciting challenges from its firm position of leadership in the conquest of Space.

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Naval Research and joined GM's Defense Systems Division.

Burdette Wright, military air pioneer and associate of Billy Mitchell, died in early June at the age of sixty-seven.

USAFE reorganized effective July 1 to place all tactical wings under operational control of the Seventeenth AF, Ramstein, Germany, streamlining organization with no physical changes involved.

The Collier Trophy, coveted annual aviation award, went to Navy Vice Adm. William F. Raborn, Jr., in recognition of the Polaris program. USAF, General Dynamics, and Space Technology Labs were honored for the Atlas program last year.

MATS Capt. Jerome F. King won 1960's Koren Kolligian Trophy, USAF's top air accident prevention award, for skillful handling of a crippled C-124 over the Atlantic last October.

The Air Force Academy graduated 217 Cadets at its third commencement. Two chose the Army, two the Marines, 213 went into USAF.

The Air Force Communications Service, USAF's new major command, officially comes into existence as of July 1. A ceremony at Scott AFB, Ill., will mark the occasion. Creation of the new command was announced earlier this year.

USAF and the Army have extended until December 1963 individual and crew training of US and Allied Air Force students for operation of the Jupiter IRBM. The Army Ordnance Guided Missile School, Redstone Arsenal, Ala., supervises the training. To date, some 1,600 US and Allied students have received Jupiter training. By 1963, the total will have risen to about 2,600 technicians trained in all aspects of the rocket maintenance and operation. An Italian crew recently was reported to have fired a Jupiter from the Cape.

SAC will field test a new machine teaching system in coming months, it announced. A number of SAC bases in different parts of the country, including Offutt AFB, Neb., command headquarters, and Vandenberg AFB will conduct instruction programs by machine systems. Results will be judged with a view to the permanent institution of such programing.

AFA President Thos. P. Stack, right, Philadelphia's Deputy Mayor Gaffigan discuss coming AFA Convention there.

In cooperation with USAF and F. E. Compton publishers of Chicago, AFA Space Education Foundation presented sets of Compton Encyclopedias to nine winners, below, in field of Aerospace Power at National Science Fair in Kansas City early this month. Youths are: William Easton, Texas; Robert Himes, Ohio; James McAleer, Alabama; Jay Sarajian, Pennsylvania; Robert Strom, New York; Mike Gorski, Indiana; Christopher Cherniak, Florida; Robert Fischer, New York; Baylor Triplett, New Mexico. Youths entered varied aerospace exhibits at fair.

The twentieth annual US National Soaring Championships will be held at Wichita, Kan., August 1 through 10.

USAF's Office of Aerospace Research has established a Scientific Advisory Council to advise and assist top-level DoD planners.

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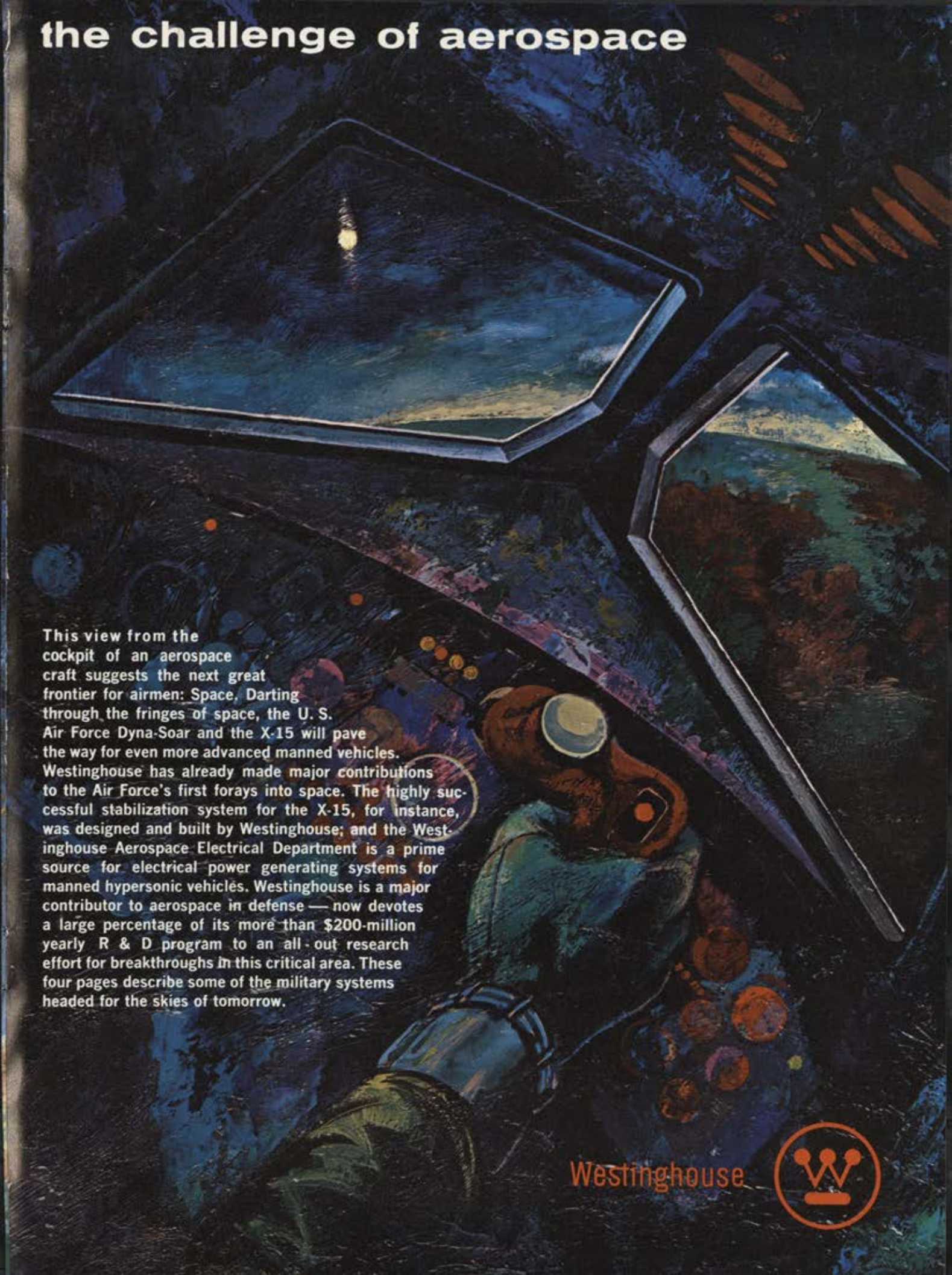
STAFF CHANGES. . . . **Maj. Gen. Frank A. Bogart,** from Acting USAF Comptroller to USAF Comptroller, Hq. USAF. . . . **Brig. Gen. Julian H. Bowman,** from Chief of Staff, AFLC, Wright-Patterson AFB, Ohio, to Assistant AF Comptroller, Hq. USAF. . . . **Maj. Gen. Wendell W. Bowman,** from Commander, 33d Air Div. (SAGE), ADC, Richards-Gebaur AFB, Mo., to Commander, AAC, APO 942, Seattle, Wash. . . . **Maj. Gen. Robert A. Breitweiser,** from Director of Intelligence, The Joint Staff, JCS, to Military Assistant to the Secretary of the Air Force, Hq. USAF. . . . **Brig. Gen. Emmett B. Cassady,** from Director, Personnel and Support Organization, AFLC, to Commander, MOAMA, Brookley AFB, Ala. . . . **Maj. Gen. Richard T. Coiner, Jr.,** from Assistant Chief of Staff, SHAPE, to Commander, 9th AF, TAC, Shaw AFB, S. C. . . . **Maj. Gen. Don O. Darrow,** from DCS/O, Allied Air Forces, Central Europe, to Deputy for Materiel, Hq. TAC, Langley AFB, Va.

Lt. Gen. Howell M. Estes, Jr., from Deputy Commander, AFSC, for Aerospace Systems, Hq. AFSC, Andrews AFB, Washington, D. C., to AFSC, Inglewood, Calif., with no change in duty. . . . **Brig. Gen. John T. Fitzwater,** from Vice Commander, 33d Air Div. (SAGE), ADC, Richards-Gebaur AFB, Mo., to Chief, USAF Group, Joint Military Mission for Aid to Turkey. . . . **Maj. Gen. Thomas J. Gent, Jr.,** from Director of Manpower and Organization, DCS/O, Hq. USAF, to Commander, 32d Air Div. (Def.), ADC, Oklahoma City AF Station, Okla. . . . **Maj. Gen. Joseph E. Gill,** from Assistant to the Commander, Ballistic Systems Div., AFSC, Inglewood, Calif., to The Civil Engineer, AFLC, Wright-Patterson AFB, Ohio. . . . **Brig. Gen. Linscott A. Hall,** from Deputy ACS, Intelligence, Hq. USAF, to Commander, AFIC, Hq. USAF Field Activity Group, Arlington, Va.

Brig. Gen. John A. Hilger, from Chief of Staff, Allied Air Forces, Northern Europe, SHAPE, to Deputy Commander, Lackland Mil. Training Center, ATC, Lackland AFB, Tex. . . . **Brig. Gen. Perry M. Hoisington, II,** from Commander, 6th Air Div., SAC, Dow AFB, Me., to Deputy Director for Legislative Liaison, Office, Secretary of the Air Force, Hq. USAF. . . . **Maj. Gen. Donald R. Hutchinson,** from Assistant for Mutual Security, DCS/M, Hq. USAF, to Commander, 30th North American Air Defense Region and 30th Air Div. (SAGE), ADC, Truax Field, Wis. . . . **Brig. Gen. Harold K. Kelley,** from Deputy Director, Civil Engineering for Construction, DCS/S, Hq. USAF, to Assistant Deputy for Site Activation, Ballistic Systems Div., AFSC, Inglewood, Calif. . . . **Brig. Gen. Richard T. Kight,** from Commander, Los Angeles ADS, ADC, Norton AFB, Calif., to Chief of Staff, Allied Air Forces Northern Europe. . . . **Brig. Gen. Joseph T. Kingsley, Jr.,** from Deputy Director for Legislative Liaison, OSAF, to Assistant for Mutual Security,

(Continued on page 37)

the challenge of aerospace



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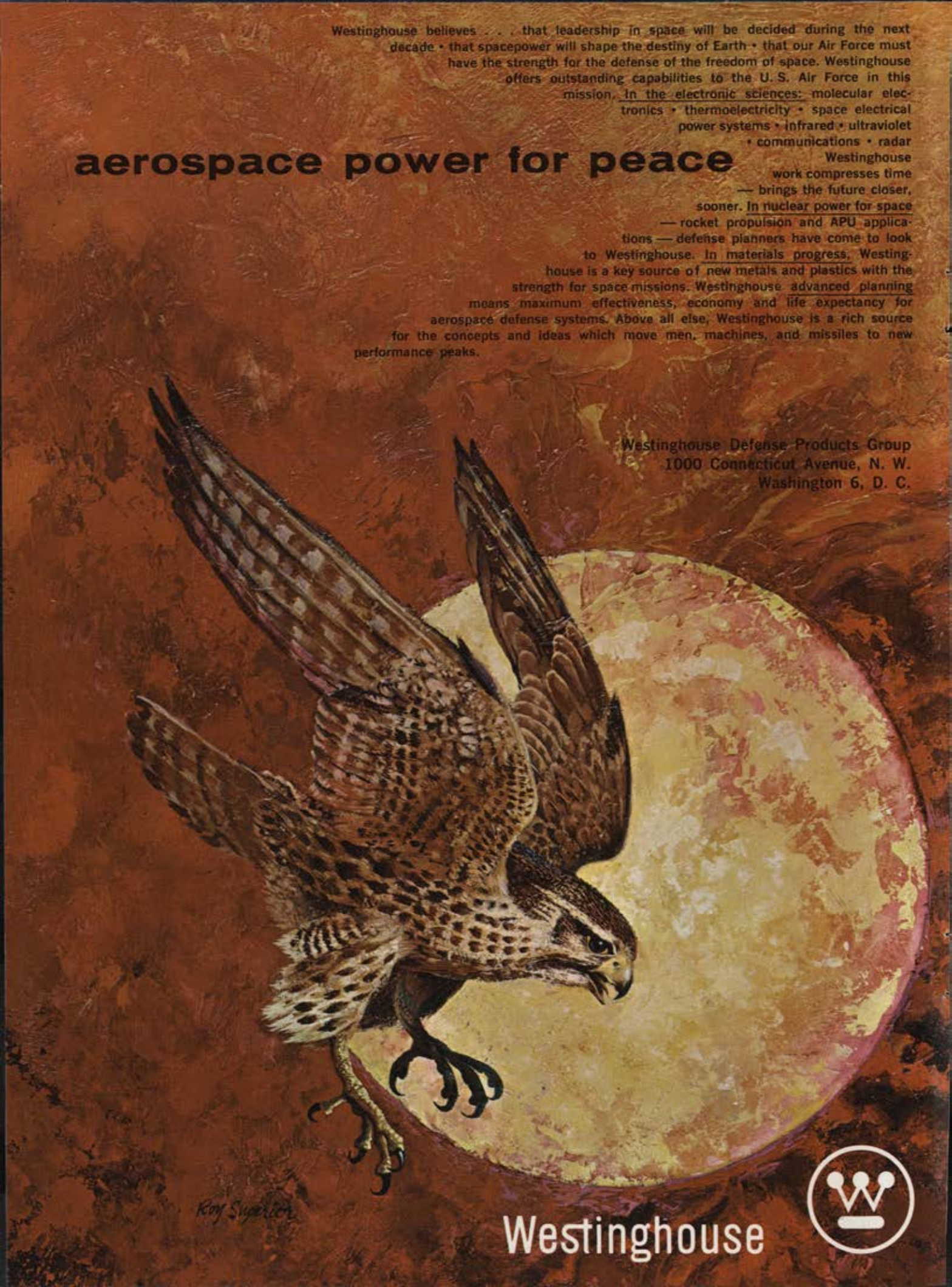
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Brig. Gen. William G. Lee, Jr., from Commander, AF Intelligence Center, Hq. USAF, Field Activity Group, Arlington, Va., to Deputy ACS/Intelligence, Hq. USAF.... **Maj. Gen. William K. Martin,** from Director of Personnel, Hq. SAC, to Deputy AF Office of Information, Hq. USAF.... **Brig. Gen. John A. McDavid,** from Deputy Director to Director, J-6 (Communications-Electronics), Office of the JCS, Hq. USAF.... **Brig. Gen. Noel F. Parrish,** from Assistant to Director/Plans, DCS/P-P, Hq. USAF, to Research Studies Institute, Air University, Maxwell AFB, Ala.... **Brig. Gen. Kenneth R. Powell,** from Chief of Staff, Missile Division, SAC, Vandenberg AFB, Calif., to Deputy Director for Materiel, SAC, Offutt AFB, Neb.... **Brig. Gen. Robert C. Richardson, III,** from Chief, Long-Range Objectives Group, DCS/P-P, Hq. USAF, to Deputy Director, Military Assistance Div., US European Command, APO 128, New York, N. Y.... **Maj. Gen. William L. Rogers,** from Vice Commander, AF Missile Test Center, AFSC, Patrick AFB, Fla., to Commander, Arnold Engineering Development Center, AFSC, Tullahoma, Tenn.

Maj. Gen. Austin J. Russell, from Commander, 822d Air Div., SAC, Turner AFB, Ga., to Director of Personnel, Hq. SAC, Offutt AFB, Neb.... **Brig. Gen. William T. Seawell,** from Military Assistant to the Deputy Secretary of Defense, OSD, to Commandant of Cadets, USAF Academy.... **Brig. Gen. Pinkham Smith,** from Chief of Staff, 15th AF, SAC, March AFB, Calif., to Commander, 819th Air Div., SAC, Dyess AFB, Tex.... **Maj. Gen. John D. Stevenson,** from Commander, 28th Air Div. (SAGE), ADC, Hamilton, Calif., to Assistant Chief of Staff, Air and Spec. Operations Div., SHAPE.... **Maj. Gen. Henry R. Sullivan, Jr.,** from Commandant of Cadets, USAF Academy, to DCS/O, Allied AF Central Europe, SHAPE.... **Brig. Gen. Jack E. Thomas,** from Director of Intelligence (J-2), US European Command, to Deputy Director of Intelligence (J-2), The Joint Staff, Office of the JCS.... **Brig. Gen. Robert H. Warren,** from Vice Commander to Assistant to the Commander, Air Proving Ground Center, AFSC, Eglin AFB, Fla.

Brig. Gen. Douglas E. Williams, from Director of Communications and Electronics, ADC, Ent AFB, Colo., to Assistant Chief of Staff, Communications and Electronics, Pacific Command, 6003d Support Sq., PACAF, APO 953, San Francisco, Calif.... **Brig. Gen. William R. Yancey,** from Commander, 819th Air Div., SAC, Dyess AFB, Tex., to Commander, 47th Air Div., SAC, Castle AFB, Calif.

MODIFICATIONS to orders as reported in June 1961 issue: Reassignment of **Brig. Gen. Kenneth H. Gibson** to Hq. Washington ADS, ADC, Fort Lee, Va., is revoked.... **Brig. Gen. James B. Tipton,** assigned to Hq. Chicago ADS, is reassigned to Hq. Washington ADS.... **Maj. Gen. Conrad F. Necrason,** assigned to Hq. 30th Air Div. (SAGE), Truax Field, Wis., is reassigned to Hq. 28th Air Div. (SAGE), Hamilton AFB, Calif.

RETIRED: Maj. Gen. Daniel S. **Campbell,** Brig. Gen. Christian F. **Dreyer.**—END

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Many these days are calling for a massive buildup of conventional, nonnuclear weaponry. The fact is, however, such capabilities simply cannot meet our current and critical military requirements . . .

AIR FORCE
JULY 1961

A SPECIAL REPORT

THE TRUTH ABOUT CONVENTIONAL FORCES

YOU HEAR a great deal of talk these days about the need for a massive buildup of conventional military forces. Most of this is dangerous nonsense.

Not that we don't need conventional—that is, nonnuclear—strength. We do. But only as it is complementary to our nuclear capability. Conventional strength on its own has no place, for our ends, in the modern world.

The suggestion that seems to be going the rounds that conventional, old-fashioned military forces may, after all, be just what we need, stems from escapism, wishful thinking, ignorance, selfishness, or a combination of these factors.

The plain, unadulterated truth is this: Nuclear weapons are at the core of our military strength, where they belong and where they must remain. We cannot do without them. Our strategy depends on these capabilities. We are at a point in history where this is perhaps the major fact of human life on planet earth. No ifs, ands, or buts.

Guerrilla warfare capabilities may have a major role

(Continued on following page)

to play in free-world strategy at present. A certain level of nonnuclear ground strength is no doubt desirable in a number of parts of the globe. The free world's oceanic lines of communication certainly must be kept open if at all possible.

But none of these factors even begins to compare in magnitude with this specific requirement: We must make sure we are ahead and stay ahead in nuclear striking power. In other words, today and tomorrow as yesterday, we must keep our strong deterrent-counterforce guard up. Conventional forces simply cannot be the answer; the world is past that.

Those who call for substantial conventional buildups often suggest that East and West have reached a point of "nuclear stalemate," or what is now more often called "stable deterrence." This is an unrealistic concept that logic should have banished from national debate long since. It is based on several unspoken but implicit assumptions. They are seldom publicly examined. A review of them here is a good jumping-off point for an examination of current conventional's-the-thing thought.

The first of these assumptions is that the Soviet Union finds the prospect of the use of nuclear weapons as frightful and as terrifying as do some military commenators in the free world. The second is that the Soviets are as prepared as some of these commentators to limit the size of their nuclear forces as a consequence of these fears. The third is that there is not too much likelihood of a sudden breakthrough giving the US or USSR a major advantage in nuclear striking capabilities.

Two conclusions are then drawn: (1) Because these weapons and their uses are too horrible to contemplate, they are for all practical purposes outside the military equation. (2) All the US needs is a small, or "minimum," deterrent force to strike terror into the heart of a potential enemy. And, as a further conclusion related to both these points, effective strength has once more come to rest on conventional forces.

But, we may ask, do the Russians truly feel a profound aversion to the use of nuclear weaponry? Wouldn't they be prepared to utilize these or any other weapons to conquer the world, their avowed aim? Are they thinking in terms of limiting their own nuclear force? Can the Russians truly be deterred by a minimum US deterrent, which could make Russia suffer but not destroy her military strength? Is it possible for the free world really to develop conventional forces able to take on the manpower-rich Red world man for man? Most of all, isn't it most likely that the side that devotes most treasure and effort to nuclear weapons will, indeed, score a breakthrough and thus place its adversary in an extremely uncomfortable position? By turning our attention to conventional forces, wouldn't we be jeopardizing ourselves in this regard?

The answers to these questions, one would assume, are obvious. Is it, then, time for a change from nuclear to conventional orientation for our forces?

Let us turn from theory to hardware.

Conventional weapons remain necessary under all conceivable forms of nuclear conflict. They certainly are necessary now when the struggle between communism and democracy goes on in such places as Laos, the Congo, and Cuba, where the utilization of nuclear weapons would be impractical and inappropriate. The decision by President Kennedy to increase by several hundred men the guerrilla capability of the US Army was long overdue. One wonders whether this token increase will be adequate—and, in addition, why the Army itself did not listen to its own preaching and augment its guerrilla capabilities years earlier and in a more substantial manner.

The free world should maintain, especially in Europe, strong conventional ground forces. Increased holding capacities on the part of the NATO armies are necessary to reduce Soviet surprise capability and furthermore will force them to concentrate firepower, thus offering effective targets for nuclear attack. In fact, for ground defense, nuclear and conventional weapons are closely interrelated—a fact of overwhelming importance which at this writing is hardly grasped by anyone in governmental authority. In Europe, Latin America, and elsewhere, conventional troops must be ready to deal with internal Communists, isolated squabbles with Red puppet states, and acre-by-acre aggressive incursions along the periphery of the free world—a familiar tactic since World War II.

However, the argument that conventional ground strength in Europe should be increased in order to raise the "threshold" of nuclear conflict falls flat. The idea seems to be that if the Soviets attack with conventional means, we should try to hold them with conventional weapon systems in order to make it possible for both sides to "talk it over" and call the whole thing off before it becomes full-fledged nuclear war. An added contention in this connection is that if the West were to retaliate immediately against the Soviet conventional attack with nuclear weapons, it would carry the "onus" of having initiated nuclear holocaust.

All reasonable men, of course, favor raising the "threshold" of nuclear conflict, and any arrangement that would allow the aggressor to reconsider and withdraw his attacking forces would obviously benefit mankind. The proposal to solve this particular problem by increasing conventional strength in Europe, however, is impractical.

It is absurd to believe that the Soviet Union, after it made a deliberate decision to attack, would reconsider its decision within twenty-four or forty-eight hours simply because the Red troops encountered machine-gun and artillery fire. Is it any more plausible to assume that any of the European satellites would attack without Moscow concurrence? If such a concurrence were given, it is likely that the attack would be pressed forward under any circumstances, just as if it were a Kremlin-originated action in the first place. It may be granted that the Soviets could decide on a test of strength or a reconnaissance in force—surely an incredible risk in the nuclear age—but it still seems doubtful that they would be discouraged from pursuing their aggression by a conventional holding action. Indeed, a measured and limited utilization of nuclear weapons, if only for demonstration purposes, would probably be more persuasive.

In the final analysis, in any event, discussion of free-world conventional strength must finally come to this dead end. There does not seem to be any way by which locally available armies could be quantitatively and qualitatively improved to a point where they would be able to halt a conventional Soviet ground onslaught for more than a brief period. Obviously it would not be feasible to station the requisite number of American troops across the length and breadth of Europe—or elsewhere. Consequently, since there is very little chance that local armies could appreciably delay a sustained Soviet attack, the threat of American nuclear air intervention is the only element which provides them with strategic protection. This is simple, oft-stated, and true.

It makes little sense, in fact, to talk about conventional strategy unless we are willing to increase conventional strengths in a substantial manner. One or two additional divisions would not change the present situation significantly. The problem in essence would require for its solution the augmentation of the NATO forces by something like ten to twenty divisions, most of them in Germany. No one is going to raise these troops. If they were raised, the United States would have to provide the bulk of the equipment. Even then, practical questions concerning quarters, training areas, and the like would arise. The concentration of these forces would be such that they would offer the most remunerative targets to Soviet nuclear attack.

Let us suppose that we did increase our ground strength by a certain necessary number of divisions. Suppose the deployments are such that the Soviets, in order to advance at all, must concentrate. If they do this, they immediately run the risk of nuclear attack. Since they cannot take such a risk, they have two choices: (1) avoid the concentrating, which would mean attacking with nuclear weapons in order to cut through our ground deployments, or (2) preempt NATO nuclear strike capabilities, which would mean attacking Western airfields and missile bases with nuclear weapons.

However we conceive the surface battle, it is very hard to visualize a grand strategy which would not, as the first order of business, try to achieve air superiority for the attacker. This means that, even if the enemy aims merely at surface conquest, he is forced to attack the opposing air and missile forces first. Obviously for this purpose he must also utilize nuclear weapons; otherwise he could knock out nothing.

For argument's sake, let us assume that a ground battle is joined in the style of World War I, with large masses of artillery and relatively few aircraft. It is obvious that as one side may go down to defeat because it is cornered by superior numbers, it might resort to nuclear weapons in order to get out of the predicament. Against this possibility it is argued that the side which is being defeated is not going to risk self-destruction by initiating nuclear war. This may be so, but the question is whether the prospective winner is going to take his chance with this type of argument and is not going to "make sure" by a preemptive surprise attack.

It is impractical, one finds, in each of these situations, to continue modern battle for a long time without one or the other belligerents resorting to nuclear weapons.

This being the situation, then, practically all military expenditures must be devoted to preparing oneself for the fighting of nuclear battle. The purchase of conventional weapons makes sense within that framework. It makes no sense whatever if conventional battle is conceived to be a *substitute* for nuclear conflict. This means that it is entirely logical to argue for an increase in ground strength, including conventional, which would force the attacker to concentrate. To the extent

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that this can be done, the threshold of nuclear conflict would indeed be raised. But the point is that this raising of the threshold results from the nuclear-conventional combination and not merely from an increase in conventional strengths.

It should be added that no one argues seriously that the Western powers could maintain two types of battle establishments—one to fight the nuclear, the other to fight a conventional war. This would not be feasible for economic and manpower reasons and no more need be said about it. However, the concept of the "dual purpose force" still is getting considerable hearing from people who should know better. This concept is infeasible for the simple reason that as pointed out before repeatedly, a conventional force would have to concentrate in order to achieve firepower and thus would open itself to destruction by nuclear attack. By contrast, the force that is dispersed needs nuclear weapons in order to be effective. This, of course, does not mean that a screening forward force needs nuclear weapons and cannot be effective in dispersal if only for a short period. In fact its effectiveness over more than the first few minutes is dependent, of course, upon support provided by nuclear forces to the rear. The beginning of proper military planning will not come before it is recognized that nuclear and conventional weapons are not mutually exclusive but supplementary, with the conventional weapons being essentially auxiliaries to the nuclear weapons. There is little possibility that this relationship will change in the foreseeable future.

At the risk of laboring the obvious, let us take a look at the possibility of putting airpower back into conventional weapon systems. Needless to say, those who advocate this course of action also would be very happy if they never heard about the aircraft again, but it is perhaps unnecessary to reiterate the old arguments of the '20s and '30s. Let us assume then that we would like to apply the air strategy of World War II against the Soviet Union. During World War II about 2,000,000 tons of bombs were dropped on Germany without quite doing the job. Let us assume further that 3,000,000 tons of bombs dropped within three years would have destroyed Germany strategically. Considering the growth of industry and the differences in the territory, it certainly must be assumed that the destruction of the Soviet Union would require a bomb load of at least 10,000,000 tons on target. Since air defense capabilities have greatly improved since 1945, surely it is not too radical to assume that in order to get 10,000,000 tons on target we would have to get 15,000,000 tons off the ground. Furthermore, while the European war could be fought at a range of less than 800 miles, a Soviet-American war would require a range of 2,500 miles, if we were able to hold Japan and Western Europe, and 5,000 miles if we were to attack from the Western Hemisphere, provided we have kept refueling bases for the return trip.

In other words, the tonnage requirement would be eight times greater than it was in the last war, and the range requirement would be about six times greater under favorable conditions, or relatively favorable conditions. It is entirely unnecessary to pursue this calculation. But for the exercise, let us assume that the war would be scheduled for six years, that 2,500,000 tons were to be dropped yearly, that each bomber would carry ten tons of bombs (a fantastic assumption for near-sonic speeds), and that each bomber would survive twenty-five sorties. In that case, we would have to have a fleet of 10,000 heavy-bomber types of a configuration considerably more costly than the B-52. Assuming that each such modern aircraft costs only $2 million, the price tag on the bomber fleet alone would be $20 billion. This, of course, does not include the maintenance and operating costs and all the other incidentals which are so infinitely more expensive than the purchase price of the airplane itself. In brief, the Strategic Air Command would have to be enlarged between ten and twenty times, and it is clear that such enlargement would have to be paralleled by augmentation in all support forces.

If we were to calculate the same problem in terms of ICBMs, the answer would be—you guessed it—that we need millions of ICBMs; it makes hardly any difference how many millions. The fact is that we can barely scrape together a few hundred of these modern weapons.

Once this point is thoroughly understood, we need not lose much time about an argument concerning the utility of having at least some conventional air capabilities to fight in such places as Laos and the Congo, and perhaps to provide some short-lived air support to a conventional screening force in Europe. This problem boils down to an estimate of how many sorties can be prepared with what bomb loads or perhaps more usefully with air-to-ground conventional rockets. Any calculation would show that not much can be achieved unless billions are spent. Perhaps low-performance aircraft may be used in some theaters, and a good case might be made for developing the strictly guerrilla-support aircraft which would not need to survive in a technologically advanced environment. Otherwise, if modern high-performance aircraft were used to drop conventional weapons, they would have very little impact, if any; yet attrition and casualties would occur nevertheless, with the result that within several days of operations the force would be destroyed without having hurt the enemy.

In summary, modern technology cannot be eliminated and none of its key elements can be pushed back into the womb of time. Technological progress continues and is accelerating. There is nothing that can be done to slow it down. Wishing won't make it do so, nor will a profound desire for a world of safe, sane, old-fashioned weapons. Any attempt to go back in time means only that a lot of money is going to be down the drain, that the nation's strength for survival will fall dangerously.

Much of the current talk about conventional weapons merely comes from persons engaged in feathering their own service nests—no more. But even they, of course, would not actually benefit from such a policy in the long run. Nobody would—not this side of the Iron Curtain, that is.—END

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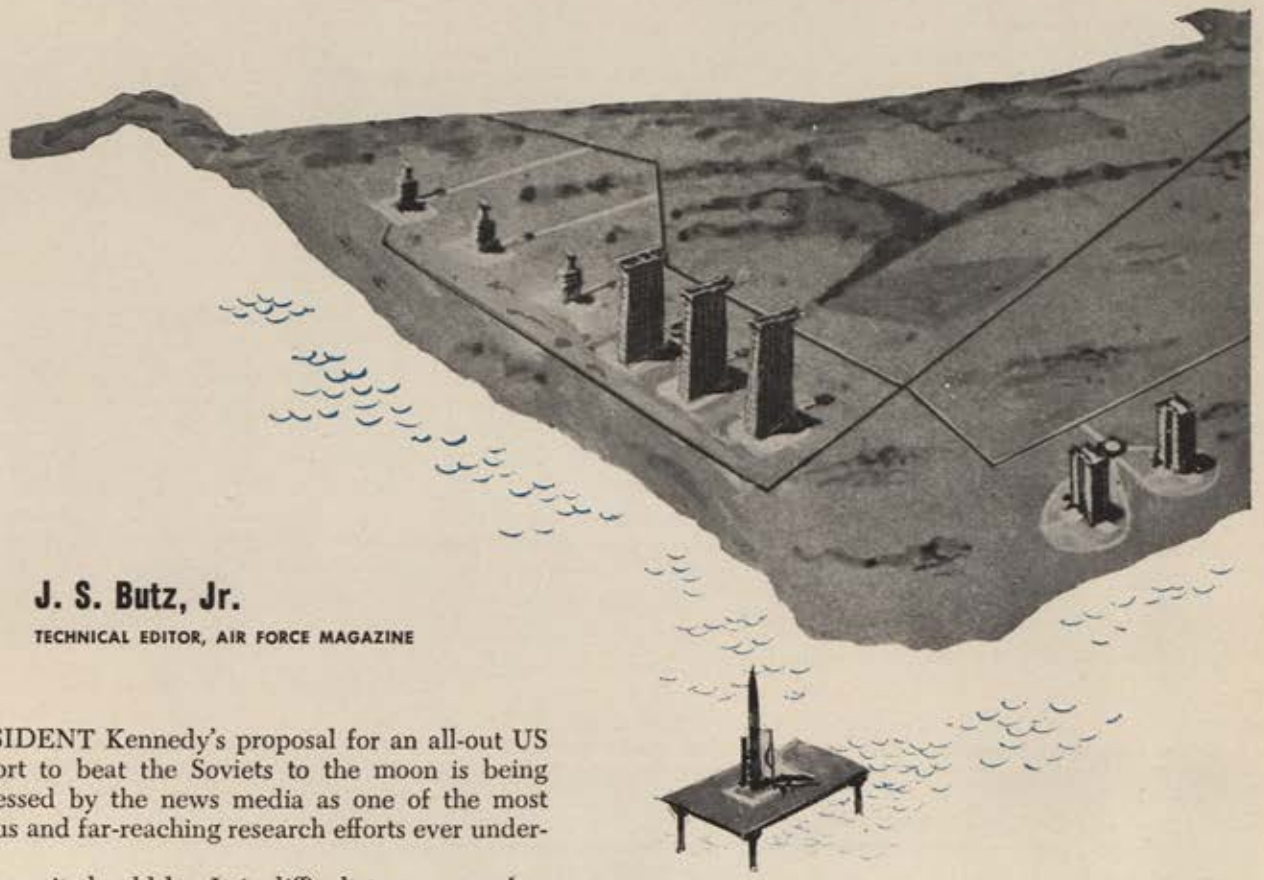
MEN TO THE MOON



J. S. Butz, Jr.
TECHNICAL EDITOR, AIR FORCE MAGAZINE

PRESIDENT Kennedy's proposal for an all-out US effort to beat the Soviets to the moon is being stressed by the news media as one of the most ambitious and far-reaching research efforts ever undertaken.

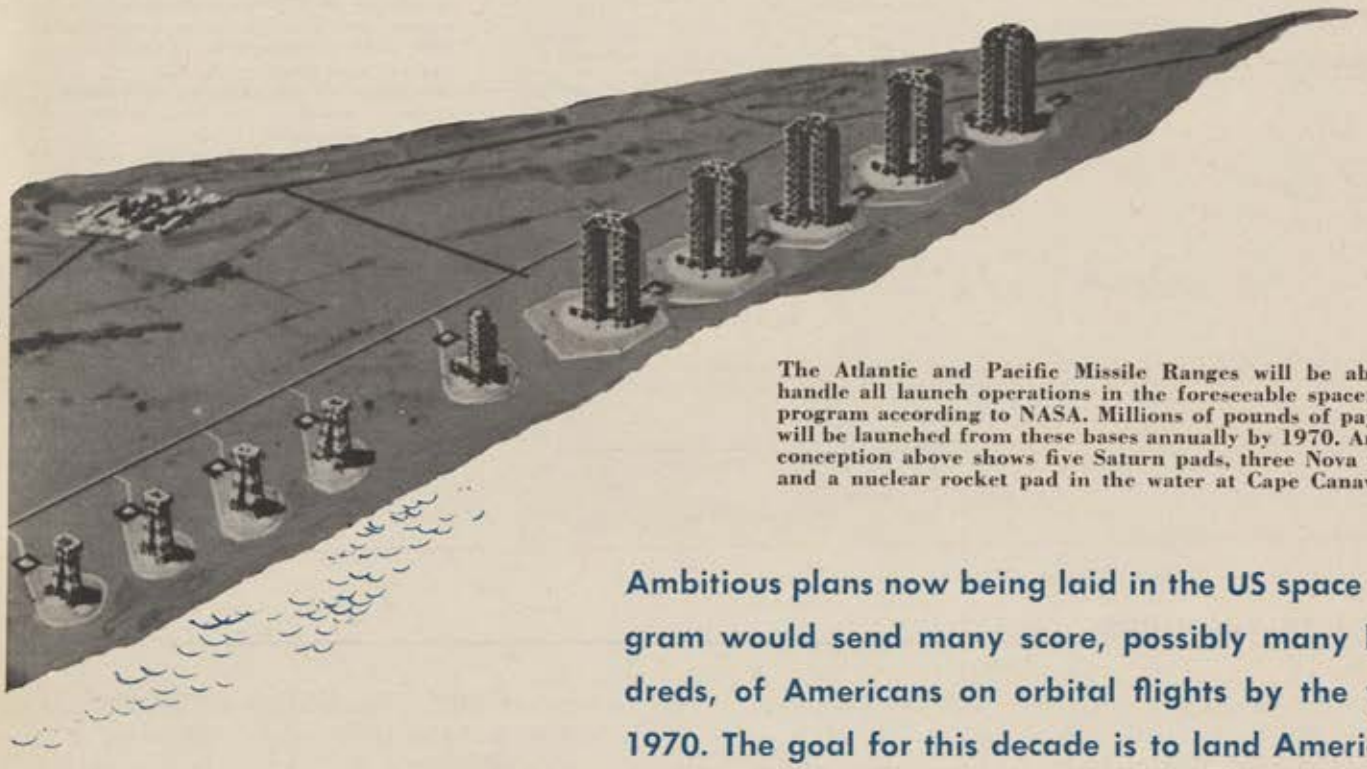
This is as it should be. It is difficult to overemphasize the magnitude and importance of this research and development effort to be conducted in this country in the next few years.

But, unfortunately, in this time of new interest in space R&D, another important aspect of the moon program is being largely overlooked, or misconstrued. For example, the impression exists in many quarters that only a few large vehicles of the Saturn or Nova types will be built and that eventually one of the Novas will take three Astronauts to the moon.

It is widely believed that perhaps a dozen new Astronauts will be selected to join the first seven. The number of orbital training flights for these men is often predicted to be very small. Outside of the few training flights for the men and a few test flights for the big vehicles, it is generally believed that the billions of dollars requested for the US moon expedition will be spent on earth-bound research and development.

No picture of the moon program or of the total US space effort for the 1960s could differ more completely from the plans that are actually being laid. An extremely rapid buildup of US operational space activity is planned as soon as the Saturn, the first of the superboosters, is man-rated. This should be about 1965. The rapidity of the buildup in manned space activity is very difficult to comprehend now, so short a time after Gagarin's and Shepard's embryonic efforts. The main operational requirements now being formulated by the National Aeronautics and Space Administration are:

- Millions of pounds of payload will have to be sent into orbit each year to perform the tasks necessary to the lunar landing project and the remainder of the space program. By 1970 it is probable that the annual payload requirement will be equivalent to much more than three million pounds in a 300-mile orbit above the earth.
- Many score and possibly many hundreds of Americans will have had orbital flight experience by the year 1970.
- Firing rate on Saturn- and Nova-type vehicles is expected to be a minimum of one every seven or eight days by 1970. If the big booster program proceeds without major technical or management problems, this rate could be much higher, possibly one every three or four days.



The Atlantic and Pacific Missile Ranges will be able to handle all launch operations in the foreseeable spaceflight program according to NASA. Millions of pounds of payload will be launched from these bases annually by 1970. Artist's conception above shows five Saturn pads, three Nova pads, and a nuclear rocket pad in the water at Cape Canaveral.

Ambitious plans now being laid in the US space program would send many score, possibly many hundreds, of Americans on orbital flights by the year 1970. The goal for this decade is to land Americans on the moon . . .

