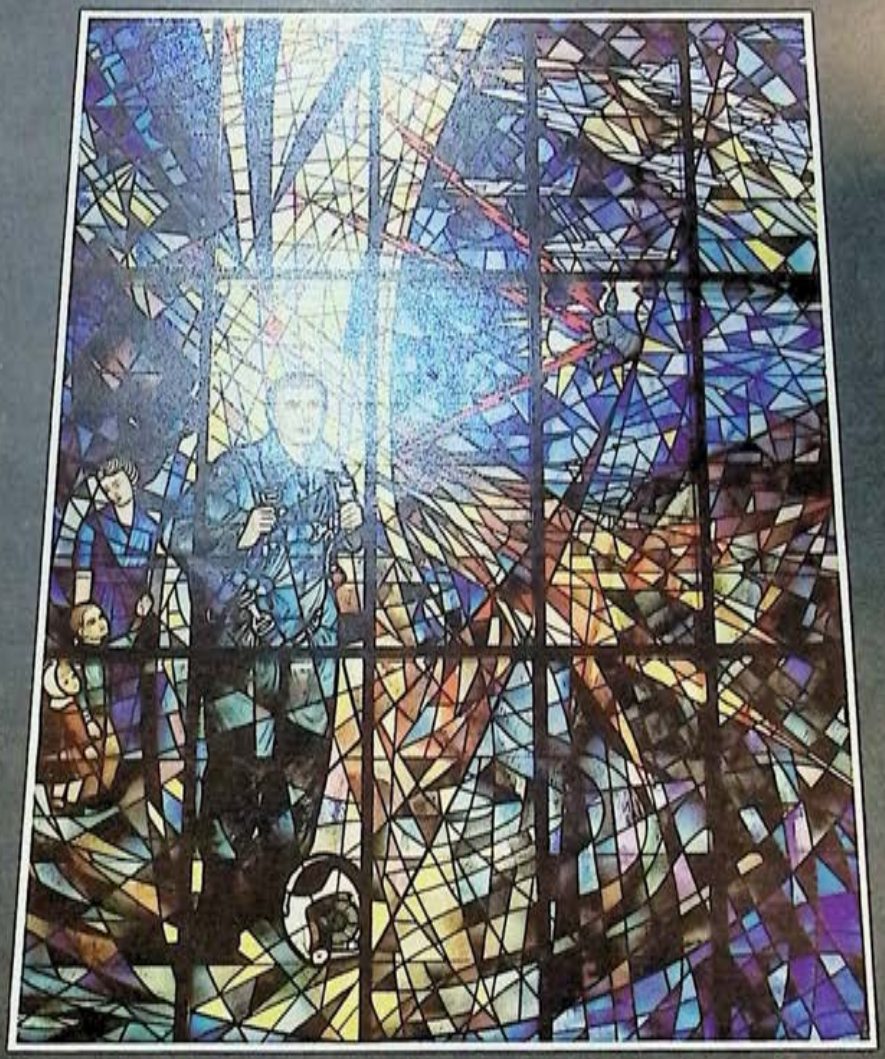
JUNE 1960 / 50c

AIR FORCE

and SPACE DIGEST

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



SAC's combat crewmen memorialized in stained glass

OFFICE OF THE PRESIDENT • THE KAMAN AIRCRAFT CORPORATION • BLOOMFIELD, CONN.

MEMO TO ROBERT:

I am in receipt of your recent letter in which you say in part:

When I got the pictures that you sent me I was very happy and brought them to school with me and on my way home I had a fight with another kid I put my books and the pictures on the ground and while I was fighting somebody took the pictures. I swear on the Bible that is the truth so could you please send me some more pictures of Kaman Helicopters.

**

Your new set of pictures is on the way. Robert, I hope that as you grow older and become a young man you will keep your interest in helicopters and aviation in general. When you and the boys of your generation take over the responsibility of running our great country, I hope you will find it strong and prosperous. Our National Defense effort right now is dedicated to that purpose, and with boys like you who are willing to fight for what is right, we know that our country will be in safe hands in the future.

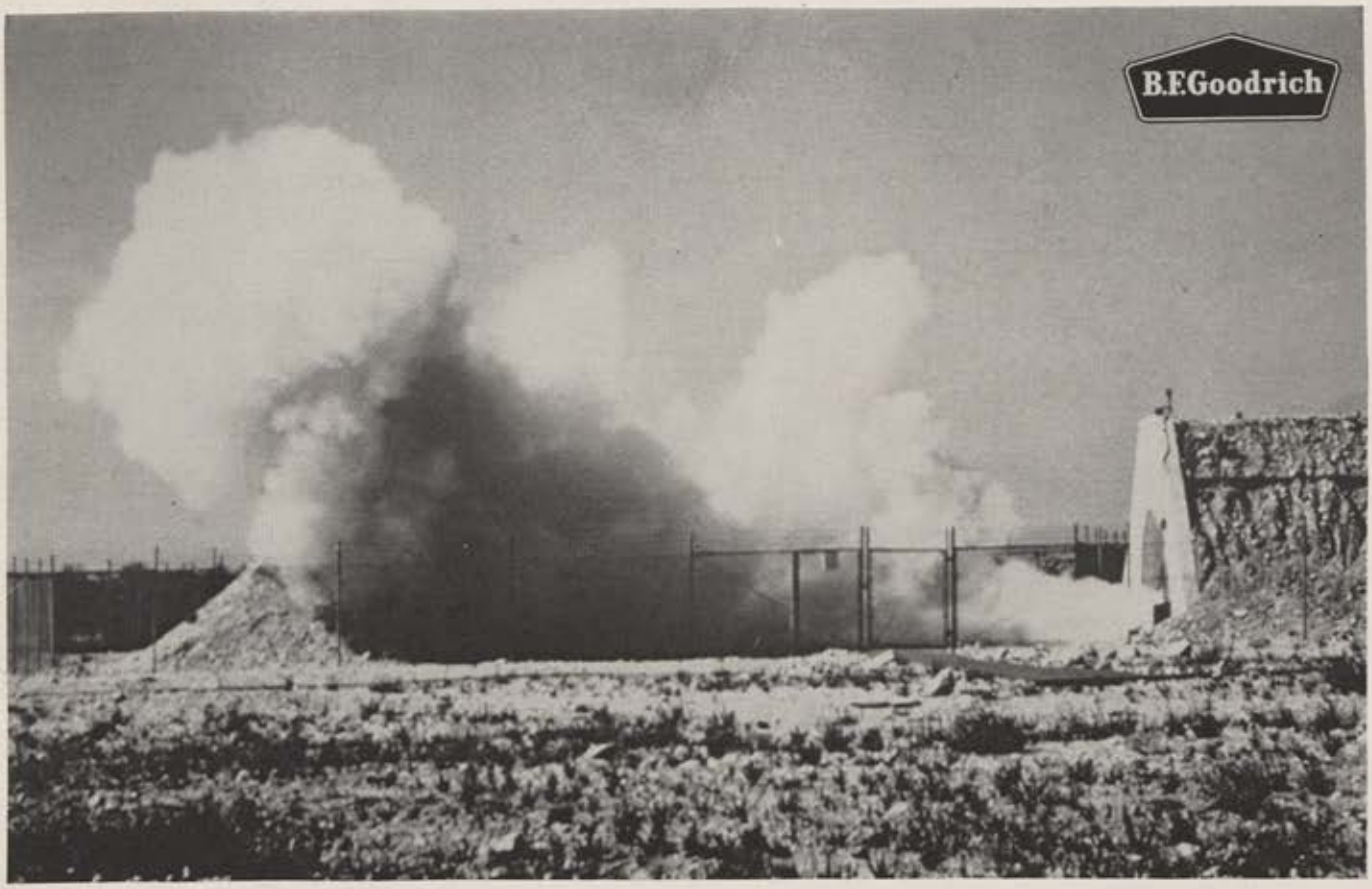
Sincerely,

Charles H Kaman

. . . IN NATIONAL DEFENSE

KAMAN IS PART OF THE PLAN

**Facsimile of actual letter received



B.F. Goodrich producing high-energy solid propellants

This static test tunnel is one of the 56 specialized facilities at the B.F. Goodrich solid propellant plant, Rialto, California. BFG-made propellants are currently being processed and loaded in solid fueled rocket motors of the LOKI, RTV and ASP types.

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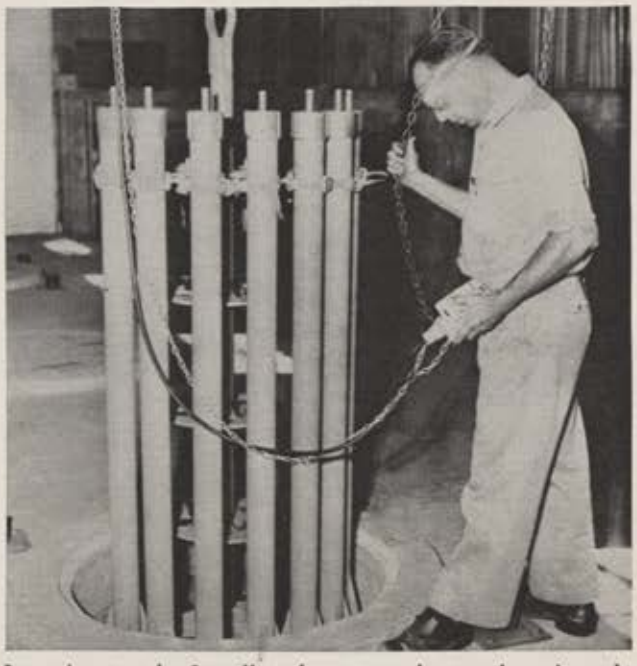
B.F. Goodrich is qualified and equipped to handle complete rocket motor projects... from complete design through testing and shipment. BFG also produces rocket motor cases, case and nozzle liners and other parts in conjunction with complete propulsion systems. Test and production motors containing cast and case-bonded propellant grains in various sizes and weighing up to 2,000 pounds have been successfully manufactured and fired.

For complete information on how BFG solid propellant facilities can help you, write for a copy of the new booklet "B.F. Goodrich Solid Propellants for the Space Age". *B.F. Goodrich Aviation Products, a division of The B.F. Goodrich Company, Department AF-6, Akron, Ohio.*



Lowering a rack of small rocket motors into curing pit at the BFG Rialto plant after propellant has been poured into the cases. B.F. Goodrich has been engaged in composite solid propellant research since 1952—in motor production since 1957.

B.F.Goodrich aviation products

NAVY CORVUS GUIDES TO TARGET

The Corvus missile "steered" past a major milestone when its first guided flight was accomplished last March with complete success. Being developed for the United States Navy by Temco, the Corvus air to surface missile was first successfully air-launched last July. The missile is designed to penetrate heavily defended areas . . . deadly to tough targets ashore or afloat. Corvus, utilizing a pre-packaged liquid engine, is launched from carrier based aircraft.

■ Latest big step toward operational status for the supersonic Corvus missile was its highly successful first guided flight. It was launched from an A3D jet aircraft at a surface target in the sea test area of the Pacific Missile Range. ■ The Navy's continuing high interest in the Corvus was reaffirmed by a recent contract award to Temco for continued development and flight test work. While the Corvus is being developed by Temco for the Navy, the U. S. Air Force has kept the Corvus under close scrutiny since its inception, furthering the policy of inter-service cooperation. ■ Temco has the Prime Weapon System responsibility for development of the Corvus missile. In discharging this responsibility, Temco draws upon the talents and facilities of the entire corporation . . an organization of over 6,000 skilled personnel engaged in the development and manufacture of electronic systems and devices, missiles, airframes and industrial products.

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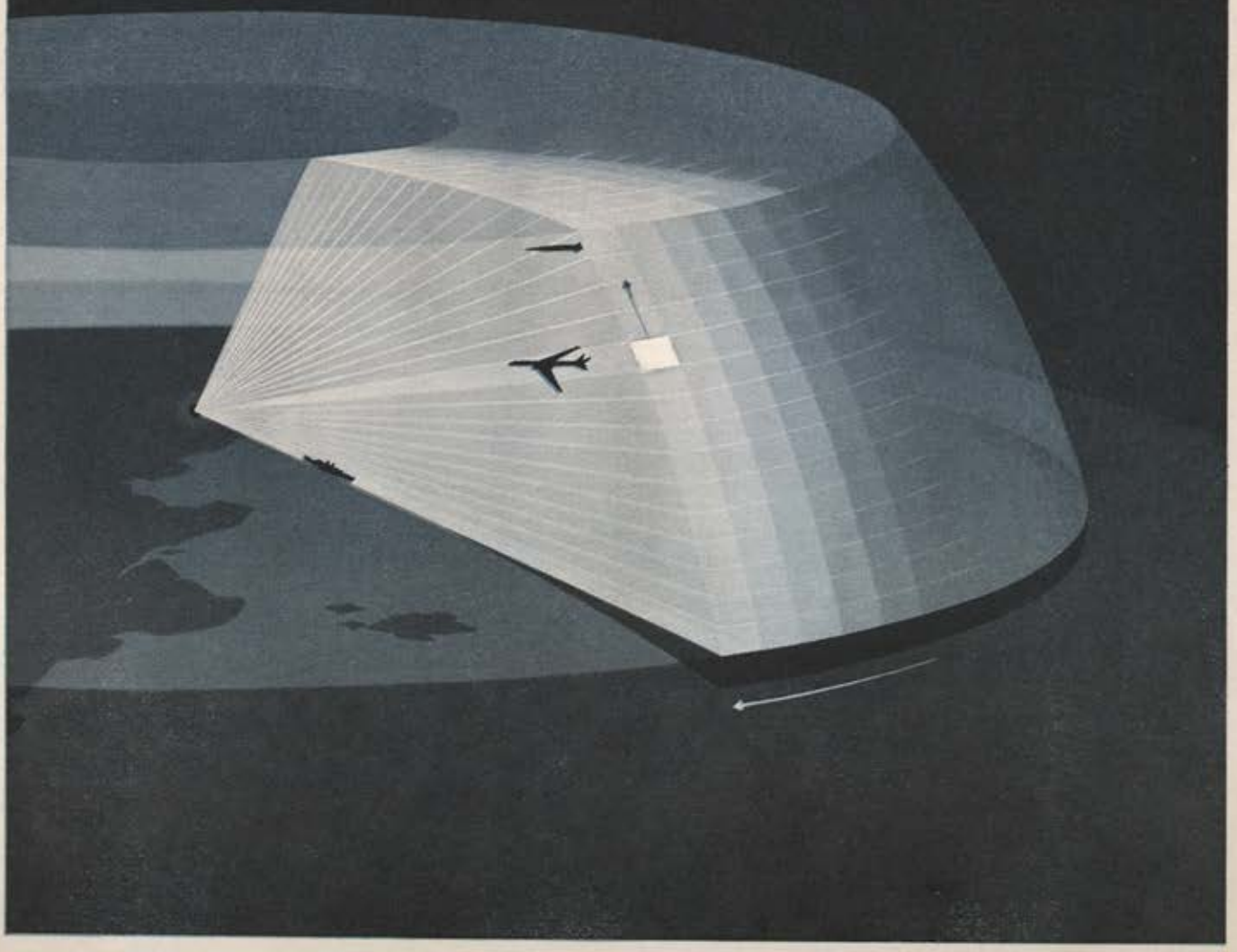

AIR FORCE

THE MAGAZINE OF AEROSPACE POWER

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FEATURES

SPACE DIGEST
Starts on page 69

DEPARTMENTS

The U-2 Incident in Perspective

Surprise vs. Survival

John F. Loosbrock, Editor

HALF a dozen years ago we asked a man, whose judgment on both military and scientific matters we very much respect, the following question:

"If you had $2 billion additional to spend on national security, over and above funds presently available, how would you most profitably spend the money?"

The answer came without hesitation:

"On intelligence. The more we know about the forces we are trying to deter, the cheaper and more effective is our deterrence."

Recalled today, the above dialogue does much to put the U-2 affair into proper perspective.

Warning against surprise attack is the key to the entire deterrent posture of the free world, since it is the key to survival of the retaliatory force. Any one who doubts this should read carefully the special report beginning on page 43. The report is based on a careful analysis of Soviet pronouncements and policy documents. Experts in Soviet military and political doctrine have read it and support its conclusions. The thesis of surprise attack runs through it like a Red thread from beginning to end. It is clear that the ringing down of the Iron Curtain involved far more than the paranoiac reflex of a totalitarian regime. It was an integral part of a calculated plan to attain military, political, and technological superiority, aided by free world confusion, delusion, and misinformation.

The Air Force Association has long recognized Red secrecy as a paramount threat to the peace and security of the free world. As far back as 1953, the AFA Statement of Policy called upon the United States to propose, under the aegis of the United Nations, a declaration of "Freedom of the Air Spaces."

In 1954, AFA's Statement of Policy pointed out that "we cannot accept the possibility of our annihilation by surprise attack. Free-world security demands a vastly improved intelligence system to provide adequate warning of impending Soviet attack, to give defense planners a more factual idea of the form and magnitude of the military threat against which we should build our defenses."

In 1955, President Eisenhower presented his famous "Open-Skies" proposal, which provided for mutual overflights by the US and USSR, with a free exchange of reconnaissance photographs. Russia rejected the plan, of course, because the Soviets had much to lose and little that they could not gain by other means from our open society.

In that year, the Air Force Association again addressed itself to the problem of surprise in a Statement of Policy which said:

"History shows that Communists have no compunction against striking first and without warning. . . . We must convince Soviet Russia that we are willing to take risks for world peace; that a free interchange of information and people among all nations is essential to world security; that the world air spaces must be free to the people of all nations."

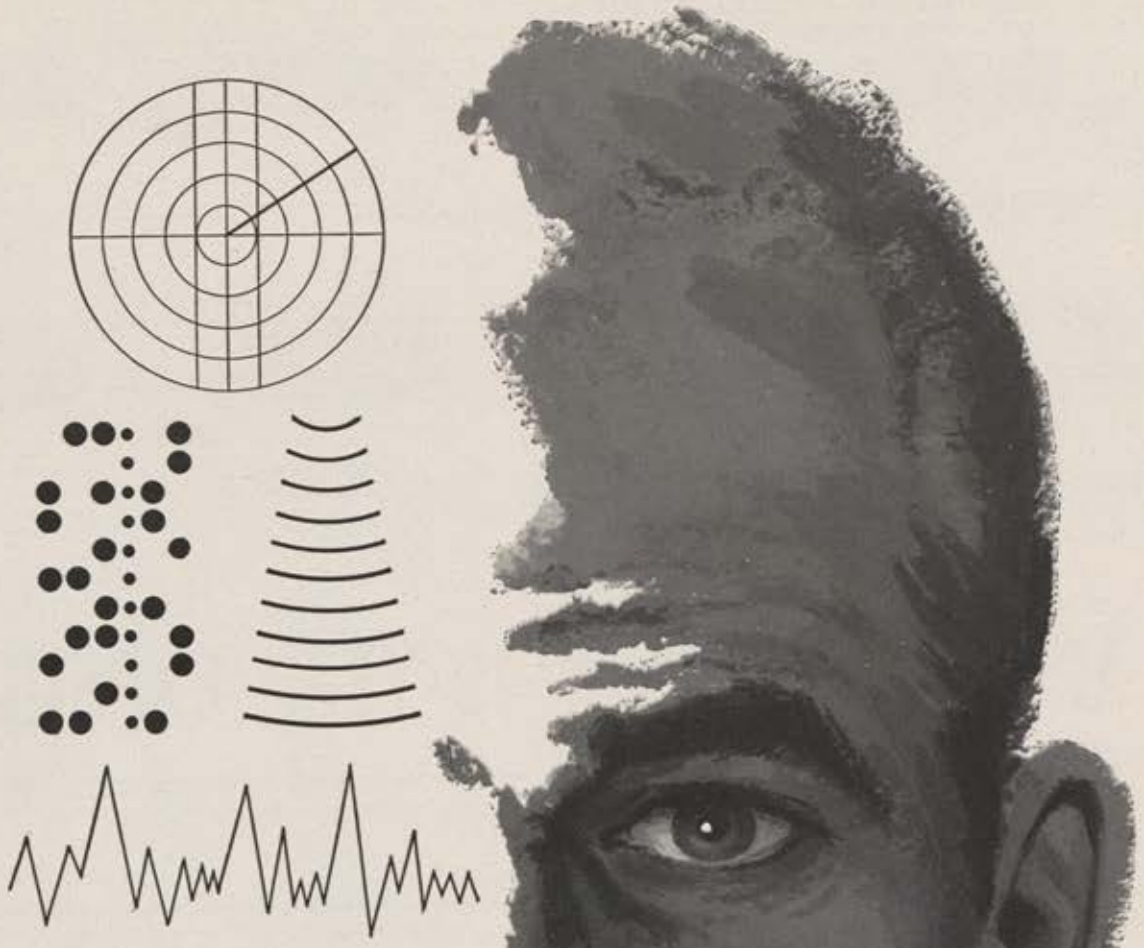
All such attempts at piercing the Iron Curtain to the degree necessary to protect the world against the threat of surprise attack have met with failure. But it should surprise no one that other and less open means have been pursued. Indeed, one salutary effect of the U-2 incident might well be the realization by the American people that this nation has been and must continue to be engaged in such activities. As a people Americans are prone to view the power struggle in which we are so deeply involved as a simple TV western kind of conflict, with the good guys and the bad guys plainly identified and with virtue inevitably triumphant, regardless of what underhanded tactics the villain may pursue. This wasn't really true in Dodge City, and it certainly isn't true in the world of today.

Another lesson we can learn from the U-2 is that we must spare neither time, energy, nor money in devising warning and reconnaissance systems that are free from the taint of clandestinity. As Publisher James H. Straubel pointed out in SPACE DIGEST last March:

"The far side of the earth—not the far side of the moon—represents the immediate and appalling threat to peace and freedom. . . . Our earth-bound and air-bound methods for detecting surprise attack must be continued and improved—but at best these are only expedients. We continue to live under the gun. Only in space—with our new line of sight—can we employ an electronic alarm system to effectively warn against surprise attack. . . . [And] with all the world alerted against aggressive action, the need for huge national attack forces would deteriorate, and voluntary reduction of armaments would be encouraged."

Use of such electronic spaceborne systems as Midas, Samos, and their more sophisticated successors would involve no violation of national air space, and their development must be pursued with every resource at our disposal.

The collapse of the summit conference, which occurred as this was being written, must not be allowed to obscure the basic need for warning against surprise attack, which continues to exist regardless of Soviet intransigence or American vacillation. The fact that the US and the USSR have painted themselves into opposite corners serves to dramatize the fundamental philosophical conflict that continues to divide the world. In assessing its impact, let us not forget that it is tension and conflict which produce U-2s, not the reverse.—END



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April Applause

Gentlemen: We at MITRE read with interest the story on the new Command and Control Development Division of the Air Force which appeared in AIR FORCE/SPACE DIGEST in April of this year.

You undoubtedly know that if we are to perform effectively the tasks to which we have been assigned, it will be necessary for us to acquire the services of many more engineers and scientists. As part of our active search for candidates for employment with our organization, we should like to use your excellent article to help explain the nature of MITRE and its activities. . . .

Dana N. Burdette,
Personnel Director
The MITRE Corporation
Lexington, Mass.

Gentlemen: Congratulations to the Air Force Association for its excellent April issue of AIR FORCE/SPACE DIGEST. Because of its invaluable editorial content and statistical information, we are making certain that all of our field engineers throughout the country receive a copy.

In addition to the many articles containing vital information which will aid our sales force, the missile and space glossary has been neatly filed away for future copy writing reference. The solar system article with statistics has become the textbook for my children's first astronomy lessons at home.

Myra Sparkman,
Advertising Manager
Marman Div., Aeroquip Corporation
Los Angeles, Calif.

Gentlemen: The April issue is a delightful book, well put together and so chock full of information I am sure it will become a standard stock reference until you get the next one out.

My congratulations for a job very well done. . . .

Herbert H. Rosen, Deputy Director
Office of Public Information
NASA
Washington, D.C.

Gentlemen: . . . As Assistant Professor of Physical Science at State College, St. Cloud, Minn., I was particularly interested in the April article "Out From the Sun—The Solar System."

Richard Skinner wrote well, classified well, and your pictures add further interest. Since I am interested in orientating the many college beginners to our space-air age (and incidentally interest some in the Air Force), are reprints of this article available? . . . Perhaps I can persuade our library to add your magazine to its subscriptions if such splendid orientation articles (and over-all explanations as the "Missile and Space Almanac") continue.

Gerald R. Ahlquist
Saint Cloud, Minn.

● *Thanks for the kind words and your interest. Sorry there are no reprints, but you have our permission to reproduce the article yourself.* —THE EDITORS

Trapped by a Deadline

Gentlemen: The article "Wherever Men Fly," which appeared in the March issue of your magazine, was still rolling off the presses when word was received that the Air Rescue Service would be permitted to retain twenty of our famous SA-16 Albatrosses. As a result, the SC-54 Rescuemaster will not be the only aircraft in our inventory. Thus, even before it could reach your readers, the article was in error and nothing could be done about it. I am aware that this "time trap" has been the bugaboo of editors since before Gutenberg invented type. My only regret is that my brief dissertation on ARS was snared in it.

At present writing it is planned to locate the SA-16s in Libya, Scotland, the United States, and at appropriate locations in the Pacific to carry out Rescue's newly assigned recovery responsibilities in support of Air Force aerospace operations.

Brig. Gen. Joseph A. Cunningham
Commander, Air Rescue Service

For Better Public Relations

Gentlemen: I believe wholeheartedly in the Air Force Association. Unfortunately, my duties cause me to travel continually, to the neglect of many personal affairs. Your publication has proven very valuable to me in my business, which involves public relations. In speeches I have quoted several editorial excerpts from AIR FORCE/SPACE DIGEST which often supports the importance of bettering public relations in the light of the civil defense role and a unified front. . . .

CWO Eugene F. Rosheger
McGuire AFB, N.J.

Gentlemen: It is inconceivable that such a fine magazine should print such matter as "Heroes Made to Order," by Gerald A. Harty [March issue], and spread to the general populace the idea that people wearing ribbons got them the easy way. I would like to ask the author how many ribbons he was awarded on the merits set forth in his article?

The writer gives the impression that awards are won with words. I wear only six ribbons, and they came the hard way. However, I can't speak for the ones he evidently wears. I would imagine most awards are not won with fancy words but with down-to-earth devotion to duty and hard work. I doubt that Longlip was within a mile of an individual to be decorated; however, he seems to think or know people are unworthy of them.

I have no subscription to your magazine at this time and will "free-lance" my copies till I'm assured the articles presented to me in a publication dedicated toward the Air Force and airpower have no discriminatory remarks like I have just read.

Should Mr. Harty desire to meet an individual who earned his ribbons and is proud to wear them with the Air Force blue, then give him my regards and address.

I still recommend the magazine minus that one article!

S/Sgt. James L. Baldridge
APO, San Francisco, Calif.

● *Reader Baldridge's sense of humor must have done him wrong this once. Mr. Harty's article was clearly a spoof and created quite a few chuckles among readers—along with thoughts that it doubtless had some basis in fact. For more of Mr. Harty's light touch, see page 123.*—THE EDITORS

(Continued on following page)

POW Search

Gentlemen: I am assisting in the preparation of the English language version of a book about Hungarian aviation, with the emphasis on both World Wars. One chapter deals with the treatment of captured Allied air personnel, written by 1st Lt. Imre Nyiradi-Szabo, who was head of the POW administration section. Some of the ex-prisoners are mentioned by name, but apart from that there is no other information available, except that they all belonged to the Fifteenth US Air Force, an integral part of the Mediterranean Allied Strategic Air Forces, based around Foggia, Southern Italy, in 1944. We would like to contact these men to obtain further information.

We need information on any associations of ex-Air Force POWs or clubs formed by members of units which served under the Fifteenth Air Force, their periodicals and reunions, if any.

We would also like to contact the following men:

Maj. Neil Lamont, CO of a fighter squadron. Downed over the Szolnok-Szeged sector in the summer of 1944. Apart from his rank and position, Major Lamont should not be too difficult to locate since only two fighter wings (305th and 306th) were operating with this force, to my knowledge.

Capt. John Dickey, probably one of a Liberator crew, shot down in May or June 1944.

1st Lt. MacGee (or McGee), same as above.

1st Lt. F. Thompson, same as above.

1st Lt. F. D. Newman, probably one of a Liberator crew, shot down near Budapest in early fall of 1944.

S/Sgt. Segall, Liberator gunner, shot down over Debrecen on July 2, 1944.

1st Lt. G. Thomas, probably one of a Liberator crew, shot down over Transdanubia in late summer 1944.

Sgt. Jack Lepoutre, gunner of bomber aircraft downed during summer 1944.

Sgt. J. B. Coleman, same as above.

Let me remark that perhaps Hungary was the only participating nation of WW II which observed the rules of the Geneva Conventions, and in accordance the prisoners received the fairest treatment. Otherwise, we would not be so anxious to contact them.

Julius R. Gaal
21 Carrington Street
Granville (Sydney)
N. S. W., Australia

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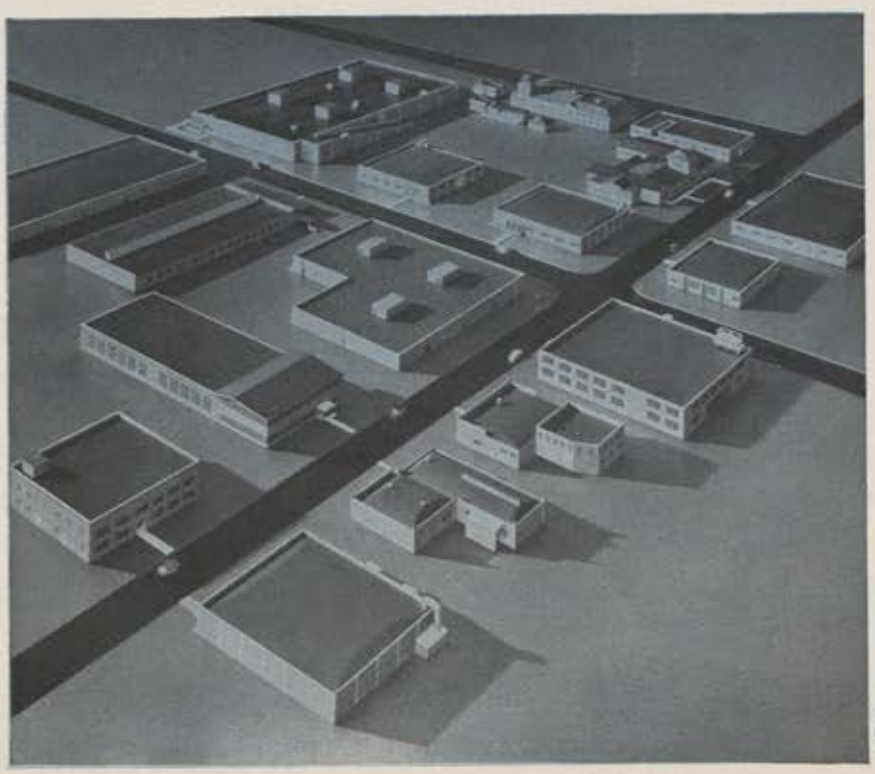
Shown below is a composite view of Librascope's facilities where a variety of computer systems are currently in different stages of design and production. Some are strategically involved with national defense...others deal with business and industrial process control. Each is uniquely designed to answer a particular need. The success of these systems illustrates the value of Librascope's engineering philosophy: A decentralized organization of specialized project teams responsible for assignments from concept to delivery...and backed up by excellent research, service, and production facilities. For your computer requirements, call on the company whose breadth of diversification in computer technology is unsurpassed. ■ Librascope Division, General Precision, Inc., 808 Western Avenue, Glendale, Calif. For career opportunities write to John Schmidt, Engineering Employment. ■

computers that pace man's expanding mind



TO REACH THE MOON... MEN AT WORK

These men are ARMA researchers. They are putting to use a three-dimensional Trajectory Analyzer, designed and produced by them to provide simple, visual understanding of the complexities involved in guiding missiles to interplanetary bodies.

Today they use it in their studies of trajectory kinematics and missile guidance in lunar orbits. Sometime soon they will employ it to study travel to other bodies.

The Trajectory Analyzer—with which the trajectory of any computer-simulated or real missile can quickly be plotted *in grease pencil*—demonstrates the ingenuity and analytical ability of ARMA's imaginative research staff, creators of the Atlas ICBM inertial guidance system. Their experience and performance are unequalled in the broad field of space navigation.

ARMA, because of its *people*, will find many of the answers in astronautics. ARMA, Garden City, N.Y., a division of American Bosch Arma Corporation . . . the future is our business.

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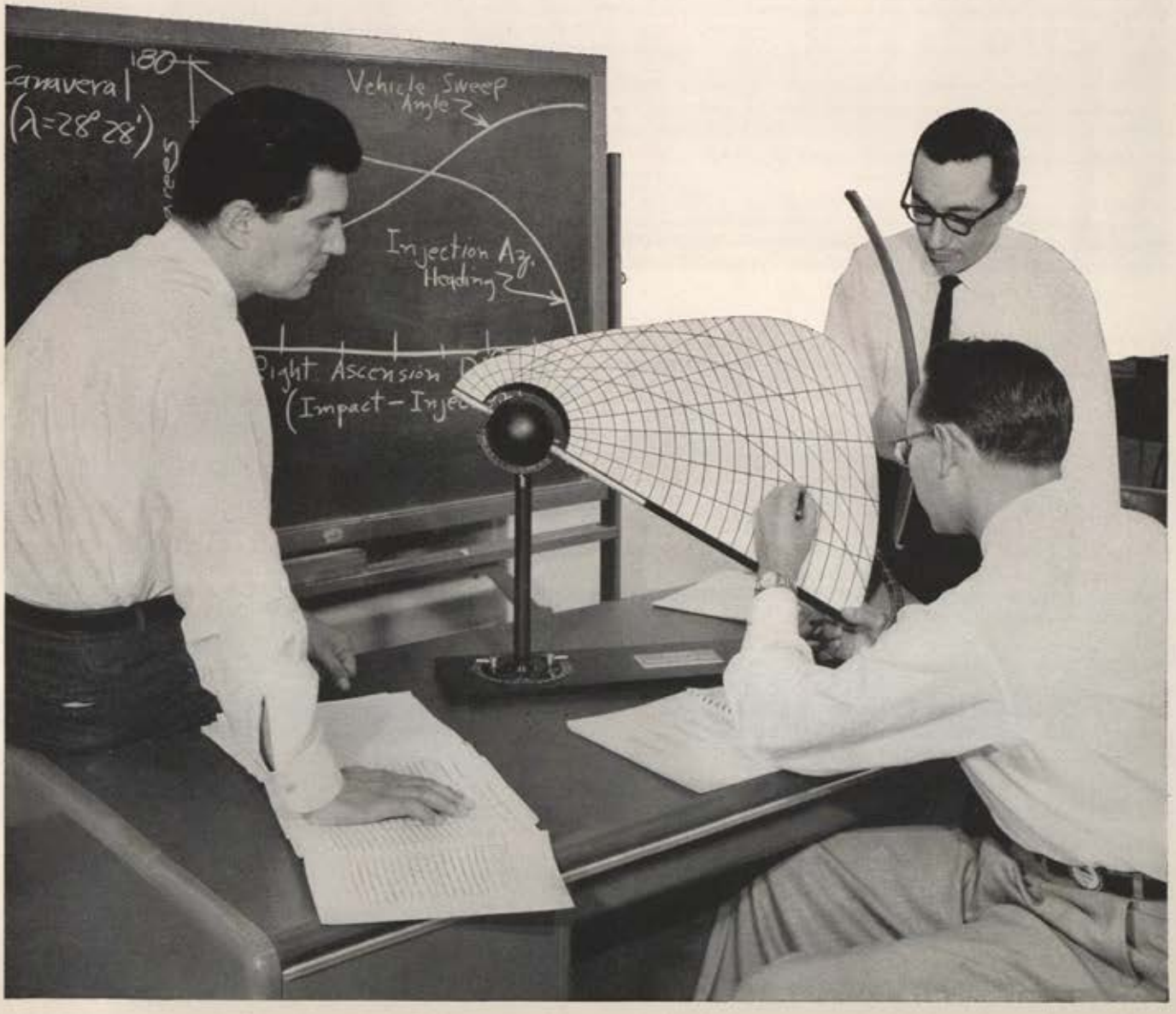


AIRPOWER in the news

Claude Witze
SENIOR EDITOR

On the Record

WASHINGTON, D. C.

The season for congressional investigations is waning in early May, and published transcripts are being sent down from Capitol Hill, each with little nuggets of information that are interesting or important or both. A great many of the nuggets never come to the attention of the public. The transcripts are of both public and executive sessions. In the latter case they have been purified before printing by the elimination of classified material, a chore that is left to the security-review authorities in the Pentagon in matters that concern the Department of Defense. Little dashes mar the pages in these cases, where significant figures have been eliminated. In addition, there are places where the testimony went entirely off the record, and the stenotypist sat silently by his machine until ordered to resume.

Transcripts are published in paper-bound books that can vary from barely a hundred pages to nearly two thousand. Hearings of House committees are bound in brown paper, those of the Senate in green. There are times, as in the case of this year's hearings on the fiscal 1961 budget before the House Subcommittee on Defense Appropriations, when the transcript is broken into several volumes. Thus the House group, headed by Rep. George H. Mahon, D.-Tex., has put out at least eight books, including a special edition devoted to USAF's recent reshuffle of the air defense program. Almost all of the Mahon group's meetings are in closed session. The transcript is a nearly interminable list of questions and answers, interspersed by formal prepared statements defending some columnar portion of the budget. The gems of information prove to be elusive because they are in the question-and-answer portion of the hearing, and it takes an industrious reporter, by Washington standards, to ferret them out. It takes both ambition and time to comb the books thoroughly. There is an index to most hearings volumes, but it is not adequate and provides only a broad lead to the subjects discussed.

With hard work it is possible to learn such diverse information as that the Marines bought a mechanized vehicle called Ontos despite the fact that it was not an ideal weapon, and how much the Air Force pays for diaper service in its hospitals. There are other things of greater significance. For example, the Navy's Deputy Chief of Operations for Development, Vice Adm. J. T. Hayward, gave the Mahon committee some details about the new Missileer aircraft program. The plane has not been chosen, but it will be a subsonic carrier-operated interceptor, armed with an air-to-air missile called the Eagle. To put the two systems into operational use, the Admiral said, it will cost $3.4 billion. The purpose of the system is to protect Navy carriers. How? With a constant airborne alert, day and night, the planes flying a four- to six-hour cycle.

There are times when the things which go on the record in hearings before two or more committees complement each other. It is one of the weaknesses of day-to-day press coverage that this dovetailing of information usually is overlooked. One case involves appearances of the Navy's provocative Vice Adm. Hyman G. Rickover before the Mahon committee and, on the Senate side, before a joint session of the Armed Services Subcommittee on Preparedness and the Committee on Aeronautical and Space Sciences. About the time these transcripts were made public Sen. Henry M. Jackson, D.-Wash., who has been performing a relatively unsung service for the country this spring, continued his probe into national policy machinery. Mr. Jackson heads a subcommittee of the Senate Committee on Government Operations that is making a study of our policy and how it is determined. He recognizes that "human talent is our most precious resource," and "poor people will defeat the best organization." Admiral Rickover, by chance, knows this too, and he can show how vital that talent is in the technological war.

Turn first to the Senate preparedness inquiry, where the Admiral put it in the record that freedom, which had been growing for 400 years, now is decreasing—and rapidly. The Communists, he said, are the ones who are winning, and

Vice Admiral Hyman G. Rickover: He wants a climate in which capable people are able to work unbothered.

we are not. One of the reasons we are losing, the Admiral indicated, is that people who have jobs to do are handicapped by administrative types all over their backs. "What can be done about it?" the counsel asked. Then:

ADMIRAL RICKOVER: I don't think I could do the *Nautilus* again in the present atmosphere.

COUNSEL: Sir?

ADMIRAL RICKOVER: I don't think with the present climate, the way it has changed in the past ten or twelve years, I could develop the *Nautilus* again. *Now that is a statement for you to ponder.* (Italics added.)

(Continued on following page)

Robert C. Sprague, a witness, with Senators Stennis, Muskie, and Jackson. The committee is finding that *people* are important, that decisions cannot be made by administrators who lack familiarity with the areas in which they work.

And in pondering, one might recall that Dr. Simon Ramo recently made the same kind of statement regarding the development of Atlas.

Other Rickoverisms:

"In the broad sense it is not the legislative branch that is responsible for our shortcomings; it is the executive branch. The executive branch must see to it that the senior administrative people in the technical departments really understand the jobs they are supervising. . . .

"Yes, sir, our lead times are increasing; theirs are decreasing . . . everybody says 'get good men.' But good men aren't available; good men already have good jobs; all you can do is recruit potentially good youngsters and spend a great deal of time and effort educating and training them.

"This is what I did. I recruit the two to three percent of the best youngsters from the best schools in this country. I train them. I have them work in an atmosphere where they are surrounded by other people who are dedicated. It is the most gratifying thing to see how these youngsters become devoted to their jobs, how they work day and night, how they forget about their pay and simply do the job.

"There are many youngsters in this country who would thrive in that sort of environment, if given a chance.

"But what happens? In most of the agencies the young men are set to doing routine administrative paperwork, to writing reports, to justifying, and they soon become hacks."

One way to remedy this situation, the Admiral says, would be to fire twenty or thirty percent of the people in the Defense Department, and he did not mean people in uniform. He meant Defense Department headquarters, which he looks upon as the fifth service, after Army, Navy, Air Force, and Marines.

For a continuation of this theme at a level where the digging is into the roots, you can turn to Senator Jackson's effort. One of his recent witnesses was Dr. James A. Perkins, vice president of the Carnegie Corporation and once a member of the Gaither Committee, whose gloomy report has never been made public by the White House. Dr. Perkins allowed that technology has conquered "the three historical barriers to the application of force—namely, the barriers of power, distance, and time." This is a look toward the true conquest of space, where the cost of programs has increased from thousands to billions of dollars. In this extravagant area, Dr. Perkins said, the programs are subject to a "high-level policy decision. Thus, the process itself has forced research projects up to the level of high administrative concern."

And who makes these decisions? Not the experts, says Dr. Perkins. He points out, for example, that foreign policy and military policy are tied closely together, but "if the military component is a decisive ingredient, there are few visible indications that the State Department has taken appropriate steps to develop the necessary internal expertise." He suggests, in fact, that the State Department should have an Assistant Secretary for Military Affairs as a counterpart to the existing Secretary of Defense for International Security Affairs. He urges military briefings for State Department officials and their attendance at the National War College. It is equally clear that Dr. Perkins agrees with Admiral Rickover about the level of competence commonly displayed among civilian political appointees. He paid a compliment, for example, to Defense Secretary Thomas Gates by citing him as "a happy reversion to the tradition of Forrestal, Marshall, and Lovett, which assumed that some prior experience would be useful."

On cross-examination, the witness appeared to agree with an observation of Senator Jackson that there may be more peril to the nation in having the Pentagon run by ill-informed civilians than there would be in control by a military staff, a thought that usually is regarded with a shudder. Dr. Perkins put the matter succinctly: "The paper power of the Secretary of Defense frequently has exceeded the competence of the men in the office." On lower levels, he said it was his experience that some appointed executives come to coordination meetings without sound information out of their own departments, much less any familiarity with others. He would not, in short, expect a sound decision on some issue of vital importance to a man like Admiral Rickover to come from a man like Charles E. Wilson. Actually, he pointed out, decisions merely are not made at all. As if to bear him out in his contrasting reference to Mr. Gates, the present incumbent, it is now reliably reported that the newest Defense Secretary "has galvanized the decision-making process . . . by the simple expedient of making decisions."

There is no doubt that Dr. Perkins could borrow the Rickover language. If he did he would call on the executive branch to make sure supervisors understand the job they are supervising, a step that would end Admiral Rickover's endless belt of reports, justifications, and explanations. It could be that the Jackson committee, if it sticks to its last and retains the priceless ingredient of its dispassionate approach, can come up with a report that will do some good. It would be a report making it possible for *some* Rickover in *some* branch of the armed forces to build a *Nautilus* again. We need more of them, up in space, under the sea, and wherever else free men are threatened.

Congress and the Deterrent Gap

In early May, as the House debated the fiscal 1961 defense appropriation, Russian rocketeers shot down an American U-2 reconnaissance plane deep in Soviet air space. A few days earlier, a Russian "fishing boat" had been pictured in all our newspapers, keeping an eye on our Navy's nuclear submarine activity off the New England coast.

