FEBRUARY 1960 / 50c

AIR FORCE

and SPACE DIGEST

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

'HIGHEST AND FASTEST'

Wide World Photos

Manned aircraft are still at the center of the aerospace picture. The fact was underlined in December when USAF pilots and their aircraft set four notable records. Shown here with USAF Chief of Staff Gen. Thomas D. White, who awarded each man the Distinguished Flying Cross, are:

- **Capt. Joe B. Jordan who flew an F-104 to 103,395 feet.**
- **Capt. Walter J. Hodgson and Maj. William J. Davis who flew an H-43B helicopter to 30,100 feet.**
- **Maj. Joseph W. Rogers who flew an F-106 1,520.9 mph.**
- **Brig. Gen. Joseph H. Moore who flew an F-105 1,216.48 mph.**

(SEE PAGE 24 FOR DETAILS)

"Manned aircraft will continue to play a vital role in the Air Force for as far into the future as I can see . . ."

—Gen. Thomas D. White
Chief of Staff, USAF

more and more in style for the men who fly and maintain gas turbine helicopters

In National Defense **KAMAN** *is part of the plan*

THE KAMAN AIRCRAFT CORPORATION • BLOOMFIELD, CONNECTICUT

PIONEERS IN TURBINE POWERED HELICOPTERS

Space-age tailors at B.F.Goodrich are making sure that America's first Astronaut will be the best dressed man in history. Never before have so much time, energy and ingenuity been lavished on a suit of clothes. But then, no suit has ever had to do so many jobs at once. This one must maintain enough pressure to keep a man's blood from boiling in an almost complete vacuum. It must provide air to breathe. It must be lightweight and flexible enough to allow free movement. And, of course, it must be well insulated to protect against the heat developed during re-entry.

The pressure suit which meets all these requirements is only one of the contributions BFG has made to man's conquest of space.

B.F.Goodrich also produces heat shields for nose cones, missile cases, air-frame structural components, flame deflectors, flare cases and rocket nozzles. For information on these and other BFG space-age developments, such as solid fuels and rocket ship tires, write *B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Dept. AF-2, Akron, Ohio.*

B.F.Goodrich

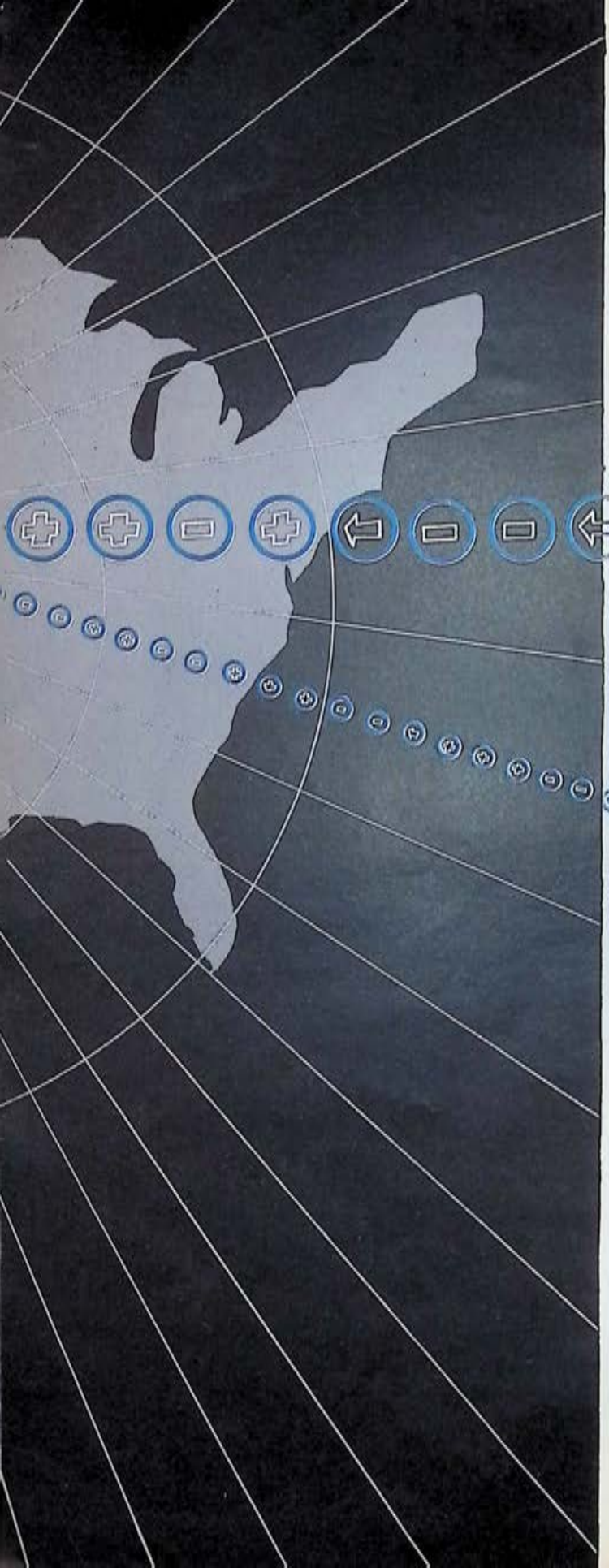
Around the world in 90 minutes

costumed by BFG

Mock-up of Project Mercury capsule, built by McDonnell Aircraft Corporation for the manned orbital flight program of the National Aeronautics and Space Administration.

Last September the first full-scale model of the Mercury space capsule was boosted 100 miles high atop this Atlas missile. Protected by a BFG laminated glass fiber and resin heat shield, the capsule shot back into earth's atmosphere at approximately 14,000 miles an hour. Although temperature of the outside skin of the heat shield reached about 3000° Fahrenheit, the temperature inside the capsule never exceeded 150 degrees during the critical moments of re-entry.

B.F.Goodrich ***aviation products***



BURROUGHS CORPORATION NAMED SYSTEM MANAGER OF ALRI

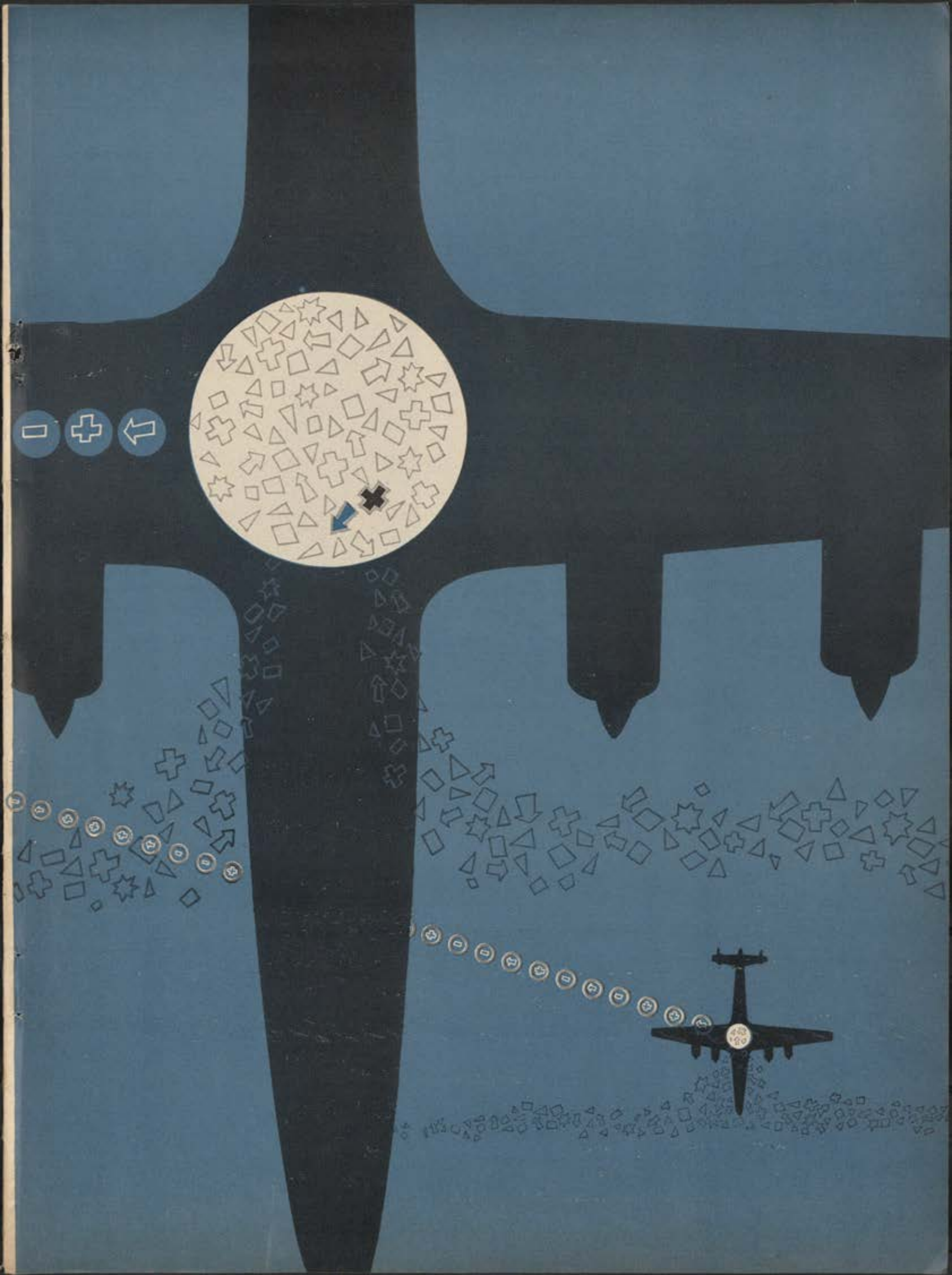
NEW PROGRAM TO EXTEND RANGE OF SAGE

THE PROGRAM: U. S. Air Force Airborne Long Range Input—a seaward extension of SAGE via radar-equipped RC-121-D reconnaissance aircraft. **BURROUGHS RESPONSIBILITY:** system management, including selection and direction of the team which will supply the radar, navigation, and communication sub-systems; aircraft retrofit design; development of a miniaturized airborne computer. **BEHIND THE NEWS:** another vote of confidence in Burroughs Corporation's unique qualifications for systems management. Confidence inspired by total competence in computation—from basic research through production to field service. By a team-oriented attitude that engenders effective interfacing relationships and intra-team communications. And by proved performance that numbers the Atlas guidance computer and the SAGE radar data processing system among its missions accomplished.

Burroughs—TM

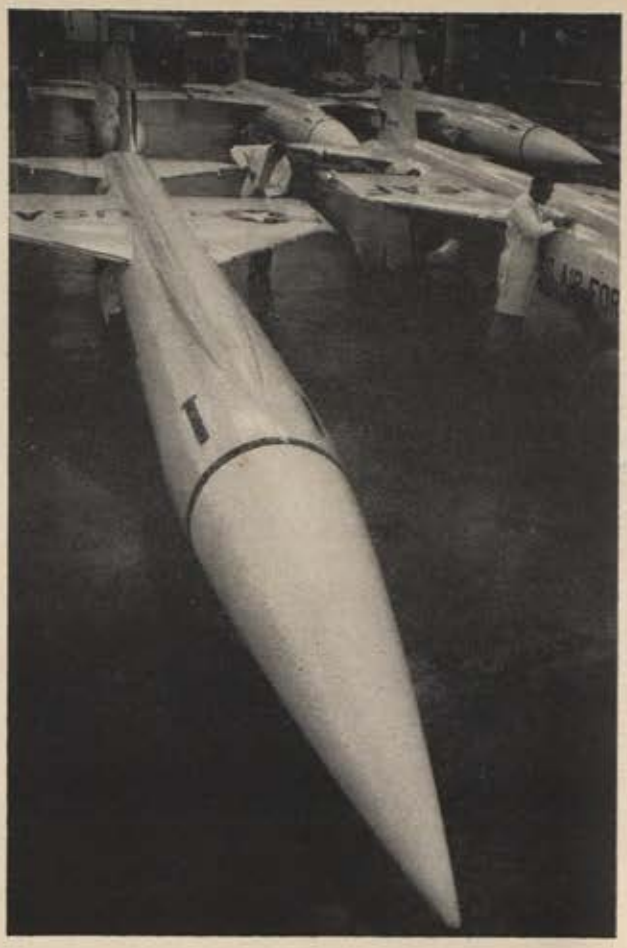
Burroughs Corporation

"NEW DIMENSIONS / in computation for military systems"

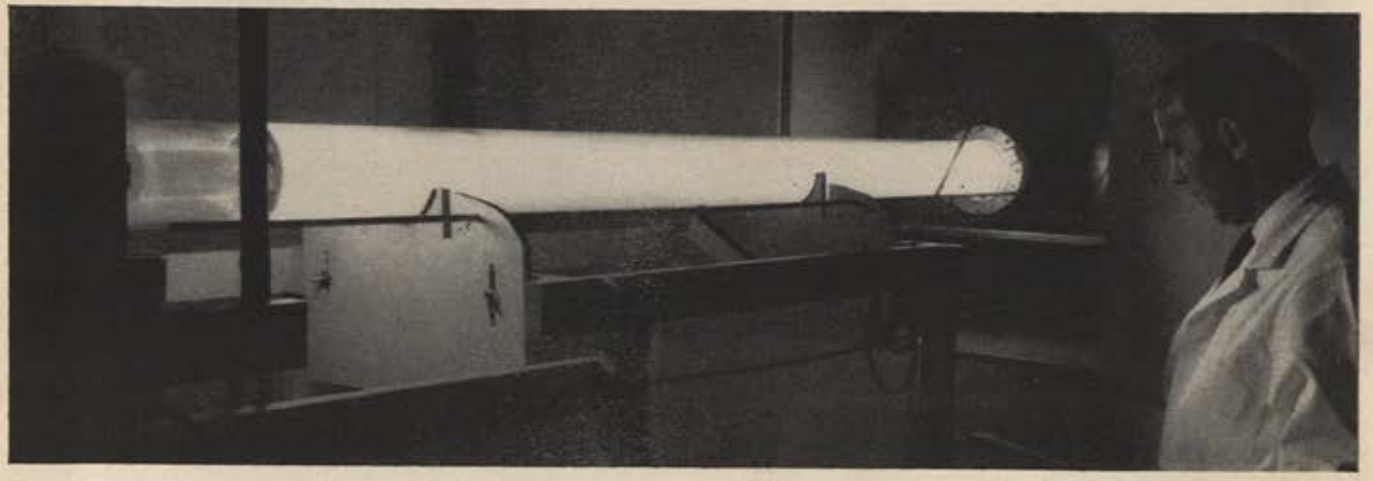


BULLETIN FROM **BOEING**

COUNTER-MOON. Drawing of an orbital vehicle designed by Boeing engineers and scientists for future space research. Manned vehicle, carrying advanced instruments, would orbit in moon's path but maintain position on opposite side of the earth from the moon. Space-age research studies underway at Boeing include other advanced orbital, lunar and interplanetary systems.



AIR DEFENSE MISSILES. Supersonic BOMARC missiles being readied for checkout in Boeing plant. In production for Air Defense Command, BOMARCS are nation's longest-range defense missiles and are designed to defend large areas against attacking aircraft. Advanced "B" model, now undergoing flight tests at Cape Canaveral, is designed for a range of more than 400 miles.



SHOCK TUBE. Industry's most powerful shock tube, designed and built by Boeing scientists for electromagnetic radiation research using gases at very high temperatures. Related research at Boeing includes extra-terrestrial gases and space gas-system structures. Goal of scientists of the Boeing Scientific Research Laboratories is to develop new and fundamental knowledge at the frontiers of science.

JET STARTER. Boeing 502 gas turbine-driven compressor, mounted in Turbo-Starter truck, gives fast, sure starts to jet and turbo-prop engines. Boeing Turbo-Starters have been ordered by major U.S., Canadian and European airlines. Boeing 502 gas turbines also power mine-sweeping launches, the first turbine craft to enter fleet service overseas with the U.S. Navy.

BOEING

AIR FORCE

THE MAGAZINE OF AEROSPACE POWER

Volume 43, Number 2 • February 1960

AIR FORCE Magazine and **SPACE DIGEST** are published monthly by the Air Force Association. Printed in U.S.A. Reentered as second-class matter, December 11, 1947, at the post office at Dayton, Ohio, under the act of March 3, 1879. **EDITORIAL CORRESPONDENCE AND SUBSCRIPTION** should be addressed to Air Force Association, Mills Building, Washington 6, D. C. Telephone, STerling 3-2300. Publisher assumes no responsibility for unsolicited material. **CHANGE OF ADDRESS:** Send us old address *and* new address (with zone number, if any) to Air Force Association, Mills Building, Washington 6, D. C. Allow six weeks for change of address. Send notice of **UNDELIVERED COPIES** on Form 3579 to AIR FORCE Magazine, Mills Building, Washington 6, D. C. **SUBSCRIPTION RATES:** $5.00 per year, $6 per year foreign. Single copy 50 cents. Association membership includes one-year subscription: $6.00 per year (Cadet, Service, and Associate membership also available). **ADVERTISING CORRESPONDENCE** should be addressed to Sanford A. Wolf, Advertising Director, AIR FORCE Magazine and SPACE DIGEST, 501 Madison Ave., New York 22, N. Y. (PLaza 2-0235). New England office: Morley L. Piper, Resident Manager, 428 Essex St., Hamilton, Mass. (HAmilton 1523). Midwest office: Urben Farley & Company, 120 S. LaSalle St., Chicago 3, Ill. (FInancial 6-3074). West Coast office: Harold L. Keeler, Sales Manager, and Hugh K. Myers, 625 S. New Hampshire Ave., Los Angeles 5, Calif. (DUnkirk 5-1436). European representative: Brayton Nichols, 151 Fleet St., London E.C.4, England.

FEATURES

SPACE DIGEST
Starts on page 57

DEPARTMENTS

An Editorial

Soviet Force Cut? Or Modernization?

John F. Loosbrock, Editor

NIKITA KHRUSHCHEV has hammered another nail into the box which he is busily constructing around the free world's politico-military posture.

In his first address of the new year to the Supreme Soviet, the Russian premier announced that the USSR was so far ahead of the United States in nuclear weapons that it could safely reduce its armed forces by one-third—from 3,623,000 to 2,400,000—"in the course of one or two years." And, he said, the Soviets are willing to undertake this force cut on a unilateral basis.

Khrushchev had made the same point, less formally but perhaps more informatively, a couple of weeks previously, at a gaudy New Year's Eve party in the Kremlin before an audience of 1,500, including the diplomatic corps of Moscow.

At the party, he said:

"We are willing to disband the Soviet Army altogether, and everybody will welcome it."

Thus, while at first blush any reduction of Soviet armed strength seems like good news, it depends entirely on what kind of armed forces one is talking about. The fact that Khrushchev singled out Red conventional forces as the target for his slash puts his proposition into a quite different and frightening context.

For if it is true, as we firmly believe, that the Russian economy is uncomfortably strained in support of its huge scientific-military effort plus the Seven-year Plan for consumer goods expansion, then it is only logical for the Soviets to look for some fat to cut out. Unlike the United States, which is fat in civilian goods and services, the Soviets have no place to go but to their military machine and the relatively unproductive and wasteful portions thereof.

What this means is that resources will be freed to concentrate on the really decisive elements of the Soviet war-making machine—long-range nuclear striking power—and thus accelerate the imbalance in world power which US wishful thinking and soft living have also helped to bring about.

Khrushchev, in our opinion, made the point quite clear in one of his homely analogies, as reported by Peter J. Kumpa in the Baltimore *Sun*.

He told the Chekhov story about the peasant who was removing spikes from the railroad tracks. Told that if he removed too many the train would crash, the peasant replied that he was not removing *all* the spikes.

Said Khrushchev, "If we remove some spikes we will replace them with other spikes."

The Soviet Defense Minister, Marshal Rodion Y. Malinovsky, backed up his boss. He said he went along with plans to reduce the armed forces as much as possible and pointed out that modern technological developments had to be understood and military force adjusted to reflect the changes in technology.

Obviously, the Soviets are well aware of the fact that deterrence is a two-way street and that long-range nuclear striking power is the core of it. Either they are not moving quickly enough in their achievement of that capability or they plain can't afford it without cutting elsewhere. From where we sit, the remarks on disbanding huge chunks of Red conventional forces presages only one thing—further concentration on long-range nuclear forces—with the propaganda fringe benefit of appearing to lead the way toward disarmament by throwing away things they neither want nor need. Couple rapidly accelerated delivery systems for nuclear weapons with the aggressor's built-in first-strike advantage and the problems of the free world become multiplied many times.

Let us not be deceived. This is no force cut. It is a force modernization program masked as a reduction in forces.

There is no likelihood that the Khrushchev pronouncement will produce any slowdown in the US military effort or a return to a business-as-usual attitude on the part of the Administration. The slowdown has been a fact of life for, lo, these many years; and business as usual is the motto of the day, of yesterday, and, as far as we can determine, of tomorrow and the day after that.

The contrast is striking. When Khrushchev needs more resources for high-priority military items he goes and gets them, even at the expense of low-priority, high-tradition forces. But he gets them.

When the richest nation the world has ever known needs more money for high-priority survival insurance weapons, it wrings its hands, looks cautiously at the interest rate for long-term government bonds, mumbles about fiscal security being a prerequisite of military security, and behaves in general like a nineteenth-century banker being approached for a loan by the village ne'er-do-well.

More than a hundred years ago a wise Frenchman, Alexis de Tocqueville, wrote a much-quoted, seldom-read book: *Democracy in America*.

In this book he referred to Russia and the United States in these terms:

"The Anglo-American relies upon personal interest to accomplish his ends and gives free scope to the unguided strength and common sense of the people; the Russian centers all the authority of society in a single arm. The principal instrument of the former is freedom; of the latter, servitude. Their starting point is different and their courses are not the same; yet each of them seems marked out by the will of Heaven to sway the destinies of half the globe."

He's right so far, but at this point we'd be almost willing to settle for half.—END

Three generations of ARMA computers:
THE SECOND GENERATION

FOUND:

an intellect that can think anywhere

The systems of tomorrow will require digital computers that can think *anywhere*—intellects that will remain superior in any environment.

ARMA—already producing computers for its inertial guidance system in the ATLAS ICBM—has accepted the challenge and developed a lightweight, second-generation digital computer applicable to *all* types of navigation. It can be used in space, atmospheric, surface, subsurface and ground navigation, making possible programming flexibility.

This all-solid state computer, with *no moving parts* and using silicon semiconductors exclusively, has a memory that is non-volatile and has non-destructive readout. And this computer has 40 per cent fewer parts than ARMA's first-generation production model, which has a test performance unequalled by any other digital computer.

An even more sophisticated third-generation computer, surpassing the reliability of the first two with still less weight, will be produced in the future by ARMA. The reliability of all three generations will be assured by thorough testing in ARMA's environmental facilities—the most complete in the industry.

ARMA, Garden City, N. Y., a division of American Bosch Arma Corp. . . . the future is our business.

Attention, Engineers: Write to E. C. Lester, Emp. Supv., about career openings in R & D programs.

AMERICAN BOSCH ARMA CORPORATION

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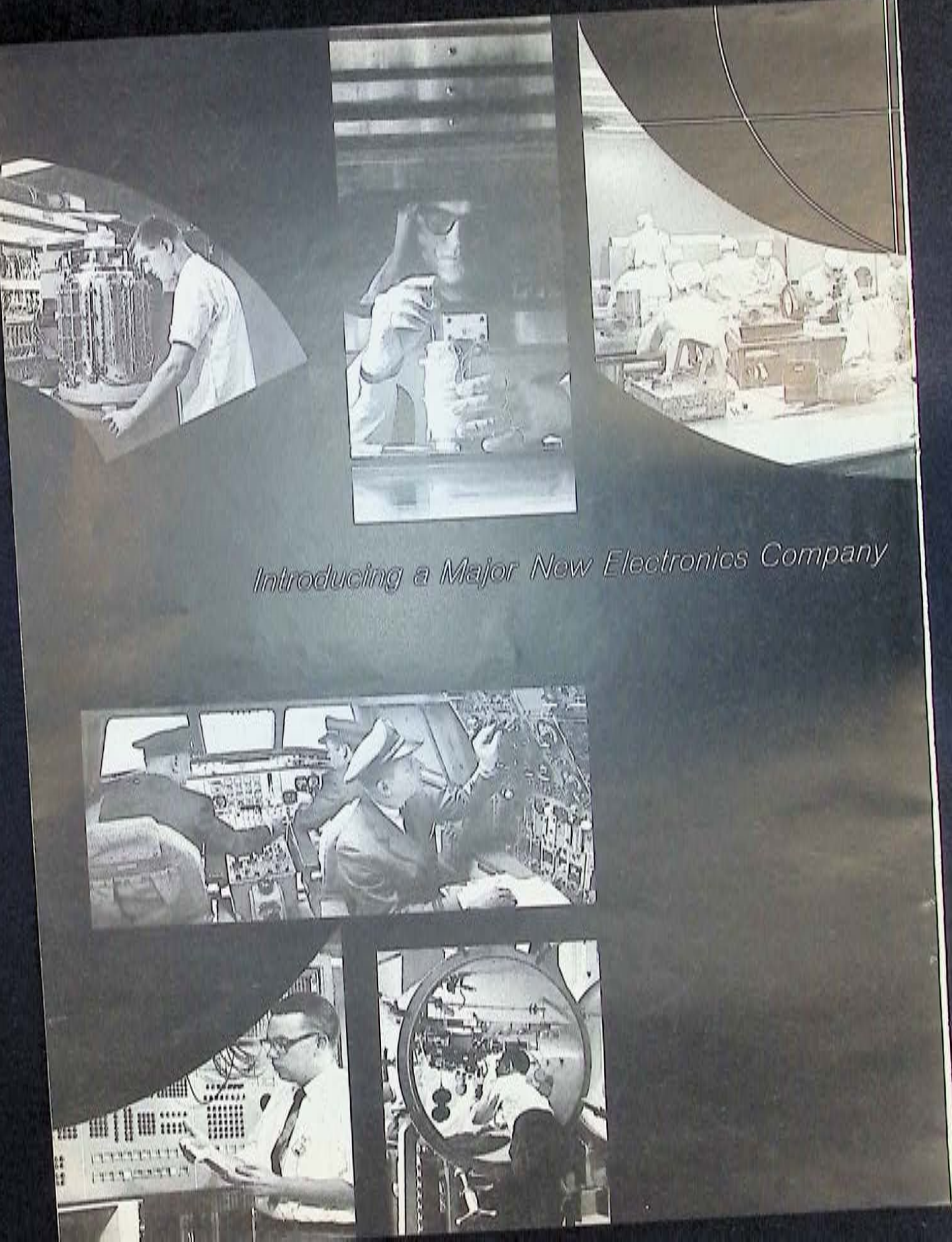

Introducing a Major New Electronics Company

Four leaders in the field of electronics have been combined to form General Precision, Inc.—a new company with unique qualifications to serve this age of precision.

The four, which have become divisions of the new organization, are GPL (General Precision Laboratory), Kearfott, Librascope and Link. Each of these was formerly a subsidiary of General Precision Equipment Corporation.

The GP divisions today are pacesetters in airborne, shipborne and ground electronics subsystems. In their new integrated organization, they will also be better able to provide advanced control and support for major military subsystems, and to offer superior data handling systems for all military services, business and industry.

GENERAL PRECISION INC.

GPL DIVISION *is playing the major role in development of a new air traffic control system for the Federal Aviation Agency. It is the world's largest manufacturer of Doppler air navigation systems and a leader in closed circuit television for high resolution military and general business and industrial applications.*

KEARFOTT DIVISION *is one of the nation's leading producers of precision components such as gyroscopes, synchros, tachometer generators, integrators, accelerometers, servo motors and airborne hydraulic products. Kearfott is also a leader in the production of inertial guidance and navigation systems.*

LIBRASCOPE DIVISION *produces an unexcelled variety of digital and analog computers—from a one-half cubic foot digital computer for aircraft and missile navigation to a large-scale ground computer for air traffic control.*

LINK DIVISION *is the world's largest manufacturer of flight simulators and jet training equipment and also designs and produces specialized analog-digital computers, inductive identification and control systems for moving vehicles, microaccuracy gaging equipment and electronic systems for a wide range of industrial and defense applications.*

General Precision, Inc.'s plants in 14 cities across the country this year will provide employment for 15,000 people, including 4,500 engineers.

MANUFACTURING AND RESEARCH: Binghamton, Pleasantville—New York; Clifton, Little Falls, Paterson—New Jersey; Cambridge, Massachusetts; Asheville, North Carolina; Cleveland, Dayton—Ohio; Burbank, Glendale, Palo Alto, Sunnyvale, Van Nuys—California; San Juan, P. R. **SALES OFFICES** in 22 cities.
AFFILIATES, LICENSEES in Canada, France, Italy, Japan, U. K., West Germany.