• Between 1965 and 1970, the operational costs of launching large vehicles are estimated by NASA to be between fifty and seventy percent of the total space budget in those years. That will amount to something over $25 billion. Operational costs include vehicle production, propellant, crew, ground crew, and various other expenses that recur at every launching. Before 1965, the major portion of the space budget will go to research and development.

• The exact procedure to use in sending men to the moon has not been selected and probably won't be for a few more years. Two methods are under consideration. The moon vehicle may be sent into orbit in pieces using Saturn boosters or a two-to-three-million-pound-thrust Nova booster. Assembly and fueling of the lunar vehicle would be accomplished in orbit for its trip to the moon. If the US moon expedition is to depart in 1967 or shortly thereafter, many experts believe that the orbital assembly technique will have to be used.

The alternate approach is to use one Nova rocket with about twelve million pounds of thrust in the first stage which would be able to send an Apollo lunar vehicle from the earth to the moon in one direct flight. While the vehicle would enter a low earth orbit for a time during this direct flight it would take on no extra weight. This heavy Apollo payload would have a propulsion system to slow it down for a moon landing and then to speed it up again for the long free-fall back to the earth. There are a number of solid doubts about a twelve-million-pound-thrust Nova vehicle being ready for the lunar trip in 1967 or 1968. The decision has not been made yet and no detailed design work has started.

In presenting his proposal for an all-out space effort to the Congress and the people of the United States, President Kennedy seems to have taken the only realistic approach. He is seeking acceptance of one long-range, prestige-loaded, and expensive goal—the manned expedition to the moon.

If the Administration tried to push the space program by describing the operational implications of mounting such an expedition, it probably would be impossible to keep attention focused on the central question concerning space during the next few months. The all-important question is whether Congress will give its support to moon landing as a national goal to be accomplished not later than December 31, 1969.

If this support is given, there will be no doubt about the United States ending this decade as an immensely strong space power. Even if the Russians did beat us to the moon, our strength would be undeniable and in all probability unassailable. The Soviets might capture this prestige symbol but if they continue to perform their space feats in almost total secrecy they could end up swamped on the propaganda front. Almost unlimited evidence of American power and energy would be openly available at our laboratories and launch sites.

As has been pointed out so many times in recent weeks, there is almost unlimited scientific knowledge

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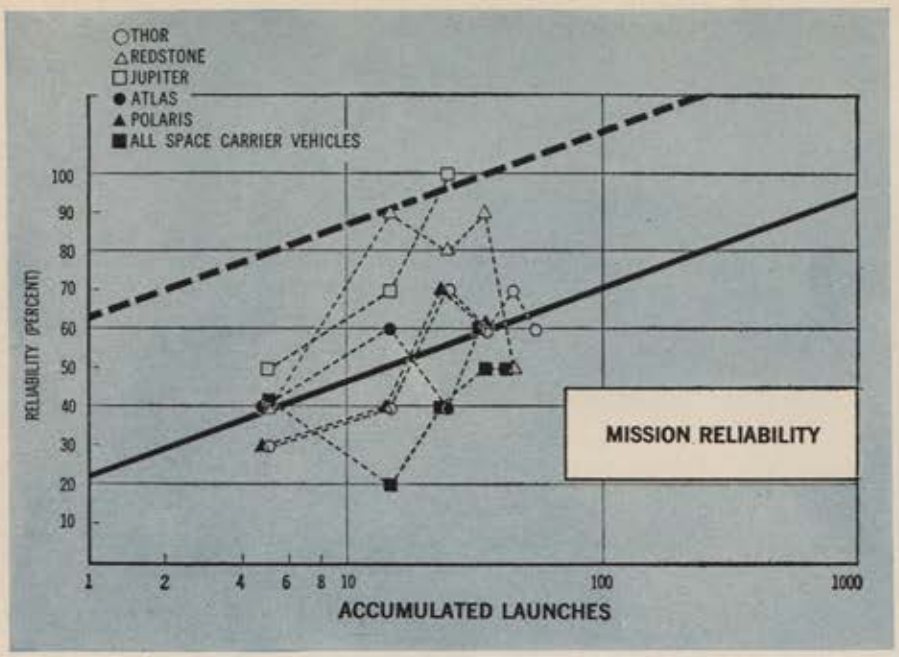

NASA curve at left shows the reliability of US rocket vehicles which have been flown extensively. This data was taken from public sources and it concerns the reliability of the vehicles and their systems and does not include the payload reliability. This curve shows that all vehicles built to date fit the same general reliability curve. If the Saturn and Nova reliability curves cannot be shifted up in the vicinity of the heavy dotted line then the US space program probably will cost more than expected. Many planners believe that the curve can be shifted up if more of the project funds are spent in its first couple of years for more thorough testing of small components.

MEN TO THE MOON — CONTINUED

to be gained when man is able to walk the face of the moon and to bore holes under its crust. There is no doubt that the spirit of adventure in most men will be awakened when astronauts or cosmonauts reach the moon.

However, in these years of doubt concerning relative national strengths, the moon-landing program has a much greater meaning to those who are interested in the US coming from behind and developing a superior operational capability in space.

An all-out effort on the moon expedition is the most volatile catalyst that could be applied to the entire US space effort. At least ninety percent of current space work is of direct importance to the moon-landing project. All of this will have to be speeded if the 1970 date is to be kept. Virtually all techniques and procedures needed to move at will in space will have to be mastered before the moon trip can be made. Maneuvering in orbit, rendezvous of vehicles in orbit, terminal guidance and control, landing at a preselected spot on a target planetoid, and the other basic space maneuvers undoubtedly will have been accomplished several times without hitch before man tries to go to the moon and use all of them in sequence on a single mission.

The same statement can be made about all of the equipment necessary for the moon-landing trip. Life-support systems, shielding to protect the astronauts from solar radiation and cosmic rays, communication and navigation equipment, stabilization systems, highly controllable engines to keep vehicles on precise trajectories in space and during landing maneuvers, all will have to be developed to a high state of reliability before men can go to the moon.

A tremendous momentum in operational experience as well as design technology will be generated by the moon-landing program. There is an exceedingly long list of reasons why manned orbital flight must be fairly common before 1967, the earliest possible date for the moon landing, and may be considered routine by 1970. First, crews must be trained. Undoubtedly professional astronauts always will spend much more time training in complex simulators on the ground than they will in space. However, there will be a substantial number of training flights in low earth orbits. It is now planned for the Apollo flexible configuration moon vehicle to make many trips into orbit. It will be used as an orbiting laboratory as well as a crew trainer. Later, the vehicle will be lightened and a crew will be sent on a flight around the moon and back to the earth. Possibly more than one circumlunar flight will be made. Finally, the vehicle's configuration will be altered again by the addition of some fairly large rockets. These engines will slow it down for a soft landing on the moon and will then be used to fire it away from the moon to the earth.

Second major reason for a large amount of manned orbital activity is to test equipment. No simulator on earth can completely duplicate the space environment. Therefore, it is impossible to guarantee that any type of system will perform perfectly in space, no matter how thoroughly it has been wrung out and tested on the ground. All operational equipment will have to be run for extended periods in orbiting laboratories before it can be used on long space trips.

There is still another important reason why a number of orbiting laboratories—most of them manned—will be used. Any pioneering space program, like that of either the US or the USSR, must be a concurrent effort. That is, basic research, applied research, equipment development, and operational work are all going on simultaneously. Orbiting laboratories will carry small specimens of materials, fluids, living tissue, and so forth, to study the long-range effect of the space environment. Basic scientific studies of the solar system, the universe, and the space environment will

also be in progress on orbiting laboratories by 1970.

Each of these laboratories and the crew-training and equipment-proving flights into orbit will add substantially to the annual payload requirement. A typical list of payload requirements is given on page 48.

Good management has been called the secret of success in space. The scientific, engineering, and organizational tasks which must be accomplished before man can go there in force are more numerous and complicated than have yet been tackled in a single coordinated effort. President Kennedy made a plea for good management and, ". . . a degree of dedication, organization, and discipline which have not always characterized our research and development efforts." He mentioned, ". . . undue work stoppages, inflated costs of material or talent, wasteful interagency rivalries, or a high turnover of key personnel" as situations we cannot afford.

Top-level management in the White House, NASA headquarters, and the Department of Defense also will have to reach decisions firmly and on time if the echelons below them are to function efficiently. Otherwise, many of the failures and much of the unpleasantness of the past inevitably will be repeated.

While there are numerous items of importance in the management problem, two of them seem especially worthy of mention at this time. The first item is deciding how much weight the US wants to put into orbit during the decade from 1965 to 1975. It is not possible to proceed intelligently with the so-called Nova "superbooster" until the national payload requirement has been established. The optimum size of the Nova cannot be determined until the people who are running the space program decide exactly what they want done.

A good indication of the future forecast for the national payload requirement is the fact that NASA studies show that the Saturn booster or a smaller one is about the optimum size vehicle if the payload requirement does not exceed three million pounds per year in a 300-nautical-mile orbit. In this context the optimum-size vehicle is the one which will put payload into orbit for the lowest total cost per pound. NASA has defined the total cost as the sum of the indirect and direct costs.

In most cases, the optimum size vehicles will not be used because they would require a very large number of launch pads. For instance, there would have to be about twenty-five Saturn launch pads if this vehicle is to be used to put three million pounds of payload in orbit each year. There is not enough usable real estate at either the Atlantic or Pacific Missile Ranges to allow this. Therefore, larger vehicles of the Nova class will be needed. Nova vehicles also reduce the time and effort which will be expended in the orbital assembly of vehicles and space stations.

NASA studies to pick an optimum-size Nova have involved vehicles in the two- to three-million-pound-thrust range and the six- to twelve-million-pound class.

Two top-level management decisions will be necessary before it is possible to sensibly pick an operational Nova from these paper vehicles. The national payload requirement must be set for the five and probably ten years following 1965. And it must be decided whether the Apollo vehicle will be sent on its moon-landing trip directly from the earth or whether it and its booster will be assembled and fueled in orbit for the journey.

The second item of major management importance now is the reliability to be expected from the big-booster vehicles. After the national payload requirement has been set and a booster size picked, their reliability must be estimated before it is possible to determine the necessary booster production rate. With fifty percent reliability, we would obviously need twice as many boosters with 100 percent reliability.

The NASA curve on page 46 is probably the most critical one that can be drawn today concerning the cost of the US space program. It shows that in the past US rocket vehicles have started off with a very low reliability. All of them have followed approximately the same reliability improvement rate. Once the flight-test program has begun, there apparently is no way to improve reliability without firing the vehicles many times.

If the Saturn and Nova vehicles follow this reliability curve, then the US space program undoubtedly will get into serious financial trouble in five to seven years. However, many technical people in NASA and industry believe that there is a way to improve the reliability picture. Their solution is to do a more thorough job in the R&D phase before a project reaches flight test. Many engineers contend that in the past rocket-vehicle projects have been starved for money during the component design and testing phase.

Therefore, the suggested reliability solution would

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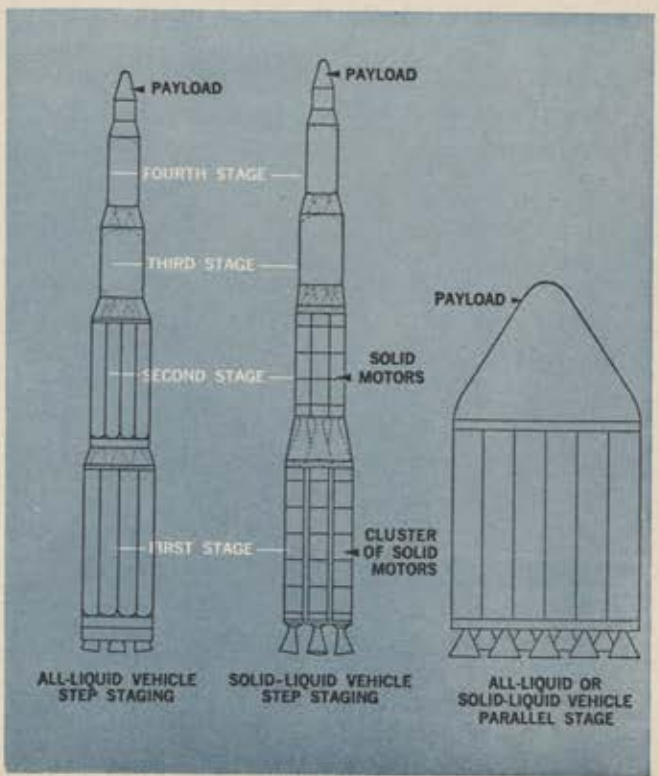
Paper studies of Nova "superboosters" include configurations similar to those below. Parallel staging is being considered because it allows all engines to be started on the ground and it eliminates control and structural problems which are critical on long vehicles with large first stages. It also allows a large volume for bulky, one-piece payloads.



call for management to put more money in a project early rather than pouring it in later for hasty fixes during the flight-test stage. If this is done, NASA experts predict the reliability curve can be shifted up so that Nova boosters will start off with fifty percent reliability or better. By the tenth firing, their reliability would be up to a tolerable level (*see heavy dotted line on curve, page 46*).

Vehicle production rate will also depend upon the effectiveness with which all of the stages can be recovered. NASA is making extensive plans to recover all stages of the large vehicles. It will not be clear for some time, however, how many of the individual parts can be reused or how many times they will function reliably. Refurbishing of the recovered vehicles will become a very large activity.

The biggest question mark regarding the establishment of a national payload requirement is the military portion of the requirement. Recently, a great deal has appeared in newspapers and magazines about the Air Force being denied a man-in-space role. The implication has been left in a number of cases that, if the Air Force and its contractors come through with successful solid-propellant boosters, then it will be able around 1965 to wrest some of the man-in-space business away from NASA.

Nothing could distort the true picture any more than this type of statement. The man-in-space die and in fact the die for most of the 1965-1970 space program will have been cast long before 1965. It is inconceivable that this nation would wait until 1965 to establish a manned military space program which could not have adequate operational strength until the middle 1970s. It is unthinkable for the US to deny unilaterally the military potential of space. It would make as much sense to disarm unilaterally.

In the military sense, it would seem impossible for anyone to forget that the Soviet's three- to four-year lead in large-booster development could allow them to launch the type of massive operational space effort in 1962 or 1963 that NASA now plans for 1965 or 1966. Nothing now indicates that the Soviets do not intend to push their present advantage to the fullest.

US ability to catch up with the Russians on both the military and civil space fronts will depend heavily on decisions made during the next two years. The national payload requirement established during this time will fix the size of our superbooster and the rate at which it will be produced. This will fix our capability from 1965 to 1970 just as firmly as the decisions of the late fifties locked us into second place during the first half of this decade.

Regarding the military portion of the national payload requirement, it can be said with certainty that the Air Force will operate NASA-developed hardware after 1965 just as NASA has used and will continue to use military rockets.

The large solid-fuel boosters, for which the President asked Congress to appropriate $62 million during fiscal 1962, will be used to lift part of the national payload requirement if they are successful. With the type of development program planned and the amount of money available, it should be possible to determine the exact capabilities of these boosters within a year and a half. If they are as successful as their proponents predict, then these boosters probably will be used widely by NASA as well as the Air Force.

While the NASA evaluation may change, it is clear that most of the propulsion experts in the organization do not believe that the solid booster will be as effective as liquid engines for the moon mission. NASA estimates indicate that a solid booster for the direct earth-moon flight by the Apollo would require thirty million pounds of thrust compared to twelve million for the liquid-fuel booster. However, NASA experts believe it is possible that the solid booster could become the most inexpensive means of lifting large payloads into close orbits around the earth.

Many people are predicting a long series of bitter arguments between NASA and the Air Force over the solid-versus-liquid rocket and a veritable host of other technical and management questions. It is encouraging, however, to get a different reaction from most people in both organizations who are called upon to do the work and not kibitz. The majority opinion seems to be that the space problem may be a good bit bigger than most people realize. It would seem clear that the US cannot hope to launch a superior space effort without constructively using all of the talent, energy, and resources of both organizations.—END

TYPICAL PAYLOAD REQUIREMENTS

Several NASA estimates for payloads required by space missions are listed below. These payloads are all in equivalent weights for a 300-nautical-mile orbit. On the moon missions, for instance, 30,000 lbs. delivered to the moon is roughly equivalent to 350,000 lbs. in a 300-nautical-mile orbit as far as booster capability is concerned.

1. Construction of a 6-man space laboratory	100,000 lb.
2. Logistic support of a 6-man space laboratory	200,000 lb./year
3. Construction of a 50-man space station	1,000,000 lb.
4. Manned lunar circumnavigation	50,000 to 100,000 lb.
5. Manned lunar landing of a single 3-man crew and return	350,000 lb.
6. Construction of 10-man lunar observatory	6,000,000 lb.
7. Establishment of a permanent 24-hour communication satellite system	200,000 lb.
8. Logistic support of a 10-man lunar observatory	3,500,000 lb./year
9. Six-man, semifast Mars expedition, nuclear propulsion	2,000,000 lb.

Through the years, the word deterrence has served many meanings for many purposes. The nature of true deterrence, a prime factor in the East-West power balance, has now shifted radically . . .

Deterrence: EVERYBODY'S CONCEPT

AN ESSAY

THE WORD "deterrence" stems from the same root as the word "terror." Its basic meaning is "to turn aside, restrain, or discourage through fear." The "deterrent concept" as it developed in this country and in England followed this meaning. It was simply the idea of preventing an enemy attack anywhere by posing the threat of a counteraction somewhere.

Like many overworked abstractions, the "concept" of deterrence has served as a grindstone for many axes. It has been deformed. The motives behind this deformation of a concept are worth reviewing.

From the beginning, deterrence had to mean more than a mere determination to resist. It had to depend upon a well prepared force capable of a dreadful counterstrike. After 1946, when the Soviets began to add territory through the pressure of their huge armies, they had to be deterred from further expansion by a powerful threat. They were certainly not vulnerable to a counterinvasion or to blockade. The only counter-

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action they had reason to fear was air action. The United States possessed atomic bombs in numbers and aircraft to deliver them anywhere on the globe. This counterthreat of air action was fearful enough to "discourage" conquests by land armies.

It was this situation that inspired Winston Churchill's famous statement on March 31, 1949:

"I must not conceal from you the truth as I see it. It is certain that Europe would have been communized and London under bombardment some time ago but for the deterrent of the atomic bomb in the hands of the United States."

This was the most important early use of the word "deterrent" in the broad sense in which it was to be employed for ten years. Churchill's term was soon repeated in this country by Secretary of Defense Louis Johnson in June of 1949, when he said at the National War College that airpower:

". . . had passed through a period of adolescence to find maturity in a concept of strategic air bombardment. Thus the threat of instant retaliation through an air offensive has become one of the greatest deterrents of war today."

It is interesting that Johnson used the phrase "deterrent to war." Churchill had spoken of a deterrent to "communization."

Communization without war had occurred in the case of Czechoslovakia in 1947. The next important Red move in Europe involved the use of force. When the road to Berlin was blocked a year later, the United States's determination to counter the pressure of Red superiority on land was firm. Two squadrons of B-29s were moved to England immediately. This was the first overseas deployment of an important segment of US power, other than occupation forces, since World War II. Mr. Forrestal's published diary explains very clearly how completely dependent was the US and the free world on this promise of an air-atomic response to the threatened communization of Berlin.

Czechoslovakia had been lost without war, Berlin was saved without a war. So Churchill's reference to a deterrent against a Communist takeover was more accurate than Johnson's "deterrent to war." Churchill, rather than Johnson, was again proved right when war was necessary to prevent a Communist takeover of South Korea. This event made it clear that to be effective a deterrent must be more specific than a "deterrent to war."

Certainly the Communists had no intention of getting into a war with the United States in South Korea. All they wanted was South Korea. It was President Truman who decided that military force would be used to keep them from having it. As Churchill had indicated, deterrence proved a far more complicated problem than just deterrence of "war." We ourselves were somehow deterred from using our most effective weapons. The Communists were not deterred from employing their unlimited manpower.

After the beginning of the Korean War it was the practice to say atomic weapons were a "deterrent to World War III." Deterrence had become a popular word, so it was not abandoned. Instead, its meaning was narrowed. General Vandenberg stated the United States Air Force had "prevented the enlargement of the Korean conflict into World War III."

The dread of atomic war had already risen to such a point that so miserable a conflict as the Korean War was looked upon as a desirable alternative. The dread continued to rise, and it prevented the use of atomic weapons to save the French in Northern Indo-China. This second failure to use the atomic weapon to prevent conventional stalemate or defeat led Denis Healey, an outstanding member of Britain's Parliament, to summarize the matter neatly:

"It cannot be denied that the deterrent value of atomic striking power has seriously depreciated through the West's proved reluctance to use it. From the experience of the last five years, it would appear that a general threat of atomic retaliation may well invite the Communists to prove western intentions by local military adventures."

Nevertheless, after the defeat in Indo-China was written off at the Geneva Conference, it faded from public consciousness. The old theory that nuclear bombs are a deterrent to "war," per se, was revived. This revival was a necessary outgrowth of Defense Secretary Charles Wilson's doctrine of "more bang for a buck," and his tendency to boast of the increased power of a reduced Air Force. Wilson's claim to "increased effectiveness" depended on the production of more powerful nuclear weapons. Wilson and his fellow spokesmen seemed convinced that a simple increase in the area of destruction that our weapons could produce, would deter war completely. The fact that the Russians were also producing more powerful weapons was flatly ignored.

The most explicit of these fellow spokesmen was Secretary of Air Force Quarles (later Undersecretary of Defense), who made maximum use of the theory that merely increasing the terror of warfare would prevent any kind of war because any kind of war would surely develop into the most terrible kind of warfare possible. He often repeated this theme:

". . . It seems clear to me that war between nuclear powers will be or will become an all-out nuclear war and that neither side can emerge from such a war with anything that can be called victory. . . ."

This was a shaky premise indeed. It was resisted by many Army and Navy spokesmen, as well as some civilian theorists, such as Henry Kissinger, who argued for "graduated" deterrence involving packages of forces (mostly land and naval) to act as "fire brigades." These packaged forces, they said, could extinguish "brush-fire wars," or somehow "limit" wars which could not be "extinguished." Their theory was, and is, that some wars are born "limited" and are not limited by superior strategic power. They used Korea as an example. They ignored the fact that superior air and atomic power had limited the action of the Chinese Air Force and enabled our troops to operate congested ports and supply lines in Korea without being bombed. They saw the Korean War "limited" principally by the presence of numerically inferior ground forces, "supported" by powerful sea and air forces.

It was during this period that all types of military organizations began to announce they were "deterrent forces." The whole concept was rendered almost meaningless through its application to every kind of uniformed aggregation. It was often said that our land forces, our naval forces, our support forces, and, in fact, everything we possessed, was part of the "deterrent." This application of the word to practically every military agency, and many civilian agencies, seemed to make them all happy. Since the meaning of a word can be inflated without financial loss, such inflation of popular words is probably inevitable.

At this point, the whole concept of deterring "limited" wars and "general" wars became confused. So it remains today. There is talk of "limiting" local conflicts by fighting them with conventional weapons. There is talk of limiting them by the use of "tactical" atomic weapons. There is also talk of limiting wars through *not* fighting them. Army spokesmen, such as Mr. Brucker, painted a picture of deterring big wars by fighting little wars, while Mr. Quarles and others were speaking of deterring little wars by the threat that they might become big wars.

It is easy to understand how public confusion on these matters matches the professional contradictions. As years of relative peace go by, the hope arises that no wars of any kind need ever be fought. There are those who argue that the destructive power of modern armament in our hands today deters war, and there are those who argue that war will be less likely if we give up these weapons. Strangely enough, it is often the same people who advance these contradictory arguments.

There are those who argue that small "mobile" forces are the best guarantee against big wars because they prevent little ones from spreading, but the majority of those who speak of deterrence today have returned to the original position that was developed when atomic weapons were scarce in the Soviet Union. They still try to insist that the increasing destructiveness of modern air weapons deters all forms of war through the threat of devastation, despite the fact the devastation would now be mutual.

The hardest question of all is what happens when an enemy, who was said to be deterred by superior weapons in our hands, begins to build weapons more rapidly than we. As we have seen, for a period of some ten years, from 1947 to 1957, the theory of deterrence, regardless of its ramifications and complications, was basically the theory that an enemy can be deterred from all types of aggression as long as we possess superior forces to defeat him at some higher level of conflict.

Mr. Finletter, General Vandenberg, and others, repeatedly stated that if we are to deter successfully, our best weapons must be clearly superior in effectiveness to the enemy's weapons. Beginning in 1954, however, this position was undermined by an argument that we can somehow deter without even matching the strength of the enemy.

The new challenge of Russian missiles and Sputniks to the theory of deterrence brought about a sudden and significant shrinkage in the meaning of the word. No longer did it mean deterring the Soviets from attacking our vulnerable allies or from pressuring, compromising, and communizing them. Deterrence suddenly came to mean deterring a direct Russian attack against the United States itself. When the word is used today it is almost always used in this new and very restricted sense.

If we are to be satisfied with an inferior force, and if this inferior force is, by our own choice, to wait for the first atomic blow, then our allies cannot count on our aid. If we once deterred as we said we did, through the superiority of our forces, then an acceptance of the superiority of Communist forces would necessarily mean that we ourselves are deterred.

Our most important allies occupy areas that can be easily and quickly overrun by Communist land forces unless such a movement is stopped by powerful weapons that can be delivered very quickly. As long as we build forces capable only of a desperate counterblow in case we are attacked directly, then responses in aid of our allies are ruled out. With an inferior strategic force, the United States is deterred from carrying out its fourteen-year-old policy of containing Communist aggression by the threat of effective countermeasures.

It seems quite clear that we should now cease being complacent about a deterrent that can do no more than discourage a direct atomic attack against the United States. The real and present problem is to develop a force that could resist such an attack and still be strong enough to overwhelm an enemy, rather than merely to damage him less than we ourselves are damaged. Our force has to be able to defeat an enemy and not merely to bring a superior enemy force down on our own heads.

We want to deter war and to maintain peace but want to do this without abandoning the rest of the world to Communist pressures and penetrations. Those who have argued that this can be done without strategic forces superior to the Communist strategic forces have left all the hard questions unanswered. These hard questions must be answered. They are already being asked in the Congo, in Cuba, in Laos. They will be asked again and again. The outdated answers of the "finite deterrent" devastators will be proved wrong again and again. (It is no longer convincing to say "so help us, we'll blast 'em" if one has to add "and be blasted in return.") The facile answers of the Kissinger school—that a few more divisions of old-fashioned ground troops will somehow save the world—will also be proved wrong again and again. Though they are contradictory, both these notions favor a return to the relatively simple past. Such oversimplified dreams can be as disastrous as they are romantic and fantastic. Until they and their advocates are discredited we are not likely to get on with the stupendous task of creating a truly superior military force to enable us to live in the space age.

This task will not be easy, and we can expect that pacifists, passivists, and conventional fantastists will multiply even as our nation tries to remain sane and realistic against the threat of an increasingly powerful and ruthless enemy.—END

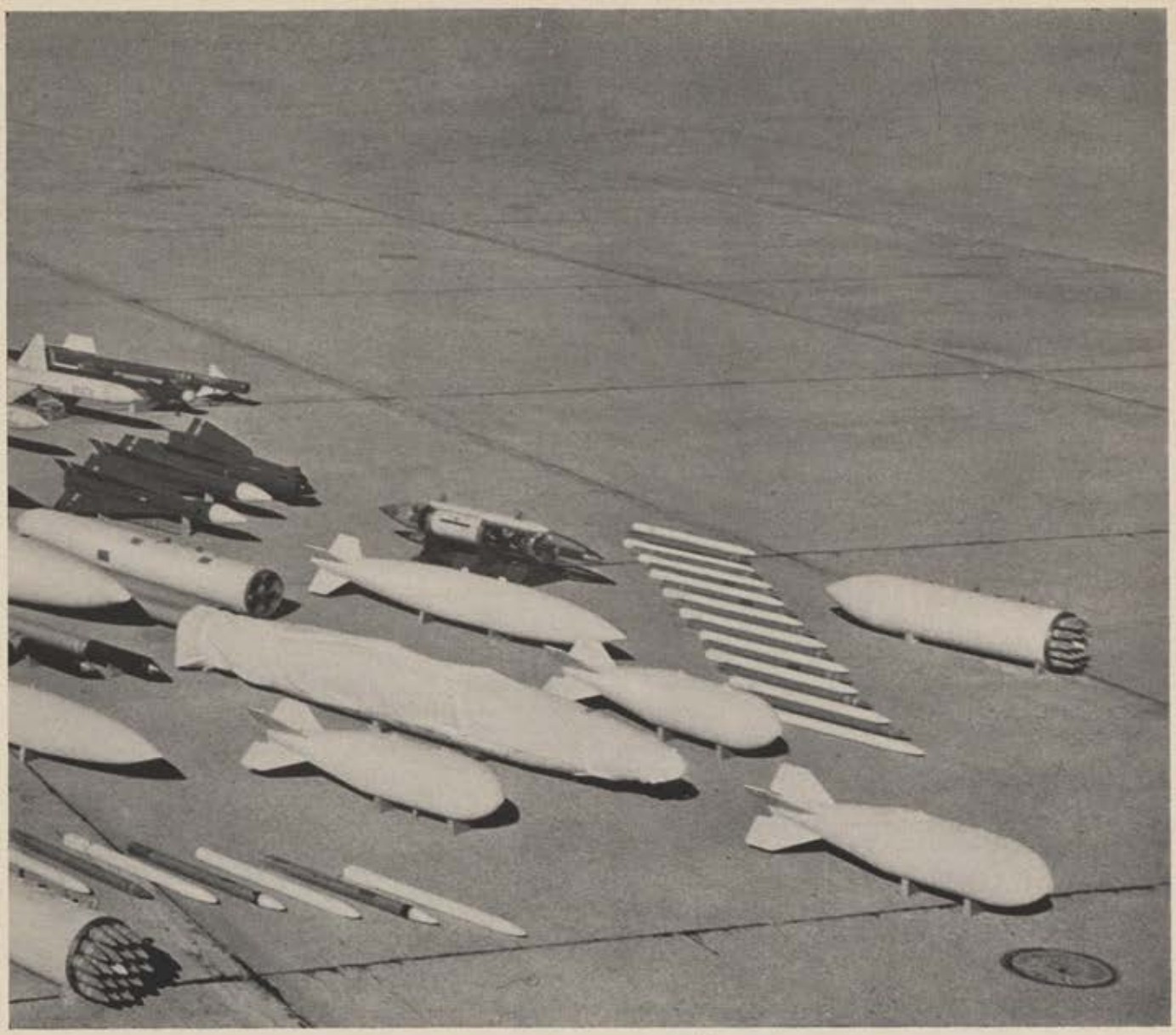
The author of this analytical discussion of what deterrence has meant in the past and its meaning in today's context is an imaginative strategic thinker who prefers to remain anonymous.

LIGHTWEIGHT FIGHTER WITH

Here is the Northrop N-156...a bold new concept in fighter weapon systems

The twin-jet supersonic Northrop N-156 is more than an aircraft; it is a complete family of lightweight fighter weapon systems designed to fulfill the many air support roles of limited war: close support of ground forces, reconnaissance and surveillance, interdiction, air defense and air superiority. The N-156 can be deployed from the United States zone of interior to any point in the world within 24 to 48 hours. It can then be dispersed throughout the theater of operations, utilize advance bases with short, unimproved runways, and operate with minimum logistic support, fast turnaround and extremely low maintenance downtime.

Its high performance, extreme maneuverability and ease of handling have won the Northrop N-156 unanimous acclaim as a "pilot's airplane." An exceptionally safe and reliable aircraft with unusual aerodynamic stability, it can accomplish its mission, return and land safely with one engine out. Very low fuel consumption eases the storage and resupply problems likely to plague advance areas. Maintenance and service can be easily accomplished from ground level without



A HEAVYWEIGHT PUNCH

designed specifically for limited warfare...ready now.

crew stands. In short, from both a tactical and logistic point of view, the N-156 is ideally suited to the mission requirements and problems of limited warfare.

The economics of the Northrop N-156 are also highly favorable for limited warfare. Low initial cost plus exceptionally low operating and maintenance costs make it possible to greatly increase the number of units in the field for the same budget dollar. Simplicity of maintenance also reduces the number of trained personnel, the amount and complexity of ground support equipment needed in the field. The result is an extremely flexible force, able to respond effectively to pressures anywhere in the world in the shortest possible time, and with minimum dependence on the difficult supply posture likely to prevail in remote areas.

The Northrop N-156 has been flying since July 1959. It is a developed weapon system, ready for immediate production. Deliveries can commence in just 14 months.

NORTHROP

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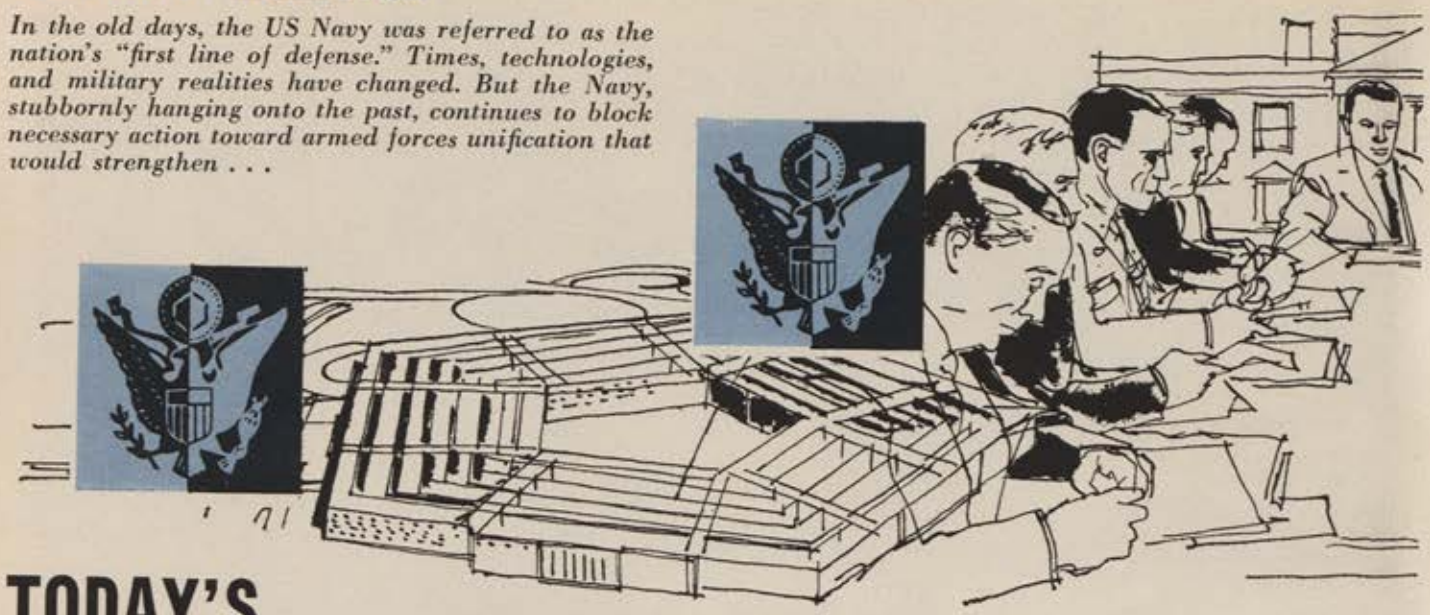
UNIFICATION: The Long Fight

In the old days, the US Navy was referred to as the nation's "first line of defense." Times, technologies, and military realities have changed. But the Navy, stubbornly hanging onto the past, continues to block necessary action toward armed forces unification that would strengthen . . .



TODAY'S 'FIRST LINE OF DEFENSE'

The National Security Act of 1947 was the first big step toward unification of the nation's military forces. It came after years of interservice wrangling through war and peace. This act created the Department of Defense and a separate, coequal US Air Force. A limited victory for proponents of unification, including President Harry Truman, it brought forth renewed opposition to the whole concept of reorganization of the armed services. At the forefront of this opposition, then and now, was the Navy.

Last month Dr. Green, in the first of two articles on this subject, traced the growing need for a unified defense establishment through World War II and the early days of the cold war. Here his historical analysis continues with the battle over the National Security Act of 1947—and the running battle that has accompanied further efforts to rationalize our defense organization since that end of the beginning in the long fight.

The following article—second of two by Dr. Green on the history of the struggle for a unified defense establishment—represents the author's own thoughts and conclusions and should not be construed as necessarily reporting official policy of the Department of Defense or the US Air Force.

PRESIDENT Harry S. Truman's message to Congress on December 19, 1945 had put him on record as the first Chief Executive to support a real unification of the military services. Opponents of his proposal who occupied key congressional chairmanships sidetracked his legislation in the months that followed. Exasperated with the successive delays and obstructions he encountered, the President dictated a twelve-point unification program to accomplish his stated objectives.

The President's letter of June 15, 1946 included an explanation of his reasoning on each of the twelve points. Under point three, "Aviation," the explanation given was quite explicit: "Land-based planes for naval reconnaissance, antisubmarine warfare, and protection of shipping can and should be manned by Air Force personnel."

President Truman also announced the "wholehearted support" his plan received from Navy Secretary Forrestal and Admiral Nimitz. As we now know, the naval leaders had exploded in wrath both at the decision and the presidential imputation of their support. Forrestal's *Diaries* refer to "the disastrous nature of this . . . decision."

Forrestal asked for an immediate appointment and got in to see the President on June 19. He told him "the Navy felt so strongly about it [land-based airpower] that they *must* have the means to carry out their mission" [*Forrestal's italics*]. Forrestal said he had received the impression that the language of the directive "did not intend to convey a denial to the Navy of sufficient land-based planes for reconnaissance and 'search and strike' purposes."

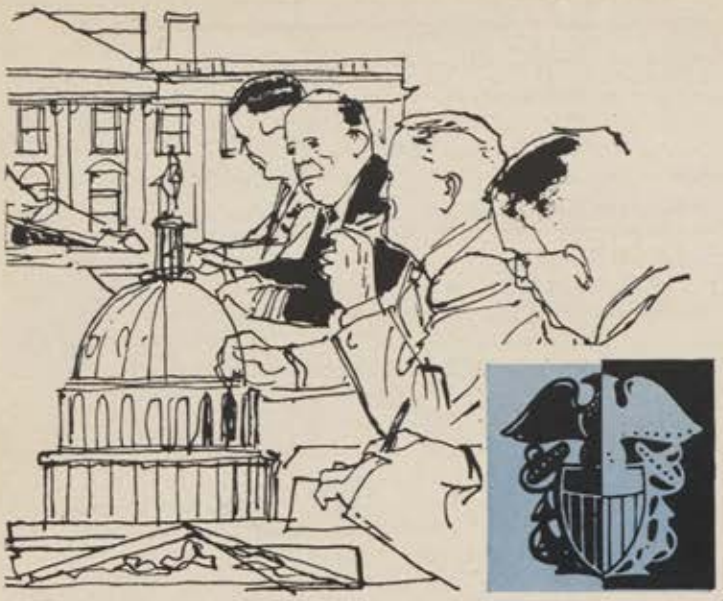
Forrestal's *Diaries* indicate that the President relented at least to the extent that the Navy was to share with the Air Force the discharge of air reconnaissance, ASW, and protection of shipping. In his *Memoirs*, however, President Truman does not at all recall this. He wrote of having "supported the War Department's opinion . . . that the Air Force should take over all land-based aviation, including naval reconnaissance, antisubmarine patrol. . . ."

"It seemed to me," Mr. Truman wrote, "that no one could give a valid reason for continuing the expensive duplication of land-based air service then existing."

Secretary of War Robert P. Patterson had promptly dispatched an enthusiastic letter supporting the June 15 decision. "I . . . again pledge my wholehearted support and that of the War Department," he wrote. "You can count upon us to furnish any assistance in any way that you may deem advisable."

After the New York *Times* had commented upon Forrestal's failure to support the President, the Navy Secretary wrote a letter on June 24 using the same ambiguity he had employed in his May 1946 testimony before the Walsh Committee: "You may be assured of my desire and that of Admiral Nimitz to cooperate with you in the effort to achieve *the objectives of* your program" [*italics supplied*].