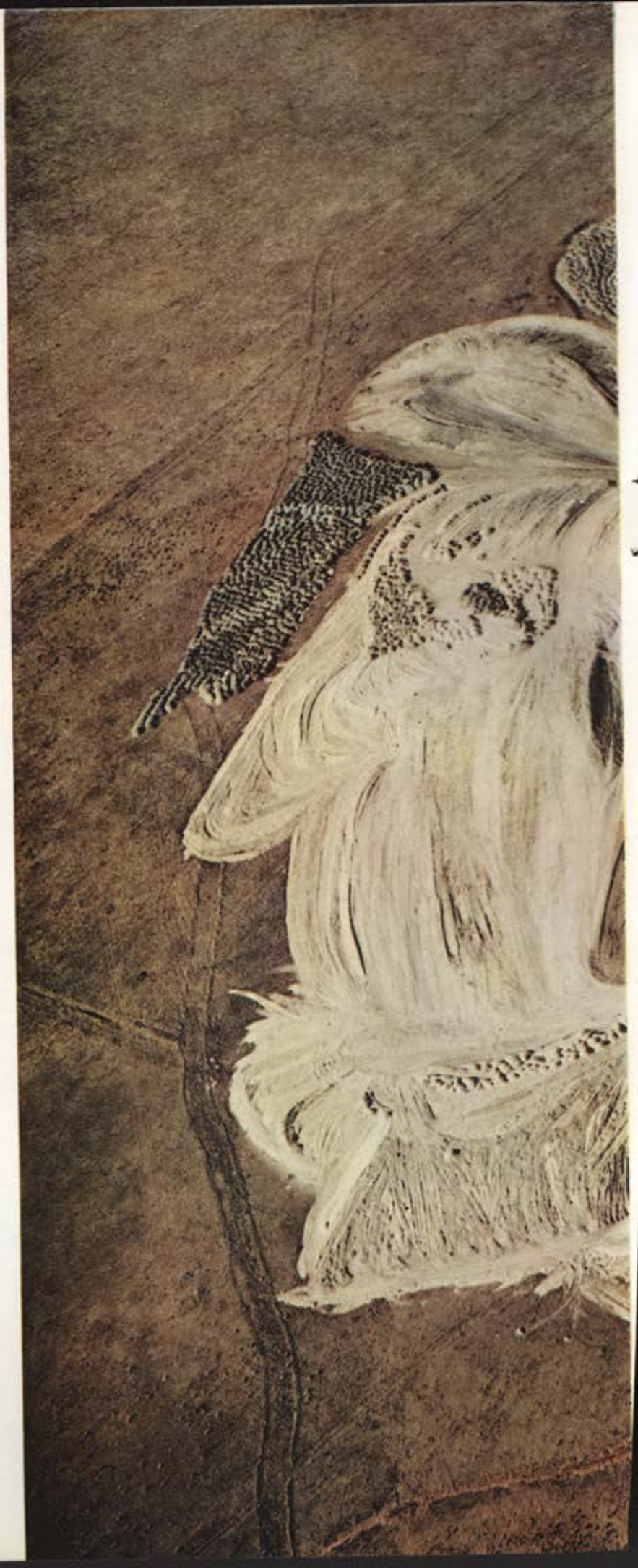
Now, if the proverbial man from Mars had landed on earth at about this time, he might have gotten the impression from these two latter events that there was some measure of tension between the US and Russia.

But some of our legislators, apparently with a surer grasp of the situation than nature would give to a Martian, saw things differently. Some of their remarks in the debate were startling. For example, even as the first reports of the U-2

(Continued on page 21)


PRACTICAL ANSWER
TO SMALL
WAR CONTROL
The Tactical Air Command (TAC) is the practical air arm of the U. S. Air Force.
TAC's all-weather mission capabilities start from the ground up. So do the capabilities of the aircraft it flies: Republic's F-105 Thunderchief. ➤➤ TAC teams up with our Army's tactical ground forces to assure terrain control. TAC helps assure this by giving close support to these ground forces . . . by becoming an umbrella which helps deter aggressor efforts, pinpoint aggressor targets, prevent aggressor action. TAC and the F-105, in addition to versatility, offer extremely important economy factors: economy of force, personnel and the defense dollar: one aircraft capable of multi-purpose performance missions.
REPUBLIC AVIATION
FARMINGDALE, LONG ISLAND, N. Y.
Designers and Builders of the Incomparable
THUNDER-CRAFT
USA
TACTICAL AIR COMMAND

At 00h00m01s GMT, May 1, 1960, Martin logged its 523,692,000th mile of space flight



ICBM HARD BASE:

This mammoth excavation, somewhere in the United States, will soon be a "hard base"—an almost invulnerable underground launch site for the Air Force TITAN Intercontinental Ballistic Missile.

It is an important element in the United States Air Force Strategic Air Command's mission—to prevent war.

The job of this TITAN hard base—and the others like it—is to insure that we will have such devastating retaliatory power, even under concentrated nuclear attack, that no enemy will consider war.

Bases such as this cannot be built overnight. It is a credit to the foresight of our military planners that the bases will be operational concurrent with the TITAN ICBMs now in production at Martin-Denver and undergoing advanced tests at Cape Canaveral.

MARTIN

Advanced hot gas systems delivered by AiResearch

FOR OUTER SPACE, ATMOSPHERIC AND UNDERWATER STEERING

AiResearch is now in production on two greatly simplified hot gas steering control systems: a reaction control system for outer space flight stabilization and a hot gas actuator control system for terrestrial steering (in the atmosphere and under water).

Both systems eliminate any need for pumps, heat exchangers, accumulators and other apparatus required in earlier control systems. And both systems utilize hot gas, operating off either the main engine or a separate fuel source.

The gas in the outer space reaction control system is fed into a set of nozzles which imparts spin to the missile to stabilize its flight through space.

In the terrestrial hot gas actuator control system the gas is fed into an on-off controlled linear actuator which moves the fins controlling the missile's attitude in the atmosphere or under water. This system also utilizes a concept developed from the AiResearch hydraulic "printed circuit." This approach eliminates complicated plumbing, thereby decreasing the weight and increasing the reliability of the system.

AiResearch is a pioneer, leading developer and manufacturer of hot gas systems and other nonpropulsive power systems for atmospheric, underwater and outer space missions. Your inquiries are invited.

THE GARRETT CORPORATION

AiResearch Manufacturing Divisions

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Systems, Packages and Components for: AIRCRAFT, MISSILE, ELECTRONIC, NUCLEAR AND INDUSTRIAL APPLICATIONS

plane incident reached print, one congressman, Rep. George H. Mahon, D.-Tex., chairman of the House Subcommittee on Defense Appropriations, was speaking out for the minimum deterrent. Pictures of the Red fishing vessel were in the paper, and the U-2 was already missing when Mr. Mahon told the lower chamber there will be no deterrent gap in the next three years. A moment later he said:

"If there is no deterrent gap and if one does not develop, those who study the record will give Congress important credit for this achievement."

Also: "If war is prevented, then the decisions which have been made against a crash Atlas program to prevent the missile gap will have been wise. If war should not be deterred and if war comes in the early 1960s, then the decisions will have proved to be unwise. Only history can answer the question with complete finality."

One listener pointed out that he is glad his doctor doesn't take this viewpoint in professional practice. But there are members of Congress who favor it. One of them is Rep. Jamie L. Whitten, D.-Miss., who gets so excited about the hunt for military waste that he gets his airplanes mixed up. In the debate he said Defense Secretary Wilson came and asked for money to buy more B-36 bombers because a bunch of scaredy-cats said the Soviets were building a lot of bombers. "Now it is agreed Russia never had them," he said, "and our B-36 has gone the way of the horse and buggy." Well, Secretary Wilson never sought money to buy B-36s in the first place. He did seek money to bolster the B-52 power of SAC, and the free world should be grateful. As for the B-36, it is gone, but it held the peace for many years without ever going on a mission in anger. It was a bargain, and so is the B-52.

In all, the House at this writing has added $121.9 million to what the President asked for to support the defense effort. The Bomarc-B missile for air defense lost $294 million, and the requested aircraft carrier was killed, saving another $293 million. The Polaris submarine project got an additional $241 million, and Minuteman was upped $20.7 million. The fund to prepare for an airborne alert was increased from $85 million to $200 million. Antisubmarine warfare got a boost of $321 million, and $250 million was provided to start real modernization of the Military Air Transport Service. There were other changes involving more interceptors, better Army equipment, and a little more sustenance for the satellites. Funds were cut where the committee thinks more procurement savings are possible, and Defense Department civilian payrolls pushed down ten percent.

It should not go unrecorded that the determined if mistaken Rep. Alfred E. Santangelo, a Democrat from Manhattan, made another attempt to annoy the defense industry. He offered an amendment that would have forbidden payment of funds to contractors who employ as salesmen retired officers who have been out of uniform less than two years. When he tried this a year ago the figure was five years, and he lost by a single vote. This time the record shows: ayes fifty-three and noes eighty-nine. If this proves anything it must be that the Hébert subcommittee hearings of last summer did some good even if Mr. Santangelo and a few others are unhappy. After all, he had his turn on the witness stand, and his colleagues have read the record.—END

AFA Returns to WONDERFUL

FOR ITS 1960 CONVENTION

SEPTEMBER 21 • 22 • 23 • 24 • 25

This is world-famous Fisherman's Wharf, a fine place to partake of some of the finest seafood to be found anywhere.

Ever ride a cable car? You will have many opportunities during the AFA Convention.

Picturesque Cliff House, overlooking Seal Rock and the blue Pacific—a wonderful place to refresh and enjoy the sunset.

San Francisco's Chinatown, a must on your schedule.

SAN FRANCISCO
AND AEROSPACE PANORAMA
REGISTER NOW!

AFA's National Convention and Aerospace Panorama return to San Francisco this year. As in the past, the Association's 1960 gathering will feature addresses of national significance by military and technical leaders from throughout the free world. The Panorama will present the largest display of aerospace weaponry and equipment ever brought together. Attendance at the Convention's social events, held in an informal, relaxed atmosphere, will read like a Who's Who in the aerospace world. In addition, Convention planners have attempted to set aside considerable free time for delegates and guests to relax and enjoy the remarkable city by the Golden Gate. This year, you should be able to attend all Convention events, visit the Panorama, and still see the sights. AFA gathered in San Francisco once previously, in 1955. It was a highly productive Convention—one fondly recalled by everyone who attended. This year's event will prove even more memorable.

THE PROGRAM

• WEDNESDAY, SEPTEMBER 21:

2:00 PM AFA Directors' Meeting
7:30 PM AFA Leaders' Meeting

• THURSDAY, SEPTEMBER 22:

9:00 AM USAF Command Briefing
9:00 AM Reserve Forces Seminar
11:00 AM USAF Command Briefing
12:30 PM Aerospace Luncheon
3:00 PM USAF Command Briefing
3:00 PM 1st AFA Business Session
5:00 PM USAF Command Briefing
7:00 PM Panorama Preview Reception

• FRIDAY, SEPTEMBER 23:

9:00 AM 2d AFA Business Session
9:00 AM Air Force Procurement Seminar
12:00 N Buffet Luncheon
12:00 N Panorama Open
2:00 PM USAF Command Briefing
3:00 PM 3d AFA Business Session
4:00 PM USAF Command Briefing
7:45 PM Awards Banquet

• SATURDAY, SEPTEMBER 24:

9:00 AM Annual Symposium
12:00 N Panorama Open
6:00 PM Nob Hill Reunion Party
9:30 PM Golden Gate Reunion Ball

• SUNDAY, SEPTEMBER 25:

12:00 N Panorama Open to Public

Everyone is requested to register IN ADVANCE. Credentials will be required to attend meetings and the Panorama during "closed" periods. Due to the heavy registration expected for AFA's 1960 Convention and Panorama, separate tickets may not be available to the BASIC REGISTRANTS.

Complete, Attach Payment, and Mail to AFA, Mills Bldg., Washington 6, D. C.

ADVANCE REGISTRATION FORM FOR AFA'S 1960 CONVENTION

NAME ..... RANK, IF MILITARY .....

TITLE .....

AFFILIATION .....

ADDRESS .....

CITY & STATE .....

Check ONE of the categories with which you wish to be identified:

☐ GOVERNMENT ☐ INDUSTRY ☐ AIR FORCE ASSOCIATION
☐ EDUCATION ☐ MILITARY ☐ PRESS-RADIO-TV

Check the type of registration desired, attach payment, and mail to:

AFA • 324 MILLS BUILDING • WASHINGTON 6, D. C.

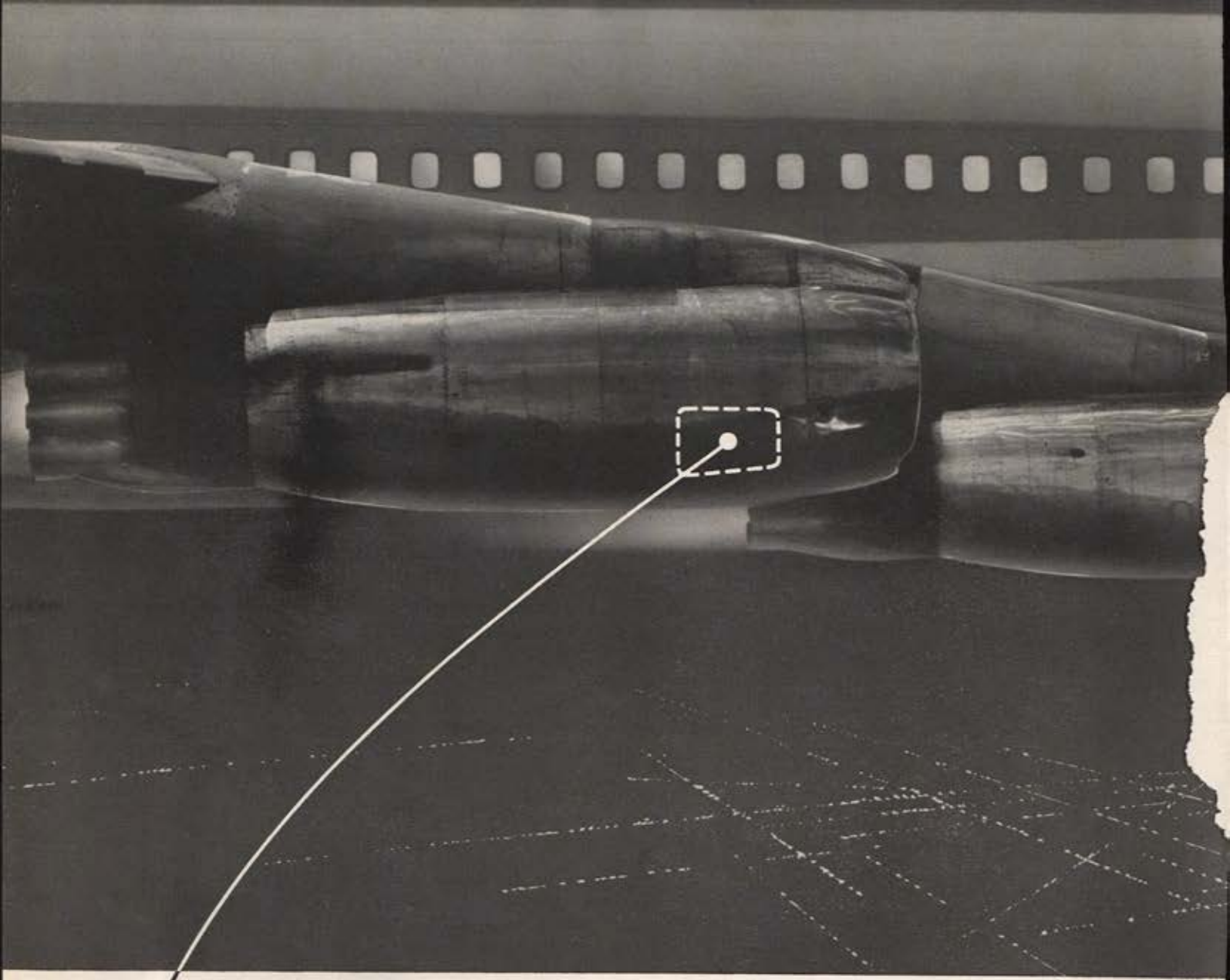
☐ **INDUSTRY REGISTRATION** **$30.00**
(Includes tickets and credentials to all Convention events)

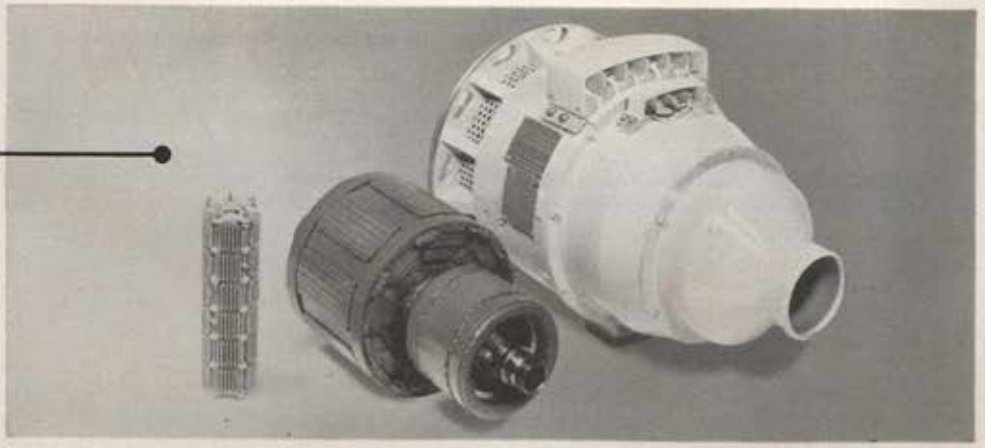
☐ **REGULAR REGISTRATION** **$25.00**
(Includes tickets and credentials to all Convention events except Buffet Luncheon)

☐ **BASIC REGISTRATION** ..... **$ 7.00**
(Includes credentials, meetings, Panorama Reception, but not tickets to any of the other Convention events)

6-60

SEE PAGE 129 FOR HOTEL INFORMATION





GREAT RELIABILITY and longer service life result from elimination of sliding or moving contacts in Westinghouse brushless generating systems. A single rectifier bundle (left above) mounted within the rotor assembly (center) eliminates commutators, carbon brushes, and collector rings. High temperature silicon diodes, produced by Westinghouse research in semiconductors, make this possible.

Wherever they fly

Westinghouse Brushless Generators set amazing reliability records

Wherever they fly—in giant 707 commercial jet airliners, in supersonic jet bombers or sleek, lightweight jet trainers—Westinghouse brushless generators and complete electrical systems are setting unmatched records of dependability.

For example: In one airline's fleet of 707s, Westinghouse 30 KVA brushless AC generators, at the end of 1959, had accumulated 2970 hours mean time between removal. This is 3 to 5 times better than the service given by ordinary brush type generators.

On the same fleet of 707 aircraft, Westinghouse voltage regulators, designed with static components, have attained a reliability factor of 12,780 hours; control panels, with static circuitry, 6085 hours.

Behind this remarkable, trouble-free generator performance is the advanced Westinghouse *brushless* design, which features a rectifier assembly of high-temperature silicon diodes instead of the usual brushes, commutator and slip rings.

Write for complete information on these brushless generators and equipment, and advanced new constant frequency devices now in development. A. L. Paquette, Marketing Manager, Aircraft Equipment Department, P. O. Box 989, Westinghouse Electric Corporation, Lima, Ohio.

WESTINGHOUSE
DEFENSE PRODUCTS GROUP

PROVED IN SERVICE—Westinghouse brushless AC generators are produced for commercial jet airliners, and military aircraft such as the coming Boeing B-52H, Convair B-58, North American A3J-1, and Northrop T-38. Sizes range from 8 KVA to 120 KVA—the world's largest aircraft generator—and both air cooled and oil cooled types are built. Many thousands of hours of trouble-free flight prove dependability of Westinghouse electrical systems.

J-02315

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.

Russia, too, is developing a Dyna-Soar—a boost-glide, edge-of-space, manned test vehicle. Work is understood under way on this project at the Russian missile center of Kapustin Yar, seventy-five miles southeast of Stalingrad in the Caspian Sea region. Some early models are known to have been constructed, but there is no indication of whether the Soviets are ahead of or behind us on this one.

USAF gave Boeing the go-ahead early in May to construct eleven Dyna-Soar vehicles. A budgetary holdup had delayed Dyna-Soar development recently. The hope in this country is to launch its first Dyna-Soar, which will be boosted by a Martin Titan ICBM, late in 1964.

° ° °

Red Chinese air routes have been lengthened by more than three hundred percent in the last ten years. More than eighty Chinese cities now are linked by air.

The Red Chinese do not yet operate pure jet aircraft commercially, but the Russians run TU-104s into Peiping on flights that originate in Moscow. The Chinese are scheduled to receive Soviet-made IL-18 turboprop transports this year. The Red Chinese have developed their own twin-engine piston transport, the Peking I. It is about the size of a DC-3.

° ° °

Who was first, an American or a Russian, to discover that the earth is surrounded by belts of radiation?

The radiation layers often are called the Van Allen radiation belts in honor of a University of Iowa scientist who discovered them from data gained by Vanguard I and other US satellites. Actually, a Soviet scientist, S. N. Vernov, who recently visited the US, is believed to have come upon evidence of the radiation belts before Dr. Van Allen as a result of data he got from the first two Soviet space vehicles.

But the Soviet scientist did not interpret the data in the same way as his American counterpart, and so Dr. Van Allen came up with the radiation belt idea ahead of the Russian.

The Russians have said privately to some American scientists that they feel the American actually deserves the honor regardless of any official controversy.

° ° °

The world's largest radio telescope, about 1.3 miles long and 130 feet high, is being planned in the USSR. The unit could be rotated around its horizontal axis—perhaps by mounting it on rails.

The Russians say they will use it to "look through" the clouds that continually envelop the planet Venus in an effort to learn more about that mysterious heavenly body, including its period of rotation. The telescope also will be used to probe the subsurface layers of the moon and to explore distant nebulae.

° ° °

Aeroflot, the Soviet airline, reports outstanding success for its new AN-10 transport in the Arctic. The airplane is used to deliver cargo to the more than seventy weather stations in that part of Russia. It can deliver up to 19,000 pounds of cargo at one time and be unloaded in less than an hour, according to reports, thanks to a wide drop-down rear door and low-slung fuselage.

° ° °

A major Soviet space scientist believes travelers from other worlds have visited earth and are on the way home. Dr. M. M. Agrest, prominent physicist and mathematician, says the space visitors were here centuries ago. Traces of these interplanetary travelers, he stated in a recent paper, may be noted in the "tektites" sometimes found in sandy places. These are unevenly shaped chunks of glasslike material. They have been found in North Africa, the East Indies, Australia, and elsewhere. Their origin is uncertain, but the general supposition has been that they were formed by lightning striking the ground.

Now Dr. Agrest says he believes the tektites may have been formed by special "sounding bullets" sent out from a space vehicle that was operating near the earth. Having used these sounding bullets to find suitable landing sites, the space vehicle and its travelers then came to rest gently on the surface of the earth, he supposes.

Why haven't the visitors returned? Well, says the Russian, interplanetary space being as vast as it is, they may still be on their way home—and haven't had time to consider a return visit at this point.

° ° °

Russia's giant TU-114 jet transport set a batch of world records in a Moscow-Sverdlovsk-Sevastopol-Moscow flight on April 9, according to Soviet report. The plane was said to have completed the 3,100-mile run in five hours forty-three minutes and fourteen seconds, at an average speed of 546 mph. The TU-114 thus became the first turboprop to fly this distance with payloads of fifteen, twenty, and twenty-five tons. Broken were speed records for hauling one-, two-, five-, and ten-ton payloads.

° ° °

Soviet newspapers indicate that Aeroflot is receiving intensified competition from railroads and steamships for the Russian travel ruble.

The ministries of air transportation, rail transportation, and water transportation are all coming up with new wrinkles to garner more summer traffic.

Train schedules will be speeded up greatly on many routes; no longer will the rail traveler rock along at a mere twenty-five to thirty mph. In addition, many new passenger steamers will appear on Russia's vast internal waterways, including some that will carry up to fifty passengers at speeds as high as fifty miles per hour in fast new craft.

Aeroflot, for its part, will add many new aircraft and recall many of its IL-14 and IL-12 transports from storage during the summer. Second sections will be common on many flights.

° ° °

An aviation industry note. Premier Khrushchev declared in a recent speech that in the USSR, as in the US, missiles are being built alongside aircraft in many plants formerly devoted exclusively to aircraft construction.— END

The Republic F-105D streaks to a new world speed record...

powered by a Pratt & Whitney Aircraft J-75 jet engine

On December 11, 1959, the Republic F-105D fighter-bomber raced over the Mojave Desert at 38,000 feet. The course was a 62.4 mile circle. With a temperature of 63 degrees below zero, the Air Force F-105D whipped through the closed-course flight to establish a new world's record of 1,216.48 mph.

Its highly advanced electronics, radar, and associated equipment, enable the F-105D to perform missions at twice the speed of sound regardless of visibility, ceilings, or target area conditions. Its speed and power make it one of the most versatile aircraft in history.

The jet engine that powers the F-105D is the Pratt & Whitney Aircraft J-75. This same engine also powers Convair's F-106 all-weather interceptor which recently set a new world's straight-away record. Over the years, the Pratt & Whitney Aircraft J-57 and J-75 jet engines have broken virtually every major flight record.

PRATT & WHITNEY AIRCRAFT

East Hartford, Connecticut

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News,
Views
& Comments

AEROSPACE WORLD

Frederic M. Philips
ASSOCIATE EDITOR

Americans brushed the dust from their atlases once again this month. Forefingers that sought Danzig, Sedan, Pelelieu, and Pusan in their seasons now traced a bow-shaped diagonal across Eurasia. The line ran from Peshawar through Sverdlovsk to Bodo.

This was apparently the intended route of a US photo-reconnaissance plane that went down in the vicinity of Sverdlovsk, 900 miles east of Moscow in the heart of the Soviet Union, on May 1. The plane belonged to a small fleet of globally deployed Lockheed U-2 jets in use for several years by NASA—ostensibly as atmospheric-research vehicles.

The U-2 drama, overhung by layers of mystery and implication, unfolded thus. On May 3, a report from Istanbul said that a single-engine NASA research plane was missing near a mountainous section of the Turkish-Soviet border. On May 5, Soviet Premier Khrushchev announced as part of a major address that a Soviet ground-to-air rocket had downed an unmarked American photo plane operating over Russia at an altitude of twelve miles. He said it was en route from Peshawar, Pakistan, to Bodo, Norway, filming Russian military sites as it went, when shot down by Soviet missilemen near Sverdlovsk.

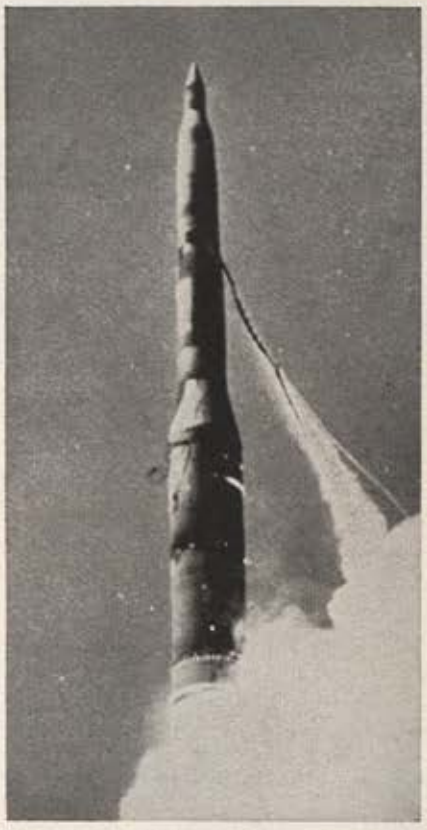
The US denied this Khrushchev "spy-plane" allegation, stating that the aircraft to which the Russian leader referred might possibly be the unarmed NASA weather research plane, which had previously been reported overdue from Istanbul. The pilot could have blacked out, it was speculated, and the automatic pilot taken the plane over Russian territory.

Then, two days later, on May 7, the State Department brushed this earlier US position aside and revealed that the U-2 had indeed been on a mission over Russia. Such flights, the US said, had been going on for years across Russia and on its periphery, and were, in fact, essential to free-world security in the face of the Soviet menace. The Kremlin, it was pointed out, had on a number of occasions rejected President Eisenhower's "Open Skies" proposal to establish regular flights over Russia and the US to safeguard each against surprise attack.

In Russian hands was the pilot of the U-2, thirty-year-old former Air Force aviator Francis G. Powers. Powers left the service four years ago and joined Lockheed as a test pilot. He was assigned to NASA to fly the U-2. It appeared, although Khrushchev was the only official person who said so, that his true employer was the US Central Intelligence Agency.

What would become of him? Russia suggested that he would be placed on trial "under Russian law." Americans wondered what sort of trial it would be, and what the outcome. This was but one, if perhaps the foremost, question that remained in the

A Lockheed U-2 aircraft of the type in which pilot Francis G. Powers made his fateful flight over the Soviet Union last month. Plane above, however, has Air Force markings. U-2 "spy plane" was ostensibly part of NASA project.



Minuteman intercontinental missile rises from silo in first released photograph of the second-generation missile undergoing tethered tests. Note nylon cable holding missile.

immediate aftermath of the U-2 incident.

Was the plane, for example, really hit by a Russian surface-to-air rocket, as Khrushchev said? If so, wouldn't it have burned or exploded, destroying film in its cameras? But during his address Khrushchev displayed pictures allegedly taken from the plane. What of the plane itself? Was it reduced to rubble as shown in a Russian-released picture? A Lockheed design expert said the wreckage in this first photo was not that of a U-2 at all, but of a Red Air Force bomber.

Why was a mission of this sort sent off practically on the eve of the East-West summit sessions scheduled for Paris later in May? Was President Eisenhower, who issued the general directive covering the U-2 reconnaissance flights, aware that one was taking place at this time?

How much did we learn of the state of Russian military might on the basis of earlier reconnaissance overflights? Might the unfortunate outcome of this flight indicate Russia's air defenses were better than when previous photo hops were flown unmolested? Or did penetration of this plane halfway across Russia before it was apparently attacked, coupled with the fact that earlier planes were not hit, show Red air defenses are weaker than we believed?

The questions were limitless. But one that was hardly asked at all was this: Did we do anything wrong?

A Washington *Post* editorial seemed to sum up the national view on this score:

"With the advent of intercontinental missiles and the simultaneous downgrading of the effectiveness of warning systems, information of the sort gathered by the intelligence plane has become imperative for survival."

☆

Several months ago, the Air Force disposed of a moderate quantity of jet-engine flushing oil at a surplus sale in Morocco. Most of it was subsequently turned to appropriate uses. But some buyers, tragically, had other ideas.

They mixed the jet oil, clearly marked and described as poisonous, with peanut and olive oil and sold the mixture as cooking fat. It was widely sold under a brand name similar to that of a reputable French cooking oil. But, unlike the established brand, the phony one contained poison likely to destroy human motor nerves if taken into the system.

The result was that, in a matter of days, more than 10,000 Moroccans who ate food prepared in the oil became paralyzed. Many of these now appear to have been stricken permanently.

Late in April, the court trial of merchants principally responsible came to an end. Five received death sentences, others prison terms.

Acquitted was a merchant named Mohammed Bennani, who purchased 150 tons of oil from USAF and resold twenty tons to one condemned defendant. Bennani was judged an innocent middleman who believed the guilty would use the fluid in a garage. Vindication of Bennani also amounted to public vindication of the Air Force in Morocco, inevitably closely associated in the public mind with the whole sad affair. If the middleman was not involved in the crime, obviously the initial seller was even further out of the picture.

Much of this feeling had already begun to dissipate. Its dissolution was hastened by widespread gratitude for US aid when an earthquake struck Agadir, Morocco, in February.

☆

★ Minuteman, the second-generation, solid-propellant ICBM, has come along far faster than expected. Early in May USAF advanced its anticipated operational date from 1963 to the summer of 1962. At the same time, the service announced that a series of tests to study use of civilian rail facilities for Minuteman begins on June 20.

A test train will leave Hill AFB, Ogden, Utah, that day. Its mission will be to get the ball rolling for the Air Force in the area of railway mobility, control, and communications. During the next five months, five other test trains will move over rails in the Midwest and Far West for trips of one to two weeks each. None of the trains will carry missile hardware. The hope is that Minuteman, when available, will be adaptable to rail dispersal as a mobile ICBM as well as firing from underground silos.

A special task force has now been activated at Hill AFB for the rail mobility operation. It is headed by Col. Virgil L. Cloyd, Jr., former operations officer for SAC's 1st Missile Division, Vandenberg AFB, Calif. He will work from a command post at Hill to supervise the first test run. The train itself, provided by the US Army Transportation Corps, will be run by a regular civilian crew. About twenty-one USAF personnel will comprise the military crew.

The first phase of Minuteman teth-

(Continued on page 31)

New Hughes GAR-11 nuclear Falcon air-to-air missile, left, on display with other Falcons: radar-guided -1D, infrared-guided -2A, and Super Falcon -3. It's a deadly family.

An Atlas stands up in its coffin at Vandenberg AFB, Calif. Coffin is new launch configuration for Atlas, previously fired only from open pads. First Atlas launch from protective coffin storage-firing bunker came on April 22.

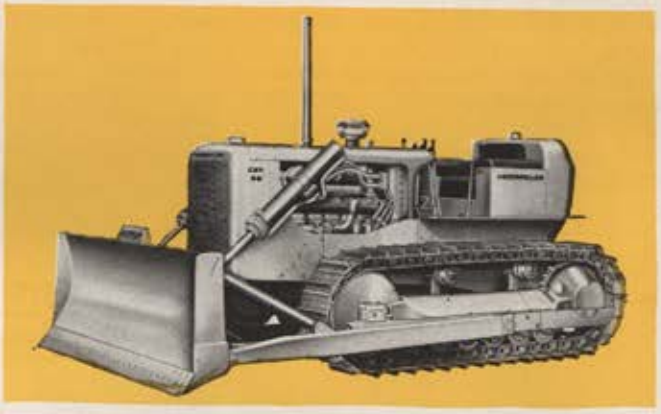
LAND IMPROVEMENT

IN LANE COUNTY, OREGON

Along the Oregon coast, Lane County's D6 cuts a road to the ocean for a new recreation area near Florence. Lane County, stretching from the Cascades to the Pacific, depends on its D6 and 18 other Caterpillar-built machines to carry out road maintenance and construction programs. Multimillion-dollar road programs, new state parks . . . these are the things being done in Lane County. County Road Engineer H. O. Walberg commented on their Cat-built equipment: "We're well satisfied with our Cat equipment for two big reasons . . . big production and little down time. And when we need dealer service, it's there! The D6 is particularly useful to us. It's small enough to work in tight places, but big enough to tackle tough jobs."

MACHINE IMPROVEMENT

BY CATERPILLAR



There's a new D6 . . . the Series B . . . just introduced by Caterpillar. On the same jobs, on tougher jobs, this new work-styled D6B sets production peaks unheard of from a machine in its size class. It has more than just improvements . . . the all-new compact Caterpillar Diesel Engine, the D333, boosts lugging ability 25%. A new integral hydraulic system (optional) puts power where it's needed . . . at the tools. Center-pivoted cylinder mounting gives increased lift/drop range. Under-the-hood location of tank, pump and valves permits convenient routing of hydraulic lines to bulldozer or implement cylinders . . . frees the front and rear for working tools. The operator's cockpit is all new. Controls make the tractor handle almost as if it knew what was needed next.

The exclusive Caterpillar oil clutch is standard on the D6B. It provides up to 2,000 hours of adjustment-free operation. Lifetime lubricated rollers need no lubrication until rebuilding . . . help roll up more operating time instead of repairs. The dry-type air cleaner removes at least 99.8% of all dirt from intake air. Can be serviced in five minutes. Cuts maintenance time by as much as 75%. Optional hydraulic track adjusters are another time saver. A grease gun is all that's needed to assure proper track adjustment.

The Caterpillar D6B comes to you thoroughly tested under demanding earthmoving duty. It's designed to set new records in production and economy.

Caterpillar Tractor Co., Defense Products Dept., Peoria, Ill., U.S.A.

CATERPILLAR

BORN OF RESEARCH
PROVED IN THE FIELD

ered test firing from a silo has now been completed. USAF, which successfully fired off its eighth such Minuteman test May 6, announced that ten further tests scheduled in this phase had been canceled as unnecessary. The first picture of a Minuteman test firing was released with the announcement *(see page 28)*.

★ USAF's family of Hughes Falcon air-to-air missiles had triplets this month. Proudest new arrival was GAR-11, first air-to-air guided missile with a nuclear capability. It was slated for delivery to Air Defense Command F-102 units later this year. The GAR-3A and GAR-4A are advancements in already existing hardware, featuring improved speed, range, and guidance *(see photo, page 29)*.

★ An Atlas got right up and flew out of its coffin at Vandenberg AFB on April 22. The missile was fired from a new coffin-shaped launching apparatus—a thirty-five-by-ninety-foot concrete bunker with twenty-foot-thick walls. It sped true to its impact area near Wake Island. The missile is stored inside its coffin. When the firing order comes, the roof slides back and the missile erects for fueling. It blasts off from where it stands. The operation is listed for fifteen minutes; this first coffin shot understandably took twenty-two. Warren AFB, one of eleven Atlas bases in the country, is readying coffin sites.

★ The Titan ICBM had two successful outings at Cape Canaveral on April 21 and 28. USAF announced two more Titan sites, Davis-Monthan AFB, Ariz., and McConnell AFB, Kan., bringing the total number to seven spread through the western half of the country. SAC also revealed new and improved range figures for later version Atlases and Titans: 8,050 and 9,775 miles respectively. Both are at 6,000 now.

At the same press briefing where these figures were given, SAC made known that it is preparing three KC-135 jet tankers for use as airborne command posts in communication with all command bomber and missile forces. Beginning July 1, one of these three will be at fifteen-minute ground alert with one-third of SAC's bombers at all times. One of the planes, each of which will carry a general, would always be in the air in the event of international crisis.

☆

On the West Coast this month, aviation writers hit hard against government obstruction of vital defense information.

At Offutt AFB in Nebraska, SAC demonstrated that it wasn't *always* right up to snuff.

These were among reports from members of our roving editorial board. Editor and Assistant Publisher John F. Loosbrock visited Los Angeles for the annual Aviation Writers Association convention. Managing Editor Richard M. Skinner toured SAC headquarters with a group of newsmen.

The aviation writers unanimously adopted a resolution introduced by Editor Loosbrock expressing "opposition to any and all attempts to control and direct the free flow of public information, consistent only with the legitimate demands of national security on a nonpartisan, nonpolitical basis."

To carry out the provisions of the resolution, a special watchdog committee on freedom of information was appointed. Our Mr. Loosbrock was named Chairman.

Other committee members chosen included: Vern Haugland, Associated Press; Charles Corddry, United Press; Robert Hotz, *Aviation Week*; and Marvin Miles, the Los Angeles *Times*.

At the same business meeting, on a motion by George Haddaway, Editor and Publisher of *Flight* Magazine, AWA voted a special citation to James H. Straubel, Publisher of Air Force/Space Digest and Executive Director of the Air Force Association, for his work in conceiving and directing the first World Congress of Flight at Las Vegas, Nev., in April of 1959. Mr. Straubel has received numerous awards for the World Congress.

AWA members also voted to change the name of their association to the Aviation/Space Writers' Association.

Meanwhile, at Offutt, Editor Skinner found there are moments when SAC's machines slow to a crawl and its vaunted communications network is of no avail.

On the second day of a two-day briefing, Mr. Skinner, a busload of other briefees, and an escort officer, Lt. Col. Joe Beler, found themselves proceeding through the rain to a SAC radio transmitter site at Scribner in the rolling Nebraska countryside, some fifty miles from Offutt.

The rain had been falling intermittently all morning. It cut visibility so the driver could hardly see the "Road Closed" sign that blocked one approach to Scribner. A "Bridge Out," part of the aftermath of recent midwest floods, effectively cut a second approach.

But SAC's are determined people. Subsequent events like getting lost on the muddy and uncharted backroads of Nebraska's heartland, then nearly stalling out on a slippery hillside, deterred the ultimately successful quest for Scribner not a bit.

Then the coup of the day: A C-54 was dispatched to Scribner from Offutt, put down on a World War II B-17 training base strip there, and whisked the group back to the main base in fifteen minutes. But it was rough going for a bit.

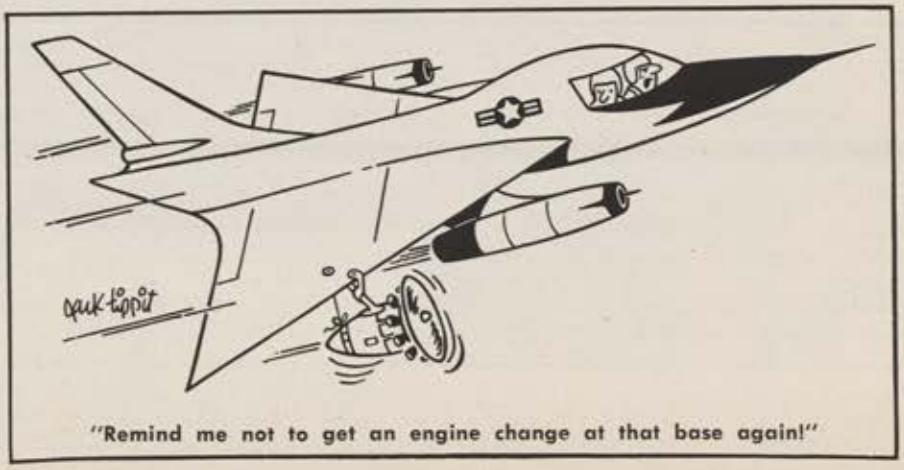
☆

Elsewhere in the Aerospace World:

USAF placed its Discoverer XI satellite in orbit on April 15. Efforts by net-bearing planes to catch its data capsule in the vicinity of Hawaii failed, as they have after previous Discoverer shots. This time the capsule simply stayed in orbit with the satellite.

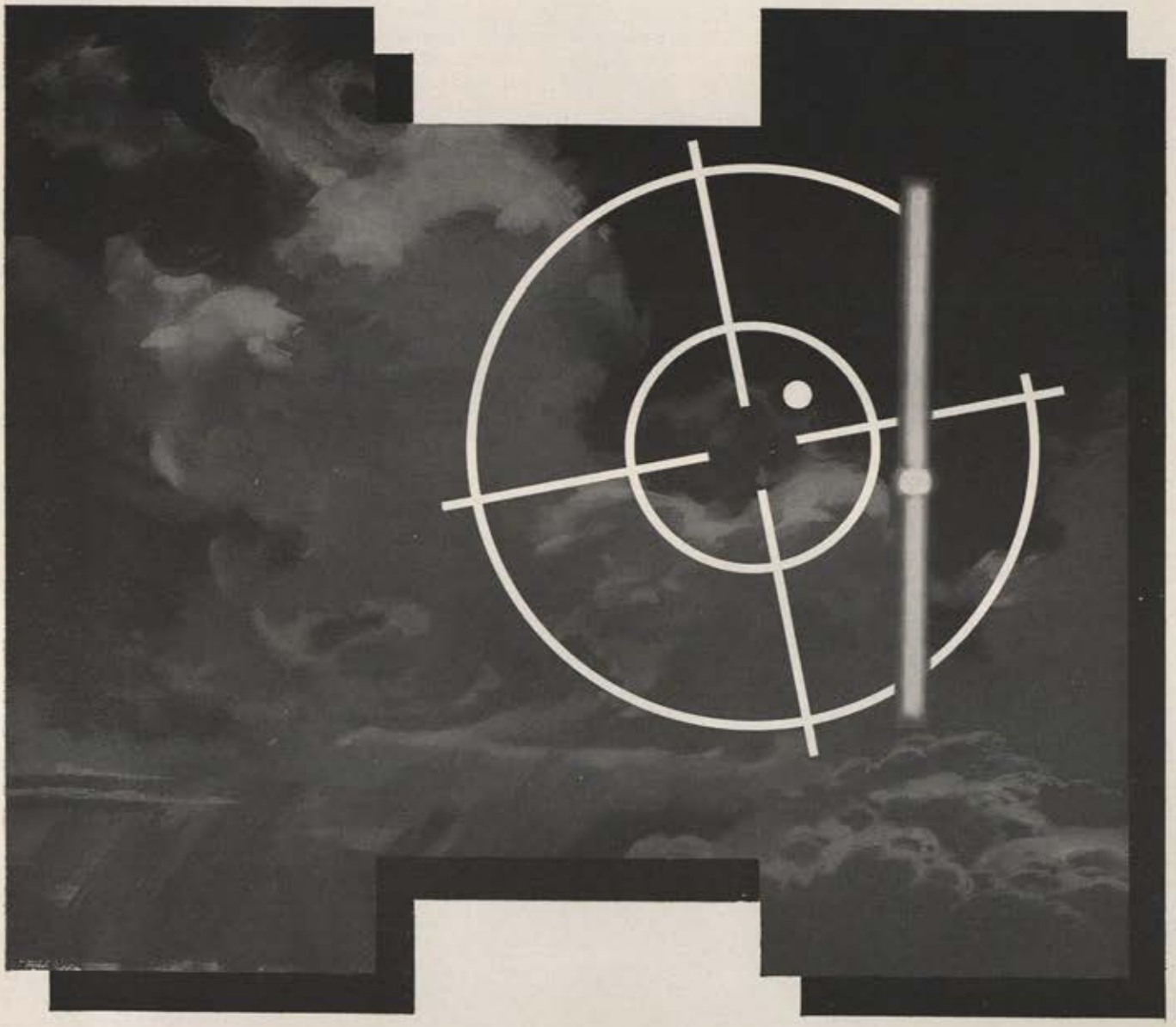
On this same day, Bomarc-B, advanced version of the operational Bomarc-A air defense missile, failed

(Continued on page 34)



"Remind me not to get an engine change at that base again!"