AIRMAIL

Expensive but Effective

Gentlemen: My compliments on your recent editorial "Pay Now . . . Survive Later" [December '59]. It was compact, articulate, and most informative, and I would say it is a "must" reading for all those who care.

I wonder if the sequel to this theme should not be "A Giant With an Inferiority Complex"?

We live in a country that is constantly underestimating itself—and this is leading to mediocrity. We see it in our schools, in government, even in our churches and families, where it is fashionable to be complacent, average, and trouble free.

We, in the West, are only a generation removed from people who carved an empire with work, guts, and courage. Survival to them was a way of life grounded on a simple and basic premise—if we don't live we will not see the fruits of our labors; and unborn generations will be deprived of sharing this magnificent country with us.

I think we should continue the theme of the basic greatness of our country.

Arthur F. Kelly
Los Angeles, Calif.

Gentlemen: I agree basically with your editorial "Pay Now . . . Survive Later," but I think you fail to emphasize some things. I infer from your editorial the attitude that we can have our cake and eat it. All we have to do is confiscate more capital (and that's exactly what it is, private investment capital) for defense.

All of us who are interested in current affairs have noticed the defense swindle going on before our eyes. Slightly more than half of the budget goes for defense or research and the rest goes for welfare, with the welfare part increasing and replacing the defense part. Legislation in the last Congress made inevitable even higher welfare costs in the future, with more of the same from this year's Congress.

It's very easy to say that we aren't down to Russia's existence level, due to taxation and regulation, and that we have a long way to go before that occurs; but the real problem is to keep from losing our political-economic system while defending ourselves.

No reasonable American would withhold anything in defending our wonderful country, but the vicious and transparent shell game that the bureaucrats play with our capital is enough to make even intelligent Americans adopt a dangerous apathy.

It's also worthy of note that, even armed to the teeth, we won't get off the ground until we find a way of breaking the ever unfavorably changing *status quo*, and start effectively dabbling on their side of the curtain.

L. S. Abbott
Wichita, Kan.

● *We agree basically with the above communication. However, the business of overcoming bureaucratic inertia and achieving a more efficient defense for the same or lower taxes is a time-consuming process. And there isn't time. A reorganization of our defense structure and a diverting of needless nondefense spending to defense projects is the sensible answer. But signs that that will happen in time to do any good are few. More money over-all is the short-term, although admittedly wasteful, solution. And the indications are that the economy can stand a good deal more than it is presently being asked to bear. Further, as the cost of weapon systems continues to rise, there is no assurance that the present spending level, even if not one penny were wasted, would be adequate to support the needed defense effort.*—The Editors

Accent on Survival

Gentlemen: I have read almost all of the articles published by Air Force Magazine since its inception, and I would like to convey my profound thanks and gratitude for your efforts in the cause of national defense.

In my opinion, the article "Awareness Is a Weapon," by Dr. James B. Conant, in your January 1960 edition, sums up many of your editorials and most of your leading staff reports and articles over the past ten years with respect to defense and survival.

Such an authority as Dr. Conant should be heard and read by every person who relishes freedom either in the West or behind the Curtain. While the meaning in the text is clear, I wonder if our leaders in government, labor, and industry are not prone to think of their own problems rather than those of a united America.

Brig. Gen. Thomas J. DuBose
USAF (Ret.)
Winter Park, Fla.

Translation Error

Gentlemen: . . . I thought you made my article "Aerodynamics at the Fringe of Space," [December '59] look very well, but I should point out one slight error in the graph at the foot of page 66. You have translated my "Dornberger" into "V-2 rocket" with which, of course, Dornberger was closely associated. I was in fact referring to the Dornberger hypersonic rocket, glide transport aircraft proposed by him in 1955 when he was working with Bell Aircraft Corporation.

This is really quite a trivial matter, but I thought I should clear myself in case some of your sharp-eyed readers feel like attacking me on the score of accuracy! . . .

John E. Allen
A. V. Roe & Co., Limited
London, U.K.

Medics Into Space

Gentlemen: I should like to commend you and your staff for the excellent layout, presentation, and the fine art arrangement of my article "Air Force Medicine Moves into the Space Age" [January '60].

It is highly significant in this aerospace age that your fine magazine plays an important part in highlighting the role the US Air Force Medical Service is playing in the conquest of space. . . .

Maj. Gen. O. K. Niess
Surgeon General, USAF
Washington, D.C.

Our Belated Apologies

Gentlemen: Help me! All of the folks in the 146th Tactical Fighter Wing are getting myopia from reading and rereading the accounts of the Miami

Convention in the October issue of AIR FORCE/SPACE DIGEST. Lo, and behold, ol' buddy, no mention of the 115th winning the outstanding unit award.

Folks are thinking I'm the nation's number zero information services type. Mebbe so!

Capt. Bill Johnston
Information Services Officer
146th Tactical Fighter Wing
Van Nuys, Calif.

● *Not so! We must plead guilty. It was just one of those things—no malice and no fault of your own. A release was put out on September 3 at the start of the Convention detailing not only the award to the 115th Squadron but also the awards to the Outstanding Reserve Unit and the Outstanding Individuals of both Guard and Reserve.*

Similar releases were the basis for Convention coverage in the October issue, but for some wild reason we didn't come back to Washington with extras of the Reserve and Guard awards release. So it got sluffed off, though we did mention the outstanding Reserve and Guard airmen in "Ready Room" and in the roundup story earlier. Let's say a possible reason we didn't bring copies of the elusive release back was that the demand in Miami Beach for this nugget of news was so overwhelming that the stocks were almost instantly exhausted.

We're sure all this will make your good colleagues of the 146th take a kinder view toward your prowess as an ISO type.—THE EDITORS

Gutted

Gentlemen: Ed Mack Miller's article on the Valkyrie [January '60] was topflight reporting. . . . That information should be spread around.

Maj. Stephen P. Cullinan
March AFB, Calif.

Lucky Member

Gentlemen: I had been in the hospital for two weeks and when the Flight Surgeon asked me if I happened to have flight pay insurance, I told him I sure as heck did! How well I recalled my first briefing on the subject when I was reminded that I was probably a typical Air Force officer who had to live on his monthly pay with very little going into bonds or a savings account. How true.

The ironic part of my grounding is that I had recently passed my annual physical with flying colors. . . .

I shudder to think of the number of flying personnel who are without this coverage. In my case, I can relax

(Continued on following page)

AIR MAIL——CONTINUED

and let the chips fall where they may. There are no doctors in the world better than our flight surgeons, but we should be able to permit ourselves to have the best care possible by being able to take off long enough to ensure proper and thorough attention to whatever ails us.

With all my heart I certainly am grateful to AFA for sponsoring that ol' flight pay insurance.

Col. Harry W. Shoup
4th ATAF
APO, N. Y.

Community Responsibility

Gentlemen: . . . Administrator Hoegh ["Your Backyard Is the Battleground," November '59 issue] on many occasions has discussed the fact that he has built a shelter in his own home in Washington that cost around $212. Whether it is a shelter, communications, or any other means of Civil Defense and Disaster Control, I still insist each individual, including the townships, villages, cities, and federal government, must make a survey of their everyday existing facilities. What do you have on hand today that you could use tomorrow if you were not able to go out and make a purchase? I still insist and sincerely feel that if we plan for natural disasters it is possible that we can be prepared for any other eventuality. . . .

I sincerely *do not* feel that the federal government should have to pour money into Critical Target Cities for a Civil Defense Program. I believe that it is the city's responsibility to have a Civil Defense Program. Civil Defense and Disaster Control should become part of any city and state government. Akron does not accept Matching Funds or Surplus Property, and Civil Defense is a part of each department. Each department head is responsible for his personnel in assisting Mutual Aid to any city or village here in Summit County. . . .

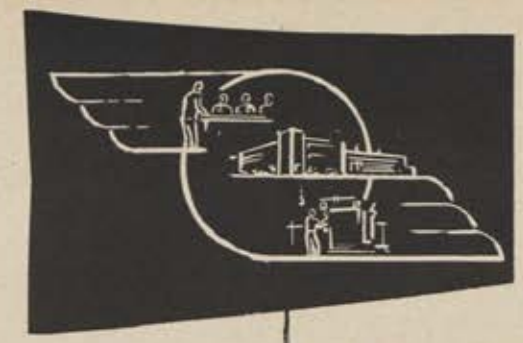
Dorothy R. Koller, Director
Civil Defense and Disaster Control
Akron, Ohio

Plugs Always Appreciated

Gentlemen: . . . AIR FORCE/SPACE DIGEST has steadily improved through the years and contains information that is well rounded and vital to keep abreast of the happenings around the Air Force.

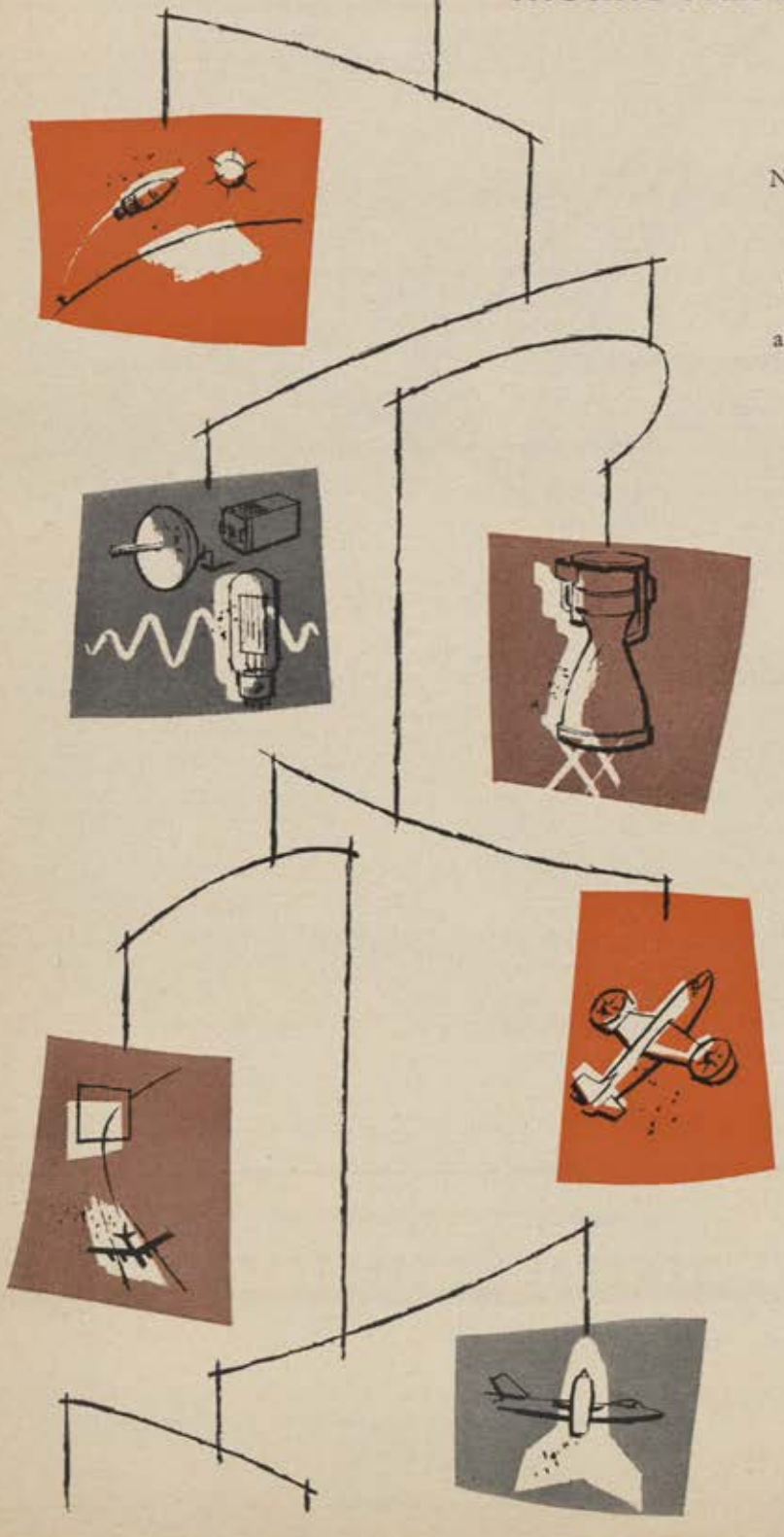
Your publication should be required reading for all Air Force personnel, particularly those who might not be in touch with the latest happenings. . . .

Lt. Col. Roy E. Eidson
Fairfax, Va.



DIVERSIFICATION

means HEALTHY BALANCE at BELL



Diversification is healthy for a defense contractor, its customers, and for the nation. Here's a brief look at today's broadly diversified activities of the Niagara Frontier Division of Bell Aircraft Corporation.

Bell rocket engines are pushing an Agena into polar orbit with each launching under the Discoverer program. The Air Force has contracted for a Bell all-weather automatic landing system already proven in thousands of actual demonstrations. Bell reaction controls are being used on the X-15 and are being readied for Mercury. Bell accelerometers make up part of the guidance systems for the Army Sergeant and other missiles. The nation's first deflected jet VTOL experimental aircraft, designed and built by Bell, has been flight tested by NASA.

Bell is also actively engaged in many other highly advanced technical projects. These, to name a few, embrace such fields as double-wall construction, automatic drone control, ducted propeller VTOL aircraft, ground effect vehicles, revolutionary new battlefield surveillance techniques and extremely accurate, highly sensitive complete inertial guidance systems for aircraft, missiles and space vehicles.

That is what Bell means by broad diversification within the defense industry. That is why the proven engineering and production capabilities of Bell's Niagara Frontier Division can serve you so well in so many ways.

BELL
AIRCRAFT
CORPORATION

Niagara Frontier Division
BUFFALO 5, NEW YORK

AN ACHIEVEMENT IN DEFENSE ELECTRONICS

HOW A 6-YEAR-OLD RADAR STAYS YOUNG

A six-year operational veteran, the FPS-6 is still the principal height-finder for air defense. Fundamentally sound design and built-in capacity for improvement enable General Electric to keep this radar "young."

Contrasted with earlier versions, today's FPS-6 features height line display as a full-time trace. Indicator calibration, sector scan, performance monitoring and azimuth blanking are automatic. The nod angle, formerly fixed, has been made variable to attain more hits per target. A new ferrite isolator increases magnetron life and stability. Noise figure has been improved by nearly 1.5 db.

The sustained effectiveness of this radar at operational sites during six years of a rapidly changing air defense environment is truly an achievement in defense electronics. 227-4

Progress Is Our Most Important Product

GENERAL ELECTRIC

DEFENSE ELECTRONICS DIVISION
HEAVY MILITARY ELECTRONICS DEPARTMENT

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.

A. N. Tupolev, the top Russian aircraft designer, is working on a new jet transport, according to Radio Budapest. On December 19, the Hungarians announced that Tupolev's plane, designated the TU-124, is under construction near Moscow. Seating capacity is set at 100.

The USSR had been hinting that work is under way on a supersonic jet transport. Tupolev is the logical man to be assigned such a task.

• • •

The USSR has abandoned one of its two turboprop engines in the 4,000-hp class to concentrate production on just one such powerplant. Both Ivchenko and Kuznetsov have developed turboprops of about this size in the years since 1950. The Ivchenko AI-20 was initially assigned to the IL-18 turboprop airplane under development at the Ilyushin Design Bureau, while the Kuznetsov NK-4 appeared in the prototype model of the AN-10 transport designed by Antonov.

However, the newer AN-10A transport is equipped with the Ivchenko AI-20s. An AN-10A brought Christmas trees and other gifts to Washington in December.

To date some twenty-five AN-10As have been built. The airplane is unique in that it can get off the ground in 2,500 feet with eighty passengers on board.

• • •

Among many different versions of developmental atomic aircraft that have appeared in Russian literature recently, there is one large transport the Soviets say would fly nonstop between the USSR and Antarctica. The USSR has a large exploration party in the southern polar regions which it apparently intends to keep there for a long time.

• • •

The first large-scale moving telescope is now in operation in the Soviet Union at a location "several miles from Moscow." According to information in the Soviet press, the telescope has two primary purposes—one to track space vehicles, the other to study the sun's emissions and their effect upon the propagation of radio communications.

The unit weighs 380 long tons and is seventy feet in diameter. Two years of work were required to assemble and adjust the radio telescope, which is credited with very precise measuring capabilities.

• • •

For many years, the USSR has claimed a Russian, not the Wright brothers, was first with a manned flight in a powered airplane. This event was supposed to have taken place in a field near Leningrad in 1882 when A. F. Mozhaisky demonstrated his steam-powered airplane.

But now an aircraft historian in Estonia has claimed that a Lithuanian named Alexander Grishkavichus flew a steam-powered airplane near Kaunas, Estonia, in 1855. The craft consisted partly of an air balloon to help hold it up in the air, and, in addition, it had flapping wings.

It may be the Estonian spoke with tongue in cheek. He may have felt that one whopper deserved another.

• • •

Some 15,000 periodicals from ninety-five countries come into the USSR each year where the All-Union Institute of Scientific and Technical Information scans them for useful information. About 2,500 to 3,000 articles are read each day by 2,000 trained personnel who can read some sixty-five different languages.

The better material is abstracted and published in fourteen different journals issued by the institute. The articles are classified and their essentials are codified on a punch-card system readily available when needed.

The fourteen journals are mailed free of charge to scientists, engineers, and other specialists, who may secure complete translations of any articles in which they have an interest.

• • •

About the time this column was on the presses last issue, the Russians were setting a new record with their MI-6 helicopter, NATO code-named Hook. Its specifications are included in the Russian helicopter table published on this page in December.

The new record was for closed-course flight. The helicopter flew from Tushino in Moscow's suburbs to Istra, then to Galitzina and back to Tushino nonstop. Average speed for the two-way trip was 167.2 miles per hour, a new world record for helicopters of this size and type. Normal cruising speed for the craft, which has a payload capability of 17,600 pounds, is 124 mph.

• • •

A Soviet design competition for an obelisk honoring the first Sputnik has been completed. The prize-winning design is called "The Creative People." It features a long, sky-sweeping piece of titanium metal with a winged space vehicle on top. The base will be of granite and construction is to get under way in Moscow next year.

• • •

According to the nonprofit Institute of Strategic Studies in Britain, Russia now has about 100 missile bases of all types, including ICBMs. Missiles are the responsibility of Soviet artillery. Some 200,000 men operate the bases.

• • •

Bonuses to plant managers and workers who meet production schedules are out in the USSR from now on, unless the schedule is met economically and efficiently. Until a short time ago the bonuses were paid for turning out a quota of aircraft or jet engines during a year. Cost was no object. Hereafter, the Russian managers will get their bonuses on the basis of profits they earn. Bonuses may be as high as annual salaries. The highest income tax rate is about thirteen percent.

• • •

Look for signs that the Russians have turned to a new jet-powered bomber as an over-all replacement for the Bison ("Russia's B-52") sometime in the next year. It will be a delta type, with more range and speed than the Bison, which is subsonic and requires inflight refueling to achieve a range of 6,000 miles.

• • •

Moscow is putting great emphasis on improving its Arctic coast defenses—obviously as a result of US submarine operations in these areas. Red air defense facilities formerly located inland have been moved to the coast and beefed up.—END

AIRPOWER in the news

Claude Witze
SENIOR EDITOR

How to Ensure Obsolescence

WASHINGTON, D. C.

Congress is back in town in an atmosphere charged with a lot of the tensions, some real, some manufactured, that usually prevail in the year of a presidential election. At least the Senate is prepared for night sessions, both of the chamber itself and of the many committees that will be looking for campaign material under rocks on Capitol Hill. The general idea is to get out of town before the political conventions start in July. Getting rid of Congress early is an idea that has a lot of merit, but the tensions are so great in a number of areas that there is a genuine danger of damage being done in the rush.

Of paramount importance, of course, are the questions involving national defense. It was pointed out here last month that these issues are not likely to provide much ammunition for the 1960 campaign, where matters like money, farm prices and surpluses, peace and prosperity are considered nearer the heart of the politician. Yet, with some persistence, defense is bound to be debated. On a recent Sunday afternoon Senator Stuart Symington, Missouri Democrat who is a veteran of the Pentagon wars, appeared on the TV program, "Meet the Press." He was introduced by the moderator briefly as a former Secretary of the Air Force and at great length as a man who was about to start a Senate investigation of the farm problem. The interesting thing, probably frustrating to Mr. Symington, is that his press panel had no interest in the farmer. For half an hour the reporters persisted in asking him questions about the Pentagon, the missile gap, the space race, and related subjects. It would be nice to think that their questions accurately reflected the interests of their readers in 1960. Somehow, we are more inclined to accept the evaluation of *The Economist,* the respected London weekly, which reviewed the upcoming session in a recent issue. *The Economist's* Washington reporter surveyed what lies ahead in the new session from the errant television industry to civil rights legislation and minimum wages. The subject of defense never was mentioned.

Yet, by mid-February both houses will be deep in investigations of our posture in defense and the space race. Again, it will be an opportunity for military and industry witnesses to get the facts of life on the record. It is a strange observation but a true one that, in an age when we wellnigh pay homage to the practitioners of communications, more and more stories are being left untold. The best and most vital example to come to light is in the recent report of the Hébert Committee.

This document, whose labored birth was reported at great length in the October 1959 issue of AIR FORCE/SPACE DIGEST, is properly titled "Report of the Subcommittee for Special Investigations of the Committee on Armed Services, House of Representatives, on Employment of Retired Commissioned Officers by Defense Department Contractors." The subcommittee, you may recall, is headed by Democrat F. Edward Hébert of Louisiana.

Now a great deal of time was consumed in 1959, particularly in the summer months, trying to explain to this group of legislators how modern weapon systems are conceived, developed, and built. The concept of the team approach, involving the best brains of American industry and the military, was spelled out in detail. Some of the most competent and highest paid executives of industry were on the stand, supported by military officers. The role of the retired officer and his contribution to the effort after he has shed his uniform was made clear, we thought.

Yet, believe it or not, the committee today can see no difference between a contractor proposing a new weapon system concept and a broker offering to sell futures in the grain market. The report actually uses this parallel (top of page 14, if you have a copy)—citing the fact that commodity futures may be sold even when the seed has not been bought or planted. It says:

"The sale of an 'advanced weapon system,' likewise, is, in our view, a sale of the future hardware. The concession in this opinion that the 'weapon system hardware' would be war material when sold does not, in our view of the meaning of the word 'sale,' make a future weapon system any the less the subject of sale than futures in grain make the transaction something other than the sale of grain."

The report then cites decisions holding that an airport runway is war material and that a retired officer hired to display drugs actually sold drugs. Then:

"We do not believe that the activities surrounding the proposal of a prospective $100 million hardware production contract is anything else than a part of the process of selling.

"A proposal to create hardware, in our opinion, is as much a part of the sale of that hardware as the product itself. One cannot exist without the other. The promotion and display of a plan which will produce hardware which is war material is a part of the selling process.

"These three steps—proposal, development, and production—are links in a chain. Each is a part of a sale."

This reasoning and the strange alchemy through which it resulted from what the committee was told by its most competent witnesses is one of the discouraging items on the Washington scene. Having decided that a revolutionary weapon proposal is like an unplanted seed and that an operational weapon is a loaf of bread, sliced, Mr. Hébert is proposing in Congress that *all* Defense Department retirees be quarantined for two years. In this period he would prohibit selling, under the above definition, in *all* departments to *all* persons. When the two years are up the criminal statutes no longer would apply, but a Code of Ethics would stand as a barrier to "keep them out of the Pentagon."

Mr. Hébert say it is his intention to keep retired personnel from obtaining contracts through direct or indirect efforts for two years. He added:

"This, of course, does not exclude a retired officer from producing things purchased by the Department of Defense, but it does prohibit him from the promotion and sale of those things. Technical skills are to be preserved."

When this is tied to his definition of selling, which would have made a drummer out of Luther Burbank if he came up with an improved brand of barley, it is almost sure to impede progress. Technology moves fast these days, as many witnesses pointed out to the Hébert Committee, and it is the kind of technology that contributes to national defense and security, not a technology that may provide a substitute for flour. Grain has been grain since long before Christ divided the loaf. The air-launched ballistic missile is less than a year old, and the laboratories are full of ideas that may save America.

The contribution of recently retired military officers to the work of the industry half of the defense team was spelled out before the committee many times. Peter J. Schenk, then President of the Air Force Association, and himself a competent technologist, argued for the abolition of all restrictions on retired officers:

"Waiting periods before a retired military man can do business with the Department of Defense only cloud the issue," he said on the stand on July 30, 1959. "The advantages of the retired military officer being able to continue to contribute his know-how to the industry-government team far outweigh the advantages of the restrictions now in force. Cooling-off periods only decrease a man's knowledge of a given situation; they do not strengthen his integrity."

The Hébert Committee decision to reject this approach is a discouraging outcome for the effort put into the case last summer. It is clear that the group is adhering to the old approach that military requirements must originate solely in the military establishment. They still fail to understand that there are outstanding examples of requirements that originated with industry proposals and that former military men, familiar with operations, made the industry proposals possible. The idea that the Pentagon can operate in a vacuum, that it can have no contact with some of the most competent men on the industry team, belies most of the testimony and the committee's own assertion that it made no "specific findings of wrongdoing."

It is interesting and possibly significant that the committee report did not dwell on one of the incidents that helped start this probe. This was the introduction, last June, of an amendment to the 1960 Defense Department Appropriation Bill. Offered by Rep. Alfred E. Santangelo, New York Democrat, it would have forbidden payment of funds to any defense contractor who had a retired general officer on his payroll who had been out of service less than five years. The change was defeated by a margin of only one vote.

Mr. Santangelo was invited to defend his idea before the Hébert Committee, and he did poorly on the stand. He proved he was unfamiliar with the industry and admitted taking much of his information from highly unreliable sources. Some of them, in fact, were proven unreliable by the Hébert Committee itself at later sessions.

It is hard to escape the conclusion, even after this performance, that the Hébert Committee has accepted the basic Santangelo thesis. That is what it has done, with minor revisions. The five years has been changed to two, and the proposed penalty is a criminal action against a person, not a financial threat to a contractor. The introduction of a definition of selling, as worded by a conclave of eight congressmen, does not mitigate the threat to our defense effort. If Mr. Hébert can defend this on the floor of the House and get it through the Senate, the industry-military team has failed utterly to reach its audience.

Thus Spake the Admiral

"In our recent exercises with the Air Force," the admiral said, "we picked up the planes—I can't say just how far away because it is classified—well over two hundred miles away—single jets—and we started shooting them down at 180 miles, and we had practically all of them splashed before they got within seventy to 100 miles of our carriers. . . ."

It was Vice Adm. W. R. Smedberg, III, who was speaking, and the paragraph was ad-libbed, inserted in a speech previously cleared for a meeting of the American Ordnance Association in New York.

There were some things that the admiral did not mention. One of them is that the exercise was not a war game. It was not an effort to evaluate the forces taking part, and it was not held to determine how the fleet could face up to an air attack. It was not concerned with the ability of the Air Force pilots to find the fleet.

The exact mission of the exercise was classified and remains so, a fact that appears to have opened the door for some people to misinterpret the results, safe in the knowledge that nobody can correct the record without running the risk of being pinned down with questions that cannot be answered. Somehow, this has resulted in newspaper coverage of the event, particularly in a Norfolk, Va., daily, which describes the nonwar-game exercise as a futile Air Force effort to locate and destroy a fleet. Norfolk is a Navy town, and unidentified "Navy officials" are mentioned in the story. Admiral Smedberg also is mentioned.

For the record, there is one *unclassified* piece of paper. It is a message from Adm. Jerauld Wright, skipper of the US Atlantic Fleet, to addressees that include USAF and the Tactical Air Command. Here is what the admiral says:

"I consider that recent press articles on the joint Navy and Air Force exercises of this fall contain statements which in our opinion are not supported by the facts. Insofar as we in the Atlantic Fleet are concerned the Air Force did a splendid job under difficult technical and operational circumstances, and we are highly pleased by the cooperation of your command. . . ."

Admiral Smedberg and the Norfolk *Virginian-Pilot*, please copy.

The Chief Fixes the Record

While we are correcting the record, which we just did, it should be called to your attention that USAF's Chief of Staff, Gen. Thomas D. White, took a crack at it himself in a recent appearance before the National Press Club.