Upon receipt of the President's letter, Senator Thomas and his Military Affairs Committee revised S. 2044 to conform to the changed plan. The bill now deleted four Assistant Secretaries of Common Defense and the Chief of Staff



MURRAY GREEN

for Common Defense. The JCS was recast to eliminate a Chief of Staff, or Chairman, as one of its members, and the Council of Common Defense was enlarged to include the Secretaries of Army, Navy, and Air Force.

Even this softened bill never came to the Senate floor because Sen. David I. Walsh once again thought that would be a good time to begin another series of hearings to which he called the same witnesses. Most took Secretary Forrestal's tone of expressing generalized support for the President's objectives, then asserting that the bill did not appear to meet them. The hearings concluded on July 11, 1946. The committee submitted no report. With Chairman Carl Vinson safely in control of his House Naval Affairs Committee, and Congress pressing for early adjournment in an election year, the bill never reached the floor of either House for a vote.

The disputants gave it another try at a White House meeting in September 1946. But the gathering dissolved into disagreement on the Army-Air Force desire for a strong Secretary of Common Defense versus the Navy's preference for a "Deputy to the President" whose powers would be limited "to providing a source of decision" on missions, composition of forces, finances, resolution of disputes. This was Forrestal's conception. More than that, the Navy insisted that the "Deputy to the President" should stay out of the administration of each military department.

Patterson's irritation at what he regarded as obfuscation and delay by the Navy led him to write an angry article for the New York *Times Magazine* in which he described the opponents of unification as "reactionaries." He ridiculed those who raised the specter, incongruous as it might seem, of a civilian Defense Secretary on a white horse who was serving at the pleasure of a civilian President. Even if a situation of a weak President and a headstrong Secretary of Common Defense developed, Patterson presupposed, "Congress will always be in the driver's seat."

The unification picture changed on November 5, 1946, when the Republican Party won a landslide victory in gaining control of Congress. The groundwork for unification action appeared to be set with the Legislative Reorganization Act which, beginning in the Eightieth Congress, merged the House and Senate Military and Naval Affairs Committees, numbering four, into the House and Senate Armed Services Committees, numbering two.

Both sides courted Sen. Robert A. Taft, "Mr. Republican," without whose active support no controversial legislation could pass the Senate. A few days after election, the Ohio Senator expressed the belief that it would be possible to reduce the total federal budget from $35 billion in fiscal 1947 to $25 billion by fiscal 1949.

Naturally, he responded favorably to Patterson's letter stating that "large savings" in defense expenditure would be brought about by unification. Senator Taft wanted to know how much. Patterson asked Symington. It was "extremely important," he indicated, that an estimate of savings be prepared to convince Senator Taft, and presumably other doubtful congressmen. Eugene Zuckert, now Air Force Secretary, and Barton Leach, Symington's advisers, cautioned against giving Senator Taft specific figures. Patterson pressed the matter, reminding Symington that War Department testimony about savings to be had in unification would be challenged unless some figures could be produced.

By February 1947, an estimate of five percent savings was compiled with the footnote notation that they did not include Navy data. In refusing to supply the requested data, Vice Adm. Forrest Sherman stated that some of the Army proposals were "incompatible with naval operational requirements." He wrote that it was "most important that we stand together against any effort to make economy the sole criterion, when combat effectiveness may be in jeopardy."

Secretary Forrestal lunched with Senator Taft on December 12, one day after the Patterson-Taft conference. Knowing the Senator's strong enthusiasm for airpower, Forrestal delicately suggested that Taft might try to appreciate the Navy viewpoint. He charged "the top command of the Army had no true appreciation of seapower." His missionary work evidently did not pay off. A year later, he was to tell Sen. Chan Gurney: "We have got to do a lot of spadework with Bob Taft and all these boys that are leading the country down the wild lanes" (presumably of more airpower).

Behind the scenes, in November and December 1946, Symington and General Norstad were meeting with Admirals Radford and Sherman in Forrestal's Georgetown home. They wrestled with two remaining substantive issues: (1) the power of a Secretary of Common Defense, and (2) roles and missions for the services, especially land-based airpower.

The Navy conferees would not accept Symington's proposal that the Secretary of Common Defense should have the power to hire and fire the individual service secretaries, although Forrestal came around to agree that the Defense Secretary should have a large hand in their selection to begin with. Agreement was reached upon his role as "coordinator" with a "sharply limited" staff "to make certain that he could not undertake any detailed administration."

On the knotty issue of land-based seapower, Forrestal told Symington that "no sensible person in the Navy ever entertained any idea about the creation of a strategic air force in the Navy." By the same token, he said, the Navy had very strong fears of the Army's desire to grab the naval air arm and get control of all aviation under the Army Air Forces.

Admiral Radford irked Symington and Norstad by asking what foundation there was for air leaders to believe that there was a place in any war of the future for a strategic air force. Radford said it was "extremely dubious" (in Forrestal's diary recollection) whether big bombers could be used effectively against any country unless they

had fighter cover. He cited Schweinfurt and Regensburg where "American losses were so high that the whole question of air attack on Germany hung in the balance."

Symington told Forrestal the Navy's delaying tactics would have less success in the new Congress. Forrestal conceded that the Army's "tactical position" before the new Congress was more favorable, although he said its logic was still faulty. Symington's economy arguments still rankled Forrestal. In November 1946 the Assistant Air Secretary had made some speeches which received national attention. He called the lip servants of unification students of the "let's-get-together-on-the-little-things" school. They agree that the services should buy aspirin tablets together, he said, but each should be free to buy separately its ships, planes, tanks, hospitals, and airports. Forrestal rejoined with a comment that the AAF during the war had insisted on creating its own hospitals, engineer forces, medical corps, etc., instead of using the facilities of others.

Between the lines of recrimination, Forrestal now seemed ready to compromise the major issues, although he was less prepared to give Symington credit for helping to attain that compromise.

The President called another White House meeting early in January 1947, and Forrestal and Patterson agreed to agree on a unification bill. They brought to President Truman a paper which he signed and made public on January 16, 1947. These points were to provide the basis of a bill:

(1) Three separate administrative departments: Army, Navy, Air Force;

(2) A single Secretary of National Defense to coordinate the three departments and to direct over-all policy. Each service secretary was to be guaranteed access to the President;

(3) A small executive staff for the Secretary of National Defense to consist of from fifteen to twenty-five "$10,000-a-year men";

(4) The JCS was to be constituted substantially as it existed;

(5) A Joint Staff under the JCS of about the existing size (one hundred officers) but better organized;

(6) A War Council consisting of the Secretary of National Defense as Chairman with power of decision, plus the three service secretaries and the three military chiefs;

(7) Roles and missions were to be excluded from the legislation. They would be spelled out by a presidential Executive Order concurrent with the signing of the bill. The Executive Order would provide for continuance of the Marine Corps and the safeguarding of naval aviation, including its ASW and naval reconnaissance missions.

This decision was based on the thought that legislating roles and missions would build rigidity into functions that would take another act of Congress to change. Military missions should be highly responsive to the dynamics of warfare, and could be made to do so by the stroke of a presidential pen. This agreement was central to the acceptance of the compromise by Symington and Norstad.

The January 16 letter committed the Army and Navy to a specific unification concept. Privately, Navy support was not so generous. Admiral Nimitz, as Commander in Chief, Pacific, during the war, had unreservedly supported unification. Upon his return to Washington to take up the duties of CNO, he had a change of heart.

The day before the President's letter was released, despite any obligation he may have felt to back his Commander in Chief, Admiral Nimitz addressed a closed-door "Amphibious Conference" at the Navy Building on Constitution Avenue in Washington. The Admiral told his all-Navy-Marine Corps audience that any future war that he could foresee, "certainly for the next fifteen or twenty years," would involve amphibious operations. They were not to fret for the future of the Navy or its component parts. "We stand for the idea that the Navy is an integrated team in which land, sea, undersea, and air forces are very essential," he said. "No one part can get along without the other, and you can rest assured we're not going to let any part of it escape from the team—they'll all be there."

At a White House press briefing the next day, Patterson called the President's plan "sound and workable," Forrestal "gave his blessing," and Eisenhower recalled past efforts to get together on a merger. "Now that one has been worked out," he declared, "I will support it with all that I have, and it is a distinctive step forward."

General agreement having been reached by the disputants, it devolved upon the legislative experts to come up with a specific bill incorporating the agreed-upon features. With Truman aide Clark Clifford directing these efforts, a product was wrought. On February 27, 1947, President Truman sent to Congress a draft bill entitled "National Security Act of 1947." It was introduced in the House as H.R. 2319, in the Senate as S. 758.

On March 4, 1947, the JCS approved a directive of instruction to all Joint Staff personnel to be guided by the spirit of the joint Patterson-Forrestal letter and the proposed Executive Order. Two days later, Generals Lauris Norstad and O. P. Weyland came to agreement with Vice Admiral Sherman on the one remaining issue between them. Each submitted to his Chief a proposed letter expressing their mutual understanding that the Navy would have primary control over naval reconnaissance, ASW, and the protection of shipping. An Air Staff directive signed by Gen. Ira C. Eaker ordered all AAF commands to construe the proposed Executive Order as giving the Navy primary responsibility for these missions. It marked a major official concession by the AAF to the Forrestal position on these points.

On March 21, 1947, Eisenhower and Spaatz signed a "Memorandum of Understanding" jointly expressing their common desire to grant strong powers to a Secretary of Defense "who will be concerned solely with the security of the country and not with a special interest or self-seeking of any particular individual or service. . . . Heretofore, we have felt that the Navy opposed placing such trust and confidence in the Secretary and preferred that all of the things in which the Navy was presently interested should be protected by provisions of the law itself."

That this memorandum was bipartite and not tripartite was made clear on March 25 when Eisenhower testified on S. 758. Connecticut's Sen. Raymond Baldwin asked him if he would object to the substitution of the phrase "general supervision" instead of the word "direction" in the definition of the duties of the Secretary of Defense. Senator Baldwin said he raised the point in order "to avoid any possibility" that the Secretary of Defense "shall in any way become Commander in Chief . . . which, under the Constitution, is delegated entirely to the President."

General Eisenhower said he would indeed object to the substitution. If he were given the job to supervise anything he said he would want the whole authority to do so. Notwithstanding, the word substitution was made.

The Eisenhower testimony kicked off the hearings. So far as the Navy was concerned, he just about propelled the legislation out of bounds. His strong support for the bill was expected, but his regrets that it did not call for a single Chief of Staff were not. He hoped it would come

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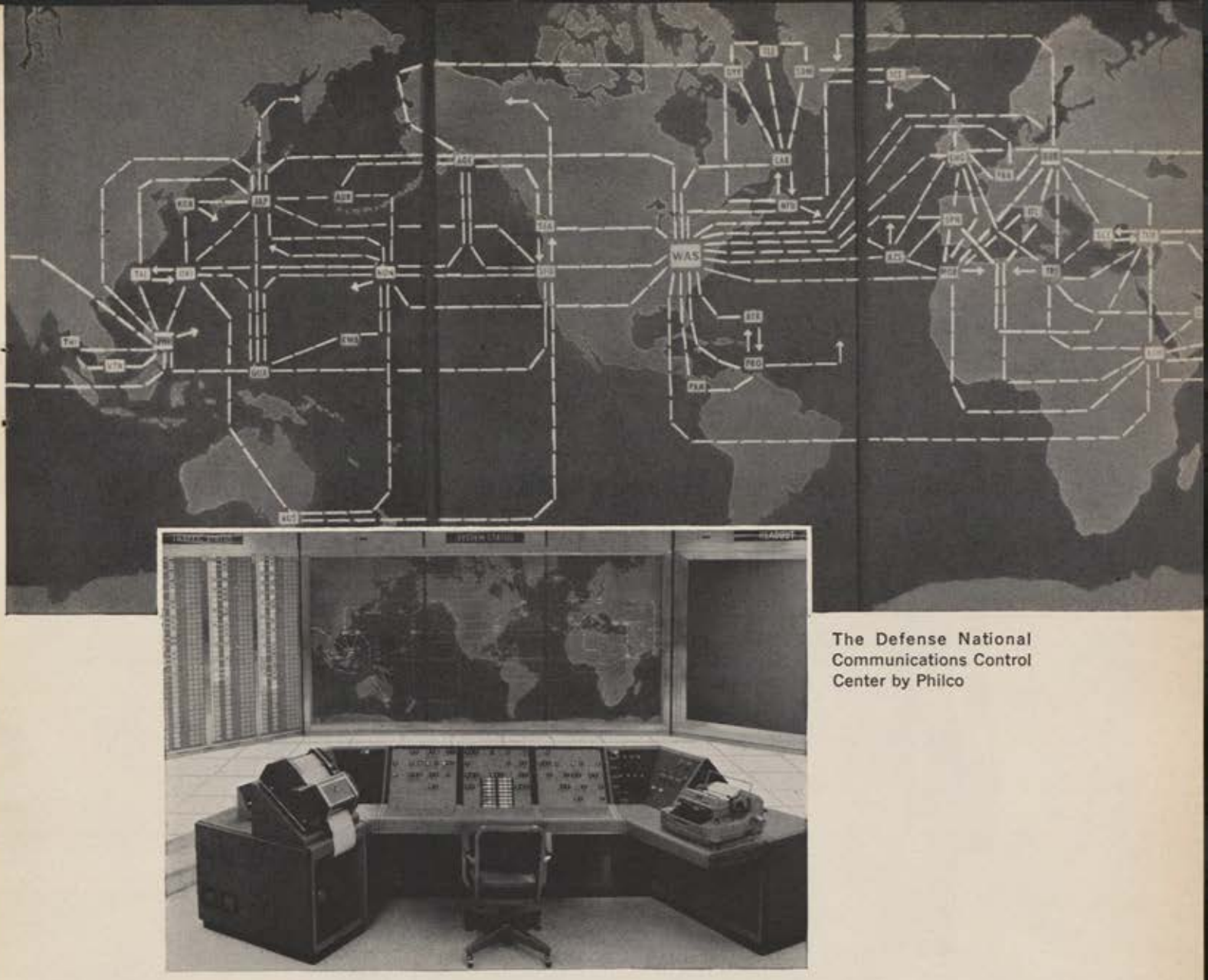

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about in the future. "Naval opinion," Forrestal wrote in his *Diaries*, "was thrown into a state of alarm."

At an April 15 meeting with Maryland Sen. Millard Tydings, Forrestal allowed himself to be persuaded to permit congressional protagonists of naval aviation and the Marine Corps to insert protective clauses in the legislation. Forrestal's repudiation of his pledge to President Truman and to Robert Patterson found him making this apology in his *Diaries:* "I said this did not conform with the policy of the Administration and that I myself did not think they were necessary although I would have to confess I was somewhat shaken by the recurring evidence of the Army's intransigence in regard to the chain-of-command concept (when, as a matter of fact, during this war they had not been able to issue a single order to MacArthur—and they couldn't now)."

If this rationalization called for reply, it could be noted that the MacArthur situation existed before Forrestal had voluntarily entered into the agreement.

When the other principals testified in April 1947 there was no doubt that the naval witnesses had lost what little enthusiasm they had generated in support of unification. It is not necessary to examine their testimony at length. The topic sentences of the major prepared testimony will suffice to reflect the witnesses' views:

Army-AAF

SECRETARY PATTERSON: "I give my unqualified support to the bill. . . ."

UNDERSECRETARY ROYALL: "Both officially and personally, I favor enactment of Senate Bill S. 758. . . ."

ASSISTANT SECRETARY OF WAR SYMINGTON: "It is with pleasure that the Air Force presents to you its wholehearted concurrence in the bill. . . ." (*Mr. Zuckert substituted for Symington, who was ill.*)

Navy-Marine Corps

MR. EBERSTADT: "Having already expressed my views at considerable length . . . I will limit my statement to observations on the bill which is before you. . . ."

ADMIRAL KING: "Mr. Chairman . . . I appear before you today to comment on S. 758. . . ."

ADMIRAL NIMITZ: "The bill which you now have under consideration represents the efforts of the services. I believe it will work. It cannot be considered perfect from the Navy point of view. . . ."

GENERAL VANDEGRIFT: "I desire to discuss certain features of the pending measure. I have never approved of the principle of unification."

Angry words were privately exchanged when Marine Corps Generals Vandegrift and Edson told the Senate Committee that Marine Corps roles and missions ought to be written into the legislation. Clark Clifford phoned Forrestal to complain of this violation of the verbal agreement. According to the Forrestal *Diaries*, the Navy Secretary "intimated" that the testimony of Eisenhower and Royall "reawakened all the Navy's fears." A showdown luncheon on April 18 produced a deadlock. Almost every Navy-Marine Corps witness, including Admiral Sherman who had personally negotiated the original compromise, either testified that he would not object to including a statement of roles, missions, or functions in the law, or specifically urged upon the committee such protective clauses in the legislation.

On the other hand, Army and AAF witnesses opposed writing any roles and missions into the law. They said it would tend to freeze organization and strategy. They urged the committee to provide only for the existence of naval aviation and the Marine Corps, with specific assigned missions to be left for the President, the Commander in Chief of the armed forces.

As we know, the congressional friends of the Navy wrote such strong and detailed protection into the law that Admiral King, over the years perhaps the most consistent opponent of any hint of unification, "was now ready to endorse the Senate Bill," according to Forrestal.

Looking back at these hectic events of a decade earlier, President Eisenhower told a press conference in May 1957 of his "preaching and praying" for unification which "I thought we could bring . . . about. Well, I encountered a very fierce opposition," he said. As a result, unification "never did take place quite in the form that I thought it should be."

Symington and Spaatz were also deeply disappointed. At this late date, they were faced with the alternative of dropping the fight for a stronger bill until the next session, or accepting the weak compromise which still contained provisions for a coequal Air Force. They decided on the bird in hand.

President Truman first offered the job of Secretary of Defense to Patterson who turned it down because of financial hardship. Forrestal accepted. The President also suggested that it would be a good idea if Forrestal would move his headquarters over to the Pentagon from the Navy Building. The President hoped that propinquity would help bring the services together.

On July 26, 1947, President Truman signed the bill, the National Security Act of 1947, into Public Law 253. He also signed the concurrent Executive Order 9877, which included a statement of the service roles and missions. However, the National Military Establishment (later renamed Department of Defense) that came into being on September 17, 1947, was, to speak in Churchillian phrase, an end of the beginning rather than a beginning of the end, of interservice controversy.

Shortly thereafter new battle cries sounded forth. The issue this time was consolidation within the framework of the reorganization act and the Executive Order.

Military air transport was an obvious choice as "pilot" unification project because the services performed by the Air Transport Command and the Naval Air Transport Services were almost identical. ATC and NATS had built up huge organizations during the war. According to a pro-consolidation report:

"ATC and NATS both operate a transcontinental air route from New York to San Francisco through the southern part of the United States. However, these routes do not utilize the same stops, although the air routes are identical."

In the San Francisco area, the report noted, ATC used Fairfield-Suisun Army Air Base, and NATS used Moffett Field a few miles away. Each agency maintained separate maintenance, spare parts, and supplies for identical aircraft which they called by different names—C-47 vs. R3D and C-54 vs. R4D, for example.

Beginning in October 1947, Air Secretary Symington and Navy Secretary John L. Sullivan held a series of inconclusive hearings which broke up on their disagreement over a merger which Symington desired under Air Force auspices. Symington cited the presidential Executive Order, which made no specific provision for the Navy to run a complete transport operation in competition with the Air Force. Sullivan quoted the reorganization act, which vaguely stipulated that naval aviation should include "air transport essential for naval operations." On December 16, 1947,

(Continued on following page)

Sullivan wrote Symington that the Navy would be sole judge of the essentiality of its air transport. He said he did not consider this provision of the Executive Order binding upon the Navy because it was not in consonance with the National Security Act.

In 1948, as we know, there was in fact a merger of NATS and ATC. MATS today is one of the most important and successful examples of unification.

In other ways, that first year of "unification" drove Secretary Forrestal nearly to distraction. The many disputes persuaded him to suggest what he termed "minor changes" in the naval functions as stated in the Executive Order to make them conform to the National Security Act. The Army and Air Force rejected them because, as Secretary of the Army Royall put it, the proposed changes embodied "general language which might be construed to extend naval functions clearly into the area of conflicts with the other departments." Symington and Royall proposed that the JCS be directed to recommend to Secretary Forrestal by March 1, 1948, specific roles and missions to be incorporated into a new Executive Order.

The interservice disputes came to the attention of the Joint Congressional Aviation Policy (Brewster-Hinshaw) Board which for more than a year had been studying the subject of US military airpower. Its report, released on March 1, 1948, stated, in part:

". . . The Navy interprets the law to permit it to develop any type of weapon and to base its plans and requirements on the utilization of any weapon. The Navy contends that it is complying with the law in disregarding the Executive Order on this point because the law and the Executive Order give to the Air Force, exclusively, certain missions. The fact that such a basic difference of interpretation exists indicates the necessity for immediate clarification. . . ."

Secretary Forrestal's quest for interservice "peace" led him to call a subsequent conference at Key West, Fla., which, in turn, needed clarification at a conference at Newport, R. I. In the end, Forrestal agreed to, and even supported, demands for strengthening his own powers as Defense Secretary. One local Washington newspaper put his dilemma in headline form: "Forrestal Bumps into Mine He Sowed."

A week after his second Administration began in January 1949, President Truman decided that Forrestal could not handle the job any more and called in Louis Johnson. On March 28, 1949, the day he retired, Forrestal went farther in the direction of a strong central authority than he had gone before. In a letter to Senator Tydings, the new Chairman of the Senate Armed Services Committee, Forrestal admitted that certain inconsistencies and weaknesses in the original law had not been foreseen. He judged himself to blame, remarking that two years earlier he had supported an objection similar to current arguments that the proposed amendments would give the Secretary of Defense too much power. Forrestal wrote:

"I am also convinced that a failure to endow this official with sufficient authority to control effectively the conduct of our military affairs will force upon us far greater security risks than will be the case if singleness of control and responsibility are achieved."

Forrestal's former supporters had already discounted him as a sick man. Ferdinand Eberstadt denounced the proposed amendments to establish a Chairman of the JCS as an "extremely dangerous" concentration of power in the hands of one military man. He said a wrong decision could be a fatal one. Later he told the House Armed Services Committee that Section III of the proposed amendment was "a shotgun, not a rifle approach" to the problem of strengthening the powers of the Secretary of Defense.

So it went. The amendments to the National Security Act which became effective in August 1949 were diluted to accommodate the objections of opponents to any change. When the new law, in turn, was found inadequate to the job at hand, it was revised, first by Reorganization Plan #6 of 1953, and second 1958's Reorganization Act. In December 1960, the Symington Committee found that these reforms did not go far enough to ensure the national defense structure that will be required to get us safely through the '60s.

As we look back upon the struggle for unification to date, the focus seems clear. The Navy did not then, nor does it now, accept any disagreement with its vision of itself as "the nation's first line of defense." In 1946-47, with the help of strong supporters in key congressional positions, the Navy methodically set about taking much of the substance out of the bill which all had agreed was to become the core of the National Security Act. When the bill passed in 1947, it only enjoined the services to get together, but forbade them to merge, and was unclear as to where one mission ended and another began.

Navy Secretary Forrestal, who became the first Secretary of Defense, had loyally argued the Navy's case before the bill became law. When it did, he was torn between his previous affiliations and his desire to administer fairly what he himself was to call an organizational "monstrosity." The impossibility of his task and his sensitivity to personal criticism drove James Forrestal out of office and possibly to his death.

The essential problems which troubled Forrestal continue to bother us a dozen years after he left public office. There is a basic conflict within our military establishment. One system would provide careful checks and balances to permit one point of view to cancel out another. In a respect, it represents an ideal transfer of the form of our political democracy to the military sphere. The other system would require single responsibility and complete authority. It rejects the idea that the officer in charge can or should take a vote of his platoon leaders before a decision is made to "go over the top."

We have not yet been able, except under the duress of war, to settle the argument between need for a complete authority and diffused patterns of peacetime control. In the peacetime of another era now past, established organizations had the weight of tradition and strength of vested interest to throw against any proposal for change. In the "peacetime" of 1961, we no longer can afford this luxury. We are engaged in a struggle for survival in which we must fully utilize our resources and armed strength.

And, today, our entire nation—educational system, economy, traditions, spiritual values, industrial potential, diplomatic competence, armed forces—make up our "first line of defense."—END

The author, Murray Green, is a civilian aide at Headquarters USAF. This is his fifth article in AIR FORCE/SPACE DIGEST. *Most recent previous contribution was an authoritative piece on French missilry in October '60. The first installment of this analysis of unification appeared in the June issue of this magazine. Dr. Green holds B.S. and M.S. degrees from the City College of New York and a Ph.D. from American University, Washington, D. C., in history and international relations. A Reserve major in Air Force intelligence, he served as a naval officer aboard an aircraft carrier in the Pacific in the second World War.*

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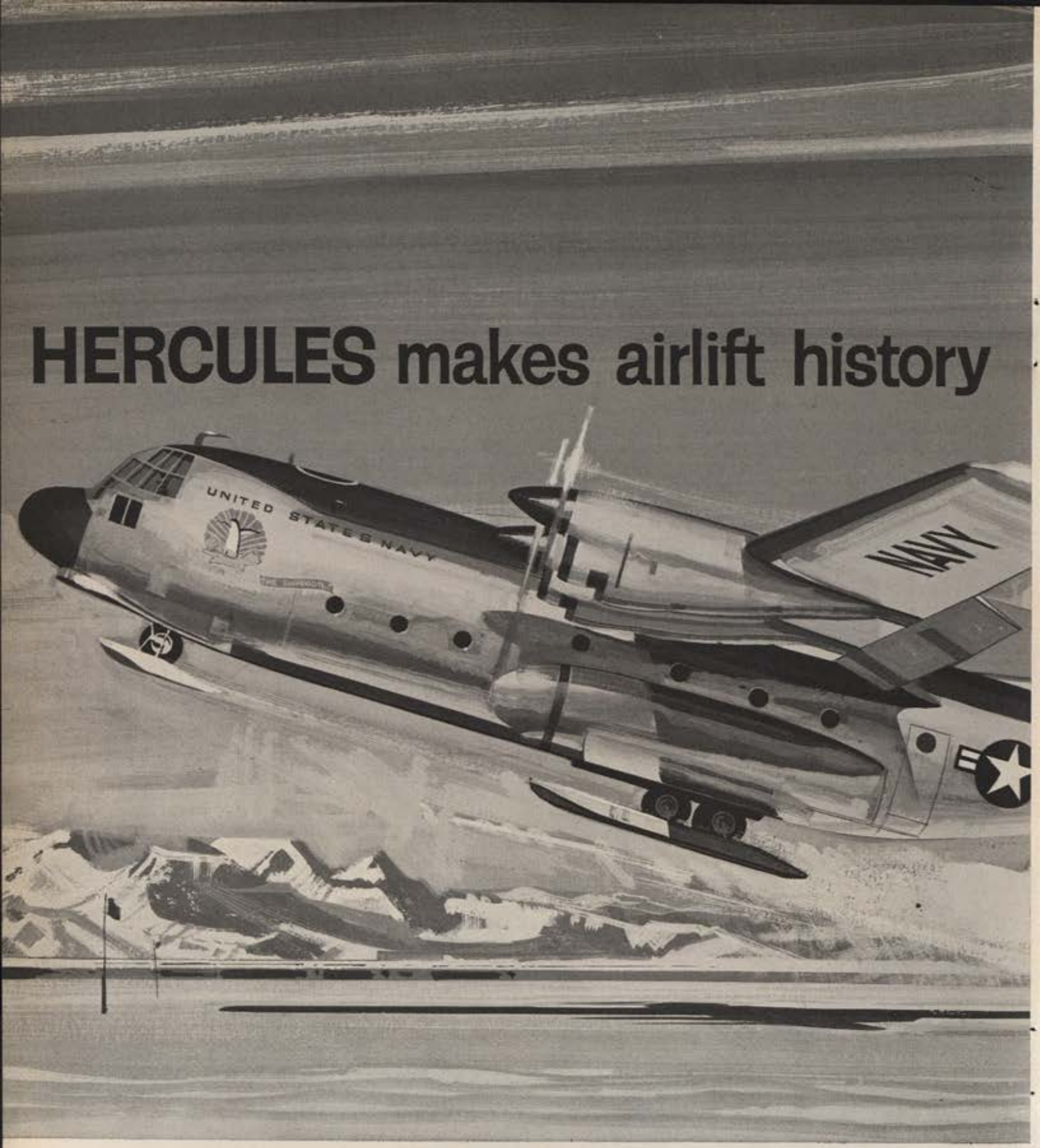
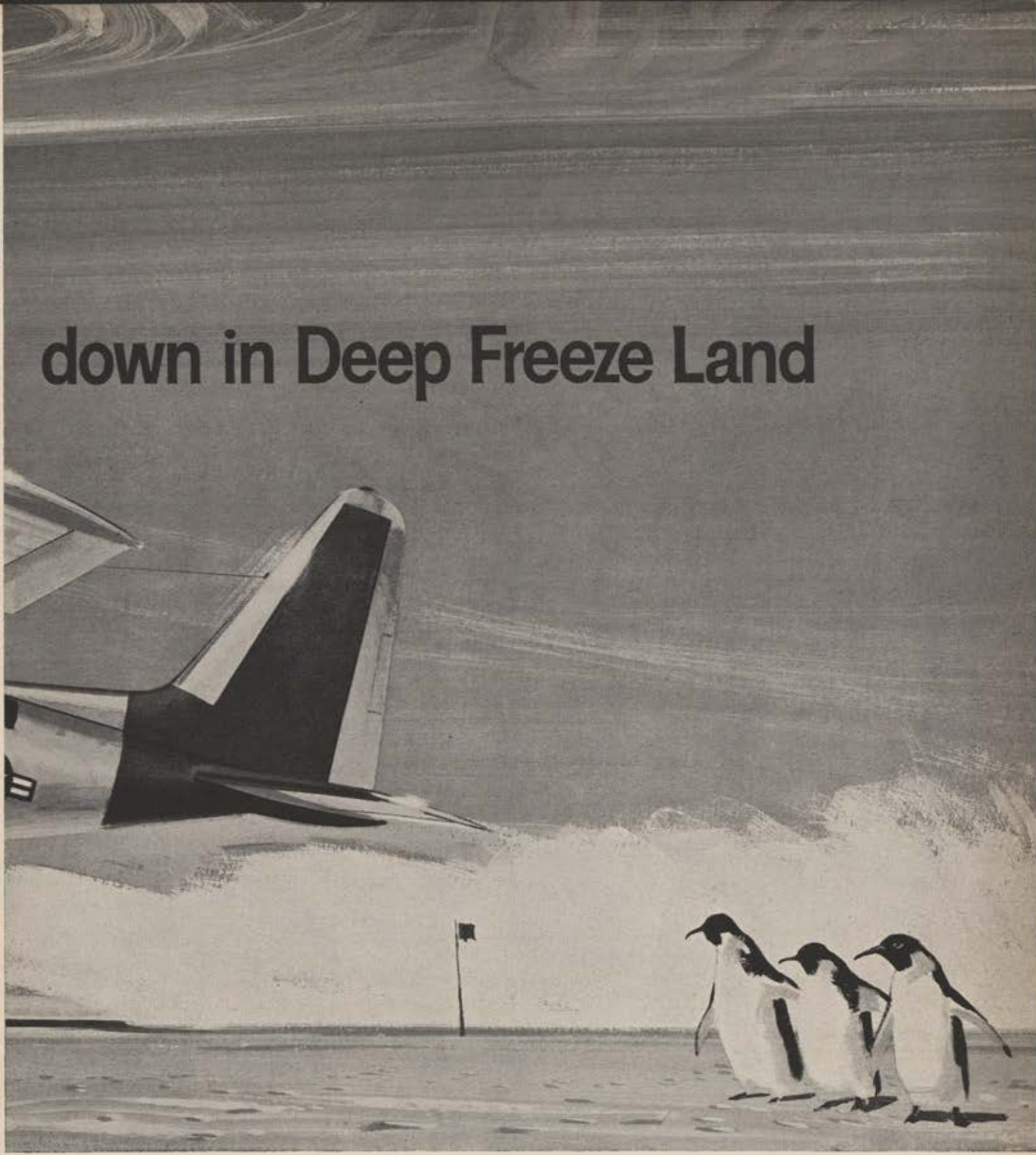


During Operation Deep Freeze 1960, Hercules Ski-130s, flown by the Air Force, became the largest airplanes and first turbine-powered craft to touch down at the South Pole. Now the U.S. Navy has its own Lockheed Ski-130s to support America's scientific expedition on Antarctica. The Navy and its big propjet ski



birds—assigned to VX-6 squadron—set new South Pole airlift records every day, opening the frozen continent to complete scientific exploration. Lockheed Aircraft Corporation, Marietta, Georgia.

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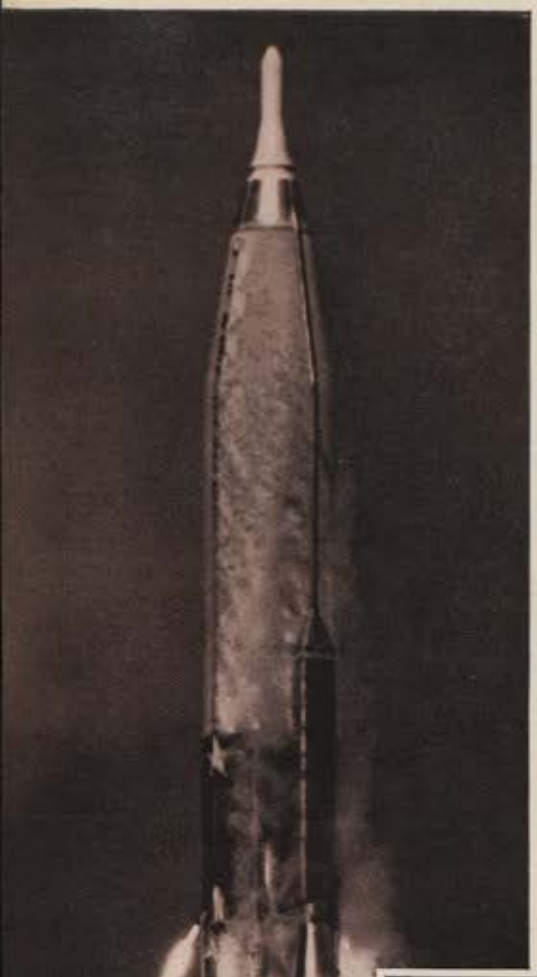

Whether disposing of ancient landmines or mating the reentry vehicle to the business end of an ICBM, the men of SAC's 51st Munitions Maintenance Squadron at Vandenberg AFB, Calif., find their work exacting—and exciting . . .

THE POWDER TAMPERS OF THE LAUNCH PAD

TSgt. James R. Doherty, USAF

PHOTOS BY SSGT. R. SILVA, USAF

A shiny new Mark 3 reentry vehicle is unpacked by technicians in Wyoming. They'll instruct USAF missilemen who are based at Cheyenne site.

IN December 1958, workmen demolishing a World War II barracks at Vandenberg AFB, Calif., made a startling discovery. Concealed in a wall—inches behind the spot once occupied by the swivel chair of a tank commander—they found a block of TNT weighing approximately one pound.

Partially decomposed, the explosive was highly "sensitized." The workmen hastily, and carefully, departed from the scene.

Minutes later, after the surrounding area had been cleared and roped off, Vandenberg's number-one ordnance-disposal expert, MSgt. Frank A. Perry, tiptoed into the booby-trapped building.

At that moment, Perry's good friend, SSgt. Archie A. Crawford, was walking into a steel and concrete bunker on the edge of the Pacific, five miles away. Crawford's assignment, by comparison, was relatively easy. He and his teammates were about to mate a reentry vehicle to the business end of an Atlas ICBM.

Meanwhile, a continent removed, six Air Force technicians—not one of whom boasted more than four

stripes on his blue worsted sleeves —were winding up a day's work in the Philadelphia laboratories of the General Electric Company. For the past eight hours, they had been puzzling like a group of T-formation quarterbacks over piles of schematics. The words "reentry vehicle" were etched on their tired minds.

And back across the country at Vandenberg, still another USAF sergeant drew a missile trajectory on a blackboard. He was SMSgt. Herbert W. Howard, Jr., then a lecturer in a classroom at the California base. His audience today was made up of British Royal Air Force enlisted men.

Sergeants Perry, Crawford, and Howard, and the Philadelphia-based technicians had much in common. All were self-professed "cannon-ball greasers." And all belonged —and still do—to SAC's 51st Munitions Maintenance Squadron, an outfit that can legitimately call itself unique.

never know," Sergeant Perry muses, "and perhaps it's just as well."

By way of contrast, the 51st boasts one of Vandenberg's most popular commanders. He is Lt. Col. Oscar J. Sundstrom, a pioneer SAC missileman who found his way into the special weapons business back in 1955. Ex-lumberjack Sundstrom arrived at Vandenberg almost three years ago.

"At that time," he recalls, "the base population consisted largely of earth movers and construction stiffs. Ours was the first operational squadron. And, believe me, our 'blue-suit capability' was a novelty in those days."

Under Colonel Sundstrom's direction, the 51st got off to a flying start. In October 1958, the outfit participated in the historic first rocket launch from Vandenberg. The shot was an unqualified success. From that date to this, emphasis in the 51st has continued to be on "professionalism."

MSgt. Frank Perry, ordnance disposal expert, checks a black-powder bomb he has rendered harmless. In foreground, casement of a 155-mm. shell.

The 51st, with headquarters at Vandenberg, has a mission calculated to make an old-fashioned, simple munitions man envious. The Squadron is knee-deep in the aerospace age. Its concerns begin with reentry vehicles and ballistic missile warheads and go on from there. Squadron ordnance experts also handle a variety of sophisticated missile accessories, like squibs, igniters, and retrorockets. And they're not above doing a bit of bomb, TNT, or land-mine disposal when the occasion demands. Sergeant Perry's excursion into the booby-trapped barracks was a not unusual event. In just the past six months, he has disposed of more than 800 pieces of live ordnance found on the former armored artillery range that is now Vandenberg.

The overripe charge of TNT on that occasion was detonated on the spot. Fortunately—for the resulting blast was a humdinger—all buildings in the area had already been earmarked for destruction.

Who installed the charge? Perry theorizes that some long-departed tank corps GI may have been seeking to have his commanding officer replaced—the hard way. "We'll

"In our business," Colonel Sundstrom is fond of saying, "we can't afford to make that first mistake once."

Currently, about 150 men sport the organization's striking red and yellow insignia. The device, an embroidered reentry vehicle hurtling across an empty sky, is intended to illustrate the squadron slogan: "First in Space." The words are appropriate. Colonel Sundstrom explains why.

"Not too many stop to realize that the reentry vehicle is the only true missile. The balance of the bird —the power package, fuel tanks, and guidance mechanism—might be likened to an outfielder's arm. They supply force and direction.

"But it is the baseball—or missile—that travels to second base. By the same token it is the reentry vehicle alone that is destined to wind up on target."

(Continued on page 67)

Lt. Col. Oscar J. Sundstrom, at left, 51st Commander, talks problem over with maintenance officer, Capt. Carl Bougher; TSgt Merle Davis, Safety NCO.

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The 51st works with the baseballs, the reentry vehicles of USAF's missile arsenal.

In addition to his "blue suiters," Colonel Sundstrom superintends the efforts of a dozen General Electric and AVCO Corporation technical representatives. Associated contractor personnel total an additional twenty-five.

Since its inception, the 51st has worked hand in glove with industry to expedite reentry vehicle development. This much-heralded concept of concurrency has paid off. Lead time has been markedly reduced. And when an RV is deemed ready for the launching pads, technicians who will maintain and install it are trained and waiting.