How to take a longer look



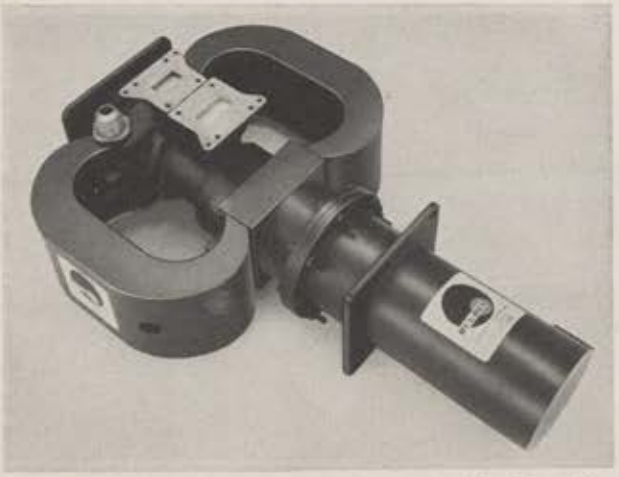
One of the vital "innards" of the new Hughes system is this miniaturized (1.3 cu. ft.) Hughes memory drum which can store over 1 million bits of information.

at air space

Tomorrow's manned interceptor aircraft – and even faster ones of the future – require radar navigation, target acquisition, armament control and electronic counter-measures systems of vastly greater scope and dimension than ever before.

To fulfill this critical requirement Hughes has developed a new advanced radar system which embodies many significant state-of-the-art advances. One of the most significant is a unique and highly advanced Traveling Wave Tube developed in the Hughes Laboratories. This tube's two outstanding advantages: 1) higher power to provide greater range; 2) broader frequency band width for operational flexibility.

In addition, this new Hughes radar system will discriminate against ground return and will detect targets at extreme ranges. Designed to operate in a "hard" counter-measures environment, the system is radar augmented by infrared detection and tracking.



Heart of the new Hughes radar system is this Traveling Wave Tube which provides greater power and a broader band width.

This radar system is the latest of a series of pace-setting Hughes systems. The Hughes E-1 was the *first* all-weather interceptor radar system ever developed. The Hughes E-4 system *first* made possible the rocket lead-collision attack. The Hughes E-9 and MG series systems were *first* to automatically stage and fire advanced air-to-air guided missiles. And the Hughes MA-1 system *first* provided complete control of aircraft from take-off to touch down.

Although over 16,000 all-weather interceptor systems have been produced to date. Hughes' radar experience is not limited to interceptor systems. For the Army and Navy, Hughes is producing surface-based 3-dimensional radar systems which utilize electronic, rather than mechanical scanning methods. And the Hughes TARAN system utilizes a high-resolution radar which makes it possible for pilots to fly tactical missions at low altitudes, in any kind of weather!

Foreseeing the needs of the future – and being the *first* to provide for them – is a deeply ingrained tradition at Hughes. Perhaps we can help you solve some of *your* radar system problems. Please write: Hughes Advanced Program Development, Marketing Department, Hughes Airborne Systems, Culver City, California.

Creating a new world with ELECTRONICS

HUGHES

HUGHES AIRCRAFT COMPANY

Culver City, El Segundo, Fullerton, Newport Beach, Malibu, Oceanside, Los Angeles, Calif.; Tucson, Ariz.

for the eighth time at the Cape. Two days previous, the first successful Bomarc-B launch had been achieved at Eglin AFB.

NASA test pilot Joe Walker flew the X-15 at Edwards AFB, Calif., for the second time on April 19 as flight tests of the plane continued. The edge-of-space craft now has three jockeys. The others are USAF's Maj. Bob White, North American's Scott Crossfield.

The House Appropriations Committee raised the Administration's defense budget by $121.9 million to $39.3 billion and sent it to the floor at the start of May. Additional funds would go to SAC airborne alert requirements, additional Polaris sub building and airlift, antisubmarine programming, some speed-up for Midas and Samos warning satellite development, moderate acceleration of Minuteman, fifty additional F-106 interceptors, and Army modernization. The presidential budget had previously been modified on recommendation from USAF to step up missile defense programming.

USAF released funds to Boeing to proceed with construction of eleven Dyna-Soar boost-glide space-probe vehicles. First launch of Dyna-Soar, follow-on to the X-15, was expected in 1964.

The Coast Guard on April 28 announced abandonment of a search for downed private aviator Peter Gluckman of San Francisco, apparently lost in the Pacific attempting to set a lightplane distance record in a flight from Tokyo to New York. He flew a Beechcraft Bonanza. The record he sought to top was set by Max Conrad in a hop from Casablanca, Morocco, to New York in August 1958.

On May 8, Pioneer V, the solar-orbiting planetoid launched March 11, reached a distance of eight million miles from earth, and its more powerful 150-watt radio transmitter was cut in to replace its five-watt radio for sending space data home.

USAF's annual Mackay Trophy for meritorious flight went this year to the Thunderbirds, USAF jet demonstration team, for their Far East good-will tour last fall. The Cheney Award for valor went to MATS helicopter pilot Capt. Herbert L. Mattox, Jr., for the successful rescue of twenty-nine men from a sinking Japanese trawler. The Daedalian Trophy for flight safety went to Lt. Gen. Joseph B. Carroll, Inspector General, USAF.

(Continued on page 37)

advanced GSE shelters by AERONCA

New Aero Van Collapsible Shelter

Shelter for "Hawk" Missile System

8893-AC

AERONCA DESIGNS, TOOLS AND PRODUCES NEW CONCEPTS IN LIGHTWEIGHT HIGH-STRENGTH AIR TRANSPORTABLE SHELTERS

Created by specialists in aircraft and missile weapon systems and sub-systems, *Aero Van* airborne shelters feature extreme versatility for world-wide applications. These new shelters achieve superior strength-weight ratios as well as interior flexibility through new design and construction concepts. In addition, they are designed for ease of modification and low-cost mass production.

Rugged all-purpose *Aero Van* shelters have been subjected to severe structural, environmental and suitability evaluation tests conducted by Armed Forces testing agencies.

Whatever your GSE shelter requirements, Aeronca can provide a "packaged" capability . . . from original concept to finished product . . . to meet your specifications. *FOR DETAILS, WRITE FOR BULLETIN AS-103.*

AERONCA

manufacturing corporation

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Openings for creative R&D Engineers with Missile-Space experience. Write to O. E. Chandler, Mgr. Professional Employment.

ANOTHER CURRENT GSE PROJECT AT AERONCA . . .

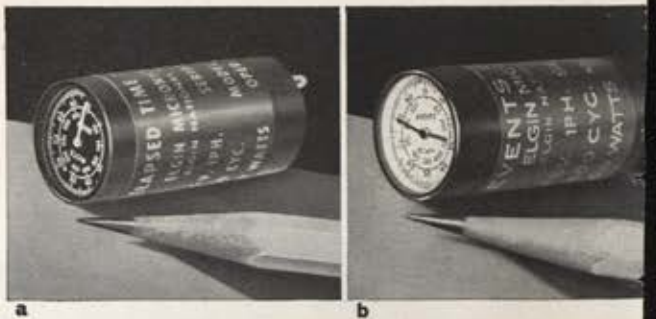
These photos show performance tests on a production model of new tactical shelter for "Jupiter" IRBM.

HERE'S THE DATA YOU NEED TO MEASURE PERFORMANCE AND RELIABILITY

Two tiny indicators, tucked into the corner of a panel or even mounted internally, give you complete "how-long-and-how-often" data on equipment operation . . . to permit accurate reliability evaluation, logistic studies or replacement schedule planning. On the left, the ELAPSED TIME INDICATOR integrates operating time in hours. On the right, the EVENTS INDICATOR counts individual on-off, temperature, pressure or acceleration events as desired. Both are designed to meet requirements for airborne and missile equipments . . . conservatively rated to operate over a —65° to 165° F temperature range and withstand 15G-11ms shocks or 20G, 20-2,000 cps vibration. Write for detailed data, including alternate mounting provisions, or order test units for evaluation.

a. ELGIN MICRONICS ELAPSED TIME INDICATOR—weight, 1.3 ounces; diameter, .680 inches; length, 1.420 inches . . . draws approximately 1 watt at 115 VAC, 400 cps.

b. ELGIN MICRONICS EVENTS INDICATOR—approximately same weight, size and power draw as above . . . counts circuit activations as brief as one half second in duration.



a b

for instruments that read out reliability

ELGIN MICRONICS

DIVISION OF ELGIN NATIONAL WATCH COMPANY, ELGIN, ILLINOIS

Courtland D. Perkins, new Assistant Secretary of the Air Force (R&D) is sworn in on April 25 by Air Force Secretary Dudley C. Sharp. He was formerly faculty member at Princeton.

If you have been wondering what ever became of the antiaircraft gun, here is your answer. The last ack-ack in the North American air defense system phases out of the picture on June 25. That day, the 2d Gun Battalion of the Army's 68th Artillery, Camp Lucas, Mich., a unit of the North American Air Defense Command, will be deactivated. The unit is equipped with the 75-mm. Skysweeper AA gun, the last unit in the nation so armed. There were once fifty antiaircraft gun battalions.

USAF has taken a major step in the field of flight training. The service announced plans on April 21 to consolidate training of pilots at fewer bases and entirely eliminate the use of civilian contract primary schools. Civilian contractors trained more than 200,000 flyers during World War II. They have trained more than 40,000 more since resumption of contract primary training in 1951. All training now will be done by Air Force pilots. Army flyers still receive private instruction. The Navy conducts its own training.

Maj. Gen. Joe W. Kelly, Jr., Commander, Air Proving Ground Center, Eglin AFB, Fla., succeeded retiring Lt. Gen. William H. Tunner in command of the Military Air Transport Service (MATS) on May 31.

General Kelly, a World War II combat pilot, served previously in SAC and as Director of Legislative Liaison in the Office of the Secretary of the Air Force.

Tunner

Kelly

General Tunner completed thirty-two years of commissioned service with his retirement. Gen. Thomas D. White, USAF Chief of Staff, commended General Tunner for "an outstanding job for the Air Force and the country" in a retirement message.

The retiring MATS Commander was formerly Deputy Chief of Staff (Operations), Hq. USAF, and Commander in Chief, USAFE. He headed the Allied Berlin Airlift operation and the Korean Airlift.

APPOINTMENTS. . . . **Courtland D. Perkins,** Assistant Secretary of the Air Force (R&D). Mr. Perkins, formerly Chairman of the Aeronautical Engineering Department, Princeton University, assumes the post recently vacated by new Air Force Under Secretary **Joseph V. Charyk.**

STAFF CHANGES. . . . **Maj. Gen. Charles H. Anderson,** now Assistant for Atomic Energy, DCS/Operations, Hq. USAF, becomes Commander, Lowry Technical Training Center, ATC, Lowry AFB, Colo., effective August 15. . . . **Brig. Gen. Milton H. Ashkins,** Commander, 73d Air Division (Weapons), ADC, Tyndall AFB, Fla., assumes duty as Chief, Air Section, MAAG, Germany, on August 1. . . . **Lt. Gen. Glenn O. Barcus,** CofS, US European Command, becomes Assistant to Commander, MATS, assigned to Travis AFB, Calif., effective on July 1 and reverting to the temporary grade of major general. . . . On June 30, **Maj. Gen. Harold C. Donnelly,** now Assistant DCS/Plans and Programs, Hq. USAF, will assume duty as Commander, Field Command, Defense Atomic Support Agency, Sandia, N. M.

Brig. Gen. Edgar W. Hampton, former Commander, 323d Air Division, MATS, Travis AFB, Calif., is now Commander, 1501st Air Transport Wing (HV), MATS, same base. . . . Effective July 1, **Maj. Gen. John S. Hardy,** DCS/Plans and Operations, PACAF, will become Commander, Keesler Technical Training Center, ATC, Keesler AFB, Miss. . . . **Brig. Gen. Frank B. James,** now DCS/Intelligence, NORAD and CONAD, Ent AFB, Colo., will become DCS/Programs, NORAD and CONAD, same base.

Maj. Gen. Albert M. Kuhfeld, from duty as Assistant Judge Advocate General, to TJAG, Hq. USAF. . . . **Brig. Gen. Loren G. McCollom,** from duty as Deputy Commander, AFCCDD, ARDC, Laurence G. Hanscom Field, Bedford, Mass., to Commander, Detachment 4, ADC (4608th Support Squadron), same base. . . . On September 1, **Brig. Gen. John A. McDavid,** Chief, Communications-Electronic Division, SAC, Offutt AFB, Neb., will become Deputy Director, J-6 (Communications-

(Continued on following page)

Electronics), Central Control Group, Hq. USAF.

Brig. Gen. Ivan W. McElroy, now Commander, 401st Tactical Fighter Wing, TAC, England AFB, La., will become Deputy for Operations, 12th AF, TAC, Waco, Tex., effective September 1.... **Maj. Gen. Henry K. Mooney,** from Commander, 16th AF, SAC, Torrejon Air Base, Spain, to Vice Commander, ATC, Randolph AFB, Tex., on September 1.... Effective August 15, **Maj. Gen. Eugene P. Mussett,** Commander, Lowry Technical Training Center, ATC, Lowry AFB, Colo., will become Deputy Commander, USAF Security Service, Kelly AFB, Tex.

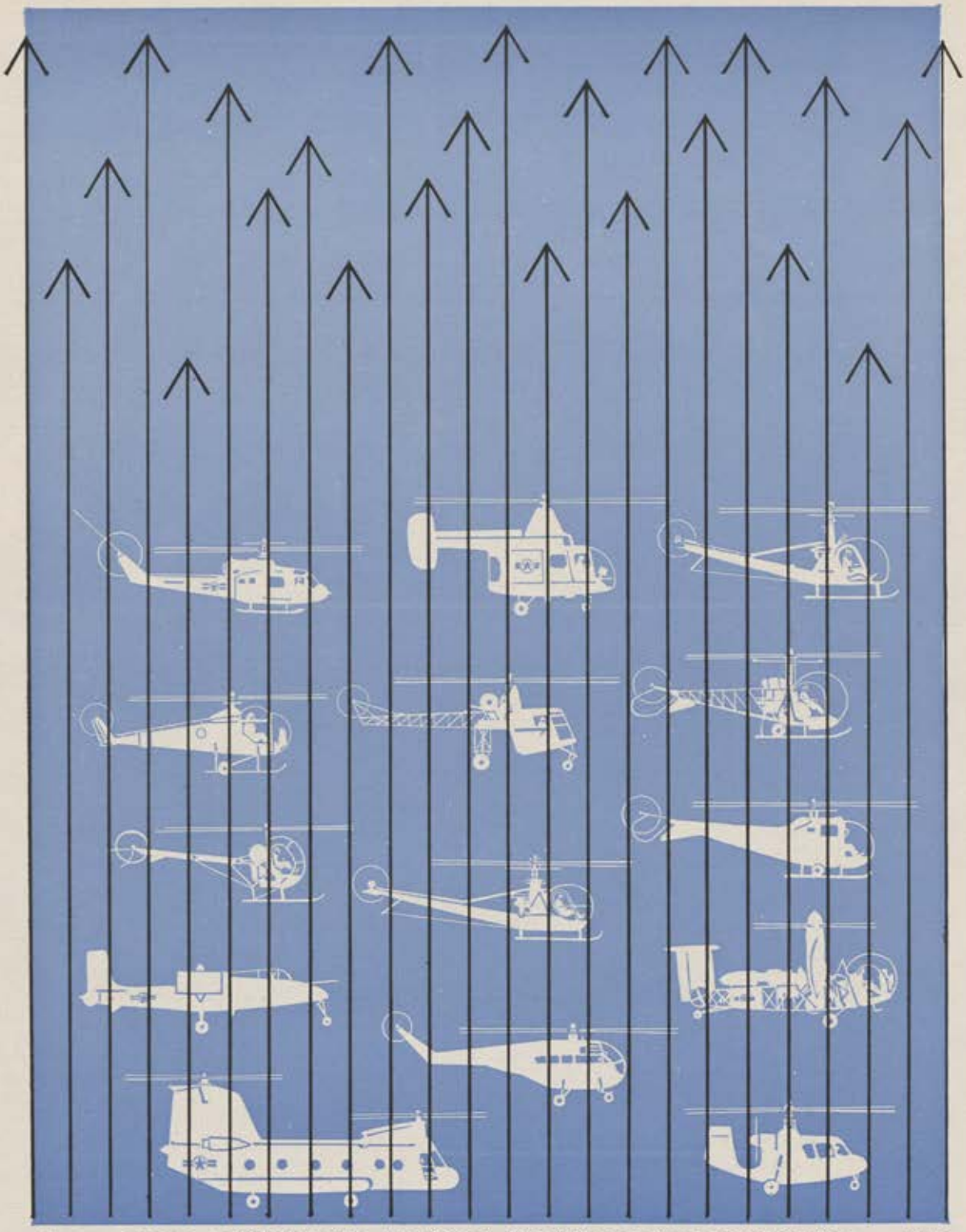
Brig. Gen. Ariel W. Nielsen, Commander, 21st Air Division, SAC, Forbes AFB, Kan., will become Deputy Director, J-5 (Policy), Central Control Group, Hq. USAF, on September 12.... **Maj. Gen. John D. Ryan,** Director of Materiel, SAC, Offutt AFB, Neb., will become Commander, 16th AF, SAC, Torrejon Air Base, Spain, effective July 11.... **Maj. Gen. Dale O. Smith,** 313th Air Division, PACAF, Okinawa, assumes duty as Commander, 64th Air Division (Defense), ADC, Stewart AFB, N. Y., on July 17.... Effective July 1, **Maj. Gen. John R. Sutherland,** Commander, Keesler Technical Training Center, ATC, Keesler AFB, Miss., will become Commander, 313th Air Division, PACAF, Okinawa.

Brig. Gen. Frederick J. Sutterlin, from duty as Deputy Director for Operational Resources, DCS/Operations, Hq. USAF, to Commander, 839th Air Division, TAC, Sewart AFB, Tenn., on June 27.... **Maj. Gen. Ralph P. Swofford, Jr.,** now Vice Commander, Air University, Maxwell AFB, Ala., becomes Commander, Allied Air Forces in Southern Europe, and assumes temporary grade of lieutenant general. . . . Effective July 12, **Brig. Gen. Frederick R. Terrell,** Commander, 64th Air Division (Defense), ADC, will become Commander, 73d Air Division (Weapons), ADC, Tyndall AFB, Fla.

Maj. Gen. Edward H. Underhill, Senior Member, Weapons Systems Evaluation Group, OSD, Hq. USAF, becomes CofS, US European Command, with temporary rank of lieutenant general.... **Brig. Gen. Selmon W. Wells,** Commander, 45th Air Division, SAC, Loring AFB, Me., will become Inspector General, SAC, Offutt AFB, Neb., on July 15.... Effective July 11, **Brig. Gen. James W. Wilson,** Inspector General, SAC, Offutt AFB, Neb., assumes duty as Director of Materiel, SAC, same base.... **Maj. Gen. Donald M. Yates,** in line with previously reported assumption of duty as Deputy Director, Defense Research and Engineering (Ranges and Space Ground Support), also assumes the temporary rank of lieutenant general.

CIVIL AIR PATROL.... Col. William C. Whelen, CAP, Nashville, Tenn., has been named chairman of the national governing body of the CAP. Colonel Whelen succeeds retiring **Col. Harold Byrd,** CAP, Dallas, Tex.

RETIRED. . . . Lt. Gen. Richard C. Lindsay, Brig. Gen. James P. Newberry, Maj. Gen. Paul E. Ruestow.—END



Avco Gives a "Lift" to Vertical Flight. More types of helicopters . . . more types of VTOL (vertical take-off and landing) aircraft . . . are powered by Avco's Lycoming Division than by any other manufacturer in the world. Today, Lycoming's superb power plants are serving both business and our armed forces on scouting missions . . . in rescue vehicles, or in personnel and cargo carriers. This complete aircraft-engine line is an example of Avco/Lycoming's quarter-century of engineering skill, piston-engine experience, and leadership in turbine development.

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We've reserved SPACE for the Big

How do you meet a man traveling 18,000 miles an hour, 500 miles from earth? Northrop is already preparing for the next big challenge after the first human penetration of space, namely, rendezvous of men in space.

In all its divisions Northrop scientists, physicists, mathematicians, doctors, and engineers are attacking the many formidable problems involved. For example, Northrop projects include techniques for freely altering the course of a vehicle once it has been launched... human factors engineering, environmental stresses, weightlessness... methods of providing food for long-ranging astronauts by actually growing it aboard their vehicles ...utilization of natural resources of the moon and planets... in-space repair and rescue operations...satellite "filling stations" for supplying additional propulsive energy to orbiting vehicles ...new metallurgical explorations to meet the severe hazards of space environments...recovery systems for returning the astronauts safely to earth.

There is, of course, much to be done before men meet in space. Today, the Northrop Corporation possesses the capabilities and is developing the technologies to help make it possible.

NORTHROP

NORTHROP CORPORATION, BEVERLY HILLS, CALIFORNIA

DIVISIONS: NORAIR, NORTRONICS, RADIOPLANE, NORTHROP INTERNATIONAL. **SUBSIDIARY:** PAGE COMMUNICATIONS ENGINEERS, INC.

Airlift in Action:

Only the C-130 paradrops 'dozers and graders

...to clear its own landing strip

The C-130 was designed for the rough-and-ready realities of military airlift, built to land on improvised strips near the front. But there are jungle glades and mountain meadows too short and too rough for even the C-130. That's when the call goes out for a bulldozer—and a C-130 to drop it.

For the C-130 was also built to paradrop practically anything. From the giant 9 x 10 foot door beneath its upswept tail, it can float the largest tractors, trucks, and tanks down to earth.

It takes a minimum of bulldozer work to make an "airhead" for a C-130. Uproot a few trees, scrape off a few high spots and fill a few potholes, and you've got a terminal for transocean non-stop flights that average 370 mph, carry 20 tons of cargo or 92 combat-ready troops.

Another reason why the Lockheed prop-jet C-130 HERCULES provides more Jet Age airlift per dollar than any other plane now flying, now being produced, now scheduled for production.

LOCKHEED GEORGIA DIVISION

OTHER LOCKHEED DIVISIONS: CALIFORNIA • MISSILES & SPACE • LOCKHEED ELECTRONICS CO. • LOCKHEED AIR TERMINAL • LOCKHEED AIRCRAFT SERVICE • LOCKHEED AIRCRAFT INTERNATIONAL • LOCKHEED, S.A. • PUGET SOUND BRIDGE AND DRY DOCK CO. **LOCKHEED PRODUCTS:** ELECTRONICS • MISSILES • AIRCRAFT • NUCLEONICS • SATELLITES AND SPACE VEHICLES • ROCKET FUELS AND MOTORS • AIRCRAFT MAINTENANCE • AIRPORT MANAGEMENT • SHIPBUILDING • HEAVY CONSTRUCTION • STEEL FABRICATION AND CRANES

The Communist propaganda apparatus made it appear that Soviet Premier Khrushchev delivered a "disarmament" address to the Supreme Soviet early this year. In fact, what Russia's top government body heard was . . .

KHRUSHCHEV'S BLUEPRINT FOR CONQUEST

A SPECIAL REPORT

KHRUSHCHEV'S BLUEPRINT FOR CONQUEST

AS 1960 dawned, some Western analysts still were describing Soviet military developments in terms of factors the Communists long ago relegated to Orwell's "memory hole of history." They maintained that Soviet reliance on mobile infantry—the predominating practice before the advent of nuclear weapons—was likely to continue to prevail in the missile-space age. They argued that the Soviets still adhere to the strategy of the counteroffensive embraced by Czar Peter, Kutuzov, and Stalin. According to them, Asia and Africa, conquerable through infantry invasions, would remain the principal targets for Soviet conquest—even in the 1970s. Soviet missiles would serve to deter US interference should Communist troops attempt to conquer Burma or invade Ghana.

Although these analysts admitted the possibility of a war "of desperation" against the US and her NATO allies, they ruled out deliberate Soviet resort to total war to plant the red flag of communism over all world capitals. If, somehow, the Soviets should be forced into all-out war, doctrinal commitment to the importance of occupation still would govern Communist military strategy. One has gone so far as to argue that the USSR's massive numbers of ground troops would then be transported by rockets to carry out transoceanic invasions and occupy the US.

Against this farrago of Western sovietology, Nikita S. Khrushchev, on January 14, 1960, personally disclosed thirteen new concepts in Soviet military doctrine. The nature and role of the Soviet military establishment, as Khrushchev described it, bears little resemblance to the wish-dreams indulged in by "experts" unskilled in looking forward. Khrushchev, of course, envisages a "strike-the-US-and-NATO-first" strategy. And he does not intend to march troops across the Bering Straits and down the Mississippi Valley, let alone drop them from rockets like manna from heaven.

Khrushchev made his disclosures in a speech to the USSR Supreme Soviet—a high-level body to which, theoretically, he must account. In the same speech, he said that the USSR possessed the capability in being to implement the concepts he had enunciated. Some Western observers have, quite rightly, accused him of exaggeration on this point. But the best evidence indicates that the Soviets are converting their force structure as rapidly as possible to one which meets the requirements of the nuclear age and of continuing advances in technology. Present Soviet capabilities have been dismissed too lightly and too often.

There have been earlier indications that Soviet military doctrine was undergoing drastic revisions. Yet future historians are likely to describe Khrushchev's innovations as a turning point in Soviet military history. For the first time since securing his position as absolute dictator, he revealed that, like Stalin, he had assumed the role of the final authority on military doctrine.

Undoubtedly, Khrushchev, in formulating his doctrinal concepts, sought the advice of his military high command. However, in public at least, all of them—including Minister of Defense Rodon Y. Malinovsky—have been reduced to a position of endorsement and implementation. And there are indications that, like Stalin, Khrushchev has forced his military commanders to carry out his orders, turning a deaf ear to protests and objections from some of them. He is demonstrating the total Bolshevik ruthlessness characteristic of his predecessors and is directing all efforts toward the urgent business of communizing the world.

The thirteen Soviet strategic concepts Khrushchev disclosed are:

1. Weapon systems capable of defeating the US and completing the world revolution exist for the first time—nuclear/thermonuclear firepower plus superior delivery vehicles.
2. The rest of the world will surrender automatically if the US has been conquered. Steps are being taken to translate into reality Marx's dream of a rapid revolution resulting in Communist domination of the world.
3. All types of surprise and all their components have assumed new and perhaps decisive significance—in the initial phase of the war and in all subsequent phases.
4. Timing surprise is a factor governing all phases of strategy, tactics, training, and organization.
5. Initial surprise blows will take the form of rapidly executed missile salvos; the prime objective will be to destroy the bases of the enemy's retaliatory forces first.

"Our armed forces . . . have been transferred over to missile-nuclear arms. These arms have been perfected and will continue to be perfected. . . . Potential depends on total firepower and means of delivery. . . . The Soviet military establishment now has delivery systems and firepower never before possessed."

—Khrushchev, January 14, 1960

6. Targeting of the initial ICBM strike and threats of follow-on strikes by delivery systems with a recall capability are expected to deter enemy retaliation. Despite these measures, retaliatory strikes still could occur during the first hours of the war. Therefore, should they eventuate, steps are being taken to minimize their effectiveness and to absorb inevitable resultant damage.
7. To absorb enemy retaliation, trained reserves prepared for instant mobilization will fight at home, performing missions of population defense and control.
8. Advantages gained in the initial strike must be exploited by follow-on strikes on key industrial targets and other strategic centers. A mixed-force structure of missiles, aircraft, and, ultimately, space-weapon systems, will be used to maximize surprise in the second strike and in subsequent strikes.
9. ICBMs and IRBMs must be based to ensure 360° coverage of the earth's surface. Proper basing arrangements permit such coverage from sites on Soviet-controlled territory.
10. Concepts of ground operations have been adapted to missile/nuclear warfare—firepower conquers and ground forces occupy, to accept surrender and supervise installation of Communist regimes.
11. Constant and intensive R&D is required to maintain a winning force structure in the face of rapid technological advances.

12. Lead times must be pared to the minimum to ensure technological surprise and to meet continuing requirements for combining all modern arms.

13. No obsolescent weapon systems will be tolerated, now or in the future.

In enunciating these thirteen strategic concepts, Khrushchev and high-level Soviet military leaders have left no doubt that they envisage a decisive war ending

"Modern missiles can destroy the selected target with the first salvo. . . . A missile salvo has enormous power, exceeding the total power of all explosions which have occurred on earth during all the wars in the history of mankind."

—Maj. Gen. G. I. Pokrovsky, March 9, 1960

in global communization. They are inspired by this vision of future war:

- Mass use of nuclear weapons of all yields and types and employment of delivery systems with global range and a capability to be switched rapidly from one theater to another will characterize the entire war.
- Surprise of many types will govern both strategy and tactics throughout the conflict.
- War will start with massed attacks by missiles with nuclear warheads to knock out the United States' strategic striking forces.
- Threat of a second strike can deter us from retaliation, or a second strike can be launched from "hidden bases" to take out remaining military capabilities with spill over to population and industrial targets.
- A third strike could be used to increase destruction to the level of genocide or, in the form of threat, could serve to include surrender followed by the installation of a Communist regime.
- Firepower will be redirected quickly, by threat or employment, to induce the capitulation of nations allied to the United States as well as the surrender of underdeveloped and neutral nations. In all cases, conquest will serve as the prelude to communization.
- After nuclear strikes, regular ground forces will

"The Soviet Union is militarily the most powerful state in the world."

—Khrushchev, March 1, 1960

occupy areas easily accessible to them. Areas less accessible to ground forces will be occupied by irregulars—guerrillas and local revolutionaries—assisted where practicable by airlifted Soviet cadres.

- In the Soviet homeland, reserves will perform clean-up and disciplinary missions.

The Communist propaganda apparatus has applied characteristic and skillfully worked out methods to conceal Khrushchev's doctrinal innovations and to convince the world that his speech to the USSR Supreme Soviet—where he initially disclosed his strategic plan—was a "disarmament" speech and another Soviet move in the interests of peace.

Despite Communist concealment efforts, even superficial examination of Khrushchev's remarks and subsequent statements by Minister of Defense Malinovsky, Air Force Commander in Chief Vershinin, Marshal A. A. Grechko, and other high-level Soviet military leaders reveals the true nature of the Soviet military "new look."

Thirteen implications affecting free-world security may be derived from the thirteen newly disclosed Soviet strategic concepts. What are these implications?

1. The Soviets have added a new dimension to their spectrum of conflict weapons. Possession of nuclear firepower means that Soviet capabilities to mount a surprise attack on the United States, and thereby to conquer the world, have been increased by a quantum jump. The USSR is acquiring a set of weapon systems based on nuclear firepower and characterized by the following advantages:

- Global coverage.
- Ability to shift rapidly from one target to another.
- Flexibility of levels of destruction, which now can be tailored to suit the target.
- Surprise potentials.

"In the . . . competition with capitalism . . . the question of the time factor, of gaining time . . . is the main question."

—Khrushchev, November 28, 1959

- Material and psychological impact in combination.
- Effectiveness for cheap world conquest, particularly if utilized in the absence of a free-world capability to survive the first strike with adequate retaliatory forces.

In brief, the Soviets estimate that proper utilization of nuclear weapon systems will furnish the means required to carry out their fundamental ideological commitment: bringing the entire world under Communist domination.

2. Khrushchev never tires of assuring us that this doctrinal commitment remains unchanged. He says that the Soviets have stood and "will continue to stand like a rock on the principles of Marxism-Leninism"; that "there can be no coexistence on questions of ideology"; that "capitalism is historically doomed"; that he will bury us. Furthermore, since his return from the United States, he has iterated the orthodox doctrine that war is required for Communist conquest of the *most powerful* non-Communist states.

Khrushchev also frequently reminds us that a third world war would result in the destruction of capitalism, but that, meanwhile, communism and its home base—the USSR—would survive. He adds that the USSR is capable of absorbing the losses caused by US nuclear retaliation.

(Continued on following page)

3. The Communists consider the United States, the chief capitalist power, to be the principal enemy. They believe that if North America goes, the rest of the world will capitulate. Initial massed missile salvos would hit both the US ZI and our overseas bases, and affect non-American populations.

Conquest of NATO, SEATO, and CENTO nations would be simplified in the wake of the disruption of communications, command, and control which would result. Domination of South America, Asia, and Africa would be accelerated by utilizing a combination of indigenous revolutionary forces and guerrilla units, both striking under the shield of Soviet missile threats.

4. The key to successful nuclear war is to avoid harm to oneself. Minimizing expected retaliation has created a Soviet doctrinal requirement for maximizing all types of surprise. Since the weapon systems involved in the first exchange are ICBMs, the initial blow assumes new importance. Moreover, deterrence of a retaliatory strike may be achieved by launching or threatening to launch follow-up strikes. Absorption of retaliation also is possible; effective military and civil defense and population control will reduce considerably the impact

"The central task and the supreme form of revolution is the seizure of political power by force of arms and the solution of problems by war."
—Mao Tse-Tung

of expected retaliatory blows. Radiological prophylaxis will be accomplished by preplanning and executing well timed decontamination and evacuation measures. Population control and panic prevention measures will include dispersing or sheltering essential cadres, furnishing medical care, prepositioning food and water, and exploiting previously carried out conditioning designed to reduce fears of fallout.

5. Despite the new importance attached to the initial surprise blow, the Soviets remain committed to the idea of the necessity to combine all arms, nuclear and nonnuclear, military and psychopolitical. A winning strategy depends upon follow-on strikes to exploit opportunities resulting from the initial success. Such blows are designed both to complete conquest of the US and to expand the war in other theaters. To be effective, such blows depend on preservation of a second-strike missile capability through the phase of US retaliation. Furthermore, other strategic systems must be utilized in combination with missiles, and military success must be exploited through occupation.

6. To meet these requirements, the Soviets, in true dialectic fashion, have synthesized all other weapons in the spectrum of conflict with nuclear/missile systems which form the core of their military and psychopolitical power.

7. Consolidation of the gains from the war will pose stringent postwar demands on the Soviet leadership. The concept of a citizen's army of trained reserves is based, in part, on the necessity to preserve the means to carry out postwar demands on the capital of world communism.

8. The Soviets already have made the decision to prepare themselves to retain, at all times, the option to attack. Orthodox doctrine requires the exercise of extreme caution on the eve of the final showdown with capitalism, and the enemy must be softened up before the attack. The "softening-up" process has taken the form of the current intensive Communist effort to convince the West of the necessity for disarmament, a nuclear test ban, peaceful coexistence, and interminable negotiations on other outstanding issues such as Berlin.

"Missile forces are undoubtedly the main type of our armed forces. However . . . it is not possible to solve all the tasks of war with one type of troops. . . . In a modern war, to carry out military actions successfully requires unified use of all means of armed combat, combining the efforts of all types of armed forces. . . . In organization and means of action . . . military operations will little resemble those of the last war."
—Malinovsky, January 14, 1960

The purposes of these moves are: deception concerning actual intentions, paralyzation of Western leadership and initiative, isolation of the United States from its allies, and a gain in time to increase Soviet force superiority.

The Soviets believe that the greater the success of these degradation tactics, the less the risk involved in launching an attack.

9. A decision concerning timing of the initial surprise strike could be made any time that requisite strength has been achieved. Precisely when the strike will be launched will depend on Soviet assessment of the success of degradation moves, the balance of forces,

"If anyone in the West imagines that the status of the Soviet economy does not permit the maintenance of the military establishment required . . . then so much the worse for those who think so. . . . It should be clear . . . that if an increase in expenditure for the maintenance of the armed forces [is required], our budget and our economy would make it possible to allocate extra tens of billions of rubles. . . ."
—Khrushchev, January 14, 1960

and the status of training, as well as on evaluation of the effectiveness of preattack preparations, including Soviet salvo capabilities. United States alertness, if extant, could cancel out a Communist decision to exploit a superior strength ratio which was purely statistical.

10. Possibilities of further new advances in technology introduce further uncertainties which the Soviet planners must take into account. In order to eliminate the possibility that the US might achieve technological surprise, the Soviets are applying their

degradation tactics in an effort designed to commit us to a completely predictable program of technological progress.

11. The Soviets have taken further steps to nullify all uncertainties by commitments to a broad and intensive spectrum of R&D efforts, by announced intent to win the lead-time race, and by planning operations around a program of continuous phase-out of all obsolescent weapons combined with phase-in of new ones. They have the necessary technological know-how, raw materials, funds, and motivation to come up with imaginative new weapon systems, and Khrushchev has announced their R&D intentions. He told the Supreme Soviet:

"The armament which we now have is formidable armament. The armament under development is even more perfect and more formidable. The armament which is being created and which is to be found in the folders of the scientists and designers is truly unbelievable armament. . . ."

"We deploy our missile complexes in such a way that duplication and triplication is guaranteed. The territory of our country is huge; we are able to disperse our missile complexes, to camouflage them well. . . . If some weapons . . . were put out of commission one could always send into action weapons duplicating them and hit targets from reserve positions. . . ."

—Khrushchev, January 14, 1960

The Soviets have become technocrats and are intensely preoccupied with firepower. It would be a mistake to interpret Khrushchev's warning exclusively in terms of new delivery systems. For a nation committed to global conquest, a nation which has already impacted the moon, delivery systems cease to be "unbelievable." Khrushchev may very well be referring to a new type of firepower.

12. If the Soviets find they cannot ensure victory by military means, they will continue to employ psychopolitical measures to lull the West to sleep, to induce us to abandon our missiles and nuclear weapons, and to slow down our R&D effort even more. Meanwhile, they will be preparing to strike a few years later with new weapons furnishing a capability for even more effective technological surprise.

13. If current degradation tactics succeed, the Soviets could complete the world revolution at minimal cost resulting from retaliation. US alertness, as well as our deterrent and retaliatory capability, would virtually disappear if the Soviets were able to cheat on nuclear disarmament and test-ban agreements, if any are made. Communist doctrine teaches that agreements of all types must be signed "whenever life and the interests of the cause demand it" but should be broken without notice whenever they cease to serve the interests of the global revolution.

* * *

Missile delivery systems coupled with nuclear firepower have confronted the leaders of the world Communist movement with the most difficult military problem they—or others—have ever faced. On the one hand, weapons in being promise an initial opportunity for completing the world revolution once and for all. But on the other hand, global conquest is impossible unless Western alertness to the true intentions of the Communists is minimized and US strengths degraded to a point where the risks of retaliation become negligible.

"Present-day ballistic missiles guarantee a high probability of inflicting powerful strikes simultaneously on a great variety of targets . . . to redirect firepower quickly, shifting the decisive thrust from one target or one theater of operations to the other, and by means of massed nuclear strikes to . . . change the situation to one's own advantage."

—Malinovsky, January 14, 1960

If they wish, citizens of the United States—and of the entire free world—can assist the Communists to gain global domination. The requirements are simple and easy to execute. They can continue to be apathetic toward civil defense and disinterested in effective utilization of our own potential and actual strengths. They can be reluctant to pay for effective missile hardening, and for airborne alert. They can attack proposals to accelerate the phase-in of second-generation ICBMs and to surge forward with the nuclear aircraft program. They can join groups supporting a nuclear test ban *à tout prix*.

In the process, they will give the Soviets new basis for their contemptuous assessment that the balance of power is shifting to favor the Communist camp. They will reinforce the Soviet belief that the free world can be deceived about true Communist objectives and has been deterred from taking effective steps to prevent global takeover.

We are confronted with an enemy born and bred on violence. Khrushchev and his henchmen have been utterly explicit about their intentions. Eventually, we will have to face the final showdown.

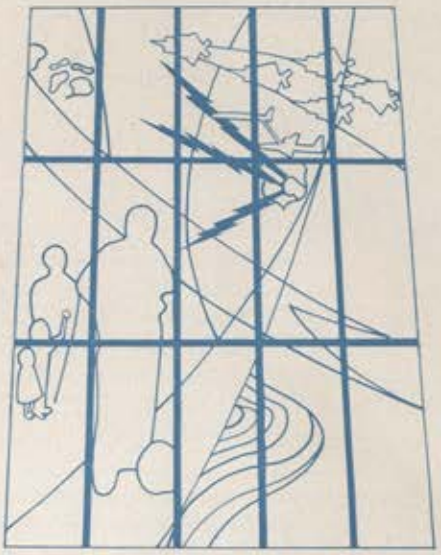
"Flying machines piloted by man have been mechanized, semiautomated, and, finally, fully automated and integrated with missiles. Air Force personnel . . . will be required to learn to use the new, more perfect, and hence more complicated airplanes."

—Vershinin, January 19, 1960

We have danced too long and too ceremoniously in the heiau of "horrors of nuclear holocaust," proffering our military superiority and moral strength on the altars of "negotiation," "disarmament," and "coexistence." The god we are worshipping is one the Communists neither recognize nor fear—the false god of international "togetherness" who, by accepting our sacrificial offertories, assists the Communists without realizing it—END

"Lord, guard and guide the men who fly/Through the great spaces of the sky . . ."

SAC's Combat Crewmen Memorialized in Stained Glass



OFFUTT AFB, NEB.

The Base Chapel at Strategic Air Command Headquarters is as modern as a B-58. A stylized metal spire tops the attractive brick building, whose sanctuary seats about 300. A church-school wing next door contains classrooms and offices for chaplains of the three faiths. Outside the building are beds of bright tulips whose colors are repeated in the ten stained-glass windows of the Chapel.

But, unlike the tulips, the windows will not fade as the seasons change. Newly installed and dedicated in a ceremony on Sunday, May 29, these windows memorialize the combat crewmen of SAC who have given their lives in the cause of world peace.

The main window, adjacent to the altar, is shown in full color on the front cover of AIR FORCE/SPACE DIGEST this month in a photo by SAC's Senior M/Sgt. William Lummus. This window and eight others, which show the crests of SAC's four numbered air forces and the seventy-two wings and air divisions, were purchased with money given by SAC personnel themselves in offerings at SAC Chapels all over the world in May and June of 1959.

A tenth window, just inside the Chapel's entrance, shows the USAF and SAC crests above the words of the Air Force Hymn: "Lord, guard and guide the men who fly/Through the great spaces of the sky...." All ten windows were designed and built by Wallis-Wiley Studio, Pasadena, Calif., and installed in April.

At the May 29 ceremony of dedication, SAC Commander in Chief Gen. Thomas S. Power announced that the Offutt Chapel had been renamed the "Strategic Air Command Memorial Chapel." The principal address was given by Chaplain (Brig. Gen.) Robert P. Taylor, Deputy Chief of Air Force Chaplains. In a prayer of dedication, SAC Staff Chaplain (Col.) George S. Wilson, who headed the planning group for the Memorial Window, said, "Today we praise men of high purpose who took up the burden of service, answering the challenge of God and country that peace might be preserved."

The main window, twelve by fifteen feet (*see drawing above*), symbolizes the dedication of the SAC combat crewman to his job of keeping the peace through deterrence. Among the elements shown are representations of the families he protects through his daily activities, the aircraft he flies, a polar projection map of the world, the upward curve of a jet or rocket trail, and the sky itself—the SAC combat crewman's area of operations.

The theme for this window is from the Book of Isaiah, Chapter 6, Verse 8, which in the King James version reads, "Also I heard the voice of the Lord, saying, Whom shall I send, and who will go for us? Then said I, Here am I; send me."

The artists' interpretation explains the various elements of this main window:

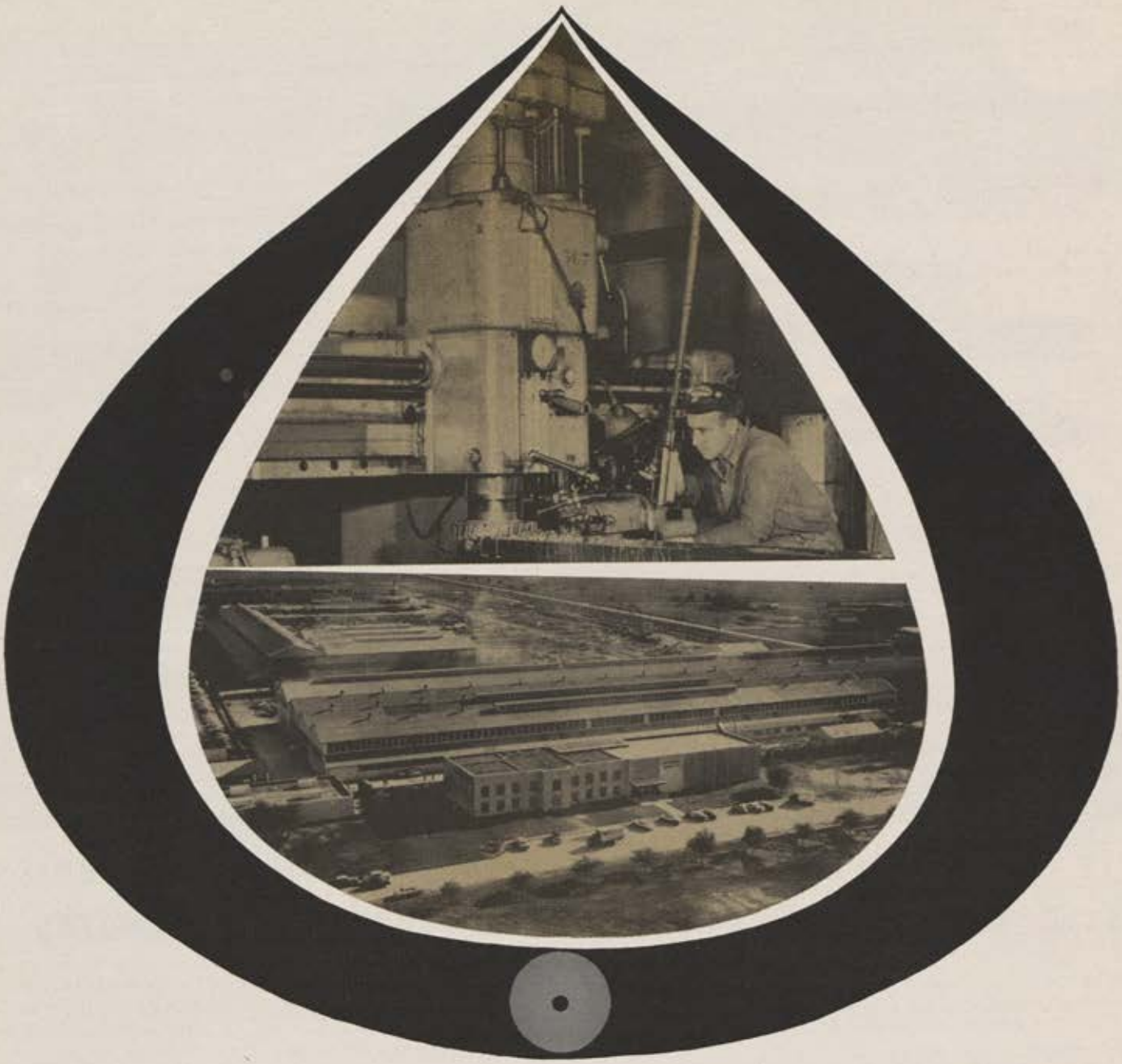
"Most prominent in the design is the Man, mature in mind and spirit, dedicated to the mission of preserving peace. Eternal vigilance, exploration, and experimentation are the work of this man of courage. On fantastic wings of science he soars into the known and unknown, in a never-ending effort to protect mankind's endeavors to live in peace and freedom. He stands, alert and ready, in the light of God's love and guidance, which he has sought to aid him in his work. Behind him is his family, symbolic of all the families which he protects.