Over a period of several months there have been an alarming number of reports in the news publications to the effect that General White wants to get into the Navy business. The gist of this report is that he had approached the Joint Chiefs of staff with a proposal that the Polaris submarine-launched missile system be turned over to the Strategic Air Command. This is *not* true, and the Chief of Staff welcomed the chance to give the facts. They did not fall on particularly fertile ears but must be recorded. The general said a lot of misinformation has been published on the subject and indicated he believes much of it has been "deliberate misinformation." He added:

"My position on the strategic command is *not* that the Polaris submarine be placed under the Strategic Air Command but quite the contrary; that the Strategic Air Command itself be made subordinate to an over-all United States Strategic Command, comprising all our strategic weapon systems under one head, the head of which might be, in the initial stages, or until the Army has a strategic weapon

(Continued on page 19)

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URGENT PROBLEMS RELIABLY SOLVED

system, either an Air Force officer or a naval officer. The staff would be a joint staff. This concept, in my opinion, would be completely in accord with the Reorganization Act, an exact parallel to many of our unified commands. . . .

"I am a supporter of Polaris. . . . I think it will add significantly to our strategic retaliatory capability. . . . I also think it ought to be part of an over-all strategic command."

Do We Need a Peace Agency?

It hasn't been pointed out in any screaming headlines, but the Eisenhower "quest for peace" that will be trumpeted in 1960 is a new challenge to American and world technology. Any assumption that a real disarmament program will mean a closing of the weapon system factories, millions of unemployed, and a fully disbanded military establishment is incorrect. Disarmament can and may open new frontiers.

The most complete study on the subject to come to our attention is from the Democratic Advisory Council at 1028 Connecticut Avenue, N.W., Washington 6, D. C. They have distributed a policy statement and a report on Defense, Disarmament, and Survival, both produced by the Council's Committee on Science and Technology. The documents merit attention from the industry-military team on which we depend to make our country safe.

"It is significant," the policy statement says, "that the various technical components of the detection system agreed upon (in Geneva in 1958) were based upon essentially new technology or applications of technology which had not been highly developed during the previous decade.

"It became clear at this time that the impact of science and technology on the possibilities for arms limitation agreements between nations was probably as immense as it had already been upon the development of new weapons of destruction."

What the council is saying here is that disarmament, once achieved, will open new frontiers for both the industry and the military. A workable disarmament plan must include a practical and foolproof system of inspection and monitoring. The type of equipment, from vehicles to electronic gear, will be similar to, but possibly more advanced than, that made necessary by modern weapons. Development of the equipment will call for new technological efforts by the same industry-military team that is providing the talent and facilities for today's more warlike missions. There are some experts who believe that the disarmament budget will be as big or bigger than the defense budget.

The Democratic committee argues that we have no adequate organization to deal with these possibilities and urges formation of a National Peace Agency, comparable to NASA, to work on technology for peace. The idea may be critical in determining the fate of mankind.—END

Space Age Milestone!

Man's flight into outer space drew nearer with the successful re-entry of NASA's "Big Joe" test capsule controlled by a Honeywell Stabilization System

The guidance system for this capsule, launched by an Atlas missile, was provided by Honeywell—and it was delivered in less than half the time usually required for projects of this scope.

Rapid delivery was possible because the basic components necessary to accomplish this sensitive and exacting task were on-the-shelf or in production at Honeywell. However, two critical jobs remained to be done. One was the task of designing a package for these components which would be rugged and exact enough to do the job; and the other was that of providing the ground support for system check-out and pre-launch monitoring. Both of these difficult objectives were completed in the time allowed.

This electronic stabilization and control system is designed to provide a reference that permits measurement of the capsule's attitude and rate of motion. By operating the on-off valves for the reaction control nozzles, it dampens any oscillatory tendencies of the capsule and eliminates the possibility of tumbling.

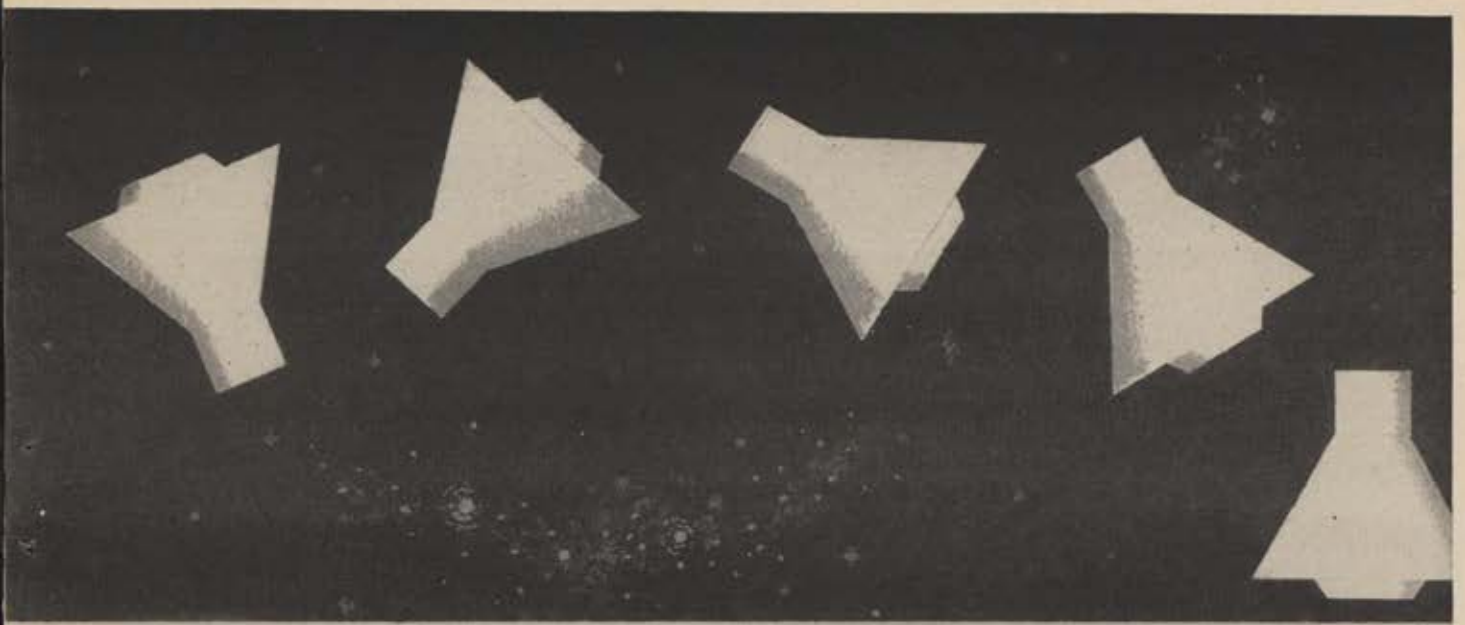
The design and delivery of this system, the first of six such Honeywell systems for NASA Mercury capsule test shots, is in keeping with the accelerated man-in-space program and is typical of Honeywell's ability to meet both stringent requirements and critical deadlines.

Final check of attitude stabilization control system for flight and re-entry control of "Big Joe" test capsule is made by a Minneapolis-Honeywell technician prior to delivery.

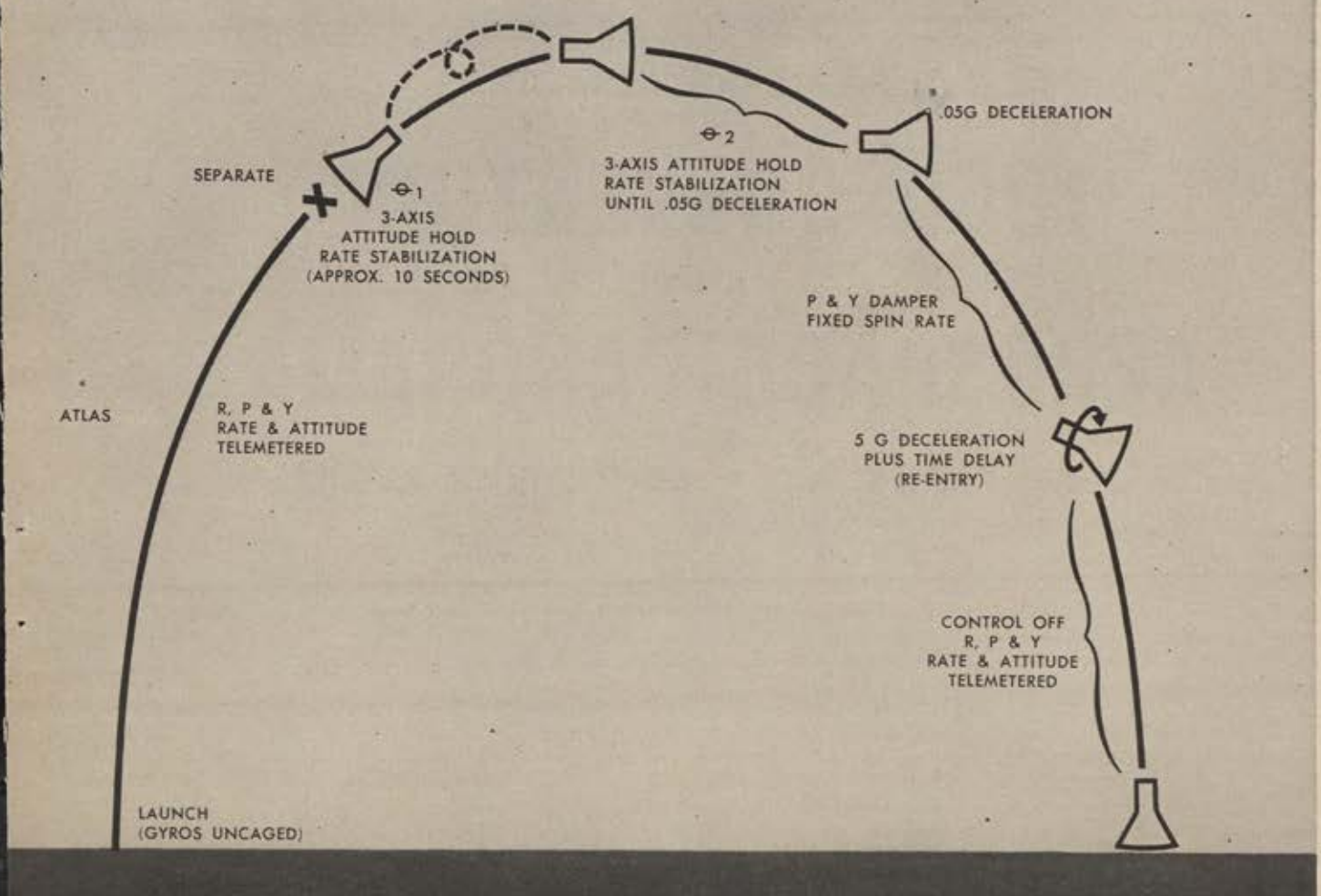
This readiness for the space age stems both from Honeywell's established policy of supporting the national defense and from the company's own historic areas of interest. For further information concerning Honeywell's capability in space age projects, write Minneapolis-Honeywell, Aeronautical Division, Dept. 671, 2600 Ridgway Road, Minneapolis 13, Minn.

Honeywell

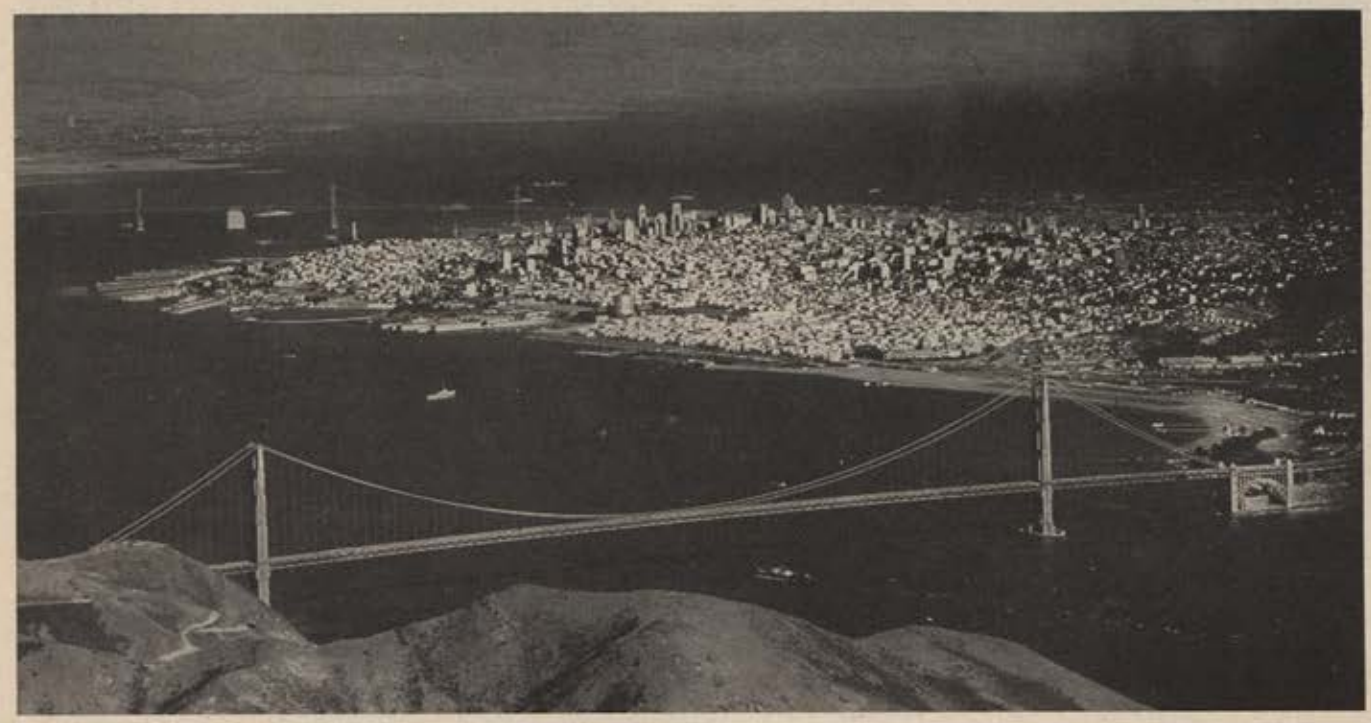
Military Products Group



The Honeywell "Big Joe" Control System assumes control at separation and immediately provides a three-axis attitude hold, rate-stabilized mode to maintain the separation attitude (Θ_1). Approximately ten seconds later, it programs the capsule to a new attitude (Θ_2), and maintains this attitude until .05g deceleration is sensed, indicating that re-entry is commencing. Upon sensing .05g deceleration, attitude hold shuts off, pitch and yaw rate stabilization are maintained, and the capsule is commanded to spin at a 6°-per-second rate until deceleration increases to 5g. At this point control ceases. With attitude reference control deleted, the blunt end of the capsule slowly turns into the flight path due to its aerodynamic static stability. The rate gyro control dampens any tendency to tumble, yet permits the capsule orientation to move as required to keep the heat-resistant blunt end leading. Pitch, roll and yaw attitude, as well as rate signals, are telemetered from takeoff to touchdown.



Make It a Date . . . By the Golden Gate!



View of San Francisco Bay Area from seaward side of the Golden Gate Bridge. AFA Convention returns here this year.

PLAN NOW TO ATTEND — AIR FORCE ASSOCIATION'S

1960 CONVENTION

AND

AEROSPACE PANORAMA

SAN FRANCISCO • SEPTEMBER 21-25

Five years ago, next September, the Air Force Association held its National Convention in San Francisco, on the tenth anniversary of V-J Day. Almost 1,500 persons registered for that Convention—nearly 1,000 more than the year before in Omaha. It was also in 1955 that AFA held its first Airpower Panorama, with 58 exhibitors. Last year, in Miami Beach, 3,113 persons registered for the Convention and 158 firms exhibited in the Panorama. San Francisco was the turning point for AFA's Convention and Panorama, now the largest aerospace meeting and exhibition in the nation. More AFA members, government leaders, military officials, and industry representatives attend AFA's Convention and Panorama than any other event of its kind anywhere.

AFA Director Charlie Morgan, who will head more than a score of committees to help with the 1960 Convention and Panorama, and Tom Stack, who served as chairman of the committees for the 1955 meeting, are already busy with plans to make this year's event the best in AFA's history. Members of the San Francisco Squadron, AFA's second largest in the country, are getting organized for the big show under the leadership of Commander Bill Cothran. There is no doubt but what these Californians will pull out all stops to top the results of the Florida boys last year. This spirit, coupled with beautiful San Francisco, will make the 1960 Convention and Panorama a must on your calendar of important things to do. Make your plans now to be on hand.

AFA HOUSING OFFICE OPENS FEBRUARY 1

AFA will open its Housing Office at the San Francisco Convention and Visitors Bureau on February 1 and will start confirming requests for hotel accommodations for the 1960 Air Force Association Convention and Aerospace Panorama. More than twenty of San Francisco's finest hotels have set aside rooms for this event. San Francisco, like Miami Beach, has many fine hotels; however, the number of rooms and suites available at each is somewhat less than in most cities, particularly at the Fairmont, Mark Hopkins, and Sheraton-Palace. As a result, the number of accommodations that any one person or company can reserve at these three hotels will be limited.

Since AFA met in San Francisco in 1955, a number of luxury motels have been built in the heart of the city. Several of them are within a few blocks of Civic Auditorium and Brooks Hall, where the Aerospace Panorama and many of the Convention events will be held. The new 400-room Jack Tar Hotel, located halfway between Nob Hill and Civic Auditorium, will be completed in time for the Convention. This is San Francisco's newest and most modern hotel, and will boast a swimming pool, ice rink, patio, and parking garage.

Civic Auditorium will be headquarters for the Convention and Panorama. The news room and VIP lounge will be at Civic Auditorium, as will the registration desk. The AFA business sessions will be held at the St. Francis Hotel, San Francisco's largest; the luncheon, banquet, and ball will be at the Sheraton-Palace; and the reunion party at the Fairmont and Mark Hopkins. None of AFA's hotels are more than six minutes from Civic Auditorium and Brooks Hall.

Hotel reservations will be confirmed on a first-come-first-served basis, with preference given to national and local AFA officers and directors, exhibitors, and industrial associates. Since the number of rooms and suites at each hotel is limited, we urge you to make your reservations as soon as possible. Be sure to list three choices of hotels; and give your arrival and departure date and time. Rooms will not be held for arrival after 5:00 p.m., unless a $10 deposit is made on each room in advance.

Remember! All reservation requests must be sent to the AFA Housing Office, c/o Convention Bureau, Room 300 Civic Auditorium, San Francisco 2, California. Use the form below to request your room now.

AFA HOTELS-MOTELS & ROOM RATES

HOTEL	SINGLE	TWIN & DOUBLE	1-B/R SUITE	2-B/R SUITE
ALEXANDER HAMILTON	$9-14	$12-18	$20-35	$60
BELLEVUE	$11-12	$11-15	$25	
CALIFORNIAN	$9-11	$11-14	$22-25	
CANTERBURY	$10-19	$10-20	$25-40	
CLIFT	$13-21	$15-23	$41-50	
DRAKE WILTSHIRE	$10-11	$12-16	$25-35	
FAIRMONT	$19-26	$19-26	$37-66	$57-92
HUNTINGTON	$11-16	$14-25	$30-50	$50-75
JACK TAR	$10-16	$12-22	$43-45	$75
MARK HOPKINS	$15-21	$19-25	$38-75	$56-91
RICHELIEU	$7-8	$8-12	$20-25	
ST. FRANCIS	$12-22	$13-25	$30-55	$48-72
SHERATON-PALACE	$8-16	$14-20	$25-50	$39-75
SIR FRANCIS DRAKE	$11-16	$13-22	$35-50	$51-70
STEWART	$9-12	$9-18	$25-30	
WHITCOMB	$10-12	$11-16	$25-60	$41-76
MOTEL				
CARAVAN	$18-22	$18-22		
CONTINENTAL	$14	$14-16	$25-37	
HOLIDAY	$20	$20	$30-50	
MART	$7-9	$8-14	$16-24	
TRAVELODGE	$8	$10-14		

NOTE: A deposit of $10 per room is required for all arrivals after 5 p.m. All rooms will be assigned according to nearest available rate. Additional hotels and motels not listed above are available at slightly lower rates.

FILL IN, CLIP OUT, AND MAIL TODAY!

MAIL TO: Air Force Association, c/o Convention Bureau
Room 300 Civic Auditorium, San Francisco 2, Calif.

DATE _____

Name _____ Rank, if Military _____

Firm/Office _____

Mail Address _____

Hotel & Choice—1st _____ 2nd _____ 3rd _____

Type Room _____ Rate _____

Others in Room _____

Arrival—Date _____ Hour _____ Departure Date _____

News,
Views
& Comments

AEROSPACE WORLD

THE AEROSPACE WORLD

December was a month of proud flight records (*see cover*) for a proud US Air Force. USAF pilots and their aircraft set four new world altitude and speed records in a week of spectacular accomplishment.

● Capt. Walter J. Hodgson and Maj. William J. Davis took a Kaman H-43B Husky helicopter to an altitude of 30,100 feet over Brookfield, Conn., on December 9. This exceeded the previous heavy helicopter record of 21,982 feet set last spring by a Soviet MI-1 chopper.

Captain Hodgson, experimental test pilot at Edwards AFB, Calif., flew as pilot, and Major Davis, Air Materiel Command project officer for the new helicopter, as copilot. Only one helicopter in history has gone higher—the considerably lighter and jet-powered French Alouette.

● Two days later, Brig. Gen. Joseph H. Moore, Commander of TAC's 4th Fighter Wing, Seymour Johnson AFB, N. C., streaked to a new closed-course speed record of 1,216.48 miles an hour in a Republic F-105 Thunderchief tactical fighter in a flight at Edwards AFB. Previous record of 1,100.426 mph was set last June 18 by Gerard Muselli of the French Air Force in a Mirage III fighter.

● On December 14, Capt. Joe B. Jordan, another Edwards test pilot, took his Lockheed F-104 Starfighter to 103,395 feet to break a ground-launched aircraft height record of 98,560 feet set just eight days before by a US Navy pilot in a McDonnell F4H carrier jet. Five months earlier a Russian Air Force T-431 had reached 94,658 feet and taken the record out of United States hands. The pre-

AF Secretary Sharp, left, congratulates new USAF record holders, from left: Brig. Gen. Joseph Moore (F-105 speed record), Capt. Joe Jordan (F-104 altitude record), Capt. Walter Hodgson and Maj. William Davis (H-43 altitude record), and Maj. Joseph Rogers (F-106 speed record).

Lockheed F-104 Starfire. During USAF's big week, Capt. Joe B. Jordan, experimental test pilot at Edwards AFB, flew an F-104 to a record altitude of 103,395 feet.

Republic F-105 Thunderchief, like the one used by Brig. Gen. Joseph H. Moore, Commander of TAC's 4th Fighter Wing, in setting his closed-course record of 1,216.48 mph.

Convair F-106 Delta Dart. A similar aircraft was flown by F-106 project officer for ADC, Maj. Joseph W. Rogers, to set a new world straightaway speed record of 1,520.9 mph.

Kaman H-43B Husky. Capt. Walter J. Hodgson, Edwards AFB test pilot, and Maj. William J. Davis, AMC's project officer for the H-43, set an altitude record of 30,100 feet.

World Wide Photos, Inc.

Three record holders—each named Joe—pose with trophies. From left: Maj. Joseph Rogers, winner of the Thompson Trophy; Brig. Gen. Joseph Moore, the Bendix Trophy; Capt. Joseph Jordan, winner of the General Electric Trophy.

World Wide Photos, Inc.

Vice President Nixon presents Harmon Trophy to France's Maj. Andre Turcat, first man to fly Mach 2 in a ramjet.

vious record of 91,249 feet was set by USAF Maj. Howard Johnson, also in an F-104, on May 7, 1958.

Captain Jordan, who attained his new heights over Southern California, also established a time-to-climb record from takeoff to 98,424 feet of fifteen minutes, 4.92 seconds.

● The next day, December 15, Maj. Joseph W. Rogers of the Air Defense Command, flew his Convair F-106 Delta Dart fighter-interceptor to a straightaway speed record of 1,520.9 miles an hour, once more over the California desert. The previous mark of 1,483.83 mph was held by a Russian pilot.

The five Air Force pilots who achieved these feats received Distinguished Flying Crosses from Gen. Thomas D. White, Air Force Chief of Staff. Captain Jordan also received the General Electric Trophy, Major Rogers the Thompson Trophy, General Moore the Bendix Trophy.

Aside from all else, the record flights did the United States no harm in the eyes of the world. Two of the records were taken back from the Russians and a third was held by them just earlier. For some time, too, Russia has turned new attention to aerial records, quite obviously setting out to gain them in bulk.

They pointed up, besides, the fact that the United States Air Force is still in the manned aircraft business, and that this is an essential fact of our defense posture.

☆

In this connection, General White, in an impressive appearance at Washington's National Press Club in mid-January (*see pages 62 and 63*), eloquently expressed the requirement for manned aircraft including the type represented by the now-gutted B-70.

At one point, in answer to a newsman's question, he put it this way:

"I have often said that as far into the future as I can see—and maybe I don't see too far, but I think I can see ten years or more—there will be a requirement for manned aircraft in every field of aeronautical combat. I would say in the tactical field particularly the manned aircraft is here to stay. Here the targets are targets of opportunity, things that come up at the last moment, or certainly not fixed targets. . . .

"Is there a future for the manned fighter-interceptor? I would say definitely, very definitely. Even though the F-108 has been canceled, I still see a requirement for a long-range fighter-interceptor for the simple reason that the air-launched missile is here. We have it in the Hound Dog. The enemy is developing similar missiles. This means that the [enemy] aircraft can launch its load long distances from the target. You must be able to reach the vehicle before the missile is launched.

"At the moment, we have no other way than to have an airborne environment.

"In the bomber field, there are many reasons. There are many things that a bomber can do that a missile can't as it stands now. Maybe some day the missile will be more versatile than they are now. For one thing, you have flexibil-

(Continued on page 27)

World Wide Photos, Inc.

William P. MacCracken, right, first Ass't Secretary of Commerce for Aeronautics, accepts Wright Memorial Trophy from NAA President Lanphier, at Wright Day dinner.

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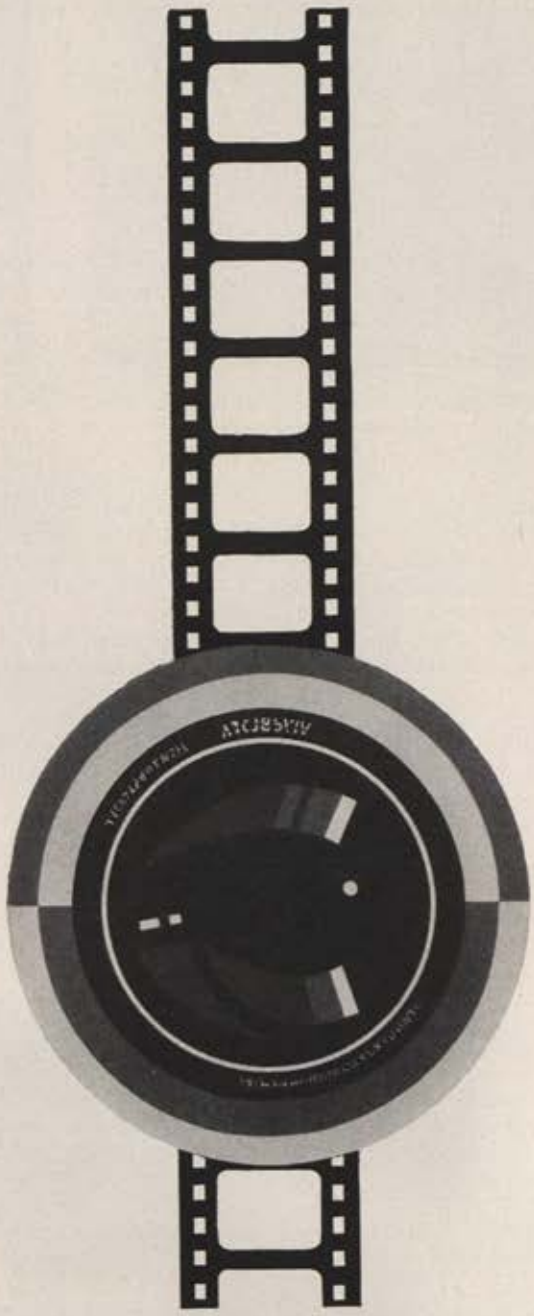
Mr. Nixon with Collier Trophy winners for F-104 design and flight, from left: Maj. Walter Irwin, Lt. Col. Howard Johnson, Gerhard Neumann, Neil Burgess, Clarence Johnson.



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ity with a manned bomber that you don't have with a missile. You can recall it. It can carry a vastly greater load than any missile now in existence.