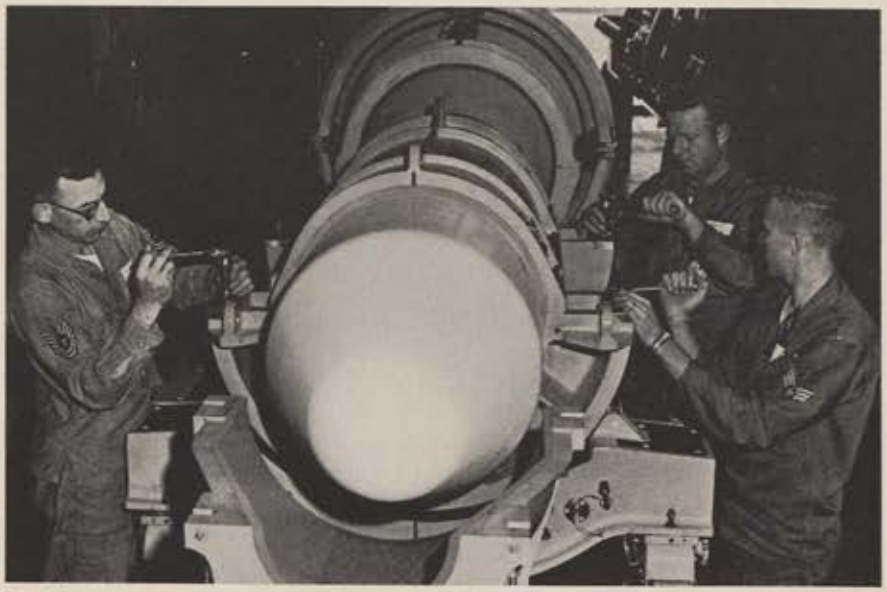
Over the past three years, 51st personnel have sat in on a variety of weapon-system development conferences. Industry has called their contribution "invaluable." As a result, provisioning techniques, the construction of field facilities, and technical-data books have become far "more realistic."

The 51st maintenance officer, Capt. Carl L. Bougher, puts it more succinctly: "We write the book, then proof-test it. Our record of success speaks for itself."

Captain Bougher, a wartime pilot and a special weapons man since 1949, was the second man in the Air Force to be trained in his RV specialty. As squadron maintenance officer, the Captain has helped to guide the RV through various stages of refinement.

There are, of course, several types of RVs in existence and in various stages of development. In this area, as in others, a great deal of progress has been recorded in the past few years.

It is difficult to discuss actual reentry vehicles without violating security in a most classified area. But a look at one of the most commonly used test RVs, even in the most general terms, points up the complexity of some of the hardware in use today. This vehicle carries aloft an arming and fuzing system, an internal power supply, and a separation system to kick it loose from the missile airframe. The payload includes a scoring kit, complete with a SOFAR bomb, for test purposes.



Final assembly of this Mark 3 reentry vehicle is complete and in a matter of hours it will sit atop an Atlas. Here technicians SSgt. Hugh Shelley, Jr., A1C John Lindgren, and TSgt. Arthur Quirk secure vehicle in cradle for trip to pad.

The bomb is a charge of black powder that is exploded by water pressure many feet below the ocean's surface. Hydrophones record the blast's intensity. In this fashion, impact points for the continuing series of Air Force ICBM launches can be determined with amazing preciseness.

When it arrives at any of the organization's several checkout bays, the RV is factory-sealed in one or more enormous metal containers. It is removed, and all interior circuitry subjected to pressure testing, using automatic checkout equipment. Next, the entire package is placed in the jaws of a machine that resembles an outsized lathe. There it is tumbled endlessly in a motion designed to simulate the RV's fall through space. The machine calibrates the instrumentation and the RV's arming and fuzing mechanisms. Malfunctions show up as red lights on the tester's instrument panel.

Final assembly of a test-shot RV includes the installation of a scoring kit. Then the RV is mated to its proper missile. The RV is trucked to the launching pad on a specially designed trailer. After being carefully aligned, it can be affixed in a matter of minutes to the missile airframe.

Unfortunately, mating—or demating—today's internally complex reentry vehicles is not quite the simple business it appears on the surface. If it were, life would be a great deal easier for the 51st's hard-working technicians. As it is, overtime has become the outfit's rule of thumb, rather than an exception. Not everyone finds it onerous, however.

One such enthusiast is SSgt. Archie Crawford. In point of service, the twenty-four-year-old noncom is the organization's enlisted veteran. On a "normal" week end, he logs twenty-five to thirty hours on the launching pads, or working in the big bays where the birds are groomed.

Last year, Crawford was asked to fly to Eniwetok as a technical adviser with SAC Commander in Chief Gen. Thomas S. Power. The shot they were slated to observe was aborted for technical difficulties, but Crawford recalls the event as one of the highlights of his career.

"The old man," the Sergeant declares admiringly, "knows as much about RVs as I do!"

He should. It was Crawford and his fellow NCOs who schooled the four-star SAC chief.

General Power is but one of the many high-ranking Air Force officers who have completed the 51st's RV indoctrination course. And the

(Continued on following page)

POWDER TAMPERS — CONTINUED

SAC Commander Gen. Thomas S. Power is awarded his "diploma" on graduation from the 51st's rigorous reentry vehicle indoctrination course. Making the presentation to the SAC chief is Lt. Col. Oscar J. Sundstrom.

bulk of these comprehensive briefings are given by noncommissioned officers. Colonel Sundstrom is proud of the fact.

"They've got the know-how," he maintains, "and the ability to pass it on. Why not make the most of it?"

Their skill as instructors keeps the majority of 51st technicians on the move. Approximately half of the enlisted force is away on TDY most of the time. As part of its mission, the 51st is responsible for training RV technicians who will man the dozens of ICBM launch sites now under construction throughout the western half of the US.

Earlier in the program, hundreds of British troops were trained at Vandenberg in the intricacies of the Thor, under knowledgeable gents like Sergeant Howard. Now, with IRBM squadrons operational in England, the 51st is busy schooling replacements for the original British contingent.

Education is a passion among Colonel Sundstrom's select crew. To date, the organization has dispatched more people to officer training schools than any other Vandenberg-based unit.

And the job of teaching goes on and on. It is a rare day, for example, when demolition expert Perry fails to address at least one Vandenberg gathering.

"We know that there are still some unrecovered pieces of live ordnance lying around the base," Perry declares. "And this is home for thousands of kids. So we talk to the Boy Scouts, Girl Scouts, church groups, and mothers' clubs.

"Nowadays, a bulldozer occasionally detonates an old land mine. But the children—who've been trained to recognize mines—won't get close to one or to an uncleared area. And they give a wide berth to any other piece of ordnance they happen to see. So far, no one's been hurt."

Which is exactly the way the 51st would like to keep it.—END

AIR FORCE/SPACE DIGEST *readers will find Sergeant Doherty's byline familiar. His most recent contribution was a photo essay on Atlas which appeared in April 1961. An information specialist at SAC Headquarters, Offutt AFB, Neb., he has written for this magazine on subjects ranging from Alaska to Minuteman on the rails. A veteran of both the Coast Guard and the Army Air Corps, with some fifteen years of military service, he joined USAF in 1954. He has written for several national magazines and is a fishing enthusiast when he can find the time. He is a native of St. Louis.*

THE SPACE AGE IN PERSPECTIVE

SPACE DIGEST

VOLUME 4, NUMBER 7 • *JULY 1961*

HOW MANY PLANES ARE THEY TALKING ABOUT?

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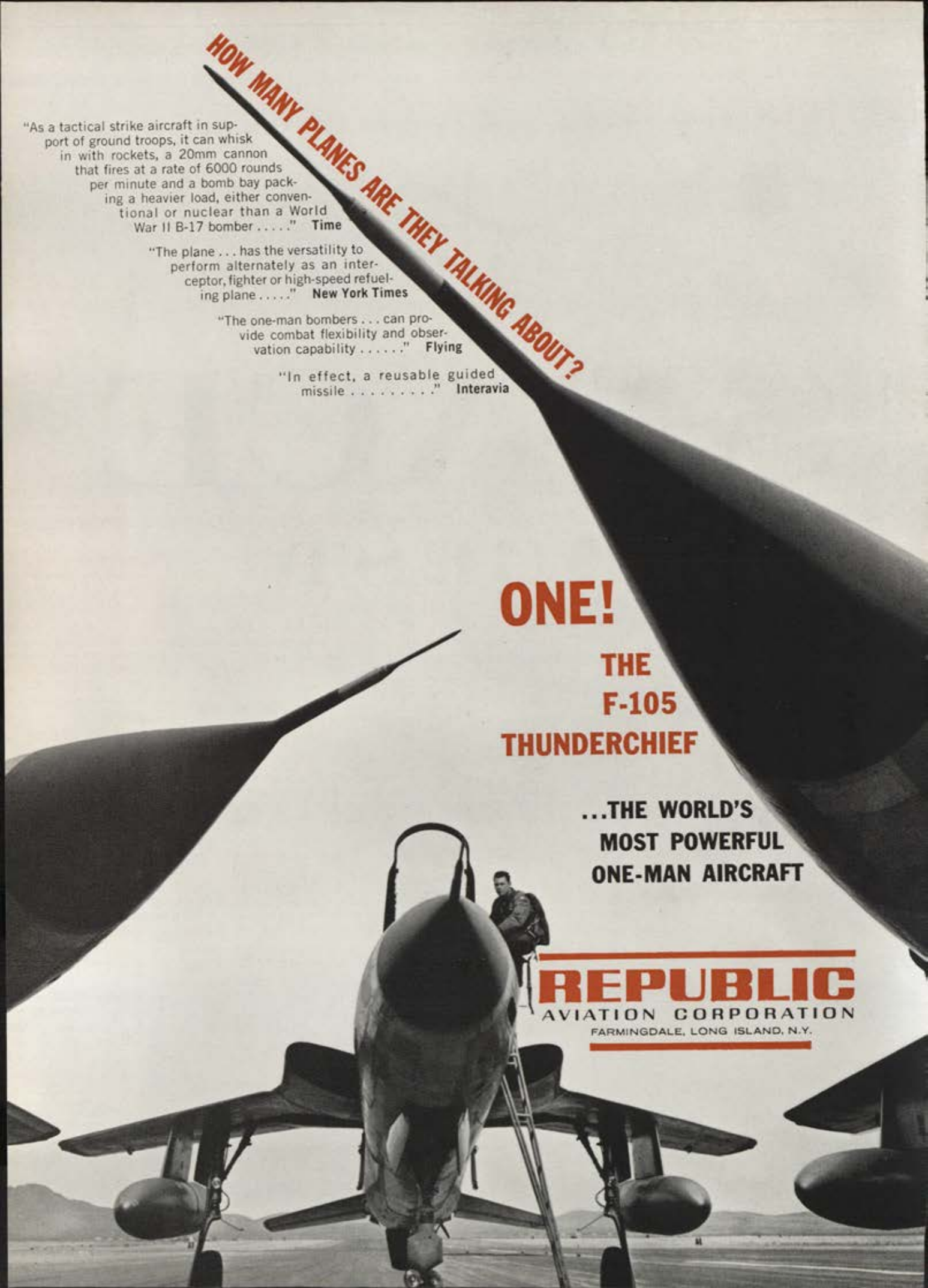

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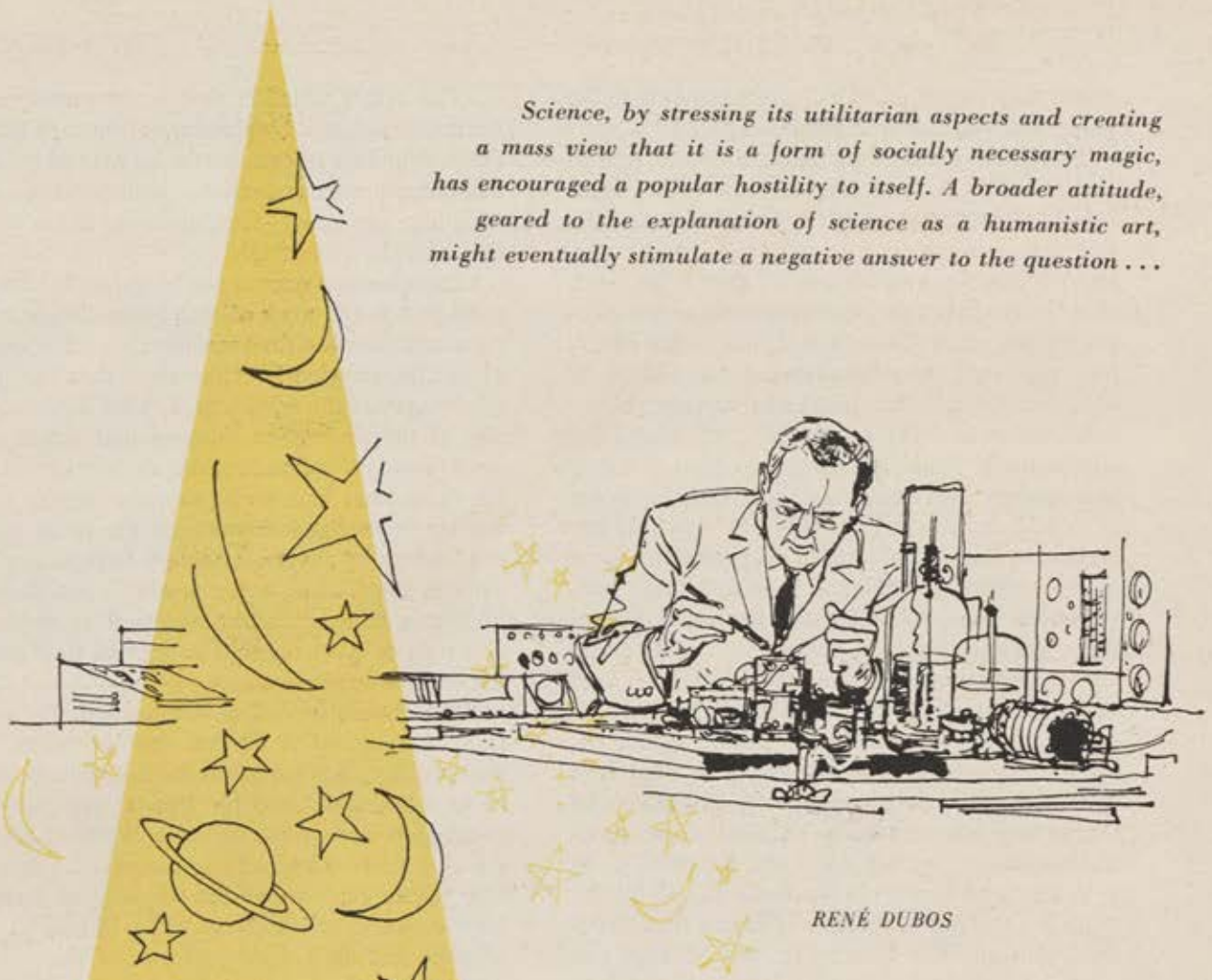
Science, by stressing its utilitarian aspects and creating a mass view that it is a form of socially necessary magic, has encouraged a popular hostility to itself. A broader attitude, geared to the explanation of science as a humanistic art, might eventually stimulate a negative answer to the question . . .



Are Scientists Learned Ignoramuses?

RENÉ DUBOS

MANY are those in the course of history who have expressed doubts as to the ultimate value of natural sciences—from Socrates' skepticism to the talk of the bankruptcy of science so common around the turn of the nineteenth century. But these doubts did not necessarily mean hostility; rather, they expressed impatience at the fact that, despite oft-repeated promises, science had not solved the riddle of human nature and destiny. Far more dangerous, it seems to me, are the expressions of contempt for science as an intellectual discipline, and for scientists as thinkers, that have appeared repeatedly during the past few decades. Along with admiration and awe for the power of science there exists presently in the lay public, as pointed out by Margaret Mead, a curious mistrust of the scientist himself, as if he were something scarcely normal or human. This modern attitude toward the scientist is not far removed from that of primitive people toward the shaman or medicine man,

whom they regard as an individual essential to the group but who is feared and often hated.

As typical of the hostile attitude toward science and scientists, I shall consider two books, published, respectively, in 1913 and 1930—namely, *The Tragic Sense of Life,* by Miguel Unamuno, and *The Revolt of the Masses,* by Ortega y Gasset. Both books have been translated into several languages and are still widely read and quoted today; they represent, and have spread far and wide, several aspects of the antiscience movement.

Unamuno and Ortega recognize, of course, the contributions made by science to human safety and comfort. But while they appreciate the merits of aspirin and motor cars, they are very little impressed by the kind of intellectual process involved in the technology that has produced these conveniences. Most scientific thinking, according to them, corresponds to a performance of a rather low intellectual order. Just as ancient societies used slaves for the affairs of everyday life, so do modern societies produce and use scientific technicians for the same end. It is interesting to note here that, consciously or unconsciously, Unamuno and Ortega have accepted Bacon's claim that the scientific method is so mechanical and foolproof as to be readily and effectively handled by small minds.

As is well known, Bacon considered that induction, with absolute objectivity, was all that was needed to advance scientific knowledge and to convert it into social power. In fact, he had such confidence in this method that he thought it could be used, with success, almost blindly and by men of little talent. "My way of discovering sciences," he wrote, "goes far to level men's wits, and leaves but little to individual excellence; because it performs everything by the surest rules and demonstrations."

Needless to say, few are the scientists today who believe that important discoveries ever result from the mere accumulation of facts. But by the general public the "scientific method" is still regarded as a more or less mechanical formula, different in quality from other creative processes. Indeed, Ortega and Unamuno seem to have taken to the letter Bacon's statement that "brutes by their natural instinct have produced many discoveries, whereas men by discussion and the conclusions of reason have given birth to few or none." As an extension of Bacon's aphorism, it seems worthwhile to quote here at some length from the several pages that Ortega devotes, in *The Revolt of the Masses,* to the low intellectual caliber of scientists and their discoveries.

"The actual scientific man is the prototype of the mass-man. Not by chance, not through the individual failings of each particular man of science, but because science itself . . . automatically converts him into a mass-man, makes of him a primitive, a modern barbarian. . . .

"Experimental science has progressed thanks in great part to the work of men astoundingly mediocre, and even less than mediocre. . . . The reason of this lies in what is at the same time the great advantage and the gravest peril of the new science, and of the civilization directed and represented by it, namely, mechanization. A fair amount of the things that have to be done in physics or in biology is mechanical work of the mind which can be done by anyone, or almost anyone. . . . The work is done . . . as with a machine, and in order to obtain quite abundant results it is not even necessary to have rigorous notions of their meaning and foundations. . . .

"The specialist . . . is not learned, for he is formally ignorant of all that does not enter into his specialty; but neither is he ignorant, because he is a 'scientist,' and he 'knows' very well his own tiny portion of the universe. We shall have to say that he is a learned ignoramus. . . . Anyone who wishes can observe the stupidity of thought, judgment, and action shown today in politics, art, religion, and the general problems of life and the world by the 'men of science.' "

Scientists having become so mechanical in their activities and so unconcerned with philosophical and truly intellectual problems, it is not surprising that, in Unamuno's words, "Science does not satisfy the needs of our heart and our will." Not only does it not deal with the problems of the real man "of flesh and bone," but it "turns against those who refuse to submit to its orthodoxy the weapons of ridicule and contempt."

Thus, according to Unamuno and Ortega, the modern scientist is thoroughly dehumanized, does not see beyond his specialized techniques, and has no awareness of worthwhile human goals. Science fails to deal with problems that are the real concerns of mankind, and furthermore it stultifies all higher aspirations by fostering and satisfying the mass aspects of human nature.

Scientists are inclined to find the reason for the antiscience movement in the fact that the public does not have the training or the ability required to appreciate the intellectual distinction and morality of scientific thought. But the possibility might be worth considering that the scientists themselves have a share of responsibility in this

misunderstanding because they do not convey to the public the nobler aspects of the scientific heritage. It seems to me that some scientists have a tendency to exhibit pride of intellect in speaking of the "scientific method," as if it were something esoteric, superhuman in its power and precision, whereas in reality it is a very human activity supplemented by the use of specialized techniques. Instead of bragging about the purely professional aspects of a "scientific method" that we really cannot define, should we not emphasize more than we do the spiritual, creative, and esthetic aspects of all great scientific advances?

Scientists defend basic research in public by asserting that it cannot fail eventually to yield practical results, but they rarely advertise that knowledge per se is also a precious fruit of science. There is truth, of course, in Farrington's statement that "man makes his mental history in the process of conquering the world," but it is also true that science, like philosophy, has been pursued for its own sake, or rather, for the sake of intellectual satisfaction and of increased understanding. Long before there was such a thing as industrial technology, Ptolemy experienced the kind of intellectual intoxication that only knowledge can provide: "I know that I am mortal, a creature of a day; but when I search into the multitudinous revolving spirals of the stars, my feet no longer rest on the earth, but standing by Zeus himself, I take my fill of ambrosia, the food of the gods."

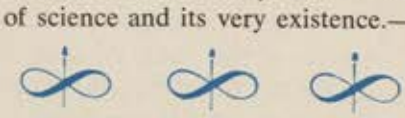
In a similar mood Kepler also exclaimed, "Eighteen months ago the first dawn rose for me, three months ago the bright day, and a few days ago the full sun of a most wonderful vision." And at the end of his life Pasteur spoke lovingly of "the charm of our studies, the enchantment of science."

The motivation which makes great scientists emphasize in public the practical worth of their studies and not their loftier intellectual goals is probably the wish to gain public approval. But there is no evidence that the public would not recognize and respect a purely intellectual motivation. In fact, it seems to me that whenever laymen have exhibited any interest in science they have been just as eager to learn of its philosophical aspects as of its practical applications.

It will be objected, perhaps, that times have changed, that the public is no longer interested in the large intellectual aspects of science but is concerned only with what technology can do for human comfort. Although this objection cannot be refuted convincingly, a few facts seem to be incompatible with it. For example, many of the books on science for the general public which became best sellers during recent decades dealt not with practical problems but, rather, with large theoretical themes of anthropology, biology, physics, astronomy, nay, even of mathematics—which could not in any way be practically useful in the conduct of the reader's material life. Here, again, an objective study of public response would be enlightening and could provide useful guidance for the popularization of science.

Earlier in this discussion I used the names of Miguel Unamuno and Ortega y Gasset to symbolize the movement which is often called antiscience. This was unfair to these authors because they are, in truth, the voice of humanity begging scientists to remember that man does not live by bread alone. They express, also, the fear of those who see science identified exclusively with power and technology at a time when it is beginning to reach populations which have never known it under any other guise. It should not be forgotten that in the Western world science was part of the culture for several centuries before it came to be used extensively for practical ends.

Today this cultural heritage conditions, to a certain extent, the manner in which science is pursued and employed in the countries of Western civilization. In contrast, science is being introduced in the underdeveloped parts of the world not as a cultural pursuit but merely as a powerful and convenient tool—to be used at best for the production of material wealth, at worst for destructive purposes. It seems to me that scientists and science writers betray a public trust when they neglect to emphasize the disinterested aspects of knowledge and are satisfied instead, with claiming that all discoveries eventually prove of practical use. On the one hand, this is not necessarily true. On the other hand, this attitude ignores the fact that today, as in the past, men starve for understanding almost as much as for food. In the long run, the exclusive appeal to utilitarianism may well endanger the future of science and its very existence.—END



René Dubos, a distinguished bacteriologist and contributor to the field of chemotherapy, is associated with the Rockefeller Institute in New York City. Above, reprinted from Science *with permission, is an excerpt from an address to the December 1960 New York meeting of the American Association for the Advancement of Science.*

Perhaps the fundamental reason for going to the planets is because we want to. Are we willing to swallow our puritanical compunctions, which force us to list specific reasons for our space efforts, so that we can show the world that our free, abundant society is willing to expend energy extending man's spirit into the unknown? A leading space technologist asks . . .

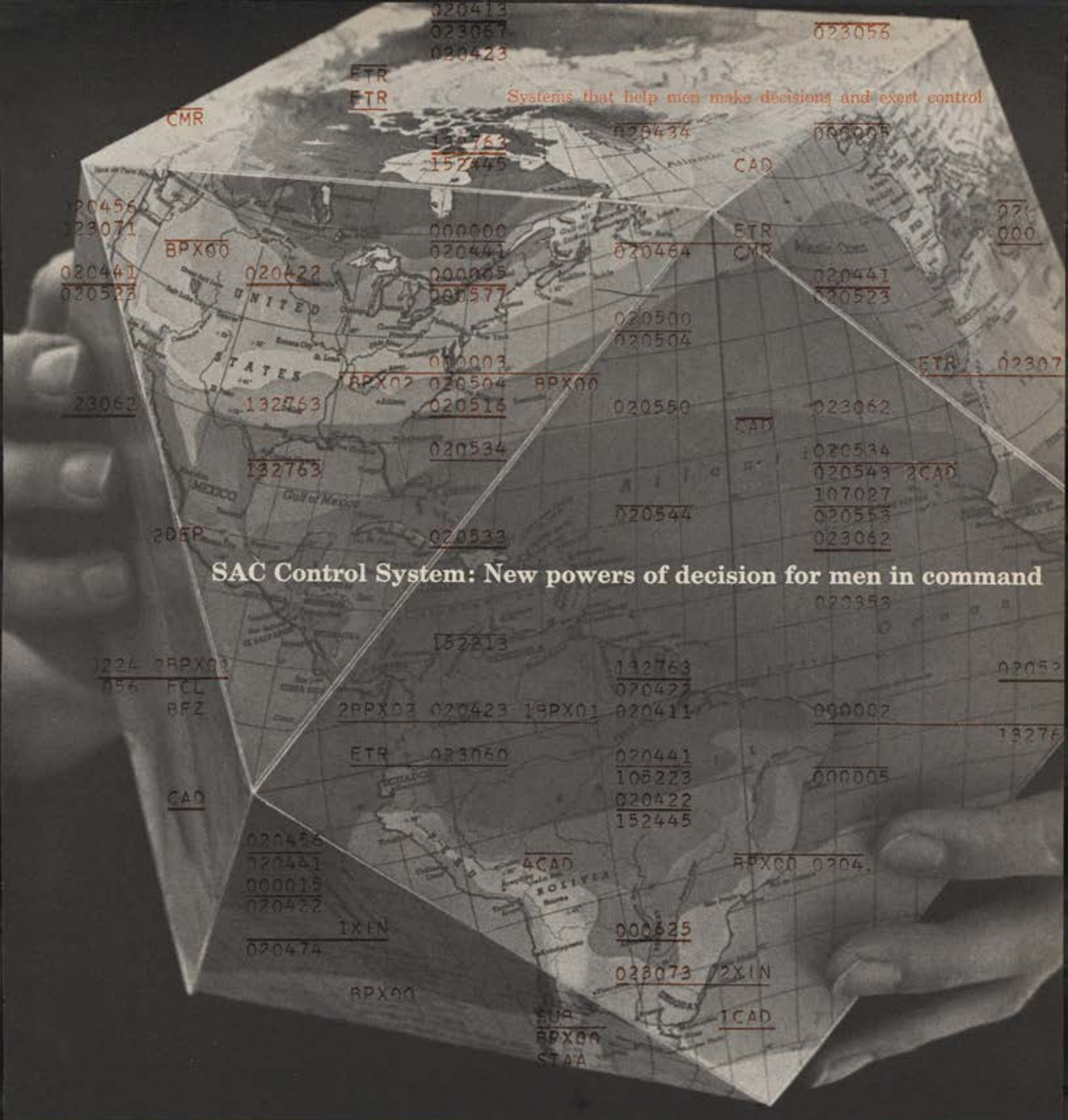
Must We Rationalize Astronautics?

A. R. HIBBS

IF WE must rely simply on the scientific aspects of the space program to justify planetary exploration, then we are perhaps in an untenable position.

There are many planetary astronomers who point out that the capabilities of ground-based observatories in making planetary discoveries have yet to be fully exploited, and certainly the use of balloons for planetary observation is a very fruitful field, still in its infancy. Both of these techniques are far cheaper than space probes and can contribute a great deal to the science of planetology.

Of course, nothing but on-the-spot observation and exploration can give us an adequate description of the life forms which probably exist on Mars. Intriguing though this may be, there are biologists who say that we shall have achieved the creation of life in the laboratory before we land on the planet Mars. Here, again, earth-based experiments, considerably cheaper than rocket-borne experiments, will offer a tremendous payoff in the field of biology even when compared with so excit-



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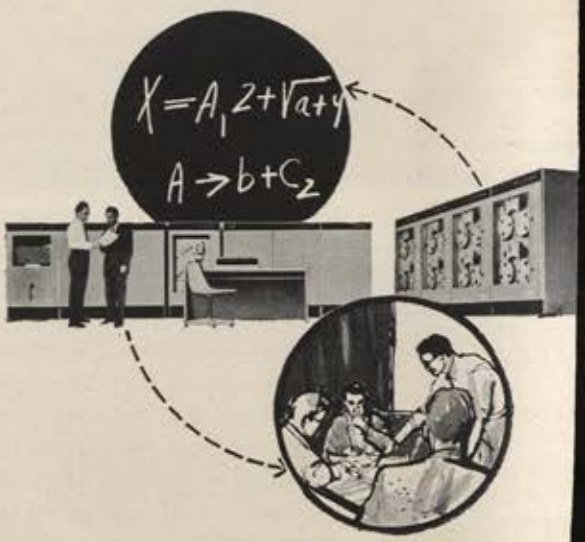

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ing a prospect as the analysis of life on another planet.

In general, I think it is a fair statement to say that even the scientists intimately concerned with the space program do not feel that science alone can justify all of the effort and all of the expenses which are going into that program. The attitude of many is this: Since we are going to the planets anyway, we should certainly do valid scientific experiments in the process. But, why are we "going to the planets anyway"?

We may have reached an impasse which, if it were applied to an individual instead of to a society, might form the basis of a neurosis. Perhaps the fundamental reason for going to the planets is that we want to. And yet it is difficult to accept "want to" as a justification for the expenditure of federal tax money.

It is not only in the field of space exploration that this dilemma presents itself. Our economy has for the past many years been operating at such a high level that it can produce much more than the necessities of our society. This applies not only to the individual consumer, but also to our whole nation as a unit.

As a nation, we are in a position where we can afford to do some of the things which we *want to* instead of having to do only those things which we need to do. Perhaps it is our puritanical background which makes this extremely difficult for us to accept.

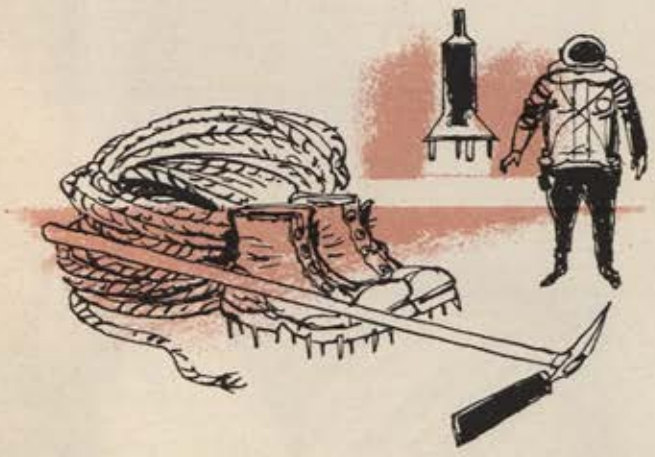
Occasionally it appears that we are stretching military necessity just a bit far when we use it to justify manned lunar bases. Is it not enough to say that we are going to put a man on the moon simply because we want to? We may be in the midst of such a problem with our present manned-satellite plans—the Mercury program. It is difficult to justify this program on either the basis of military or scientific need. Therefore, we are left with the only other *need* to which we have recourse in the space program, namely, national prestige. Now, the unfortunate fact is that the Soviets will very likely beat us in putting a man into orbit [as they did on April 12, 1961]. Thus, all of the publicity and effort we are putting into the Mercury program on the basis of national prestige is very likely to destroy the prestige rather than build it. The Russians will cash in, and we will be left with our press releases hanging out.

Would it not be more healthy (and more honest) if we were to say that we are going to put a man into orbit around the earth, because that is what we want to do? Might this not also contribute to the national prestige? Might it not be worthwhile to show the world that our economy, our political system, our national strength, is so vital that we can afford the indulgence of our national urge toward human adventure and excitement with a program for manned spaceflight?

It is possible that this dichotomy between the national need and the national want is the basis for the apparently endless argument about the role of man *vs.* machine in space. Of course, it is difficult to justify the position of man in space if we look only toward the *needs* of a space program, but then it is difficult to justify the program itself.

If we turn, instead, toward the wants of our society which find their outlet in the space program, then the role of man in space needs no justification. It is an objective in itself. It then becomes meaningless to argue that a machine is better equipped to satisfy the mission, since the mission is to put man on another planet.

If man into space is an object in itself, then it is so basic that it needs no justification on the basis of any other objective. By this same token, it becomes an objective which is difficult to analyze or to argue—either pro or con. It is possible to try to understand such an objective in terms of human behavior. It is possible to make a direct analogy between the urge to explore the planets and the drives which have motivated all our explorers, starting with the first man that stood erect to become a man and including Marco Polo and Adm. Richard E. Byrd. It is possible to understand the urge to adventure which will carry men to the planets as an analogy to the urge which carried men to the top of Everest and on a traverse across the Antarctic Continent via the South Pole. (It is intriguing to note that these two accomplishments were actually the work of the same man, Sir Edmund Hillary, who ascribes to himself the occupation of "beekeeper," which proves that the sun never sets on British whimsy.)



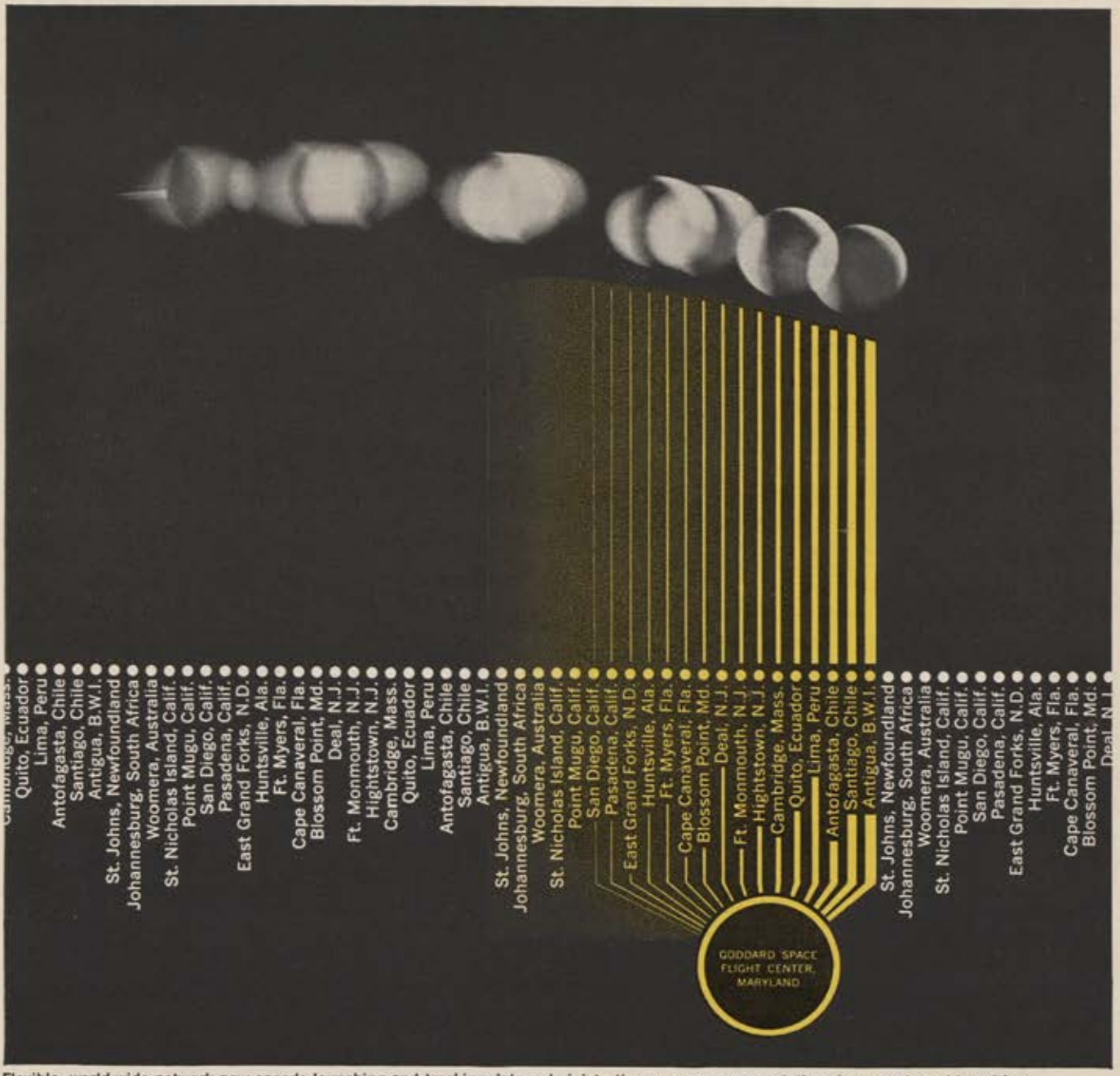
Although we may have some success in relating the exploratory urge of space travel to the exploratory urge of more earthly adventures, we cannot prove with logic or justify on the basis of need the role of man's adventurous spirit in the space program. Either we accept it as a matter of faith or we reject it on similar grounds.

From this point of view, the role of man in space as a part of the national space program rests on the beliefs and the desires of the individual citizens of the country. In that case, each individual must search his own soul to find the answer. There is no rationalization which will lead him to it. We who are privileged to be connected with the space program certainly have the primary obligation for such soul-searching, and undoubtedly all of us have indulged in it.

Let me then recall to your mind a picture which I am sure has been there many times before. One day—a day that is probably farther away than many of us would like to believe, but a day that may be closer at hand than many of our conservative cohorts are ready to admit—one day, a mammoth rocket with a man in its nose will pursue its thundering logarithmic history beyond the speed of escape; and, until the successful burnout of the last stage, the whole world will hold its breath. On that day, the first human being to head for Mars will begin the long, silent months of weightless coasting, and, regardless of the uniform he wears, his payload will carry neither gun nor bomb. In the months that follow, he will describe to his earth-bound neighbors the panorama of the universe; and it will not matter whether or not he reports a single scientific observation. One day a capsule carrying a man will streak down through the atmosphere of Mars, and the incandescent trail which follows that capsule across the Martian sky will illuminate the hopes and dreams of two billion human beings. There will come a day when the first man stands erect on the red sands of Mars—and you and I can help him do it.

Perhaps we will help him because of the scientific enlightenment which will result from his exploration. Perhaps we will be trying to strengthen the national military posture or add to the national prestige. But is it not possible that we will help simply because we want a man to stand on Mars? —END

As Director of the Division of Space Sciences at the Jet Propulsion Laboratory of the California Institute of Technology at Pasadena, Calif., Dr. Hibbs plays an important role in development of instrumentation for planetary exploration for the National Aeronautics and Space Administration. Above is condensed, with permission, from the April 1961 issue of Aerospace Engineering.