"Near the center of the window the symbol of the Strategic Air Command is shown, representing the guiding and coordinating force which makes it possible for devoted men to work together toward the end that man's dream of peace on earth may become reality. In portraying this we have taken the liberty of extending the lightning beyond the confines of the shield to emphasize SAC's vitality and far-reaching power.

"Around and above the Man are the means by which he carries out his work. To the right are isobars, indicative of weather maps, the development of which is vital to the successful operation of the Strategic Air Command. Above are the planes he flies, one of which is being refueled during flight. The aircraft shown are an abstraction of their actual design.

"The main flight of aircraft is bathed in a golden light similar to the rays of light descending from God. This sameness of coloring is a strong reminder of the saying, 'Peace Is Our Profession,' and that this is the labor of God-fearing men."

—RICHARD M. SKINNER



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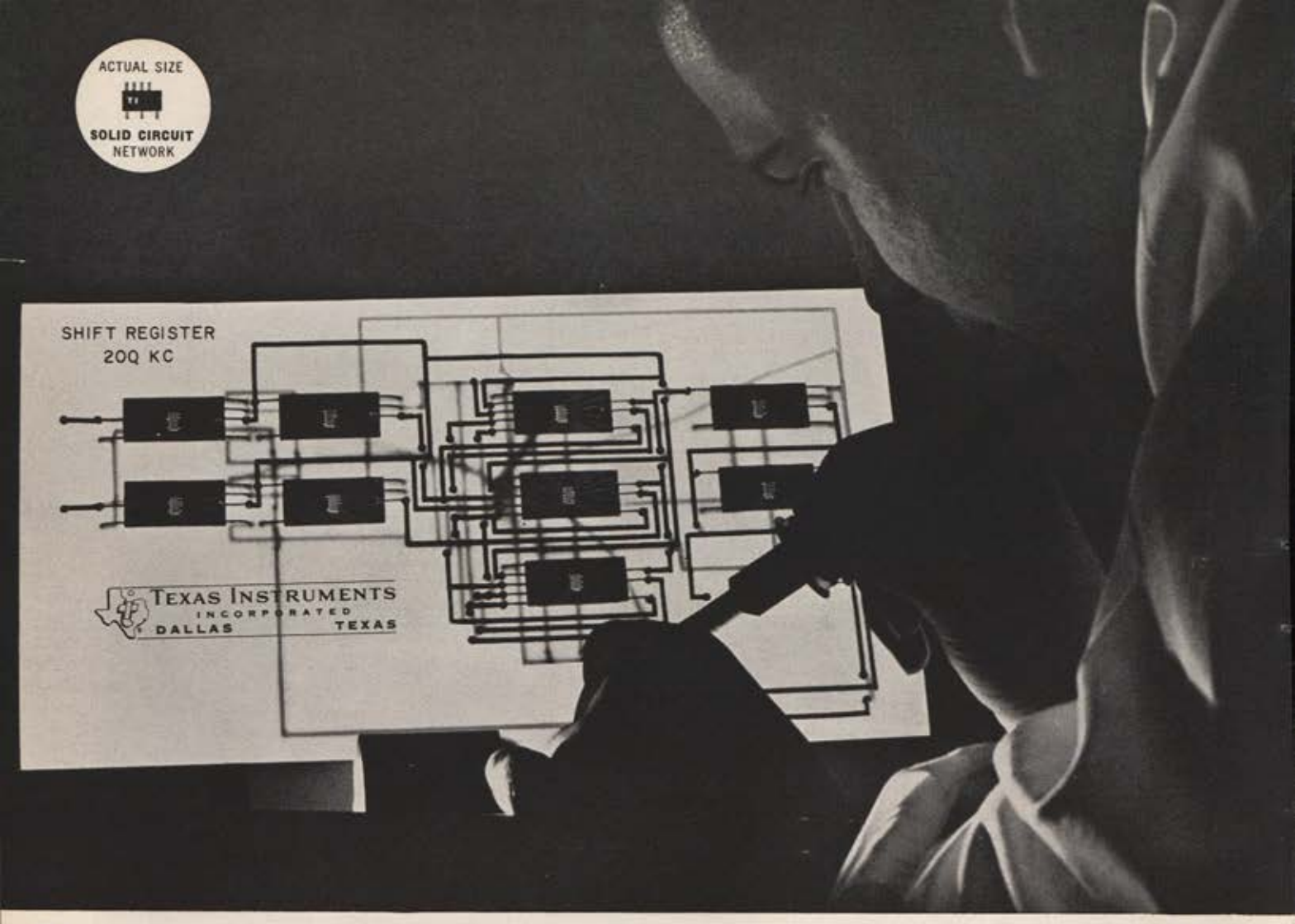

TI is now developing revolutionary missile electronics using *SOLID CIRCUIT** semiconductor networks

In 1959, four years ahead of industry expectations, Texas Instruments introduced *Solid Circuit* semiconductor networks . . . a new concept for harnessing the functions of a complete circuit in a single crystal silicon wafer no larger than the head of a match.

Now, system designers in TI's Apparatus division are applying this concept to digital flight control problems — and the result is minimum 30-to-one size reduction over the highest-density packaging previously available. Equally important is an 80% reduction in the number of solder joints — a major cause of electronic equipment failure. Apparatus division experience in this new concept indicates that nearly half of today's military electronics, ground or airborne systems, can make practical, beneficial use of *Solid Circuit* networks.

Other reliability gains attributed to this new design concept evolve from simplified production, test and process control. Equipment fabrication steps already have been reduced to one-tenth those needed for the same circuit functions using conventional components. Where unprecedented long-term reliability is required such as in space flight, the weight and space consumed by conventional components can now be diverted to circuit redundancy and "self-healing" techniques. And in missile/space vehicle design these new space and weight savings mean that fuel load can be increased without displacing valuable instrumentation.

The application of this advanced technology is another example showing how TI puts new concepts to work in military electronic systems. For more information on TI capabilities, send for booklet "Missile Electronic Systems" or contact SERVICE ENGINEERING.

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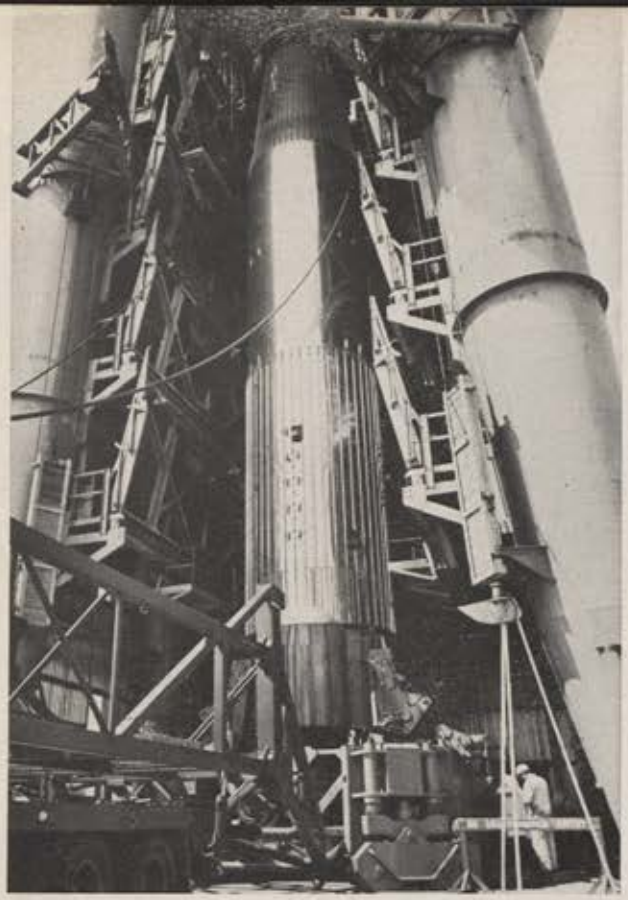

Photo courtesy British Information Services

Great Britain has once more realigned her national defense posture. Many experts see in this latest move across the Atlantic the germ of new, more closely coordinated policies for the NATO nations . . .

BLUE STREAK . . . END OR BEGINNING?

Norman H. Gibbs

The body of one of the now-defunct Blue Streak ballistic missiles in a test tower at Hatfield, Hertfordshire, England. The missile was to be 70 feet high and 10 feet wide.

BRITISH generals on active service intervene less frequently in public debate about government defense policy than do their American counterparts. Whether this is good or bad, and whether done for good or bad reasons is, of course, another matter.

But the result is that when a general in Britain does express himself publicly about official policy, particularly if he criticizes it adversely, then he is certain to hit the headlines. This happened last November.

Lt. Gen. Sir John Guise Cowley, a senior general and the Controller of Munitions, gave a public lecture in London. In it he pointed out obvious and universal problems associated with nuclear weapons. He argued that because of the risk of mutual annihilation, the West would not use its thermonuclear deterrent even in the early stages of what threatened to be a total war, but would attempt to fight in more conventional fashion, thus at least imposing some delay before the worst.

He concluded his argument, directed specifically at Britain's nuclear-oriented defense policy, thus:

"I believe that the British contribution to the peace of the world can be far more useful in other directions than in producing weapons which are only useful because of their threat, and which can only be threatened in very exceptional circumstances."

Here was a clear challenge to Britain's policy of maintaining an independent nuclear deterrent. This policy had dominated the nation's defense planning since enunciated in 1957's Defense Ministry White Paper. The speech happened to coincide with appointment of a new Minister of Defense, Harold Watkinson, to replace Duncan Sandys. Mr. Sandys had taken office in January 1957 prior to preparation of the White Paper and was closely associated in the public mind with its contents. General Cowley, instead of being publicly reprimanded, was in fact promoted.

Did all of this, it was asked at the time, indicate a fundamental change in Britain's defense policy? The new Minister of Defense gave at least part of the official answer to this question by announcing abandonment of Britain's Blue Streak ballistic missile program in mid-April. He also left the door open to further major policy decisions.

The whole matter and its implications are of considerable import for Britain and her free-world allies.

To put Britain's position in perspective, it is worth looking back briefly over the past few years.

Britain has had an atomic weapons program since 1945. Her present generation of nuclear bombers was put on the drawing board in 1950. But it was not until 1955 that Sir Winston Churchill, in his last military move as Prime Minister, announced Britain's determination to develop her own deterrent capabilities —both delivery systems and thermonuclear weaponry.

It was this decision which Mr. Sandys took to its logical conclusion in the 1957 White Paper.

Britain today has a small but steadily growing stockpile of fission and fusion warheads. The present delivery system for these is the V-bomber force. These planes—the Vickers Valiant, the Avro Vulcan, and the Handley-Page Victor—are medium bombers with a radius of action of some 1,600 to 1,700 miles. They could strike with devastating effect against a large number of targets in western and central Russia.

The total size of the force has not been officially disclosed. But the estimates of well informed sources, both in Parliament and in the press, suggest an overall figure of about 200 aircraft. This force, armed with a free-falling and later a stand-off guided bomb, is felt to provide a British contribution to free-world deterrent strength at least until the mid-1960s.

After that Britain, according to previous planning, was to have remained in the military nuclear race

(Continued on following page)

with her own medium-range ballistic missile, Blue Streak. Blue Streak was to have been a liquid-fuel, fixed-base missile, fired from below ground level, and with a range of about 2,500 miles. Blue Streak would have been, it was believed, a good deal superior to America's Thor IRBM, which it would have supplemented and later supplanted at launching sites in the United Kingdom.

But now Blue Streak, at least as a military program, is no more. Its cancellation, moreover, left Britain with no plans for a delivery system of her own to take over from the manned bombers if and when they become obsolete.

Why has Britain placed herself in this new position? What does her action mean to the West? The answers are found in the nature of international power, politics, and economics at this juncture in history.

> *The building of Blue Streak was a mistake . . . but it was the kind of mistake that might have been made by any government committed to an independent deterrent for this country. The moral of Blue Streak is that Britain alone cannot afford the costs of full membership in the nuclear club. She is too poor to hedge her bets by pursuing several different lines of weapon research and development at the same time, and so guarding against the risks of failure in any one weapon system. Instead she has to plump for what seems to be the most satisfactory prospect—and hope for the best. Inevitably her hopes will sometimes be disappointed: However wise the British government may be, it cannot predict with complete accuracy all the changes which are likely to take place in military technology.*
>
> —The Manchester Guardian, April 28, 1960

They could point the way to new directions for NATO.

They almost certainly contain object lessons for several governments. For an experience similar to Britain's may well await any other nation that aspires to join the United States and Russia as an independent participant in the military nuclear race.

Britain entered this race primarily for political reasons. Arguments have, it is true, been put forward to justify the V-bomber force and its weapons on strictly military grounds. And it is incontrovertibly true that 200 bombers armed with thermonuclear bombs comprise a reasonably potent deterrent force.

But, primarily, Britain's development of her own nuclear deterrent was designed:

- To reinstate her as a great power alongside America and Russia.
- To give Britain's Prime Minister added influence with America's President.
- To give Britain, by virtue of her achievements, a claim to share more fully in American knowledge and developments.
- To ensure Britain a prominent place in any disarmament negotiations.

In addition, it was reasoned, not only might her own deterrent give Britain a measure of freedom from American policy. But, further, the threat of its use, should Britain be in imminent danger of attack, might also ensure American participation on her side.

The Conservative Party, in power since October 1951, was generally supported by the opposition Labor Party in establishing this nuclear defense policy.

Aneurin Bevan, Labor's prospective Foreign Secretary, made this clear in an address to the Party Conference in 1957. He declared that any British Foreign Secretary would enter international negotiations with his hands tied behind him unless Britain possessed an independent nuclear deterrent. Until that point, it might be noted parenthetically, the antinuclear segment of the Labor Party had looked upon Mr. Bevan as its fair-haired boy. Afterward, this group was left without an effective leader of national and party stature—although antinuclear groups in and out of politics remained active.

Thus, Britain's nuclear defense policy, built around the V-bombers and thermonuclear weapons, was based on a solid list of international political advantages that received widespread recognition at home. There were, however, negative factors on the international scene as well.

Other members of NATO could well ask why Britain should claim a position in the western alliance that was denied, for example, to France, Italy, and West Germany. Britain's efforts to keep up with the Joneses militarily, and thus socially/diplomatically, were undeniably looked upon in this unflattering light throughout much of Western Europe.

In fact, many French leaders including President Charles de Gaulle have felt all along that France was quite as entitled as Britain to a privileged status within the alliance. And for a similar mix of political and military reasons as had motivated Britain earlier, France moved into the nuclear club with its Sahara tests this year.

It, too, has now reaped certain status dividends and some ill feeling from its allies. Tangible military advantages will have to await further development of French nuclear capabilities, if this is forthcoming in the face of the prodigious investment involved.

Which brings us to a vital element in the British nuclear deterrent story—money. Britain has been spending about $4.5 billion a year on defense, about one-tenth the annual US defense budget but still a massive expenditure. Of this, about fifteen percent has been alloted to the deterrent. Within this limited budget, and there is at least as much pressure in Britain as in the United States against an increase in defense spending, two problems have become obvious.

First, the remaining eighty-five percent is today inadequate to satisfy all the essential nonnuclear-deterrent demands made upon it. Second, the fifteen percent is not nearly enough to keep Britain in the independent nuclear power race.

In other words Britain, three years after the Sandys White Paper, found herself in a position where something had to give. Enter Blue Streak.

(Continued on page 55)

An achievement in defense electronics

NEW THERMOPLASTIC RECORDING DISPLAY ACHIEVES

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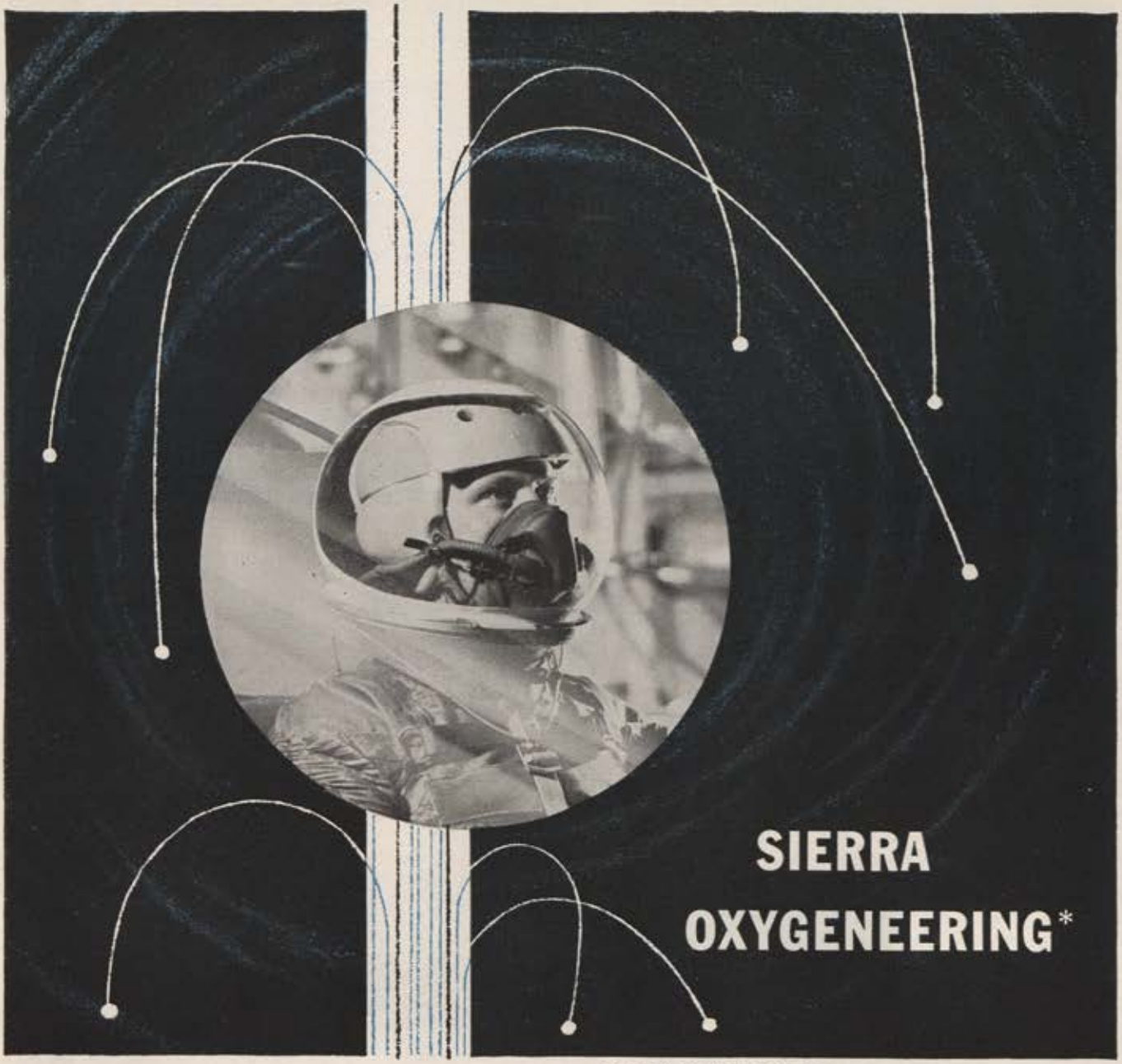

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One unavoidable consequence of Britain's defense budget limits is that she cannot, like the United States, keep a whole lot of irons in the fire for future development. The United States can afford to develop a range of weapon systems, depending on technological factors to help her make final choices. Britain must select one or two weapons at most at the drawing-board stage, and hope that they won't be out of date by the time they are in production.

When Blue Streak was selected some years ago, it was expected to be a much better weapon than Thor, and the answer for a country which, because of its geographical position, needs medium rather than long-range weapons at present. But as early as two years ago Blue Streak's critics were opposing it because, as a liquid-fuel missile, it would have become usable in the same time period as other nations' second-generation, solid-propellant missiles, such as USAF's Minuteman.

The accuracy of recent Russian missile shots in the Pacific may have been the last straw. These apparently convinced the Defense Ministry that Blue Streak, because it would need a fixed base, would be far too vulnerable to enemy attack.

The project had cost about $200 million so far and would probably have cost ten times that amount before completion. These are not amounts Britain can afford to spend on weapons of questionable utility.

At the moment, Britain still has a sizable missile program despite the Blue Streak cancellation. She has a whole range of guided weapons, ground-to-air and air-to-air, of domestic design and manufacture. A space research missile, Black Knight, has already proved of interest to the United States. Blue Streak itself may well be kept in production as a vehicle for space research, even though it ceases to be of direct military value.

All of Britain's missile and space hardware is not going to be just tossed away. Nor is it desirable, from Britain's point of view or that of her allies, that the human and material resources used and developed so far should be entirely wasted.

But recent well inspired rumors in London and at the disarmament conference in Geneva suggest that Blue Streak will not be the only project to go. It looks as though the whole problem of Britain's independent missile and space research will have to be reexamined in the light of costs.

By contrast, independent British development of nuclear bombs and warheads continues for the forseeable future according to all present indications. Plainly, it is now easier to possess nuclear weapons than to deliver them.

In this connection, studies in the US and Britain conclude that many countries could develop atomic and nuclear explosives in the next few years. How many of these nations would find it feasible to maintain effective delivery systems as well?

The British delivery situation now is this. Defense Minister Watkinson has said that Britain will retain her independent capability in the immediate future. The V-bombers and their present free-fall and stand-off bombs are going to remain in the game for some years to come. After that, the government feels the service lives of the V-bombers can be prolonged until the late 1960s, through procurement of America's now-developmental, air-launched Skybolt missile.

Then there is talk of trying to remain in nuclear power with supplies of the mobile Polaris IRBM, whenever it becomes operational and available from America.

But clearly, any nation which can remain in this race only by virtue of a delivery system bought from another country cannot properly be considered independent in this sense. Who knows? The US Congress might decide to pass another McMahon Act, this time restricting knowledge and supplies of missile delivery systems to foreign countries even though the latter possessed their own stocks of nuclear warheads.

The initial McMahon Act, which restricted the sharing of US atomic secrets with overseas allies, spurred Britain's independent atomic development. It played a major role in the shaping of British policy in this whole area.

> *In what conceivable circumstances would independent British control of our own missiles save us, where joint reliance with our allies on a collective deterrent would not? It seems entirely obvious that the only real reason why Britain would not be singled out for Pearl Harbor treatment by Russia is that we can say: "If you hit us, our big brothers NATO and the American Strategic Air Command will hit you." This in fact is what our treaties do say. What deters the Russians is not the V-bombers or the British H-bomb alone, but the NATO framework in which they would, with many other weapons, be used. The Russians know perfectly well that since they could destroy Britain long before Britain could destroy Russia, we could not go it alone in a nuclear war; indeed the Suez episode showed that we could not go it alone even in conventional war, if the rest of western opinion did not march resolutely on our side. Without a shot fired, technology and the small size of this island have made Britain—on its own—defenseless.*
>
> —The Economist, London, April 23, 1960

Let us examine, at this point, what this turn of events in Britain portends for the free-world defense posture.

Suppose current Geneva negotiations, and whatever succeeds them, fail to produce a sizable measure of disarmament. This, it must be judged, is the likely outcome. Then the democracies would remain in for a long, difficult, and potentially exhausting race with communism. This race would, as it does, cover the broad scope of national and international activities in the field of defense and elsewhere—with the cost becoming ever greater.

(Continued on following page)

Unhappily, this British experience would seem to indicate that nations of the free world other than the US cannot stand the pace in such a many-sided race—not on their own. Not even the US, as a matter of fact, could view such burdensome competition for an indefinite period with equanimity.

The lesson underlined by Britain's inability to go it alone, as it were, is that in this international battle for survival, the democracies must make use of all their resources—the resources of all of them. Because few, perhaps none, of them can bear the full burden of the current defense race.

Together, however, they should be capable of far outdistancing the Communist world all along the line.

Examples of this transatlantic interdependence, of course, exist widely today. For instance, at the moment the United States needs, and has, aircraft and intermediate-range missile bases in Europe to help in her own defense as well as defense of her allies. And even when the US has ICBMs in quantity, she will still need early-warning stations, one of which is being built on British soil.

The need for interdependence will become many, many times greater, however, as we face the continually mounting costs and varied demands of nuclear, space, chemical, and biological research and development, and the ever-increasing demand for aid to underdeveloped countries.

So far as Britain is concerned, what she cannot afford to do by herself, she could certainly help to achieve in close cooperation with her allies.

For some time past there have been many people in Europe, and in America too, who have argued that what is needed is not an independent British or an independent French deterrent, but a NATO deterrent drawing on the resources of all the interested European powers. Western Europe looked upon as a single entity is, after all, an industrial giant quite comparable to the US itself in many ways. If successful, such a development would lighten the burden of the United States and, perhaps, powerfully supplement US efforts in a number of areas.

It would be foolish to suppose that this sort of cooperation will be achieved easily. But, within weeks of the Blue Streak announcement, with its suggestion of things to come, there were well informed reports of steps in the right direction. Plans were understood under discussion for Britain and France, together with Australia and perhaps Canada, to combine in a space research program using an adapted version of Blue Streak for launching satellites. This would be a joint, cost-sharing enterprise, covering a number of astronomical, communications, and cosmic problems, dealing especially in matters of radio and television.

In this way important space research could be undertaken by a group of powers, no one of which could move into space on its own. There is also a suggestion that Britain and France may combine in a new nuclear program. Such activities could well mean a new lease on life for NATO, which to some has appeared to be losing its vitality.

Behind all of this, of course, there lingers the great strategic puzzle of our times. What sort of war should we be prepared for?

First of all, the free world must keep up with the Russians in all developments of this aerospace and nuclear age. Our deterrent must be the most powerful that it is possible to achieve.

But it has long been apparent that the more devastating our weapons become, the more they act successfully as a deterrent to all-out war, the more the West must be on its guard against having its position nibbled away by small wars in which our use of nuclear warheads and missiles might be unsuitable or even dangerous. In other words, since the threat to us is an all-around threat, we need all-around defense.

This is not simply an argument of stick-in-the-mud soldiers and sailors against progressive airmen. The danger here is too real to be analyzed on that outworn basis. Recent events in Southeast Asia and elsewhere provide sufficient evidence in this regard.

This specific problem, as noted earlier, figured in the Defense Ministry equation that led to the Blue Streak decision. In attempting to do something of everything, to maintain an independent deterrent and an all-around defense posture, Britain was failing to do any job properly. Conventional and nuclear preparations were suffering mutually.

Ideally, if Britain could now enter into increased cooperation with her NATO allies in nuclear and space programs, she could both do that job better than on her own, and also leave herself with more money to spend on countering the obvious risks of small wars. Indeed, the government has announced that it aims to give Britain's Army, Navy, and Air Force a greater capability to get anywhere in the world quickly and with the best weapons available to deal with local conflicts.

These are only hopes. But they need not and should not end there.

If they do, it will be because Britain and her allies have ignored the handwriting on the wall illuminated by the end of Blue Streak as a weapon.

In this sense, the new turn in Britain's defense policy is potentially of greater importance than the changes wrought by Mr. Sandys three years ago. The independent deterrent experiment heralded by the White Paper has, in some vital respects, failed. If the reasons for and implications of the failure are honestly analyzed and accepted, then the West could be at the beginning of new moves toward genuine collective defense as important as those which, over ten years ago, led to the creation of the Atlantic Alliance.—END

The author, Norman Gibbs, is Chichele Professor of the History of War at Oxford University and a Fellow of All Souls College, Oxford. He has contributed three earlier articles on British defense matters to AIR FORCE/SPACE DIGEST, *the latest in July '59, entitled "Britain's Defense Dilemma."*

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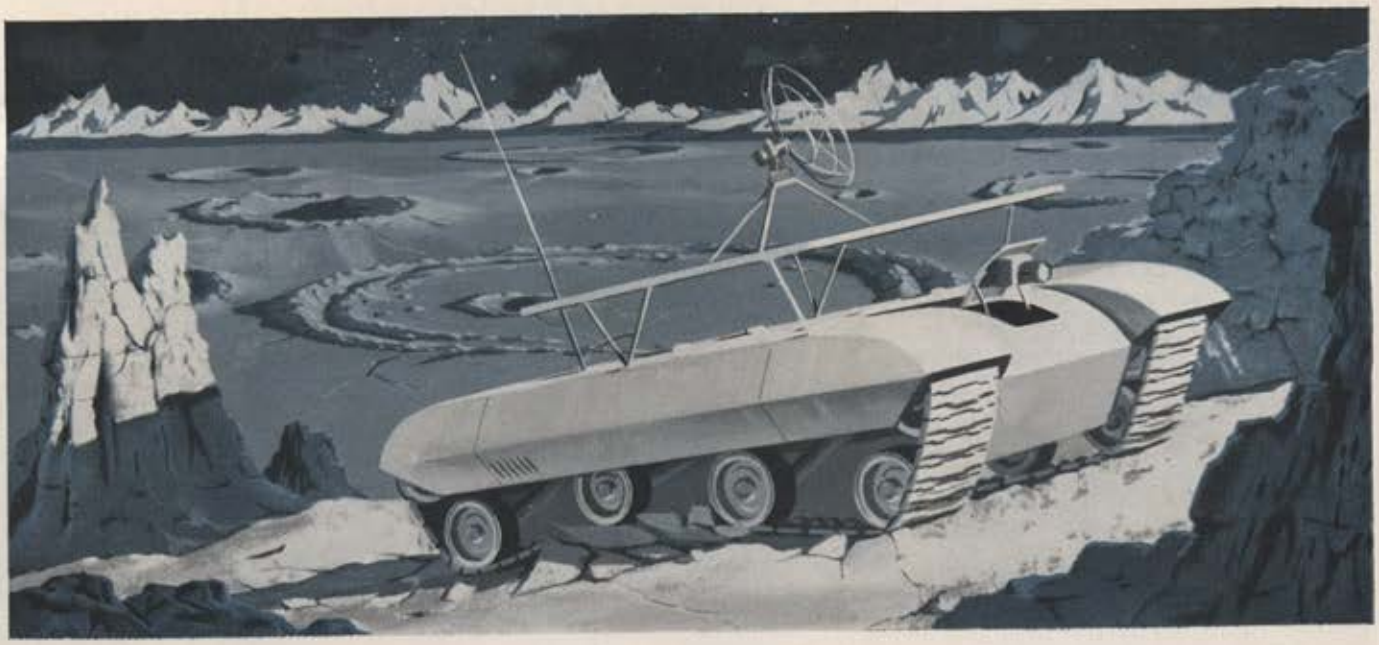

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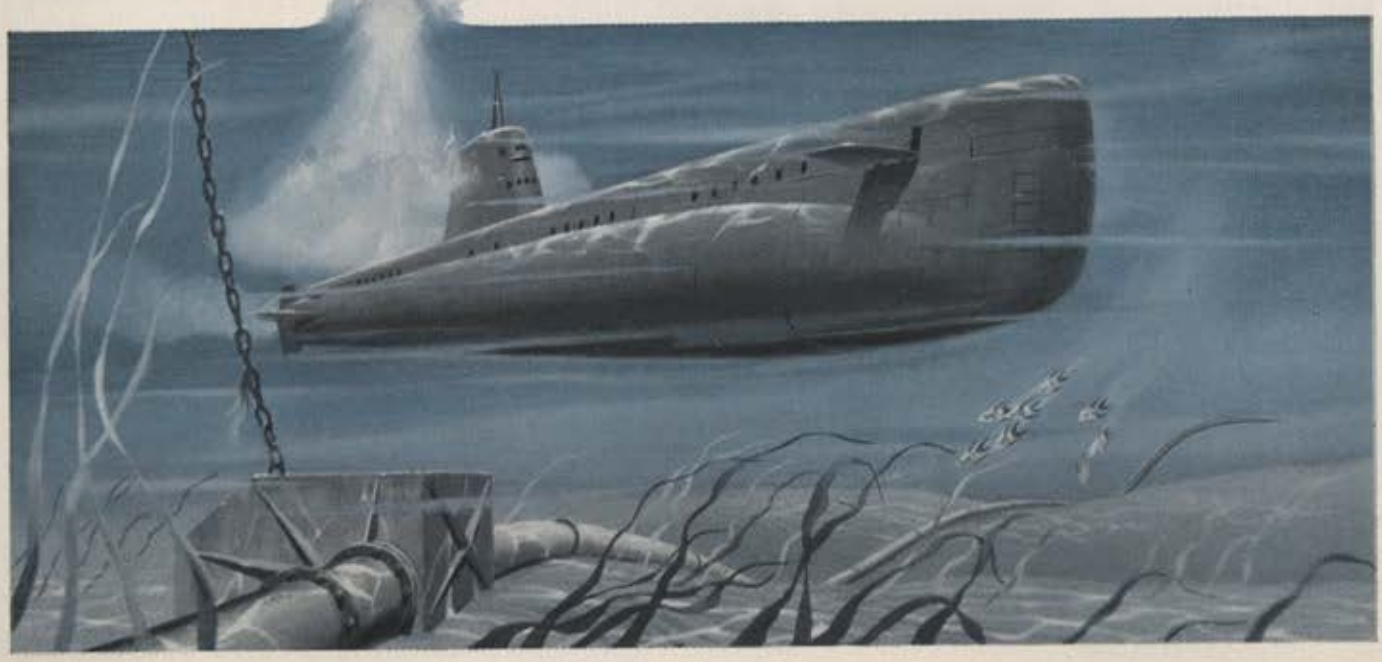


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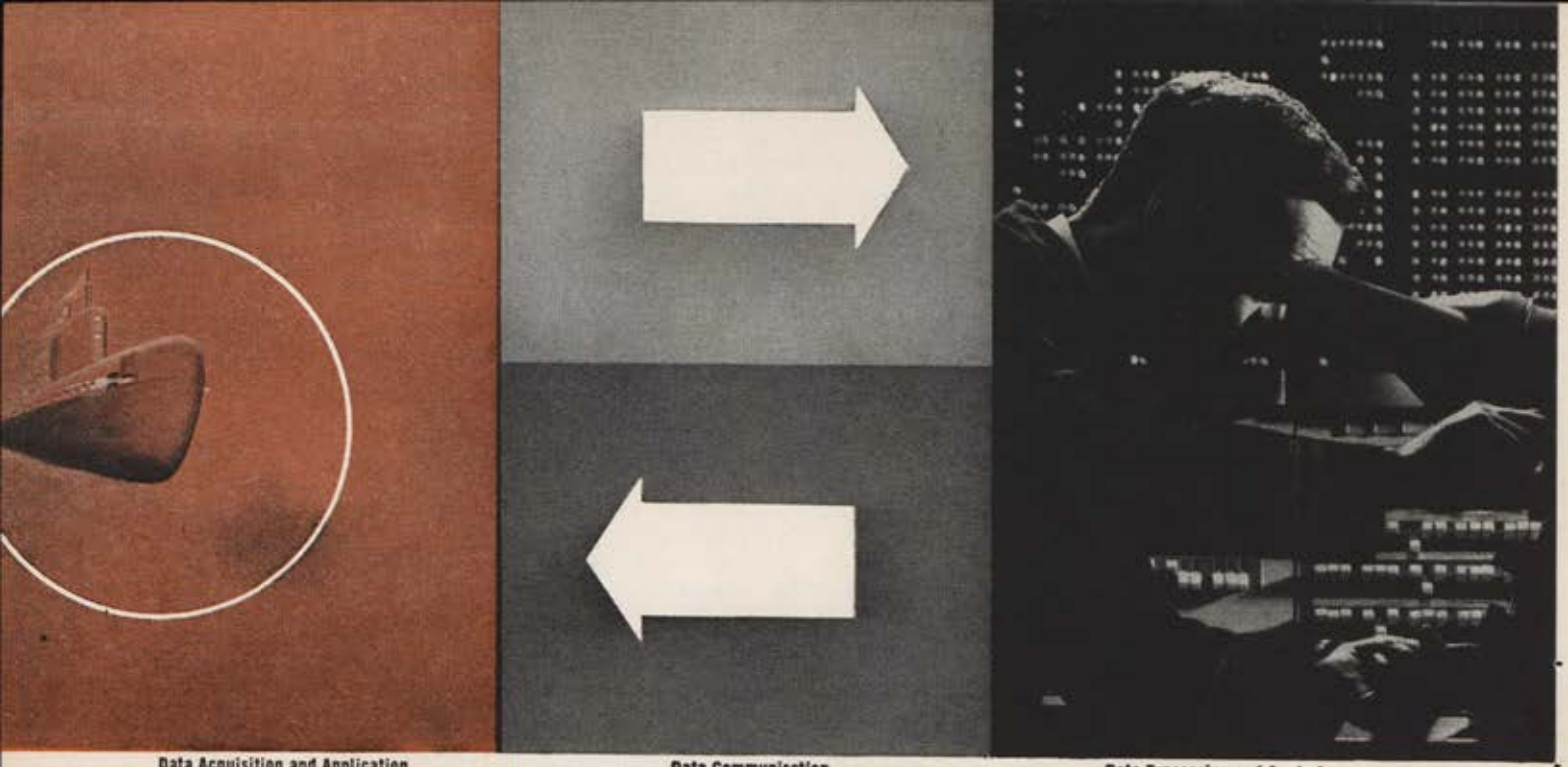

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THINKING AHEAD...

THE IMPACT OF MORE DEFENSE DOLLARS

Manuel L. Helzner

What actually might happen to the economy if defense spending were increased by $3 billion or more per year? Is a great sacrifice in standard of living required of the American people? Or can the economy absorb this increase without significant strain? To obtain authoritative answers the Editors of the Harvard Business Review *commissioned Manuel L. Helzner to bring up to date an earlier study which had been prepared by him and Gerhard Colm, Chief Economist of the National Planning Association, and on this basis to make an appraisal of the economic and budgetary implications of raising defense expenditures over the next three years to a level $10 billion higher than that now contemplated for 1963. His report is presented herewith with the permission of the* Review.—The Editors

WHILE some express alarm at the prospect of a rise in government spending, others maintain that government outlays—particularly for national security—fail to meet the Communist challenge. This report does not intend to go into the adequacy or the inadequacy of current defense programs or defense strategy. Rather, it will concentrate on analyzing the economic and budgetary implications of a significant increase in defense expenditures, without passing judgment on the desirability of the increase.

Fundamental to this economic appraisal is the assumption that in a democracy public support for maintaining a large defense program is essential. The tools of economic policy available for achieving national objectives are indeed useless if business, labor, farm groups, and the general public cannot be convinced of the necessity of the objective and of the policies required to achieve that objective.

An economic appraisal should also take into account the technological and administrative ability and capacity to absorb and effectively utilize the anticipated expenditure increase. In this report, a $10 billion rise in defense spending is assumed to take place over the period 1960-1963. This means that about three years would be needed from the decision to increase defense expenditures to the peak in actual government outlays. In addition, it is assumed that regardless of the size of the defense program, a high level of employment will be maintained as a principal objective of government. Hence, this study is concerned primarily with the policies and conditions that are needed to maintain balanced growth under different defense budgets.

On the basis of the 1961 budget figures proposed by President Eisenhower in January, it is clear that little change is being contemplated for national security from the 1960 budget level of around $46 billion (direct military budgets of about $41 billion plus some $5 billion for other security items like atomic energy, civilian defense, and foreign aid).

By 1963, however, some of the current missile development programs and other more advanced weapons systems are expected to reach operational stage. Thus, even without any major upward revision in current defense programs, national security expenditures in that year can be estimated at $48 billion (in constant 1959 prices). This modest increase in outlays largely represents cost increases due to the shift from relatively less expensive conventional weapons (e.g., manned aircraft and conventional armaments) to more expensive war materiel, such as missiles and nuclear vessels.

In the context of the federal government's budget outlook as a whole, government program commitments presently on the statutes can be expected to increase total budget expenditures over the next three years from about $78.5 billion in 1960 to roughly $84 billion by 1963. Defense spending would continue to account for the largest share of government outlays, while at the same time increases could be expected for interest payments and other nondefense programs (e.g., veterans' pensions).

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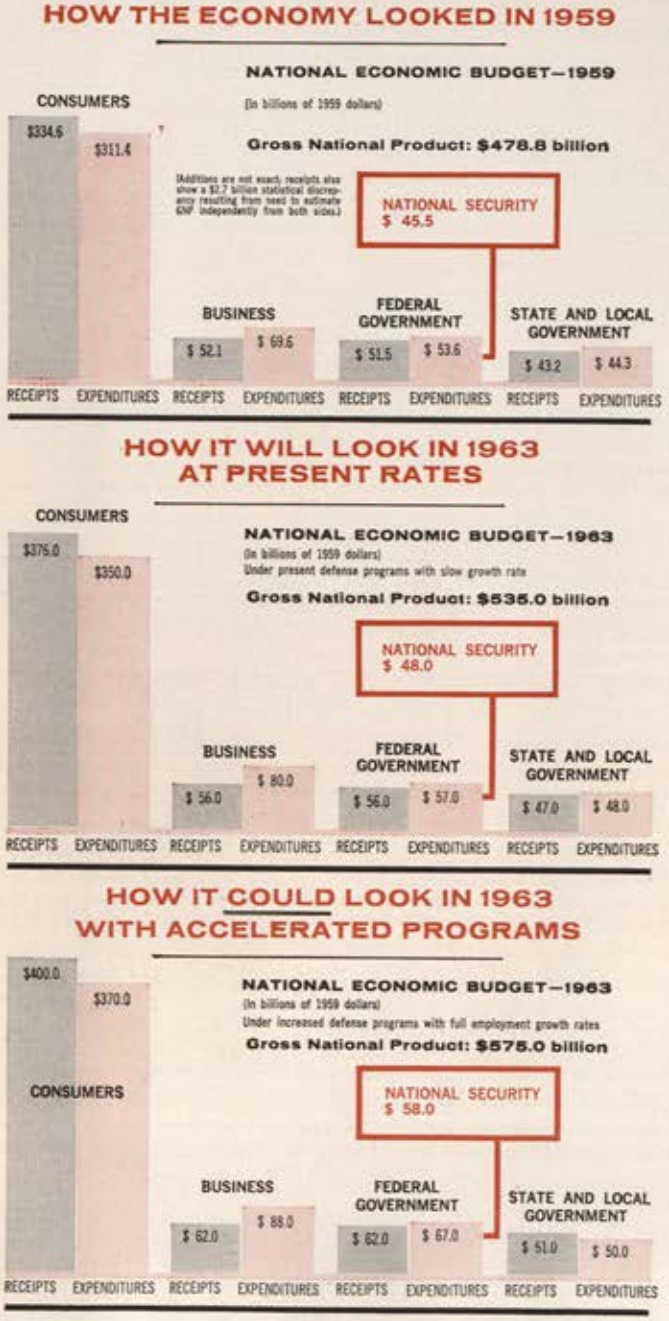

Charts portray US gross national product, at it was in 1959 (top), then as it will be in 1963 under present rates of defense spending (center), finally as it would be in 1963 if we increased defense spending $3 billion per year.

Because long-term expenditure commitments have been established for many nondefense programs, no substantial reduction in budget totals would appear feasible unless a cut in major national security spending can be made. On the contrary, in the absence of the need for a substantial increase in defense outlays, it has been suggested that consideration be given to expanding essential nondefense programs, such as combating air and water pollution, improving education, and developing natural resources.