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On the B-70 specifically, General White said that he felt the Valkyrie has "vast potentialities" for a variety of missions, and he was prepared to say so "before a proper forum" when the time comes.

☆

To test or not to test. The nuclear problem took on a new dimension as we entered the new year.

President Eisenhower announced on December 29 that the United States would allow her voluntary fourteen-month moratorium on nuclear tests to expire on December 31. He said the US considered herself "free to resume weapon testing" from that date, but at the same time pledged not to do so without prior agreement.

The move in effect challenged Russia to remove a log jam of her own making in negotiations for a permanent end to nuclear tests.

At the same time, it reopened the whole test question. There are powerful reasons to cease testing permanently. There are also reasons to resume testing.

Here is the background:

Free-world military strategy is a strategy of nuclear deterrence. Man for man, the Red Army and those of its allies in the Communist world far outnumber the free world's forces. In modern weaponry, however, even at our present sluggish pace we are probably still a step ahead of the Russians.

Thus, in purely military terms, communism's best interests would be served by a ban on nuclear weapons. By the same token, and once more in purely military terms, these weapons are our long suit.

But the problem is not purely military. First, a future nuclear war could bring unspeakable human suffering and destruction. Second, nuclear explosions, we fear, might contaminate our globe with radioactivity and thus bring permanent harm to the human race in addition to the horrors visited upon those struck directly in nuclear attacks.

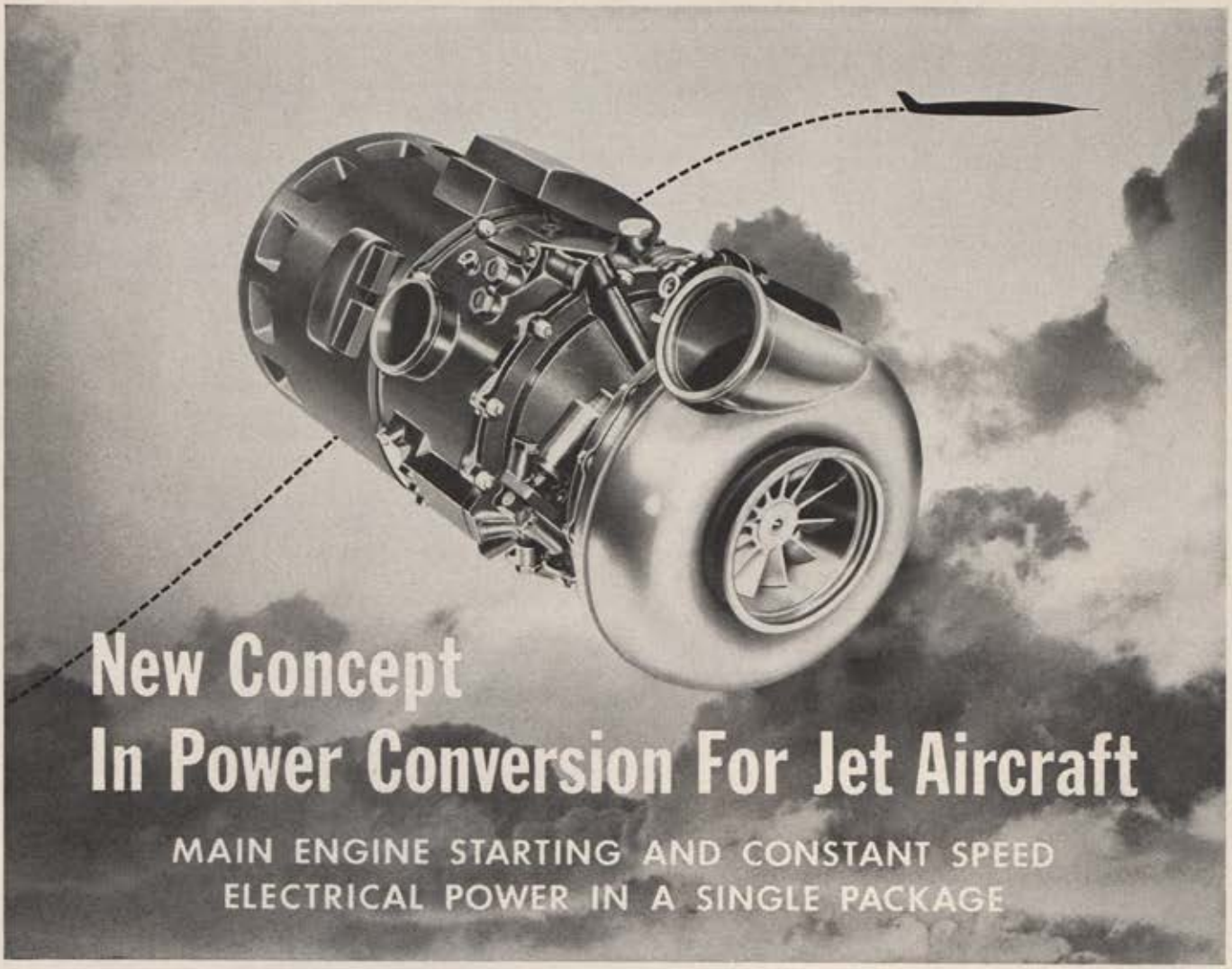
It was these two factors which led the United States in the early post-war years to put forth the Baruch Plan to ban the atom bomb. At that time, the US still retained its wartime monopoly on the bomb. But Russia stood in the way of this proposal, ostensibly because it called for international inspection of Russia as well as the rest of the world by way of policing. And Russia would not have inspectors on her soil.

The same two factors led the United States to declare a voluntary moratorium on nuclear testing, a step on the road to nuclear disarmament, as of October 31, 1958. Britain did so as well. By this time, fear of contamination from nuclear test-generated radioactive materials had become widespread throughout the world—although many scientists maintained proof of such radioactive danger to the world did not exist.

Russia, which with the United States

(Continued on page 29)

USAF honors Republic Aviation vice president Ken Ellington for his help in AF recruiting program. From left: USAF information chief, Maj. Gen. Arno Luehman; Republic president Mundy Peale; Maj. Gen. E. S. Ligon, Director of Personnel Planning; Mr. Ellington; Brig. Gen. Henry Thorne, AF recruiting chief.



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and Britain comprised the world's "nuclear club," declared its own moratorium earlier, openly calling on the West to follow suit. The purity of Russian motives was open to question. First, the propaganda value of the move was immense. Second, the West was quick to point out, Russia acted only after completing a series of tests believed to have met her testing requirements. US and British tests were already scheduled for shortly thereafter.

The three-way moratorium set the stage for the international conference on nuclear testing that began in Geneva, Switzerland, at about the same time. Prior to this diplomats' conference, top scientific experts from East and West met in Geneva through the summer of 1958 and batted around the technical feasibility of a fully safeguarded, or "policeable," nuclear test ban. The conclusion of this earlier conference was that an international inspection force of some 6,000 men and a string of 180 monitoring posts would be the minimum requirement to accomplish the task. This experts' gathering was generally considered a success, in that it accomplished its exploratory and advisory mission.

From its inception, the test ban parley that followed dragged from stalemate to stalemate in a manner all too familiar in East-West dealings. The issue came down to this, as 1958 moved into 1959 and the months of another year ticked off around the Geneva conference table. The West, on the basis of exhaustive scientific studies including a RAND Corporation report, contended that underground nuclear testing could be concealed or made to look like earthquakes to monitoring stations. Therefore, free on-the-spot inspection throughout the world was required. The Soviets rejected the underground test data and the need for inspecting.

Russia, once again, after a decade and a half of cold war, rejected open inspection.

This was the stalemated state of affairs when the conference recessed in December after 150 sessions during fourteen months of talks. And it was at this point that President Eisenhower, on advice from top government and military leaders, announced that the US was set to reopen tests in the face of continuing Russian obstruction at Geneva.

With the negotiants returning to the Swiss city a few weeks later, Russia was thus placed on notice to "put up or shut up" over her oft-repeated concern for dangers to the "peoples of the world" from nuclear weapons testing.

Meanwhile, many knowledgeable persons within the Administration and Congress and in Western scientific and military circles feared that a test ban would be ill-advised at best. This position was presented in detail in an AIR FORCE/SPACE DIGEST special analysis, "The Case Against the Nuclear Ban" (*May* '59), in which an expert who favored continued testing explained why. The argument ran this way:

Even if we could get Russia to accept full inspection, the technical difficulties of policing the world would be overwhelming. The hope that we could, therefore, truly ban nuclear tests may be illusory. It would require immense international cooperation in good faith, an area in which Russia's record is undistinguished. Secret work in nuclear development within Russia while we were abiding by a ban would allow her to surpass us in a field where we have to this point maintained definite superiority.

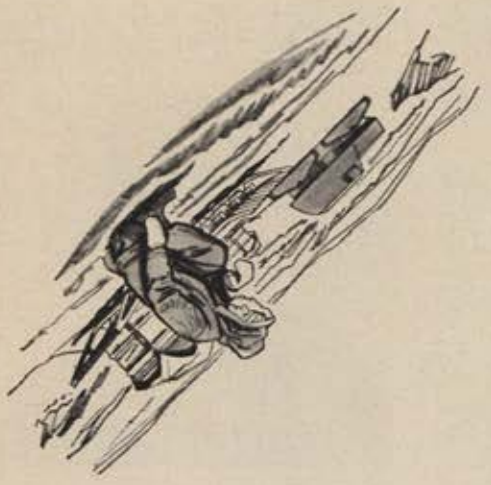
Further, we need nuclear testing to continue development of nuclear warheads side by side with development of ballistic missiles. We have not gone as far as we can in this field, which is

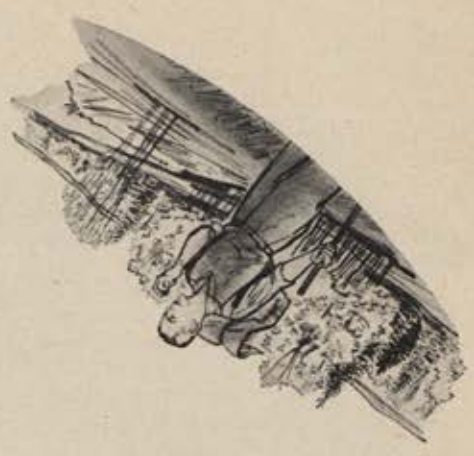
TAC's new insigne, featuring red-and-blue shield and gold lightning, will soon be on all TAC aircraft.

at the technological center of our deterrent plans for the immediate future. In addition, development of essential tactical and air defense weapon systems would be seriously hampered by an end to testing. A part of the problem is that "clean" nuclear explosives, those with minimal nuclear fallout, are requisites for such weapons. These

(Continued on page 31)

THE NEW AGE OF COMMUNICATION





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"clean" weapons, which would be less likely to cause unnecessary casualties or backfire against the user or neutrals, might also be desirable should the need arise in the field of strategic warfare. But we must test to develop such "clean" explosives. Thus, for a range of reasons in the field of national military strength, testing should continue.

So far as danger to the world's populations is concerned, this reasoning continues, future nuclear tests could be held underground or in space. These methods would effectively eliminate this hazard.

Whatever the pros and cons of the test ban debate, however, the fact remains that national policy at present is to seek an effective, workable ban on tests. The hope a while back was that this could be achieved while there were but three nuclear nations, the theory being that the greater the number of parties involved, the fuller the fiasco in the field of negotiating. Chances of this dimmed as France, despite United Nations opposition, prepared to test its first nuclear weapon in the Sahara.

In an age of superpowers, superweapons, and superstrife, the nuclear test question presented the United States with perhaps its most awesome, fateful superproblem.

☆

Point Barrow, Alaska, is the northernmost tip of America. It juts into the frozen Arctic, only 200 miles south of the polar ice pack. Two hundred and fifty miles into the pack, north and slightly west of Point Barrow is—or *was*—Ice Floe Charlie.

Was is the pivotal word, because twelve-foot-thick, six-mile-long, four-mile-wide Charlie started to break up early last month with fourteen Air Force personnel and fourteen scientists aboard making meteorological and other scientific observations. A USAF rescue operation that spanned most of the North American continent swung into action as a result.

An Arctic storm hit Charlie hard on January 6. Within twenty-four hours, the floe's ice runway had decreased from 5,700 to 3,700 feet in length—and the signs were that Charlie's days as a good-sized floe were flowing away.

Two Fairchild C-123 Providers and a Douglas C-54 Skymaster of the Alaskan Command flew out and took two scientists and 4,500 pounds of equipment back to the mainland on the seventh. At the same time, a pair of Lockheed C-130 Hercules transports left Sewart AFB, Tenn., some 6,000 miles away, en route to the scene.

Construction is proceeding on the intricate launch and storage complex for Titan, Martin-built ICBM backup to Atlas. This scene is at Vandenberg AFB, Calif. Army Corps of Engineers builds the silo-like structures for USAF.

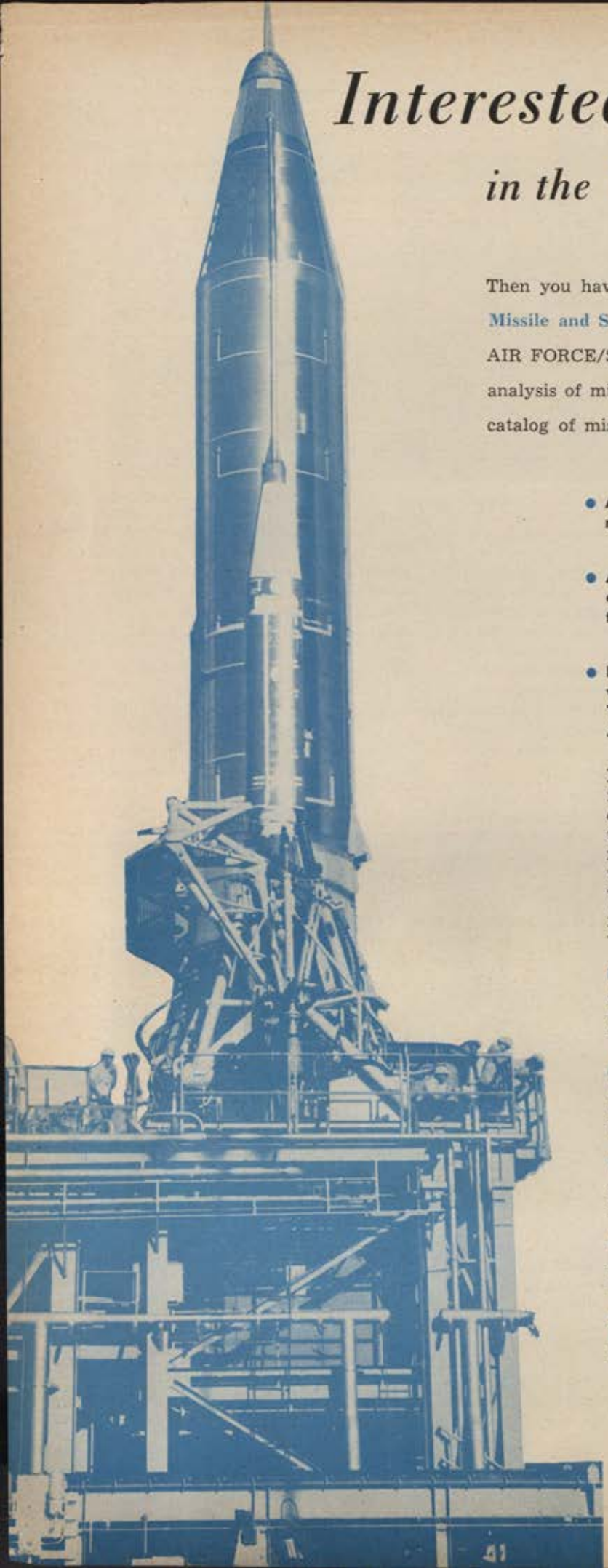
During the following week, these two and Alaskan Command planes evacuated the remaining scientists and airmen, who belonged to the 11th Air Division, Ladd AFB, Fairbanks. Left on Charlie at the conclusion of the operation on the fifteenth were several prefab huts, a flag pole, and airstrip landing lights. Ceremonial lowering of the Stars and Stripes was the last official act at the experimental station, which had been manned since April. Then Charlie was abandoned to the Arctic wastes.

Flight Lines

Elsewhere in the aerospace world:

The first production Hound Dog air-launched missile was turned over

(Continued on page 33)



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to SAC by North American's missile division plant, Downey, Calif., on December 21. The missile has a range of 500 miles, a speed of Mach 1.7, is powered by one Pratt & Whitney J52 engine. Unofficial reports say that the total USAF order for Hound Dog is in the neighborhood of 200.

General White, in the January 11 National Press Club appearance mentioned above, announced that the developmental air-launched ballistic missile (ALBM), still some years in the offing, has been dubbed "Sky Bolt." He gave its projected range as about 1,000 miles. *(See also "Can Jet Bombers Armed with ALBMs Make SAC Too Tough to Tackle?" by Claude Witze,* AIR FORCE, *February '59.)*

Air Force Capt. Joseph W. Kittinger, Jr., who made the longest parachute jump in history on November 16 (*see "Aerospace World," January '60*), jumped again from miles and miles up on December 11. This one was from an open gondola 74,700 feet in the air. The record leap was from 76,400 feet. The jumps are part of an Air Research and Development Command high-altitude survival project.

The third Ballistic Missile Early Warning Station (BMEWS) will be built in the Scottish highlands, it was announced early in January. BMEWSs are already under construction in Alaska and Greenland. The third one was originally planned for Northern England.

The Atlas intercontinental-range ballistic missile gained new plaudits. The President announced in his State-of-the-Union message that it had undergone fourteen consecutive full-range launchings. The Titan, Atlas' companion ICBM, meanwhile came on bad times. It blew up on its pad on December 11, has now blown up twice in a row, hasn't had a successful test since the spring. The Air Force still thinks highly of Titan, however, and points to the fact that Atlas did not do so well at first either. Minuteman, the developmental second-generation solid-propellant ICBM, underwent its fourth successful tethered test on January 5.

From Moscow came the announcement that Russia was inaugurating a Pacific Missile Range of her own. The announcement was somewhat enigmatic. The US wondered why, decided also that the move did not seem to violate international rights (*see page 87, "Speaking of Space"*).

The end of 1959 brought an Aerospace Industries Association report for 1959 that made the following points. More aerospace companies are now competing for fewer contracts. Accent is more than ever on reliability. Two hundred and forty-five turboprops and jets had been delivered by US manufacturers at year's end. Sales at $11 billion were virtually unchanged, but net profit continued toboganning for the fifth straight year and reached a near rock bottom 0.9 percent based on sales for the first nine months. Employment also hit a recent year low of 730,000 in September.

Views & Comments

A gleaning of recent and memorable uttered or written words—

The Washington *Post* of January 7 on Administration defense spending:

The plain, simple, elementary, and obvious fact is that the United States is going to have to spend more money—a lot more of it—in order to assert parity, let alone primacy, in defense and space programs. Better organization and more efficiency no doubt would accomplish something, but there is no use looking for panaceas or regarding "waste" and "duplication" as scapegoats. More money for defense space and other national needs is going to require tax adjustments. . . .

Perhaps we can continue to skimp and drift for another year, at which time the efforts to catch up will be more painful. But we are in great danger meanwhile of giving the world, and particularly the Russians, the impression that we are indeed soft and flabby and that we value our luxuries over our sinews. It will do no good, however, for Congress merely to bemoan the dilemma and use it as a political club against the Administration. Congress has the power of the purse and can do something about the problem if it wishes.

° ° °

SAC Commander in Chief Gen. Thomas S. Power on his command's combat readiness:

To appreciate the scope and complexity of the alert system, it must be realized that never before in history has a peaceful nation such as ours been prepared to go to war within minutes. This is a dramatic illustration of the fantastic reduction in time, action, and reaction time, which has been brought about by the hydrogen bomb and modern delivery systems.

° ° °

Former House Space Committee

(Continued on page 35)

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consultant Frank Gibney in the December 24 *Harper's* Magazine:

If nothing else in the missiles and space program has fulfilled its potential, "Operation Salve" has succeeded magnificently. For two years the US public has been led to believe that everything is doing just fine. This intensive propaganda effort, one can assume, resulted from a high-level conviction that the public could not be trusted to hear any bad news.

The first Soviet successes, for instance, brought assurances that if Russian "thrust" was strong, American guidance "mechanisms" were far superior. When Russians proved the virtue of their guidance mechanism by hitting the moon (after the US had failed) the tune was changed. The Washington experts then pointed out the superior "sophistication" of American hardware and lauded our triumphs in "miniaturization." (They did not explain that we had to miniaturize because we lacked the propulsion for heavy equipment.)

Staff Changes

Brig. Gen. Prescott M. Spicer, from Commander, 27th Air Division (Defense), ADC, 27th NORAD and CONAD Division, to Commander, Los Angeles Air Defense Sector and these divisions, Norton AFB, Calif. . . . **Brig. Gen. L. Render Braswell,** formerly Surgeon, MATS, Scott AFB, Ill., now Surgeon, AMC, Wright-Patterson AFB, Ohio. . . . **Brig. Gen. Don Coupland,** reassigned from Deputy Commander, Hq. San Bernardino Air Materiel Area, Norton AFB, to Commander, AMC, Ballistic Missile Center, Inglewood, Calif., replacing **Maj. Gen. Ben I. Funk,** now Commander of the San Bernardino AMA. **Maj. Gen. Osmond J. Ritland,** former Deputy Commander, Ballistic Missiles, and Commander, Detachment 2, AFBMD, Hq. ARDC, Andrews AFB, Washington, D. C., named Commander, AFBMD, and Deputy Commander, Ballistic Missiles, ARDC, Inglewood, Calif. **Brig. Gen. Charles H. Terhune, Jr.,** who was his Assistant Deputy Commander and Vice Commander at Andrews AFB, will be Vice Commander, AFBMD, at Inglewood.

Brig. Gen. Norman L. Peterson, reassigned to Acting Commander from Vice Commander, at Hq. Air Weather Service, MATS, Scott AFB, Ill. . . . **Brig. Gen. Elliott Vandervanter, Jr.,** is now Assistant to the DCS/Personnel, Hq. USAF, Washington, D. C. . . . Former Commander, Hq. 7100th Support Wing, USAFE, **Brig. Gen. Reginald J. Clizbe,** now assigned to 1141st USAF Special Activities Squadron, Hq. Command USAFE, as DCS/Operations, SHAPE, 4th Allied Tactical AF.

Formerly with 1171st USAF Foreign Mission Squadron (MAP), as Chief, MAAG, Denmark, **Brig. Gen. Stoyte O. Ross** is now Assistant to Commander, Hq. Command, Bolling AFB, Washington, D. C. . . . **Brig. Gen. George S. Brown,** former Military Assistant to Deputy Secretary of Defense, has been assigned as Military Assistant to the Secretary of Defense. Replacing him in the former assignment is **Brig. Gen. William T. Seawell,** formerly Executive Assistant to the Secretary of the Air Force. **Lt. Gen. William D. Eckert,** former Vice Commander, Tactical Air Command, USAF, Langley AFB, Va., appointed Comptroller of the Air Force, succeeding retiring **Lt. Gen. Manuel J. Asensio.** Succeeding General Eckert is **Maj. Gen. Jacob E. Smart,** former Commander, 12th Air Force, TAC, Waco, Tex. . . . **Maj. Gen. Joseph F. Carroll,** Chief of Staff, USAFE, will become Inspector General, USAF, Washington, D. C. . . . **Maj. Gen. Gabriel P. Disosway,** former Deputy Commander, USAFE (ADVON), is now Commander, 17th AF, USAFE, and reassigned as Deputy Commander, same station, is **Maj. Gen. Henry R. Spicer,** formerly Commander, 17th AF. Assigned to duty as DCS/Operations, USAFE is **Maj. Gen. Benjamin O. Davis, Jr.,** from DCS/Operations, USAFE (ADVON). . . . Deputy Inspector General for Security, USAF, **Maj. Gen. Richard J. O'Keefe,** has been given the additional duty as Acting TIG, USAF.

Maj. Gen. Stanley T. Wray has been reassigned from Commander, WADC, ARDC, Wright-Patterson AFB, Ohio, to Commander, Wright Air Development Division, ARDC. . . . **Lt. Col. Dorothy N. Zeller** has been named Chief, USAF Nurse Corps, succeeding **Col. Frances I. Lay,** Command Nurse, USAFE, Wiesbaden, Germany. . . . **Maj. Gen. Marshall S. Carter,** who was Chief of Staff, North American Air Defense Command, Colorado Springs, Colo., is now 8th Army Chief of Staff, stationed in Korea.

RETIRED. . . . Maj. Gen. Norman D. Sillin; Maj. Gen. Hugh A. Parker; Brig. Gen. Winslow C. Morse; Brig. Gen. Harold W. Bowman; Maj. Gen. John S. Mills.

(Continued on page 37)

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USAF on Film

Here is this month's list of recent Air Force training and documentary film releases. They are available to USAF units, Reserves, and a wide range of civilian groups. To request films or further information, contact either the Air Force Film Library Center, 8900 So. Broadway, St. Louis 25, Mo., the overseas central film libraries at Chateauroux Air Station, France, and Tachikawa Air Base, Japan, or one of the 131 USAF base film libraries dotted around the globe.

Air Force News Review No. 46
Air Rescue Service Conducts Pararescue Tactical Effectiveness Tests; Air Police Receive Badges; Tracking Station Monitors Satellites; Amateur Rocketeers Hold Meet; Turks See Air Show; TAC and ADC Generals Retire; Thor-Able Launches "Paddlewheel." Fourteen minutes. Black and white.

School of the Sky
Enjoy an exciting pictorial tour of the US Air Force Academy. You'll learn about a Cadet's life—his military and physical training, academics, field trips in the States and abroad, and social activities. Fourteen minutes. Color.

The X-17 Story
Traces the development of the X-17, the three-stage test missile designed to solve the reentry problem, from drawing board to its supreme test at a Cape Canaveral launching pad. Fourteen minutes. Color.

Vertical Frontier
This is the story of aviation medicine and the tremendous research that is being carried on to hasten the day when man will find himself able to explore the heavens. Twenty-eight minutes. Color.

Intercept
Deals primarily with the computer phase of the SAGE-Bomarc program and reviews highlights of the project from initial planning to the successful integration of Bomarc into the SAGE system. Ten minutes. Color.

Career Opportunities in ARDC
An exciting tour of Air Research and Development Command centers where dedicated military and civilian scientists, engineers, and technicians work as a team for the conquest of time and space. Twenty-two minutes. Color.

Thor—the IRBM
Tells the exciting story of the Thor missile and its role in the IRBM defense concept. Shows how the military, industry, and science worked hand in hand to produce one of the most versatile weapon systems in the defense arsenal of the free world. Twenty-six minutes. Color.

The Eagle's Strength, Edition Three
Portrays the story of the Air Materiel Command, logistical arm of the Air Force, and its vital mission of keeping our complex, mobile, and technical Air Force battle ready in the rocket age. Twenty-seven minutes.

Organization and Mechanics Of Writing
Unlocks the doors to better writing and explains techniques that develop good paragraphs and ideas. Also shows how to arrange words in proper order, punctuate, and organize a paper. Thirty-two minutes. Black and white.

Long-Range Navigation—Loran
Explains theory and operational principles of the Loran system and shows how to use the APN-70 receiver. Twenty minutes. Black and white.

Nightmare for the Bold
An unforgettable story about an airman who must learn to live with a lifetime of regret as the result of an auto accident. Fifty-three minutes. Black and white.

Deep Sea Survival
A pilot ejects over the North Atlantic—a crew of eight must ditch in tropical waters—alone at sea, a man survives twenty days on a raft—these and other factual stories of courage portray the violent conditions to be faced in survival at sea. Twenty-seven minutes. Color.

The AACS Story
Presentation of worldwide communications and air traffic services mission and operation of the Airways and Air Communications Service. Twenty minutes. Color.

● **Reunion:** World War II veterans of the 377th Fighter Squadron, 362d Fighter Group, are planning their first reunion this summer. Former members of the unit who are interested should contact Chuck Mann, 786 Baltic Street, Memphis 12, Tenn.

—FREDERIC M. PHILIPS


MARINES 107
MARINES
MARINES

NEW "QUICK PUNCH" FOR MARINE ASSAULT MISSIONS

The twin-turbine powered YHC-1A is the perfect partner-in-mobility to today's fast-striking Marine Corps units. This swift, multi-mission aircraft can be launched from a carrier, fly to the battle area and set down on virtually any terrain — including rivers and streams. Its unique rear-loading ramp and unobstructed payload compartment permit men and equipment to be loaded and unloaded in minimum time. Tactical loads can be transported internally which permits concealment of mission objectives and offers personnel and equipment protection from weather. Carried externally, pre-packaged loads can be hooked to the cargo sling by a crewman inside the cabin and precisely dropped by the flick of a switch on the pilot's stick.