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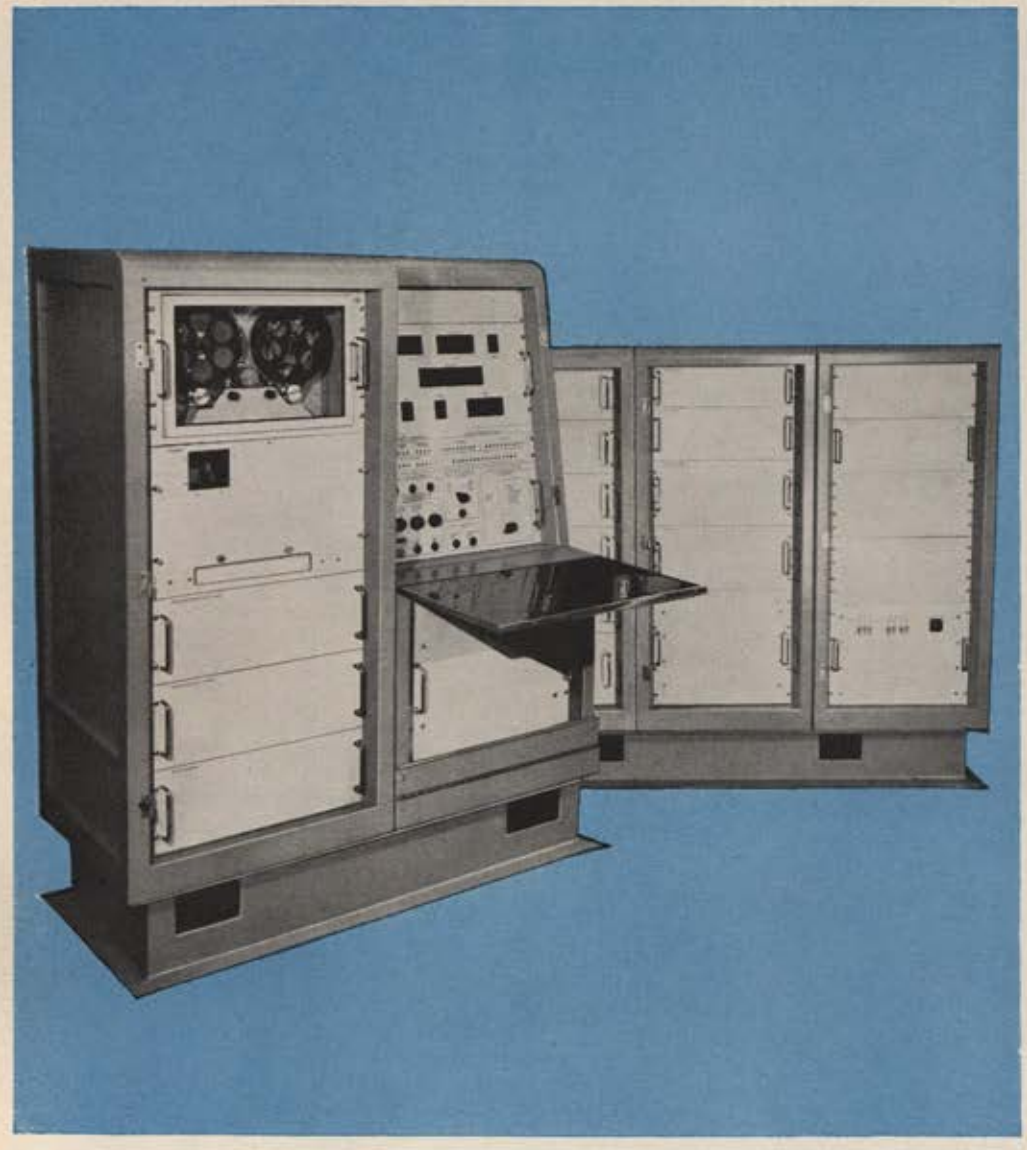

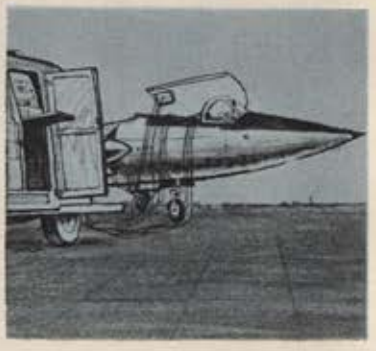

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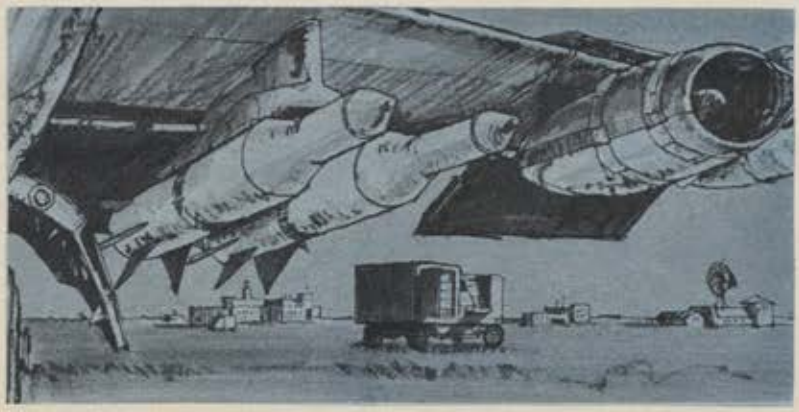

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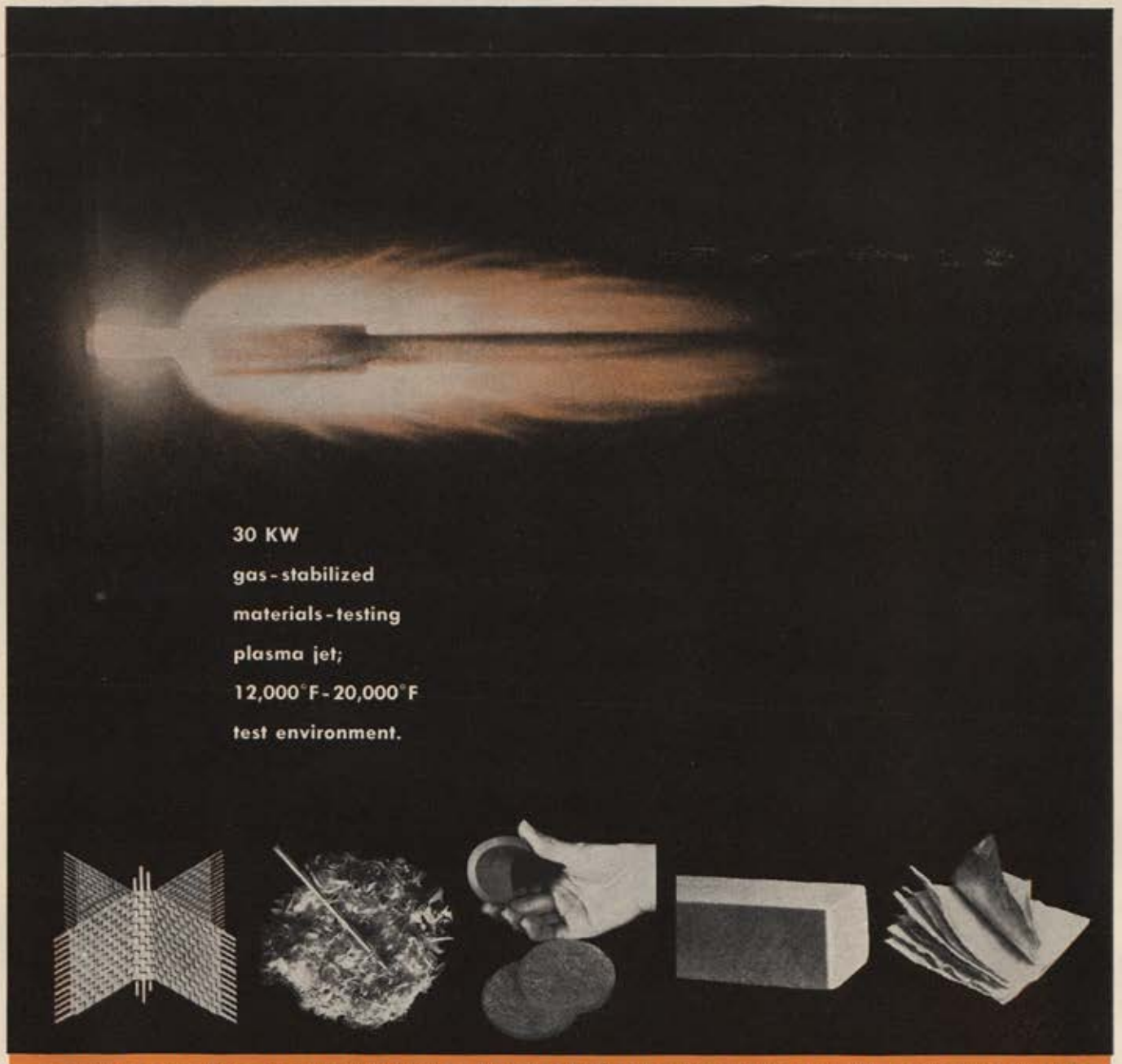

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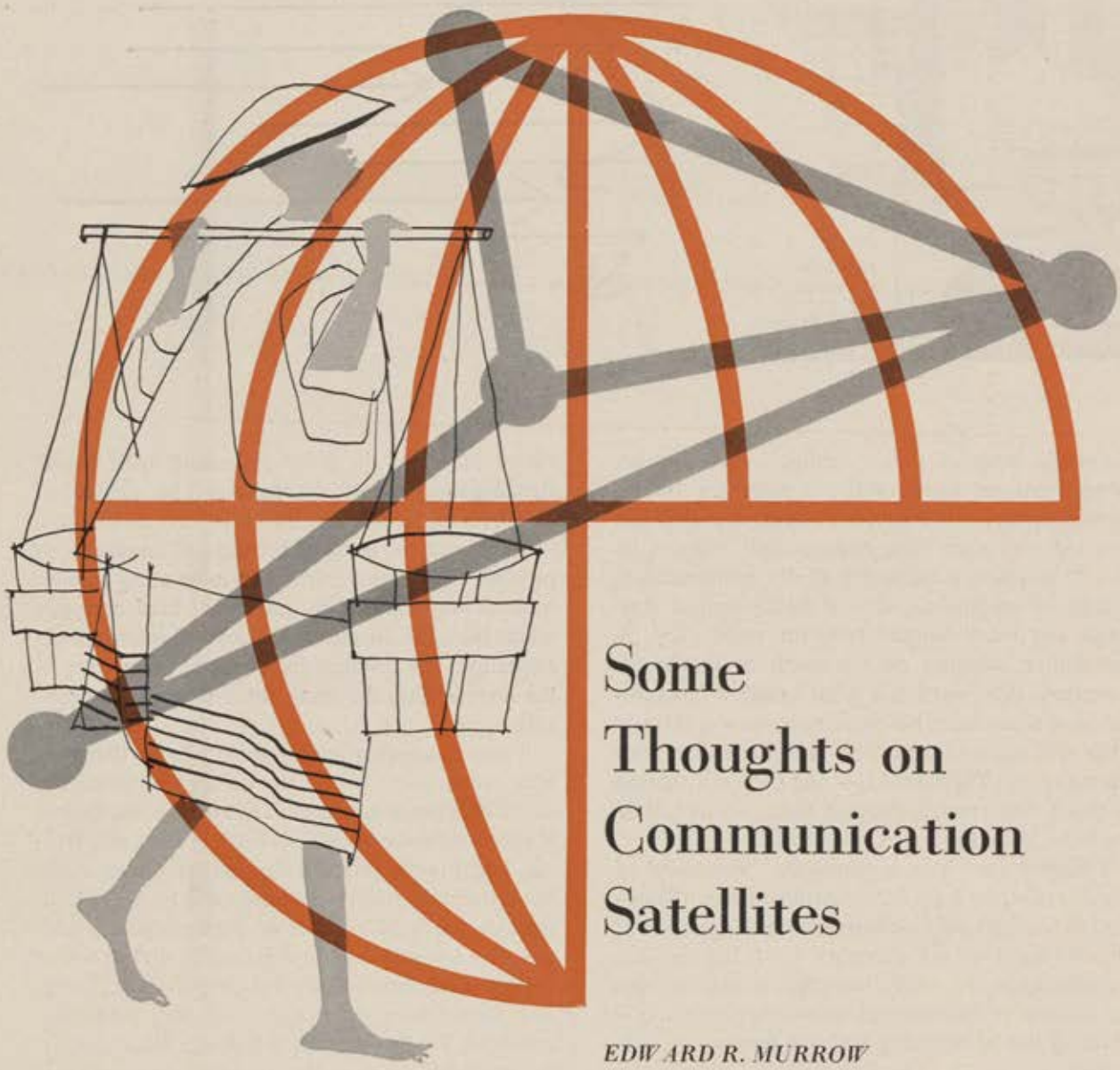
"It may be that the history of our day will be decided by what dreams we choose to deliver. The issue is not how we deliver it, but what our delivery has to say."

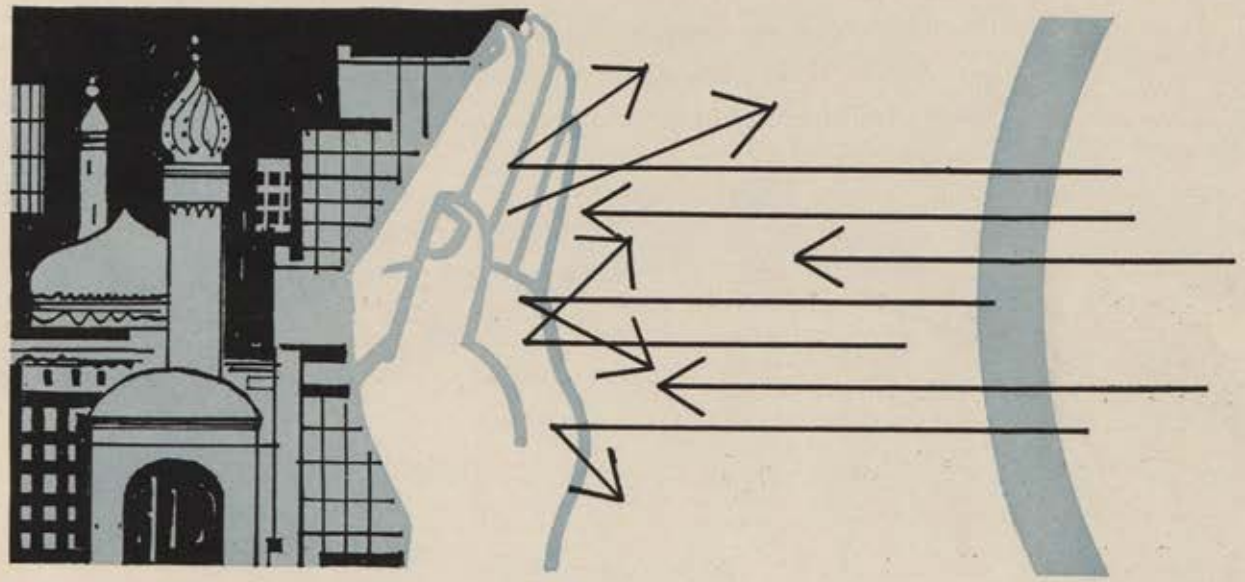


Some Thoughts on Communication Satellites

EDWARD R. MURROW

COMMUNICATION systems in space can help unburden communication systems on earth. Subways and highways will continue jammed, but at least while waiting for commuter routes to unclog, we may someday be able to watch live the latest TV from Europe. Broadcasting, of course, is the main reason our [US Information] Agency is watching developments in space. Whether done directly, or by point-to-point relay, we have a large and obvious stake in any improvement in bombarding the world with words and music and pictures.

And that is precisely the point. We can orbit our rockets and transmit our broadcasts, but in the end we still deal with the base elements of human communication: words and pictures. Space satellites will not make it any better; they will simply diffuse it over a wider area.



On the basis of policy, politics, and content, space communications will *not* solve the fundamental problem of communications, one that has haunted man since time immemorial: What is he to say, and how is he to say it? A communication system—even one in space—is totally neutral. Batteries and wave lengths have no vocabulary. A transmitter, whether on the earth or in the atmosphere, does not know what to say. Communication systems have no conscience, only a history. They will transmit both filth and inspiration with equal facility. The mistakes—and they will abound as much tomorrow as they do today—will still be made by humans.

I suggest that here is where the "wasteland of television" speech by Mr. Newton Minow [Chairman of the Federal Communications Commission] imposes itself on our thoughts. Even beyond that wasteland, do we really want the world, without the context of background knowledge, to see TV covering the bloodletting and bus burning in Alabama?

Space satellites will neither solve our dilemmas nor salve our conscience. Television and radio are still television and radio, whether sent from a tower 500 yards away or a satellite 500 miles above.

But even beyond our sins of society there are grave matters of international policy. Any system, I take it, by its nature must be global. One does not send a signal to a satellite and have it die there. There must be a terminal point in another country. Like Pandora glimpsing inside her box, the problems begin to appear. We must, in some cases at least, use facilities of other countries. How? Shall we do it by agreement with them? Broadcasting needs frequencies. In developed countries these frequencies have been distributed.

There may be a major problem of finance; who pays for the system? Participation by many smaller nations may involve an outflow of hard currency when they can ill afford the loss of international exchange. The problem then becomes a mixture of the engineering, the legal, the political, the financial.

There is another international barrier that is at least worth mentioning: the difference in international broadcast standards. Television in the United States is different from television in England, Russia, and France. Standardization has great merit, but a nation's individual standard is precious to it. Besides the bald element of national pride, control of standards, as I understand it, means within certain limits, control of what people see and hear. This would bring us in conflict not only with other countries but even with ourselves. What American engineer, for example, would recommend overhauling US television production standards to gain international compatability?

Will we make the system pay its own way abroad, subsidize it in part, or give it away free? Although foreign cooperation is important, many countries cannot afford the cost of a satellite participation.

Communicating around the world is expensive. To the extent communication costs are high, the free flow of information is hindered. If costs for a satellite system are higher, the flow of information will be hampered even more.

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All of which brings me to the uncomfortable subject of paying the bill. Experts agree on only one thing: The astronomics of space become the astronomics of money. Beyond that, estimates diverge like forks in the road.

It is here that I make certain emphasis for our Information Agency. A system of communication satellites will be meaningful for our Agency only if it is a cheap system. We cannot squander millions for the novelty of using a new satellite system. On our Agency budget we must staff and maintain over 200 posts in nearly 100 countries around the world and carry on a range of highly diversified activities. Broadcasting is only one of those activities.

Satellite communication will be an additional system of communications—not a completely new system, but an additional one.

We will still broadcast standard-band radio; there will still be normal broadcasting of television. The satellite system will be an expansion and expensive, but it is unlikely to be a replacement.

There is a further problem in the power system to be used. How does one send the best signal to a satellite and then back to earth? We must be competitive in our broadcasting. People will not listen to or watch a signal if that signal is weak or distorted. They will turn to the signal offering the best quality of reception. There must be good transmission, consistently every day of the week, every week of the year.

There may be another issue worth discussing: Let us call it the "gimmick value" of the satellite. When a person can receive our radio on normal broadcast bands, and TV over normal broadcast channels, why should they ever bother looking or listening for the same programs merely because we have beamed them via satellite? For the first few weeks it may have the gimmick value of inducing an audience. But when the honeymoon is over and our marriage between programing and audience has settled into its day-to-day monotony, satellite broadcasting may offer little if any more than we offer today.

We have flown Commander Shepard's Mercury capsule to the United States exhibit at the Twenty-fourth International Air Show at Le Bourget in Paris. There over a million people at the world's largest international exposition on aviation and space will see this symbol of the latest American space success—and this on the very site where nearly a generation ago a slim lad named Lindbergh landed his *Spirit of St. Louis* after another historic flight over the Atlantic.

One assessment we will have to make is how we choose to shape our lives and our fortunes. This generation of Americans has no monopoly on problems. They abound abroad. Over much of this globe there are unfed bellies and tired bodies that will turn to our satellite system with but marginal interest. The grindstone of poverty will still be the lodestone of policy. It would seem the level of living would be a relatively high priority for this generation to face. Maybe schools and sewers are more important than satellites.

I pick no quarrel with a dream. The hope of a world system of communications with satellites may be a dream worth the trying. But history will record that there were more people than there were nations, and more dreams than there were people. Not all of those dreams could be delivered to reality. It may be that the history of our day will be decided by what dreams we choose to deliver. The issue is not how we deliver it, but what our delivery has to say.—END

Edward R. Murrow, now the Director of the US Information Agency, which operates the Voice of America and numerous overseas information services, has a distinguished record in radio and television reportage. The above is condensed from his remarks to the Conference on Peaceful Uses of Space, held at Tulsa, Okla., on May 27, 1961.

Working out a mode of communication with intelligent extraterrestrial beings would require both ingenuity and caution, a space scientist points out as he offers, tongue in cheek, a set of topics we might discuss with our otherworldly neighbors while we decide their intentions.

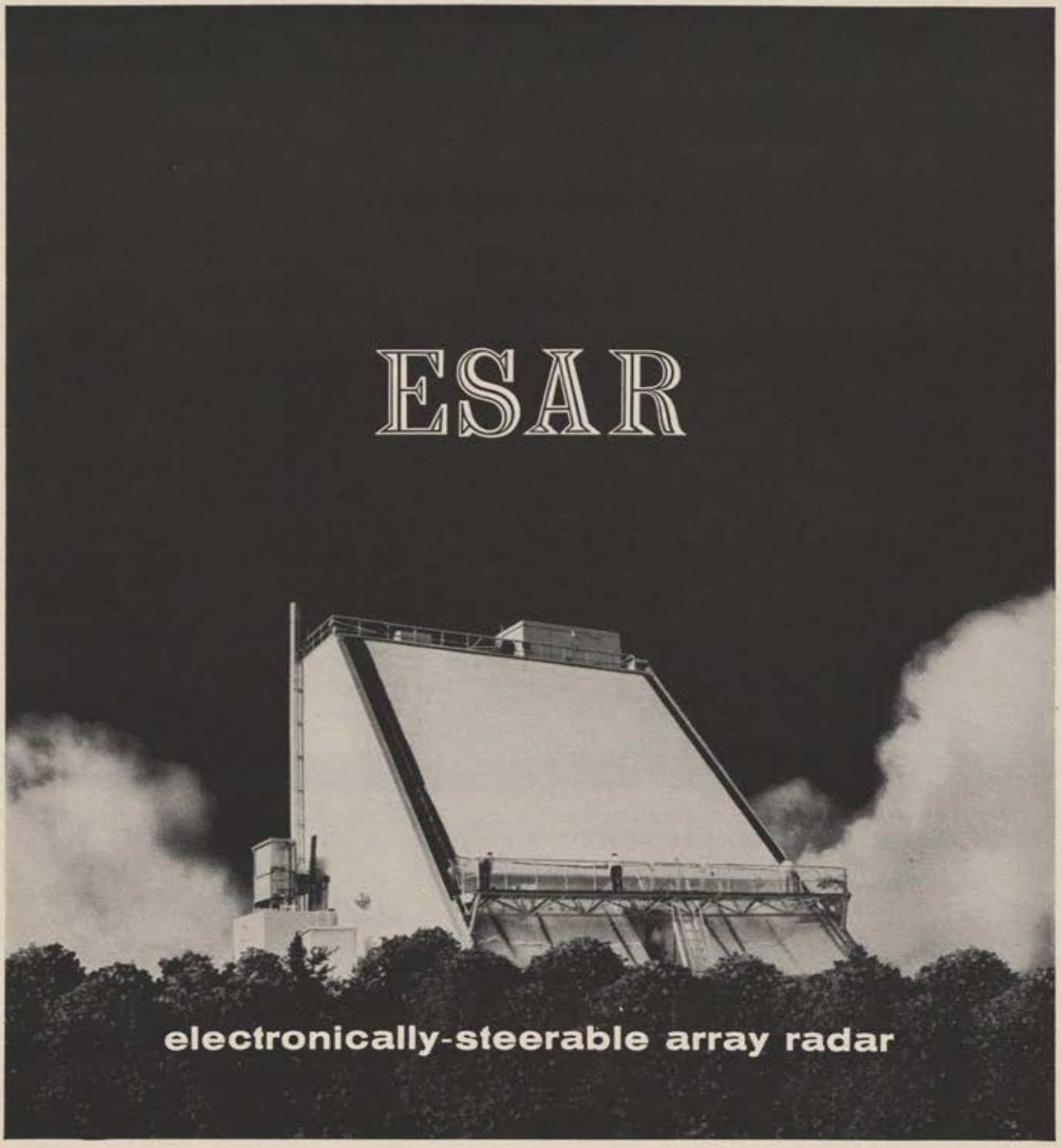
A Short Primer for Extraterrestrial Linguistics

SOLOMON W. GOLOMB

THERE are two questions involved in communication with Extraterrestrials. One is the mechanical issue of discovering a mutually acceptable channel. The other is the more philosophical problem (semantic, ethic, and metaphysical) of the proper subject for discourse. In simpler terms, we first require a common language, and then we must think of something clever to say.

So far as the channel is concerned, there would seem to be many different possibilities. On earth, we can communicate by speech (using the ear as the receptor), by writing or semaphore and pictographs (using the eye as the receptor), by tactile means (*e.g.*, Braille), and, as demonstrated recently, by modulating an olfactory channel (aromarama). Electromagnetic relaying being involved or not, any message we receive must ultimately activate one of our many sense perceptions—sight, hearing, touch, smell, taste, temperature, equilibrium, pressure, acceleration, etc. There is also conceivably telepathy, or at least alpha-rhythm.

If we met a strange creature on an alien planet who seemed to be capable of intelligence, it could be quite difficult to decide which of the many



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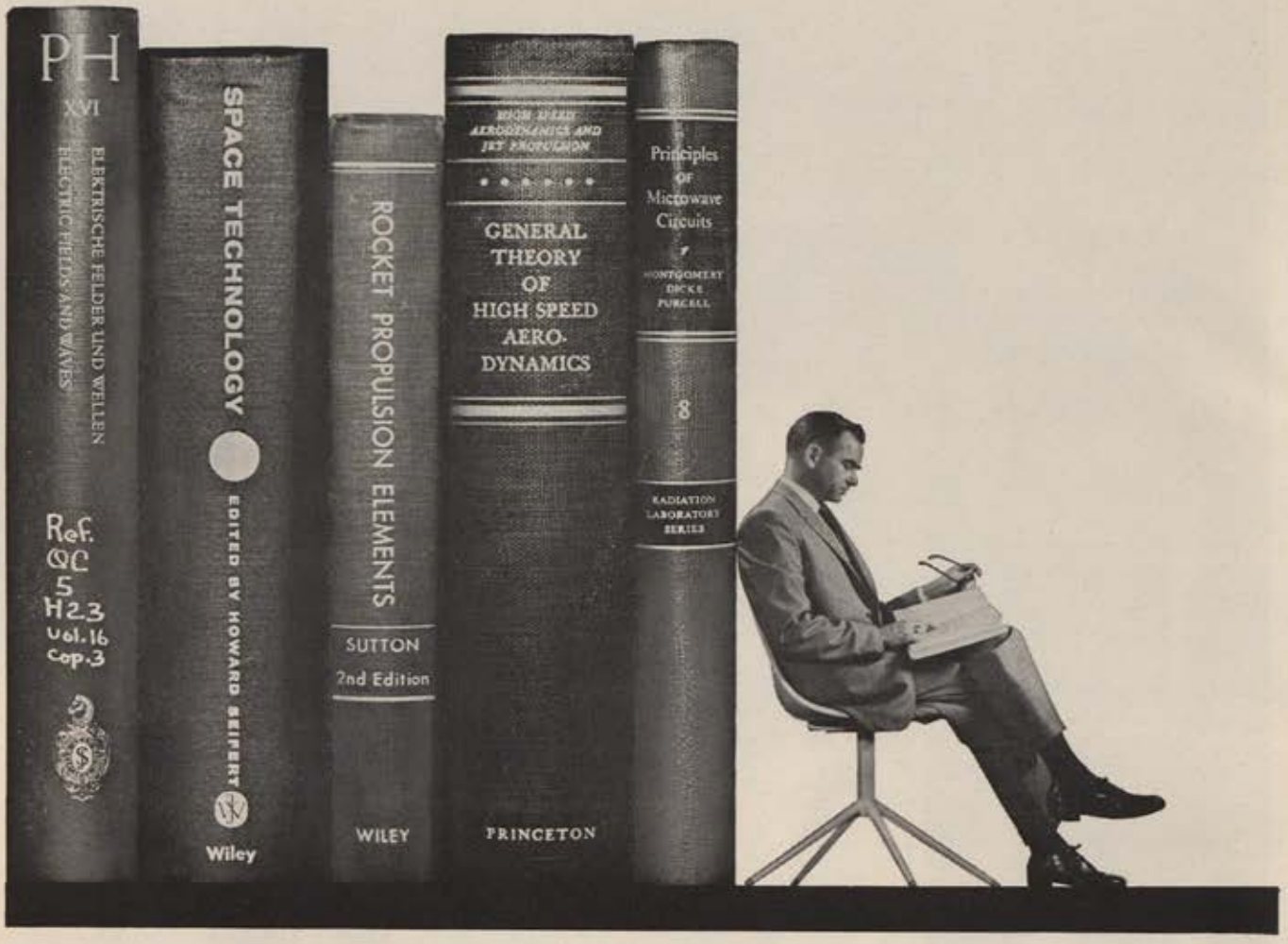

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sounds (whistles, clicks, snaps) or smells (of which we have no theory to speak of) or radiations at many frequencies (possibly, but not necessarily, including optical frequencies) would be information bearing. It could turn out that none of these is significant, but that behavior patterns such as fluttering of appendages and agitation of membranes tell the story, as in human discourse, where gestures and glances can easily replace words.

On our own planet and within our own species, there have developed such diverse systems as sign, whistling, and gesturing languages (not only in Southern Europe, but in such constructs as the deaf-mute language), not to mention Morse, semaphore, Braille, and spoken languages using quite dissimilar phonemes and intonation patterns. How to recognize an attempt to communicate something when you first encounter it might prove quite a difficult matter.

Of course, there is the approach of Project Ozma [the recent, short-lived attempt at Green Bank, W. Va., to tune in on possible radio signals from inhabited planets beyond our solar system]. If we start with as many assumptions about the reasonableness of our friends, the Extraterrestrials, as UFO enthusiasts do, we might end up with English-speaking, anticommunist, white, Protestant Centaurians. Relaxing the constraints slightly, we find humanoids who build the same kind of radio systems we do, and who think and act much as we, even to the point of recognizing the 21-cm hydrogen line as the best of all possible frequencies. However, they are more interested in us than we are in them, which is why they are transmitting, whereas we are merely receiving.

It would be wonderful, indeed, if this approach would lead to success, but 100-to-one would be good odds that no results will be obtained by Ozma in time to affect my intention to retire from active space probing in the year 2000. After all, if they are as similar to us as all that, they have a budget-minded Congress which has set their peak transmitter power level just below our minimum detectability threshold, if it hasn't canceled the project altogether for having failed to produce results for lo! these many millennia.

It would be particularly ironic if our portion of the universe were densely populated with gigantic receiving antennas but with no one willing to undertake the additional expense and round-trip delay time required for transmitting. The conservative assumption is that, even if there is other intelligent life in our neck of the galaxy, we would not find it until we had brought a spacecraft fairly close to it.

Suppose that we have landed on or near some congenial planet, and we find there a species living in elaborate cities, and hence prime suspects in our quest for new intelligence. The mechanical problem of finding a mutually acceptable channel for the commencement of negotiations cannot be divorced from the semantic problem of convincing these creatures that *we* are intelligent. The solution to this problem depends on whether we are truly face to face with the creatures or merely

have a narrow-band link in operation. The narrow-band link, being more constrained, is easier to analyze. For it, we want a pattern too regular to be random noise but too irregular to be a naturally produced pulsation phenomenon. Standard suggestions include the binary expansion of the number *pi*, the sequence of the first few prime numbers, or simple arithmetic, such as "3+4=7."

To begin with, it is probably rank terrestrial provincialism to expect others to attach the same importance to *pi* that we do. Even in our own mathematics, such constants as *e* and *Log 2* are considered important, and the exaggerated role of *pi* stems largely from the Greeks' undue efforts attempting to square the circle. Doing arithmetic has the drawback that such concepts as "plus" and "equals" must be brought into the picture.

My own recommendation is the prime sequence 2, 3, 5, 7, 11, 13, 17, 19, 23 . . ., with a long period to prove the nonaccidental nature of the signal. It isn't so much that I'm sure these Extraterrestrials would *recognize* the primes; but if they don't they must be dull fellows indeed, and I would just as soon not get acquainted. Of course, we use the base, 1, thus: 11 - 111 - 11111 - 1111111 - . . . . We could equally well send portions of arithmetic progressions—for example, 1, 2, 3 . . .; 1, 3, 5 . . .; 1, 4, 7. . . . This makes fewest demands on pattern-recognition capability, and hence is a low-threshold intelligence detector.

The eminent Netherlands mathematician, Hans Freudenthal, is currently at work on a book to be called *Lincos* (for *lingua cosmica*), in which he will attempt to describe an ideal language for cosmic intercourse. This is all well and good, except that the Arcturists may be less interested in learning Lincos than in teaching us some equally ingenious invention of their own.

At closer range we can demonstrate gadgets, especially munitions, at which our species excels. Other than publicly killing one another, we can perhaps demonstrate our intelligence by collecting biological specimens to raise in captivity. Such scientific curiosity is an unmistakable sign of intelligence, although with a notable drawback: If our specimen belongs to the dominant species, his capture and imprisonment may be regarded as an act of war.

Now we come to the really significant question. Suppose we have passed the IQ tests, resolved all the semantic questions, and have an effective communications link going. What do we talk about? Bell Telephone and Western Union assume their subscribers already have something in mind to say, so that classical information theory turns out to be of no help. Ruling out such commonplaces as baseball scores, the weather, and backfence gossip, I have compiled the following list of likely topics for discussion with our extraterrestrial neighbors: (1) Help! (2) Buy! (3) Convert! (4) Vacate! (5) Negotiate! (6) Work! (7) Discuss!

Each of these topics merits a brief elucidation:

(1) *Help!* assumes we have encountered a superior civilization and want their help in solving our earth-bound problems or fighting our internecine battles.

(2) *Buy!* presupposes that some basis for mutually profitable trade exists and should be acted upon.

(3) *Convert!* suggests that as missionaries from the Chosen Planet we have undertaken to spread the Good Word that the Galaxy is coming to an End.

(4) *Vacate!* means that we like the planet and figure that we can defeat the inhabitants.

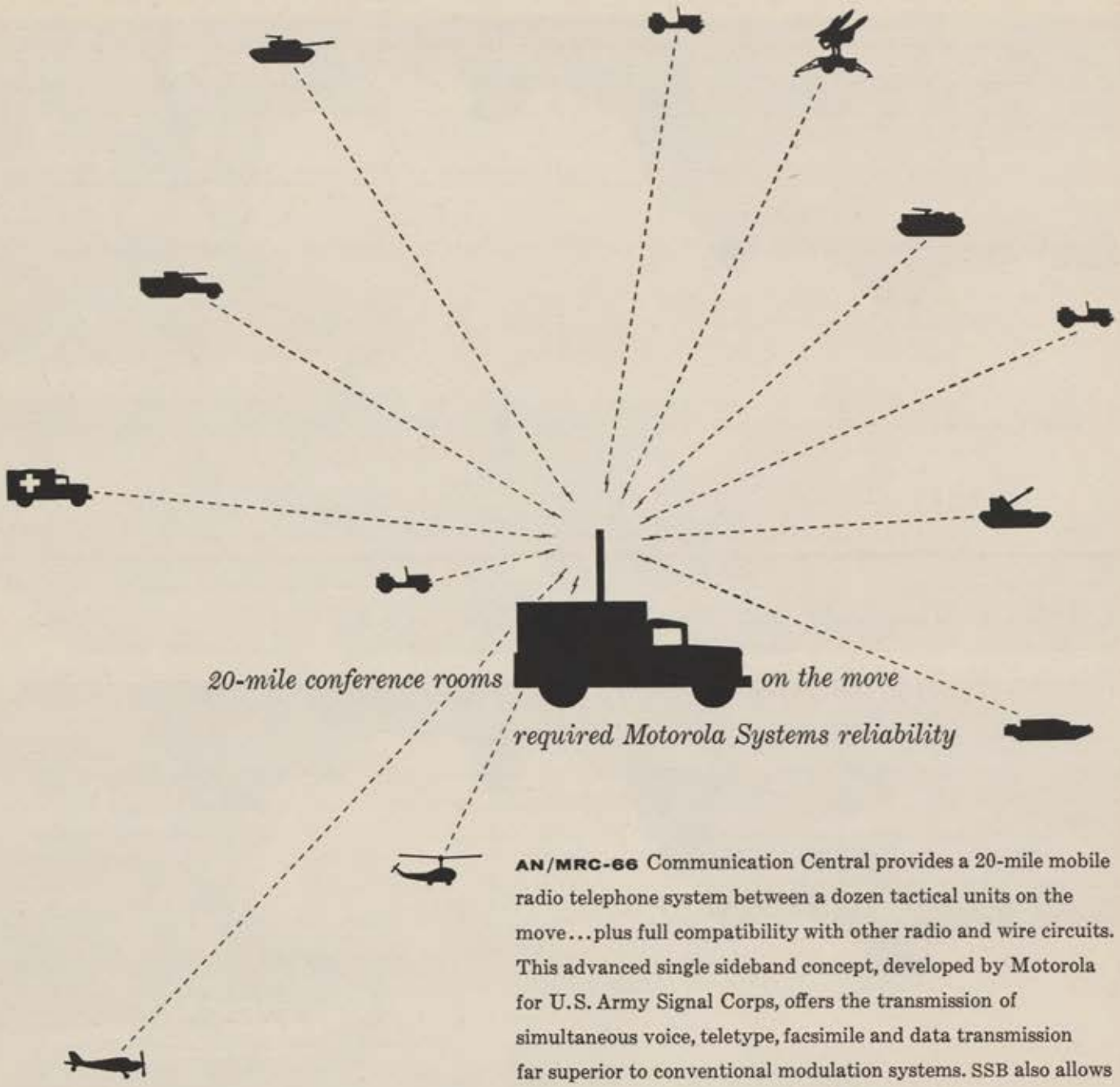
(5) *Negotiate!* means that we are looking for new members in OPTO (the Occidental Planetary Treaty Organization).

(6) *Work!* supposes that we've uncovered a good source of cheap labor.

(7) *Discuss!* presumes that there is no common environment which we and they can share. Only in such a case does the history of our species offer encouragement for the prospect of free mutual interchange of ideas, experiences, and scientific theories.