Now what would happen if there were, in fact, a $10 billion increase in our defense spending above current programs? National security outlays would rise from the estimated $45.7 billion in fiscal 1960 to about $58 billion in 1963. It seems more realistic to expect a slow start and subsequent acceleration than even jumps. Then, phased over the three-year period, the increase in defense spending would progress like this:

	1960	1961	1962	1963
	(Billions of 1959 dollars)			
Present defense programs	$45.7	$46.2	$47.0	$48.0
Additional outlays		1.0	5.0	10.0
Adjusted defense programs	$45.7	$47.2	$52.0	$58.0

The way the national economic budget might look in 1963 if these additional outlays are made is shown in the accompanying chart, compared with 1959 and also with 1963 as it might look under a continuation of the level of defense spending now contemplated. If the underlying assumptions are realized (particularly in regard to maintenance of full employment), *we can easily weather a $10 billion increase in defense spending.*

In evaluating the economic impact of the adjusted defense program, certain crucial assumptions must be made about the nature of the increased spending. We face problems like this, for example:

- If the increase in defense expenditures calls for a rapid expansion in *missile output,* certain specific industries, such as electronics, would be most directly affected; the result could be serious production bottlenecks, material shortages, and inflationary pressures unless adequate countermeasures were adopted, such as materials allocation or possibly price control for critical materials in short supply.
- A broadly based *civilian shelter* program, by contrast, might find productive capacity available in the required industries without generating inflationary price increases.

Apart from these specific industry or production bottleneck problems, however, is the basic issue of whether a high and continuously rising level of defense expenditures can be sustained without inflation. Where the increase in defense outlays presses against productive resources whose growth is sluggish, inflationary pressures would indeed be generated. However, where the pace of economic growth can be sustained at relatively high levels, the increased demands of business, consumers, and the government can be met more readily.

It must be noted, nevertheless, that excessive demand is not the only source of upward pressures on prices. Wage increases which outstrip productivity gains may also force prices up. Or price rises may take place in industries characterized by monopolistic or largely demand-insensitive conditions (such as in steel or petroleum) for reasons other than excess demand or wage boosts.

These so-called cost-push pressures are a phenomenon of structural developments within the economy and have to be faced even in the absence of any significant increase in defense spending. Moreover, such price pressures are largely unresponsive to the more conventional measures for controlling prices through

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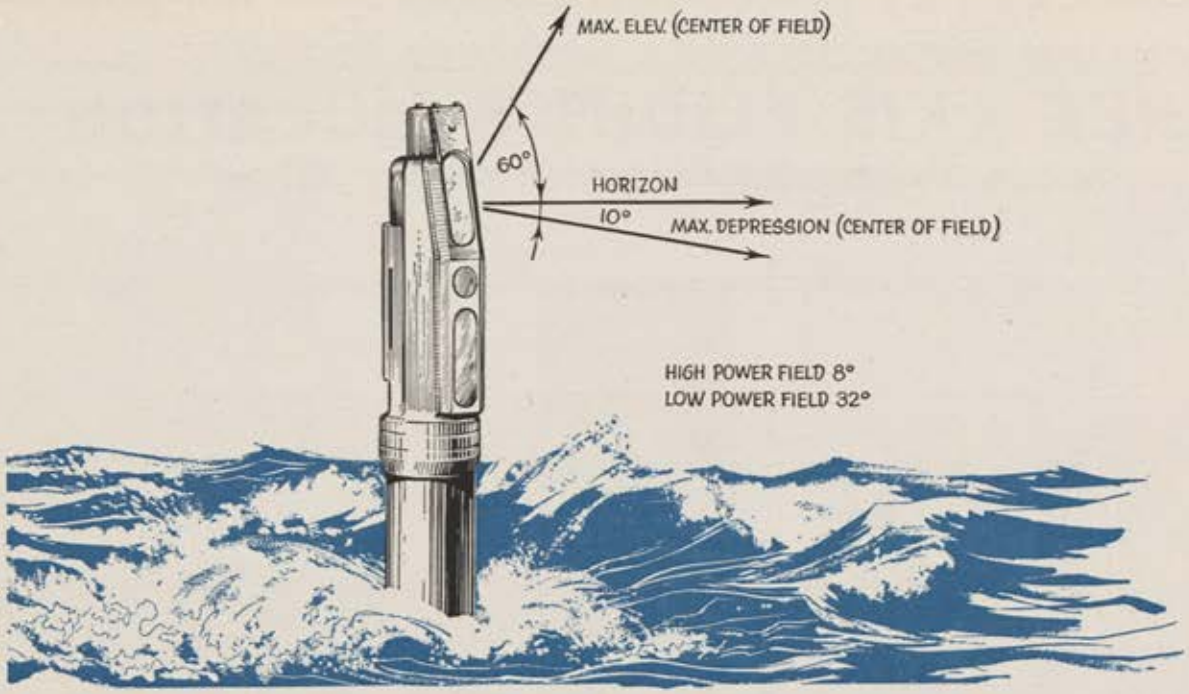

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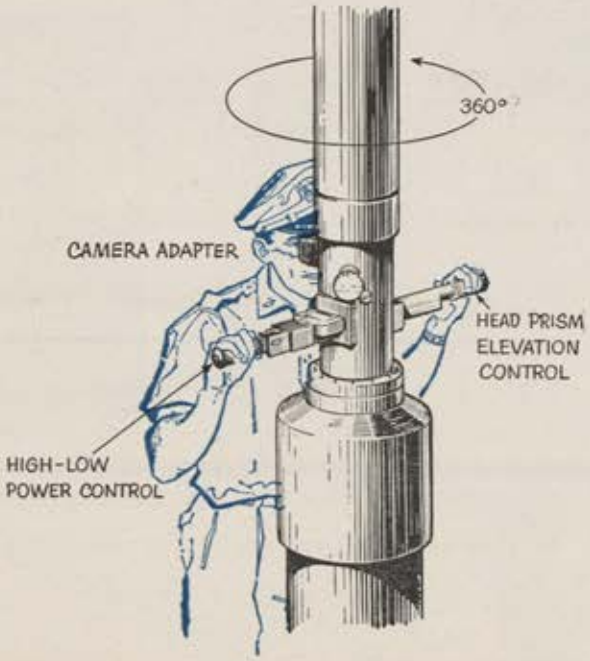

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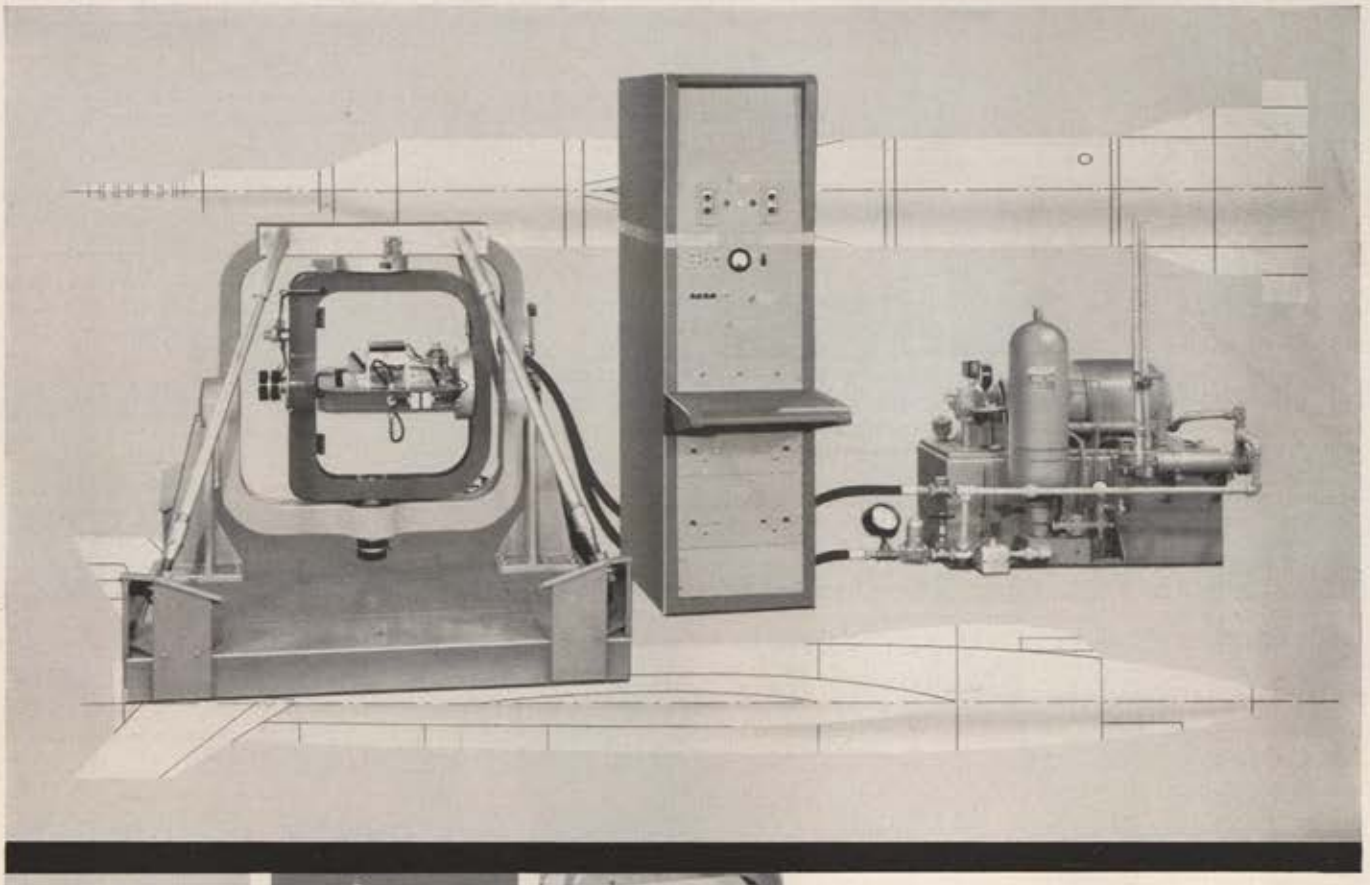

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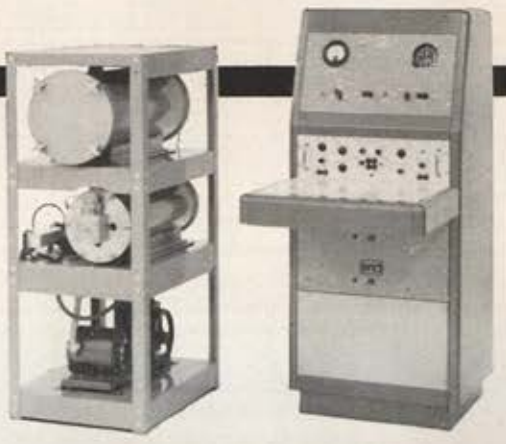

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influencing demand or supply. Hence, they require the development of some other more effective price restraining mechanism.

An economic appraisal of the impact of increased defense expenditures should be viewed in the context of the growth prospects for the entire economy. Such an appraisal could take as its starting point a simple extrapolation of recent growth trends:

- Since 1953 the gross national product in real terms has been increasing at the rate of 2.5 percent per year. If this low rate of growth is projected to 1963, we could expect a GNP of about $535 billion, an increase of some $55 billion above 1959 levels.
- National security expenditures under current programs would represent a declining proportion of the GNP, dropping from approximately 9.6 percent in 1959 to 9.0 percent in 1963.
- Increases in nondefense programs beyond what is currently anticipated, or a possible moderate reduction in taxes, would not only be feasible but might become necessary in order to forestall deflationary developments.

Under these conditions current defense programs would be compatible with further increases in consumer purchases and business investment.

Under more nearly full employment conditions, however, a larger productive potential for the economy could be realized. Part of this increase in production would come about through more man-hours, resulting from reduction in unemployment, attraction of additional workers into the labor force, lengthening the average work week through increased overtime, and a shift from part-time to full-time employment.

In addition, productivity rates would rise, in part reflecting the shift in production from the lower productivity consumer goods to higher-valued defense materiel, in part because the research and development activities associated with defense objectives not only improve productivity of defense equipment but also find applicability in nondefense industries. In this regard, the experience during and after World War II and the Korean War has demonstrated the contribution of defense-oriented innovations for peacetime application.

However, not all the the potential increase in GNP would be available for meeting increased defense requirements. In reality, a large part of the potential production is "preempted" by those sectors which make the increase in production possible. Only a relatively small portion of the additional productive resources would become available for "discretionary" use. Here are some of the preempting forces:

- Business requires additional productive resources for capital formation.
- An increasing population raises demand for goods and services.
- Consumers cannot be expected entirely to forego increases in consumption in the face of increased earnings.
- State and local governments may not be able to curtail or prevent increases in essential public services.

Nevertheless, with rising production, the discretionary portion grows and production can more easily be directed to national defense objectives.

As economic activity increases, the discretionary influence of federal, state, and local governments also grows—assuming no change in tax rates. It has been estimated that with each $10 billion increase in national output, total government revenues rise by about $3 billion. Thus, government programs which promote economic growth contribute to a rising tax base and, hence, make the financing of some of these programs possible without necessarily requiring higher tax rates or impairing improvements in the private sector.

Accordingly, in line with economic projections prepared by the National Planning Association's "National Economic Projections Series," it can be estimated that under conditions approximating full employment:

- The economy would show a growth rate of roughly 4.5 percent per year (presuming of course that monetary and credit policies will be adopted which foster such growth).
- On this basis a GNP of $575 billion could be achieved by 1963.
- National security expenditures of $58 billion would thus represent 10.1 percent of GNP in 1963 compared with 9.6 percent in 1959.
- There would be no significant increase in inflationary forces—no decrease, either. Consumer expenditures would represent 92.5 percent of consumer receipts, as compared with 93.0 percent in 1959.

Some conclusions can be drawn at this point:

(1) If production bottlenecks were to be avoided, adequate resources could be made available for meeting the $10 billion increase in defense needs without jeopardizing the requirements of business, consumers, or the need for some expansion in government nondefense programs.

(2) On the other hand, the tax reduction which would otherwise be feasible would not now be possible, although the prospect for some rate revisions and the closing of tax loopholes would not necessarily be excluded.

(3) With a $10 billion increase in defense programs over the next three years, it would still be possible—with economic growth proceeding at approximately full employment rates—to maintain and perhaps slowly increase some of our nondefense programs as well.

(4) If there should occur a spring thaw in world tensions, the economy could equally support a $10 billion increase in nondefense programs over the next three years. And with economic growth, significant advances could be made—even with defense programs at about present levels—in overcoming some of the serious deficiencies in essential nondefense programs.—END

Until recently, when he took a position as economist with the US Post Office Department, Mr. Helzner had, since 1955, been an associate economist with the National Planning Association. He was with this group when he prepared the accompanying article, which appeared originally in the March/April 1960 issue of Harvard Business Review *and is reprinted here with permission of that publication. Mr. Helzner holds a Ph.D. from George Washington University.*

There are two sides to the deterrent coin today. First, the United States must maintain its strategic air capability. Second, we must be prepared to recover from a nuclear attack. Here an aware and hard-willed citizenry is the . . .

KEY TO SURVIVAL

Maj. Luther R. Myers, Jr., USAF

THOMAS JEFFERSON commented that it was an aim of the Declaration of Independence "to place before mankind the common sense of the subject, in terms so plain and firm as to command their assent, and to justify ourselves in the independent stand we are compelled to take."

In my opinion, this states a position that the military must take today. We must go before the public and make them aware of the fact that our survival as a nation is at stake right now, and we must do this in terms that they will understand and will respond to.

We are still a free nation today because of our strategic air capability. No other posture would have been as effective.

Neither can I envision any time in the future when this retaliation capability could safely be lessened. Rather it must grow, continue to be modernized with the state of the art, and remain flexible.

I think it necessary, however, that we now develop, alongside our strategic capability, an internal capability to survive as a nation. There seems to be a growing acceptance of the idea that our nation will receive a tremendous blow in the event of a war with Russia. Such a blow could easily prove a mortal one if we were not prepared to accept it.

The fact is, our ability to survive all-out attack and strike back is becoming more and more important. Basically this ability to recover becomes an extension of the arm of retaliation.

The strength of America, or any nation, lies ultimately with her people. Lose the people and what is left to recover? Conversely, deny an adversary the means of destroying the people and you have magnified his problem of offense many times over. You not only pose a serious threat to his ability to deliver an initial knockout punch, but you burden his economy with increased military requirements.

Assume that we do have a citizenry that becomes hard-willed enough really to plan for survival—a citizenry that prepares reasonably secure shelters, practices emergency procedures, is ready if the need arises to fill bomb holes, repair aircraft, remove debris, care for the wounded, and cheer a bomber crew as it turns around for another mission. Then, and only then, would we have developed a real meaning to the term retaliation. Development of such a prepared, survival-conscious citizenry must, therefore, be among our major goals.

Usually, at this point in a discussion of this type someone asks the rhetorical question, "Is there no other solution to this dilemma besides war and mutual destruction?" Others feel there's no sense in trying to defend ourselves against a nuclear missile attack. Some desire to place implicit faith in a firepower stalemate. And of course there are, even now, some dreamers who think we are still hiding behind those big oceans.

Pacifists may argue that we could coexist by surrendering, partially, to the Communist ideology or by making a deal with it. I suggest that this would preserve nothing. We have before us many examples of those unfortunate countries that succumbed to such false reasoning and disappeared completely behind the Iron Curtain.

This, then, leaves us only one choice. We must prepare to win a war for survival. Naturally, we hope we will not have to fight such a war. But we must be prepared—to survive or die.

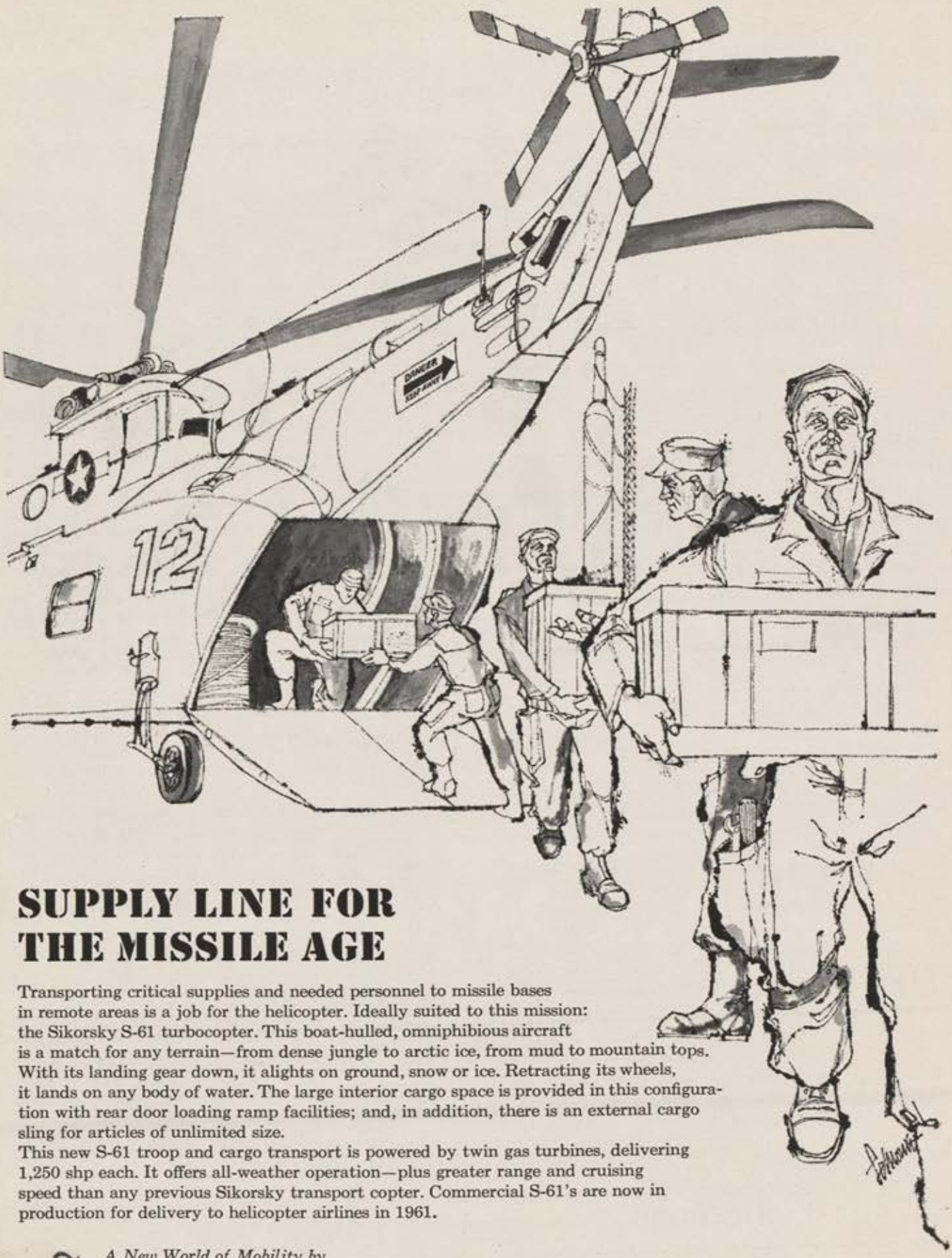
Now the question becomes: "What must we do to survive?" We have already suggested the answer. This fight for survival will require a frank acceptance from everyone in this country of our individual obligations to do everything in our power to protect our way of life.

It means we must become a nation of joiners—not in Wednesday bridge clubs, but in civil defense agencies, in disaster relief organizations, in military reserve units, or military support organizations. It means a military strength in being ready to fight war on an instant's notice.

The plans and means for survival of our people must be in the same state of readiness as our military arm for retaliation, not only to save lives but as part of our military posture. There must be an interlocking military-civilian recovery plan in being and capable of spontaneous reaction. I suggest this would call for utilization of our military forces, including airlift, that are not committed to an offensive role in preplanning and training for an all-out survival and recovery role.

It is our nation's destiny to play the lead role in this great twentieth-century drama of survival. I am confident that we will succeed in developing our military and survival capabilities if we can wake people to this fact. We can now be completely and irrevocably destroyed at any minute of any day or night. But we *can* prevent this ever happening.—END

The author, Maj. Luther B. Myers, Jr., is Assistant Director of Management Analysis, CONAC. He was previously Commander, 13th ATF, MATS, Brookley AFB, and Director of Management Analysis, Caribbean Air Command. A member of the USAF Speakers' Bureau in 1958 and 1959, Major Myers has delivered numerous talks on defense.



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THE SPACE AGE IN PERSPECTIVE

SPACE DIGEST

VOLUME 3, NUMBER 6 • JUNE 1960

The Lunar Space Station project at Martin is one of astonishing magnitude, for it coordinates practically all areas of scientific thought into one common objective: *sustaining life in outer space.* If you have the scientific or engineering talent required to aid in the fulfillment of this objective, we urge you to write immediately to N. M. Pagan, Dir. of Tech. & Scientific Staffing, The Martin Company, (Dept. HH-8), P. O. Box 179, Denver 1, Colo.

MARTIN
DENVER

As we examine scientific achievements in astronautics, we must be increasingly aware of . . .

Space Advances and US Defense

BRIG. GEN. RICHARD D. CURTIN, USAF
Deputy Commander for Space Systems, USAF Ballistic Missile Division

THE primary purposes of Pioneer V, Tiros, and Transit are clearly scientific. But it is easy to see that all have military usefulness. . . .

One can see . . . that the kind of communications capability we are demanding with Pioneer V will lead to global high-capacity communications when it can be translated into orbiting communications satellites. The military significance of reliable, uninterrupted, instantaneous global communications facilities will become more vital as our inventory of intercontinental ballistic missiles and space systems grows larger with time. Early warning and reconnaissance by satellites will become even more effective if we have the means to relay expeditiously the information they provide. . . .

What Pioneer V is doing with its electronic beeping in pushing back the space frontier, Tiros is accomplishing with pictures. A few years ago we were elated to be able to distinguish the curvature of the earth in pictures taken from balloons or jet aircraft. Yet today, photographs which clearly reveal broad areas of the earth's surface are almost routine. Tiros has sent back thousands of them with its two television cameras.

Tiros, in keeping a "weather eye" on our earth's cloud cover, will greatly improve weather forecasting—a great need and boon for all military operations. Photographic coverage of the globe from polar-orbiting surveillance satellites will do much toward raising the Iron Curtain.

Transit I-B, the third shot launched by the Defense Department/NASA team last month, is demonstrating experimentally what satellites can do to improve navigational mechanics. The military value in this should be obvious. The accuracy of our ballistic missile submarines using such precise navigational data will be greatly improved, and navigation for all military and civilian air and sea units will benefit eventually. . . .

[But] there are significant differences between military and scientific missions. One Midas satellite, for example, does not constitute an early-warning system. If we are to detect ballistic missile launchings within a broad geographic area, we must ensure coverage of that area twenty-four hours a day, seven days a week. This requires a network of Midas satellites, operating as a system, and strategically located. . . .

Another difference between the space needs of the military and the scientific lies in the need for larger numbers of boosters and stages (as in the Midas system). The maintenance of constant reconnaissance and warning will require numbers of satellites, and thus, to remain economically solvent, we are trying hard to prove the feasibility of booster recovery and over-all simplification and ruggedness for repeat use of such hardware. . . .

Of course, too, our military space systems, operating as they will twenty-four hours a day, will be operated by military officers and men, and the need is a great requirement which the scientific single experiment need not face. . . .

The military has necessarily practiced great selectivity in moving ahead into space systems. This has been so because of the great cost of these systems. Whereas a number of various programs have started with a few launches to test feasibility, the areas of communications, warning, reconnaissance, navigation, etc. . . . but one system [has] thus far [been] initiated. As space defense continues to be studied more systems will probably be developed to allow the military mission in this area to be better performed.

Whereas many of the early systems in space will use unmanned vehicles, the Dyna-Soar system will no doubt show the way for a growing use of man in space vehicles. . . .

The inescapable fact of life today is that space is available for our use. If we fail to use it to our advantage, it may very well be used against us. —END

—From an address to the Aviation/Space Writers' Association, Los Angeles, Calif., May 3.

'. . . I don't think of or worry about [Sputnik]. After all, you vote your government in; let them take care of it, after all.'

—Reply given to Associated Press's Saul Pett in a post-Sputnik poll in Sheboygan, Wis.

SPUTNIKS AND PUBLIC OPINION

. . . The Myth of 'Impact'

DONALD N. MICHAEL

IT WAS a matter of hours after Sputnik I settled into orbit that American newspaper editorials, news analysts, and voices in Washington were expressing indignation and concern over the Russian victory and proclaiming in the same breath that the citizens of the United States were aroused as one man, indignant, and clamoring for an all-out effort to recapture our position of political and military preeminence. Was this image of aroused American public opinion, in fact, a valid one? Or were there large segments of the public unconcerned about, or ignorant of, the implications of the Russian accomplishments.

It is a common and comforting American axiom that at times of crisis public opinion stands behind our leaders, monolithic in expression, informed, and decisive. Nevertheless, many studies of the nature and distribution of public opinion indicate that, surprisingly, often the impact of major events makes at best a selective impact, impressing only certain segments of the public, and that the impression itself produces only an inconsistent and incomplete appreciation of the event.

What did the headlines proclaiming the Soviet moon mean to Americans when they first came upon the words? For many Americans, the news of October 5 was their first introduction to astronautics. Six months earlier, the Survey Research Center of the University of Michigan, conducting a survey for the National Association of Science Writers, asked a national sample of Americans: "Have you heard anything about plans to launch a space satellite, sometimes called a man-made moon? From what you've heard, what is the purpose of launching these space satellites?"

About half of the respondents had never heard of space satellites, and only about one-fifth of the sample had any real idea of the nature and purposes of the devices. Respondents who had taken science in high school and college were most familiar with the idea and purposes of the satellite of all the education groups, but, even among them, only about half had a good idea of what the man-made moons were to be used for. In Baltimore, the city next door to the home of the Vanguard itself, Sidney Hollander Associates found that in June of 1957 only about one-sixth of their respondents had any understanding of the term "satellite."

Were Americans surprised at the Russian accomplishment? The Gallup Poll asked people in

Washington and Chicago the following question: "The Russians have just launched an earth satellite. Were you surprised that the Russians were able to do this before the US?" About half of their sample said they were surprised, the rest being either not surprised or having no opinion.

It's difficult to know just what to make of those many who said they weren't surprised by Russia's first place in the race for space.

Perhaps some of the respondents were not surprised because they didn't know enough about our efforts in this area either to realize that (a) we were in competition with the Russians, or (b) that the technological accomplishment per se was of such a magnitude as to demolish our myth of unmatchable technological superiority.

Perhaps one evidence of naiveté is apparent in the Chicago and Washington responses to another question asked in a Gallup Poll at the same time: "The US was the first to develop the atomic bomb. Russia was the first to develop the earth satellite. In your opinion, which country will come out with the next great achievement of this nature—the US or Russia?" To which about two-thirds of the persons queried answered that the US would make the next great advance and slightly less than a fifth answered it would again be Russia.

One wonders—whence all the optimism? Certainly, unless we assign a good deal more sophistication to the various American publics than the facts of the pre-Sputnik surveys seem to warrant, the responses to this last question indicate that at the time of Gallup's survey, either the great American myth still persisted or the respondents simply did not appreciate the profound technological feat a satellite represented.

The contributions to the state of mind of some Americans of the myth, of ignorance, and doubtless of Washington pronunciamentos, are evident too in the responses to questions about Sputnik collected by the Minneapolis *Tribune*'s Minnesota poll in mid-October. These pollsters asked: "Do you think the US could send up a satellite within the next thirty days if we wanted to; or do you think we're not able to?" In Minnesota, sixty-five percent of the sample said we could do so, and even slightly more than half of the college educated said we could.

This optimism about our satellite-launching capability as expressed in Minnesota, and about the likelihood of our making the next great advancement in the scientific-military line, as stated by the Washington and Chicago samples, is interesting also in the light of the American publics' explanations of how the Russians got there first.

The week end following the first Sputnik launching, Hollander's organization asked: "How do you explain Russia's getting its satellite up first?" Half couldn't explain it. A quarter of the sample felt the Russians succeeded because they tried harder, fifteen percent thought they were just better at this sort of thing.

Gallup asked a cross-section of Americans the question: "Why do you think Russia was able to launch the earth satellite before the US did?" He found four principal reasons: (a) "The Russians worked harder and longer at it; concentrated on it." (b) "Russia has better scientists; got scientists from Germany after World War II." (c) "US program was badly organized; interservice rivalry slowed our program down." (d) "Russians made more money available for their satellite program."

Gallup says that among the most frequent responses in category (a) were those which echo the words of a thirty-year-old housewife in Pitts, Ga.: "We had too many things going on at once, while the Russians concentrated on one—the satellite." Variations on this theme are also evident in the statements of public figures and in many editorials.

The roots of this belief deserve far more study than they have yet received, since there is ample evidence, well known to the readers of AIR FORCE/SPACE DIGEST, that the Russians, far from concentrating exclusively on Sputnik, had been distributing their scientists and technological and military efforts in many directions—and successfully, too.

One type of response in the second most frequent category of explanations for Russia's success also sounds like the most transparent of rationalizations—that Russian success resulted from the large number of "German and Italian scientists" who worked on the Russian project. Again, there is no factual basis for that argument, and it was not one which dominated the explanations provided by the mass media. Therefore, it was hardly one that the man on the street could have proposed on the basis of previous information. It did, however, fit one popular explanation for Russian success in the design and production of nuclear weapons; hence, it was easy enough to carry it over to the Sputnik situation.

And what of our military strength and prestige in the international arena? (Possibly that is what the Indiana University Extension Center wanted to know when it mailed cards to its students asking: "What do you think the effect of Sputnik will be on America's future?" According to an Associated Press release, as reported in the New York

Times of October 26, "Ten percent of the first- and second-year college students answered that they didn't know that the Soviet Union had launched a satellite." However, it should be added here that by the time the Survey Research Center conducted its second survey in November, ninety-five percent of the population had heard of Sputnik—an almost unprecedented degree of public awareness.)

Two-thirds of the "Minnesota Poll's" sample thought it didn't matter very much "that Russia was ahead of the United States in sending up a satellite." A quarter thought it mattered a great deal. (Incidentally, those people who thought it mattered a great deal also tended to be the group who had doubts that we could launch a satellite in thirty days.)

In Baltimore, Hollander asked his sample, "What do you think about the satellite?" While about half of the responses referred to aspects of our competition with Russia, less than a fifth of these responses could be construed as indicating that the respondents felt the Russian lead was serious and that our position was in jeopardy.

Gallup found that his Washington and Chicago respondents split about fifty-fifty as to whether or not our prestige had suffered seriously.

The noted political analyst Samuel Lubell also sensed this limited concern in his interviews conducted in New York state and New Jersey during the six weeks following October 4. He says in the *Columbia University Forum*, "There was no evidence at all of any panic or hysteria in the public's reaction. On the contrary, people generally tended to avoid looking at the dark side of the Soviet moon. They seemed to want to see the event in the light least threatening to this country even though most were quick to say: 'We ought to do everything necessary to catch up.' "

Half of Gallup's national sample felt that "Russia is moving ahead of the United States in the development of missiles and long-range rockets," but the remaining half either felt the Russians were not moving ahead of us or were undecided as to what the true situation might be.

The Survey Research Center asked, "What do you see as results of this [Sputnik launching] during the next year or two?" About three-quarters felt that the Russian satellite should make "a difference in what we are doing about the defense of this country" with the largest vote of about half going for a crash program on weapons development.

There are other bits of evidence that, at least during the first weeks following Sputnik's launching, Americans were not of one mind regarding the significance or meaning of the satellite. Dr. Allen Hynek, associate director of the Smithsonian Astrophysical Observatory, commenting on the reactions among laymen he met in the Midwest, is quoted by the Associated Press as saying, "Their attitude seemed to be that we had lost the ball on the forty-yard line but would surely win the ball game. . . . It was a shocking mixture of complacency and superiority. They seemed to want reassurance from me that everything was really all right."

The Associated Press sent two reporters out to sample public reactions in Sheboygan, Wis., and Gatlinburg, Tenn., during those first weeks. Saul Pett, talking with citizens in the industrial community of Sheboygan, begins his report with, "The people . . . read about, talk about, wonder about the Soviet satellite, but there is little sign of deep concern. Mention Sputnik in Sheboygan and the first reaction is a broad grin and frequently a joke." Pett continues, "Among many people, there is a refusal to admit that the US is really behind the Russians in outer space, or, if it is, [the belief] that it will not stay behind long."

As examples of this attitude, Pett quotes a waitress, and he says essentially the same argument was proposed by as diverse citizens as a lawyer, electrician, and banker: "I think we're catching up with them, but we're just not letting it out. After all, this is the US. We haven't been licked yet. Sure, the Russians are smart. But what it took them five years to make, we'll probably make in a year."

Lubell suggests an explanation for these indications of public optimism about our own satellite-missile potency and our military posture. He says, "One thing that I found especially striking was how closely the public's reactions corresponded to the explanatory 'line' which was coming from the White House. Relatively few persons repeated the criticisms which were being printed in newspaper editorials or were being made by members of Congress or by scientists. In talking about Sputnik, most people tended to paraphrase what Eisenhower himself had said."

There are two more sets of data worth mentioning herein; they were collected late in December 1957, and in January 1958, slightly later than those referred to so far. These are the data collected by the Opinion Research Corporation and the data deriving from a questionnaire printed in *The Saturday Review*'s Science and Humanities Section headed by John Lear.

The ORC pollsters found that a bit over a

tenth of their sample felt that "the US is dangerously behind Russia in developing advanced weapons," while eighty-two percent felt that either we were behind at the moment but would catch up soon, or that taking all kinds of weapons into account, we were at least even with the Russians. As to why we had not gone ahead faster on missiles and rockets, eighteen percent said it was because Americans were not aware of the need before Sputnik, seventeen percent blamed it on government inadequacies, fourteen percent felt we had not allocated enough money to such efforts, thirteen percent blamed it on service rivalry, and eleven percent felt our educational system was faulty in supplying scientists.

The ORC sample was asked, too, "Looking to the future, what would you say is the real meaning of Sputnik for us here in America?" Twenty-three percent thought that we must catch up in education, science, and defense; fifteen percent saw it was a further threat to our security. Another twelve percent saw it as evidence that Russia is ahead in scientific research, while eleven percent professed to see nothing significant in the accomplishment. Eighteen percent saw it in terms of space exploration and the advancement of science. Six percent thought it was a good thing because it shook our complacency, but five percent saw it as propaganda and bluff. And one percent felt that this was an invasion of God's territory, and thereby wrong.

One way or the other, two-thirds of the sample felt that in a war with Russia, we would have as good a chance of coming out on top as we did in World War II. While about a third said we should increase defense spending by several billions, almost three-quarters were against raising personal income tax rates in order to increase government funds, preferring instead to cut government waste and foreign spending and to raise corporation taxes.

Asked what aspects of the Russian satellites (Laika was in orbit by then) made the deepest impression, about one-fifth of *The Saturday Review* sample said the magnitude of the scientific accomplishment, and another one-fifth said the magnitude of the Russian deed.

What do we conclude from this recounting of the statistical facts of American reactions to Sputnik? Before we conclude anything, a sharp note of caution is in order. In the large and taken together, the precise percentages supplied here give little more than an indication of where the emphasis lay in the patterns of attitudes expressed by the respondents.

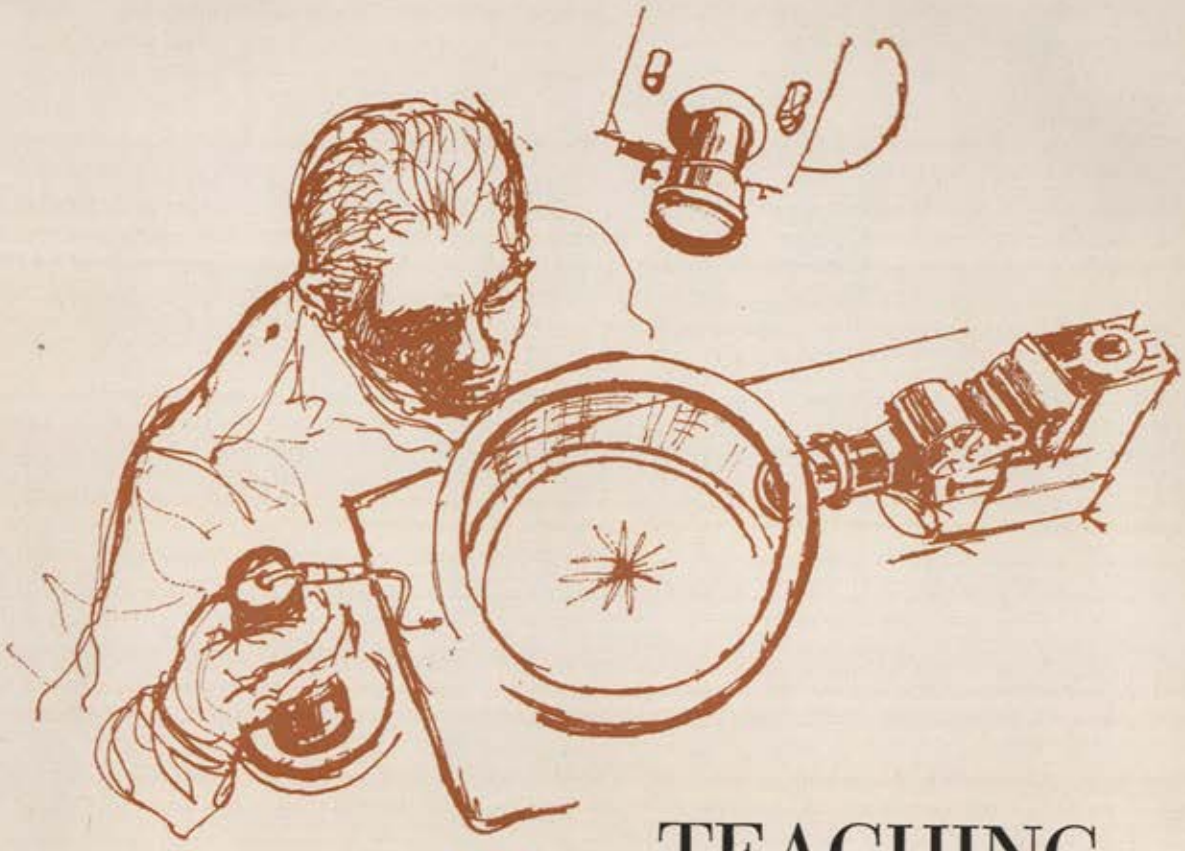
However, in spite of the limitations of polls, several conclusions seem sufficiently clear:

In the days and weeks and months immediately following the launching of the Soviet satellite, a considerable portion of the American public responded vigorously, but variously, to the implications of the accomplishment. But by no means *all* of them did so respond, nor did they all respond in ways calculated to convince the observer of the depth and solidity of their appreciation of the situation. This was so in spite of the massive coverage of all aspects of the event by the mass media. The fact is that considerable portions of the American public also showed a very limited appreciation of the significance and implications of the accomplishment and a gratuitous confidence about our position vis-à-vis Russia in the fields of advanced technology.

The opinions held by many Americans regarding this first step into space were sometimes inconsistent, occasionally rich in *non sequiturs,* and not infrequently illogical. As Lubell says, "I was astounded repeatedly by the strange uses people made of the facts they were reading in their newspapers or listening to over the radio." But—and this is the important fact—the limits in public understanding and reasoning regarding the Sputnik are not unique to this event; they appear to be characteristic of responses people provide for events which are essentially alien to their everyday way of life.

The years ahead will face us with many Sputniks and will thereby require of our citizens stern, costly, and imaginative participation in programs to meet and surmount the many complex challenges with which our growing technology confronts us. To succeed in space and to succeed on earth, we must somehow learn to make the larger world of ideas, so brilliantly exemplified by the satellites, the "immediate environment of the individual." There is a race we must run—the race for an enlightened and involved public.—END

Donald N. Michael is a social psychologist long interested in public opinion research with special reference to national security. Now associated with the Brookings Institution, Washington, D. C., he received his doctorate from Harvard. Above are his personal views and do not represent official views of the Brookings Institution.



TEACHING SPACE-AGE SCIENCE

A teacher whose students have been good naturedly keeping him up to date on the space age suggests that the earlier the better is the time for . . .

WILLIAM I. HARBER

IN A short monograph, "Man in Space: A Tool and Program for the Study of Social Change" [*Annals,* New York Academy of Sciences, Vol. 72, New York, 1958], there is a contribution by Lawrence K. Frank entitled "Cultural Implications of Man in Space." Mr. Frank says, among other things, "Ordinarily the teaching of physics, chemistry, and mathematics is limited to the classic framework, the ideas developed prior to 1900, with the result that the younger members of society learn of the new climate of opinion from comics, science fiction, TV, movies, and other informal sources." He goes on to say that "an introduction to MIS (man in space) may be more feasible in nursery school than it is in elementary grades."

My first reaction on reading this statement was that Mr. Frank was pulling the reader's leg. But after a careful rereading I began to sense his meaning.

As a teacher of physical science in the junior college, I had been puzzled from time to time by the following phenomenon. Affable students would bring articles and clippings on scientific matters to my desk and leave them with the earnest suggestion that I read them. Even though I had frequently seen or read the particular item a student brought, I thanked each student warmly for his thoughtfulness.