Equally adaptable to Marine and/or Navy operations, this all-weather helicopter can perform missions ranging from ASW and mine-sweeping to ship-to-ship transfer. This adaptability, together with all-around superior performance, make the YHC-1A the most advanced helicopter in the air . . . a logical transport for the fighting Marines.

VERTOL Aircraft Corporation

MORTON, PENNSYLVANIA

SUBSIDIARIES: ALLIED RESEARCH ASSOCIATES, INC., BOSTON, MASS.
CANADIAN VERTOL AIRCRAFT LTD., ARNPRIOR, ONT.

STABILIZING THE

In happier, less complicated days, even as recently as a decade ago, the doctrine of deterrence was comparatively simple to enunciate and to carry out. It was not much more involved than Teddy Roosevelt's "Walk softly and carry a big stick." Perhaps even less complicated, since the United States not only possessed the only copy of the big stick but held a monopoly of the means to carry it as well.

Those days are gone forever. The technological revolution has also exploded behind the Iron Curtain, where it is being exploited shrewdly and with great determination. Deterrence is now a two-way street and, with this evolution, has taken on subtle and sophisticated overtones, difficult to expound, even harder to understand. The "big stick" has grown ever bigger, yet it must be handled with the delicacy and finesse of a rapier.

Herman Kahn, of the RAND Corporation staff, has spent the last eleven years studying the intricate relationships between weapons and strategy and during that time has served as consultant to the Gaither Committee, the Atomic Energy Commission, and the Office of Civil and Defense Mobilization. The accompanying text has been extracted from a larger article, "The Nature and Feasiability of War and Deterrence," in the current issue of the Stanford Research Institute Journal *(a fine issue, incidentally, devoted to what its editors call the "Spectrum of Conflict"). This material in turn is based on a series of lectures by Mr. Kahn which is being made into a book to be published later this year by the Princeton University Press.*

The author's basic quarrel is with a popular thesis, which has been phrased in many ways but most commonly in these terms:

"A nuclear war is too horrible to contemplate, too mutually annihilating to consider."

As Mr. Kahn points out, "This concept has been comforting." It holds out "the hope that the very violence of war would deter it." It is also cheaper because if we believe it we need not spend much money on the various means, military and nonmilitary, which contribute to a deterrent posture.

The catch, says Mr. Kahn, is that the Russians don't feel this way. Malenkov did but he didn't last long. And Khrushchev and the Soviet military people, while agreeing that nuclear war would be horrible, appear to feel that if they play their cards right "only the capitalists would be destroyed." If the West buys the theory of deterrence through mutual terror while the Soviet Union does not, the truth of the theory need not matter. We could, as Mr. Kahn says, wind up with a Pearl Harbor or an Armageddon. Even if both sides believe in a reliable balance of terror, a potential aggressor can still stage an unlimited number of Munichs.

So we can best deter war by being strong enough to fight one, win, and recover in our economic and governmental machinery. And we have the resources to do so.

For the convenience of the reader, the various types of deterrence referred to are:

Type 1: Deterrence of a direct attack.

Type 2: Deterrence of extreme aggression short of direct attack, i.e. in Western Europe.

Type 3: So-called "tit-for-tat" deterrence, where the potential aggressor is afraid that the defender will take limited actions, military or otherwise, that make aggression unprofitable.—THE EDITORS

'BALANCE OF TERROR'

Herman Kahn

IT IS important to understand that we have [as an] asset the ability to spend large sums of money rather rapidly. Let us, for example, assume a new Berlin crisis in two or three years. Assume also that the United States has done nothing to fix up its Type 2 Deterrent capability (of extreme provocations) and done very little to improve its limited-war capability, but does have a first-rate Type 1 Deterrent (against direct attack). Under these circumstances it would be most improbable that we would wage a war if the Russians gradually put the squeeze on Berlin. Nevertheless, in all likelihood State Department negotiators negotiating with the Russians will try to tell them that they couldn't afford to push us out of Berlin because in some vague way we will do something very violent; that we would use our military forces. But our negotiators would be afraid to spell our threat out, for nothing that they could spell out would be credible.

Even today the Russians have told us that if we send soldiers, they will kill them; that if we send tanks, they will burn them; and that they can deter us from an all-out war, because they have rockets trained on our cities. The Soviets are saying that at any level of violence that we care to use, they can either meet that level on the spot or promise such a severe punishment that we will be deterred. The Russians have also pointed out that Berlin is a chess game; that everybody can see what our position is.

If the Soviets are right, that our only alternatives are violence or defeat—where defeat would be an acceptance of some new and unsatisfactory status of Berlin—then the Soviets could probably be successful in talking us into adopting a face-saving method of losing Berlin, rather than one which made it clear to all that we have suffered a serious defeat.

In actual fact, we have some very strong cards to play, but if we do not know what these cards are, we may be tricked out of playing them. If we refuse to accept a face-saving defeat and in fact force the Russians to rub our noses in the dirt, then it would be clear to all in NATO and the United States that unless we do something spectacular to recover the situation, that the NATO nations can no longer rely on us for any kind of protection. Under these circumstances the United States government would have to go into enormous defense budgets, probably close to at least a $100 billion a year level.

These defense budgets would be designed not only to implement our current forces but also to buy large limited-war forces, and to buy things like civil defense and the corresponding military forces that would give us a credible capability for initiating a war if a humiliating crisis should be repeated. There will also, under these circumstances, be enormous pressure on the NATO nations to combine into an even tighter alliance and to mobilize their resources for their defense also. This would mean that, as in Korea, even if we lost Berlin in the military sense, the Russians would have lost this particular campaign. While Berlin is important both ethically, politically, and even resourcewise, its loss would not compare to the greatly increased power on the side of the West.

This is the threat we have against the Russians. If we don't know that we have this threat, if we believe that increasing the budget by a factor of two really would mean some sort of immediate bankruptcy or other financial catastrophe, then the Russians can present us with alternatives, which may in the end result in their getting the diplomatic, political, and foreign policy victory. It is important that we understand our own strength.

Even if we have acquired the highest quality Type 1 Deterrence capability, we must still have a capability for fighting and surviving wars as long as it is possible to have such a capability. This is true not only because it is prudent to take out insurance against a war occurring unintentionally, but also because we must be able to stand up to the threat of fighting a war or even be able to credibly threaten to wage war ourself. We must have an "alternative to peace," as long as we don't have a

(*Continued on following page*)

world government and as long as it is technologically and economically possible to have one.

Under current programs the United States may not be willing in a few years to accept a Soviet retaliatory blow, no matter what the provocation. The occurrence of such a situation is equivalent to breaking our alliance obligations and signing a nonaggression treaty with the Soviets—a nonaggression treaty with almost 200,000,000 American hostages to guarantee performance. Before we drift into such an "alliance," we should ask ourselves: "What does it mean to live with this nonaggression treaty? Can we prevent it from being signed? Can we delay its ratification?"

Those who would rely on limited means to control possible Soviet provocations must ask themselves the question, "What keeps the enemy's counteraction to acceptable limits, if there are no credible Type 2 Deterrent capabilities?" That is, those who think of very limited capabilities or mutual homicide threats separately or in combination as being satisfactory for meeting our Type 2 Deterrence problems are ignoring the dynamics of bargaining and conflict situations. When two men or two nations are arguing over something which both feel to be of moderate importance, it is very common for things to get out of control in the sense that the threats and counter-threats, the actions and counteractions, increase in intensity, almost without limit, unless there are external or internal controls to make and enforce such limits.

These remarks will distress many who properly view the thought of fighting a war with the utmost horror and who feel uneasy even at having a high-quality deterrent force, much less a credible capability for initiating, fighting, and terminating all kinds of wars. While one can sympathize with this attitude, it is, I believe, close to irresponsible.

The threat of force has long been an important regulatory factor in international affairs; one cannot remove or greatly weaken this threat without expecting all kinds of trouble. True, most of the alleviating measures that can be considered are temporary expedients that may not solve our long-run military problems, but this does not mean they are not important. You cannot reach 1970 or 1975 if you do not pass through '61 and '65 successfully. If we neglect our short-term problems, we are bound to run serious risks of a disastrous deterioration in the international situation or in our own posture. This, in turn, may make it impossible to arrive at a reasonable, stable state.

In fact, insofar as the balance of terror theory is correct, then if any nation actually does use bad behavior as part of its foreign policy, then no matter what our previous threats were, we must meet that bad behavior by using limited means or simply allow that nation to get away with whatever it is trying to do. The aggressor will realize this too, and realize it with high confidence. For this reason any attempt to use threats of mutual homicide or world annihilation to control an aggressor's behavior (short of trying to deter him from attack on one's own country) is ill-advised. Even if one means the threat seriously, it will still not be credible to the enemy or ally—particularly if the challenge is in any way ambiguous.

Since it now seems most unlikely that the Soviet menace will go away by itself and since we have eschewed preventive war as a possibility, we must seek the solution to our problems along the path of some degree of coexistence or collaboration. If we are to do this effectively, we must appear extremely competent to the Soviet leaders. They must feel that we are putting adequate attention and resources into meeting our military, political, and economic problems. This is not a question of attempting to bargain from strength, but one of looking so invulnerable to blackmail and aggressive tactics that Soviet leaders will feel it is worthwhile to make agreements and foolish not to, simply because as an opponent we and the world look much more dangerous than as a collaborator, even if an uneasy collaborator.

One gets the impression that up to about 1956 or 1957 the average senior Russian did have an enormous respect for United States planners and decision-makers—a respect which they now have begun to lose. Many of the comments they make on remarks that some our military and political leaders have made are contemptuous—and, a sober examination indicates, properly contemptuous. In the precarious present and the even more precarious future it would be well to go to some trouble not only to be competent as an antagonist to the Russians, but to look competent.

Ideally, winning the cold war would mean the establishment of peaceful democratic and prosperous nations everywhere and the complete elimination of all international conflicts of greater significance than those that, for example, occasionally plague United States-British relations. No sober student of the international scene visualizes anything of this sort occurring. Even a more limited objective, the attainment of a physical security that is independent of Soviet "good-will" is probably unattainable. In the limit there is no acceptable way to protect ourselves from a psychotic Soviet decision-maker who launches a surprise attack at us without making rational calculations.

But the situation is worse than this. It is most unlikely that the world can live with an uncontrolled arms race lasting for several decades. It is not that we could not match Soviet expenditures; it is simply that as technology advances, as weapons become more powerful, and more diverse, it is most likely that there will have to be at least implicit agreements on their use, distribution, and character if we are not to run unacceptably high risks of unau-

thorized or irresponsible behavior. No matter how inimical the Soviets feel toward us they have common interests with us in this field. This does not mean that they will not try to use the common threat to obtain unilateral advantages; it just means that there is an important area for bargaining here and one which we must fully exploit.

As a prerequisite to exploiting it we must do our homework. We must know what we are trying to achieve, the kinds of concessions that we can afford to give, the kind of concessions that we insist on getting from the Soviets. All of this will require, among other things, much higher quality preparations for negotiations than have been common.

The intellectual quality could probably be improved if in our criticism we were more discerning. We should learn to distinguish between first-strike and second-strike forces, between Type 1 and Type 2 Deterrence, between the use of credible and silly threats of retaliation, between "bankruptcy" and a reduction in standards of living, between sober and reliable measures and desperate gambles or "calculated risks," between deterrence by assumption and deterrence by objectively capable systems, and so on.

Aside from the ideological differences and the problem of security itself, there does not seem to be any objective quarrel between the United States and Russia that justifies the risks and costs that we subject each other to. The big thing that the Soviet Union and the United States have to fear from each other is fear itself. (I am here making a very optimistic assumption: that the Soviets would really be willing to give up any hopes of world domination to be achieved by the use of military force, give up their curious notion of the only satisfactory *status quo* as being a situation in which the Soviet world increases every year and the free world decreases, and that all kinds of subversive and violent activities are part of this peacetime *status quo*. On the other hand, our understandable desires to liberate the satellite nations do not look like a reasonable acceptance of *status quo* to the Soviets.)

In this respect, the situation is quite different from what it was in World War I when all the great powers were competing in trying to cut out empires for themselves, both inside and outside of Europe. Today two or three years' normal increase in the GNP of either Soviet Russia or the United States are of much greater significance, both militarily and economically, than quite sizable additions or subtractions of geography, which means that we both can afford to be relaxed about changes in our respective "spheres of influence."

Aside from the caveats given above about Soviet and United States expectations and hopes, both the Soviet Union and the United States are *status quo* powers. But even if it were conceded that all we have to fear is fear itself, this would not imply that the problem is simple or easy, or even that it can be eliminated by any kind of arrangements that are practical for the next decade or so; it is only to say that there do not seem to be any fundamental blocks to making things more manageable and safer than is the current arrangement, namely, an almost uncontrolled arms race ameliorated by some vague implicit agreements and unilateral practices.

Even if there are now very few direct and critical clashes between the United States and the Soviet Union other than those generated by the rivalry itself, there would be at least minor clashes between us. And minor clashes have an unfortunate aftereffect unless they are settled—they tend to be dynamic and lead to major ones almost as a byproduct.

While many are suggesting various versions of a "rule by law" to prevent this from happening, I am not very hopeful that we can succeed totally. Such efforts are to be encouraged—in fact they are indispensable—but they can alleviate the problem only to the point where the inevitable conflicts of interest can be handled, not eliminated. We still need a balance of terror to motivate those who would be tempted to use violence to use the other machinery instead. If the balance is to be stable and not subject to being overturned by minor changes in tactics, posture, technological innovation, or cheating on arms control agreements, then initially it will have to be based on a massive program on each side.

We must, however, take the problem of alleviating the conflict seriously. We do not have unlimited time. Our problems are being increased rapidly by many things including the mounting rate of technological progress, the "revolution of rising expectations," increasing nationalism, and an increasing diffusion of the newer military technologies. It is not at all unlikely that there may be some invention, discovery, or crisis that simply cannot be handled in our present international society, even momentarily. Progress is so fast, the problems are so unprecedented, and the lead times for cultural assimilation so long, that it is difficult to believe that muddling through will work. We will need much better mechanisms for forward thinking, for imaginative research into problems of strategy and foreign policy, for anticipating future developments, and for planning to meet them than we have had.

These mechanisms can be made available. The tools actually or potentially available to the analyst, planner, and decision-maker, both organizational and technical, are many orders of magnitude better than anything we have had before; it is just barely possible that with a determined effort by large numbers of responsible people, that we can achieve enough to make a significant difference. The survival of our civilization may depend on this effort being made. Let us hope that it can be done.—END

Without the Air Force's new VC-137 jet transports, President Eisenhower's remarkable peace mission, in which he flew 19,600 miles to eleven countries in nineteen days, could not have been made. Here's the story of Presidential Pilot Draper and the other USAF people and outfits that made possible . . .

OPERATION MONSOON

Claude Witze
SENIOR EDITOR

On his return President Eisenhower was presented by his Cabinet with this Steuben glass plaque, engraved with a map of his eleven-nation peace tour.

OPERATION Monsoon started with a USAF operations order that was drafted in October and ended a couple of days before Christmas with 15,000 giant sparklers being waved late at night in the rain outside the White House. It is highly probable that nobody in that cheering crowd ever heard Operation Monsoon called by its right name or knew it was the US Air Force that carried Dwight D. Eisenhower 19,600 miles on his history-making trip to eleven nations.

Only time will tell whether the President made diplomatic and political history that will live. The untold side of the story is that he added a chapter to aviation history.

There were forty-three USAF units and installations, more than twenty airplanes, and to one degree or another thousands of USAF personnel involved in making a success of Operation Monsoon. The people and the equipment were scattered all the way from Strategic Air Command headquarters in Nebraska to our far-flung stations in Turkey, India, North Africa, and Western Europe.

Indications are that the pattern will stay in existence for the remainder of the Eisenhower Administration, as the President pursues his worldwide effort to ensure peace. In late February there will be a 14,500-mile tour through South America. It is on USAF records as Operation Amigo. There is talk at this writing of a trip to the Far East. In addition, the now-peripatetic Chief Executive is expected to visit Russia and attend a summit meeting in Europe.

It would be easy to say that this travel, in which the President aims to promote a "greater world understanding," is a natural and easy thing to do in the air age. But there is more to it than this simple plug that could come out of an airline advertising brochure or a travel-agency folder. Technological advances are what has made the world's peril so critical, with responsibility for deterring that danger to the Western world primarily in the hands of the US Air Force. USAF also now is using a technological advance to promote peace by carrying the free world's leading evangelist all over the world.

It was only about a year ago that there were petulant queries raised, many of them on Capitol Hill, about USAF's justification for the purchase of three Boeing VC-137 executive jet transports. They were not bought, the Air Force made clear with some difficulty, for the exclusive use of the White House.

"It is perfectly reasonable," an Air Force spokesman told a congressional committee, "to expect that our top-level officials, in traveling to international meetings, will have this kind of transportation available to them just as top-level representatives of certain other countries do."

The point was not missed. Russian jets already had landed in this country, and N. Khrushchev was about to embark for Washington in his turboprop monster, the TU-114. Approval was given to an expenditure of about $15 million to put three VC-137s in the Special Air Missions fleet.

To Col. William G. Draper, there is more to it than prestige. The presidential pilot says the Eisenhower trip would have been virtually impossible with slower piston-powered equipment. Not that the *Columbine*, White House Super Constellation, could not have done the job. The time involved would have been prohibitive for the Chief Executive. Colonel Draper estimates that the nineteen-day tour of Europe and the Middle East would have taken more than a month without the jets. Certainly the President's ambitious program for 1960 would be a monumental undertaking with the kind of airplanes available only a year ago.

It would be both difficult and unfair to say that any single USAF command distinguished itself more than any other on Operation Monsoon. Colonel Draper is first to spread the credit, and he has done it on orders from the Chief. The pilot has sent commendations from the White House for every USAF unit and man who contributed to the mission. But the fact remains that the Military Air Transport Service, its 1254th Air Transport Group, Airways and Air Communications Service, Air Rescue Service, and Air Weather Service got the lion's share of the jobs.

There was support from US Air Forces in Europe, Strategic Air Command, Tactical Air Command, North American Air Defense Command, and unrelated units in Turkey, Rome, Athens, Karachi, and at Andrews Air Force Base near Washington. At least nine air attachés were involved in the programming, and one of them, at Kabul in Afghanistan, had to make up for the lack of good landing aids and the thoroughly unpredictable weather. He installed a portable tower at the airport to provide hourly weather reports from the scene all night before the President's arrival. When Colonel Draper was due, the attaché flew his C-47 out of the Kabul airport, built by the Russians on a mountain-ringed site that looks like a canyon, and met the VC-137 with the latest weather information, just as Draper was about to start his letdown. The day before, in Karachi, Pakistan, the local press had predicted that the American jet would miss its scheduled landing in Kabul. The press was wrong.

It also was at Kabul that the President's air escort of Russian-built MIGs created a flurry among news corre-

spondents. Less publicized was the fact that all of the nations visited provided an honorary escort of fighter planes, although the Italian Air Force was deprived of its chance to show off by bad weather. The Indian Air Force flew British-made Hawker Hunters, and the air forces of our NATO allies used American-built planes. The air forces asked Colonel Draper for permission to do this during the survey flight he made with Press Secretary James Hagerty in November. He agreed to the displays with the restriction that the planes were not to appear if visibility was less than five miles. They could come no closer than 2,000 feet from the VC-137. Along three legs—from Ankara to Karachi, from New Delhi to Teheran, and from Teheran to Athens—the President was escorted by Douglas B-66 all-weather jet bombers from the 47th Bombardment Wing (Tactical) at Sculthorpe, England.

There were five Lockheed C-130 transports in the presidential party to provide logistic support. Two came from the Tactical Air Command's 839th Air Division at Sewart AFB, Tenn. Three were provided by USAFE from the 322d Air Division at Evreux, France. These aircraft were the backbone of the logistic system set up for Operation Monsoon. Spare parts, power carts, ramps, maintenance personnel, and baggage were carried in the transports. The airplanes worked on a skip-stop basis to ensure that needed equipment was in position at each stop well in advance of the President's arrival. Upon departure of the VC-137 the C-130 crews would assemble their gear and move to a new airport for a repeat performance.

On the November survey trip Press Secretary Hagerty was accompanied by Maj. Mark Walker, project officer from the USAF Directorate of Operations in the Pentagon. It was Walker's job on this trip to anticipate every need at every stop and make sure it would be met. His list of responsibilities covered such diverse items as demineralized water for use in the jet engines, to heaters, catering service, fuel, and transportation for the crews to and from their hotels. A special security detail was arranged to protect the fuel for the President's airplane. The JP-4 or JP-1 was tested and stored, sealed, and kept under guard until it was put in the plane.

The President's VC-137 was designated "Air Force One." It was at all times followed, thirty minutes later, by a second VC-137 intended to provide backup insurance if Colonel Draper's aircraft was forced to abort. Also on the trip was the slower piston-powered *Columbine*. Both the *Columbine* and the second VC-137 carried baggage, security personnel, and members of the White House party or State Department officials.

From the first takeoff until the return to Washington the aerial caravan was watched over by at least five SC-54s and an SA-16 from the Air Rescue Service. These aircraft, with crews and maintenance support, were supplied by rescue squadrons at Otis AFB in Massachusetts; Keflavik, Iceland; Goose Bay, Labrador; Sidi Slimane, Morocco; Lajes Field, the Azores; Wheelus Air Base in Tripoli; and Prestwick, Scotland.

On every leg of the trip, over land or water, these aircraft were spotted, airborne, in advance along the route. As the President passed, each SC-54 in turn followed the President's plane for an hour and a half. On the six-hour-and-fifteen-minute flight from Goose Bay to Rome, for example, the orbit stations were one hour apart, giving Colonel Draper's Air Force One tight coverage all across the Atlantic.

On the water below there were six Navy ships, destroyers and cruisers, spotted along the route. A radio and radar watch was maintained at all times during the crossing. The Navy also had responsibility for helicopter transportation at many stops in Europe and the Middle East, and

(Continued on following page)

Wide World Photos, Inc.

Auto carrying President Eisenhower and Italian President leaves Ciampino Airport, Rome, after reception in rain. MATS VC-137 is being disgorged of passengers' luggage.

In Rajghat, New Delhi, Mr. Eisenhower plants a sapling from America. Site is near the grave of Mahatma Gandhi, who also strived for peace. Another tree was put on grounds of US Embassy to be available in case this one fails to live. Both were part of cargo carried with the White House party as gifts to hosts in eleven nations. At New Delhi he was hailed by millions as friend of mankind.

The Chief Executive at the Taj Mahal with Prime Minister Nehru of India. Lady on the left is Barbara Eisenhower, the President's daughter-in-law, who served as hostess.

Colonel Draper, presidential aide as well as pilot, is at President's elbow upon landing in Kabul. Scene on ride to Afghanistan capital shows rugged hills that surround airport, built by Russians, at altitude of 6,000 feet.

Boeing VC-137 used on Operation Monsoon is one of three operated by USAF to transport government officials. It grosses at 248,000 lbs., cruises about 550 mph at 40,000 ft.

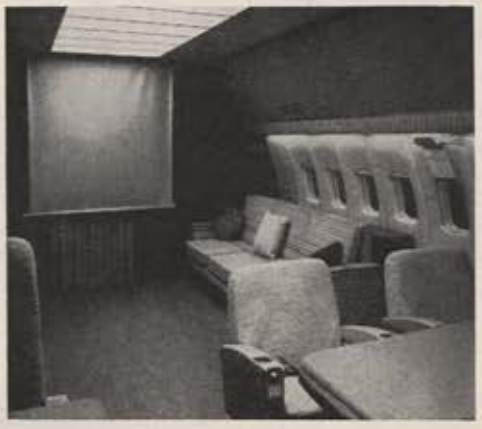
an assist in the air and on the ground when there is a language barrier. The navigator speaks French, Italian, and Spanish, a talent the aircraft commander finds useful in foreign weather offices and in working out the details of flight clearances.

One of the busiest USAF men on both the survey flight and the actual trip was Capt. Jack L. Birkenstock, who carried the responsibility for security. It is a field in which he must cooperate with the White House Secret Service detail, the local military and civil police, the air attachés, and managers of civil airports. Captain Birkenstock had seventeen air police to accompany the party and provide a round-the-clock guard for the American airplanes. In advance he made sure the local police, military or civil, were briefed on their duties and had barriers ready to protect the planes and the party on arrival.

The captain also took charge of ground transportation

Cockpit controls in VC-137 are fewer and simpler than those in any modern four-engine piston-powered aircraft. Navigator is aft of pilot on the left side, flight engineer behind copilot.

Communications center is forward in the aircraft, just ahead of this cabin with eight seats, lavatory, galley. Conference cabin is in background, on other side of the dressing room.



The Flying White House. Here the Chief Executive can hold conferences, talk to any spot in the world by phone. He can sleep or see briefing on screen, an important facility in wartime.

carried the burden for much of the huge communications traffic. The US Army also shared in this work, and part of USAF's mission was to transport men and equipment of the Army Signal Corps to points where they were needed. Seven thousand pounds of Signal Corps equipment was put in place along the route for use by the White House Army Signal Agency. At all times, on the ground and in the air, the President was in instant touch with his home base, both by voice and teletype.

Aboard Air Force One, USAF had responsibility for communications with both teletype and single sideband radio. The radio used Andrews AFB and Wiesbaden, Germany, as focal points, with Colonel Draper required to make his position reports to these two central offices even when he lacked time to check with ground stations as he passed along the route. All position reports were given instantly to the White House, the Joint Chiefs of Staff war room in the Pentagon, and the Army and Navy. This vigilance was maintained for each leg of the journey.

The President's navigator, Lt. Col. Vincent Puglisi, has had his job shaken up with the advent of the VC-137. For Operation Monsoon he was forced to take the aircraft's high speed into consideration and precompute his star shots, anticipating where he would take a fix and at what time. The arithmetic was worked out in advance to speed the results and let the navigator and his slide rule keep up with the aircraft.

Colonel Draper also gives navigator Puglisi credit for and baggage handling for the USAF crews. Regulations require that the mountain of luggage can be handled only by Americans. The precision of the schedule for takeoff and landing of Air Force One made the handling of the crews and their equipment a matter calling for equal precision, despite the many early reveilles. Handling of baggage and ground transportation for the presidential party was a responsibility of the Secret Service.

One of USAF's big problems with baggage grew out of the vast number of gifts picked up by Mr. Eisenhower and his entourage. There was a staggering amount of shifting of cargo among the planes in order to keep the weight limitations in order. The *Columbine* and one of the C-130s carried the bulk of this material, although some of it had to be crated and turned over to MATS for shipment Stateside. There were some animals presented to the President, but the shipping responsibility here was given to the Navy.

No serious maintenance problems were encountered. One of the C-130s carried a spare jet engine, but it was not needed. Each of the VC-137s had its own flyaway kit, and extra spares were on hand in a maintenance C-130 at each stop. While the *Columbine* always is accompanied by a service representative from Lockheed, there is no Boeing expert assigned to travel with the VC-137s. There are two Boeing men assigned to the 1254th at Andrews AFB, and they assisted in making up the spares list for the trip. At one point they had a call from Paris with a query. They obtained the answer from the Boeing plant in Seattle, Wash.,

and had it back to the crew chief in less than a hour.

The VC-137s get a postflight check every fifty hours and a periodic inspection each two hundred hours. The big inspections and engine overhauls are performed by Lockheed Air Service in New York. On Operation Monsoon, two full USAF maintenance crews were supplied. One of them was always ahead of the flight and waiting for the President's arrival, the two groups skip-stopping along the route.

Boss of the flight stewards for Operation Monsoon was M/Sgt. Robert E. Hughes. He had three men to cook and serve meals to thirty-three passengers and twelve of the crew on most legs in Air Force One. The food was almost entirely prepositioned in frozen lockers that were shipped out of New York well in advance of the trip. At all stops they were kept under guard and sealed until turned over to Hughes prior to takeoff. Responsibility for this job was shared by USAF and Pan American Airways, which supplied catering service at many stops.

Hughes says that some of his passengers became ill from food, "but not from food they ate on our airplane."

Pan American took responsibility in most cases for ensuring that all water, including that in form of ice cubes, had been boiled. Mr. Eisenhower used nothing on the trip but bottled mineral water.

In addition to the food, Sergeant Hughes was responsible for cleaning the aircraft interior at each stop, a job that is entrusted only to USAF personnel. He also helped with passenger baggage and gave special care to gifts that were fragile. Large gifts were shifted to one of the support aircraft. One of these, not identified, weighed more than four hundred pounds.