Naturally, we must not risk telling too much until we know whether the Extraterrestrials' intentions toward us are honorable. The government will undoubtedly set up a Cosmic Intelligence Agency (CIA) to monitor Extraterrestrial Intelligence. Extreme security precautions will be strictly observed. As H. G. Wells once pointed out, even if the Aliens tell us in all truthfulness that their only intention is "to serve mankind" we must endeavor to ascertain whether they wish to serve us baked or fried.—END

Dr. Golomb, Assistant Chief of the Communications Systems Research Section at the Jet Propulsion Laboratory, specializes in application of discrete mathematics to coding and communications. The above article is reprinted with permission from the May 1961 issue of ASTRONAUTICS, *the publication of the American Rocket Society.*



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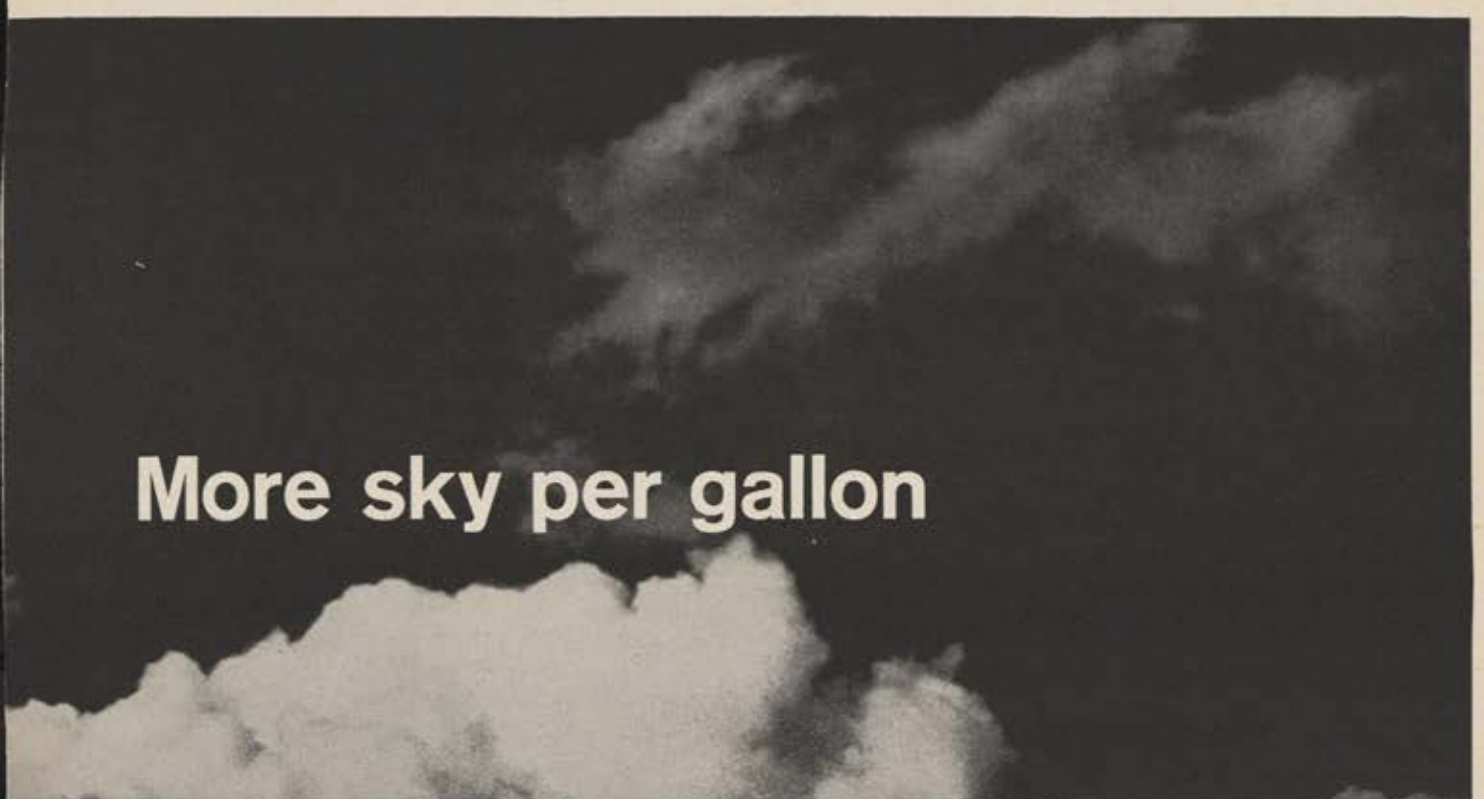
Northrop's Laminar Flow Control will enable large aircraft to fly up to twice as far as they now can, and stay aloft proportionately longer, on the same amount of fuel. Or it will permit them to carry heavier payloads over a given distance. And it will accomplish this without increasing the airplane's size, weight, or engine power.

Laminar Flow Control is a revolutionary technique developed by Northrop for reducing friction drag on an airplane in flight. This drag is caused by the turbulence of the boundary layer of air as it flows over the surfaces of the plane. By drawing off this turbulent air through paper-thin slots in the aircraft skin with a suction system, and exhausting it in the direction of thrust, a smooth "laminar flow" of air is obtained.

The implications of Laminar Flow Control are far-reaching. To commercial operators it can mean substantial cost savings on long distance flights, and make



possible non-stop flights over greatly increased distances. To the military, it will be immensely important for surveillance and airborne alert missions, or for any operation requiring aircraft to stay aloft over long periods. On logistic missions, planes can fly in and out of trouble spots without refueling. Dependence on overseas bases will be reduced.

Northrop is conducting a continuing research program for the U.S. Air Force to investigate the applications of Laminar Flow Control to many kinds and phases of flight. Two airplanes are now being modified under a separate Air Force contract to demonstrate the practicability of this new aerodynamic technique in day-to-day operation.

NORAIR
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Speaking of SPACE

WILLIAM LEAVITT
Associate Editor, SPACE DIGEST

Space '61—Perfection: No —But Progress: Yes

"Let it be clear that I am asking the Congress and the country to accept a firm commitment to a new course of action—a course which will last for many years and carry very heavy costs—an estimated $7 to $9 billion additional over the next five years. If we were to go halfway, or reduce our sights in the face of difficulty, it would be better not to go at all."

With these words, President Kennedy on May 25 called for action and new money to support a beefed-up national space program, with the special target of getting an American to the moon and back before the end of the decade. As this is written, the Senate space committee, chaired by Sen. Robert Kerr, Democrat of Oklahoma, is examining the President's proposals, which total up to $679 million additional space budget money in fiscal 1962, some $531 contributing to the moon project. That the technical difficulties of such an objective are formidable is beyond question (*see "Men to the Moon," page 44*). But there is strong hope that the President's requests for money—requests reflecting decisions that, sadly, were not made during the Eisenhower Administration, when the whole process of speeding up the space program might have been a lot easier—will go through both congressional space committees and both houses with no major hitches.

Retiring from active Air Force service at the end of this month is Brig. Gen. Don Flickinger, Special Assistant for Bioastronautics to the Commander, Air Force Systems Command. A longtime proponent of man-in-space programs, General Flickinger has in his most recent post been coordinating biomedical work within AFSC.

A vital portion of the President's program is his request for $62 million for solid-fuel space-propulsion development to be undertaken by the Department of Defense. This is a major decision for two reasons: First, it is at least the beginning of a green light for the solid-fuel proponents who have pushed hard on Capitol Hill for a chance to prove their claims of multimillion-pound thrust for their propulsion mode—and second, because it signals a coming healthy technical competition between the National Aeronautics and Space Administration and DoD in the realization of multimillion-pound-thrust goals. In general, NASA will be concentrating on liquid-fueled programs such as the Saturn system, while DoD will specialize in solid-fuel development. Of course, this dual approach will be expensive, and the country might at some future date have to face the prospect of scratching one approach after a sizable investment (although the chances are better than good that *both* liquid and solid systems will find important uses, separately and in tandem) but such a healthy competition marks a welcome departure from the "eggs-in-one-basket" approach that has generally featured our big booster programs thus far.

As Deputy Secretary of Defense Roswell L. Gilpatric put it to the Senate space committee on the first day of hearings on the new Kennedy space budget:

"To augment the NASA effort, [DoD] is now going to support the national space effort by undertaking the development of large solid-propellant motors. This is a logical contribution to the national effort on the part of DoD in view of the extensive experience which we have obtained as a result of the Pershing, Polaris, and Minuteman programs, and the extensive applied research programs with still larger solid engines which the

Air Force has been sponsoring. At the present time, we in Defense have no plans for weapon systems based on these large motors. They will be developed in response to requirements supplied by NASA in connection with the Nova [superbooster] . . . program. Thus the specific motors developed will be primarily directed toward manned exploration of space. However, the characteristics and capabilities of both our present and proposed future weapon systems are continually under review. It may be possible at some future date that the availability of these large motors will favorably affect capabilities and costs of some prospective military space systems."

This is a refreshingly far cry from the days, not so long ago, when it was virtually impossible for the military to proceed with large booster developments without spelling out a specific military requirement.

Mr. Gilpatric also reported to the Senate committee: "We are . . . planning to modify the Titan missile for space use and will develop an upper stage for use on the Titan II vehicle. This upper stage will be developed to meet the joint requirements of NASA and [DoD]. . . . We believe that this approach will provide desirable insurance required in our military space effort. . . ."

The Undersecretary stressed to the committee that it is "important to recognize and understand that there are some space applications which are distinctly military; others are already of mutual interest for civilian as well as military use. Still other missions are, at present, primarily of civilian or scientific interest. However, these latter will provide fundamental knowledge which may provide a basis for military applications at some future date. Similarly, out of military programs, technical data is produced which has civilian application. History is certainly replete with both kinds of examples. . . ."

Even with the prospect of new money and new impetus for the nation's space programs, all is not yet A-OK. There remain many decisions of substance which must be made, but the basic trend seems to be healthy. Decisions apparently are being made and with dispatch.

The role of the revitalized Space Council in this decision-making process is evident. In just over a month, from late April to late May, the Council ran a series of informal but highly important meetings with representatives of NASA, DoD, the Atomic Energy Commission, the military services, Bureau of the Budget people, State Department officials, and other interested agen-

This is an artist's conception of Douglas Aircraft Company's proposal to "piggy back" the huge Saturn second stage atop a Douglas C-133 transport. To minimize the drag which the externally carried spaceload would create, the Douglas proposal calls for attachment of lightweight fairings to the front and rear of the Saturn stage. Dr. Wernher von Braun, Saturn program chief, says that NASA is looking into the lift proposal.

—NASA Photo

MAN INTO SPACE!

We are proud that the epoch-making success of National Aeronautics and Space Administration's first launching of man into space depended, in part, upon guidance and control system components under contract to the Ford Instrument Company–and that this confidence was justified by the event.

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Other missile and space "firsts" in which Ford Instrument guidance and control components participated: • First operational ballistic missile (REDSTONE) • First successful launching of a Free-World satellite • First successfully recovered nose cone • First recovered simian passengers (Able and Baker) • First successful Free-World space probe • First MERCURY-REDSTONE space vehicle (chimpanzee, Ham). 1.2

A CREATIVE TEAM OF SCIENTIFIC, ENGINEERING AND PRODUCTION TALENT

cies and parties, to hear space program views and recommendations. Out of these exchanges emerged the President's major new space budget proposals.

One of the questions raised by the apparently wide divergency between the President's relatively modest $126 million space money request in March and the much larger request of May was: What caused what seemed to be a reversal to many observers? Was it simply the Gagarin feat?

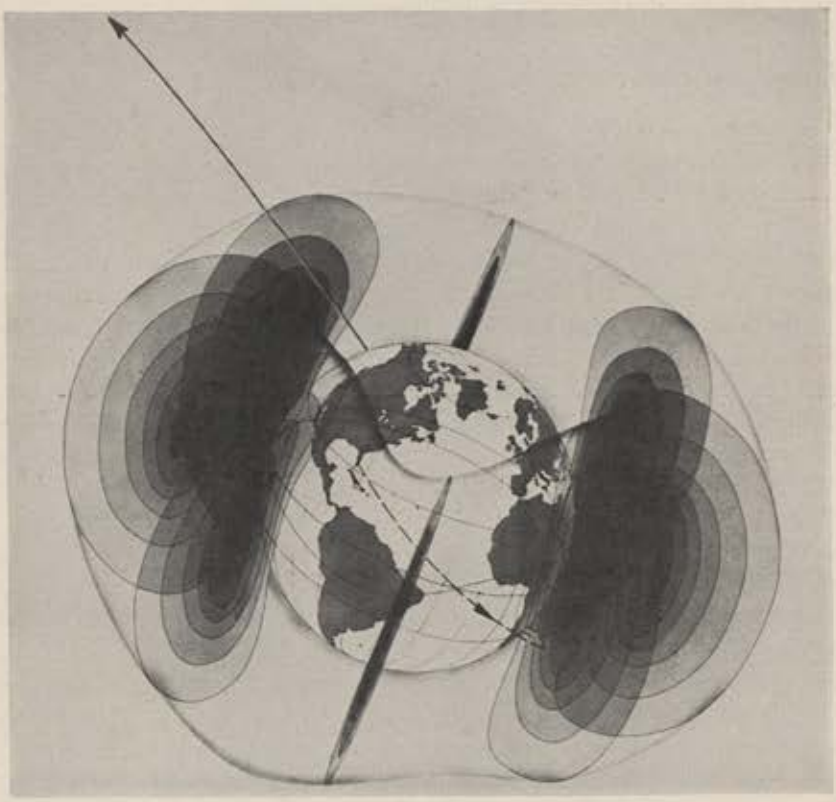
Sources close to the Space Council explain that in reality the May request is an extension of the March one, but that the President's desire to push through his domestic programs had to take priority. Hence, what was done in March was essentially an interim measure, $126 million additional to push the existing booster program, while the Council geared for the preparation of the Kennedy full-dress space-funding proposals of late May.

The Council, as noted last month in this space, is not thinking of itself as a supermanagement agency. But in a sense, it can act indirectly in that capacity, in view of its prestigious position. The Vice President is now legally the Chairman. What a hard-working Council staff comes up with by way of proposals has a strong chance of getting the President's ear. The President makes the final decision.

Having completed its initial project, the policy commitment and funding planning for the man-to-the-moon program, the Council is proceeding to other matters and presumably will press for viable decisions.

High on its list is communication satellite policy. Although the Federal Communications Commission has made a general decision in favor of a civil communication system to be owned jointly by existing carrier companies, the Council feels that this is really only a beginning of a policy—that methods of meeting military requirements in this field have still to be worked out, that also this very important question must be answered: Where does the profit motive have to be balanced against our national needs to meet the Communist propaganda challenge in Asia and Africa?

This latter is a highly significant question. For a civil communication satellite program, assuming the international agreements required are made, the big money for private enterprise would doubtless be in Western Europe-US exchange of programing and message relay. But what of our hopes to reach, through the medium of space



Martin Company space planners believe that space-vehicle trajectories plotted as indicated by the arrows on this sketch would provide alleviation of radiation hazards of Van Allen belts. Arrows indicate "escape" paths via relatively radiation-clear polar regions. Martin is one of the aerospace firms engaged in NASA Apollo feasibility studies.

technology, the uncommitted nations. Thus, to Edward R. Murrow's caveat (*see page 83*) that *what* we broadcast is as important as *how* we broadcast it must be added the query: Will the economics of private enterprise let us broadcast via space to those areas vital for us to reach?

In its efforts to examine problem areas, the Space Council has plenty to keep it busy. One job it must get to as soon as possible is a close analysis of the life sciences question. Despite improvements in coordination between NASA and the military in recent months, there continues to be a painful situation best summarized by some observers this way: As matters stand, the civilian agency has a sizable charter for man in space but little existing aerospace medical capability, while the military, with a poorly spelled-out charter for man in space, has most of the aerospace medical know-how.

If man in space is to be a realizable objective, an aggressive pooling of the existing but rare talent in space medicine is an absolute necessity. There is an increasing danger of dissipation of this talent. For example, good people who have helped create the large military capability in this specialty area are being lost to industry, and with their loss there is fragmentation of the talent that *both* NASA and DoD are going to need for successful manned missions.

Added money, welcome as it is, for space medicine (NASA's new life science fiscal 1962 budget, under the Kennedy May proposal, would be some $20 million) is not the sole answer by any means. The basic problems, as with boosters, are management and the setting of goals. Compartmentalization of effort in space medicine could stymie the lunar and men-in-orbit objectives. Experts have already pointed out that the Soviets may well have surpassed us in space medicine; they are reported to have achieved a workable sea-level atmosphere in their life-support system used by Cosmonaut Gagarin. Somehow, a policy must be developed whereby the existing capability in DoD can serve national requirements, civilian and military, with a strong central coordinating authority to watchdog the operation. This seems the only way to assure successful manned space capability.

Space Capsules

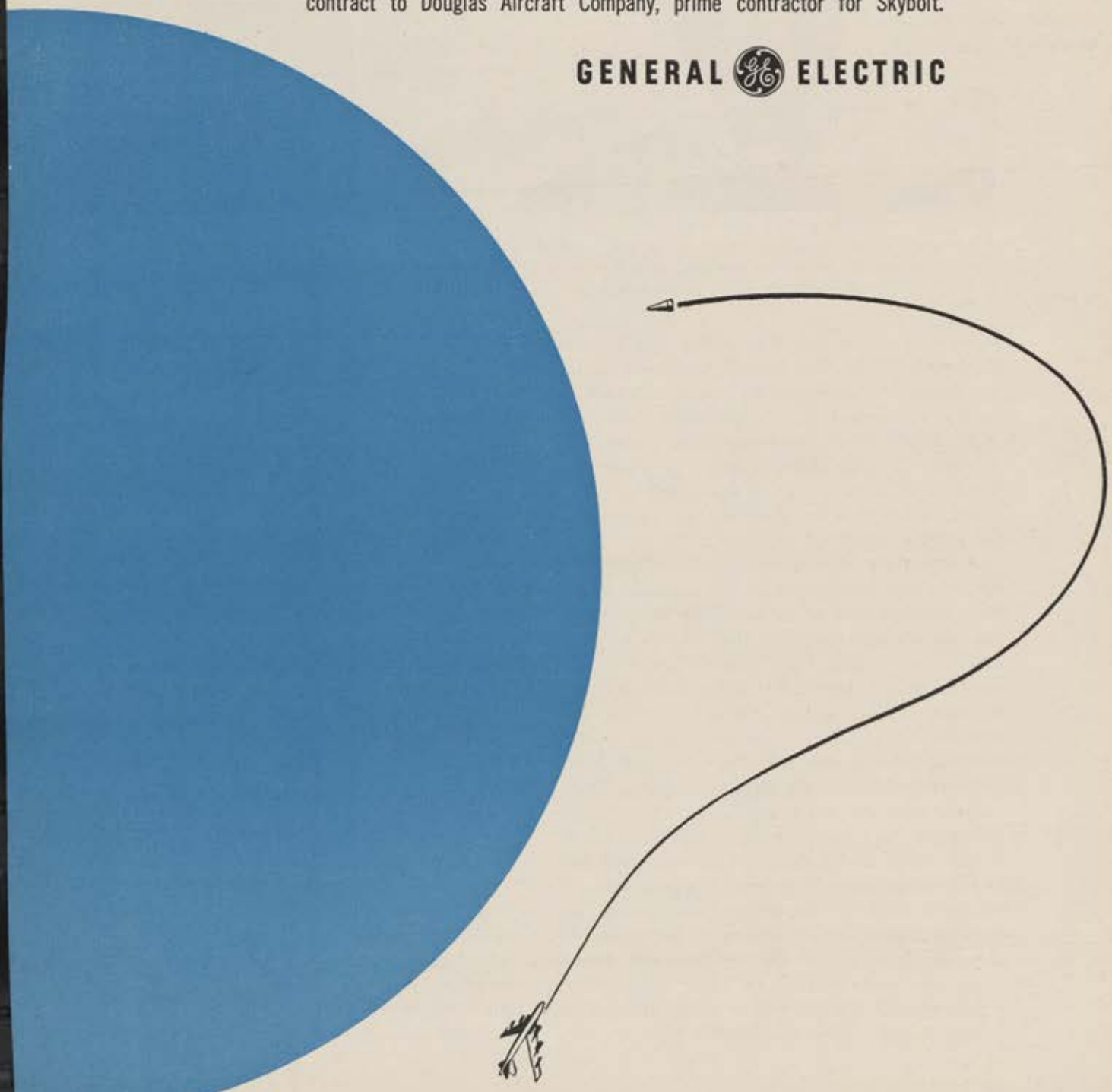
The recent Tulsa, Okla., conference on the peaceful uses of space was a fount of astronautical gags, uttered in the corridors while the formal sessions proceeded. An enterprising Tulsa newsman worked up a roundup of the astrohumor that appeared in the Tulsa *World*. The story included such space-age witticisms as the image of DR. WERNHER VON BRAUN leading "cluster's last stand," (a reference to Dr. Von Braun's lack of enthusiasm for solid-fueled space propulsion). Another joke, attributed to an AIR FORCE ACADEMY Cadet attending the meeting was: "Well, I'm here to attend the conference because when I get up there in space, I want to make sure that no one starts shooting at me." Another comment overheard by the Tulsa reporter and duly recorded was: "Well, I'm certainly interested in the peaceful uses of space, but I think we ought to keep in mind the useful *pieces* of space."

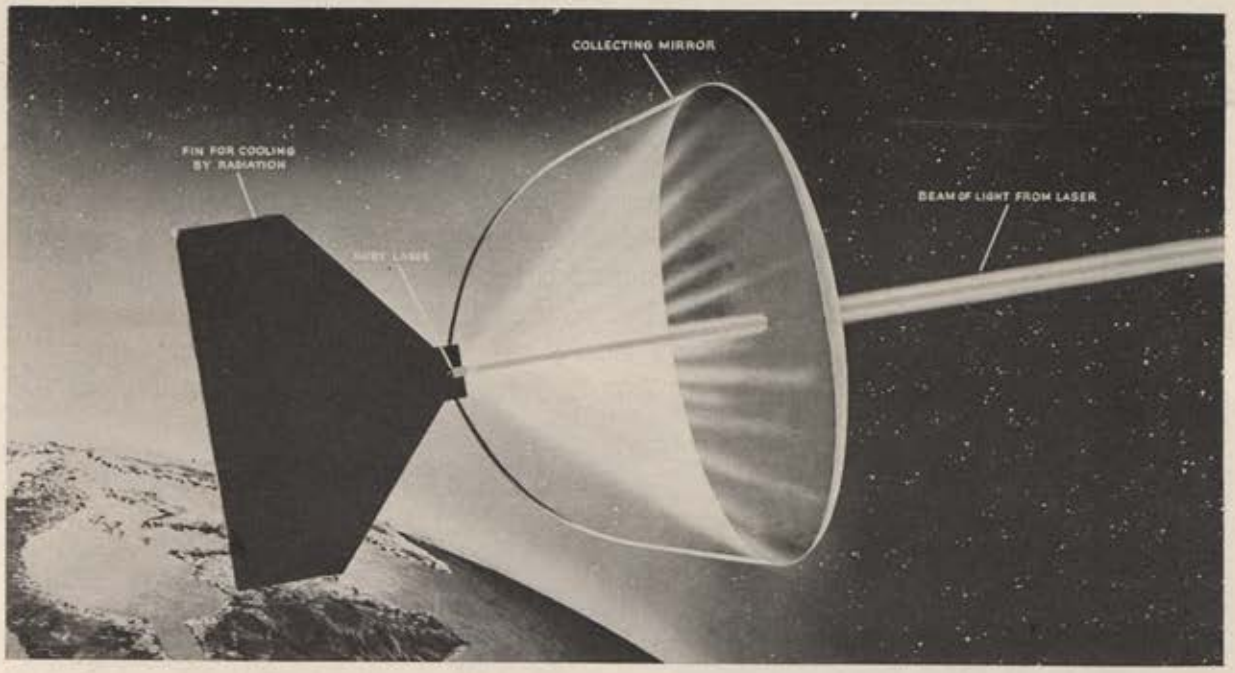
Romantics who like to think that scientists are above nationalism take note. The following was written by astrophysicist V. A. AMVARTSUMYAN, President of the ACADEMY OF SCIENCES OF THE ARMENIAN SOVIET SOCIALIST REPUBLIC, in the Soviet journal, *Tekhnika-Molodezhi*: "In the future world, the importance of that science in which I and my colleagues are working—the science of the universe—will increase steadily. It is evident that a Communist society will regard as one of its principal problems a deeper comprehension of the world around us and the mastery of the vast

MISSILE AND SPACE VEHICLE DEPARTMENT, PHILADELPHIA, PA.

SKYBOLT is being developed to add a new dimension to America's growing missile might. Launched from an airborne B-52, it is being designed to arc through space toward targets more than 1000 miles away. The re-entry vehicles for this advanced USAF missile are being developed by General Electric's Missile and Space Vehicle Department under contract to Douglas Aircraft Company, prime contractor for Skybolt.

GENERAL ELECTRIC





American Optical Company, under a contract with Air Force System Command's Wright Air Development Division, is developing a sun-powered laser system which would use direct sunlight to power system for communication in space. Sharp light beam would be focused and signals carried on beam, similarly to radio.

areas in space. Side by side with astronomy and cosmonautics, the more distant future will doubtless witness the development of a new branch of technology—space technology. Man will use space technology to actively influence phenomena in space. I speak about a future in which the triumph of communism on earth will give the people unlimited possibilities for developing their creative energies."

A FORDHAM UNIVERSITY-ESSO RESEARCH AND ENGINEERING research team has reported to the NEW YORK ACADEMY OF SCIENCES what it calls the first physical evidence that life forms exist beyond our planet. DRS. BARTHOLOMEW NAGY and DOUGLAS J. HENNESSY of Fordham, and DR. WARREN G. MEINSCHEIN of Esso described their analysis of a ninety-seven-year-old meteorite, using a mass spectrometer, infrared and ultraviolet spectroscopy, and X-ray diffraction. They said the meteorite had been examined many times previously but only now have analytical techniques advanced far enough to permit examination in sufficiently minute detail. Their analysis of the extraterrestrial relic revealed the presence of parafinic hydrocarbons, known to be similar to molecules found in the skin of grapes and apples, molecules produced only in living matter. The scientists concluded, in part: ". . . Hydrocarbons in the Orgueil meteorite resemble in many important respects the hydrocarbons in the products of living things and sediments on earth. Based on these preliminary studies, it appears that biogenic processes occur and that living forms exist in regions of the universe beyond the earth."

Retiring from active Air Force service at the end of this month is BRIG. GEN. DON FLICKINGER, an officer who has contributed heavily to the concept of US man in space, not only in his most recent post as Special Assistant for Bioastronautics to the Commander, Air Force Systems Command, where he coordinated biomedical work in that command, but also in his earlier role as a principal planner of pre-NASA Air Force man-in-space programs that eventually fed into the NASA Mercury program. General Flickinger, who started his military medical career in 1934, was the medical officer of the day during the Japanese attack on Pearl Harbor on December 7, 1941, and his recollections have served chroniclers of the "day of infamy." He has served in numerous medical and research posts in the Air Force and was the first commander of the AIR FORCE OFFICE OF SCIENTIFIC RESEARCH. A tireless proponent of forceful human factors research programs, he has long pushed for adequate recognition of the military mission in space and the requisite attention to building the aerospace medical capability to meet that mission.—END

What can a skipping stone teach us about re-entry from space?

One promising approach to the problem of atmosphere re-entry is called the skip-glide path. The spaceship would follow an undulating trajectory, glancing off the atmosphere to lose its speed, much as a stone skips across the water. The necessary lift might be provided by a deployable pneumatic wing which would inflate on entering the atmosphere.

This and other approaches to aerospace deceleration are now being studied and evaluated at Northrop's Radioplane Division as part of its comprehensive program in landing and recovery systems. Long recognized as the leader in all aspects of paradynamics, Radioplane is fast becoming the industry's standard for space and aerospace landing systems. Active programs now include lunar soft landing studies, aerospace decelerators, and re-entry drag devices as well as recovery and landing systems for *all manned space vehicles actively scheduled by the U.S.*

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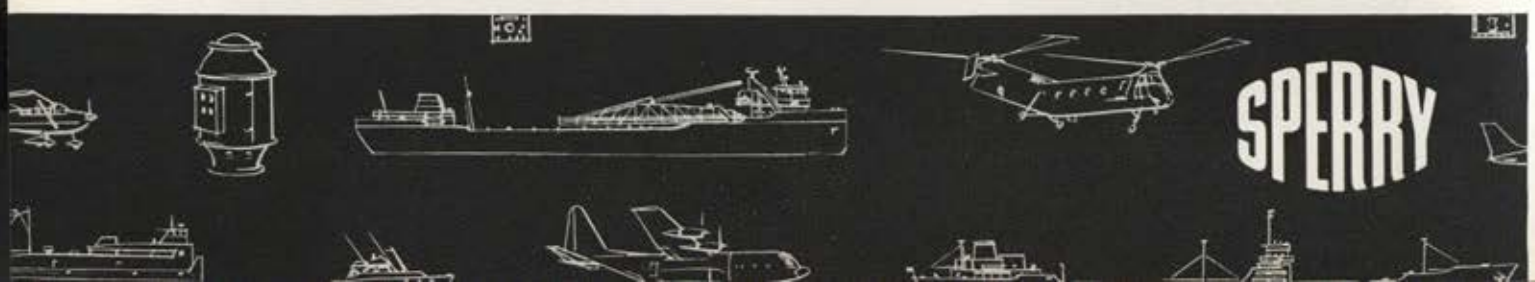

Speaking for Aerospace Power

Claude Witze
SENIOR EDITOR, AIR FORCE MAGAZINE

The four toughest cold-war years for USAF were those just past, protecting the free world with airplanes and rushing missile capability. Gen. Thomas D. White, as Chief of Staff, did both as the man who was . . .

"Just What the Air Force Needed"

GEN. Thomas Dresser White, the soldier-scholar who has just vacated the Air Force's most important staff desk in the Pentagon, has left an imprint on USAF history. It is not easy to define this imprint in 1961, on the threshold of military aerospace operations, but when the transition is complete there will be no doubt of his role.

It is not likely that another man with General White's particular blend of talents ever again will be Chief of Staff. It is equally improbable that USAF ever again will need a man with his particular blend of talents in that position. The reason is simple.

As the General himself puts it, he was running USAF at the very climax of the technological revolution, at a period when the number of problems was matched only by the variety and criticalness of the possibilities. His objective had to be the proper expansion of USAF's area of operation out of the atmosphere and into space. At the same time, and for the same reason—to protect our national security—he had to keep a foot in the door to ensure continued operation of manned systems and a foot in another door for missiles.

"Pretty soon," the General has commented, "you run out of feet." The task of trying to hold onto existing capabilities, rush the utilization of new systems, and prepare for whatever it is that technology will bring next, is staggering.

Eugene Zuckert, present Secretary of the Air Force, has suggested in private conversation that "the right man for the times" doesn't always show up with eligibility for the job but that "Tommy White was just what the Air Force needed." Mr. Zuckert has known General White since 1947 and, in the previous Democratic Administration, was instrumental in selecting the General for his first Headquarters assignment as Director of Legislation and Liaison in 1948.

It is both interesting and germane that General White never was a combat hero and that the qualities that made him "just what the Air Force needed" when he became Chief of Staff four years ago are not those usually attributed to combat heroes. General White has been described as "a thoroughgoing professional and a global intellectual, a military and civilian thinker." Newspaper photographers never have been able to take pictures of his near-professional interest in ichthy-

(Continued on following page)

On duty in the Canal Zone in 1924, Lt. T. D. White was cited for "unusual capacity, energy" in final fitness report.

ology and there is little military folklore built around officers who are adept in seven foreign languages, including Russian and Chinese.

General White leaves the Pentagon with few critics and no vociferous enemies. He has been cussed out, as he was by an Army lieutenant in the Pacific theater when he wandered too close to the enemy lines. Tommy White was fishing that day and had a lapse when he forgot there was a war going on. He later requested a commendation for the lieutenant.

During General White's administration, the fighting strength of USAF has been drained, if that strength is measured on the conventional yardsticks of aircraft wing structure and personnel. The number of wings has dropped from 137 in 1957 to a scheduled eighty-four in 1962.

This depletion got fully under way almost at the same moment that General White moved up to the Chief's post, replacing Gen. Nathan F. Twining. President Eisenhower put White House impetus behind the effort to cut the armed forces. Congress was trimming the budget. General White consistently stressed the real nature of the Russian threat in the face of these decisions.

It is possible to find men, in uniform and out, who feel that General White has fought a smart battle but a feeble one for Air Force interests. Members of his own staff, seething with ire and straining for conflict, have been coolly reminded by the Chief that they are working first for the United States and that the national good comes before that of the Air Force.

Soon after his appointment in 1957, *Time* Magazine called General White a "brilliant, unobtrusive West Pointer with a flair for understatement." It went on to say that this "tall, austere airman with a ramrod-back carriage well knows the Russian danger, well knows the need to tighten and use the bomber force in being to best advantage. . . ." *Time* pointed out how General White's staff duties in the Pentagon ever since 1948 had brought him close to the fast-changing airpower scene and observed that he "invariably made it his business to emphasize how the Soviets were catching up."

If we turn now to 1961, on the eve of his retirement, there is testimony that he still has his eye on the ball. It was on April 11, the day *before* a Russian Air Force officer, Maj. Yuri A. Gagarin, made an orbital trip around the world, that General White told the Senate Armed Services Committee that the Russians "may put a man in space in the very near future."

Said he, without knowing there was a countdown already under way behind the Iron Curtain:

"There can be no question that the Soviet Union has progressed to a point where it is one of the very few nations, perhaps the only one outside of our own, that can afford to support a forced draft, sustained exploration of all fields of science pertinent to military power.

"During the coming years we can expect the Soviets to expand their efforts in research, to make additional major scientific advancements and, concomitantly, to achieve great progress in their military development programs.

"It is obvious to me that the Soviets no longer walk in our footsteps. On the contrary, they are breaking new ground on their own, after an apprenticeship during which they have forced the pace through a combination of native ingenuity and maximum exploitation of the free world's own research and development results."

1934, in Moscow. Lt. White was acting military attaché and pilot for Ambassador William Bullitt, second from right. He once landed at Leningrad upside down but uninjured.

Peking: 1927. Lt. White, center, back row, was language officer. He is shown here with military attachés and his teachers. It was here that he also started on Russian.

Tireless and expert fisherman, General White has cast flies all over the world and shown many airmen how to catch trout. This is a silver salmon, hooked in Alaska.

Then there was a touch of jousting with the school, still strong in political circles, which holds that space is not an area where victory or defeat can or will be determined:

"In my mind," General White said firmly, "it is particularly significant that Soviet efforts in the military exploitation of space have an extremely high priority.

"Apart from their lunar probes of 1959 and their recent probe directed at Venus, however, Soviet exploration of space has been concentrated on the near-earth region—the logical area for the near-term expansion of military aerospace power... [they] could launch a large space platform—truly a major rung in the ladder to the achievement of effective space weapon systems....

"It is apparent that the Soviets have demonstrated by intensive research and development programs... that they would like to acquire a clear military advantage at the earliest practicable date. Meanwhile, they are pruning away large masses of obsolete and obsolescent forces from their existing strength."

Then the General sounded his warning:

"On the basis of these actions... I believe that a very critical period is upon us. In fact, I consider the total power represented by the growing Soviet aerospace strength to be perhaps the greatest threat in the history of our country. To disregard this fact would be tantamount to inviting military inferiority, to degradation of our total security position, and almost certain failure to obtain our national objectives."

Later in his testimony the General was equally specific and determined in his defense of the B-70 Mach 3 bomber system in the face of an Administration decision to speed the transition to reliance on long-range missiles. And he challenged some of the basic ideas on which predominantly nonmilitary men had made the choice.

General White pointed out that missiles are "a static nondynamic system, like the Maginot Line... the nation which as a whole places its defense, and its most vital part of it, entirely on a static system is going to develop a psychology from which it cannot react in time of war."

Missiles, he pointed out, are the least flexible of weapon systems. The orders are go or no go and this will be a handicap if nuclear war comes with the "greatest confusion that mankind has ever known." And if nuclear arms are outlawed, which the General sees as a possibility, missiles will provide a way to launch conventional explosives only in the most difficult, expensive, and useless way.

These are telling arguments put in General White's characteristic dispassionate way. Their effect on Congress was that steps were taken to continue bomber production. They show why Robert Smart, counsel for the House Armed Services Committee, says General White always has been successful with the "soft sell" and that "his intellect alone is enough to command respect." Mr. Zuckert points out that this respect is held by such diverse and experienced congressmen as Carl Vinson, House Armed Services Chairman; L. Mendel Rivers, Daniel J. Flood, and George H. Mahon. "They

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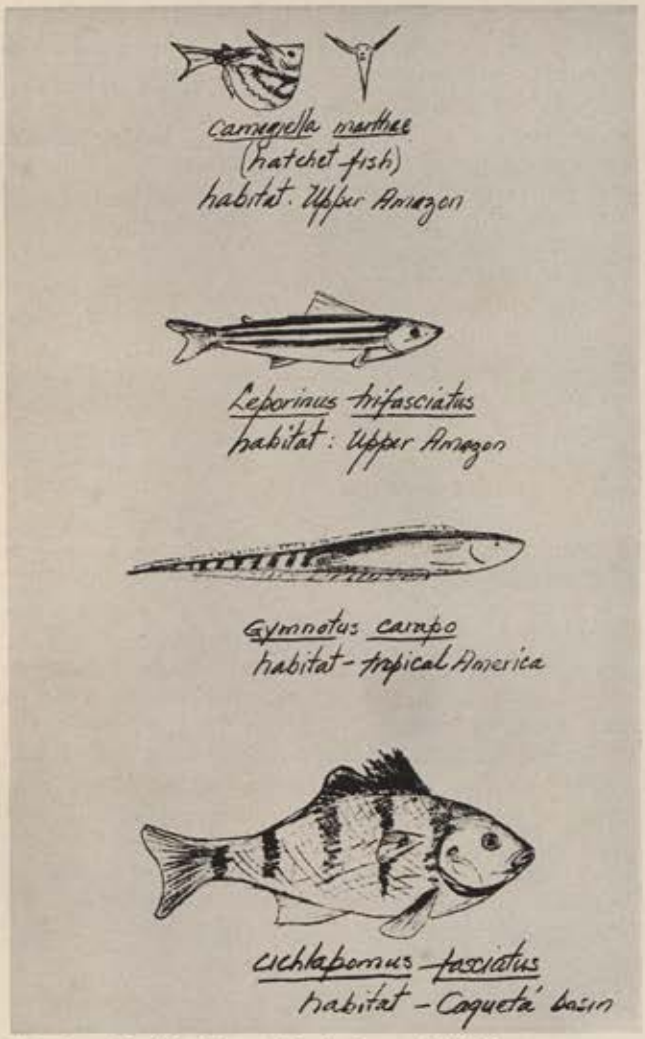
The most informal portrait ever made of a Chief of Staff. The place is Colombia, the river a tributary of the Amazon. Lt. Col. White was attached to a mission in Rio de Janeiro.



This is a doodle, left at his chair at a high Pentagon meeting. General White has no recollection of making it. It reveals talent, expertise in ichthyology. Two fish, *cynolebias whitei* and *brycon whitei* (not shown), were named for him.

always know he is not bluffing," the Secretary says, "and they take his opinion seriously."

All of General White's associates, including Gen. Maxwell D. Taylor, retired Army Chief of Staff, stress his constant ability to put national interest before service interest. It was General White who suggested and quietly encouraged the formation of an interservice group to handle the selection and allocation of strategic targets, a proposal that was widely and deliberately misinterpreted as an effort to put the Polaris submarine system into the arsenal of the Strategic Air Command.

More recently he reached an agreement with Gen. George H. Decker, Army Chief of Staff, that would give the ground forces a decisive voice in the selection of certain tactical air systems. This is a move that irritated many men in Air Force blue, but General White says he made the approach on his own authority because he "was convinced it was best for the United States and the long-range good of USAF itself." The agreement illustrates another characteristic of the General that *Time* brought to the surface in 1957: He has the ability, the magazine said, "to steer clear of cliques and cabals, and win a reputation for sheer performance, for all-out mastery of Air Force doctrine and operations."

One officer, who has worked far into many long nights preparing USAF position papers for Congress and the Defense Department, says that General White's greatest strength may lie in the fact that he always can recognize what is, and is not, worth fighting for. In making these choices he was certain to make some people unhappy, yet he convinced the men closest to him with a frequent midnight lecture on "The Art of the Possible." Under the circumstances of the past four years, this colleague maintains, a master of this art is the only kind of person who could have been effective as Chief of Staff.

General White graduated from West Point when he was eighteen years old and was one of the youngest men ever commissioned by the US Army. He stood 148 in his World War I speedup class of 270 new officers. His fitness reports are generously sprinkled with superlatives and only rare dissents. One commander, in 1939, called Major White an "excellent officer, one of the best I know." The endorser wrote: "I do not concur. I consider this officer superior." The endorser was a major general named H. H. "Hap" Arnold. In another case, four years earlier, 1st Lieutenant White was given a straight superior rating with superlative comments. The endorser in this case, who never became Chief of Staff himself, disagreed on the premise that no young officer could be that good.

History, of course, proved that Hap Arnold was a shrewd judge. He also would have applauded General White's later career in the Head Shed and his consistently honest approach to his job.