What I didn't understand for some time, longer

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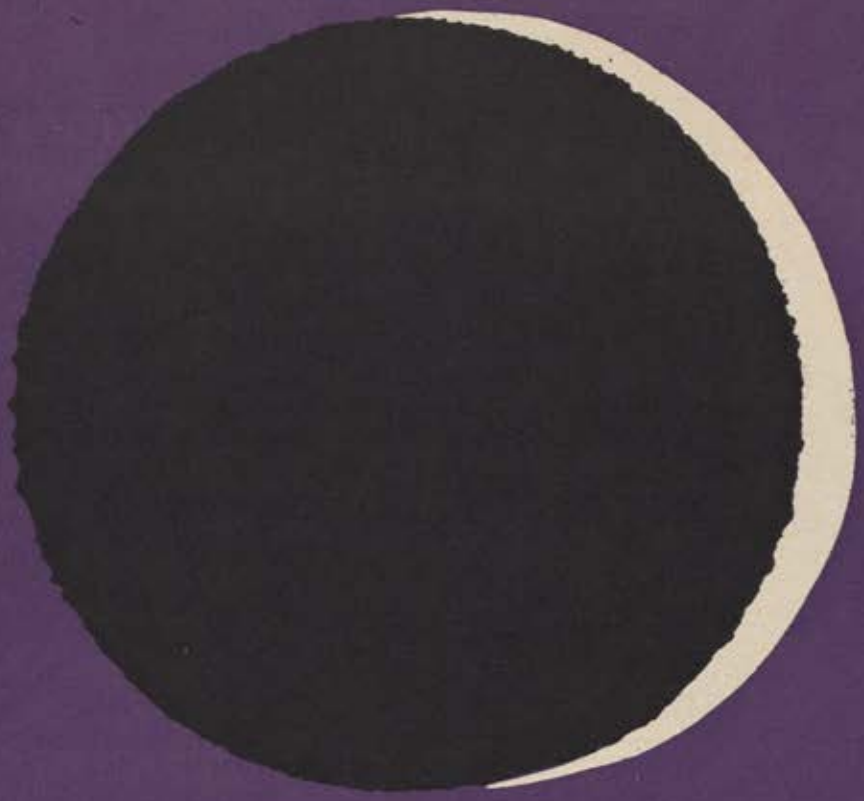

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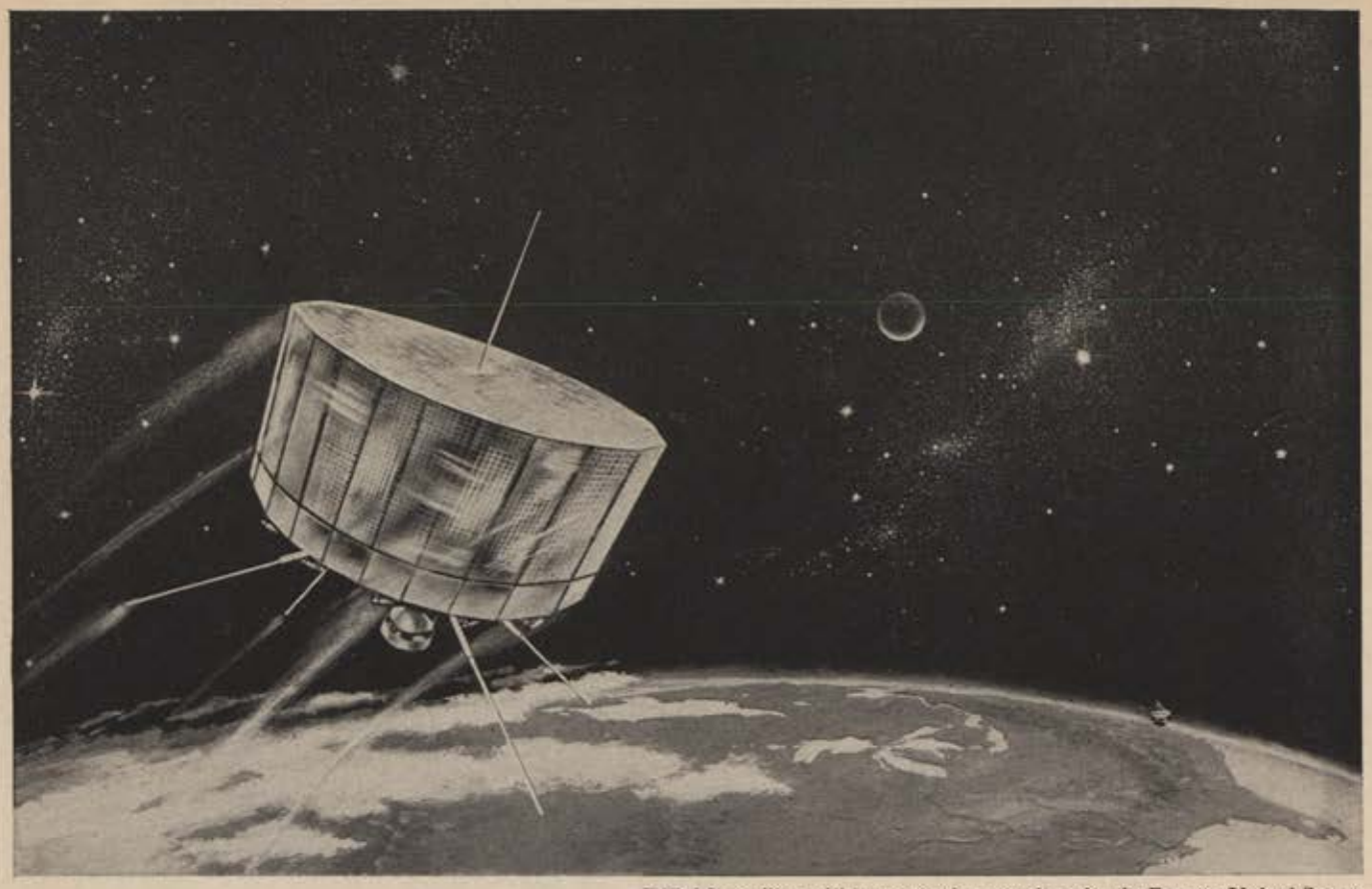

TIROS satellite orbiting towards ground station in Eastern United States.

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The success of experimental Project TIROS opens the door to a new era in weather forecasting—with benefits to people of all lands. This experiment may lead to advanced weather satellites which can provide weathermen with hour-by-hour reports of cloud cover prevailing over the entire world. Weather forecasts, based on these observations, may then give ample time to prepare for floods, hurricanes, tornadoes, typhoons and blizzards—time which can be used to minimize damage and save lives.

Many extremely "sophisticated" techniques and devices were required to make *Project TIROS* a success—two lightweight satellite television cameras, an infra-red horizon-locating system, complex receiving and transmitting equipment, and a solar power supply that collects its energy from the sun itself. In addition to the design and development of the actual satellite, scientists and engineers at RCA's "Space Center" were responsible for the development and construction of a vast array of equipment for the earth-based data processing and command stations.

Project TIROS was sponsored by the National Aeronautics and Space Administration. The satellite payload and ground station equipment were developed and built by the Astro-Electronic Products Division of RCA, under the technical direction of the U. S. Army Signal Research and Development Laboratory.

The same electronic skills which made possible the success of man's most advanced weather satellite are embodied in all RCA products—RCA Victor black & white and color television sets, radio and high-fidelity systems enjoyed in millions of American homes.

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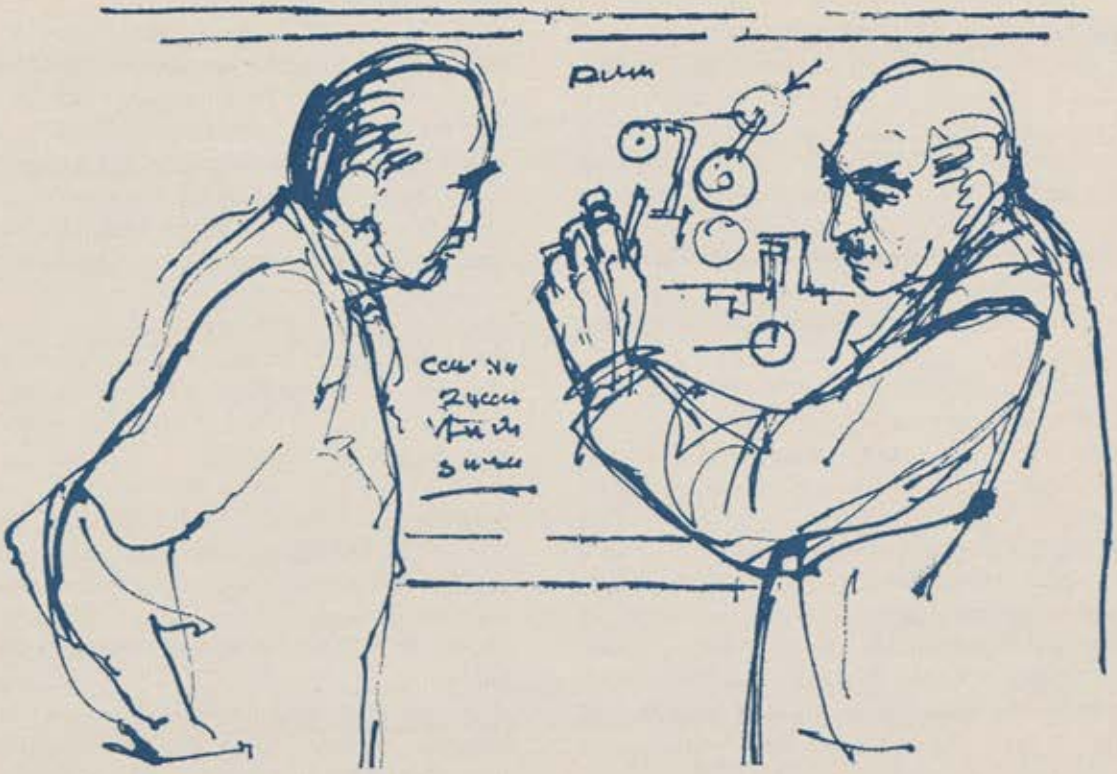
RADIO CORPORATION OF AMERICA



than I care to admit, was why such bearers of reading material were so obviously trying not to give offense as they laid the magazine or clipping down. I think, in part, they were trying to bring me up to date on some topics, so that I wouldn't be so far behind the times when the next semester came around.

At the same time they were considerately trying to avoid any suggestion, other than the implied one, that their teacher was unfamiliar with twentieth-century developments in science. It is a tribute to their scientific acumen that such a judgment was amply supported by the only evidence upon which a hypothesis could be formulated—the content of their course—and a tribute to their human acumen that they realized that, although the poor fellow obviously needed help, it would be best to render it diffidently and as if by accident, lest his pride be wounded.

Let us take a look at one of the major areas we cover in our physical science survey course—astronomy. During the last decade that I have taught this subject, I have started out with this bombshell: "Is the earth really round?" The syllabus which I have used for the course furnishes such exciting bits of information as the fact that ships disappear over the horizon bottom first and the fact that you see more the higher up you go.

While I am explaining to the class how back in B.C. old Eratosthenes figured out the circumference of the earth in "stadia," my audience is quietly dividing up into two major camps: (1) those students who knew that this had to be a dull course, else why would it be required, and (2) those students who are wondering whether their teacher is an unreconstructed birdwatcher who has been impressed into the teaching of physical science because of the shortage of scientists. It is the students in this latter group who, I believe, begin to feel sorry for the instructor, and commence to slip him hot items in the sciences from press and periodicals.

I am happy to say that in recent years college instructors, aware of the inadequacy of the Newton-Galileo kind of course for present-day science, are contemplating revamping some of their course content. The new texts deal at length with twentieth-century developments. At least, if such a text were employed together with lecture-demonstrations which took cognizance of more than the most traditional and elementary physical concepts, students would not feel it incumbent upon them to bring me articles on solar batteries after a discussion on the voltaic cell, clippings on solar furnaces after a lecture on the steam engine, and items on radio telescopes after examining and discussing the operation of the crystal set.

But this is science at the college level. How does it fare in the high schools? Examination of the equipment catalogs shows that the laboratory

supply houses are still vending the same apparatus that was in use twenty-five years ago. In fact, since the equipment is sturdily built, much of it in use is twenty-five years old. Physics teachers are famous for the extreme care with which they handle and maintain their equipment. The result is that many laboratories are well stocked with equipment designed to teach a science which has experienced only a small portion of the impact of twentieth-century theory and experiment, and only partially or not at all supplied with equipment for demonstrating or experimenting with post-Newtonian concepts.

What do the experiments largely center around? Usually they deal with the great classic works of the seventeenth and eighteenth centuries. Not that Galileo's gravitational constant and Archimedes' principle are unimportant, but where do such limitations leave the student? Mainly he comes to rest at the beginning of the twentieth century, when Messrs. Planck, Einstein, and Bohr began to take up the slack in the physical sciences and created a new approach to time, matter, and space.

The preceding comments are not at all intended to denigrate the high school physics teacher. He is no more nor less the victim of the cultural lag which has weakened science instruction than is the college teacher. One of the first experiments in many college physics courses is designed to teach the student to use measuring instruments such as calipers and micrometers. Such an approach to the thrilling and compelling world of time, space, and matter not only makes the student's entry into that world dull, plodding, and perhaps distasteful, but does not even concede that an eighteen-year old can measure. This conviction that eighteen-year olds can't measure is frequently shared by college chemistry courses. The college chemistry student sometimes—you may not believe this—also starts the course with an experiment in measuring but on an even cruder scale. The student works with a meter stick.

If the student had some idea before he came to college that he was capable of measuring objects or spaces, he is soon disburdened of this belief.

Much of the kind of procedure for instruction in science which I have so far described is, fortunately, in the process of disappearing from high school and college classrooms. But a peculiar problem faces the college teacher and frequently the high school teacher. This is the fact that elementary school science instruction, insofar as it deals with the physical sciences, tends to approach them largely in the classical manner.

A first reaction to the suggestion that it would be appropriate in the elementary school to talk about mass-energy relationships, curved space, and the expanding universe might well be one of angry rejection or at least of extreme doubt. Is it really possible to utilize all we know about the physical world in teaching elementary science? The answer is, of course it is. The view of the world which is implicit in pre-twentieth-century science is no less strange to the young child than the view which recent scientific developments demonstrate to be more accurate. Young children adopt new frames of reference much more readily than do older ones.

If, in the elementary grades, the child is exposed only or even mainly to the classical kind of science, he will have to wait until high school to transcend the limitations of the prequantum picture of the world. If we serve him the classical approach in high school, then it is left to the college to reorient him.

In general, the longer the child lives with the classical view, the more difficult it becomes for him to make any change. College teachers frequently wonder why students don't become excited by new ideas which are presented in the college classroom. The answer is that the students figure that, if they have gotten along this well with, for example, a classical science framework, why throw it aside for views and insights which are much more complicated and not at first glance obviously more rewarding? At eighteen, a student has the world and its inhabitants pretty well figured out.

I think that Mr. Frank is right. We cannot begin too soon to deal with and teach science of the space age. . . . We can, and I think we should, begin as early as we are able to teach our students a science which deals with mass-energy relationships instead of inclined planes, with curved space instead of pinholes in black construction paper, and with an expanding universe instead of a round world. These students live in a world in which astronauts are training for other worlds. We should not circumscribe them within the narrower horizons of our own childhood.—END

William I. Harber, who holds a Ph.D. from Iowa State College of Agriculture and Mechanic Arts, teaches at Chicago City Junior College. *This material is reprinted, with permission, from the February 1960 issue of the* Chicago Schools Journal, *published at the Chicago Teachers College.*

A TALENT FOR BINARY DATA LINK SYSTEMS

The application of binary data link transmission to large or small radio networks is made feasible by the Stromberg-Carlson Automatic Binary Data Link.

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Decide which seal design will permit the nozzle to vector properly, withstand the tremendous heat and pressure of extremely hot gases.

These are some of the problems which Allison has encountered and *is overcoming* in designing and producing vectoring nozzles for missiles.

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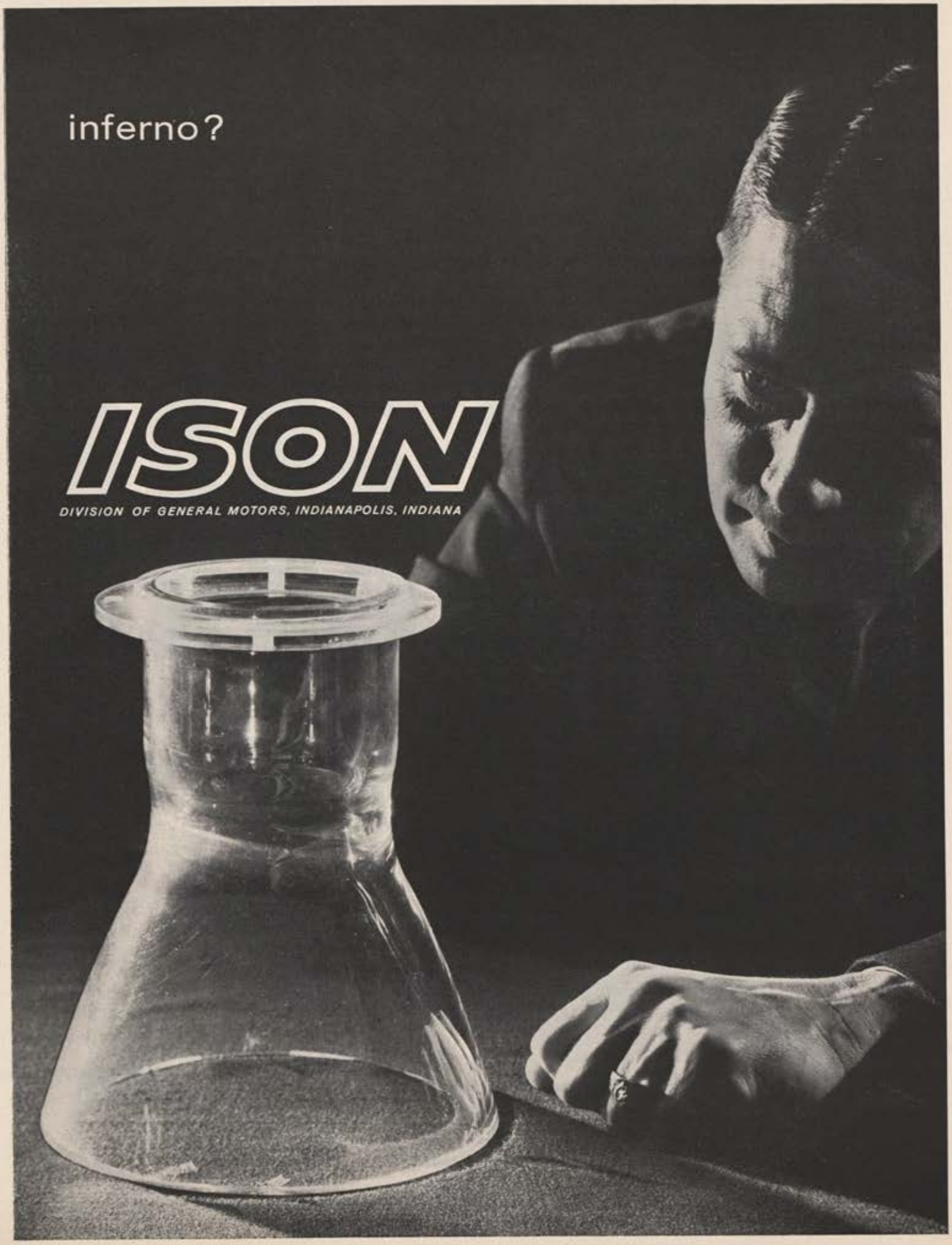
Thus, the state of the nozzle art has been advanced–a serious bottleneck broken. And this is but one of the many areas in which Allison–backed by every resource General Motors commands–is working in the space age.

Whether your problem lies in the heavens, in the oceans, or on the earth, Allison has the will and–if it can be solved–the way to solve it. We're doing it for others–we could do it for you.

Illustrated is a plastic model of one type of nozzle used as a research tool by Allison scientists and engineers.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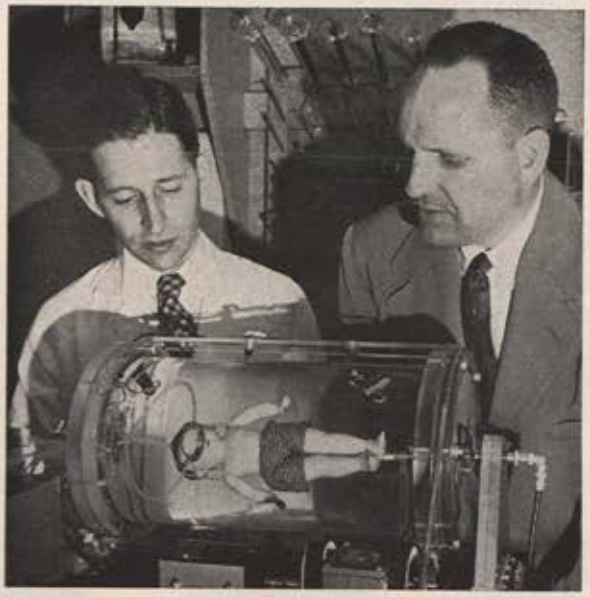

Mercury Astronaut will watch the world turn via this Minneapolis-Honeywell miniature globe mounted in capsule. Little globe will revolve to correspond to earth's movement, tell the Astronaut where he is, help him in the return maneuver.

from? Dr. Mead agrees with William I. Harber (*see page 76*) that the place to begin is in the schools, the earlier the better.

The symposium was rewarding. In addition to Dr. Mead, speakers included Malcolm M. Willey, Vice President of the University of Minnesota; Dr. Walter Cook, Dean of the University's College of Education; Dr. Paul W. Cherington of the Harvard Business School; Brig. Gen. Robert F. McDermott, Dean of the Air Force Academy; and Dr. E. Paul Torrance, Director of the University's Bureau of Educational Research. Sparking the meeting were men like retired Air Materiel Command chief, Gen. Edwin W. Rawlings, who served on a committee chaired by Edwin A. Kube and including Everett Collin, J. D. Holtzermann, and Merle R. Else, Jr.

As noted, there were some 200 educators, school administrators, teachers, and others intimately involved with the problems of the space-age impact on education. That they were willing to give up most of a week end to listen to the battery of speakers on hand is a healthy indication of the strength of a new movement in education across the land, to which the Air Force Association, its affiliated Space Education Foundation, and the Aerospace Education Council (a national committee of educators, the activities of which have been supported strongly by AFA) have been proud to contribute.

A dramatic impetus to far-seeing educators anxious to design new and needed space-age curricula was given a little more than a year ago when at the World Congress of Flight at Las Vegas, Nev., a large group of educators gathered concurrently with the World Congress to see the array of aerospace technology on display and to discuss space-age educational needs. A second meeting on aerospace education was held in conjunction with the Air Force Association's 1959 meeting at Miami Beach, Fla.

Here is a quick survey of educational programs in various states which have been sparked to a considerable degree by educators who have attended workshops described above:

- ALABAMA. State vocational schools now offering courses in electronics, instrumentation, aeronautics instrumentation. High schools adding new space oriented courses.
- CALIFORNIA. Increasing teacher interest in aerospace education, notably on lower-grade level. Well attended teacher workshop last year on aerospace education.
- COLORADO. University of Colorado will offer "History of Space Course" starting this summer. Development of space-oriented course in one junior high school. Plans on state level to design space-oriented curriculum extending from elementary grades through high school.
- CONNECTICUT. State-level Superintendent's group and Parent-Teachers' Association studying aerospace education materials, reporting impressions to city school authorities. Addition of new audiovisual devices in some schools. Expected additional changes in curricula.
- DELAWARE. Half-year courses in astronomy now available to Wilmington district sophomores, also experimental Air Science Course.
- FLORIDA. Teachers have attended eighteen-session Air Age Workshop at Orlando. Orange County staff has developed new aerospace educational material for use in elementary classes.
- GEORGIA. Statewide "Universe and Solar System" course in elementary schools, with addition of a fifth "traveling" science teacher to the current four assigned to similar secondary school programs.

FOR THE AIR FORCE, MSVD developed experimental 12-foot ablating ICBM re-entry vehicle, the RVX-2, largest ever to be recovered. Vehicle, with its recovery package (upper left) developed for General Electric by Cook Research Laboratories, is shown here being hauled on board ship.

MISSILE AND SPACE VEHICLE DEPARTMENT

...center for missile and space technology research and development at General Electric

Progress in search and recovery

With each recovery of a space vehicle, scientists gain important new knowledge about the environment of space and its potential effect on man and the operation of vehicles and equipment. As more advanced vehicles are developed for space flight—some with life aboard—successful location and recovery become increasingly vital.

General Electric's Missile and Space Vehicle Department pioneered in the development of space vehicle search and recovery techniques as part of its re-entry and recovery vehicle program for the U.S. Air Force. MSVD developed and built the first payload to be recovered from space—an 18-inch data capsule ejected from an Air Force Thor re-entry vehicle on June 13, 1958. Many such data capsules have since been recovered from both Thor and Atlas flights—some carried cameras providing films from space. MSVD also developed and built the 12-foot long, one-ton re-entry vehicle shown above which the Air Force recovered on July 21, 1959—the largest to be returned to date. Today, as MSVD builds and flight tests more complex vehicles, it is continually expanding and improving its already successful search and recovery program.

Currently, this search and recovery experience is being applied to the development of such important space programs as the Air Force "Discoverer" recovery satellites and NASA's radiation research recovery vehicles (NERV).

For more information about MSVD's work in search and recovery, write to Section 160–79, General Electric Co., Missile and Space Vehicle Department, Philadelphia 4, Penna.

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MISSILE AND SPACE VEHICLE DEPARTMENT

A Department of the Defense Electronics Division

THE NEW AGE OF COMMUNICATION

WORLD-ROUND TV!

By the time today's sixth graders leave college, space relay television will start to change the world. It began in December, 1958, when President Eisenhower's Christmas message was transmitted from space. This was Project Score. In a little over a year a more advanced system will orbit communications satellites that will provide 1,000 times the communications potential of their predecessor.

This is the beginning. In ten years the new age of communication will be changing the world. TV sets will offer dozens of channels. Ideas, entertainment, news, education can reach every home or hut on earth. The language barrier to world-wide communication will vanish, for programs will be broadcast in many languages; the viewer will select his native tongue as simply as he switches channels today. Jamming or censorship will be difficult or impractical.

Radiation Incorporated played an important part in Score and will participate in its more sophisticated successor. We developed the antenna that received the first voice from a space satellite. Now we're developing, and will install, the tracking communications stations for the new project.

RADIATION IS a growing company in space communications. Our business is research, development and manufacture of electronic systems, including radar, telemetry, data processing, test devices and related electronic equipment. If you'd like more information on Radiation, write for the latest capability report. Address: Radiation Incorporated, Dept. A-6. Melbourne, Fla. Radiation's plants are at Melbourne and Orlando, Fla.; Mountain View and Palo Alto, Calif.

RADIATION
INCORPORATED

MAIN OFFICES AND PLANTS ARE LOCATED AT MELBOURNE AND ORLANDO, FLORIDA; MOUNTAIN VIEW AND PALO ALTO, CALIFORNIA.

• IDAHO. More than 9,000 teachers and administrators have attended preschool workshops on statewide basis, heard aerospace specialists. Teaching teacher-training workshops aided by AFA.

• ILLINOIS. University Air education workshop for education students, covering instruction techniques, field trips, flight orientation. Rockford integrating aerospace subject matter into science, mathematics, language, arts courses.

• IOWA. Some ninety percent of state's educational personnnel exposed to in-service program aerospace-age-impact materials. Drake University integrating new materials into its annual Air Age Education Workshop. Spirit Lake studying realignment of science programs, planning air science materials for elementary and junior high school levels.

• KANSAS. Wichita and Friends Universities have summer Aviation Workshop programs. Interest increasing.

• MARYLAND. Boards of Education meeting with supervisors, principals to analyze methods of increasing aerospace education. Curriculum committee studying revisions of standard state curriculum.

• MASSACHUSETTS. Boston schools offering astronomy and aviation courses, also Science Institute for Able Learners with aerospace lectures.

• MICHIGAN. Detroit held 1959 workshop to develop junior high school course on space and air ages, State Curriculum Committee now has Space Education Committee.

• MINNESOTA. Association of School Administrators has formed Aviation Education Committee which will meet in 1960.

• MISSOURI. Plans under way to integrate aerospace education into state school system. Aerospace education guide being prepared for junior-high-school level.

• MONTANA. Creation of statewide Superviser of Air Education post. Plans for local-level curricular changes.

• NEBRASKA. Increasing statewide interest. Plans for tenth-grade-level "Beginnings of Space Age" course.

• NEVADA. Parents and teachers receiving aerospace educational materials. State 1959 course of study has expanded air-age material in fourth and sixth grades. Possible creation of separate course.

• NEW HAMPSHIRE. Keene Teachers College has new course on aviation education.

• NEW MEXICO. Space-age stress on new textbooks. State-level briefings of teachers on aerospace subjects.

• NEW YORK. State-level encouragement of teachers.

• OKLAHOMA. Plans under way for scholarships to outstanding high school students. Tulsa integrating aerospace materials into all existing courses, particularly science.

• PENNSYLVANIA. State designed course on Earth and Space Sciences in Junior High Schools, first offered in 1959.

• TEXAS. Increasing statewide interest.

• WASHINGTON. Increasing statewide interest. Summer aerospace education workshop planned for teachers in 1960.

• WYOMING. Some schools now offering Earth and Space Science Course. Elementary teachers' workshop material being updated.

These are beginnings, and good beginnings. You might want to look at this survey in its complete text. Write to A. H. Duda, care of AIR FORCE/SPACE DIGEST, Mills Building, Washington 6, D.C.—END

GEORGE "MOON" MEYERS—By Jack Tippit

"Skip all that flying stuff, Uncle George . . . we wanna hear about the parking ticket you got on your moonship the second day you were there!"

Giant boost to US space capability has been given by Thor in USAF Discoverer series from Vandenberg AFB, Calif., program leading to acquisition of vital data for man-in-space, for reconnaissance, and for early-warning satellites.

A preponderance of American space vehicles has been sent into orbit by "old-reliable" Thor, adapted for space missions. Its descendants will be doing more space jobs in the years ahead . . .

USAF's THOR...

WILLIAM LEAVITT
Associate Editor

THE [Air Force missile program], through the technology it is fostering, the facilities that have been established, the industrial teams being developed, and the vehicles themselves, is providing the key to the further development of spaceflight. . . ."

Those prophetic words were uttered not last week or last month but *months* before Sputnik I, by then USAF Ballistic Missile Division chief, General Schriever, at the Astronautics Symposium cosponsored by the Air Force Office of Scientific Research and Convair at San Diego, Calif., in February 1957.

General Schriever's faith in missile know-how as the key to astronautical achievement has been more than justified in the months and years since the unnerving day in October 1957 when the Soviets launched the world's first artificial satellite.

Of the eighteen earth satellites placed in orbit by the US since Sputnik I, ten have been boosted into space by the Air Force's Douglas-built Thor intermediate-range ballistic missile, tailored to carry payloads into the void. In the trade, the Thor, originally dubbed Thor-Able in its space configuration, has deservedly gotten the tags

the "DC-3 of Spacepower" and "Old Reliable."

Add to the tally above the historic Pioneer I lunar probe shot on October 11, 1958, which carried a scientific payload more than 70,000 miles into space—furthest penetration at that time —and the March 11, 1960, Pioneer V solar satellite which has established a multimillion-mile radio-communication record.

The Thor program record is a remarkable demonstration of the Air Force concept of concurrency as applied to the twin fields of missilry and astronautics, the application of technical knowledge to multiple uses of the same basic vehicle. For it must be remembered that in the same time segment in which Thor was converted into a reliable space booster, it was being perfected as a military missile, and plans for its deployment overseas were being completed.

How did a military missile, ostensibly designed for 1,500-mile range, become, simultaneously with its weapon system development, the backbone of current US spacepower systems?

Think back to late 1957, when, after the jolt of Sputnik, the nation was demanding US demonstration of space capability. At long last, General Schriever and his technical/industrial colleagues at Space Technology Laboratories, RAND Corporation, Douglas, and North American Rocketdyne, had justification to pull together space propulsion ideas for which backing had previously been minimal.

From their studies emerged two alternative pro-

"DC-3 of SPACEPOWER"

Eye-in-the-sky Tiros satellite was boosted by "Old Reliable" in April of this year, showed feasibility of weather study from space, reconnaissance practicability.

When US space tide was low, in October 1958, Thor-boosted Pioneer I established space long-distance record for the time, more than 70,000 miles into the void.

Explorer VI "Paddlewheel Satellite," launched in August 1959, relayed valuable data back to earth, was also sent into orbit by USAF's Douglas Thor booster.

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We have been supplying rotary components to U. S. Gauge for 11 years. Of 14,744 units shipped to U. S. Gauge over the past 20 months, only 308 have been rejected by them. After return to our plant of these 308 units, and subsequent re-examination and retest by the CPPC Quality Control Department, CPPC agreed that 164 of these 308 units did not meet acceptable quality standards when retested. 164 of 14,744 units shipped is a quality rejection rate of only .0111!

Included in the 164 rejections were ultra high temperature units capable of withstanding 450° F which call for higher than ordinary quality standards of manufacture.

This is not only proof of CPPC quality, but is possible only if the customer is equally scrupulous and careful in his utilization; and it demonstrates U. S. Gauge's excellent handling of quality products in their plant.

During this 20 month period, Clifton Precision was under the heaviest pressure for deliveries in its history, but was still able to deliver 14,580 acceptable units 9 calendar days ahead of promised delivery schedules on an average.

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gram possibilities, both involving Thor as the basic booster for space shots. One proposal was to mount a cluster of solid-propellant rockets atop the Thor, as second stage, the other was to use available Vanguard rockets, already scheduled for use with the US IGY satellite program. The latter course was chosen, and the program got under way, under the designation Project Able-Zero.

Immediate ostensible aim of Project Able-Zero was to establish a capability, using a Thor IRBM as first stage, of propelling a reasonable-weight nose cone to intercontinenal range and beyond (more than 6,000 statute miles) at reentry speeds exceeding the 17,000 mph, using the ablating nose cone technique. The idea was, so to speak, to extend Thor to ICBM capability, and then ring in space-boosting adaptations to that ICBM capability.

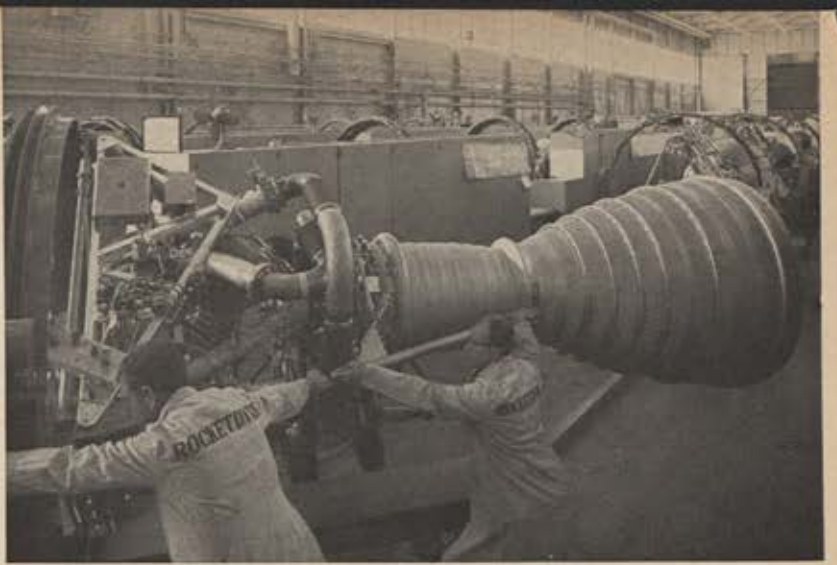
Even then, the Able program, aimed eventually at a space capability, was somewhat disguised as a "reentry test vehicle program." The country was still officially committed, to the Vanguard earth satellite program, which later proved to be such an initial disappointment.

The first Thor-Able flights, in early 1958, gave fairly conclusive proof of the feasibility of extending Thor's range to intercontinental distance with assurance of safe reentry of the nuclear-warhead-carrying nose cone.

The immediate extrapolation by space planners at BMD and its industrial/technical teams was that the addition of a solid-propellant third stage to the new Thor-Able combination would give the vehicle the capability of taking a payload to the vicinity of the moon, the fruition of General Schriever's predictions in the months before Sputnik that military missilry *could* provide US space boost capability.

The next stop was design of the space-adapted Thor, in mid-1958, and dispatch by BMD of Space Probes Division people to points overseas to set up tracking stations for the series of Air Force lunar-probe shots under the aegis of the Department of Defense's Advanced Research Projects Agency, which was riding herd on military astronautic developments.

The first space mission went up in smoke, an inauspicious beginning for the space-booster combination now called "Old Reliable." On August 17, 1958, Thor-Able I, aimed at a complicated lunar orbit, blew up on the pad at Cape Canaveral as a result of first-stage engine failure. It was a bitter moment for the planners who had worked for months to demonstrate space capability for the adapted Thor.



A Thor liquid-propellant engine leaving the assembly line at North American Rocketdyne's plant at Canoga Park, Calif. The versatile engine, developing some 150,000 pounds of thrust, has powered Thor boosters for both missile and space use.

Bitter failure in August was followed on October 11 of the same year by what this magazine called "the most glorious failure in history"—the Pioneer I lunar probe. The Thor-Able-boosted Pioneer went 70,700 miles out before falling back to earth, because of slight error in aiming. Even with this failure, Thor's space usefulness had been established.

Meanwhile, improvements were being built into the Thor-Able combination. A new version, called Thor-Able II, contained a very precise radio-inertial guidance system. On the weaponry side, these additions were designed to give better impact prediction information and improved aim. On the "space side" these improvements would assure good ground control.

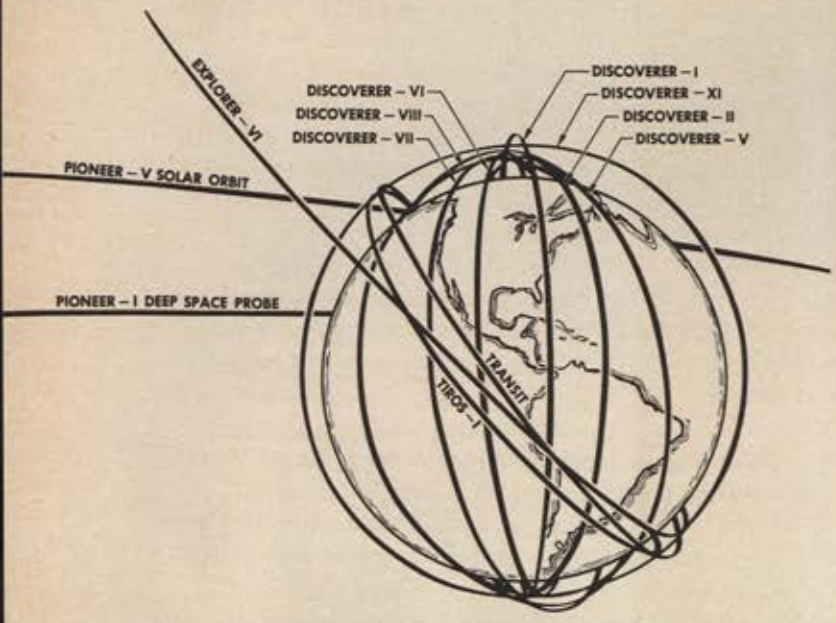
It should be stressed here that although the "space side" of Thor was being continually studied during these improvement programs, the missile development retained highest priority. The blessing was that the Air Force, already accustomed to the concept of concurrency—molding the end product while in the midst of research, development, and production—found it relatively easy to extract the space capabilities of Thor while perfecting its main, military capability.

Guidance of the space-oriented Thor-Able II was enhanced with the BTL System's (Bell Telephone Laboratories) radio-inertial guidance. In 1958, telemetry results improved, as did the General Electric nose cone recovery record. Meanwhile, the AC Spark Plug *all-inertial* system for the *weapon* configuration was being perfected.

By 1959, a great deal was happening, all simultaneously. Under ARPA direction, the Air Force was running its highly successful Discoverer pro-

gram, with launches from Vandenberg AFB, Calif. Aim of the program, still under way, was perfection of attitude-stabilization-in-orbit and recovery capability, with direct contributions to the Midas and Samos early warning and reconnaissance satellite programs and to the Project Mercury man-in-space program. The booster: Thor, with a Bell Hustler second stage now called Agena. The record: as of May 1960, seven Discoverers placed in orbit.

Although the fact is often lost in news accounts, Thor, in its various configurations, has boosted (*see chart below*) in addition to the Discoverer



Around the world with Thor. Drawing illustrates the space record of "old-reliable" Thor, including the first and fifth Pioneer shots, Explorer VI, seven Discoverers placed in orbit, the Tiros weather satellite, and the Transit navigation satellite.

series, Explorer VI, the "Paddlewheel Satellite"; Pioneer V, the solar satellite now establishing long-distance radio records; and the recent Tiros weather satellite and Transit I-B navigation satellite.

The Tiros launch marked an auspicious end for the Thor-Able configuration, while the Transit launch, using a new configuration—Thor-Able-Star—marked the first successful engine restart in space.

Looking back on the Thor record—as a military missile program which got going in record time, as an intermediate-range weapon which was stretched to intercontinental range with equal dispatch, and as a versatile space booster with a solid record of success—one gets a three-sided demonstration of the validity of the Air Force's concurrency approach to hardware development.

As one BMD officer who was closely involved with the Thor program puts it:

"It's literally an example of concurrency *within* concurrency. Here's a situation where a complex military weapon system was used as a space vehicle even prior to operational deployment."

He was recalling the fact that the space requirement had been put on the Thor—and the requirement had been filled—even before Thors were deployed in Britain beginning in late 1958.

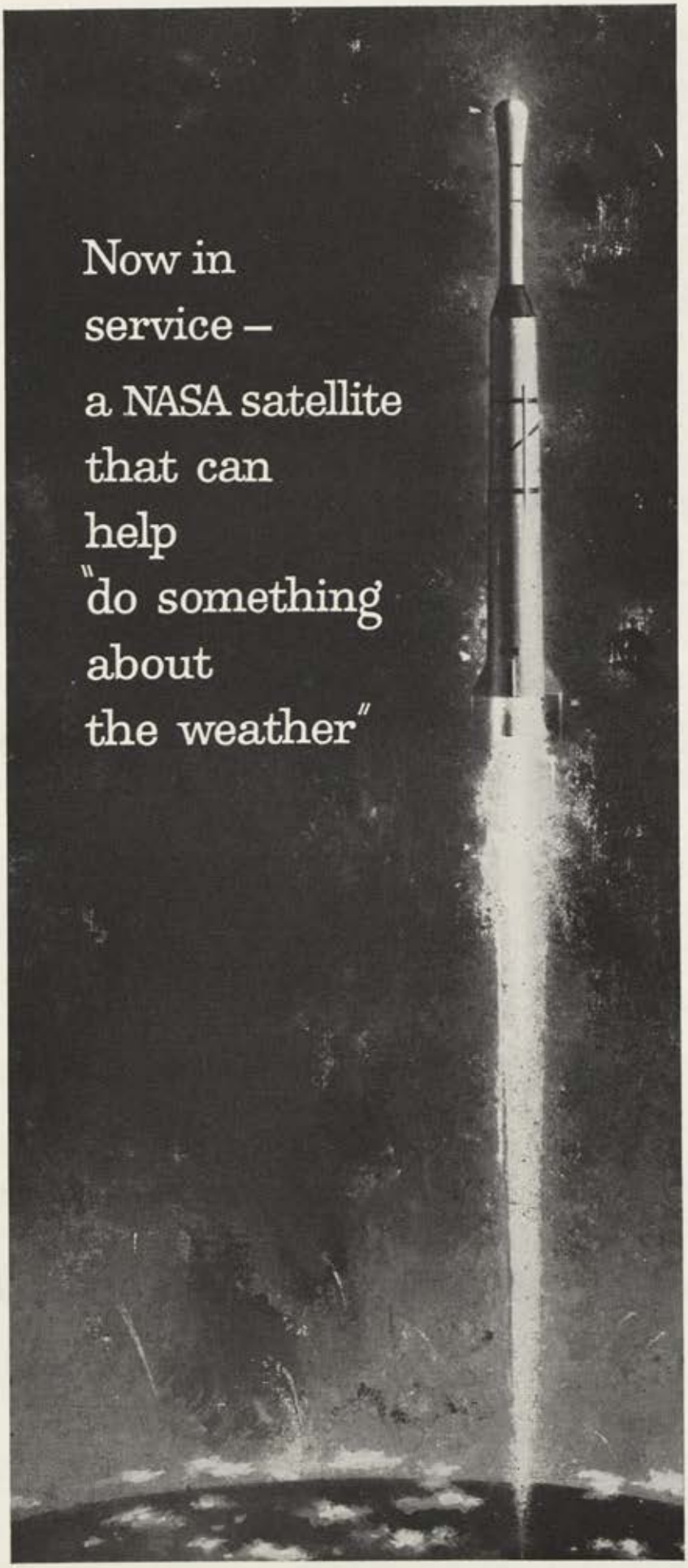
The Thor story dates back to December 1955, when the Air Force let the first contract to Douglas. Less than a year after the initial contract, in November 1956, the first booster was delivered to BMD, a remarkable example of cooperation among the Air Force; Douglas (airframe, assembly and test); North American Rocketdyne (propulsion); AC Spark Plug Division of General Motors (guidance); General Electric (nose cone); and Space Technology Laboratories (technical direction and systems engineering).

The double program, described above, of stretching Thor to intercontinental capability while at the same time extracting space-booster capability, stands as a further tribute to the imagination of the Air Force as well as the industry team involved.

Although over-all the multiple-purpose program ran smoothly, as the results indicate, there were problems. Thor program people can recall items that had to be ironed out all along the line, such as the need to keep their eyes constantly on the basic military requirements while working on the space-booster concept. But somehow, enough people and enough boosters were at the right places at the right times to assure success. End results: development of Thor as weapon system *and* progenitor of a reliable space booster.

A good record, but what of the future? If you will look at the National Aeronautics and Space Administration's ten-year plan (AIR FORCE/SPACE DIGEST, *April '60*), you'll note Thor's space family tree all over the block right through 1969, as represented by Thor-Deltas and Thor-Agena-Bs, the same old basic booster with new upper stages. In addition, studies are under way to add advanced, powerful hydrogen-oxygen upper stages for the growth possibilities that are so important in the expensive space business.

It's a good bet that space-adapted Thors will be carrying US astronautical payloads for years to come.—END



Out of Space Age achievements by Government and Industry will come better living for everyone

Someday soon the art of weather forecasting will become more precise as the result of a network of meteorological satellites. Even weather *control* may become possible.

The first of these satellites, *Tiros I*, is already transmitting pictures of weather around the world. The booster that helped put it in orbit was a modified version of the reliable Douglas *Thor* IRBM. *Thor* is prime booster in the scientific "Discoverer" firings . . . has worked perfectly in over 85% of its space missions.

Thus the knowledge gained through the development of missiles has a useful peaceful application through NASA projects.

Thor is one more proof that Douglas' extensive experience in missiles is a national asset, and that nothing can substitute for the imagination, experience and skills which Douglas has accumulated in nearly 20 years of missile development.