Weather forecasts for Operation Monsoon originated at Offutt Air Force Base in Nebraska, where MATS operates a global service for the Strategic Air Command. Special forecasts were provided from Offutt for each leg of the trip, about an hour before the scheduled takeoff. In addition, weather experts were on the job at USAF headquarters in the Pentagon, at USAFE in Wiesbaden, and at all USAF stations in the vicinity of the President's airplane.

The VC-137 is an executive version of the Boeing commercial 707 and, like the 707, a cousin of the USAF KC-135 jet tanker. The passenger cabin of the VC-137 is divided into three parts. The forward area holds the communications center with a radio teletype, high-frequency radio, and the intercom. There also is a galley, a lavatory, and eight passenger seats.

The center section is designed as an airborne headquarters. There are conference tables with swivel chairs, intercom phone to the communications center, and a projection screen for inflight briefings. Two sofas can be converted into bunks.

The aft cabin is similar to the 707, with fourteen double reclining passenger seats. In the rear there are three galley units, closets, stowage space, and two lavatories.

The press party that accompanied Mr. Eisenhower on Operation Monsoon rode in a chartered Pan American 707. There were 108 newsmen passengers and eleven in the crew. This plane departed ahead of Air Force One to permit the reporters to cover each arrival. Press Secretary Hagerty, who rode with the President, made arrangements always to have one reporter and one photographer on the President's plane to cover for the press pool. Members of the press paid $4,000 each for their transportation and hotel accommodations. Pan American also supplied terminal support for the USAF jets at some airports abroad.

Except for three delays, Operation Monsoon stayed on schedule. Air Force One was over the airport at Rome on time, but the landing was delayed by weather and traffic. On two departures, from Kabul and Nouasseur, the President was held up by crowds en route to the airport.

At the most recent inventory, everything was brought home that was destined to stay with the party. Missing are two pairs of black shoes and twelve cans of caviar, losses suffered by Air Force personnel.

Operation Monsoon went off without a hitch. From here on the President's peace missions will be "routine" for all USAF commands.—END

Colonel William G. Draper, aircraft commander on AF One in Monsoon, flew for General Eisenhower in World War II.

The crew, up the steps: Colonel Draper; Lt. Col. William W. Thomas, pilot; Lt. Col. Vincent Puglisi, navigator; CWO John J. Higgins, Jr., and CWO John R. McLane, flight engineers; SMSGT Russell F. Ellis, radio operator; and M/Sgts. Robert E. Hughes and Jack M. Woodward, flight stewards.

Arriving at work. Col. Edwin J. Witzenburger, Air Force Senate liaison officer, outside Old Senate Office Building.

Among Washington's top all-around utility men, the Air Force congressional liaison officers help the nation's legislators grapple with all manner of military problems from constituents' complaints and inquiries to such matters as appropriations, roles, and missions . . .

USAF's MEN ON THE HILL

Albert E. Eastman

CONGRESSMAN "A" finds a complaint in his morning mail. Farmer Brown's son Billy says the chow at his base is unpalatable.

Senator "B" wants to know the considered Air Force view on a number of questions of military strategy.

Congressman "C" understands that shifting technology may affect the nature of the air base in his district.

In many such instances, the legislator or a staff member will promptly pick up the "blower" and call one of the top all-around utility men in Washington—the Air Force liaison officer.

This officer is ready to provide a variety of services for congressmen. He puts queries and complaints into a top-priority pipeline, sometimes reports back in mere hours. He supplies copious background material. He sets up top-level briefings. He is on hand to offer a speedy fill-in on service matters whenever the legislator's need arises.

The Air Force liaison officer, in short, provides a vital link between USAF at all levels and the nation's elected representatives. He and his Army and Navy counterparts serve both their services and Congress.

I have found in several years on Capitol Hill that these gentlemen play an essential role in the efficient administration of a congressional office. Most persons of my acquaintance in the congressional arena agree, yet I have noted a surprising lack of general recognition of this important service function.

I have attempted, therefore, to set down here a picture of the armed forces' congressional liaison business as it looks from Capitol Hill.

Who, first of all, is the liaison officer?

He is an experienced line officer in his particular service, often a colonel or of equivalent rank. He may have been trained to command a B-52, pilot a supersonic jet fighter, or con a cruiser or destroyer. He can put together a Bailey bridge over most of the world's rivers, is equally at home commanding a regiment or the desk he now mans for congressmen. He is painstakingly selected for his job, married, well thought of by his superiors, and considered a credit to his community and the service he represents.

In brief, he reflects the civilian's picture of the perfect officer.

These highly trained, professionally qualified young officers provide answers by the score to inquiries about Mrs. Smith's "Willie" who wants out of the Air Force, Army, or Navy for any of a number of reasons; Fred Jones's shoes that don't fit; the trouble Jimmy claims to have with his back; or the chow in the boondocks at paratrooper school.

As the "outside" man for the Secretary of the Air Force's

Making the rounds. Colonel Witzenburger in discussion with Harry Wingate, Chief Clerk, Senate Armed Services Committee, over globe in committee's conference room.

Getting down to cases. USAF man on the hill chats with Mrs. Doris Bradshaw, military case worker on staff of Sen. Harry F. Byrd (D.-Va.) in veteran senator's office.

Next on the agenda. Colonel Witzenburger and Sen. Gale W. McGee (D.-Wyo.), member of Upper House's Appropriations Committee, glance at photos in latter's office.

On the House side. Col. Jack A. Sims, chief of USAF's liaison office for House of Representatives, in standup conference with influential Rep. Gerald R. Ford (R.-Mich.).

Colonel Sims, center, and staff member, Maj. Dick M. Hofman, turn attention to report in USAF office in Old House Office Building. On phone, staffer Virginia Kocur.

Away from Air Force office once more, Colonel Sims meets with Rep. Paul A. Kilday (D.-Tex.), ranking majority member of House Armed Services Committee, military expert.

Office of Legislative Liaison, the Air Force liaison officer is supported by several office divisions—Congressional Inquiries, Congressional Committee Division, the package known as the Office of Legislative Liaison, and others. Separate liaison officers serve the Senate and the House of Representatives.

Chief of USAF's House Liaison Office, which directly handles our congressional office's needs, is Col. Jack A. Sims. The Air Force's Senate Liaison Office chief is Col. Edwin J. Witzenburger. Both work under the current

(Continued on following page)

Maj. Gen. Thomas C. Musgrave, Jr., is Director of the Air Force Office of Legislative Liaison. Colonel Sims and Colonel Witzenburger work under him. Office's task is to serve Congress as well as the Air Force. General Musgrave recently assumed this spot after serving in a key SAC post.

Colonel Witzenburger and Senator Henry Dworshak (R.-Idaho) on visit to aircraft plant. Major liaison officer task is escorting legislators on various orientation tours.

Overseas visit. Rep. Overton Brooks (D.-La.), Chairman, House Committee on Science and Astronautics, Colonel Sims, center, greeted on arrival at Wheelus AFB, Libya.

USAF'S MEN ON THE HILL

CONTINUED

Director of the Office of Legislative Liaison, Maj. Gen. T. C. Musgrave.

The liaison officer is in touch with members of Congress, their staffs, and those of congressional committees, furnishing information about activities, views, policies, and procedures of his service. The material he provides may relate to military legislation. In most cases, it does not. His duties are manifold because a congressman's job is not limited to making laws.

The complexion of a congressional district may require a congressman to spend as much as sixty to seventy-five percent of his time performing individual services for constituents. He has a staff of from two to seven persons, most of whom deal with nonlegislative work to free his time for committee assignments, floor work, and required social activity.

Constituents' inquiries of congressmen involving the armed services run the gamut of the imagination. Transfers and discharges, poor medical treatment, unsympathetic noncoms and commanding officers, bad food, no leave, slow promotions, ill-fitting uniforms, immigration problems of war brides, pay, quarters, and even General Accounting Office claims against overpaid individual servicemen—all are the subjects of letters arriving daily.

Constituents, of course, "own" their elected representatives and each who writes fancifully yearns for the politician's magic shears to cut red tape and secure more favored treatment for himself or a friend.

A score of officers for each of the services do their Washington tours in this arena, day in and day out, handling this type of complaint. In most cases, they are effective middlemen, neither performing the actual investigation nor signing the "palatable" letter which the congressman will use to reply to his constituent.

MAAG Gen. James Fry, Senator Brooks, Charles Ducander, counsel to Brooks committee, Colonel Sims gathered for conference on European defense problems in Naples.

The services maintain their liaison offices for a number of reasons. First, liaison officers expedite inquiries. Most are handed to the congressman under the gun. "I need an answer right now!", is the usual tenor of constituents' demands. The liaison officer can put his finger on the proper bureau, office, or department of his service to answer the inquiry accurately and speedily.

Second, Hill staffers and their bosses find less of their own time spent in dealing through liaison offices than in picking a dozen or so Pentagon telephone extensions in the usually vain hope of finding the right one.

Third, the service contact man is indispensable for his service. One senior liaison officer puts it this way: "With 533 congressional offices, not to mention the committees, our department and bureau heads conceivably could receive a thousand telephone calls and letters a day just from Congress. And there isn't enough time in a day even to receive them properly, much less reply in accurate detail."

In addition, the service, as a professional military organization, justifiably feels that its positions on military issues should be placed before the nation's senators and representatives. Here, too, the liaison officer is a key point of contact.

Fortunately, most of the individual service queries and complaints crossing my desk fall into a few common categories. To these, the congressman can reply authoritatively from information furnished previously by the liaison officer, its current status checked simply by a telephone call. The liaison officer's workload is unnecessarily burdened, however, by many congressional offices which assert their need for a separate and distinct reply to each inquiry regardless of the number of similar cases preceding it.

Many congressional staffs refuse, on too many occasions, to use the wealth of experience they, themselves, sometimes have. Our staff, for example, has composite experience from wartime active-duty and peacetime Reserve assignments, and two manned complaint bureaus for the American Red Cross during World War II and the Korean War. All have some level of capability at judging validity of service complaints.

Many such complaints are fired off to Washington from barracks and tent without resort to built-in corrective machinery in each service. It's too easy just to "write my congressman." In those cases, our replies note simply the existence and duties of the Corps of Chaplains, inspec-

Left, visit to an aircraft plant escorted by Colonel Witzenburger. Fully visible senators include, at left of X-15, Cotton (N.H.), Hruska (Neb.), Thurmond (S.C.), Martin (Iowa). In cockpit of test plane, on display at North American's plant at Inglewood, Calif., is Cannon (Nev.). At right, Rep. Bob Wilson (Calif.) in McDonnell F-101 for orientation hop.

tors general, the United Service Organizations, and the Red Cross. Few press their cases further.

Some call it dodging the issue. It's not, for at least two reasons. A constituent rarely gets what he wants from any agency of government, including the services, through his congressman or senator unless he is entitled to it strictly on merit. Many writers, rather than regard their congressman as a "court of last resort," see him as a shortcut to bypass available administrative remedies.

Also, constituents often write concealing major portions of the story, even distorting fact, expecting the congressman, simply because they may have voted for him, to represent them before government agencies without regard to truth in the matter.

The "lobbyist" tag has been hung securely on the liaison officer by some members of Congress. This would seem to distort the word's definition to a considerable extent. Actually, we may observe, although to many the term "lobby" or "lobbyist" is distasteful, congressmen, their staffs, and even congressional committees have come to rely heavily on civilian lobby groups for specific information on a variety of legislation. So complex has modern life become that it is impossible for small congressional staffs to be thoroughly informed on all kinds of legislation even to the seemingly simple extent of preparing a bill which outlines only broad legislative intent. Most lobbies are, in fact, storehouses of data, statistics, theory, philosophy, and practice.

In this connection, the service liaison office is indeed similar to a "lobby." Without these offices, administration of congressional offices would be severely hindered in the areas of service inquiries as well as the defense "big picture."

On the other hand, the liaison office hardly can be classed as a lobby in the full and usual connotation. The liaison officer, of course, presents at every opportunity his service's views on such matters as appropriations, roles, and missions. But to suggest that he attempts to exert influence in the manner usually associated with high-powered lobbying is both unfair and inaccurate so far as my experience is concerned.

This question may be asked about liaison officers: "Why waste the talents of a relatively senior officer, trained as he is, at a cost to the American taxpayer of literally thousands of dollars, keeping him at the apparently work-a-day chore of congressional liaison?" Why not use an ISO type, someone trained or skilled in the contact field, advertising, or journalism? What's wrong with picking liaison officers simply for their personality or their ability to carry on an intelligent conversation? It has been suggested that young legal officers newly assigned to the various judge advocate generals' offices be assigned to L&L because so many congressional inquiries deal with interpretations of law and service regulations.

But here the congressman's wishes enter the picture. He may pick up his phone and say, "Colonel, I have a problem with an important constituent. I can use your help. Will you come up right away?"

As a rule, a congressman handling a service problem refuses to settle for the advice of a captain, a second lieutenant, or a civilian. Protocolwise, he rates five-star treatment. He knows it and may demand it. He may refuse the advice and counsel of a junior officer. Often he even questions assistance offered by a colonel or Navy captain, or from generals, no less.

For the most part, the liaison officer has few guidelines to help him do his job. None of the services has a "regulation" establishing ground rules for the day-to-day conduct of liaison with Congress. Senior officers, however, place the twin qualities of judgment and personality high on the list of requirements of liaison personnel. Both are functions of experience. Judgment and personality are partly inherent qualities but generally are acquired in dealing with people through the years—which in this case means years of service seniority.

What are the rewards, careerwise and to each service, to be expected from good congressional liaison?

Many liaison officers have moved from "The Hill" to important commands. Often, they return in later years for appearances before congressional committees, their testimony generally greeted with cordiality. Each, as a result of his liaison assignment, has acquired additional poise, balance, and perspective—important factors in his professional career which increase his value to the service and the country.

But, more important, he has helped develop understanding of the armed services on the part of congressmen and their staffs; and helped pass on to private citizens authoritative and sympathetic replies to specific inquiries.

He has, in reality, helped through chores small and large to bring the nation's armed forces that much closer to the American people.—END

The author, Albert Eastman, administrative assistant to Rep. George Meader (R.-Mich.), is a former newspaperman. During the second world war, he was a US Army Air Forces information officer in the Pacific. He is a qualified aerial navigator. He has continuing dealings with USAF and other liaison officers in his Capitol Hill post.

True national preparedness must include a nonmilitary strategy to assure survival. And the time to start being truly prepared is now . . .

WE CAN LIVE THROUGH NUCLEAR ATTACK

. . . AND RECOVER

Rogers S. Cannell

The author, Rogers S. Cannell, is Manager, Industry and Civil Defense Research, Stanford Research Institute, Palo Alto, Calif. For the past six years, he and his colleagues have conducted an intensive examination of nonmilitary defense. Portions of the following article were first published in the Stanford Research Institute Journal *as one of a number of studies within the "Spectrum of Conflict."*

This is the third in a series of Air Force/Space Digest *nonmilitary defense articles aimed at stimulating interest and disseminating information in this critical field. "Your Backyard Is the Battleground," by Federal Civil Defense Director Leo A. Hoegh, appeared in November '59; "Survival in the Nuclear Age," by aviation historian Eugene M. Emme, now with NASA, appeared in last month's issue.*

NONMILITARY defense of our homeland can be effective. We have both the technical know-how and the economic wherewithal to achieve protection.

With sufficient protection we can also recover from an attack—again, provided we are prepared in advance.

These conclusions are the answer to the heavy feeling of hopelessness with which many, perhaps most, persons face the prospect of thermonuclear war.

In future total war, the major combatants would fire missiles at each other's homelands. Two simple examples serve to illustrate the importance of nonmilitary defense in total war—one in which the US is attacked first, and the other in which we respond to an act of aggression with massive retaliation. Even in the least destructive attack, the nonmilitary defense role is important. In more destructive attacks, where nonmilitary defense is even more important, it can also be very effective.

Let us assume that the Russians attack the US but aim their weapons at our military bases and try to avoid our cities. With our present limited program of civil protection, we could lose about twenty-five percent of our population just from fallout. On the other hand, when our damaged forces struck back, they would be assaulting an enemy whose population had been trained in civil defense and had adequate warning to evacuate cities and make crude fallout shelters.

The recent compulsory nationwide Russian civil defense course of twenty-two hours was participated in by a large portion of the adult population. It is to be followed by a fourteen-hour course. In addition, large civil defense organizations are maintained on a local basis. These are trained in such activities as decontamination, shelter improvisation, and atomic, biological, and chemical warfare protection.

In 1958, Soviet Premier Nikita Khrushchev claimed that twenty million people were trained in civil defense, a reference probably to the number in organized cadres. With Russian industry decentralized, military targets empty of weapons, and cities empty of people, we would have difficulty inflicting a serious blow with our remaining forces. Russian civil defense would be a major reason.

It is clear that even if the Soviets purposely avoided wiping out our cities, our population losses would be greater than Russia's—and this would to a large extent be true because we had no protection for the population. When population centers are targets, protection becomes even more of a necessity. In fact, it is the only way we can avoid giving enemy forces an insurmountable advantage if they strike first.

There is also the possibility that if Russia marched into Western Europe and we followed our announced policy of massive retaliation, we would be the first to launch a nuclear attack. If we thought we could achieve surprise, we would probably aim at Soviet military bases. Russian civil defense could be effective against the fallout from such an attack since their program emphasizes radiological protection. In any event, the natural dispersion of Russian population centers and the fact that many of their military targets are far from cities would at present keep Russian casualties to a smaller percentage of her population.

Any attack returned to the US by Russia's damaged forces would probably be aimed at our cities and industry, since our retaliatory bases would be empty. Under these circumstances, our chances of survival would depend upon just how many of our people we could protect from the attack by evacuation and hastily built fallout shelters. Certainly no one would argue that Americans are adequately informed or prepared to react properly in such a situation, and one would question whether we would dare to use our policy of massive retaliation considering the vulnerability of our people. These are only two of the many situations that might arise, but most others point up an even greater necessity for protecting the civil population.

Shelter is the central feature of nonmilitary protection because it saves lives directly. Evacuation also can save lives, but it is effective only with sufficient warning—and does not eliminate the need for fallout shelter.

People have been led to believe that one nuclear weapon could destroy an entire city, so they conclude that no type of protection can be effective. The popular obsession with this idea has obscured the truth. Protective actions can be quite effective not only at distances from a target city but also within it.

The first need is protection from fallout. In many areas, existing structures would provide enough protection depending on their construction and the radiation intensity. Fallout intensity is difficult to predict at any place; however, experts believe that adequate shelters should reduce exposure to radioactivity by a factor of 1,000. This could be accomplished either by improving existing buildings

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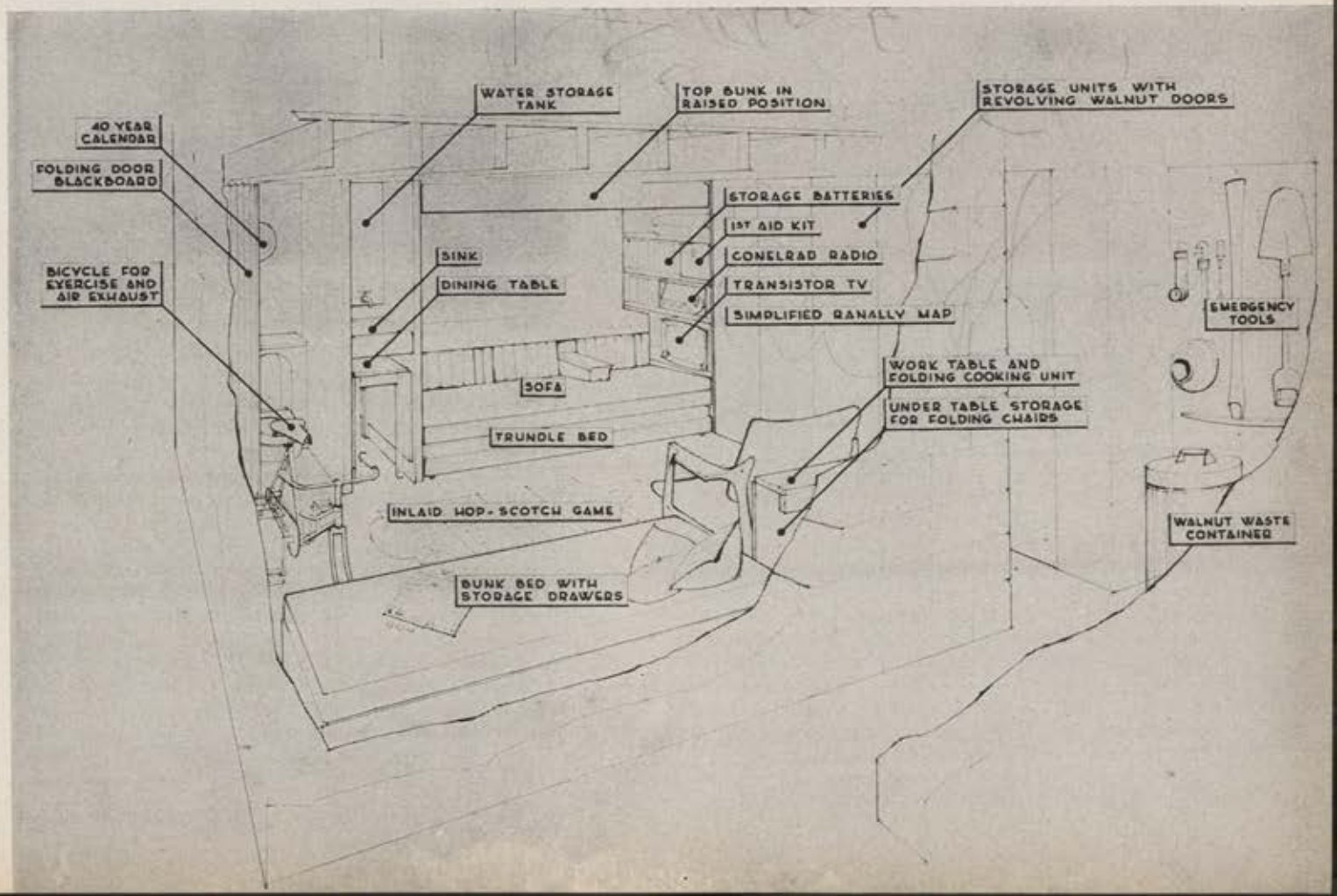
Photos courtesy American Institute of Decorators

Two views of "The Family Room of Tomorrow," a fallout shelter designed by Marc T. Nielsen of Chicago in keeping with shelter specifications laid down by the Office of Civil and Defense Mobilization (OCDM). In peacetime, room could be used as den, recreation room, or guest accommodation, as well as for protection against hurricanes or tornadoes. It is built to contain two-week supply of food and water, sanitary supplies, all basic emergency equipment.



Photos courtesy OCDM

Left, family takes advantage of existing structure for use as shelter. At moderate cost, average family can buy necessary emergency supplies, stocks of food for shelter.

Midwestern couple built this simple shelter at cost of about $500 in the basement of their home near Battle Creek, Mich. Here, they are using it as a utility room.

or by building special shelter. Current calculations for many possible attacks show that over half of the US population lives in areas where people would survive if they had fallout shelter, yet would die without it. Fallout shelter would be required after any expected attack.

Fallout is not the only hazard, however. The immediate weapon effects—heat, fire, the force of the blast, and radiation from the fireball itself—are the principal dangers in the areas near ground zero. Blast shelter would reduce the fatal area of destruction for one weapon to 1/200th of the area when shelters are lacking. Studies of many possible attacks indicate that a program providing good blast shelters in urban areas plus fallout shelters in the rest of the nation could hold casualties to less than ten percent.

There is no question that the United States has the technical know-how to provide the protection needed to save ninety percent of the population in nuclear war. In 1958, a report by the Advisory Committee on Civil Defense of the National Academy of Sciences and the National Research Council stated, "Postponement of basic shelter construction is not warranted in our judgment by any lack of essential technical knowledge." This was the evaluation of a well conducted government investigation of the adequacy of civil defense research.

But authorities have expressed doubts about the economic feasibility of such a program. Could the nation bear the cost of any program which could contribute a significant saving in lives? Studies at Stanford Research Institute have indicated that effective shelter systems can be designed for costs which are small in comparison with our present total defense budget.

This fact can be illustrated by three nonmilitary defense programs. Each depends on a different shelter system: (1) maximum use of existing fallout shelter, (2) construction of special fallout shelters, and (3) construction of special blast shelters in metropolitan areas and fallout shelters in nonmetropolitan areas. About one-third the cost of the first two programs and one-half of the third is in shelter. The remainder is for warning, decontamination, monitoring, stockpiling of food and fuel, and so on. These three programs cover the range between the lower and upper

Somewhat luxurious family shelter built under front terrace of $50,000 Pittsburgh home. Total cost was $2,900. Ceiling, walls are concrete. It includes an escape tunnel.

limits of complete programs for protection and recovery.

Shelter in the first program fits the current government policy. The government is now urging the public to make maximum use of existing shelter—improving it where necessary—and to provide themselves with survival supplies. The average family investment would be about $200, and the cost to the government would be an additional $5 per family per year.

The government must act to make the individual's investment effective. For example, warning is essential, because without it no one would enter a shelter. Other necessary activities include survey and marking of existing shelter in large buildings, monitoring of radiation hazards, public information, and so on. The cost of these to the government would be on the order of $500 million. If the program were completed in two years, its annual cost to the government would be about $1.50 per person, contrasted with $230 per person for the present military budget.

This program could—if there were substantial public response—add twenty to thirty million survivors over and above those who would survive without it. This would be adequate effectiveness in an attack against military targets—but not against major population centers—within the next few years. It would be less than adequate in any attacks later on.

The second program would involve construction of special fallout shelters. In this case, the government would bear the cost of the shelters and the emergency supplies in addition to the expense of warning, monitoring, and the like. A program of this scope would cost on the order of $5 billion per year if completed in six years. This is equivalent to an annual cost of about $30 per person.

This plan would not compete with any military program for manpower or resources. On the contrary, over the past few years, we have frequently had idle in the United States sufficient plant and personnel to undertake it without even pressing the economy (over $10 billion worth in 1958). This program could add sixty to ninety million survivors over and above the number who would survive with no program. It would provide adequate fallout protection in any attack on the US at least through the 1960s. However, in attacks against population centers there would be millions of blast casualties this program could not prevent.

The maximum program would provide shelter against immediate blast effects in metropolitan areas plus fallout shelter elsewhere. If this program were to be completed in eight years, it would cost about $5 billion per year for the blast shelter portion of the program, but the fallout portion of the program would cost less because those shelters would no longer be needed in cities. The total annual cost would be $55 per person. This program would add approximately eighty million more survivors in a heavy attack against military and population targets in the late 1960s.

It is important to recognize that the true value of any defense program lies in its contribution to national objectives. If total war should come, the survival of the people—and the people are the nation—would be a primary objective. A program saving twenty million lives would be satisfactory if virtually the entire population survived. It would not be satisfactory if virtually no one else survived. In the one case, the nation could achieve its objectives; in the other, it could not. What the nation is willing to spend on defense programs is an indication of how intent it is on achieving its objectives. At present, this nation is spending each year about 25¢ per person for nonmilitary defense—a rather low valuation of human life for a Western nation. Sweden spends about $4.

There are many who accept the idea that shelter can effectively reduce casualties but who believe that survival in the postattack environment would be impossible. They fear invisible and mysterious atomic radiation and believe that recovery from the loss of a major portion of the nation would be impossible. Such fears are no excuse for failing to take every possible step to prevent death among our population in event of attack.

The second task for nonmilitary defense in total war is recovery from attack—whether or not the war continues after bombs fall. The purposes of the recovery effort are to reestablish the nation's social structure and to get the economy back into business.

The first job would be to make available to the people the surviving resources—food, medical care, housing, etc.—they need for their physical and mental well being. Then, with the people cared for, it would be necessary to control the investment of surplus manpower, materials, energy, and productive capability into repair and building. Effective central planning and control would be the key to the rate of recovery.

Photos courtesy Boeing

Maximum use of manpower during World War II—involving use of womanpower exemplified by "Rosie the Riveter," shown working on B-17—bolstered total national power.

Times change but the principle, if anything, is even more important. Dexterity of skilled women workers today is used in jobs such as intricate wiring for electronic gear.

If attack were directed only against military bases, few cities would be damaged and there would be little permanent disruption of the social order or the economy. The net effect on the economy in nuclear war of this sort would be mainly a loss of production while fallout denies access to the facilities.

But if cities were targets, the postattack situation would be vastly different. A segment of the social order would be destroyed and a large percentage of the industrial plant lost.