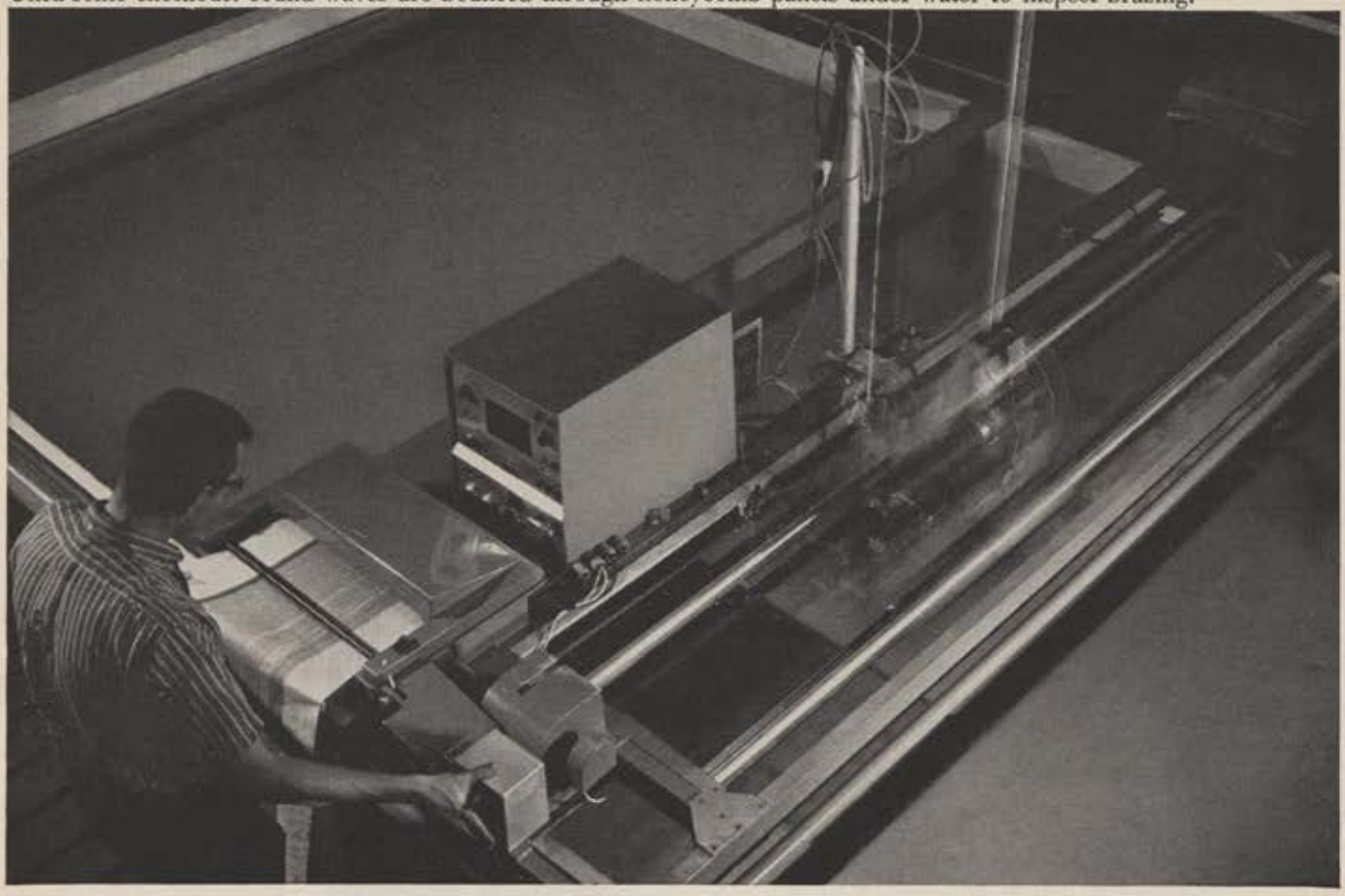
This high regard is no monopoly of general officers. General White is credited with strong consideration for teamwork and morale. In the South Pacific, the record shows, he was the first commander to enforce a rule giving enlisted men flooring in their tents before officers. Once in his fishing clothes, which he dons at every opportunity, the stars are gone and with them the rank.

Last September, during the Air Force Association's Annual Convention at San Francisco, General White was the speaker at the reunion luncheon of the Night Fighter's Association at the St. Francis Hotel. The first thing he did was tell them—a ballroom of men with as much attachment for their birds as the cavalry had for horses—that he did not want to appear with any misunderstanding about who he was.

"I," the General said with his shoulders back, "am the man who canceled the F-108 Mach 3 interceptor." He explained that he faced a choice between this aircraft and the B-70 Mach 3 bomber and could not warrant support for both systems. He said further that he picked the B-70 because it presented a bigger, more potent, and costlier threat to the Russians.

There was a silence after the admission and a touch of tension seemed to quiver between the speaker and his audience. The General repeated, "I am the man who canceled the F-108." Then, from the back of the room, a voice almost aghast with surprise: "Well, hello there." Laughter broke the tension and there was a round of applause for the Chief of Staff.—End

Ultra-sonic checkout: sound waves are bounced through honeycomb panels under water to inspect brazing.



Mach 3 Manufacturing

Sounding out the inner secrets of brazed honeycomb panels

Manned aircraft are built with brazed panels of stainless-steel honeycomb in order to fly for hours at supersonic speeds. But inspection of these panels becomes a major problem because the interior of brazed honeycomb panels cannot be seen.

To solve this problem in designing the Air Force's new B-70 Valkyrie airplane, a special Quality Control Development Program was undertaken at the Los Angeles Division of North American Aviation.

The result: ultra-sonic inspection, a process that works like the Navy's sonar systems for locating submarines. By immersing each finished panel into a tank of water and then traversing a scanning head over it, sound waves are transmitted into the panel and reflected back to the scanning head. The reflections are recorded on photo-sensitized paper for a permanent record of every minute area where honeycomb and skin are brazed together. Any area that has been improperly brazed will show up instantly.

This method of inspection is just one of the many processes and advances in Mach 3 manufacturing that have been evolved by North American development programs. Other advances cover the full spectrum of triple-sonic fabrication. As a result of these programs, North American Aviation has met the challenge of Mach 3 manufacturing.

Builders of the B-70 Valkyrie

THE LOS ANGELES DIVISION OF **NORTH AMERICAN AVIATION, INC.**

A Ready Room Feature

Keeping USAF in Business

Under a plan developed by a Reserve lieutenant colonel, the Reserves are assuming a vital new "recovery" mission.

A USAF plane on a combat mission needs a base to come home to. But in the event of hostilities, US air bases are likely to be prime enemy targets. Thus combat crews will have to face a most unpleasant possibility: Their home bases may be in no shape to receive them when they return from doing battle with the enemy.

This month, thanks to an idea developed by a Reserve lieutenant colonel who is a successful farmer in civilian life, Air Force Reservists across the country are organizing to meet this problem. Under a plan now off the drawing board, these Reserves will man alternate "recovery" airfields able to handle returning planes if the prime fields are out of business.

When these Reserve-manned fields are ready for use, they will more than double the number of bases in the US that can take care of combat aircraft—with these major benefits:

- They will complicate the enemy's problem. He would find it far more difficult under these conditions to cripple USAF by destroying operational airfields.
- They will strengthen our retaliatory capability by helping to recover combat aircraft after a mission and readying them for additional sorties.
- They will provide combat crews with the comforting knowledge that many alternate fields are open to them if home base should be knocked out.

The Department of the Air Force approved the recovery mission for the Air Force Reserve and authorized a test program conducted by seven recovery groups and seven squadrons since last September, when they went into test operation under last year's new Reserve concept. DoD has now authorized formation of seventy-five more groups and 193 more squadrons in a total of forty-seven states, effective July 1.

Each group headquarters is authorized a forty-man staff. Squadrons will average 150 men each. Thus, when the units are fully manned, more than 30,000 Reservists will be engaged in recovery tasks. The fields they man will be located throughout the length and breadth of the nation.

Lt. Col. Clinton V. Murdock, a thirty-nine-year-old farmer of Pocatello, Idaho, is credited by the Air Force with the original suggestion that Reserve units undertake this vital recovery mission.

Colonel Murdock, a troop carrier pilot in World War II and an active Reservist since that time, first put his idea into words in March 1957 in a letter to his congressman, Idaho Representative Hammer Budge. He followed two months later with a letter to Headquarters USAF.

"SAC bases will be first priority targets in case of an attack," Colonel Murdock wrote. "Bombers returning from their missions would have to be diverted in case the base was destroyed. . . . Our Air Reserve squadron sits here in Pocatello adjacent to a former military air base that could certainly, if only to a limited extent, be used as a dispersal base for some of these planes. . . . Surely . . . our Reserve personnel could be useful in this kind of a circumstance."

Colonel Murdock's plan was forwarded by Hq. USAF to Lt. Gen. William E. Hall, Commander of the Continental Air Command. With General Hall's enthusiastic support, the ideas were tested, expanded, translated into operations, manning, and funding documents, and finally approved by the Air Staff and the Department of Defense.

Colonel Murdock is to move from Flight Commander in his Reserve training squadron to Commander of the new recovery squadron at Pocatello.

Who is this outstanding Reserve instrumental in bringing forth a major new program?

Lt. Col. Clinton V. Murdock, US Air Force Reserve

Colonel Murdock was an engineering student at the University of Idaho when we entered World War II. He joined the Air Force as an aviation cadet, was commissioned in February 1943, and flew twenty-six combat missions with the 75th Troop Carrier Squadron. He took part, as a member of the 75th, in the airborne invasion of Normandy on D-Day.

Returning to Idaho after the war, Colonel Murdock acquired a 260-acre tract overgrown with sagebrush. He turned it into a productive farm, growing potatoes and raising registered Hereford cattle. Today, this farm provides a comfortable living for the Murdocks and their six children.

The National Junior Chamber of Commerce named Colonel Murdock "Farmer of the Year" in 1957. He is a member of the Snake River School Board, is active in church, service, and political affairs. He flies his own plane, a Cessna 182, on hunting and fishing trips.

Colonel Murdock is well aware that developing his squadron into an effective recovery unit will require considerable effort.

"The main characteristic of recovery squadron personnel, it seems to me, will be ingenuity," he told AIR FORCE/SPACE DIGEST recently. "The civilian community doesn't realize how great a military potential it has. Sometimes members of the active Air Force don't realize this either. But the Reservist, who combines military and civilian experience, is in the best position to determine what the Air Force can use of the civilian community's assets."

Across the country this month, Reserves are facing the recovery task with like awareness of its challenge—and like pride in themselves and their new responsibility.

—LT. COL. ALLAN R. SCHOLIN

the Ready Room

RESERVE AND AIR GUARD NEWS

Barnie and Snapper

The Air Force Association and the Air National Guard have lost two devoted, longtime members in aircraft accidents—**Barnie McEntire and Snapper McCallister.**

Brig. Gen. Barnie B. McEntire, Jr., Chief of Staff of the South Carolina Air National Guard, died May 25 when his F-104 aircraft stalled shortly after takeoff from Olmsted AFB, Pa., and crashed on an uninhabited island in the Susquehanna River. He had just attended a conference on F-104 jet-engine-maintenance problems at the **Middletown Air Materiel Area, Olmsted.**

General McEntire, forty-three, was the **first Air Guard pilot to check out in the F-104.** It was in tribute to his outstanding leadership, his technical skill, and his unfailing can-do attitude that the National Guard Bureau selected the South Carolina Air Guard to receive the first of the **ANG's F-104s in February 1959.** Barnie had logged **207 hours in the plane,** more than most of his squadron pilots.

Brig. Gen. Barnie B. McEntire, Jr., Chief of Staff, South Carolina Air Guard, killed in an F-104 crash on May 25.

Gov. Ernest F. Hollings of South Carolina has initiated action to rename **Congaree Air Base,** home of the state's Air Guard, in honor of Barnie McEntire. At present, the base takes its name from a nearby town.

Barnie's interest in flying dated from his early teens when **he used to wash airplanes at Owens Field** near Columbia, S. C., in exchange for an occasional hop. He studied engineering at the **University of South Carolina** but left in 1939 when he was accepted for pilot training. He was commissioned on graduation from pilot training in 1940.

During World War II he was with the **North Atlantic Division of the Air Transport Command** as chief pilot and operations officer at Presque Isle and Dow Field, Me. He made frequent flights to the ETO.

Returning to South Carolina as a lieutenant colonel after the war, he was selected to **organize the first units of the state's Air Guard.** In 1951 he was recalled with his squadron. Promoted to Group Commander on active duty, he led his group of F-80 and B-26 aircraft on a flight to Europe, where it flew **photo-reconnaissance missions from North Africa to Norway.**

Upon release from active duty in March 1953, General McEntire returned to South Carolina to become **Chief of Staff for Air. He was promoted to brigadier general in December 1958.** He is survived by his wife, three daughters, his parents, a sister, and five brothers. One brother, Hanes, is a technical sergeant in the state Air Guard at Congaree.

Less than two weeks later, on June 4, **Lt. Col. David F. McCallister** was killed when the T-33 he was piloting lost power on takeoff from Scott AFB, Ill. A man of many talents and interests, "Snapper" McCallister was **Commander of the 142d Tactical Fighter Squadron, Delaware Air National Guard.**

Brig. Gen. William W. Spruance, Delaware's Assistant Adjutant General for Air, who was riding with Colonel McCallister, survived the crash but sustained burns over a third of his body. He was hospitalized in serious condition.

Colonel McCallister was gifted with boundless enthusiasm, energy, and wit. Besides giving considerable time and attention to his duties as Squadron Commander, he was **chief test pilot for All-American Engineering Co.** and helped to manage his family's catering business. He was also a devoted father to a family of six children, served in AFA and civic groups, and wrote numerous articles and books. His first novel, *Sabres over Brandywine,* is being published this month. He was a frequent contributor to *Flying Safety* and AIR FORCE.

McCallister was the inspiration for **cartoonist Milton Caniff's "Hot Shot Charlie,"** growing out of a letter Snapper wrote Caniff when he was a sergeant pilot early in World War II.

Born in Philadelphia on Washington's birthday in 1920, Snapper went into the Air Force as a radio operator after graduating from Upper Darby, Pa., High School. After pilot training he rose from **sergeant through flight officer to captain on active duty** as a fighter pilot in the ETO.

Lt. Col. David F. "Snapper" McCallister, Commander, 142d Tactical Fighter Squadron of Delaware Air Guard, who died in T-33 crash on June 4.

After the war he joined the **Delaware Air Guard** and was recalled with the squadron in the Korean War. He won the **Guard's Ricks Trophy event in 1956,** over a course from Los Angeles to New Orleans.

Barnie McEntire and Snapper McCallister were members of **AFA's Air Guard Council.** General Spruance is on **AFA's Board of Directors and is Chairman of its Membership Committee.** Spruance and McCallister were en route home from an Air Guard Council meeting at Colorado Springs, Colo., when their accident occurred.

Aviation thus claimed two more of its own in sudden and tragic accidents. Military flying was a way of life for Barnie and Snapper—a way of life woven of planes and men, of courage and comradeship. **They contributed immeasurably to this Air Force world,** and in the final analysis, of course, to the vast aerospace power that is today the backbone of the nation's strength. **This world they loved mourned deeply at their passing.**

(Continued on following page)

The Adjutant General of South Carolina has named **Col. Bob Morrell** to succeed General McEntire as Chief of Staff for Air and Base Detachment Commander. **Lt. Col. Bob Corbett** moves up to command the 169th Fighter Group. **Maj. Grady Patterson** takes over the 157th Interceptor Squadron. Corbett is a telephone company executive; Patterson is South Carolina's Assistant Attorney General.

Navel Orange Battle

The **8499th Air Reserve Navigation Training Squadron** of March AFB, Calif., won the **1961 CONAC navigation competition at Ellington AFB, Tex.**, May 21-28.

In so doing, it gained juicy revenge over **Miami's 8511th Squadron**, last year's winner, which finished third this year. The **8508th of Dobbins AFB, Ga.**, was second.

Last year the Californians lost a side bet to the Florida unit, and paid by **eating a crate of Florida oranges** during the banquet ceremony. This year it was the **Floridians' turn to sample California's product.**

Top Air Force Reserve navigator for 1961 is **Maj. Robert S. Holden** of the March team. **Capt. Allen Boyd** of Dobbins was second. **Maj. Bob Marcellus** of the 8496th Squadron at McGuire AFB in New Jersey, was third.

MSgt. Raymond L. Shannon of Texas ANG, outstanding Guard airman chosen to take part in AFA National Convention in Philadelphia this year.

Teams representing each of CONAC's thirteen navigator training squadrons participated in the meet, which was hosted by **Col. Russell F. Gustke**, Commander of the 446th Troop Carrier Wing at Ellington.

Events included a **daytime dead-reckoning flight, a long-range (LORAN) navigation mission, and a night celestial mission,** all flown over the Gulf of Mexico. Navigators were required to guide their aircraft within a twenty-mile-wide corridor throughout the flights.

Topnotch maintenance was evident in the fact that all planes took off within five seconds of their scheduled times. **There were no aborts.**

Besides awards to the individual winners, trophies were presented to members of the three top teams. They were:

8499th, March AFB: **Maj. Edward W. Blanchfield,** Squadron Commander; **Maj. Holden, Maj. J. W. McKenna,** and **Capt. Howard J. Kinney.**

8508th, Dobbins AFB: **Maj. Harry M. Henkin, Captain Boyd, Capts. James Miller** and **William E. Jackson.**

8511th, Homestead AFB: **Majs. Harrison M. Faith** and **Robert Perman, Capts. Vaino Pennanen** and **Charles Rice.**

No Duplication

The concept and operations of the **Air Reserve Forces** provide the "ideal answer" in meeting particular Air Force mission requirements, **Maj. Gen. Robert E. L. Eaton,** Assistant Chief of Staff for Reserve Forces, told state adjutants general at their **annual conference in Wichita, Kan.**, in May.

General Eaton said he is often asked about "duplication" in the Air Reserve Forces since they include both the **Air National Guard and the Air Force Reserve.**

He acknowledged that while it "undoubtedly would be simpler" to administer one program, "the Air Guard has proved its value time and again. No one who knows the Guard can seriously doubt our judgment in **supporting the Air National Guard** as part of our total aerospace force."

There is **no** duplication between the two forces, he asserted. "There is correlation and cooperation rather than competition. Each **Air National Guard and Air Force Reserve unit** has a specific wartime mission to perform. In every case it is a mission which the Air Force considers necessary to fulfill the war plans.

"Our primary concern is the **combat readiness of our Reserve Forces**—readiness which can be put to work as useful Air Force capability," General Eaton said. "Our system is producing this kind of readiness."

Reserve Forces programs are continually changing to keep up with new developments and new requirements in the active Air Force, he said. The problems created by these changes are **readily being resolved by cooperation between the states and the Air Force.**

"All it takes," he said, "is adherence to and understanding of tradition, law, and tested practices.

"We believe in our program," he declared. "We know that we have the best Reserve Forces program in operation today."

ANG's Top Airman

The Air National Guard's **Outstanding Airman for 1961 is MSgt. Raymond L. Shannon,** who has been a maintenance expert with the **111th Interceptor Squadron, Texas ANG,** for thirty-three years.

Sergeant Shannon, who will be fifty-two this month, joined the 111th in 1928. He has worked with **aircraft ranging from the Jennies and DHs** of the twenties to the supersonic **F-102 Delta Dagger.**

He and his wife, Margaret, will join outstanding airmen of other major commands and the Air Force Reserve as honored guests at **AFA's National Convention in Philadelphia, Sept. 21-24.**

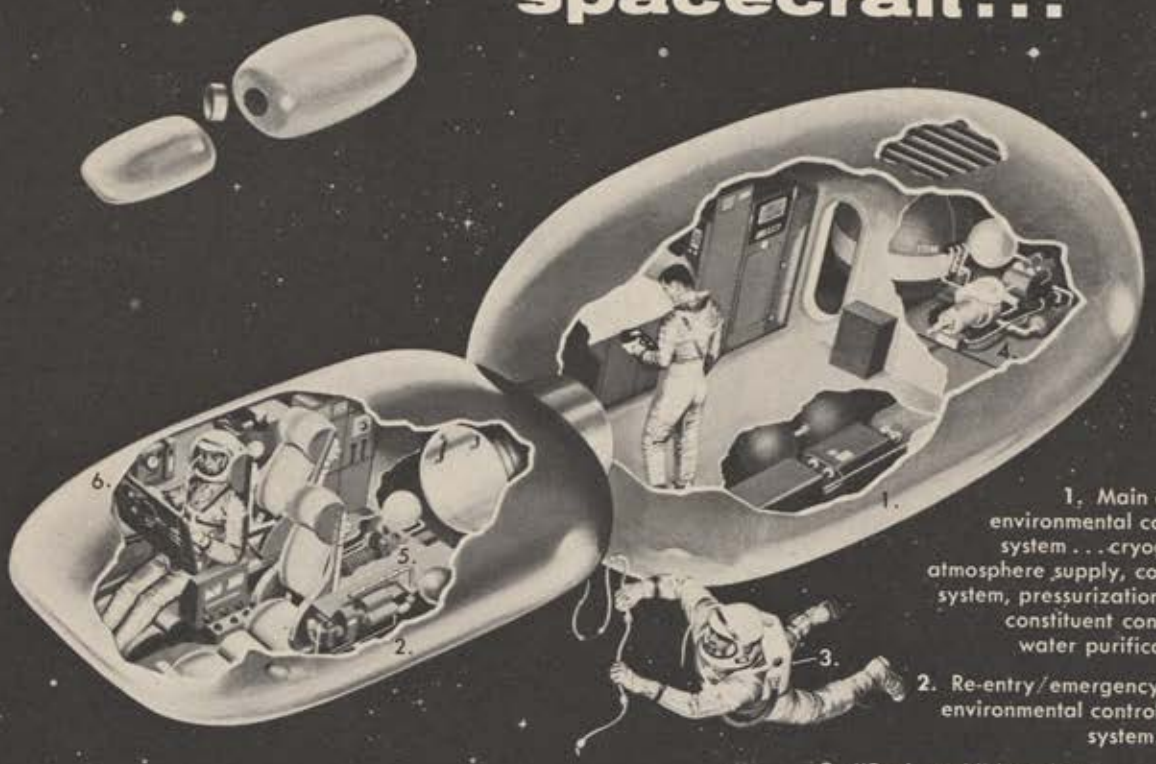
Twice Sergeant Shannon has been called to active duty with the 111th, serving in the **South Pacific in World War II and in Korea in 1951-52.** In Air Guard service, he has never missed field training or a scheduled drill.

His civilian career follows the same steady pattern. He went to work for the **Texas Company** when he was fourteen and, except for active duty, has been with that firm all his working life. Now he is in charge of historical records in **Texaco's Houston office.**

Short Bursts

Brig. Gen. John S. Bagby, Commander of the 512th Troop Carrier Wing at Willow Grove, Pa., will command Air Force Reserve units in Exercise Swift Strike, the joint Army-Air Force maneuver in the Fort Bragg, N. C., area in August. . . . The 900th Air Guardsman to complete the ANG jet instrument course at Ellington AFB in its three-and-one-half-year history is **Capt. Richard D. Gilbert** of Maryland's 104th Tactical Fighter Squadron. . . . Some 25,000 Air Force Reserve lieutenants will be considered for promotion to captain by a board which will convene at the ARRC in August.—END

Environmental and secondary power systems for multiman spacecraft...



1. Main cabin environmental control system . . . cryogenic atmosphere supply, cooling system, pressurization and constituent controls, water purification.

2. Re-entry/emergency environmental control system.

3. "Back pack" breathing and pressurization system.

4. Secondary power system . . . multiple re-entry turbine, pump, alternator and cryogenic fuel supplies.

5. Attitude control system . . . reaction motor, fuel and attitude controls.

6. Instrumentation . . . flight data and physiological monitoring systems.

Manned space flight requires reliable and efficient thermal and atmospheric systems and secondary power equipment.

Complete and integrated systems, as pictured, are being studied or under development at The Garrett Corporation. Through optimized design they offer an unmatched degree of compatibility and high performance.

Their design reflects Garrett's 20 years of leadership in developing and producing secondary power and environmental controls for aircraft and spacecraft, including NASA's Project Mercury life support system. This unique capability offers an unequaled source of research, development and production to the government and industry.

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You can now keep your AFA Group Life Insurance at the same low rates when you leave the service!

There's one condition you must meet. Your coverage must have been in force for more than a 12-month period immediately prior to the date you leave the service. This means that if you insure yourself now, and leave the service any time after Aug., 1962, you are entitled to keep your group coverage at the same low group rate until you reach age 65. And you still get **all** the benefits of this remarkable policy whether you remain on active duty or not—— 1. 50% additional benefit for **all** accidental deaths. 2. Longer protection—to Age 65—provided your policy is purchased prior to Age 60. 3. One low premium for all ($10 per month) regardless of age or flying status—a premium we hope to reduce even further by payment of dividends as soon as sufficient reserves have been established. 4. Guaranteed conversion privilege gives you complete flexibility. When you leave the service, you may either keep your low-cost group insurance or convert it to a permanent plan of insurance, depending on what's best for you and your family. If you choose to convert your policy, you would be eligible to convert to any permanent plan of insurance then being offered by the Underwriters, United of Omaha—**regardless of your health at that time.** 5. No physical examination, no medical questionnaire to fill out. Your signature on the application is all you need.

50% ADDITIONAL BENEFIT 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*

*Continuing benefits. Policy must be purchased 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*

*Continuing benefits. Policy must be purchased prior to Age 60.

EXCLUSIONS—FOR YOUR PROTECTION. There are naturally a few exclusions which apply to your policy, and to keep the record straight, they are listed here in detail, as follows:
Death benefits for suicide or death from injuries intentionally self-inflicted while sane or insane shall not be effective until your policy has been in force for 12 months. The Accidental Death Benefit shall not be effective if death results: (1) from injuries intentionally self-inflicted while sane or insane, or (2) from injuries sustained while committing a felony, or (3) either directly or indirectly from bodily or mental infirmity, or poisoning, or asphyxiation by carbon monoxide, or (4) during any period while the policy is in force under the waiver of premium provision of the master policy.

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Your premium may be paid either by monthly government allotment, or direct to AFA in convenient installments. See the Application Form below for details.

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☐ I enclose $6 for annual AFA membership dues.
☐ I am an AFA member.
I understand the conditions governing AFA's Group Life Insurance Plan. I certify that I am on active duty, that to the best of my knowledge I am in good health, and that I have successfully passed an Annual Physical Examination within one year.

Signature of Applicant ..... Date .....

Please indicate below the form of payment you elect:

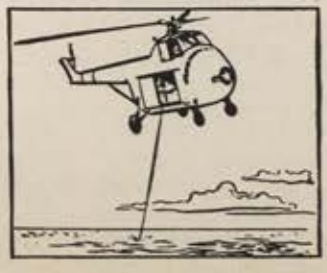
☐ Monthly government allotment (I enclose $30 to cover the period necessary for my allotment to be processed.)
☐ Quarterly (I enclose $30)
☐ Semi-annually (I enclose $60)
☐ Annually (I enclose $120)
☐ I am currently on flying status.
☐ I am not currently on flying status.

Application must be accompanied by check or money order. Send remittance to: INSURANCE DIV., AFA, 1901 PA. AVE., NW, WASHINGTON 6, D. C.

Wire

A LINK WITH THE PAST

Remember when you and kids in the neighborhood used to hook up a couple of tin cans with string and communicate from across the street? It wasn't fancy but it worked. Today, when uninterrupted communication between moving or fixed stations is so essential, Vitro has developed a link as simple and reliable as the old tin can technique. Nothing fancy, just a fault-free wire link system that assures maximum protection against such factors as outside interference, abrasion, jamming and foul weather conditions. Light weight packaging and snarl-free payout combine to make the wire link system, perfected by Vitro, as versatile as it is reliable. ■ In today's troubled world we're no longer playing games, but two lessons we learned from tin cans – simplicity and dependability – are still a very real concern in station-to-station communications.



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TECH TALK

J. S. BUTZ, JR.

Recovery of **both small payloads and large vehicles from space** will continue to be a major topic of US research into the indefinite future. Several systems are generally accepted as feasible. **New theoretical and experimental study contracts** are being awarded almost monthly.

Most of the newly authorized work is intended to extend the capabilities of systems which are fairly well understood. **A typical case is Rogallo's flexible wing,** which is scheduled to recover the **Saturn first-stage booster** after it burns out at a speed of Mach 3 or 4 and an altitude of more than 75,000 feet. New studies are in progress to **use the flexible wing to recover the Saturn upper stages** and all of the vehicle that does not go into orbit.

Upper stage recovery has been demonstrated as feasible through **tests of large-scale models** fired to an altitude of over 200,000 feet from **NASA's Wallops Island, Va., station.** These flexible wings, over five feet long, were deployed inverted. They righted themselves immediately. Models and payloads were **tracked by radar for more than half an hour** until they descended over the horizon. No trouble has been experienced in deploying the wings at low dynamic pressures or at **Mach numbers up to about 7.**

Radically new ideas are also under study. One such concept would call for complete **removal of landing gear from Dyna-Soar-type hypersonic gliders.** The gear's function would be handled by a **curved bottom.** The vehicle would slide down the runway at high speed, **rocking violently on the curved bottom like a big rocking chair.**

The technical explanation of how rocking could replace the shock-absorbing action of wheel or skid-type landing gear is this: **Sinking speed energy could be converted into angular energy** for dissipation by damping forces. **Researcher Wilbur L. Mayo** offers the first published treatment of this type of landing in a paper written at **NASA's Langley Research Center.**

Touchdown, in a rocking-chair type of landing, would be made **tail low on the back of the rocker.** The downward movement of the center of gravity would set up the rocking motion. Theory and small-scale experiments have shown that the **initial landing will not cause the aircraft to bounce,** primarily because wing life is spilled completely as the aircraft rocks forward to a negative angle of attack.

Apparently this type of landing can be successful, **even at the sinking speeds of over 20 mph** planned for Dyna-Soar-type gliders. These vertical speeds are above those experienced by any operational aircraft today. They would **require relatively heavy landing gear.**

The rocker bottom offers an opportunity to **eliminate this weight penalty** because no shock-absorbing units or beefed-up structure would be necessary **between the rocker and the primary structure** in the aircraft.

Current studies also show that both the vertical and angular accelerations imposed on the pilot by the first impact and the rocking slide down the runway can be kept within human tolerance.

In another recovery area, the **Air Force has awarded a $448,000 contract to the Kaman Aircraft Corporation** to study the usefulness of the rotochute in **recovering manned space capsules, nose cones, and large rocket boosters.**

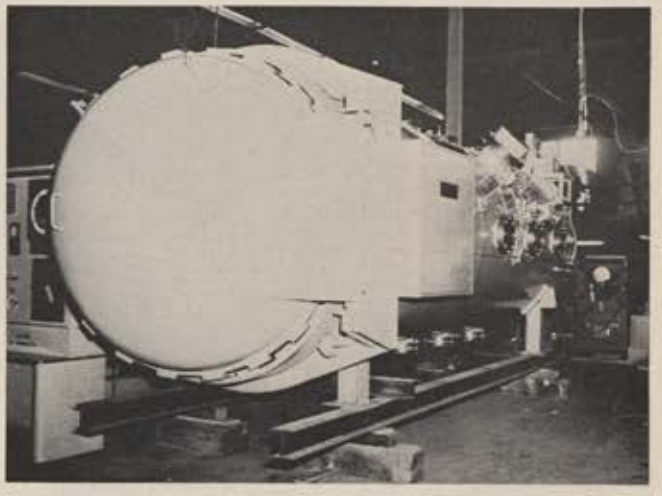
Basically, a **rotochute is a set of helicopterlike rotary wings.** The number of blades may vary.

During the first phase of this contract, rotochutes **weighing about 200 pounds** will be released at **high subsonic speeds and altitudes up to 50,000 feet.** In the second phase, smaller models will be released at much higher altitudes from rockets traveling at supersonic speeds.

At **Holloman and Eglin Air Force Bases,** meanwhile, the first flight tests of **Goodyear's "ballute"** deceleration and recovery devices are being conducted. With the ballute system, **a balloon made of high-temperature cloth is** deployed behind a vehicle to slow it down. Final recovery is handled with a parachute.

(Continued on following page)

Major design details of Northrop laminar-flow control test bed are shown in artist's sketch above. The upper wing surface has spanwise slots to suck boundary layer air into the aircraft, the suction pumps are in sleeve pods under the wings, and the propulsion engines on the rear fuselage.



Pressure chamber above contains targets for use in micrometeorite research at the Arnold Engineering Development Center. Various materials under consideration for space vehicles are used as targets. Altitudes up to seventy-five miles and skin temperatures of 1,500° F are simulated.

The current tests will try the system out at **altitudes to 155,000 feet and speeds up to Mach 10.** Ultimately the designers hope to recover capsules from orbit with a ballute. Operationally, it is intended as an **emergency parachute system to bring astronauts back from orbit,** to recover data capsules inexpensively, and possibly to slow down Dyna-Soar-type gliders to reduce their maximum heating period.

The usefulness of the conventional parachute also has been extended well beyond supersonic speeds. **New organic and metal fabrics** have raised the hope of **recovering men from space** using nothing more than a light personal heat shield, a small back-type life-support system, and a parachute.

Fine-mesh, stainless-steel cloth, with **40,000 openings per square inch,** has been made by several US firms. Studies indicate it can be used to return payloads from earth orbits if the reentry is begun at a small angle to the horizontal.

Organic fiber cloth which retains **eighty-five percent of its strength at 500 degrees Fahrenheit** has been developed for the Air Force by the **Dupont Company.** The new cloth, HT-1, looks like nylon, but will not melt, fuse, or burn. Nylon melts at **482 degrees Fahrenheit,** but the carbonization point for HT-1 is **840 degrees.** Even then, its fibers stay intact. The fiber could be used on tires for high-speed aircraft—and possibly for bringing personnel and small payloads back from orbit.

* * *

Northrop is performing a major rebuilding job on a pair of **Douglas WB-66 weather reconnaissance aircraft,** converting them into laminar-flow control, or boundary-layer control, test-bed aircraft.

Ryan test bed using a Rogallo flexible wing is shown at right during flight tests which have been under way for several months. Army will sponsor extensive proving tests of this aircraft to establish whether it can be used on a wide scale to move troops and materiel on the battlefield. The wing is parachute cloth coated with mylar plastic.

Studies to prove that the Saturn booster can be recovered with a flexible wing included free-flight tests of the model at left. The cylindrical tank represents the booster. During flight the wing and the booster would be radio controlled from the air and the ground. Skids on the booster would allow it to land on the runway at Cape Canaveral.

The original wing is being replaced with a new one that is longer, has more area, and also has a series of paper-thin, spanwise slots through which the boundary layer air is drawn into the aircraft. In addition the **B-66 wing-mounted engine pods** have been relocated to the aft fuselage in Caravelle fashion.

General Electric J79 engines will power the test beds instead of the **Allison J71s** used on the operational aircraft. The noise level of the J79 is lower than that of the older engine. This is a major consideration in selecting an engine for airplanes with boundary-layer control. Noise from the engines can **trip the boundary-layer air on the wings** and make it have an unnatural transition from laminar to turbulent flow.

This could defeat the whole purpose of the **Northrop test bed,** which is intended to prove that suction-type boundary-layer control can maintain laminar flow over the entire wing. If the aircraft proves to be a complete success and turbulent flow can be prevented on the wing, then the plane's **total drag can be reduced by nearly fifty percent.** Its fuel consumption would be reduced a corresponding amount and its range and economy greatly increased.

If this aircraft is completely successful, Northrop and the creator of this boundary-layer control system, **Dr. Werner Pfenninger,** will have made a truly major contribution. Profoundly affected would be the military, the airlines, and general aviation.

One effect would be to change the relative economic attractiveness of supersonic transports versus subsonic transports. Current studies show that the flight efficiency of these two types of aircraft is roughly the same. But the Northrop system could change this. **The first flight of the test-bed airplane is expected within the next year.**

* * *

The flight weight nuclear rocket nozzle under development by **Rocketdyne** for the **Project Rover Kiwi-B tests** will be made of hundreds of tubes of **Iconel X.** Design of this nozzle is complicated because it must withstand a heat load almost **ten times higher** than any experienced on a chemical rocket. Cooling of the nozzle will be accomplished by **forcing hydrogen through the tubes** under very high pressures.

* * *

North American Aviation's Rocketdyne Division is going to enter the business of **converting sea water to fresh water.** A freezing process originated by two San Francisco consultants will be used to remove the sea water impurities. It promises to be an economical method of purifying salt water to public health standards.

A pilot plant will be built at Oxnard, Calif. The company will **invest $1 million** during the next two years on further research and development of the process.—END

Air Products pioneered in research and production of cryogenic systems. Specialty: closed cycle refrigeration systems—"right-off-the-shelf" or custom-tailored to your specific requirements . . . 80°K or 2°K. Air Products offers unmatched facilities and capabilities for any low-temperature need. We invite your inquiries.

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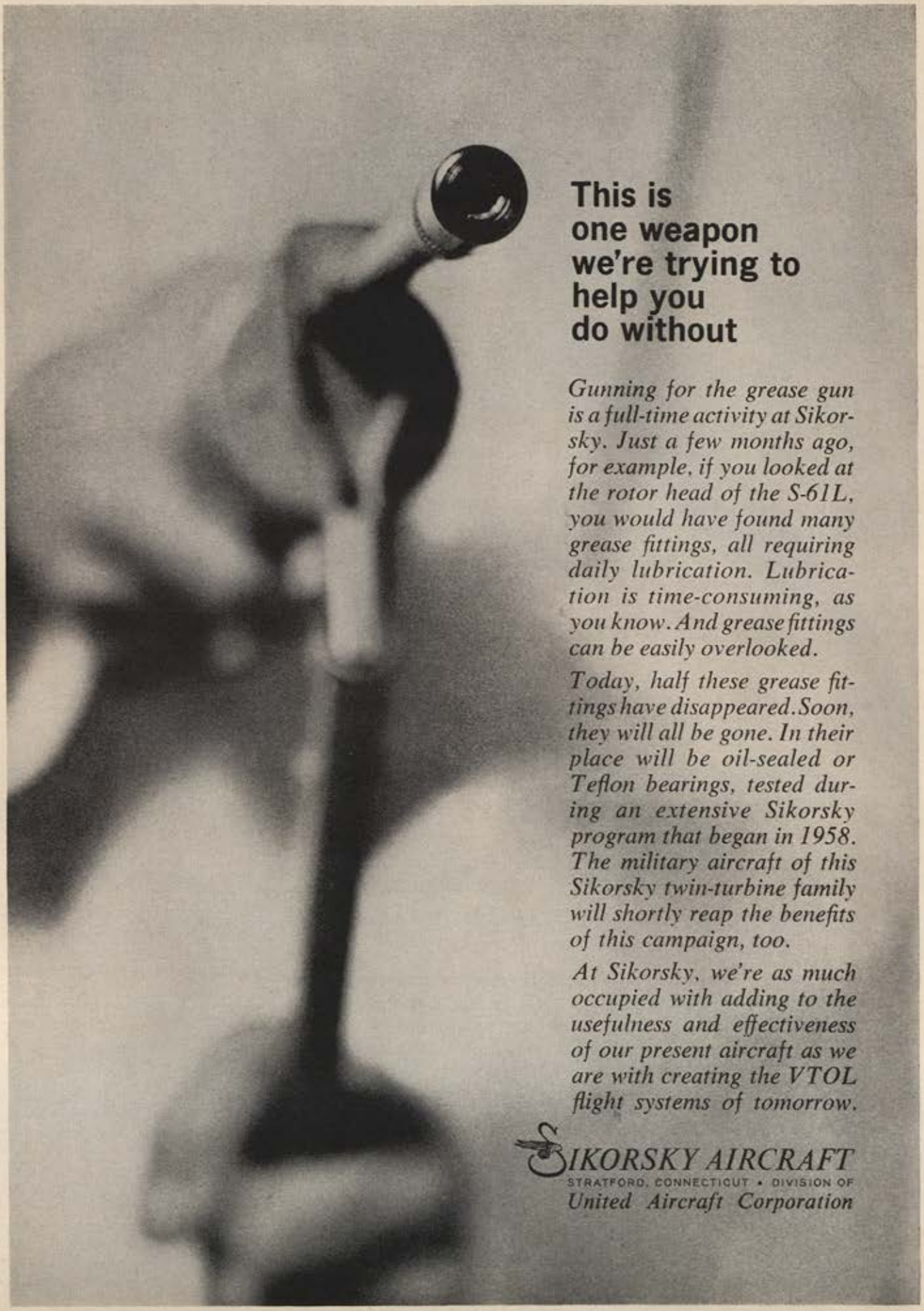

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Gunning for the grease gun is a full-time activity at Sikorsky. Just a few months ago, for example, if you looked at the rotor head of the S-61L, you would have found many grease fittings, all requiring daily lubrication. Lubrication is time-consuming, as you know. And grease fittings can be easily overlooked.