TIROS (Television Infrared Observation Satellites) would serve weather observers—relaying information on cloud cover, temperatures, solar radiation

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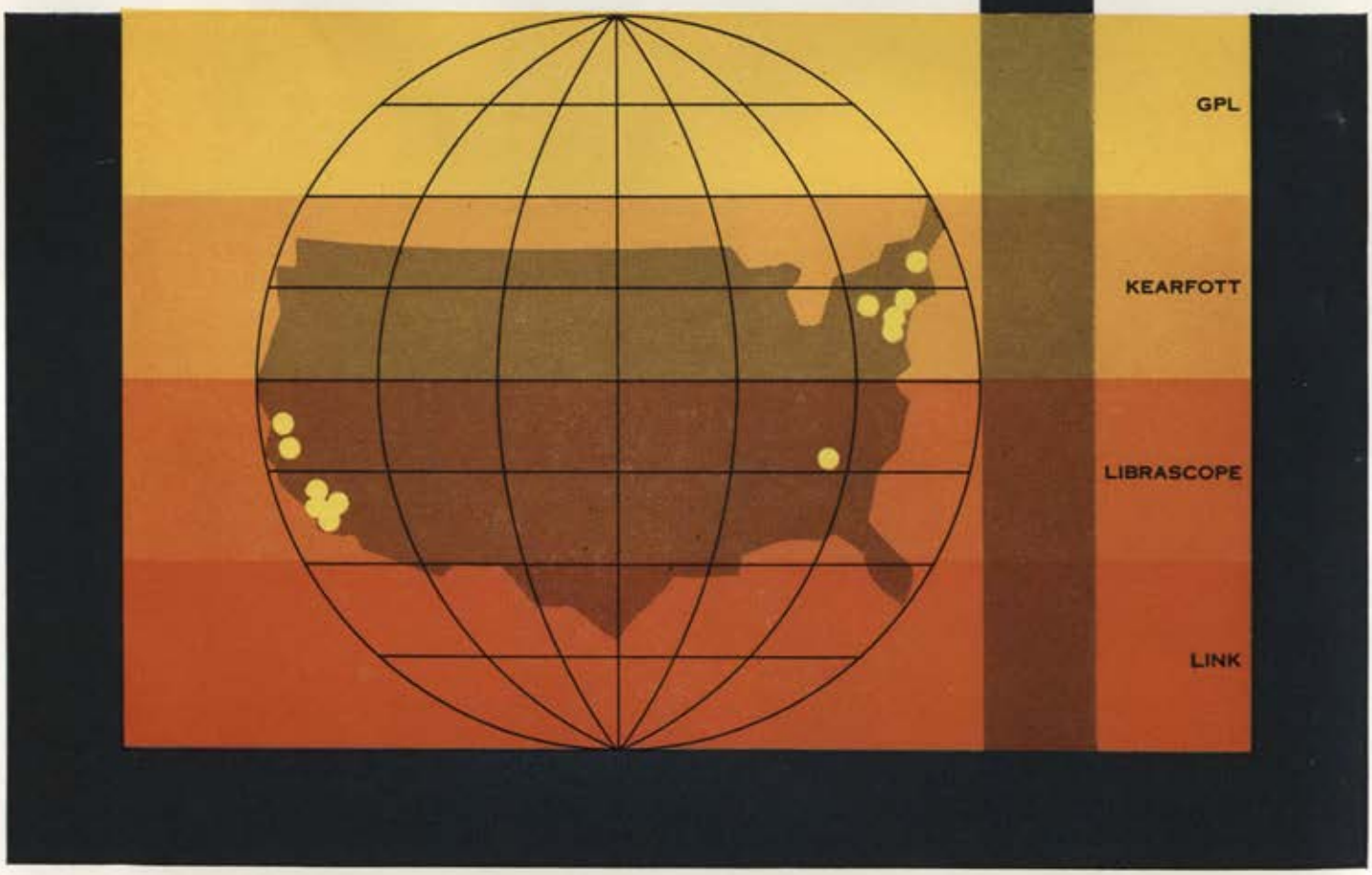

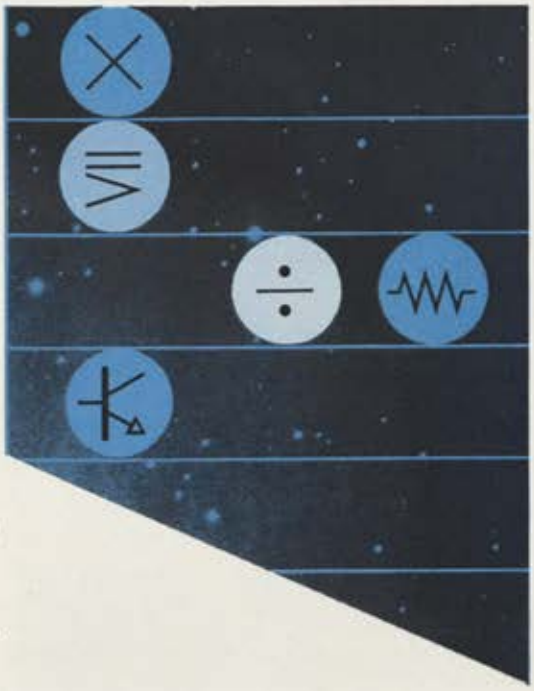

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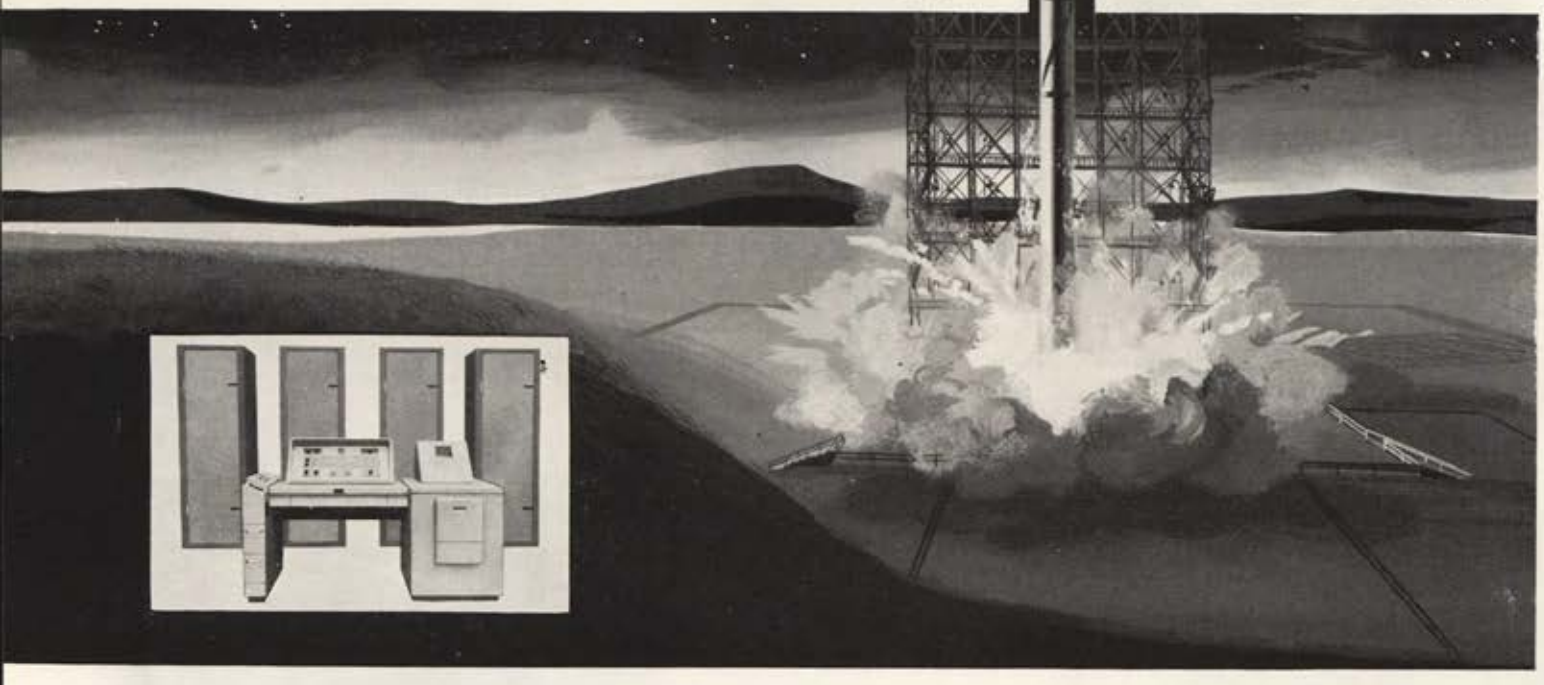

APCHE (Automatic Programmed Checkout Equipment) is a solid-state, universal, high-speed, highly reliable, compact general-purpose tester designed especially for automatic checkout of aircraft, missile and space systems and their supporting systems. In its various versions (differing in input media, size and weight) APCHE installations may be fixed, mobile, airborne or submarineborne. APCHE was designed and is being produced as a part of RCA's ground support electronics subcontract from the Convair (Astronautics) Division of General Dynamics Corporation, prime contractor for the ATLAS Intercontinental Ballistic Missile.

The system being supplied to Convair for the ATLAS Program includes a console and four rack cabinets providing both analog and discrete test functions with a resulting printed and GO-NO GO indication. As a product of RCA's Missile Electronics and Controls Department, Burlington, Massachusetts, APCHE is one of the latest RCA developments in the field of military weapon readiness equipments.

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As a nation, we devotedly seek some way to safely ban nuclear tests. But our experience with Russia warns that we must keep up our nuclear guard even as we pursue . . .

AIR FORCE
JUNE 1960

THE GOAL OF PEACE

Dr. Edward Teller

One of the world's foremost nuclear physicists reviews the recent past in an attempt to answer the question, "Can we ban the testing of nuclear explosives?" This expression of his views, initially presented in an address to the Fordham College Alumni Association in New York earlier this year, continues the running discussion of this important issue that has appeared in these pages. Last month, an article by Earl Voss cautioned against a complete ban under present conditions.

PEACE is a topic which is uppermost in all our minds. I have some special reasons to love peace, to seek peace, to do whatever I can, little though it may be, to make it more probable that peace will endure. I have come from a country which, when I was born, was a country free and growing and hopeful. It is so no longer, largely due to a great extent to the ravages of two terrible wars.

I have a second reason. During the late 1930s and early 1940s and ever since, I have been involved in the development of a terrible system of weapons. We who have been so involved have to think about the consequences of our acts; not that it is given to any of us to control these consequences, but just in order to act with our eyes open.

Let us go back into the past—the days when the atomic project was born. They were the days after Munich. They were the days when the free nations had disarmed. They were the days when honest, well-meaning, and idealistic people sought peace along the road which we now call appeasement. And in those days it became clear to the scientific world that there was the possibility of developing a new source of power, of energy whose first manifestations probably, almost certainly, could be turned into destructive channels. None of us undertook this task without worry. That worry, that fearful thought about the future, has never left us.

In the way in which success is measured, we were successful. This was proved in the last days of World War II in terrible flashes over Japan. I do not intend to criticize those who made the decision to use the weapons. We were involved in a war, the ferocity of which most of us still remember. It was a war in which lives were snuffed out every day by the thousands. To stop this slaughter nothing seemed too terrible. But I had a regret then, and I have a regret now. It is that we used this terrible weapon without attempting to demonstrate it first, without giving the Japanese a chance, having been shown the weapon, to surrender.

This has turned the minds of many people even with greater intensity to this determination: Never let the priceless gift of peace leave us again. How shall we do it? What can we do about it? What have we done about it?

I must now turn to the recent past and to the present because there is where our decisions must lie and there is where our present thoughts must be concentrated. Our government made a courageous decision. Remembering the dangers of appeasement, remembering Munich, knowing that any halt in the further development of arms, of nuclear arms, could have most serious consequences, we still decided to stop and sit down and talk it over with the Russians.

Can we ban the testing of nuclear explosives?

One thing was clear in all these negotiations, and that is one thing about which I think there have been no serious disagreements in principle: one-sided disarmament, one-sided cessation of testing, makes no sense. If we disarm, it must be on an honest basis of complete mutual guarantees; it must be with the understanding that treaties are carried out. To do otherwise would endanger our safety and would debase the idea of the treaty itself. The beginning seemed auspicious. In the summer of 1958 experts from our country, Great Britain, and the Soviet Union met. They agreed that it is feasible to police an agreement to ban nuclear tests.

At this point we must go into some technical details. This matter has been discussed, has been presented, and has been often misrepresented. The facts are simple, and on the purely technical side there is in this country no disagreement about these facts, only possibly about their interpretation.

When the experts met in the summer of 1958, they agreed on a number of things. First, tests carried out in the atmosphere with an adequate control system can be checked in a reasonable manner. Second, tests carried out under water, at any depth of the ocean, likewise can be checked. At least there is a very good chance of detecting a violator, if not immediately, nevertheless in the course of time.

Then came a harder nut to crack. What about tests underground? Tests underground create earthquake-like motions which can be noticed for thousands of miles. They can be detected. But can they be identified? There are a great number of natural earthquakes. How do we tell nuclear tests from natural earthquakes? Many people say it is simple: Just make sensitive instruments. Today, we have sensitive instruments, and

(Continued on following page)

we work to develop more sensitive ones. But the crust of our earth is a noisy medium, and to distinguish the real danger signal from the noise is not simple.

So far only one method has been proposed. Within certain limits we have the feeling that it is reliable. A nuclear explosion produces at first an outward push. The first signal which arises from such an explosion is a motion of the earth's crust in a direction away from the point of detonation. By contrast, an earthquake usually is created by something like a slippage in the earth's crust. The result is that the first motion noticed from an earthquake appears in some seismographs as a push outward, but in others as a motion inward toward the source.

Therefore, if we have enough seismographs and if observation shows that all motions recorded by all seismographs are motions outward, this need not be a nuclear explosion, but it is suspicious. If some motions are outward, some are inward, it looks like an earthquake although it still might be a nuclear explosion. Actually it turns out that it is not so easy to notice this first motion. The first motion may be submerged into the general noise which prevails in the crust of the earth. The result is that only in case of big nuclear explosions or only in case of very closely spaced earthquake stations, can we make the distinction in a reasonable way.

After the Geneva discussions in the summer of 1958 were concluded, there was agreement that underground explosions could be detected and identified if they were greater than five kilotons. It would still be necessary to inspect and to verify, but the hope was expressed that explosions about five kilotons could be brought under control. Remember, this is five thousand tons of TNT, one-quarter of the nuclear explosive which was dropped over Hiroshima. Below the level of five kilotons the probability of detection rapidly decreases, and below one kiloton the probability of detection no longer exists.

There was one other serious deficiency. Nuclear tests in interplanetary space were not discussed at the conference.

Developments were rapid in the next few months. Immediately following the conference there was a windup phase of our nuclear tests in Nevada. At that time we augmented our sparse knowledge of underground nuclear explosions. We had conducted but one underground test. In the fall of 1958, we added to this experience half a dozen more shots. When these shots were analyzed it turned out that the conclusions of the summer conference of 1958 were too optimistic.

After we were through with our painstaking studies, every informed person in the United States and Great Britain agreed that nuclear explosions underground can be detected and identified *if* they are greater than twenty kilotons. This is the full force of the Hiroshima explosion. As we fall below that limit the efficacy of detection and identification rapidly decreases.

We told the Russians, but they dismissed the matter out of hand. In America then commenced a concerted investigation of our own with a view to improving the detection system. The question of improving the seismic net was carefully examined. It was found that with enough additional apparatus one could detect and identify explosions of ten kilotons or maybe somewhat less. Thorough work, by many excellent people, went into these studies.

An excellent contribution was made by a young man from the RAND Corporation in California at about this point. This piece of research showed a surprising thing. If you set off a nuclear explosive in the center of a big cavity underground, at appropriate depth, the apparent size of the explosion as recorded on monitoring devices may be only one-hundredth the actual magnitude.

Of course, the size of this hole would have to be quite big for it to hide a big explosion. To hide a hundred-kiloton explosion one can build a hole which is inconspicuous and at an expense which is not high compared to the usual cost of testing. It would be quite easy to make cavities which will hide one to twenty kilotons. At these lower yields the masking of the nuclear explosion is so complete that in practically all cases, at least for few kilotons, none of the seismic recording stations would even respond, much less be able to distinguish the explosion from an earthquake.

Having found that in underground testing we were too optimistic we looked also at the possibility of testing in space. The unanimous conclusion was that it is possible to test in space and it is possible to detect such tests in space. But the hiding of space testing would be practical and effective up to one-half of a megaton, up to 500 kilotons. Only if a test exceeds this size, is it possible to detect and identify nuclear tests which your adversary did not want you to see.

In all these discussions, we have made the assumption, if there was a doubt whether a certain instrument of detection could be developed or not, that the instrument of detection could be developed. We have been optimistic about detection. In spite of this, severe limitations have been found.

It was decided to submit our findings to our Russian colleagues. As far as space testing was concerned, this was done in June and July of last year. The Russians agreed. The conclusions were released in somewhat complicated terms. It takes expert reading to understand what the agreement of last July means. But it means that one can test in space and hide the test in space up to half a megaton.

Last November and December we submitted to the Russians the findings about the seismic situation. Our men who went to this conference were devoted to the cause of nuclear test cessation, as a first step toward controlled disarmament. They presented facts; the Russians would not accept them. The Soviet delegation had no valid counterargument. They simply said: "These facts don't help to make an agreement; therefore, why do you present them?" They accused our people of ill will, of an intention to get out of the test agreement, which I am sure was the farthest from the minds of those particular individuals who devotedly sought for some way of banning nuclear tests.

This is the impasse at which we find ourselves today. We can say simply, surely, and clearly that if we agree on test cessation today, we have no way of knowing

whether the Russians are testing or not. There are no technical methods to police a test ban.

What shall we do? I believe that the cause of peace has to be pursued. How? Where do the Russians stand? Not long ago Khrushchev announced a reduction of Russian manpower because he said he can rely on improved weapons. Can we under these conditions stop our technical development? Can we halt the development, that of nuclear weapons? About the importance of this development I shall say a little later as much as I can.

Khrushchev followed up his statement early this year about reducing manpower by boasting about a fantastic and new weapon. What is this fantastic weapon? There are many possibilities in the nuclear field and in many other fields. There are surely many possibilities of which none of us has thought. What chance is there for disarmament by inspection when we do not even know what the inspectors are to inspect?

But we should proceed along the road to peace as far and as fast as we can. If we can bring about a relaxation of the present tension by concluding an agreement which can be reliably controlled, then the very success of such action may generate some good will, some little progress toward mutual confidence. I say that we can stop nuclear testing in the atmosphere. We may do this unilaterally. We can then challenge the Russians to follow suit even if they won't sign a treaty. We shall know whether they have followed suit or not.

We can do more, and we should do more. We should increase our research to find methods by which to detect and control underground tests and tests in interplanetary space. We should use our plentiful resources. We should do it publicly, under international inspection, and indeed with international cooperation. When and if methods are found which will reliably check underground explosions or any other kind of explosions, we shall be ready to enter into a reasonable treaty concerning that particular kind of test.

In the meantime we must remember that we have already lost time. The Russians may or may not have been testing in the last year. We do not know. We have no way of knowing. We could not have developed any new weapons, let alone a fantastic one, without tests. Was Khrushchev's "fantastic" weapon a nuclear one? Was it tested? We don't know. It is dangerous to add to our many other handicaps a self-imposed ban in a field in which we do not know whether the Russians are moving forward or not. By testing underground and by testing in space we can make the necessary progress in nuclear weapons.

I would like to state simply, categorically, and with complete assurance that such tests will not add to the radioactive contamination of the atmosphere. The danger from contamination by nuclear tests has been grossly and improperly exaggerated. For practical purposes this danger does not exist. Still, can we abstain completely and reliably from releasing radioactivity into the atmosphere by future weapons development? A very small amount of radioactivity might get into the air in the execution of some peaceful work, which I consider important, like building harbors or canals. This radioactivity would certainly be harmless.

Hungarian-born Dr. Teller is Director of the University of California's Lawrence Radiation Laboratory, Livermore, Calif. An early researcher in the field of thermonuclear reactions, he played a leading role in development of thermonuclear weapons in this country. He has also made notable contributions in other branches of physical science including chemical physics, molecular physics, and quantum theory. Dr. Teller came to the United States in the 1930s. He took part in the wartime Manhattan Project that produced the first atomic bombs—those "terrible flashes over Japan."

But why should we be testing? Don't we have enough nuclear weapons to destroy the world? Do we need to proceed farther along this destructive road? I want to say a few simple things about this point. There is a popular misconception that in 1945 we tested an atomic bomb, and we had it. And then in 1952 we tested a hydrogen bomb, and then we possessed that. And that's all there was to the development. This is a gross distortion of facts.

Year by year we were involved in the development of this new explosive power. Year by year we learned something new and important. I do not like the word "nuclear tests," because it implies one is merely checking a device of known properties. What we have actually performed were experiments with nuclear explosives, experiments the results of which we could not foretell. Often we learned much more by failure than by success. These experiments pointed the way into the future. Without such experiments all development soon would stop. But what is the purpose of further development?

At this point I have to leave the purely technical ground. I would first like to say something with which many may disagree. I don't like the idea of massive retaliation. There is a Biblical thought—an eye for an eye, and a tooth for a tooth, which has been often misinterpreted as demanding hard and cruel justice. I do not understand it that way. I learned that what this statement means is: You must never exceed the measure of justice. Justice may be and should be tempered by mercy. But never are you allowed to take *more* than an eye for an eye, or more than a tooth for a tooth. It is unjust; it is cruel; and in the international scene it

(Continued on page 103)

Knowmanship in Action

Much that was new and informative was discussed and demonstrated at Eclipse-Pioneer's recent cost conference held with representatives of the Air Force, Republic Aviation, and over 50 of E-P's subcontractors and suppliers.

Bendix cost conference reports

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contributes to fatal instability. If we are to respond to a smaller aggression by all-out destruction, we would, in my opinion, be committing an immoral action.

But if this premise is believed, if we take the statement seriously, then we must look in a hard and realistic way into the kind of future that we will have to face. There are two simple conclusions.

One is: What if we are hit by an all-out attack? Then and only then are we justified to hit back. But we must be so prepared that under those conditions we should have the power to hit back with certainty. This is not easy. If rockets take only fifteen or twenty minutes in flight how can we protect our ability to retaliate? Nuclear experiments can provide us with smaller, more handy, more flexible tools which can move easily, survive even the hardest attack. With more nuclear experimentation we can establish a system of retaliatory power, with which we can be satisfied because we can say to the Russians, "We won't hit you first, but if you hit us first, you cannot escape."

Without nuclear experimentation the same thing can be accomplished on the basis of our present arsenal. But without further nuclear experimentation it will cost many billions of dollars more to accomplish the same objective, because more experimentation means smaller nuclear warheads, smaller rockets, smaller bases, more mobile systems, easier disposition, greater flexibility, greater assurance. These are important considerations at a time when our efforts are taxing us to a very considerable extent.

There is one other point: What about our allies? If we do not defend them by the threat of massive retaliation, are we to abandon them? Here is the vigorous and so far victorious Communist empire—ambitious, expanding, grasping for world domination. This empire is supreme in conventional weapons, enjoys a central location, and possesses an initiative unhampered by moral scruples. How can we hope to stand up against them without turning the free world into a military camp?

By one way and by one way alone, and that is by being prepared with the best and most modern weapons. These are nuclear weapons. With nuclear weapons we can achieve not victory, but we can deprive the Russians of the advantage of the element of surprise. We can prevent them from concentrating overwhelming power against defenseless nations. We can impose upon their forces utmost dispersion and thereby give a chance to people who are willing to defend their freedom.

In this sense nuclear weapons can become and should become weapons of real defense. We have made progress along the line of developing defensive, tactical weapons. We could make and we know how to make much more progress along this line. We can defend the free world provided we remain prepared. In our rapidly advancing world, technology becomes obsolete in a few years. To remain satisfied with our past great accomplishments will certainly ensure our defeat. We must continue our work. This is a hard thing to accept at the time when everybody is looking and should be looking for peace.

There is always the big, and to my mind, unanswered question: Where will it all end? More power, more weapons—this cannot be peace. All we can buy with more weapons is time. What we shall do with this time will determine the future. This is no theoretical question; this is no question that can be relegated to the unknown and distant posterity, to the next generation; this is a question to solve now and here. How shall we use time? How shall we ensure peace? By the only logical method by which peace can be ensured, by the removal of the causes of war.

I believe that we need something desperately, something that may be impossible to get, something that may come close to a miracle if we get it. We need an international authority which wields moral power and which wields physical power. We need an international authority which commands the loyalty of every human being. We need it, and we need it not only because the weapons are getting ever more dangerous. We need it also because our world is becoming smaller.

Let me make a last detour and tell you about a fantasy. I don't think it will happen, but it might. And something similar to it is almost sure to happen. We are learning more about the ways to predict weather. We are on the threshold, as far as decades go at least, of discovering methods by which we might control weather. If one nation manipulates the weather it may cause a drought in the neighboring country. Our world has become so small that we have become our brothers' keepers and even more serious to contemplate, our brothers are our keepers. We can no longer separate and compartmentalize the world. Are we ready for it?

I offer no concrete plan. We need moral power and we need physical power in an international authority. We need an international police force, but how shall we get it? Shall it be a UN police force? Shall it be a police force constituted by some other means? I do not know; nobody knows. Nobody is clever enough to dream up a solution. We do not even know what are the right steps leading in that direction, and I claim that this problem cannot be solved except by the devoted and intelligent and selfless labors of all of us.

This brings me to the end of what I want to say. Peace is the aim of our time, but peace is not just the absence of war. Peace like everything else that is really important, like life itself, cannot be ensured, cannot be maintained, without the utmost exertion of all our abilities, all our imagination, without the renunciation of many things that we all hold dear; it cannot be ensured without sacrifices. Peace will not be ensured if we seek easy and simple-looking remedies. Yet, in our often erroneous ways we all must look for peace.

There are many of my friends who are trying to find a road to peace in a way which is mistaken. There are many of my good friends who think that what I am here proposing myself is mistaken. I am sure that we all are right in saying this about each other. The question is so difficult that I am sure that in one way or another we all are mistaken, and we cannot do better than to face the facts honestly, to think clearly, and then with all our minds and with all our hearts, work for peace.—END

USAF Maj. Gen. Lloyd P. Hopwood, left, with North American Vice President for Military Relations Alex T. Burton who accepted AAS's Hoyt Vandenberg Trophy for his company.

AFA Executive Director James H. Straubel, left, accepts, from AMC's Gen. Samuel Anderson, the Paul T. Johns Trophy for his direction of the first World Congress of Flight.

New officers are elected and Arnold Air's major annual awards are presented in Miami Beach as more than 1,000 AFROTC Cadets take part in the . . .

RECORD TURNOUT AT AAS CONCLAVE

At AAS conclave, from left, AMC's General Anderson, Lt. Gen. James Timberlake, USAF (Ret.), ARDC's Lt. Gen. Bernard Schriever, and Maj. Gen. Joseph D. Caldara, Hq. USAF.

MORE than a thousand youthful members of the Arnold Air Society, AFA's AFROTC affiliate, spent a long, pleasant, and worthwhile week end at Miami Beach, Fla., early last month. The occasion was the eleventh annual AAS Conclave—a junior edition of AFA's National Convention.

The cadets elected officers for the forthcoming year, presented their major annual awards, heard talks by top Air Force officers, and viewed a dramatic display of the latest aerospace weaponry.

Five University of Miami cadets were chosen as national officers, honoring the host school in line with AAS tradition. Richard S. Matta was elected National Commander; Julian Marzolf, Executive Officer; Albert T. Erkinnen, Operations Officer; Fred D. Galey, Comptroller; and Frederick S. Pacacha, Adjutant Recorder.

They replaced a string of outgoing officers from the University of Pittsburgh headed by National Commander Thomas E. Cindric. Gen. Samuel E. Anderson, AMC Commander, also succeeded Gen. O. P. Weyland, retired former TAC Commander, as honorary AAS National Commander.

Atop the list of award recipients was Lt. Gen. Bernard A. Schriever, Commander, ARDC. He received the Society's H. H. Arnold Trophy for "countless contributions to world peace as a leading architect of this nation's missile power."

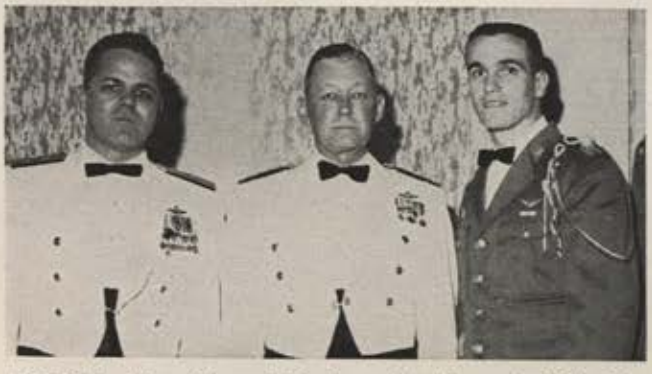
AFA Executive Director James H. Straubel, in recognition of his direction of the first World Congress of Flight last year, won the Paul T. Johns Trophy. The Muir S. Fairchild Trophy went to the General Electric Company for development of "advanced aerospace propulsion systems."

North American Aviation received the Hoyt S. Vandenberg Trophy for development of the B-70 bomber and X-15 research craft. University of Nebraska professor Frank E. Sorenson received a citation of honor for outstanding contributions to aerospace education.

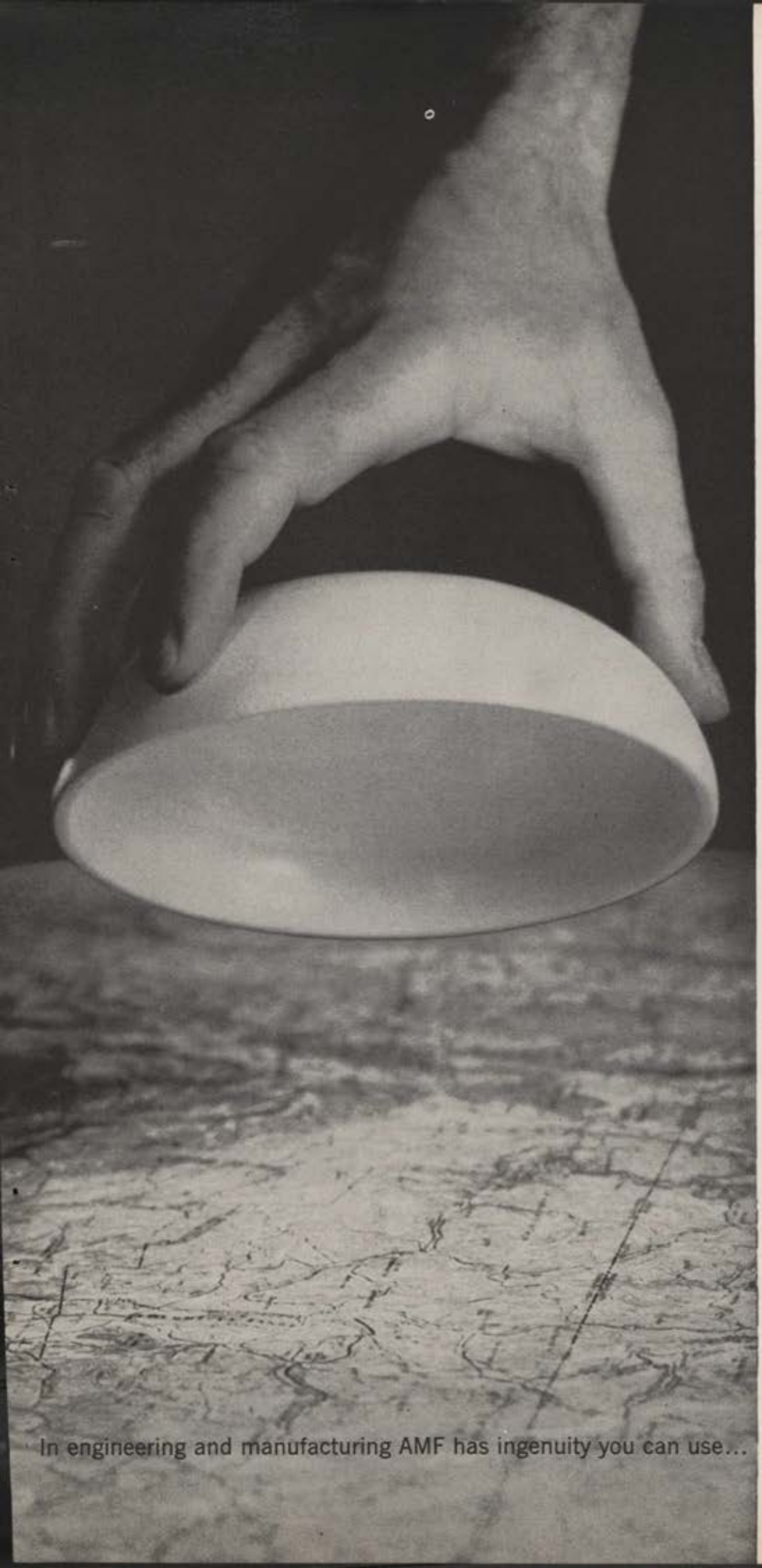
The University of Illinois AAS unit won the Society's Maryland Trophy as outstanding unit of the year. Outstanding area commander honors went to George P. Kazen of the University of Texas.

AFA President Howard Markey was among primary speakers at the Conclave, which ran from April 29 to May 2. Others included Maj. Gen. Joseph D. Caldara, USAF Deputy Inspector General for Safety; Lt. Gen. Walter E. Todd, Commander, Air University; Col. Carey L. O'Bryan, Jr., Deputy Commander, USAF Special Weapons Center; Maj. Gen. Lloyd P. Hopwood, Director, Personnel Procurement and Training; Brig. Gen. Charles H. Terhune, Jr., Vice Commander, Ballistic Missile Division; and Brig. Gen. John B. Bestic, Deputy Director, Communications-Electronics.

The Conclave's aerospace exhibit included models of the Thor IRBM, the Titan and Atlas ICBMs, and the X-15.—END



ANG Brig. Gen. Howard Markey, President of AFA, left, with General Anderson and Cadet Richard S. Matta, 1960-61 AAS National Commander, from the University of Miami.



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This AMF engineer knows what it takes to shrug off megaton forces. He *had* to know because he designed the prototype atomic bomb shelter at Frenchman Flats, the only building that stood up under the force of the atomic bombs exploded there. Well, not altogether—a flange on the door *was* bent.

In order to design the shelter, he had to calculate the effect of the explosion on materials and structures. He had to know how the shock was transmitted through the earth's crust and what effect it would have on the shelter—from beneath as well as from above. And, after the dust of calculating had settled, he had the very practical problem of expressing the results in steel and concrete. He did so, successfully.

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The READY ROOM

RESERVE AND AIR GUARD NEWS

AFA Cites Reserve Requirements

AFA placed a **list of recommendations** on reserve forces **roles, missions, and structure** before Congress during the second week in May. **President Howard Markey,** in a statement to a subcommittee of the House Armed Services Committee headed by **Rep. L. Mendel Rivers,** D-S.C., called for:

- **Conversion of additional air reserve forces units to a military airlift mission.** He submitted a copy of the airlift report prepared by **AFA's Air Guard Council,** and expressed appreciation that the Rivers subcommittee has recommended an **increase in reserve forces airlift capability.** In commenting on this recommendation he suggested transfer of the **Civil Reserve Air Fleet** from MATS to the **Office of Civil and Defense Mobilization.**
- **Assumption by the reserve forces of some peacetime support missions of the Air Force.** Markey said the reserve's **Swift-Lift** and **Ready Swap** missions and the **Air Guard runway alert air defense program** have fulfilled important peacetime requirements and that there are undoubtedly **other peacetime missions** which the reserve forces can handle.
- **Legislation which better defines the terms Ready, Standby, and Retired reservists.** Existing definitions apply essentially to wartime use of reservists, he said. New legislation is needed to cover reserve forces personnel in possible peacetime missions, AFA feels.
- **More drill pay spaces and more technicians for the reserve forces.** The Air Guard is already at its drill pay ceiling, and the Air Reserves will hit it by the end of fiscal year '61.
- **Continuation of thirty-six extra flying drills for all rated personnel.** These drills, he said, have contributed immeasurably to reserve forces flying safety gains, and AFA is "disturbed" that action is being taken to limit extra drills to tactical pilots.
- **Promotion policies for reserve general officers, as developed by the Hall committee.** AFA "heartily endorses" these new policies, Mr. Markey said, and will support any legislation necessary to put them into effect.
- **More flexibility in the Air Guard budget.** Guard funds are now appropriated by a **major expenditure category** within USAF's budget. As an example of the need for flexibility, AFA's President cited the assignment of **F-102s and F-104s to the Guard** earlier than programmed. To accommodate such shifts, he suggested Congress authorize the Air Guard to **transfer up to five percent** of its funds from one category to another.
- **Direct procurement of aircraft for the air reserve forces.** As "fallout" of aircraft from the USAF inventory declines, reserve forces might be left with **aircraft of limited combat capability and difficult maintenance problems.** To avoid this prospect, it is felt authorization should be granted to allow for direct purchase of such aircraft as are required by the air reserve forces to fulfill a wartime mission.

USAF Answers AFA on Reserves

Mr. Markey had previously set forth **AFA's views** on the reserve forces concept **in a letter to USAF.** The Air Force reply, just received, **takes exception to two Association recommendations.**

AFA had recommended that the **Assistant Chief of Staff for Reserve Forces be a member of the Air Force Council** with rank commensurate with that position. In its reply, signed by **Benjamin W. Fridge,** Deputy for Reserve and ROTC Affairs in the Office of the Secretary, the Air Force said:

"Assistant Chiefs of Staff attend council meetings in their capacity as **advisers when the Council is considering items within their immediate areas** of responsibility and when they can make positive contributions to the deliberations of the Council."

Since the Assistant Chief of Staff for Reserve Forces is directly responsible to the Chief of Staff for Reserve Affairs, Mr. Fridge explained, he has **"direct access" to the Chief of Staff** in addition to his participation as an adviser to the Council.

USAF said it considers that this arrangement provides **"adequately strong" administration and centralized control**

Maryland Air National Guard now operates two squadrons from the Martin Company's Baltimore airport. Here Martin President William B. Bergen greets Lt. Col. V. A. Kilkowski, Lt. Col. M. D. Britton, Maj. J. F. R. Scott, Lt. Col. G. W. Taylor, Maj. R. T. Lynch of Guard at the field. Colonel Kilkowski is Deputy Commander of Maryland ANG.

of the air reserve forces, and it is **neither "advisable nor necessary"** that the Assistant Chief of Staff for Reserve Forces be a member of the Council.

The second point concerned **AFA's reservations about earmarking the Air Force Reserve's troop carrier wings for assignment to the Tactical Air Command** on mobilization when there was a possibility they might be needed in the Reserve's new **recovery missions.** Recovery, of course, came in for **major attention** in the new reserve forces concept although, in AFA's view, specifics in this connection have not yet been **adequately spelled out.**

Mr. Fridge said **TAC would continue to be the gaining command** for these wings. "Should there be a requirement for **recovery airlift** or any other mission, **force structure will be reviewed** to assure that vital priorities are met," he said, adding that **TAC will coordinate tactical airlift for combat support and recovery support.**

Otherwise, he assured President Markey that AFA's "comments will be **given consideration in the implementation plan** for management of the air reserve forces."

(Continued on following page)

Extra Flying Drills

AFA's Air Guard Council has come out fighting **against a Department of Defense proposal** to permit thirty-six **extra drills only for tactical pilots** after July 1.

It approved a resolution calling on AFA's President to **advise the Secretary of the Air Force** of the necessity to **retain thirty-six extra drills** for all pilots. Mr. Markey made this point in his presentation to Congress.

The steady **drop in ANG aircraft accidents** is "directly related" to the **increase in flying training** made possible by the thirty-six extra drills, the Council said.

It pointed out that nontactical pilots **hold other assignments** which make it difficult for them to fly during drill periods. Thus the DoD proposal will require them to do **most of the flying without pay,** alongside tactical pilots who will be paid. The Council objected to this **"adverse categorization" of pilots in the Air Guard.**

DoD has argued that extra drills are **not being fully utilized,** but the Council suggested that "command action should be taken" to resolve cases of pilots **who fail to make full use of drills,** rather than this "across-the-board action."

Reserve General Officer Promotions

Recommendations for **promotion of Air Force Reserve officers to general grades,** drawn up by a committee headed by **Lt. Gen. William E. Hall,** CONAC Commander, have been endorsed by a **Senate Armed Services subcommittee.**

The Hall committee recommended that **criteria now existing for promotion of Air Guard officers** be applied also to the reserve.

To go from **brigadier general to major general** would require a minimum of **two years in grade,** age below **fifty-seven,** and a minimum of **fifty points per year** for at least two years as a brigadier general.

To go from **colonel to brigadier general** would require the following:

1. **Three years** in grade of colonel;
2. Less than **fifty-five years** of age;
3. A minimum of **fifty points** a year for not less than three years while in the grade of colonel;
4. At least **one year's service** in a general officer position.

The latter point will not be enforced, however, until **another recommendation is carried out.** The Hall committee discovered that, while the Air Force Reserve is authorized a total of 157 general officer spaces, that figure is **not related to mobilization requirements.**

Accordingly, the committee recommended that reserve general officer **requirements be established by position needed to support emergency war plans.** Once the requirements are established, it suggested that present reserve general officers be **assigned to approved positions** and that promotions **be made promptly to fill the remaining spaces.**

The **Hall Committee** also:

- Recommended that regular officers who go into the reserve on leaving active duty **should meet criteria listed above before being appointed reserve generals.**
- Again urged by the same token, that extended active duty reservists should **compete for active duty general officer promotion against regular officers,** rather than for reserve general officer vacancies against ready reservists. But it recommended that the **temporary promotion** of a reservist on active duty to general should **carry over into his reserve service.**

The subcommittee, headed by **Majority Leader Lyndon Johnson,** concluded that "in principle, the recommendations of the Air Force committee **appear sound. . . .**"

Air Guard Seeks Tankers

The **Air National Guard** has asked USAF for **four squadrons of KC-97 tankers** to increase its global capability, **Maj. Gen. Winston P. Wilson,** Deputy Chief of the National Guard Bureau, reported at the ANG commanders' conference at Ellington AFB, Tex., in April.

With its own tankers, he said, the Guard can **provide inflight refueling** to permit overseas deployment of its tactical fighters and reconnaissance squadrons.

AFA President Markey later **supported the Guard's request** in his statement before the Rivers subcommittee.

Brig. Gen. William E. Arnold, USAF Director of Flight Safety Research, announced at the conference that ANG's **accident rate dropped to 7.5** for the first quarter of 1960 —almost **fifty percent below** its record 14.2 rate in 1959.

USAF flight safety awards went to the **112th Tactical Fighter Squadron,** Toledo, Ohio, and the **125th Air Transport Squadron,** Tulsa, Okla., for the last six months of 1959. These two squadrons were among fifty-two of the Guard's ninety-two flying units given awards by General Wilson for an **accident-free record throughout 1959.**

Forced Retirement?

The air reserve forces need some kind of **plan comparable to USAF's 20-10** to force out a percentage of officers with twenty years' service, according to **Lt. Col. Ray Higgins,** Chief of Air Guard Personnel in the National Guard Bureau.

The **"hump" is just as pronounced** in the reserve forces as in the active Air Force, he explains. Unless some measures are taken to remove officers with twenty years' service or more as USAF is doing in Project 20-10 (*see February '60 "Ready Room"*), there **won't be any room for promotion of junior officers** to prepare them for future command assignments.

Colonel Higgins points out that in a five-year period beginning in 1969, the Air Guard will **lose almost every one of its generals and field grade officers** and thirty-six percent of its captains.

"Today's lieutenants will be our **senior commanders** in the next ten or fifteen years," he told the Air Guard commander's conference in April. "Right now we should be picking the men **we believe are capable of becoming our commanders** in the next ten years. Meanwhile, we must retire a percentage of our field grade officers so that we can train our future commanders in positions of increasing responsibility."

The same factors apply also to the **noncommissioned ranks,** Colonel Higgins noted. "Our recruiting and reenlistment programs are going very well right now," he said. "But they **will deteriorate fast unless we continue to provide promotion incentives.** Nothing is more discouraging to a competent airman than to see the top spots in his unit loaded with master sergeants who expect to be around for ten or fifteen years."

Colonel Higgins believes it **unlikely that enough reserve forces officers and airmen will voluntarily** go on the retired list after twenty years' service. "It may seem hard-hearted to force out a loyal and dedicated individual after we've served with him for twenty years or more," he said. "But there is **no alternative if we are going to assure qualified leadership** for our units in the years ahead."—END

New missions for the Agena

The Lockheed-built Agena satellite—used by the U.S. Air Force in its Discoverer, Midas, and Samos programs—has been chosen for another major program. The National Aeronautics and Space Administration plans to use a larger, more powerful version, the Agena B. NASA will use both Atlas and Thor boosters to launch it. Atop the Atlas, the versatile Agena B will vary from a 5000-pound earth satellite to an 800-pound space vehicle. Atop the Thor, it will be used for a new series of 1500-pound meteorological satellites. Lockheed is prime contractor and system manager for the Agena and Agena B.

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Agena is America's largest satellite, weighs 1700 pounds on orbit. Agena B is larger, has doubled fuel capacity.

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Ultra-Reliable Athena Computer Guides ICBM Titan to Target 5,000 Miles Away

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Athena is the ground based guidance computer for the USAF Titan ICBM. The Athena continually computes the speed, elevation, direction, azimuth, and position of the Titan and compares this information with data stored in its magnetic memory. Responding to commands issued by the computer, the missile maintains a course which will put it on target.

Recently an ICBM Titan missile was fired from Cape Canaveral by the USAF Ballistic Missile Division. The accuracy of the ground-based guidance system was such that technicians were able to quickly recover a data capsule within a target area 5,000 miles away.

This same system made possible the highly successful launching of TIROS I, America's television-equipped weather-eye satellite. The Athena computer, guiding a three-stage Thor-Able type missile, put TIROS I into the most nearly perfect circular orbit of any satellite, Russian or American, yet launched.