Historically, the growth of an industrial economy has depended on agriculture. Crops have fed more people than it took to raise them, leaving a manpower surplus for industry to tap. Industrial recovery after any attack would depend upon adequate farm production to start with. Analysis of the effects of many possible attacks has shown that the crop-producing facilities of this nation would survive well enough to permit a strong agriculture in the

(Continued on following page)

postattack period. At least thirty percent of our crop land should receive less than 100 roentgens per hour an hour after attack. This is sufficient land to meet our food requirements under any shelter program, and foods grown in soil with this level of contamination would be quite safe for human consumption. Enough farm machinery would be available to meet the need for ten to fifteen years after an attack, but fuel to operate this equipment would be essential.

In addition, farm surpluses stored by the Commodity Credit Corporation and other food stockpiles would feed the population for at least two years. Even if petroleum to run farm machinery were in critically short supply after an attack, we would not need to take a crop from the land immediately to avoid famine. A major obstacle in making use of the surpluses, however, would be their location. The stocks should be moved nearer population centers so they will not have to be hauled there in case of attack. This is just one of the many examples of the need for planning to speed recovery.

Besides agriculture, a strong economy would need transportation and power. Preliminary studies indicate that sufficient transportation equipment would survive. Dependent only on the availability of fuel, air transportation could be back in operation immediately, railroads would be running within a few months, and trucks would operate in all local areas within six months after an attack. Electric power generating plants should stand attack better than their consumers, and they are generally close to the demand. These plants normally have on hand fuel for several months' operation. With a reduced load, these stocks should last many months.

The immediate demand for fuel, then, would be for transportation. It could be provided by stockpiling of some fuel in secure storage. Production could finally be resumed from continuing supplies of natural gasoline and by setting up distillation units stockpiled before the attack.

Recovery also requires manpower—laborers as well as people with technical and managerial skills. With farming mechanized, a few people would still be able to produce food for many. Accordingly, there would be a large enough labor force left over to rebuild as necessary.

In World War II, the Soviet Union lost from its control about sixty percent of its coal, iron, steel, and aluminum production, and up to ninety-five percent of some key military production. The problem was further complicated by the relocation of much of the remaining plant. Yet, through all of this, Russia was able to maintain some productivity and recover. With a broader base of technical know-how, more plant intact, and more material that could be saved, our problem would not likely be as difficult as was Russia's.

In limited war, the major powers would stop short of exchanging nuclear weapons. Whereas in total war there might be little time to do anything but seek shelter once hostilities begin, limited war would give civilians more time to contribute to the whole strategy of the nation. For this reason, resource management would be the major nonmilitary task to be undertaken.

Resources are (1) manpower with skills and abilities, (2) raw and processed materials and the facilities for their processing and distribution, (3) services that do not produce a tangible product, and (4) management—the integration of manpower, materials, and services to support our strategy. In limited war these resources must be quickly available to ourselves and our allies in the quantities needed.

There are two sides to control. On the positive side, the resource management effort is directed to increasing the quantities available. In the manpower field, for example, special schools to train housewives to be welders, lathe hands to take over as foremen, and so on. In the materials field, premiums are paid for increased production of oil, ore, trucks, guns. The government builds new plants and buys from other nations goods such as steel, which this nation does not normally import in significant quantities.

On the negative side, resource management channels products and services into essential programs by limiting their nonessential use. Consumer goods in short supply are rationed; basic materials are allocated to various producers; priorities are established giving essential users first call on goods in the open market. Civilians are encouraged to use certain services only when necessary because it is impractical to ration communications, public transportation, or electric power.

Today readying nonmilitary protection is largely a matter of installing various systems and training people to use them. Warning systems, for example, need to be expanded to the people beyond metropolitan areas. Shelters should be prepared, equipped, and stocked. People should be trained to operate them. These are long lead-time programs—they take several years to plan and get started, more years to complete. Not only should these programs be undertaken without further delay, but preparations should also be made to put them on a crash basis if the need arises.

Preparedness for the other nonmilitary defense actions in limited and total war is also a resources management problem. The objective in the cold-war period is to have resources available when, where, and in the quantities needed. The availability of manpower could be improved by training. An example of this is the government's executive reserve program in which executives are recruited from nongovernment fields and trained for emergency assignments in the government.

Management readiness can be improved by enacting standby legislation and issuing standby executive orders which can be put into effect by declaration when a certain set of conditions has been met. Such preparation, in fact, is a necessary parallel to training of manpower.

Materials can be made more readily available by stockpiling either the materials or the facilities for producing them. Rubber, for example, could be purchased and stored. A rubber manufacturing plant could be built and held in standby status. Or, plans could be drawn and stored so that a rubber manufacturing plant could be built more quickly when it was needed.

Even though a few years from now the plant might manufacture an outdated product in commercial terms, during recovery the product would be very useful because the normal competitive economy would not exist. In fact, technical obsolescence could be turned to good use for defense preparation; instead of scrapping obsolete products or facilities, they could be put "in mothballs" for possible future use.

Services can also be "stockpiled" in a sense. Food, for example, would not survive an attack in sufficient quantities in many places, although other areas would have large surpluses. This would require postattack transportation. But this transportation could be "stockpiled" by moving the stocks before the attack.

True preparedness requires a nonmilitary strategy that includes a wide range of factors to meet a wide range of possibilities. And the time to start being truly prepared is now.—END

THE SPACE AGE IN PERSPECTIVE

SPACE DIGEST

VOLUME 3, NUMBER 2 • FEBRUARY 1960

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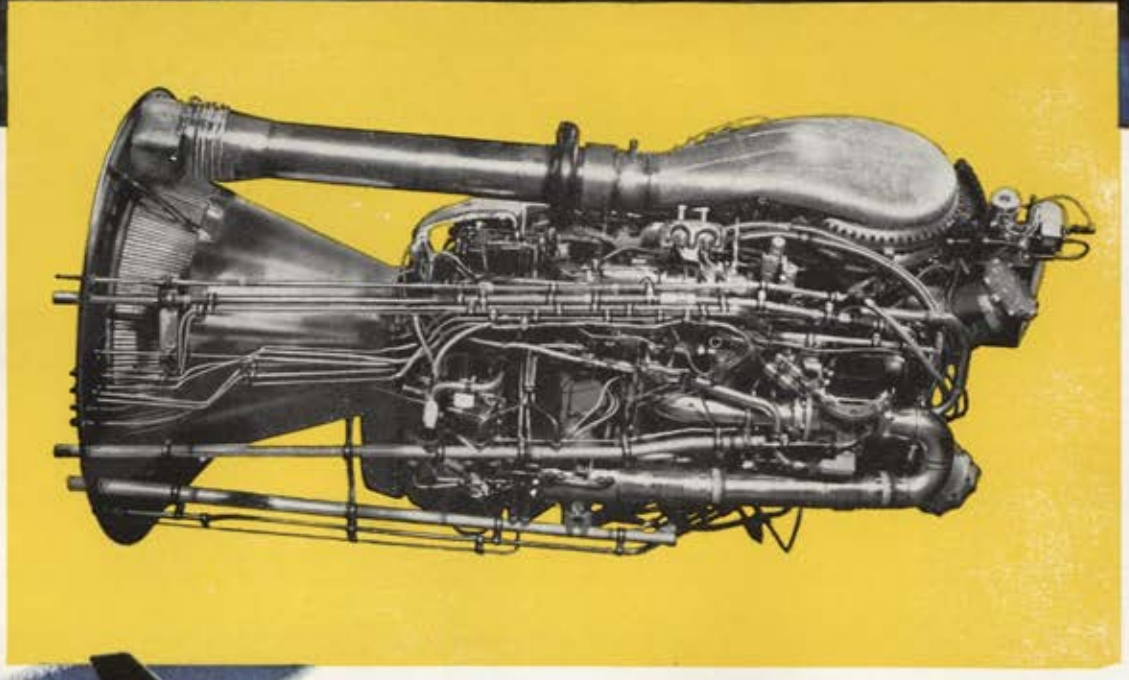

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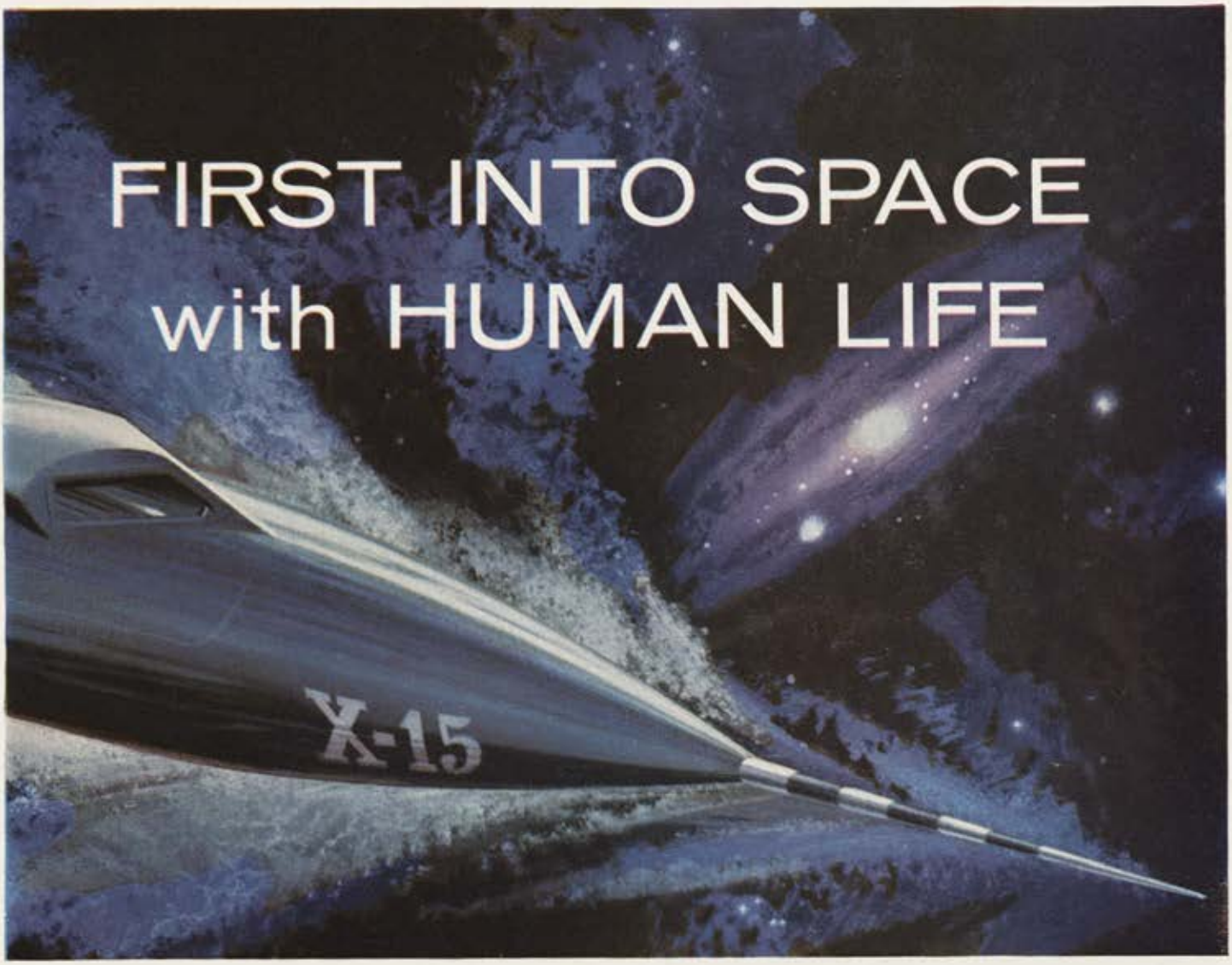

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NORTH AMERICAN AVIATION, INC.

How satellites can give us low cost emergency telephone service

Launched by the Douglas-built *Thor* IRBM, satellites like this would relay telephone messages anywhere in the world without costly cables or towers.

Beyond their immediate military necessity, our present rocket and missile programs promise many vital peacetime benefits to us all...

Well past the drawing board stage are plans to use satellites as a low-cost emergency stand-by system to relay telephone calls around the world.

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While satellite telephone service is still in the future, *Thor*—the rocket that can put it into being—is thoroughly proved. Built by Douglas, maker of the DC-8 jetliners, *Thor* has been successful in more than 90% of its shots. It is key booster in the "Discoverer" firings and launched the first nose cone recovered at ICBM range.

Thor is another product of the imagination and experience gained by Douglas in 20 years of missile development.

DOUGLAS

MISSILE AND SPACE SYSTEMS
MILITARY AIRCRAFT • DC-8 JETLINERS
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GROUND SUPPORT EQUIPMENT

A STRANGE *DUALISM*

". . . I refer to our effort in space exploration, which is often mistakenly supposed to be an integral part of defense research and development."

—From the President's State of the Union message, January 7, 1960.

THE strange dualism that pervades the Administration's thinking on space technology is underscored by the statement above. The President's view has caused some consternation on Capitol Hill, and it may well become the basic touchstone of argument between the Executive and Legislative branches in the weeks ahead.

Already, Rep. Overton Brooks, Democrat of Louisiana, Chairman of the House Committee on Science and Astronautics, has taken strong exception to the President's view. Congressman Brooks was quoted prior to his committee's current hearings on our missile and space posture as saying that the President's statement fails to take into account the effect of space achievements on other countries and fails also to consider the potential of satellite vehicles in US defense. An extension of this latter idea—the use of military space vehicles as a possible new key to world peace—was explored by Air Force Chief of Staff Gen. Thomas D. White in his recent address to the National Press Club, excerpts from which are printed on pages 62 and 63.

The President is reported to be adamant in his view that there is no race between us and the Soviets in the field of astronautics. It is understandable why he might be disturbed by demands from some quarters that we match exactly everything the Russians do. This is patently impossible. First, because we do not now have the thrust capability, and second, because we have no way of knowing what grand new feats they are going to unnerve us with next, until the feats have been performed, thanks to their excellent security. That is not really the point.

The point is that in over-all capability, militarily and scientifically, we must match the Russians. We must recognize, too, that no arbitrary division between "scientific" and "military" space applications can exist now, regardless of our earnest national hope that, if the cold war really abated, space could be used for peaceful purposes. There is no reason why we cannot be imaginative enough to run *two* space programs, scientific and military, which are in reality *one* program adaptable to any contingency. This is the all-purpose approach of the Soviets, and it is a realistic method in today's world.

There is another facet of the problem that ought to be considered by the congressional committees now studying our missile and space posture. This is the President's refusal to acknowledge that we are indeed in a race. It will be recalled that when the tables were turned back in the forties, when we alone had the bomb, the Russians did not spend their energy minimizing *our* achievements. Instead, they got busy catching up with us.

Congress, through its investigative and opinion-molding power, and certainly through its financial prerogatives, can do much to improve our posture in a world increasingly threatened by Nikita Khrushchev's ballistic blackmail.

But no matter how dispassionate the studies and how disconcerting the reports of the legislative branch, it remains the job of the Executive to decide direction and drive. —William Leavitt

Contemplation of man's extension into space suggests that in this vast arena we may find the most imaginative and challenging key to the control of peace. We must take every advantage of this opportunity . . .

LACKING specific guarantees that the benefits of space science and technology will be used solely for peaceful purposes, it is essential that we consider the application of this knowledge to our own military capabilities. There is no dividing line between air and space. They are one vast operating arena, and they must be considered as one medium —aerospace. Advancing technology will inevitably carry with it the opportunity for improved aerospace capabilities. Therefore we must move steadily toward operations in space—not merely because it is there—challenging us—but because it is vital to our nation's security to do so.

The overpowering element in evaluating military stability in the world today is the possibility of surprise attack. It is a major obstacle to preserving the peace, the big barrier to reducing our military budget, and the key to much of our strategy and tactics. With this in mind, let us consider an interesting series of developments in the technological revolution.

The development of nuclear warheads made it practical to develop aerospace vehicles with intercontinental range. It made practical the concept of the big missile which required a new and radical development in rocket propulsion. The nature of this vehicle, with its intercontinental range, also demanded new and radical developments in electronic guidance. These concepts and developments have now become a practical reality—for example, we possess an operational intercontinental ballistic missile whose effectiveness far exceeds our original planning objectives.

All of this has intensified the problem of surprise attack—but the same technology which gave birth to the big guided missile carries in it the seeds of a possible solution to lasting peace. The big rocket has propelled us into space, and its guidance requirements have accelerated the science of electronics.

These technologies have advanced to the point where new controls for peace are conceivable. I do not say that there will ever be an *absolute* guarantee against surprise attack. Absolute guarantees are few. But I do say that the time is coming when the possibility of surprise attack will be reduced—reduced through advanced technology

Military Aerospace Power...

NEW KEY TO WORLD PEACE?

GEN. THOMAS D. WHITE
Chief of Staff, USAF

to the point that we can live with the problem and, perhaps, solve it.

In this respect, there are certain specific military advantages that we can expect to gain from the extension of our capabilities farther out into aerospace. Among them are more reliable communications, improved early warning, and better reconnaissance. Two of these are particularly valuable as far as defense is concerned—their main purpose is to provide us with warning of impending attack. Midas, a satellite containing infrared detection devices, is being developed to obtain the earliest possible warning of an ICBM attack against this country. Samos is another defensive satellite designed to give us a reasonable answer to the question, "What are the actions of a potential enemy?"

A year ago, in testifying before the House Committee on Science and Astronautics, I said, "The major military threat which faces our nation today lies in Soviet aerospace power—even though, at the moment, this power is expressed in terms of aircraft and ballistic missiles. The primary military deterrent which has contained this threat and which has precluded it from developing into catastrophic reality, is United States aerospace power. This has been true for the past ten years with our conventional and early jet fighters and bombers. I am convinced that it will continue to be true as we operate with improved jet aircraft, missiles, and eventually spacecraft and satellites. The decisive weapons of the future will be aerospace weapons. That nation—or group of nations—which maintains predominance in this area—not only in its military forces, but also in its laboratories, in its industries, and in its technology—will possess the means for survival."

Nothing has occurred since that time to change my conviction. Moreover, further contemplation of man's extension into space suggests to me that here in this vast arena we may find the most imaginative and challenging key to the control of peace. We must take every advantage of this possibility.—END

From an address by General White at the National Press Club, Washington, D.C., January 11, 1960.

Once strictly science fiction, the possibility of "antigravitation" is now attracting theoretical interest on both sides of the Iron Curtain. But to even *consider* antigravitation, a much deeper understanding of the nature of gravitation is required. Here is a survey of the theories of two leading Soviet scientists on what pulls that apple down from the tree . . .

WHAT IS

BORIS KIT AND RUSSELL R. ZAVISTOVICH

"IT IS sufficient that gravitation exists," Sir Isaac Newton remarked in the seventeenth century in a treatise explaining the laws of gravitation.

Neither Galileo, the first scientist to describe the laws of motion of a falling body, nor Sir Isaac Newton appeared to suspect that the laws of gravitation might be suspended to man's advantage. They apparently felt then, as science has believed since, that gravitation is—like the weather—a constant phenomenon about which little, if anything, can be done.

But is this really true? Can modern man do something about gravitation to the point of suspending or nullifying it to his advantage?

Some modern scientists on both sides of the Iron Curtain suggest that possibly something *can* be done. Of particular interest are basic studies being carried out by the Soviets with a view toward greater understanding of the nature of gravitation, the first step in any program of finding the key to "antigravity"—if it exists.

Thus far, man's only successes in the face of the laws of gravitation—even to the point of sending vehicles into orbit—have all been caused by sheer lifting force, either through gases lighter than air, or through the aerodynamic lift of air craft wings, or through the tremendous thrust of rockets. By any and all of these means, and by others related to them, man only *overcomes* the force of gravitation temporarily or, in the case of satellites, strikes a happy bargain with gravitation But he does not begin to nullify gravitation.

The ideal would be to *nullify* the force of gravitation. Such an approach requires a basic understanding of what really constitutes the force of gravitation.

It is important to note that there is a clear distinction between *gravitation* and *gravity*. In everyday language, and in many dictionaries, the terms are used interchangeably. But they really are not interchangeable except at just two points on the surface of the earth.

Gravitation, as Sir Isaac described it, is the force which impels two material particles or bodies which are free to move to accelerate toward each other. In basic terms, the force of gravitation is directly proportional to the product of the masses of the two bodies and inversely proportional to the square of the distance between them. As part of a wider generalization related to his studies of relativity, Albert Einstein described gravitation in much more specific mathematical terms, but Sir Isaac's explanation has more or less stood the test of time for the layman's understanding.

Gravity, on the other hand, is that force which accelerates terrestrial bodies toward the center of the earth. But this force—the commonly known G force—is modified by the shape of the earth, centrifugal force due to the rotation of the earth, and other factors at any given point on the earth's surface. Although the force therefore varies from point to point, the acceleration it produces on a freely falling body, used in general computations, is 32.16 feet per second per second. While gravi-

GRAVITATION?

... Some Soviet Views

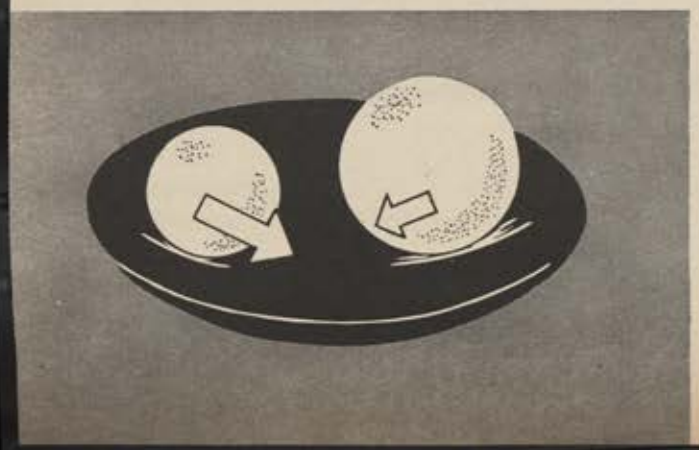
tation and gravity, as forces, differ because of the variable factors, the two forces are identical at either the North Pole or the South Pole where the variables affecting gravity tend to cancel one another.

Spectacular successes in the field of rockets and satellites demonstrate that Soviet scientists, having profited by earlier Western scientific study and research, are particularly competent in the art of at least overcoming the force of gravitation through sheer propulsive power. But with respect to the *other* approach to the problem of overcoming gravitation, that of nullifying the force or creating an antigravitational force, the Soviet Union is working quietly without the fanfare that surrounds its present program. As a special field of study, gravitation (or antigravitation) is regarded in the Soviet Union as important and promising.

An analysis of Soviet scientific literature available in the West shows that there are two scientists who have concentrated more than their also-interested colleagues on developing a theory to support antigravitational research. These are: Dmitriy D. Ivanenko, professor at Moscow State University; and Kiril P. Stanyukovich, professor at the Higher Technical School imeni Bauman in Moscow.

It is important to mention here that a third, and older Soviet scientist, Vladimir A. Fok, is due considerable credit in the development of present Soviet theories of gravitation, having earlier offered certain variations of Einsteinian relativity to take what he considered a more accurate account of gravitation.

One of Ivanenko's earlier achievements was the development, in collaboration with I. Ya. Pomeranchuk and A. A. Sokolov, both of Moscow State University, of an expansion of the work of the famed British physicist, P. Dirac, who had worked out equations suggesting the possibility of negative energy, or negative mass. If the existence of negative mass could be proved *and* measured, the problem of antigravitational devices might be solvable. This is because theoretically negative mass, instead of mutually attracting, as is the general case in the universe, would mutually repel, the reverse process to gravitation. A body of negative mass, so to speak, would *have* to leave the earth.



This drawing is a simplified way of illustrating the attraction of two bodies in space due to the curvature of space as explained by the Einstein theory of relativity. Two balls placed on linen tightly stretched over a ring come together as a result of the curvature formed on the linen surface created by the weight of balls acting on linen.

The Ivanenko school holds to the idea, well accepted by many scientists in the West, that gravitation is based on gravitational waves and gravitons, the smallest particles which are emitted by bodies and which make up the gravitational field around them. In this theory, gravitons, through collision, are transformed into electrons, positrons, and photons.

The theory is that forces of gravity within a body are constant; and, quite importantly, the transformation of gravitons into electrons, positrons, and photons does not signify that gravity is being destroyed.

As Ivanenko sees it, there is in the theory of gravitation room for both fission and fusion, to use terms that are more appropriate to the field of nuclear physics. In the gravitational field, the collision of an electron and a positron may produce two gravitons. Likewise, the collision of two gravitons may produce an electron and a positron. In any case, the probability of either occurrence is small, something on the order of $1/10^{82}$.

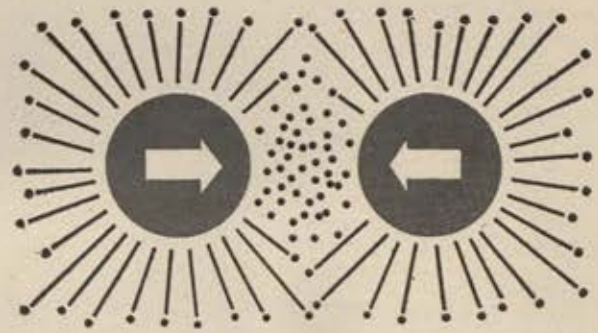
In his study of gravitational phenomena, Ivanenko uses a method known as quantization, a process in which the magnitude of a quantity is divided into a finite number of smaller quantities represented by "quantized" values.

This is a complicated approach but in essence, it means that Ivanenko is attempting to analyze the phenomena of gravitational fields in such a way that a study of a special case, low-intensity gravitational field will give him an applicable understanding of the general gravitational field. His work thus far, he believes, has given him mathematical equations that actually describe the energy of the gravitons that make up the portion of the gravitational field he has been examining. From this knowledge of the particular, so to speak, he believes it might be possible to get worthwhile data on the general field. And if his theory is true, the workable knowledge of the general gravitational field might eventually lead to an understanding of how to nullify its activity.

It is also the opinion of scientists in the Soviet Union that Ivanenko's theory of gravitation, developed in the early 1950s, is the most significant and, mathematically, the most nearly proven theory available in this day and age. In a 1952 book, *The Quantum Theory of Fields,* written with A. A. Sokolov, Ivanenko summarizes the results of his study of gravitation, and he and Sokolov advance theories and hypotheses that seem to be shared by the majority of their colleagues in the Soviet Union.

It is interesting to note that Ivanenko's approach to the study of gravitational phenomena, however, does not appeal to some Western physicists. In fact, a well known Austrian scientist, W. Pauli, considers the quantization of a weak field as being devoid of any significance.

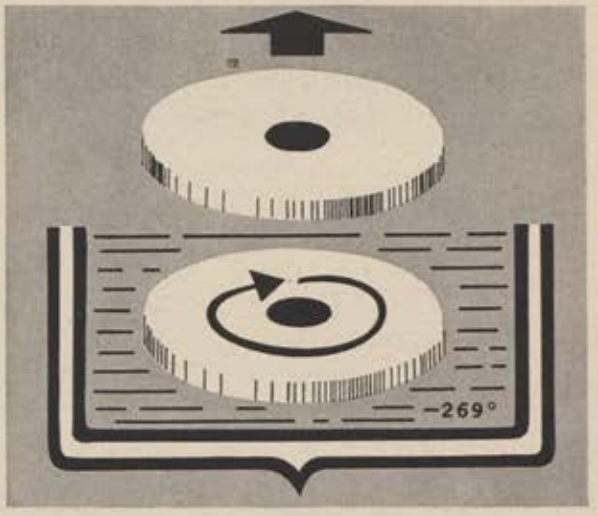
Stanyukovich does not hold entirely to Ivanenko's theory, and in recent literature has explained what he calls the hydrodynamic theory of gravitation. Somewhat oversimplified, his idea suggests that the reason bodies attract mutually is that a jet-exhaustlike reaction results from the action of the gravitons in the space between the bodies. What happens, he suggests, is something like the following: The concentration of gravitons in the space between the bodies builds up a pressure between the bodies. This, at first glance, would seem to cause the two bodies to push apart, as would two jets of water played at each other. But, meanwhile, he says, the gravitons in the space around the bodies, not under the same tight pressure, move outward in all directions away from the bodies, causing a thrust *inward* of the bodies toward each other.



Stanyukovich's "hydrodynamic" theory of gravitation. The intensity of the gravitational field, caused by the emissions of "gravitons" from the bodies, is considerably greater in the area between the two bodies than at any other point around the bodies. Therefore the emissions of gravitons into the area of greater intensity, or crowding of gravitons, will be less than the push outward of gravitons on the nonfacing sides of the bodies. This outward thrust pushes the two bodies inward.