Today, half these grease fittings have disappeared. Soon, they will all be gone. In their place will be oil-sealed or Teflon bearings, tested during an extensive Sikorsky program that began in 1958. The military aircraft of this Sikorsky twin-turbine family will shortly reap the benefits of this campaign, too.

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AFA NEWS

SQUADRON OF THE MONTH

Hudson, N. J. Squadron, Cited for
effective cosponsorship of a highly successful science fair program.

New Jersey's Hudson Squadron receives AFA plaudits this month as the top Unit for its cosponsorship of the excellent **Hudson County Science Fair** at **Jersey City State College.** Under the guidance of **Joe Bendetto,** representing the Squadron, the members obtained **Bomarc and Honest John missiles** and arranged for a float from **Picatinny Ordnance Works** depicting many of the nation's defense arsenal items. Judges and speakers for the three-day event were also furnished by the Squadron.

Highlight of the program was the awards banquet, where citations and plaques were presented to those students whose exhibits were selected as outstanding. Awards of most interest to AFA were given in the fields of nuclear science, aerospace science, electronics, aerospace medicine, and aerospace power. These were presented by **Donald J. Strait,** a member of **AFA's Board of Directors** and **Commander of the New Jersey Air Guard.**

Primary sponsors of the Fair were the *Jersey Journal* and **Jersey City State College.** Representatives of both organizations paid grateful tribute to the Hudson Squadron members for their outstanding support. We're proud to add our congratulations to this Unit for its fine effort.

Left to right, Maj. Jim Laulis, Gil Mayfield, and Mike deBerardinis shown at the conclusion of the Aerospace Education Seminar sponsored by the Shreveport-Bossier City Squadron on the Campus of the Centenary College in April *(see text)*.

Shreveport-Bossier City Squadron, located in the northern part of Louisiana, has long taken a back seat to AFA activities in **New Orleans,** but this trend was reversed on April 29, when the Squadron sponsored a highly successful **Aerospace Education Seminar,** utilizing the excellent **Briefing Team** from **Air University** and combining it with the sincere effort and brilliant work of some local leaders.

Key roles in the program belonged to two old-time AFA leaders, both of whom started in other states, but are now stationed at **Barksdale AFB,** and to two local businessmen. All four share equally in the success of the event. **Maj. Jim Laulis,** formerly a leader in the **California Wing,** and **Maj. Dick Goldfogle,** former **Lansing Squadron** and **Michigan Wing Commander,** were in the middle of the program, along with **Gilmer Mayfield, Squadron Commander in Shreveport,** and **N. W. "Mike" deBerardinis,** public relations director for the Shreveport *Times.* These four men form a team that is tough to beat, and together they staged a program that was truly outstanding.

In addition to the Air University team, top speakers on the program included **Dr. R. D. MacCurdy, Centenary College Department of Education** head; and **Dr. Shelby M. Jackson, State Superintendent of Schools.** The luncheon was devoted to recognition of outstanding leaders of the area who have made lasting contributions to those principles to which AFA is dedicated. Toastmaster at the luncheon was Mr. deBerardinis. A capacity crowd of more than 300 attended the function, and many laudatory comments have been received as well as requests for further information on aerospace education; enough requests, in fact, to spur Louisiana AFAers to plan expansion of the program into other cities. Officials of the Louisiana Wing have announced that similar programs will be held in Baton Rouge, Alexandria, and possibly New Orleans.

—Gus Duda

Left to right, Bill O'Brien and Sam Boghosian present "junior pilot's" wings at the conclusion of the Fresno Squadron-sponsored tour of the local air base. Both are former commanders of the Fresno AFA Squadron. This is a part of the aerospace education program sponsored annually by the California Squadron.

Foss

Stack

Gross

Hardy

AFA Nominees for 1961-62

AFA's Nominating Committee met in Colorado Springs on June 2, to select a slate of national officers for the coming year.

For President the Committee chose Joseph J. Foss, Sioux Falls, S. D., a current member of the Board. A World War II Marine fighter ace, he holds the Congressional Medal of Honor. Following his return to civilian life in 1946, he served two terms as Governor of his home state, at the same time switching to the uniform of a brigadier general in the Air National Guard, and becoming Commander of all ANG units in his state. During this period he also organized two AFA Squadrons, and was elected Wing Commander. He is married, with three children, and divides his time between Sioux Falls and Dallas, Tex., where he maintains his office as President of the American Football League. He is completing his second year as President of the National Society for Crippled Children.

Thos. F. Stack, San Francisco attorney and current National President, was nominated by the Committee as Chairman of the Board of Directors. Jack B. Gross, Harrisburg, Pa., and George D. Hardy, College Park, Md., were nominated for reelection to their respective positions as Treasurer and Secretary.

Stack's election to the presidency in 1960 capped a fifteen year tenure in which he achieved every elective AFA position from Squadron Commander to the presidency. He is married, with two children.

Gross is completing his second term as Treasurer, with many key committee assignments also behind him. He organized the Olmsted AFA Squadron, and has remained active in Squadron and Wing affairs.

Hardy is completing his second term as Secretary, and boasts a number of years on the Board as Regional Vice President and Director, along with several important committee slots.

Stack (1956), Hardy (1957), and Gross (1958), all have earned the Association's highest individual award, the President's Trophy as "AFA's Man of the Year."

Apart from the incumbents, six new names appear on the Committee's slate, all well known for their interest in the Association objectives, and their efforts on behalf of the organization's development.

James H. Douglas, Chicago, former Secretary of the Air Force, was a member of the Board of Directors in 1946, the first year of the Association's formation. He is a Charter Member, and an attorney in the Windy City.

Arthur Godfrey, Leesburg, Va., television and radio personality, is another "new" name to AFA, although he is widely known for his support of our objectives and help in achieving them. He recently received a commission in the USAF Reserve.

Maxwell A. Kriendler, New York City, has long been active in AFA activities nationally and locally, and is currently a member of AFA's Finance Committee. He is married, with two children, and is President of 21 Brands, Inc., a New York importing firm.

W. Randolph Lovelace, II, Albuquerque, N. M., is another former Director, who served in that capacity in 1951-52, and since has contributed much to AFA in his service as a member of the Policy Committee. A noted aerospace physician, he is director of the Lovelace Clinic, chairman of the NASA Life Sciences Committee, and has contributed heavily to the aerospace medical planning for the Mercury Astronaut program.

Edwin W. Rawlings, Minneapolis, is currently Vice President of AFA's North Central Region, as well as Vice President of General Mills. He was commander of the old Air Materiel Command until his retirement in 1959.

The name of Thomas D. White completes the roster of "new" names. Another Charter Member, he has long been one of the Association's staunchest advocates, at the same time compiling a brilliant record in the Air Force prior to his retirement as Air Force Chief of Staff on June 30.

Incumbent members of the Board nominated for reelection include Walter T. Bonney, Los Angeles, Public Relations Director of Aerospace Corp.; Roger J. Browne, Commissioner, Department of Purchase of the City of New York; Carl J. Long, Pittsburgh, a private electrical contracting consultant; John B. Montgomery, Murray Hill, N. J., President of Daystrom Corp.; O. D. Olson, Colorado Springs, Vice President of the Exchange National Bank; Earle E. Partridge, also of Colorado Springs, formerly Commander, North American Air Defense Command, now a consultant with Lockheed Aircraft Corp.; G. Barney Rawlings, Las Vegas, Nev., Assistant Manager of the Clark County Convention Bureau; Roy T. Sessums, New Orleans, Vice President of Freeport Sulphur Co.; James C. Snapp, Jr., La Mesa, Calif., owner of an insurance agency; William W. Spruance, Wilmington, Del., Chairman of the State Aeronautics Commission; Arthur C. Storz, Omaha, Chairman of the Board of Storz Brewing Co.; and Donald J. Strait, Bedminster, N. J., Commander of the New Jersey Air National Guard.—END

1-6 Commutator assembly—analog input

7 Digital input processor

8 Housing

9 Programmer

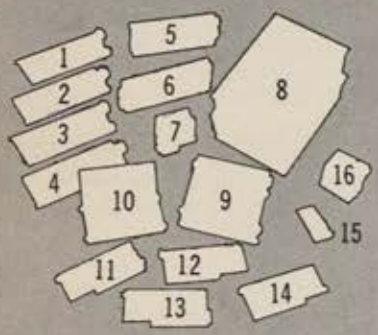
10 Low-level amplifier and super multiplexers

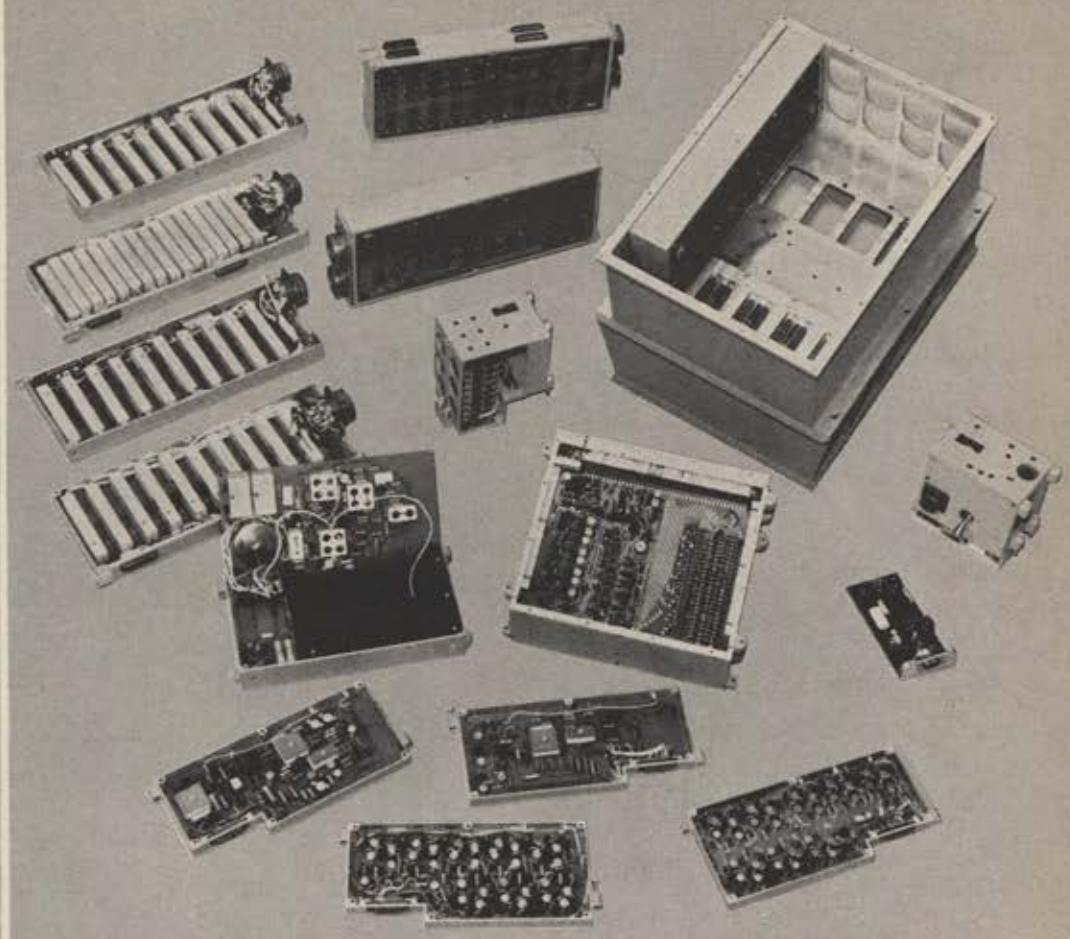
11-13 Analog to digital converter

14 Automatic, drift and gain compensation networks

15 Output filter

16 Power converter





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airman's bookshelf

Two Special Weapons

***Journey of the Giants*, by Maj. Gene Gurney, USAF (Coward-McCann, 1961, 280 pp., $4.95)**

Reviewed by Frederic M. Philips

The B-29 Superfortress will always be remembered as the plane that rang down the curtain on World War II. B-29s dropped the atom bombs on Hiroshima and Nagasaki in August 1945. Earlier in the year, masses of these aerial giants rained fire bombs on most of Japan's major cities. The damage they inflicted in these incendiary raids was incredible. The March 9 raid on Tokyo, first in the fire-bomb series, virtually destroyed one of the world's major capitals.

In *Journey of the Giants*, Maj. Gene Gurney tells the story of the Boeing-manufactured '29, from its entrance into the design stage in the late '30s through those climactic months in 1945. Here is the B-29's war from both the policy-strategy level and from the cockpit—from Stateside war plants to bases in China, India, and the Marianas, from war rooms of top commanders in the US and abroad to the flaming skies over Japan.

Two special weapons really brought the B-29 to fruition as the most destructive strategic system yet used in war. One was the atom bomb. The other was a youthful major general named Curtis E. LeMay.

General LeMay, today USAF's new Chief of Staff, had made a name for himself in the strategic air onslaught against Nazi Germany. Rough-and-tough taskmaster, perfectionist, daring aerial tactician, by 1944 he was Commander of the 3d Bombardment Division of the Eighth Air Force and the youngest major general in the US Army. In August of that year, he took over as boss of B-29 operations in the Far East.

In March 1945, disappointed with results of high-altitude, precision bombing of Japan to that point, General LeMay boldly switched signals. He adopted tactics worked out by Brig. Gen. Thomas S. Power, one of his '29 wing commanders. The General sent every plane he could muster—300-plus—on a perilous nighttime, low-level, incendiary attack over Tokyo. Guns and ammunition were not carried; the planes were stripped of every extra pound including auxiliary fuel tanks. Formation flying was thrown out the window by formation-stickler LeMay; the '29s were sent over singly to inflict maximum concentrated fire damage on target. The mission was simply to burn out the core of the Imperial Japanese capital, whatever the cost. This was the immensely destructive raid of March 9. The cost, strangely enough, was only a few planes.

General LeMay now successively sent his bombers on fire raids against Japan's other main cities. As the air offensive built up, he warned Japanese civilians which centers would be hit next. In full swing, the "LeMay plan" struck terror at the very heart of the Japanese Empire even as other Allied forces slashed at it elsewhere. Then came the atom bombings by a specially trained B-29 unit. The Japanese Empire and the B-29's war came to an end.

Major Gurney, wartime pilot and currently an information officer, relates the '29 story well. He previously wrote *Five Down and Glory*, a history of US air aces. *Journey of the Giants* is the current selection of the Aero-Space Book Club.

About the Reviewer: *Mr. Philips is an Associate Editor of* Air Force/Space Digest.

The National Peril

***America—Too Young to Die!*, by Maj. Alexander P. de Seversky (McGraw-Hill, 1961, 237 pp., $4.95)**

Reviewed by Lt. Col. Donald Martin, USAF

Maj. Alexander P. de Seversky is greatly alarmed about our national security and believes, as we all do, that America is too young to die. In this, his latest book, he presents an analysis of military matters today and a grave warning to the United States.

"If we continue our current rate of military growth," he writes, "an attack by Russia in 1962 could destroy us completely, while they themselves would be suffering only acceptable damage—hideous, perhaps, from our point of view, nevertheless acceptable to them."

Seversky warns that our overwhelming aerospace superiority of a decade ago has evaporated. Shortly, military superiority will shift to Russia. When this happens, we will be in mortal danger.

He believes we can regain the lead over the Reds by a determined military buildup. One of our most urgent requirements, he says, is for an effective antimissile system.

"Once there is a practical defense against oncoming missiles, the present atomic stalemate is bound to evolve into the classic 'balance of power' in which the subjugation of one nation by another can be accomplished only through protracted attrition—destruction over a period of time of the military power of one belligerent by another. In such a war the losses must be absorbed, missile silos reloaded, manned vehicles replaced. And so, once again, the overriding strategic consideration will demand that the offensive force be applied to the enemy military complex and not the population centers."

Seversky charges that "at the bottom of our military weakness lies a fallacious military organization:

"In order to implement the strategy of the future we must integrate our three services into one single military force, with one uniform, one promotion list, and a single Chief of Staff."

He takes sharp issue with the "balanced forces concept" that requires that the national effort be split equally between the Air Force, Navy, and Army:

"A surface Navy is today an anachronism. Through modern radar and other means of detection, its vessels can be spotted and their position marked from a distance of several hundreds of miles. A ballistic missile with a nuclear warhead, traveling at a speed of 18,000 miles per hour, can swamp the largest carrier afloat if it lands within twenty miles of it."

Seversky offers this view on the lessons of the Korean war:

"Korea was principally a ground war. This was where the Communists won their great victory. It was their devilish design to destroy our confidence in airpower and bring us back

NOTE: Any book reviewed in Airman's Bookshelf may be obtained, postpaid from the AeroSpace Book Club, 1901 Pennsylvania Ave., N.W., Washington 6, D. C. Full payment must accompany order. Information on the Book Club may be obtained from the same source. Club members are eligible for substantial savings on Club selections.

to the ground, where we can never match their manpower. . . .

"And all the while the Russians were diverting the lion's share of their production potential into a strategic air force which was soon to rival ours and into a ballistic missile weapon system which is ahead of our own."

Turning to the subject of our overseas bases, he notes that most of them are so close to Red IRBM launching pads that they would be unable to detect oncoming missiles, therefore would have no time to react accordingly and would be of little real value to us.

Over-all, Seversky's thesis is stimulating, provocative, controversial, somewhat overstated, yet nonetheless of mortal significance to our nation.

About the Reviewer: *Colonel Martin is currently assigned to the Office of the Assistant for Coordination, Deputy Chief of Staff, Plans and Programs, Headquarters USAF.*

Mysteries of Space

***Satellite Environment Handbook*, by Francis S. Johnson (Stanford University Press, 1961, 155 pp., $5.50)**

Reviewed by J. S. Butz, Jr.

The most important guessing game in the US space program is predicting what the space environment is between the earth and the moon. Even though experimental measurements from satellites are spotty and incomplete, detailed predictions must be made now on the incidence of micrometeorites, penetrating particle radiation, radio noise, and many other important variables in the space environment. Without these predictions, it would be impossible to proceed with the design of the Apollo moon landing vehicle or other manned craft which must function with absolute reliability for long periods above the atmosphere. Certainly the most frustrating feature of Apollo design work is that new facts are becoming available, almost on a monthly basis, which alter the most expert predictions concerning space.

Probably the most comprehensive summary of what is definitely known about the space environment has been prepared by Francis S. Johnson in the course of his activity as Manager of Space Physics Research for Lockheed's Missiles and Space Division. Mr. Johnson's *Satellite Environment Handbook* would be valuable if it contained only the basic data taken with instruments in satellites up through March of this year. However, he has gone much farther and interpreted this data in an exceedingly clear manner.

Anyone interested in following the unfolding story of the space environment and understanding the basic physics involved can use this book as a primer. As the author points out, many of the phenomena he discusses were not "known or even suspected three years ago," and "it is probable that there are still major surprises in store for us."

From the standpoint of the manned spaceflight enthusiast, Mr. Johnson's most encouraging assessment is that the intensity of penetrating particle radiation in space is not nearly so high as many people have predicted. In other words, Mr. Johnson believes that

(Continued on following page)

the radiation in the Van Allen belts around the earth and the cosmic radiation coming from the sun during solar flares will not be as harmful to human beings as many authorities expect. If Mr. Johnson is correct, lightweight shielding can be used on space vehicles to protect the occupants against radiation. In turn their general construction can be lighter. In regard to micrometeorites, another hazard to space vehicles, he views present data as inadequate.

About the Reviewer: *Mr. Butz is Technical Editor of* AIR FORCE/SPACE DIGEST.

Report on the X-15

***X-15 Diary*, by Richard Tregaskis (E. P. Dutton, 1961, 307 pp., $4.95)**

Reviewed by Lt. Col. Francis X. Kane, USAF

During the initial phases of the X-15 program, author Richard Tregaskis haunted Edwards AFB in California. He was everywhere, talking to everyone.

Now we have the product of these activities, *X-15 Diary*, the latest from the man whose name will always be associated with a book he wrote almost twenty years ago, *Guadalcanal Diary*.

As a reporter, observing and recording the various X-15 flights, Tregaskis does a solid job. He is at his best in his handling of the people who are making history in the X-15 project—pilots, directors, engineers. He has recorded every bit of information he could find: technical description, tape recordings of the pilots' experiences, interviews, gossip, rumors, personal observations.

Tregaskis in this connection has made a real reporter's contribution to the literature of the project. His reporting complements and supplements books which have already appeared on the X-15.

However, there are certain facets of Tregaskis' *Diary* which detract from this close-up account of the project milestones. He has gathered a wealth of information, but it lacks unity and interpretation. The reader feels a great deal of only partially sorted information is being thrown at him. This may be fine for those who know a good bit about the X-15. But for others, it can scarcely fail to produce a confused image of an extremely significant program.

About the Reviewer: *Colonel Kane is Special Assistant to Lt. Gen. Roscoe C. Wilson, DCS/Development, Hq. USAF.*

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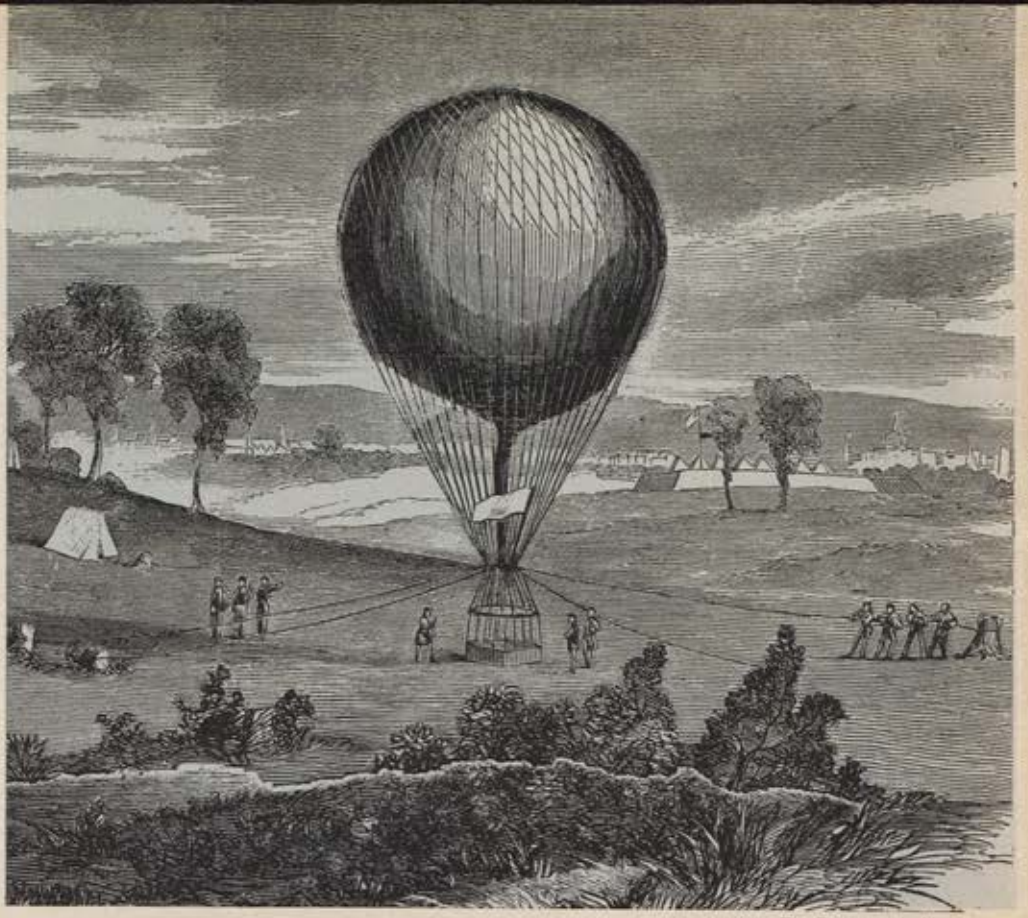
In an era of space-reconnaissance hardware, it is refreshing to look back a hundred years to see how Professor Thaddeus Lowe and his colorful cohorts of the Balloon Corps of the Army of the Potomac used lighter-than-air craft . . .



—The Bettmann Archive

"War balloon" is prepared for reconnaissance mission at a Northern camp in Civil War.

'To Spot the Camps of Rebel Scamps'

Frank Cunningham

THE HUNDREDTH anniversary of the Civil War, being marked across the nation this year, is also the hundredth anniversary of America's first eye in the sky.

The conceptual forerunner of today's advanced aerial reconnaissance and tomorrow's space reconnaissance, it was put up there by an imaginative gentleman named Thaddeus Sobieski Constantine Lowe and his colorful, adventurous cohorts.

Lowe, a civilian, headed the Balloon Corps of the Union's Army of the Potomac, truly the first US air arm. It was formed in September 1861, forty-six years before military aviation came to stay with formation of the Army Signal Corps' Aeronautical Division.

During the two years following 1861, Union balloonists nobly performed observation and gun-direction missions over the battle lines. They reported to the ground by telegraph. In addition, the generally unarmed Northern balloons proved to be capable of an infinite amount of passive harassment of Confederate forces—what came to be known as psychological warfare in later years. The balloons gave the rebels the willies hanging over them in the sky.

Southern troops continually brought the balloons under fire. This provided a picturesque game of chance for some of those watching from the ground. It also caused at least one Union soldier and his unfortunate tentmates a singularly unpleasant experience. Other than that, the Confederate ground fire had little effect.

Then, in June 1863, the Balloon Corps was disbanded. The Northern Army had lost interest, to the recorded amazement of Southern leaders who themselves were laboring to get a Confederate balloon corps off the ground. The South did ultimately manage to put up a few balloons of its own. But the Southern balloonists inevitably com-

pared unfavorably with a Union group built around the nation's prime prewar balloon daredevils. Among these, in addition to Lowe, were John Wise, John LaMountain, and James Allen.

These men were among the leading actors in a quite compelling "air war" portion of the Civil War—along with the Confederates who tried in vain to counter or match their efforts. Their war records contain a diverse series of ups and downs—dual meaning intended.

Wise had been the greatest individual proponent of ballooning in the United States. As early as the Mexican War, he had advocated bombing the Mexican fortress of San Juan Castle at Vera Cruz from a balloon capable of carrying "18,000 pounds of percussion bombshells and torpedoes." This idea was met with ridicule, although some did remember that Revolutionist balloonists made important observations on the Royalists lines in the French Revolution.

In 1859, Wise and LaMountain, another distinguished pioneer balloonist, and several others made one of the early historic flights—800 miles from St. Louis to Henderson, N. Y. The same year, Wise carried what was probably the first airmail—123 letters and twenty-three pamphlets—from Lafayette to Crawfordsville in Indiana aboard a balloon.

James Allen made his first solo ascent from Exchange Place, Providence, R. I., in 1857. He became a well known aeronaut in the years that followed. Allen was actually the war's first military balloonist. He answered Lincoln's prewar call, on December 23, 1860, for 75,000 militiamen.

Thaddeus Lowe was most active before the war in attempting to promote balloon transportation. On the eve of hostilities, Lowe built a "transoceanic" balloon which he flew from Cincinnati to South Carolina. On landing, he was arrested by South Carolina folk who judged he might be a Northern spy, then released in time to return North before the war broke out.

Wise, Lowe, and LaMountain all joined Allen as soon as bullets began to fly. Wise had ill luck from the start. His first balloon was damaged while being transported through a forest. His second was accidentally damaged beyond repair. He was unjustly accused of being at fault. Wearied by criticism, Wise resigned as an Army balloonist.

Allen's initial endeavors in the Army also resulted in failure. One balloon collapsed. One thing after another went wrong. A Union officer serving with him on one occasion uttered this classic condemnation, "I didn't join the Army to be a bird!"

Allen, too, soon left the service as a result of his disappointing experiences. He returned, however, and was so successful that he rose to become chief of the Balloon Corps in its closing days.

—The Bettmann Archive

Professor John Wise, great prewar balloonist who met ill fortune after volunteering at the start of Civil War.

LaMountain took up his war balloon from the deck of the small Navy vessel USS *Fanny*. The ship thus became the nation's first aircraft carrier. LaMountain made a number of observations over Virginia after launch from its deck.

LaMountain had more ambitious plans. He wrote to Union General Butler in August, 1861:

"I am well convinced in my mind that at an expense not to exceed $8,000 or $9,000, I can build a balloon in a month's time, and with it shell, burn, and destroy Norfolk or any city near our camps. Ballooning can be made a very useful implement in warfare. All depends on the encouragement it receives."

Butler forwarded a copy of LaMountain's letter to Assistant Secretary of War Thomas A. Scott, advising that the aeronaut's recommendations be given a trial, stating, "I take leave to call your attention to that portion of LaMountain's communication in which he proposes to use his balloon for warlike purposes. Is it not worth the experiment? . . . The proposal is a novel one and daring, but with the explanation he has given me, I think it may have an element of feasibility in it; at any rate the cost is not large, in comparison with results so far. . . ."

Nothing came of this project.

The most outstanding aerial performer in the War between the States was Lowe. Arriving at the Virginia front in the fall of 1861, he soon had his balloon, the *Union*, high in the air observing Confederate movements. He, too, had his aircraft carrier, the USS *Parke Custis*, used for river work. By 1862, Lowe was in command of seven balloons, a dozen or so aeronauts, and a considerable ground crew. Lowe devised mobile gas units for filling his craft, so they could best serve ground forces on the move.

Lowe's aerial activities caused apprehension at the headquarters of the Confederate high command. His constant inspection of the lines led to energetic Southern countermeasures.

Three days after Lowe's first ascent from Arlington, Va., General Beauregard instructed Longstreet on a method of camouflage:

". . . No light should be left at night except where necessary and then under screens as may conceal the light from observation. Further, tents, if used, ought to be pitched under cover of woods and sheltered in all cases."

Confederates deliberately kindled fake campfires to deceive the night observations of the Yankee balloonists. They were often successful.

In December 1861, General Beauregard again wrote to General Longstreet on the matter of the balloon observations:

(Continued on following page)

—The Bettmann Archive

Union balloon *Washington* rises from specially constructed steamer deck in Potomac River in early days of war.

"As it has become suddenly important to prevent the enemy balloon observations from discovering whether or not we have guns in our batteries or more properly to let them believe that we have, you will have at once the position of each gun protected from aerial vision by a rough shed of leaves and brushwood, elevated about six feet from the ground or the height of the crest, putting in each embrasure a piece of wood the proper size blackened to represent a gun."

These fake guns were called "Quaker guns." They were also constructed of stove pipes of different lengths. These confused the Union balloonists. When the camouflage was too successful, the aerial observers were unable to locate even the "Quaker guns" set up by the Rebels.

One of the fondest hopes of the Confederates was to shoot the Union balloons down. They tried and tried—but always failed. In one instance, they set a trap for Lowe—twelve masked guns of the most accurate type. When Lowe's balloon came into range, the guns were fired simultaneously. Shot tore the rigging of the balloon but missed the bag and basket. Lowe quickly retired.

The Confederates peppered away at the Northern balloonists just about whenever they were airborne. Often they scored near misses. The contest between ground fire and balloonist at some points took on the elements of a sport. One Northern correspondent wrote the following:

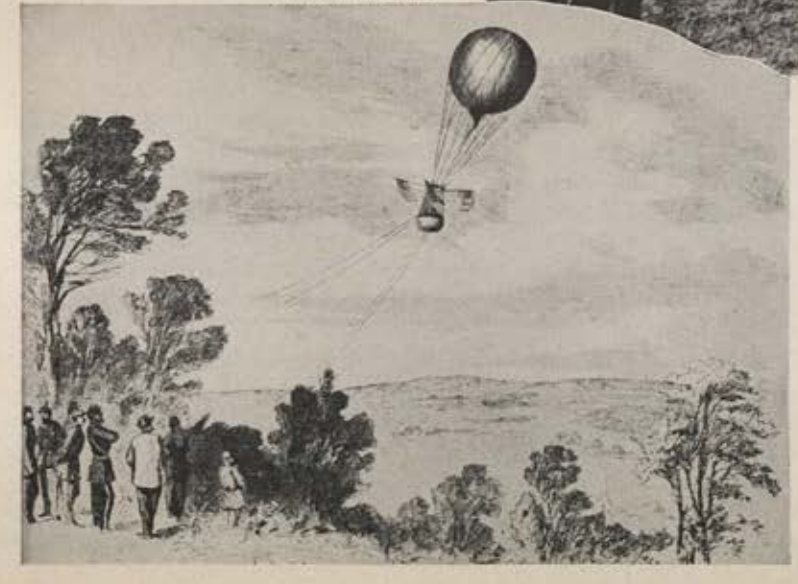
"It came at length to be our principal amusement in camp to watch the Rebels fire at the balloon as it sailed tranquilly above our picket line, and I have seen many a dollar staked by the 'boys in blue' on

—The Bettmann Archive

Right, Thaddeus Lowe writes report in balloon gondola behind Union lines after observation flight over battlefield during fighting in Virginia.

Below, Professor Lowe airborne over Virginia in balloon gondola decorated with flags. It carried two balloonists.

—The Bettmann Archive



the skill of the gray-coated artillerists. It was laughable to watch these bets, and I think I shall not go too far astray from the truth when I say that some very good patriots would have been glad to see the balloon struck, since it would have enabled them to win their wagers."

Shot and shell aimed at the Northern balloons often did considerable damage on the ground. Sometimes, like the poet's arrow, "it fell to earth, I know not where." On this score, an officer of the 13th

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INDEX TO ADVERTISERS

AFA INSURANCE PROGRAMS

are constantly reviewed to offer maximum protection at minimum cost

CONSTANT review of policy provisions and suggestions from policyholders are an important part of the AFA Insurance Program.

They are important because the whole object of the program is to offer Air Force Association members and their families maximum protection at minimum cost, consistent with good management and sound financial policy.

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—The Bettmann Archive

Bloody battle of Fair Oaks, Va., in May, 1862. Union balloon at upper left observed the action as Northern and Southern armies fought hand to hand below. Balloons in this and other battles had many psychological and military values.

New Hampshire Regiment wrote in his journal:

"Wednesday. Stinging cold. No chill. David Hogan of 'E' had an experience he can never forget. His round of duty takes him near the regiment's sinks and cesspools. A large shell, intended for one of Professor Lowe's balloons, falls into one of them and bursts there, and scatters about two carloads of the vile contents for rods around, nearly burying Hogan out of sight. Hogan is unhurt beyond a scare, but his clothing and appetite are utterly ruined."

(Airpower supporters may be pardoned if they see a certain symbolism in this incident from the early days of flight, it might be noted in passing.)

McClellan's Peninsula Campaign fared badly for "Little Mac." It has been said that at Fair Oaks, Va., his forces were saved from destruction by Lowe's aerial intelligence. General McClellan's enthusiasm for the Balloon Corps was shared by President Lincoln. It was not shared by some lesser leaders who looked scornfully at the gas-filled bags.

Union public opinion was also mixed on the subject of ballooning. One humorous example of opposition attitude was this verse, "On War Balloons:"

"Professor Lowe would fain
get high
At government expense;
With his big balloon, he'd
scale the moon
To spy Virginia fence;
To spot the camps of rebel
scamps
With telegraph and glass—
You ask me, friends, how will
this end?
And I reply—in gas!"

Early in the war, the South decided that it, too, needed balloons. They built a few in the years that followed. The best descriptive words for the Southern balloon unit, however, were: small, brave, ineffective.

The best-known Southern military balloonists were Charles Cevor, Richard Wells, and Capt. John Randolph Bryan. Cevor and Wells engaged in ballooning before the war. Their aerial exploits had been widely hailed. Captain Bryan was the adventurous aide-de-camp to Gen. J. B. Magruder.

In the spring of 1862, Captain Bryan performed on various balloon scouting missions. The Confederates had no hydrogen. They inflated their balloons with city coal gas, then towed them to the front. The brave Bryan, the "flying fool" of the Confederates with no ballooning experience, made his last flight in May 1862 when his balloon was blown behind Yankee lines. A wind switch then sent his bag back to the Confederate lines. Bryan may have neglected to fasten a Southern battle flag on his balloon. When it reached the Rebel lines, it was fired upon—fortunately doing little damage.

The Confederacy's most publicized balloon was said to have been made from silk dresses contributed by Southern ladies. It appears, however, that it was made of varnished strips of silk imported for balloon building. It was built in early 1862 by Capt. Langdon Cheves, Jr., of Savannah, Ga., at his own expense.

Brought to Richmond, the balloon, which had a capacity of some 7,500 cubic feet, was put into action on the front on June 27, 1862, to the glee of both Confederate officials and civilians who wanted a Stars and Bars answer to the Union Balloon Corps. It was destined for a short life.

On July 4, the Confederate armed tug *Teaser* ran aground on Virginia's James River. The Confederate crew escaped before the *Teaser* was captured by the Union gunboat *Maritanza*. Tied to the *Teaser* deck was the "silk-dress" balloon, which had been making daily ascents from the armed tug during the preceding four days.

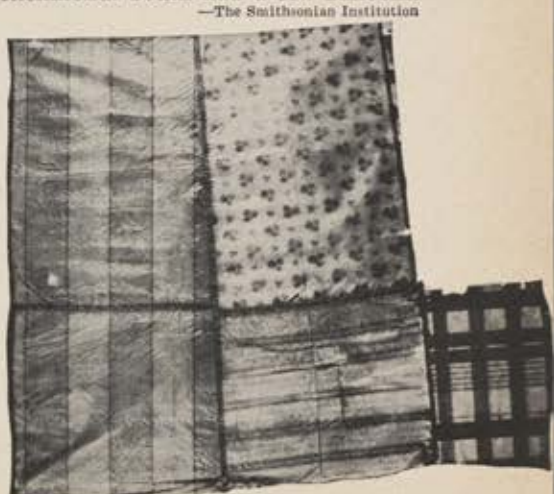
Confederate balloons were used in a few further Civil War actions. One took part in the defense of Charleston, S. C., in late 1863. But for all practical purposes, when the *Teaser* went aground, the Rebel flag came down from the heavens.

By late in 1863, then, with the

(Continued on following page)

Fragment of silk from Confederates' balloon which saw brief action near Richmond. South had a few balloons.

—The Smithsonian Institution



collapse of Southern ballooning and the Northern decision to abandon their balloon activities, the aerial chapter of the War between the States had been written. A Mobile, Ala., mechanic, William C. Powers, did design and build a model of a steam-driven helicopter-type bombing plane that he dreamed might bring the Confederacy victory. The craft itself was not built, though years later the model of this Confederate air bomber was presented to the National Air Museum of the Smithsonian Institution in Washington as an example of pre-Wright brothers heavier-than-air design. The plane, experts now agree, could never have flown although its design was advanced for the period.

Neither North nor South, so far as available data is concerned, shot down an enemy balloon in the Civil War. There was only one known civilian casualty on either side, a telegrapher of the Union Balloon Corps named D. D. Lathrop. He was killed when he stepped on a Confederate land mine.

Thus ended US military air activity prior to the birth of the Aeronautical Division in 1907, except for the brief use of a single balloon during the Spanish-American War.

Today, a century after Thaddeus Lowe and his Balloon Corps went into action, America's modern, global Air Force moves forward with accelerated development of space-reconnaissance hardware. It is interesting to note, as these highly sophisticated aerial intelligence devices go into operation, that they follow in direct line of succession the handful of Union and Confederate Civil War balloons—the nation's sky eye-openers.—END

The author, Frank Cunningham, is a prolific writer of books and magazine articles. Among these was a Book-of-the-Month - recommended biography of Donald Douglas, Sky Master. *An unreconstructed Southerner, Mr. Cunningham has produced two volumes on the Civil War. His grandfather, a Confederate cavalry captain, took part in Virginia fighting under the watchful eyes of the Union Balloon Corps.*

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