The Athena Digital Guidance computer was designed and produced by Remington Rand Univac to meet unprecedented reliability requirements. Several Athena computers have since been delivered and have logged thousands of operating hours. All have exceeded a reliability rating of 99.992 per cent, a record considered as a major breakthrough in the computer art.

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Additional information describing capabilities and experience or career opportunities may be obtained by writing to Remington Rand Univac at the above address.

AFA NEWS

SQUADRON OF THE MONTH

Pittsburgh, Pa., Squadron Cited for outstanding programming in bringing to the community the five USAF holders of speed and altitude records. The program reflects great credit upon both the Squadron and USAF.

In January, when the Air Force announced that several **speed and altitude records** had been set by USAF pilots *(see cover story, February '60* AIR FORCE), **AFA's Pittsburgh Squadron** decided it had the makings of a program of sufficient merit to follow its outstanding Operation Hometown of 1959. The result was March 18's **Project Highest and Fastest.**

The program featured **Maj. William J. Davis** and **Capt. Walter J. Hodgson,** coholders of the new altitude record for helicopters; **Brig. Gen. Joseph H. Moore,** closed-course speed record holder; **Capt. Joseph B. Jordan,** new altitude record holder; and **Maj. Joseph B. Rogers,** straightaway speed record setter. All appeared before area school assemblies, on TV and radio programs, and at a large gathering at the University of Pittsburgh.

Carl J. Long, 1959 Association Man of the Year, a former Director, and current chairman of AFA's Organizational Advisory Council, was the program's general chairman.

About three months ago, we got a phone call from a chap named **Donald Clark, Jr.,** in Tucson, Ariz., who said he wanted to organize a Squadron. He asked the size of the largest unit ever chartered in AFA. We advised him that the **San Antonio Squadron,** organized in 1956, had **303 members.**

"We're going to beat that," we were told.

On April 18, at the Officers' Club at **Davis-Monthan AFB,** the Squadron Charter Dinner was held. Sure enough, the goal was not only reached but was **surpassed by thirty new members. James H. Straubel,** AFA's Executive Director, was the principal speaker at the banquet, which also featured the presentation of the Charter by **Jim Snapp, Jr.,** of San Diego, Far West Regional Vice President. Snapp awarded the Charter to **Jack B. O'Dowd,** newly elected Squadron Commander *(see cut).*

Additional honored guests included AFA's first President, **James H. Doolittle,** on his way to Colorado Springs for the annual reunion of the Tokyo Raiders, and **Brig. Gen. Frank Lahm,** first US military pilot, who in 1909 was taught to fly by **Wilbur Wright.**

At Tucson Charter Banquet (from left), Jim Snapp, Jr., Jimmy Doolittle, Sqdn. Cmdr. Jack B. O'Dowd, and AFA Executive Director James H. Straubel. The April 18 dinner climaxed drive to organize AFA's largest Squadron, with total of 333 members signing Charter.

During his recent active-duty tour of USAF installations in Europe, AFA President Howard T. Markey (center) was briefed by 4th Allied Tactical AF, Germany. Also shown are RCAF Sqdn. Leader P. W. Holloway, R. L. N. Douriax, French AF; Maj. G. Kolw of German AF; and USAF Brig. Gen. R. J. Clizbe.

AFA's Mitchell Squadron, Milwaukee, has presented a portrait of its namesake, Gen. Billy Mitchell, to local airport. Admiring the gift are Airport Supervisor John Doyne, Mrs. Lewis Pillsbury, and Mrs. Martin Fladoes, Billy Mitchell's sister. The Squadron arranged for the painting under the joint leadership of Bob Gerhart and Gary Ortmann.

Santa Monica's Miramar Hotel was the scene of the **California Wing's twelfth annual convention.** The meeting coincided with the annual meeting of several state educational groups. The awards banquet was attended by more than 500 people.

William P. Gilson, retiring Wing Commander, presented several awards during the program.

North American X-15 test pilot **Scott Crossfield** was named Man of the Year for Flight. **Joseph D. Myers,** convention chairman, was named Wing Man of the Year. Unit of the Year honors went to the **San Diego Squadron. Helen Henderson,** retiring president of the state ladies' organization, was honored as Auxiliary Woman of the Year. Auxiliary Unit of the Year laurels went to **Air Harbor.**

(Continued on following page)

Arthur J. Welling, Florida real-estate man, accepts charter for new Broward Co. Squadron from County Commisioner George Peterson. From left, Jack Holforty, Vice Cmdr.; Welling; Peterson; Dewitt Cromartie, Treasurer; and E. B. Twells, Secretary.

James M. Trail, former AFA Board Chairman (right), congratulates Warren Murphy, Cmdr. of Idaho's new Magic Valley Sqdn. Col. Joseph D. White (center) is Deputy for Operations, SAC's 813th AD, Mountain Home AFB. The unit's charter will be presented at the Idaho Wing convention next month.

Col. Dean E. Hess, USAF, was named Service Member of 1960. **Carl Lundberg,** San Bernardino Squadron, was selected as Associate Member of the Year. **Chico Squadron** received the Wing plaque for Community Relations success. **Robert B. Young,** Rocketdyne vice president, was the Wing's Science Award winner.

At the closing business session, **Bill Gilson** handed over the gavel to **John L. Beringer,** Pasadena, Commander for 1960-61. Elected to serve with him were **Carson P. Sheetz,** Sacramento, Vice Commander; **Robert Vaughan,** San Francisco, Secretary; **George E. Sanchez,** Orange, Treasurer; **George M. May, Jr.,** San Diego, Sergeant at Arms; and **Joe Myers,** Organization Director. **Marjorie Beringer,** wife of the new Wing Commander, was installed as Wing Auxiliary President.

The **New York Wing,** one of AFA's largest, hit the jackpot recently in its drive to establish new Squadrons. Applications have come in for **three new units**—one in Broome County, one on

Long Island, and one in Westchester County. We commend Wing Commander Fred Monsees and other Wing leaders.

The **Broome County Squadron** is headed by **Kenneth N. Martindale,** 326 Norton Ave., Endwell; the **Empire Squadron** on Long Island by **Edwin F. Benson,** 13 East 7th St., Brooklyn; and the **Falcon Squadron** by **Vito J. Castellano,** Westchester County Airport, White Plains.

This gives New York a total of thirteen Squadrons, second only to California's nineteen.

AFA's National Nominating Committee will meet in Washington's Sheraton-Park Hotel June 17 and 18 to consider recommendations for Association offices. At stake once more are **the following positions:** President, Secretary, Treasurer, thirteen Regional Vice Presidencies, eighteen National Directorships, and Chairmanship of the Board of Directors. Past Presidents and past Chairmen serve as ex officio members of the Board.

The **Nominating Committee** is composed of current holders of these top offices plus AFA Wing Commanders. **Any AFA unit or member** can recommend an individual for nomination. Elections are held at the National Convention.

AFA Vice President **Robert H. Mitchell** of Portland, Ore., advises us that he has plans to ensure that his **Northwest Region** is well represented at the San Francisco Convention. Bob, who represents AFA members in Alaska, Idaho, Oregon, Washington, and Montana, predicts that all but Montana will have achieved **full Wing status** by the time of the Convention. New Squadrons scheduled to be set up prior to the Convention are in **Fairbanks, Alaska,** and **Eugene, Ore.** They will give these states two Squadrons each, making them eligible to organize Wings.

The **Aerospace Education Forum** at last year's World Congress of Flight inspired the **Commonwealth of Pennsylvania** to initiate a new junior high school course entitled **"Earth and Space Science."** It began with the 1959-60 school year. **Dr. Charles Boehm,** Pennsylvania Commissioner of Education and a participant at the WCF, built the statewide program

(Continued on following page)

around **150 teachers** and a textbook written under his supervision.

On May 25, in cooperation with state authorities, our **Harrisburg AFA Squadron** will sponsor an orientation conference for instructors in the course. The day's activities will begin with an orientation flight. USAF **Maj. Gen. Don R. Ostrander,** NASA's Director of Launch Vehicle Programs, will speak at a luncheon at the Olmstead AFB Officers' Club. In the afternoon, **Col. Carlo R. Tosti,** Special Assistant to the Commander, ARDC, will deliver an address entitled "Road to the Stars." **Dr. Donald F. Kline,** a member of AFA's Aerospace Education Council, will then speak on implications of the dawning aerospace era in education. **Dr. Boehm** will address a dinner gathering.

Former Harrisburg Squadron Commander **Steve Yednock** is program chairman for this fine program.

Pennsylvania, largely through the efforts of Dr. Boehm and his staff, is at the forefront in the area of aerospace education.

Ben J. Barrett, retiring Commander of **AFA's "500" Squadron** in Indianapolis, Ind., represented the Association on May 14 at the windup awards dinner honoring top exhibitors at the **National Science Fair** in Indianapolis. AFA honored five of the 400-odd fair entrants for excellence of presentation in the fields of **Aerospace Dynamics, Meteorology, Propulsion, Electronics, and Aerospace Power.** Best of these five will be a guest of honor at AFA's forthcoming San Francisco Convention. Names of the five youths chosen were not yet known at presstime.

CROSS COUNTRY . . . Our **Anchorage, Alaska, Squadron** is running a membership campaign. In three months, the unit has doubled its membership. . . . **Omaha Squadron** is also completing its annual drive in this regard. Its total membership stands at something **over 1,500 members. . . .** The **Erie, Pa., Squadron,** one of the fastest growing units in the country, has announced plans for its second annual aviation show to be held on July 4.

We reported earlier on the **Omaha campaign** to raise funds to modernize its municipal airport. **AFA's Art Storz,** largely responsible for the drive's success, turned the first shovelful of earth on April 26. . . . On his way back from the recent **Arnold Air Society Conclave at Miami Beach,** AFA Executive Director **Jim Straubel** stopped off at **Birmingham, Ala.,** to address the **newest AFA Squadron** in the South. Wing Commander **Reid Doster** and Squadron Commander **Dr. Edwin Speed** headed the reception committee. Jim received a major award at the AAS gathering, reported on page 104 in this issue.

Frank J. Sieminski, 339 S. Fostoria Ave., Springfield, Ohio, asks that anyone interested in the 1960 annual reunion of the **10th Troop Carrier Group** get in touch with him. The reunion is planned for August 7. . . . Speaking of reunions, **USAF Capt. Jim Low,** jet ace in Korea, is spearheading a project designed to arrange an **"Aces' Reunion"** during the 1960 AFA Convention in San Francisco. . . . On April 28 **Jack Loosbrock,** Editor of AIR FORCE/SPACE DIGEST, made an AFA presentation on national defense to the **Advance Platform Committee of the Democratic Party.** In August, AFA will make a similar presentation to the **Republican Party** in Chicago.

—GUS DUDA

Another Philco achievement in global communications

As part of a major study of space communications techniques, Philco is prime contractor for an Air Force project to relay high frequency radio communications around the curvature of the earth, through space. Known as the Passive Satellite Relay Link, it will reflect voice and teletype signals from a 100 ft. aluminum-skinned plastic balloon. Under NASA's Project Echo, the balloon is to be launched into a 1,000 mile earth orbit for use as a passive communications reflector.

The parametric amplifiers, receiving antennas, and tracking and receiving systems are Philco designed, built and installed. The entire program is managed by Philco, under the supervision of the Communications Directorate, Rome Air Development Center.

This is one more step in man's utilization of outer space . . . and another important Philco achievement in global communications. For capacity, facilities and experience in advanced electronic systems, look to the leader . . . look to Philco.

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America. He ultimately lost his life at the hands of the savage tribe.

Far to the north, Roman Catholic priest William A. Leising became an expert bush pilot while pursuing his ministry in medicine and religion throughout frozen northwest Canada. *Arctic Wings* (Doubleday, $4.95) records his experiences.

• • •

In 1956, following his resignation from the Air Force, Capt. Edward J. Ruppelt, one-time head of the USAF Project Blue Book at the Air Technical Intelligence Center, Wright-Patterson AFB, published a much-discussed book, *The Report on Unidentified Flying Objects* (Doubleday). It was based on the knowledge gained during the years he officially investigated flying saucer reports and was the first "rational" publication on this subject.

Now Ed Ruppelt brings out a revised and enlarged edition (Doubleday, $3.95), which comes to much the same conclusions advanced in 1956—that serious and thorough scientific investigation and evidence cannot substantiate flying saucer existence nor justify charges that the Air Force is withholding information on the subject of saucers.

For Armchair Astronauts

Here are several new titles for armchair astronauts of varying spatial sophistication.

In *Strange World of the Moon*, by V. A. Firsoff (Basic Books, $6), a Fellow of Britain's Royal Astronomical Society discusses earth's only natural satellite as one might brief spacecraft passengers on a moon-bound vacation. As to the moon's origin, he accepts the theory that it was "captured" by the earth, rather than once being a chunk of it dislodged by some gigantic geological upheaval. He believes there may well be life there.

"To see the earth-moon system in its full glory," writes Patrick Moore in *A Guide to the Planets* (Norton, $6.50), "let us go to the tiny minor planet Hermes, a miniature world scarcely more than a mile in diameter," and at times only 400,000 miles from the earth. From this vantage point, earth is a "magnificent spectacle—a shining blue-green world, crossed by whitish cloudy streams and patches, with snowy poles and gleaming oceans, and attended by a smaller planet with rough, volcano-scarred surface . . . a pleasant place, were it peopled by a race with more advanced ideas of how to live in harmony."

Author Moore, a distinguished British astronomical writer, takes his readers on a verbal journey through space. Stops include each planet, the moon and the asteroids, as well as galaxies other than our own. In the final chapter, he describes voyages to the planets, using a balanced mixture of the astronomer's vivid imagination and the scientist's respect for fact.

Civilian information specialist Lew Zarem deals with a broad range of aerospace research and development at Wright-Patterson AFB. His years of experience show in *New Dimensions of Flight* (Dutton, $4.50), one of the best simplified aerospace technology books in existence today. It deals with aircraft, missiles, aerial research vehicles, development programs. Major attention is also devoted to aerospace medicine's efforts to prepare man for spaceflight.

• • •

Charles Coombs's *Gateway to Space* (Morrow, $3.95) reviews the record

(Continued on page 121)

WHO TOOK THE DIESEL ENGINE OFF ITS HEAVY FOUNDATION?

Pre-1931 diesel engines were big and heavy. Although they were efficient, economical and uncomplicated, they only could be used where there was room for their bulk and for the massive foundations they required. Diesels, at that time, couldn't be used for mobile applications like those Caterpillar required. So Caterpillar designed and built its own diesels.

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Today, with over thirty years of diesel experience, Caterpillar has built hundreds of thousands of these compression-ignition

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engines. Modern Cat Diesels are light, compact and efficient. They are probably the most advanced diesel engines made. They are available for practically every diesel or natural gas application.

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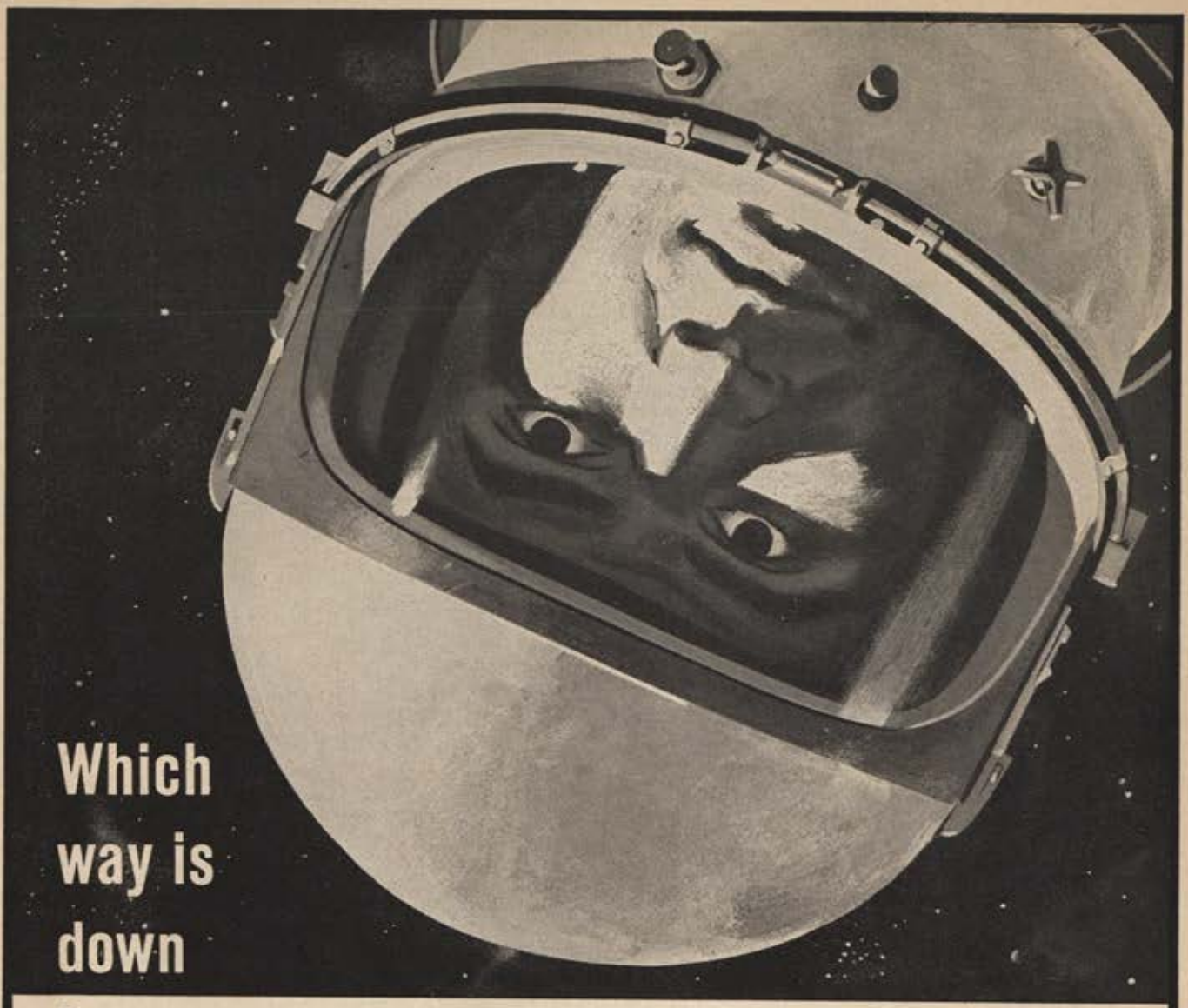


Which way is down in Space?

GUIDANCE IN SPACE for manned and unmanned vehicles is one of the most challenging projects underway at Ryan Electronics today. Through advanced research and development, Ryan Electronics is solving the problems of missile and space guidance systems.

Some of the areas being explored include rendezvous terminal guidance, anti-satellite guidance, space vehicle landing aids, satellite communications, and mid-course guidance.

Ryan Electronics is also studying applications of continuous-wave doppler techniques to the terminal phases of space missions.

Ryan Electronics is the pioneer and recognized leader in continuous-wave doppler navigation systems—the most advanced, proved means of aerial navigation yet developed for modern flight. Automatic Ryan navigators, in wide use throughout the world, guide all types of aircraft—ranging from helicopters and slow flying reconnaissance aircraft to high altitude supersonic jets.

Now, through a major research and development program, Ryan is working to provide the best guidance for America's ventures in Space tomorrow.

RYAN OFFERS CHALLENGING OPPORTUNITIES TO ENGINEERS

RYAN ELECTRONICS

DIVISION OF RYAN AERONAUTICAL COMPANY • SAN DIEGO, CALIFORNIA

RYAN BUILDS BETTER

at the Air Force Missile Test Center, Cape Canaveral, choosing particular missile flights to illustrate progress and development. Coombs, a veteran author, provides an excellent general history of rocketry and introduction to space exploration.

New and Old Fiction

First Men to the Moon, by Wernher von Braun (Holt, $3.50), originally appeared in serial form in *This Week* Magazine. It is fact set to fiction—the story of the "first space pioneers" to blast off from a Pacific atoll and return to earth. Details of principles and laws of rocket propulsion, guidance and orbiting, and spacecraft design factors, are explained well.

Arnold Brophy of the Long Island, N. Y., newspaper *Newsday* tells the story of a fictionalized Air Force missileman in *Space Sentry: A Missileman in Service* (Dodd, Mead, $2.75). He traces the career of Airman 2/C William E. Duncan of the 4751st Air Defense Squadron (Missiles) at Hurlburt Field, Fla., from enlistment into the Air Force, through technical missile training, to duty as a highly trained technician in a Bomarc squadron. The book answers many questions for the younger set about one career field the Air Force has to offer.

Arch Whitehouse, World War I flyer and long-time aviation writer, has collected eleven of his previously published stories about the men who fought in bombers in the skies of World War II. These short, snappy, adventurous yarns appear in *Bombers in the Sky* (Duell, Sloan & Pearce, $3) and carry the flavor and the tempo of the bitter air war in Europe, the Mediterranean, and the Pacific.

Writer-flyer William E. Barrett includes two of his novels, *Flight From Youth* and *The Blue Sleep,* and two novelettes, *Velma* and *The Destroyer,* in *The Edge of Things* (Doubleday, $3.95). The stories are extremely well written, based on a flyer's knowledge of the air and feeling for flight.

For Youngsters and Others

Countdown To Danger, by Charles Coombs (Lantern Press, $2.95). Novel about two young children who live on a rocket base and whose father has been selected to make the first rocket flight into space.

Planet Trip, by William Nephew and Michael Chester (Putnam's, $2.75). Fiction story of the first men to reach Mars and explore that planet.

Space Monkey: The True Story of Miss Baker, by Olive Burt (John Day, $2.50). The biography of the first earth creature, an eleven-ounce squirrel monkey, to be launched into space and return. The US took this step toward space on May 28, 1959.

The Rockets' Red Glare: The Challenge of Outer Space, by Mortimer W. Lawrence (Coward-McCann, $2.75). Highly photo-illustrated account of work toward the design of spacecraft and the preparation of earthlings to travel in space.

The Wright Brothers, by Henry Thomas (Putnam's, $2.50). A simplified biography of the Wrights.

Space Volunteers, by Terence Kay (Putnam's, $2.50). The stories of men like USAF's Col. John P. Stapp and Maj. Herbert Stallings, and civilian test pilot Scott Crossfield—today's space pioneers.

Roads To Discovery, by Ralph E. Lapp (Harper, $3.75). An atomic physicist explores the magnificent world of the atom and traces the scientific experimentation and discovery that led to the harnessing of atomic energy.

Amelia Earhart: First Lady of the Air, by Martin Friedman (Houghton Mifflin, $1.95). A lively narrative about this famous lady air pioneer's adventurous flying career from early youth to mysterious disappearance on a flight around the world.

Famous Airships of the World, by James Alexander Sinclair (Globe Books, $3). Illustrated account of the history and uses of dirigibles.

Handbook for Space Travelers, by Walter B. Hendrickson, Jr. (Bobbs-Merrill, $3.95) provides many handy tips for tomorrow's bold ventures in a book aimed at today's youth. Takes up today's tools of space exploration, the history of rocketry, future space bases, and possible designs and operating characteristics of spacecraft.

—MAJ. JAMES F. SUNDERMAN, USAF

TARGETS: MOON AND BEYOND. Guidance and control requirements for lunar and planetary travel, and for computers that will operate accurately in space vehicles, are among problems Sperry is studying under current space contracts.

PRECISION FLOATED GYROS for space "platforms" must be as clean as surgical instruments to maintain accuracy through thousands of miles of flight. Assembly is delicate job performed in dust-free laboratories.

ENVIRONMENTAL CHECK FOR HUSTLER BOMB-NAVIGATION SYSTEM. The USAF's supersonic bomber must maintain global capability over a period of years. Here Sperry engineers put the control console of the B-58's rugged, highly accurate bomb-nav system through its paces.

"Sharpshooting" Near and Far Space

New techniques in inertial guidance, space computing, airborne radars are answering the new challenges of space-age navigation.

ONE OF A SERIES:

THE STORY BEHIND THE STORY
of Sperry's Air Armament Division

Inertial is a word in the news more and more, as man ventures farther and farther into space. What it means fundamentally is built-in, independent guidance to a target—whether that target be a hamlet on the map or a plateau on the moon. Inertial navigation success depends greatly upon the absolute accuracy of the individual guidance system and its gyros and accelerometers.

To achieve this accuracy for the Convair B-58 Hustler bomber . . . and for the lunar, planetary and orbiting craft of the future . . . is the major assignment of Sperry's Air Armament Division. The magnitude of this job is seen in the fact that since 1950, 25 million manhours have been expended on inertial guidance by Sperry engineers.

Air Armament has produced or is developing advanced air and space craft equipment such as inertial navigation components for space-exploring vehicles . . . USAF's lightest and smallest search radar . . . Loran C radio navigation system that can pinpoint position up to 1500 miles. And when North American's X-15 takes the first man to the fringes of space and back, an advanced Sperry inertial system will guide him.

Meanwhile, Sperry continues to research and develop still more advanced concepts for ever sharper "shots" in space. Air Armament Division, Sperry Gyroscope Company, Division of Sperry Rand Corporation, Great Neck, N. Y.

SPERRY

TELECAST IN THE GARDEN OF ALLAH

Ever serve in Saudi Arabia? If so, your recollections of the experience may not jibe with the following fictionalized memoir—which some readers will judge to be more fun than fact . . .

Gerald A. Harty

A COUPLE of years ago I did a hitch at the isolated desert station of Dhahran, Saudi Arabia.

This is nothing unique, of course; hundreds serve there every year. Most of the men who return snap back to stateside routine at the first glimpse of an unveiled female.

I must be slow to adjust. I am only now getting back to normal. My psychoanalyst advises self-expression as a form of therapy; the idea, I suppose, is to purge myself of a traumatic experience. Hence this story.

Things were rough from the start. After MATS had bounced me onto the sand at Dhahran, the personnel officer told me to report to the base radio and television station. I was to be a newscaster. I protested that I was an old PIO hand of eighteen years' standing and mentioned my chronic and violent videophobia.

He gave me the codfish stare of the career personnel man and I recognized defeat. I began mushing my way across the sand dunes to my new job.

I was not familiar with the Dhahran policy of keeping a person busy every minute of his tour. Idleness in the desert is as corrosive of manpower as two-dollar bourbon. I was startled in the next few days to find my new compatriots busily spinning wheels, twirling knobs and dials, and generally rushing about twenty-four hours a day.

I do not want to imply that all this activity was generated by a hot-rock, go-go-go outfit made up of stripe-happy buckeroos. It was more like the St. Vitus dance I had known on Pentagon duty. I felt immediately at home and found I had not forgotten the steps: up one corridor bearing a sheet of paper . . . down the next to pick up another . . . a pause to deliver the first to a neighbor . . . a quick two-step and a nod of approval . . . a worried frown and another round and off to repeat the quadrille again. Except that there was no corridor in our quonset hut, the routine was the same.

The confused life into which I had been dunked irked my newsman's sense of values. Life in a putty-knife factory could not compare with my gambol with a cast

(Continued on following page)

of characters dedicated to the electronic embellishment of the daily scene in Arabia. I sought solace in the only tenuous link with reality in the combination dance studio, electrical shop, and choral group: a short-wave radio teletypewriter receiving Associated Press news from Tangiers, two thousand miles away. I drew the mantle of the Fourth Estate about me and retired to the sanctity of the newsroom.

At this point, the dramatic subtlety of the Armed Forces Radio and Television Service reached its zenith in showmanship. Presumably for access to this airborne source of news, I was issued a handsome, laminated press card. Engraved on it was my authority to "seek out, gather, compile, and disseminate to the armed forces" all items of newsworthy information my inquisitive role might uncover. Since the nearest settlement that could conceivably interest the forces of Dhahran was more than a thousand miles across the desert, I was tempted to trade the card for a camel saddle and a goatskin water bag.

It was not long before I realized that I would ferret out few facts in Saudi Arabia. Translation of the gibberish that chattered onto our news ticker was an all but impossible task. Static made hash of our news four days out of seven. At one time, atmospheric disturbances produced such garbled copy that it was Thanksgiving week before I found that our election returns were a Saturday's football scores.

I tore up the press card and decided to join the radio-television types around me. It was a drop in status, but I am a guy who is constitutionally unable to sit around doing nothing. The electronic boys did not accomplish much themselves, but the semblance of activity that marked their day made the passage of time more interesting. I was soon recruited to assist with the daily disc-jockey shows that poisoned the desert air.

As the father of a pair of extroverted teen-aged daughters and a supposedly knowledgeable former newspaperman in my own right, I had thought I possessed a fair, working familiarity with the more lucid compositions of Tin Pan Alley. My first tumultuous day among the platter-spinners disabused me of that idea and convinced me that the men from outer space were already among us. The jargon that assailed my ears in telephoned requests was as obscure and terrifying as though I had tapped into a XII Dynasty talkathon from the center of the Great Pyramid.

Out of a babel of GI voices in the dialects of Arkansas, West Virginia, Tennessee, Kentucky, and points south and west, I was able to grasp one recognizable request. A desperate-voiced airman was pleading for "I Feel Like Traveling On." When the request sheet began to fill with calls for "Pork Chop Stomp," "Bowlegged Boy from Texas," and "A Six Pack to Go," I decided it was time for me to move on.

I spent the remainder of my tour in the most incredible duty any fighting force has known since the days of Hannibal's elephant cavalry. Armed Forces Television, AFRS-TV, engulfed me in a montage of smoking six-guns, ponytailed heroines, and beatnik private eyes. I breathed a prayer of thanks for the anonymity of desert service. With luck, I considered, this ill-spent period of my military career might remain concealed outside Arabia.

The instinct of self-preservation soon taught me the intricacies of television-station operation in the never-never land of the sheiks. I stalked my electronic jungle fearful of pushing a button or turning a dial that might suddenly send an uncensored Hollywood production across the Arabian airways. Under the system in effect, this was not an unreasonable fear.

Saudi Arabia is not the most progressive nation on earth. Such blessings of civilization as parking meters, freeways, and drive-in pizza parlors have still to invade this lovely land. But around Dhahran, the Saudi Arabians live with televised wrestling matches, fast-drawing western heroes, and encyclopedic panel shows. The activation of AFRS-TV was followed by hordes of TV salesmen who put television sets in every hut, tent, palace, and harem within range of the station. Bedouins who once tented in remote desert oases now camped beneath power lines and aimed their rabbit ears at Dhahran.

To keep this band of brothers in happy thralldom and to prevent contamination by an overabundance of western ideas, the local authorities decreed a limited censorship on the emission of electronic imagery. The ukase disallowed the telecasting of alcoholic liquor consumption, the frisky romping of scantily clad dancing girls, and a too-true depiction of the American way of life.

Faster than a camel can follow his head into a tent, AFRS-TV set up a special projection room for previewing and censoring scheduled programs. I spent an unpleasant apprenticeship in this dark little grotto, staring at every turkey that had ever been promised "for showing to our armed forces overseas." Eventually, I came blinking from my lair and advanced to the responsible task of pushing the buttons and knobs that controlled our nightly output. I was the final arbiter of the cultural growth of thousands of my brother-in-arms and uncounted desert tribesmen.

This was where the real fun began.

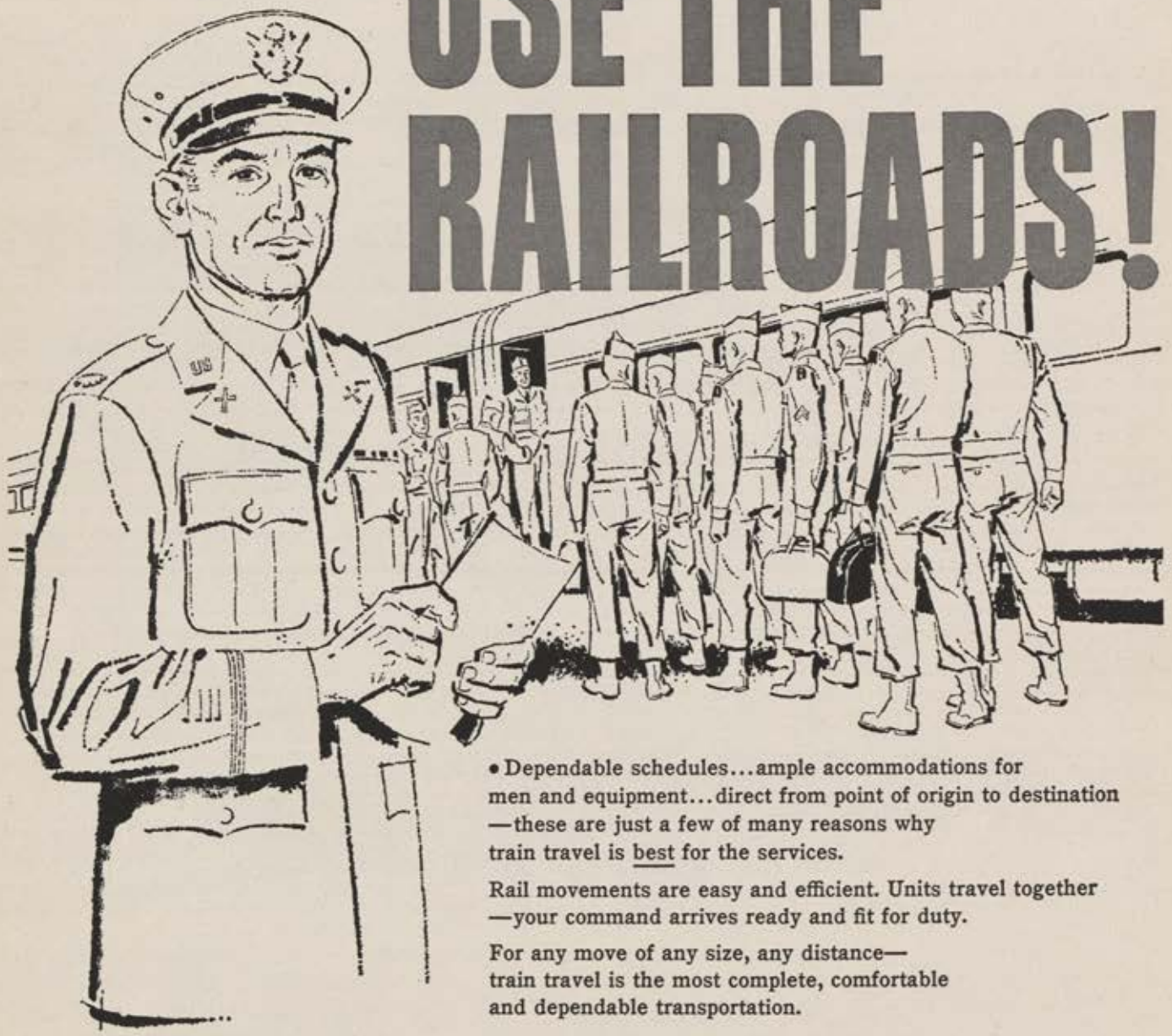
The unrelenting flow of horse operas and bronco-busting histrionics inevitably excited the imagination and envy of desert horsemen. Word went out from the tribes' black tents that these callow, tobacco-chewing riders of the west should be exposed as rank amateurs. A message was sent to the USAF liaison office announcing that the Royal Arab Cavalry would parade in review for a live telecast.

Air Force public relations people went *gung ho* for this hands-across-the-desert overture. Operation Beau Geste blossomed, and a project officer was sent from the Pentagon. To the Saudi cavalry post went trucks, trailers, cables, cameras, and all the paraphernalia of a Broadway-Hollywood epic. Technicians tuned equipment to a fare-thee-well.

Arab traders, snake charmers, dervishes, and bearded nomads from the desert wastes joined camel caravans swaying toward the scene.

(Continued on page 127)

TO BE SURE... USE THE RAILROADS!



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To be eligible for protection, you must have passed your last annual physical . . . be presently in flying status . . . and be a member of the Air Force Association.

Most claims are routine. Where a difference of opinion exists, the Air Force Association has the right to request a review of medical records and other claim evidence by appropriate medical authorities—normally the office of the Surgeon General, USAF.

There are also some exclusions that affect your coverage under the Flight Pay Protection Plan. They are designed primarily to protect your investment in the Plan—restrictions that you'd normally expect, such as groundings due to insanity, court-martial, attempted suicide, etc. Here they are in detail:

EXCLUSIONS:

The insurance under the policy shall not cover loss to any Member resulting in whole or in part from or due to any of the following:

1. Criminal act of the Member or from injuries occasioned or occurring while in a state of insanity (temporary or otherwise).
2. "Fear of flying," as officially certified by responsible authority of the Member's Service and approved by the head of the Service in accordance with applicable regulations.
3. Caused by intentional self-injury, attempted suicide, criminal assault committed by the Member, or fighting, except in self-defense.
4. Directly or indirectly caused by war, whether declared or not, if act of an enemy in such war is the direct cause of loss insured hereunder, hostile action, civil war, invasion, or the resulting civil commotions or riots.
5. Failure to meet flying proficiency standards as established by the Member's Service unless caused by or aggravated by or attributed to disease or injuries.
6. Inability of a member to continue to meet physical standards for Hazardous Flight Duty because of a revision in those standards, rather than because of preceding injury or disease causing a change in the physical condition of such member.
7. Mental or nervous disorders.
8. Alcohol, drugs, venereal disease, arrest, or confinement.
9. Willful violation of flying regulations resulting in suspension from flying as a punitive measure, or as adjudged by responsible authority of the Member's Service.
10. Suspension from flying for administrative reasons not due to injuries or disease, even though the Member may have been eligible for or was being reimbursed at the time of the administrative grounding because of a previously established disability.
11. Loss of life shall not be deemed as loss for purposes of this insurance.
12. Primary duty requiring parachute jumping.
13. Voluntary suspension from flying.
14. A disease or disability preexisting the effective date of coverage, or a recurrence of such a disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directive of the service concerned, *unless the Member was insured under the master policy issued to the Air Force Association for 12 continuous months immediately prior to the date disability (grounding) commenced.*

Underwritten by Mutual Benefit Health & Accident Association (Mutual of Omaha).

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This insurance is available for AFA Members only ☐ I am an AFA Member ☐ I enclose $6 for annual AFA membership

Rank (please print) Name Address

City Zone State $ Annual Flight Pay Years Service for pay purposes

I understand the conditions and exclusions governing AFA's Flight Pay Protection Plan, and I certify that I am currently on flying status and entitled to receive incentive pay and that to the best of my knowledge I am in good health, and no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

Signature of Applicant Date

Underwritten by Mutual of Omaha

6-60

It was the most exotic and colorful panoply of animals, men, tents, and costumes assembled at royal command since Henry VIII gathered his nobles on the field of the Cloth of Gold.

With the unerring predestination that placed Lincoln in the box at Ford's Theatre, fate selected me to direct the televised pageantry from the station control room.

For the first twenty minutes, the show was a success. Colorfully attired Arab horsemen rode their animals with skill and precision and with the pride of centuries of heritage. Burnooses flew in the wind, and the sun glinted on the shimmering steel of lances. Back and forth across the screen of my monitoring set, the cavalry wheeled and galloped, reversed and broke ranks and reformed, in a series of intricate displays.

I studied my knobs and dials. The scopes and needles and gain indicators showed everything under control. I checked the standby projector. An American moving picture was unreeling silently and unseen. It was ready for instant presentation in case the live show was interrupted. In the frenetic world of television, the unforgivable sin is an empty screen. I had merely to press a button and the film projector would flip the picture on the air. Moses' deliverance of the Israelites from bondage would be as nothing to my liberation were the button pressed in error.

Anyone can make a mistake, I mused; it was not as though atomic retaliation would result. Again I put temptation aside and prayed for strength.

This was the moment the Beau Geste project officer chose to visit the control booth. He was a high-strung, nervous type of individual of bird colonel rank. He was inclined to perspire and wore a permanent frown of care on a face that looked like a wet, steamed yam. Since his arrival at Dhahran, he had developed an alarming tremor in his hands and his fingers fluttered in the air with the gyrations of a far-out hula dancer. He should not have been in the booth.

"What a day!" he sighed, expelling air like a burst balloon. "I hope everything goes all right. If this show goes over, it might mean the Order of Abdullah ba Shadda. If not. . . ." His voice trailed off.

"If not, what, colonel?" I asked, and jostled him a bit. His hand bounced to within an inch of the console and his fingers played soundless arpeggios above the buttons and keys.

The colonel did not hear me. His eyes darted crazily about in their sockets like marbles in a pinball machine as he took in the lights and dials.

"That picture is off-center!" he cried. "Can't we square it off?"

He reached toward a control knob and his fingers capered across the console buttons. I heard a click and saw the instantaneous flash of change on the monitor screen.

A new army had invaded the set. Gone were the Arab horsemen. And the sand dunes. And the shrieks of the dervishes. A column of US cavalry galloped across the screen. The clarion notes of "Boots and Saddles" rang out, and Old Glory snapped in the breeze. Custer's Seventh Cavalry was hell-bent for leather on the way to the Little Big Horn. The troopers rode like the wind, and their yells rose into the Arabian air.

For an instant, I stood unmoving, not daring to believe my eyes. I watched the battle unfold. Then, the change in scenery, in uniforms, in horses and men and sounds, lost its magic. I leaped to undo the damage.

Too late, the colonel had sensed his mishap. He had turned the knob to adjust the picture when he felt the button go down. His hands had flown to the console board and now, in a panic, his fingers pecked and tapped among the keys like a flock of woodpeckers in a worm-filled log.

The dance macabre of his hands was producing results. But they were all wrong. The Saudi cavalry appeared on the screen for an instant and was gone. A slide came on urging airmen to vote an absentee ballot. The screen went black, then flashed all white. Momentarily, the Wyoming massacre was seen again, and then a man appeared introducing an educational film.

The situation was out of control now. I had lost track of the sequence of buttons, slides, and films. I was utterly befuddled by the maze of lights and instruments. I hit both projector switches at once and pulled a bright red handle.

Red, green, and orange lights flashed brilliantly for a second or two, then died to a ghastly yellow. A thin wisp of smoke rose from the rear of the console and disappeared. On the screen, Crazy Horse came into view drawing a bead on Custer. Then the lights went out. Armed Forces Television, Dhahran, was off the air.

° ° °

Justice is swift and merciless in Arabia. The immutable law of the desert governs all; an eye for an eye and all that sort of thing. Within hours, diplomatic representations were being made on the consular level. That isn't very high, but it was high enough for me.

The colonel showed himself a decent enough chap by seeing me off on the MATS flight in the morning. He tried to accompany me, but an Arab deputation wanted to see him. He gave me the name of his psychoanalyst and wished me well.

The head shrinker tells me that the old boy stayed there in Saudi Arabia and is retired on a half-and-half mental-physical disability. He sells a patented camel saddle with a built-in antenna and has settled into community life.

He was elected recently to honorary membership in the Society of Whirling Dervishes. I understand he considers it a fair substitute for the Order of Abdullah ba Shadda.

—END

The last evidence of Mr. Harty's tongue-in-cheek treatment in AIR FORCE *appeared in the March issue, "Heroes Made to Order." Now a fulltime free-lance writer living in Tampa, Fla., Mr. Harty is a combat veteran of World War II who later served in the Pentagon in a public-relations assignment and afterward was with the Strategic Air Command before he left the Air Force in 1958. His first offering for this magazine was "The Flight of the Blue Beetle," May '58 issue.*

INDEX TO ADVERTISERS

Recent USAF film releases of special interest to readers of AIR FORCE

Requests for any of these six newly released films should be sent to the Air Force Film Library Center, 8900 S. Broadway, St. Louis 25, Mo., and should include the serial number, correct titles, and alternate films and showing dates.

AFNR 50—Air Force News Review No. 50—X-15 Makes Emergency Landing; Annual West Berlin Police Show Spectacular; River Training Gives Survival Know-How; ADC-SAC Hold "Exams"; Airman Ranks in Ancient Art.

AFNR 51—Air Force News Review No. 51—Morocco Greets President; Starfighters Make Long Hop; 9th AF Honors Missileman; USAF Sets New Records; Canberra Tests Bomarc Guidance; Reserves Hold Troop Carrier Rodeo; SAC Demonstrates Swift Reaction.

SFP 697—Down to Earth—Animated film brings space down to earth. Every condition that might exist in space is tested in laboratory to ensure man's safety in space and his reentry into the earth's atmosphere.

SFP 616—Quality Control—A Management Tool—Film highlights various quality control operations in depots, industrial plants, and air commands. Also shows how integrated teamwork helps maintain a constant high degree of perfection in aircraft and missile components.

TF 1-5192b—Be Water Wise—Boating—Water Safety Practices—Places emphasis on careful preparation and safety check of boating gear prior to launching.

TF 1-5292—Survey of Astronautics—Shows orbiting satellites and explains the variety of purposes they serve. Manned capsule satellite performs its mission of reconnaissance and space research. Shows what it will be like to be a member of the crew of a manned space station of considerable size and of many-sided usefulness.—END

This Is AFA

The Air Force Association is an independent, nonprofit airpower organization with no personal, political, or commercial axes to grind; established January 26, 1946; incorporated February 4, 1946.

Objectives

• To assist in obtaining and maintaining adequate airpower for national security and world peace. • To keep the AFA members and the public abreast of developments in the field of aviation.

• To preserve and foster the spirit of fellowship among former and present personnel of the United States Air Force.

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Industrial Associates: Companies affiliating with the Air Force Association on a nonmembership status that receive subscriptions to AIR FORCE Magazine and SPACE DIGEST, special magazine supplements, and Industrial Service Reports.

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