Stanyukovich goes along with the theory regarding the existence of gravitational waves and gravitons, but he believes that the intensity of graviton radiation by a body (1) is proportional to its mass; (2) is proportional to the acceleration acting on a given body, that is, depends, in

One way to overcome gravitation. This is a diagram of Arkad'yev's experiment described in text. He immerses a lead ring into a container filled with liquid helium, cooled to —269° Centigrade. The lead ring becomes a superconductor. He then holds a ring-type permanent magnet made of an iron-nickel-aluminum alloy over the helium. Due to mutual induction, the lead ring becomes a powerful magnet. The repulsive force generated is enough to hold the permanent magnet in midair. A neat trick, not unknown in the West.



the case of an isolated system of two bodies, on the mass of the second body; and (3) depends on the surrounding gravitational field similar to the way the rate of flow of combustion products into a medium depends on the gas pressure in that medium.

According to Stanyukovich, all elementary particles of the atomic nucleus (nucleons) and of the atomic shell (electrons) are in a continuously excited state—pulsating or oscillating. Since these oscillations, Stanyukovich says, take place in the gravitational as well as the electromagnetic field, they are accompanied by the emission of energy; gravitons are elementary portions of the energy thus emitted.

Among other things, Stanyukovich believes that transformation of a substance into gravitons is affected by temperature. Gravity, he believes, is not the constant force it appears to be. As the temperature of a body decreases, the rate of emission of gravitons likewise decreases and their interaction with surrounding bodies diminishes accordingly. A loss in the apparent weight of the body would be the result. If he is right, supercooling might be the road to antigravitation.

These, then, are the basic theories regarding the nature of gravitation, as seen by two of the more prominent Soviet gravitational theorists. But what about actual demonstration of these theories? And what about research and development in the Soviet Union with respect to antigravity and antigravitational devices?

In point of fact, antigravity or antigravitation, as a separate and distinct field of endeavor, has progressed little—if at all—beyond the realm of theory. Soviet literature shows little in the way of laboratory demonstration work. But one experiment described in the literature indicates that Soviet scientists are interested in means of determining how gravity could be nullified or, more accurately, *overcome*, at the expense of an insignificant amount of energy.

The experiment, by V. K. Arkad'yev, immersed a lead ring in a container of liquid helium, the temperature of which was —269° C. Under these circumstances (*see cut*), the lead ring became a superconductor. A ring-type permanent magnet was then held over the helium and released. The repulsive force generated by the lead ring, which due to mutual induction became a powerful magnet, was sufficient to hold the permanent iron-nickel-aluminum alloy magnet in the air directly over the lead ring immersed in the helium. There is nothing fantastically new about this approach, but it is a way of using magnetism for "lift."

About the only other word concerning Russian efforts to develop antigravity devices comes from Stanyukovich himself, who has been quoted by Tass, the Soviet news agency, as saying that "The USSR is working on a 'graviplane,' i.e., a space vehicle not subject to the law of gravity." Apart from this bare and rather cryptic announcement, nothing further has been said about the "graviplane" or any other similar device.

It remains to be seen whether Soviet theories concerning the nature of gravitation are valid, but it is apparent from Soviet literature that the USSR is showing much more than a passing interest in this field.—END

The authors of the above survey, Boris Kit and Russell R. Zavistovich, are colleagues at the Library of Congress. Mr. Kit's background is in the physical sciences, while Mr. Zavistovich's field of special interest is electronic engineering. Mr. Kit received his academic training abroad, while Mr. Zavistovich studied his specialty in the US.

Science, like war, is too important to be left entirely to the scientists. Intelligent outside evaluation is needed if it is to be understood not only by the public and by the decision-makers, but by the scientists themselves . . .

SCIENCE | *its true nature*

JOHN R. PLATT

SCIENCE no longer needs to be explained just to laymen and citizens and children; it now needs to be explained to statesmen and philosophers.

What shall we give these audiences? Everyone has his own recipe, but I am sure we are all agreed that quiz-show facts are not enough. Perhaps the American public knows more facts that are almost right than any other public in the world. But even if the facts are right, the public needs something larger if it is to understand what science is all about.

What I want to pick out and discuss here are particular qualities of basic science—not of technology, but of basic science—that I think a citizen in a scientific society should be shown over and over until he begins to feel them for himself. One quality I have in mind is the excitement of science; another is the incompleteness of science.

To say that basic science is exciting may sound like a contradiction. We are used to the really spectacular excitements of the engineers with their radar and rockets, and the life-and-death excitements of the doctors—the biological engineers—with their white coats. By contrast, the intellectual excitement of a man sitting over a microscope in a university basement, tracking down a clue, may seem pretty tame. But I would remind you that there are intellectual excitements that are not tame at all and that we remember all our lives. One is the thrill of following out a chain of reasoning.

Intellectual thrills in science are not something distant or alien, but something closely continuous with our everyday thinking. It is true that science is complex. This is because so many men have been building it up for so long. Nevertheless, every individual step in it is a little inference as simple as looking out at the weather and deciding whether or not to take a raincoat. When we look at a celebrated rocket engineer like Wernher von Braun, we see a man running a big complex organization and dealing with incredible horsepower. But when we look at a fundamental scientist like James Van Allen, the university professor whose tiny satellite equipment detected the radiation belts around the earth, what we see is essentially a man stepping to the door of his planet to see how the temperature is outside.

What is essential in any science story is the little chains of everyday inference—the reasoning. It may surprise many people to know that the chain of new scientific reasoning in a whole research study is frequently less complex than an everyday business decision or a crossword puzzle or a game of chess. It would have a salutary effect on our attitudes if for twenty-four hours we could cross out the words "science" and "scientist" wherever they appear, and put in their place the words "man reasoning." Even in the mathematical sciences, like physics, it is the reasoning that

comes first, the equations second; and the equations will not save the theory if the reasoning is wrong. It cannot be said too often that science is not mathematics, but reasoning; not equipment, but inquiry.

The master at demonstrating reasoning to a mass audience was Conan Doyle. It would not be far wrong to think of every science story as his kind of story, with its puzzles and its suspense, its false leads and frayed tempers, and its brilliant Sherlock Holmeses and its half-brilliant Inspector Lestrades and its admiring Doctor Watsons. It is interesting to remember that Galileo used a very similar group of characters to explain his theories.

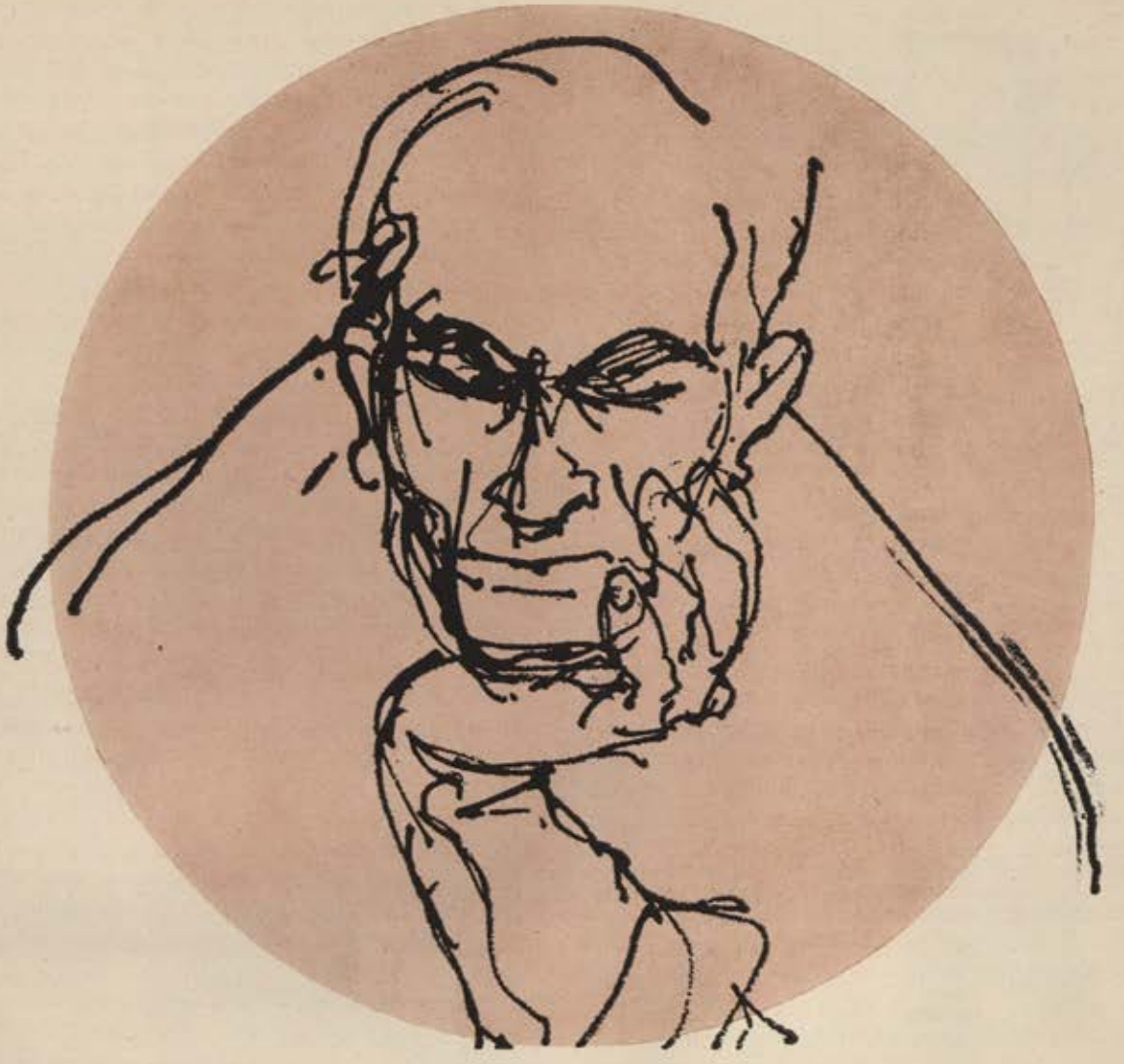
All science has gaps in it. The most familiar are the inevitable small gaps, the data that one could still go on taking, the unexamined minor assumptions or the unresolved questions. Most of these do not bother us, because we realize that a scientific age is an age of tentative conclusions and working rules that may well have to be changed later. Yet it is important for us to emphasize this incompleteness, especially to the young, because they have hopes and aspirations and they want an open-ended story, with something left for them to do when they finally take our places.

What is not so often realized is that science is incomplete in more serious ways, with gaps that scientists themselves, tied to their own narrow specialties, hardly realize the existence of. In some ways, for all its diversity, science is narrower now than it has ever been before. Few of the men who work on photosynthesis know anything about physics; few of the men who work on nervous tissue know any organic chemistry; few of the men who work on the brain have any understanding of the mind. There are exceptions. An Enrico Fermi or Edward Teller or Harold Urey can work on stars or nuclei or molecules, just as his fancy strikes him. A John von Neumann can work on quantum mechanics as well as the theory of games. A Percy Bridgman can work on solids as well as logic. But for every such man, there are hundreds who spend their lives repeating the kind of experiments they did for their doctor's degree.

Even the intellectual leaders are blind to some fields. For over a century, some of the greatest physicists, Young and Maxwell and Helmholtz and Schrodinger, thought it of the greatest importance to study human visual perception. Today, I daresay not one of the twenty leading physicists in this country would have even a casual interest in this subject. Likewise, interest in the philosophy of physics has dropped almost to zero among the bright young men; yet this field may simply be waiting for a new Ernst Mach who will stir it up and pave the way for another revolution like relativity. And we have all noticed such blind spots in the more technical fields, where it has suddenly been discovered, for instance, how badly everyone has been neglecting oceanography, an area perhaps of central importance for our future food and resources.

I think these gaps cry out for reviewers and critics broadly trained and broadly read, who are competent to see what the neglected areas are and to encourage the young to go into them. A balanced and vigorous science requires a balanced and vigorous criticism. Science, like war, is too important to be left to the scientists. Intelligent outside evaluation is good for a department, it is good for a university, and it would be good for science itself. The incompleteness of science is a challenge to great criticism.—END

A member of the University of Chicago physics faculty, Dr. Platt has been teaching and researching for more than two decades. The above, first presented at a Thomas Edison Foundation Symposium, is reprinted in this form, with permission from Saturday Review, *of January 2, 1960.*



AN INCH IS AN INCH

LT. COL. CARROLL V. GLINES, USAF

An unsung but vital space-age need is precise standardization of measurement equipment, a requirement the Soviets fully realize and are working at . . . as is a little-known army of Air Force mobile specialists

A ROSE ISN'T ALWAYS AN INCH

A ROSE is a rose is a rose may be true, but an inch is an inch is not always an inch. One of the major paradoxes of today's science is the fact that we cannot be sure anything we mass produce will match exactly from item to item in form and function. A significant cause of this annoyance is that there is no real agreement on the basic units of measure.

The most common linear measurement in the English-speaking world, the inch, comes in three different sizes. There is the American inch which equals 25.4000508 millimeters. The United Kingdom inch equals 25.399956 millimeters, and the Canadian inch is exactly 25.4 millimeters. (As of July 1, 1959, the English-speaking nations of the world agreed to standardize on Canada's 25.4 millimeter inch as the so-called International Inch.) This disparity means nothing to the layman, but space technology people and other physical scientists are frustrated by the minute differences.

The demand for extremely precise measurements in length, time, electricity, weight, temperature, pressure, shock, optics, and radiology have pushed the state of the metrology art to the breaking point. The lack of uniformity has slowed technological progress on all fronts.

The National Bureau of Standards, hard pushed to maintain a national *status quo* in the science of measurement, is often not aware of a need for a certain kind of calibration until a specific request is received from industry. In order to fill a request for a new "exotic" calibration, funds must be requested from Congress to buy the equipment to meet the demand. This lead time causes unacceptable delays in important defense programs.

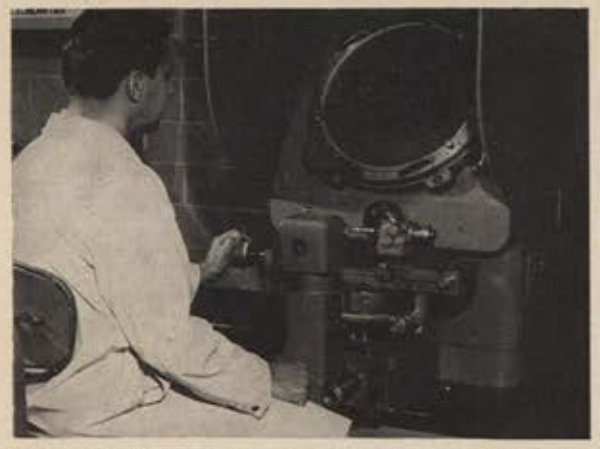
Industry, continually making rapid scientific breakthroughs, has been frustrated to the point where it turns to commercial measurement laboratories, calibrates its own equipment, or lets the matter slide hoping that, when a standard is established, theirs will be within acceptable limits. The possible result? Failures at Cape Canaveral and Vandenberg AFB, not to mention the daily accidents and materiel failures in manned weaponry and errors in design or problems in weapons on the drawing board.

Uniformity in weights and measures and the necessity for national standards was recognized as far back as 1776 when the Articles of Confederation were being written. That document said: "The United States in Congress assembled shall also have the sole and exclusive right and power of . . . fixing the standard of weights and measures throughout the United States."

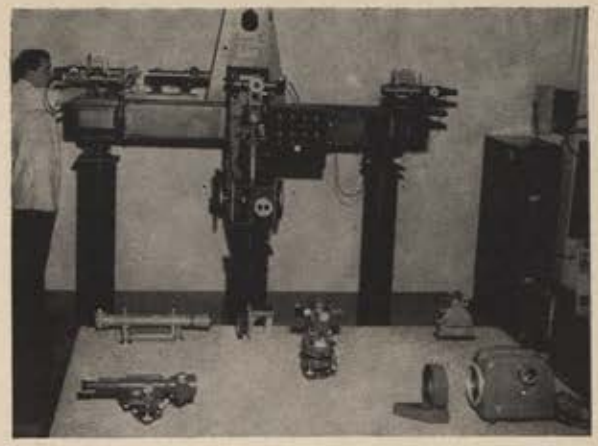
But in spite of this foresight not much was done. There was in this country overwhelming resistance to the metric system. The British system of weights and measures wasn't well established even in Britain, and several states, impatient with the Congress, set up their own standards. The yard, the foot, the inch, and the pound were peculiar to each locality and often changed at state boundaries.

It wasn't until 1828, for example, that Congress adopted the British imperial troy pound. A minister was sent to London to bring back a brass weight similar to the British master weight for the use of the Mint at Philadelphia. This brass weight became the basis of the avoirdupois pound still in use today.

One proffered solution to the measurement standard problem has been the suggested total public changeover to the metric system, already in partial or total use in most American scientific facilities. Delegates to the recent Chicago meeting of the American Association for the Advancement of Science held a panel discussion of the pros and cons of changeover, heard the report of one pharmaceutical company on its changeover, which took six months and was considered highly successful. Proponents of the switch to meters and grams believe that despite the sizable public education program that would have to attend the changeover, its standardization fruits would be worthwhile. They add that the longer the changeover is delayed, the more difficult it will be to effect. Opponents of changeover say that switching from inches, pounds, miles, etc., to what is essentially an entirely different system would be more trouble than it is worth.



This "optical comparator" gear, used by Air Force in calibration work, is but one of the highly specialized weapons in the battle for exactitude.



More complex hardware currently in USAF calibration program. The technician is certifying the precision of an alignment telescope in AF lab.

From this crude beginning, there gradually evolved standards for the gallon, the bushel, and the yard. But as time passed, Congress found that measurement needed firmer control. The National Bureau of Standards was finally established in 1901 to meet this need. But today, the job is getting even tougher, and additional thought and effort is becoming necessary.

The need for precise measurement is perhaps most acute to Air Force and industry missile engineers who listen, haggard and tense, to the countdown inside their sand-bagged blockhouses. When that agonizing moment of truth arrives, everyone wonders, "Will it work?" Will the thousands of small parts, fitting together in precise order, function together—and on time? In an ICBM, for example, there are more than 153,000 separate elements. If each one should check out 99.98 percent of the time, the composite missile would be only ten percent accurate. As everyone knows, there have been some notable successes and some colossal failures. The failures, often traceable to measurement inconsistencies, have brought home the unalterable fact of the importance of exact measurements *emanating from a single source* all too often in the last five years.

Recognizing the space-age stakes at exact measurement, the Air Force has begun a vigorous Calibration Program which has already yielded dividends in increased weapons reliability. In the procurement of new weapons, it is now mandatory that all contractors doing business with the government have their measuring devices calibrated periodically and their standards traceable to the National Bureau of Standards.

The Air Materiel Command has stationed a Calibration Detachment at the Colorado facility of the NBS at Boulder, under the direction of the Dayton Air Force Depot, the Air Force's principal Calibration Laboratory. Each of the nine Air Materiel Areas of AMC maintains a calibration laboratory fully equipped to provide calibration services to Air Force bases and missile sites around the world.

The "calibrators," operating out of the nine depots as teams, perform their measurement science job at aircraft control and warning sites, missile bases, and air bases in the US, and at sites as far off as Newfoundland, Greenland, Bermuda, and the Azores. In a single year one group of technicians has calibrated more than 6,300 pieces of complex electronic gear used in our early-warning systems.

Traveling by helicopter, jeep, dog sled, and even on snowshoes, one team services the vital network of early-warning stations and Texas towers guarding our borders. On a recent calibration trip to the north country, one team had to work in temperatures of minus thirty-one degrees at Thule, Greenland, while another battled giant snowdrifts on a trip to an aircraft control and warning station on the Canadian border.

Although just getting the men to the sites is tough enough, bigger problems are posed for the delicate electronic equipment, which is particularly sensitive to jolts and bumps. Calibration instruments for the Texas towers, for example, must be transported gently and laboriously by ship. The vibration of a helicopter could ruin them.

To ensure that Air Force contractors have accurately calibrated equipment and that it is kept that way, future Air Force contracts will specify

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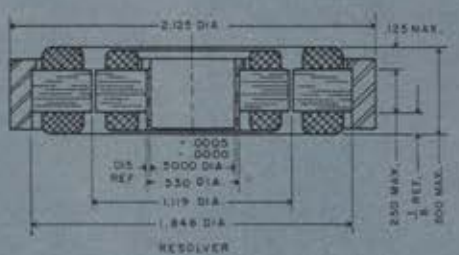

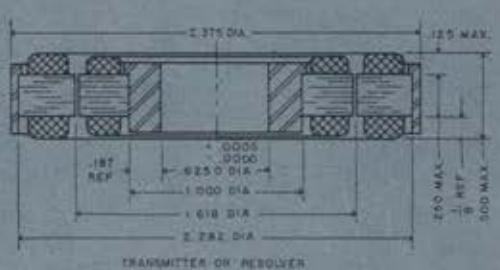

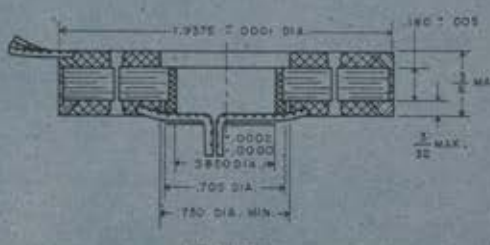

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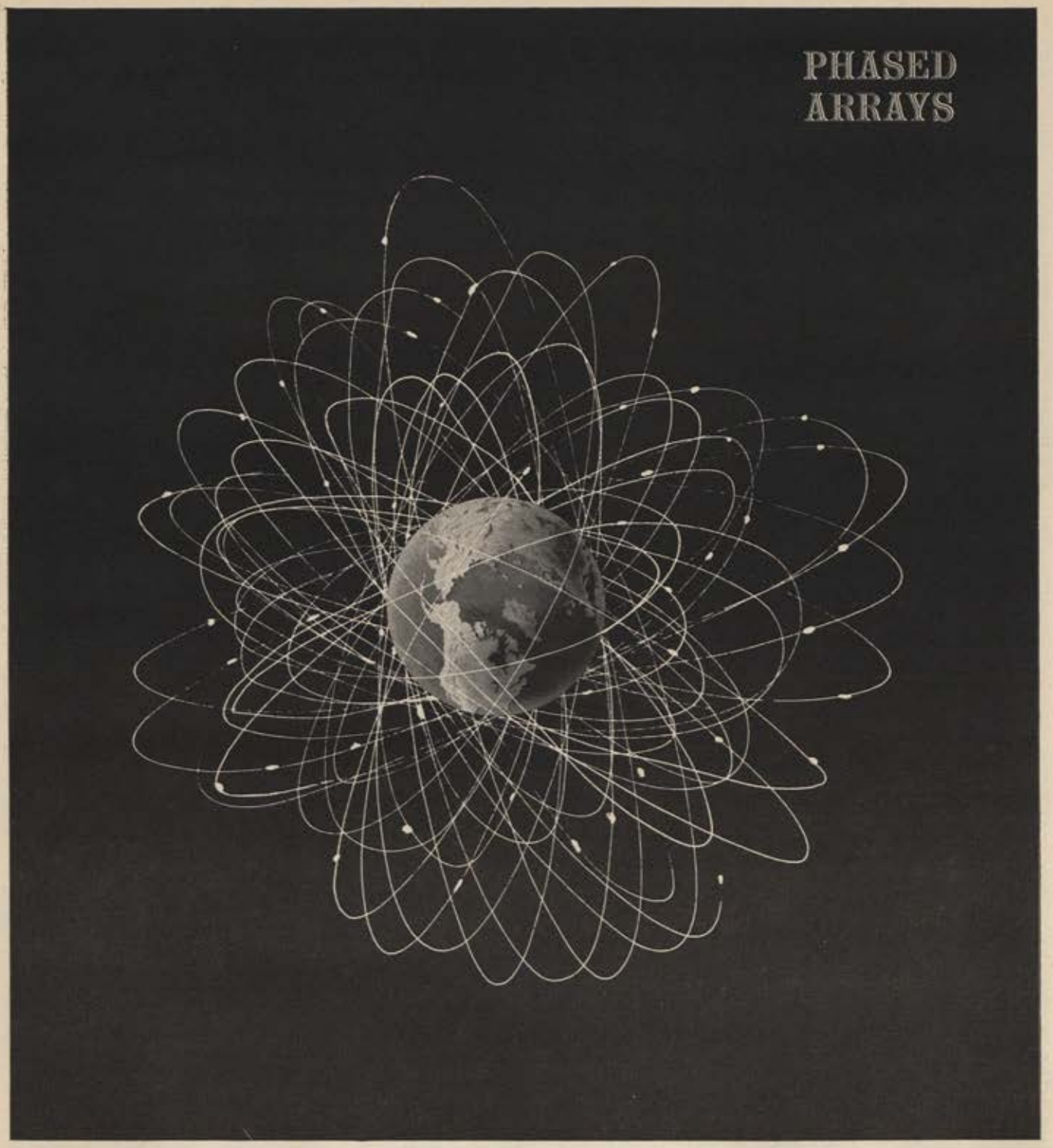

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that each contractor maintain current evidence that his measuring equipment has been checked with the NBS or against standards which have themselves been derived as directly as possible from the NBS.

Meanwhile, AMC has an extensive program to make sure its own precision equipment is in order. Plans are under way to convert a $14 million surplus heavy press plant at Newark, Ohio, into a calibration facility. A seismic study has shown that this building, originally built to house one of the world's largest aluminum extrusion presses, is nearly perfect for vibration tests on gyros for inertial guidance systems to be used in tomorrow's spaceships.

The unique structure has large concrete pits sixty feet below the surface. The walls of the pits are forty-eight inches thick, and the floors are fourteen feet thick.

At the same time, AMC is maintaining the equipment already in the inventory. Radar stations, maintenance shops, and laboratories all over the Air Force can't shut down just to have their equipment calibrated. Mobile vans hit the road around the clock and around the country to check standards and measurements. The converted trailers are loaded with $30,000 worth of electronic equipment with complete climatic controls. A crew of three technicians drive the van and operate the "transfer standards." The trailers have their own electrical generating systems, air conditioning and heating units, work counters, and storage facilities. All are insulated throughout with fiberglass. Each van saves more than $100,000 per year in transportation costs of shipping the fragile equipment to the depots for test and repair and then back to the user. Delicate radar and other electronic equipment doesn't have to be moved and the risk of damage or decalibration is nonexistent.

While our own engineers fully realize the value of extreme accuracy in measurement, what gives the Air Force particular cause for alarm is the advancement made by Russian metrologists in the state of the art in the last five years.

The Russians, in their sixth Five-year Plan, which began in 1956, have set a goal of a seventy percent increase in their means of production. They call for an increase of eighty percent in the output of the machine tool industry. Most significant is the fact that their plan calls for a 300-percent increase in their instrumentation industry.

The entire Soviet measurement program is under a Committee on Standards, Measures and Measurement Apparatus of the Council of Ministers. They have set up five research institutions under the Committee to work on new and improved techniques for physical measurement. Under the supervision of these institutes is a vast network of calibration centers, which will reach 129 in number by next year.

A Standards and Measurement Conference was held three years ago in Moscow, which revealed some startling advances in Russian appreciation of the science of measurement. In their four-day conference they discussed research problems relating to production, precision, interchangeability, and engineering measurement which indicated how far their thinking had gone. The most revealing achievement *at that time* was their calibration of temperature-measuring devices.

They declared they were prepared to make calibrations of temperature-measuring devices up to 6,000° centigrade and had plans to extend this to 12,000° centigrade by 1960. It is an unclassified fact that our National Bureau of Standards has the means to check temperatures accurately to only 2,800° centigrade and cursorily to about 4,000° centigrade. The reason for this is that the best temperature-producing device we have is a small solar furnace capable of attaining temperatures of about 3,500° centigrade. This could mean that the Russians are winning the race against us in the development of high-energy fuels.

What does all this mean to the Air Force and the nation? It means that we as taxpayers had better be concerned about how accurately we can measure our inches, pounds, volts, degrees, roentgens, and millibars. The Air Force has recognized the problem and is doing something about it. The National Bureau of Standards is appealing to Congress for more funds, not just to keep abreast of technological advances in other fields but to try to get ahead. The aerospace industry is taking steps to improve the situation, too. It is good space-age news that we are beginning to give serious attention to making an inch an inch.—END

Colonel Glines, Chief of the Plans and Analysis Branch, Quality Control, Hq. Air Materiel Command, Wright-Patterson AFB, Ohio, is a versatile commentator on aerospace matters. Author of a recent book on the C-47, he contributed three articles to AIR FORCE/SPACE DIGEST *last year: "Have Show . . . Will Travel"* (December '59); *"Billion Dollar Boneyard"* (August '59); *and "Wanted: Old Airplanes,* (March '59).

Space Technology and the Cold War

The international competition problems of expanding space technology in a hostile world cannot be evaded on the assumption that a clear distinction exists between military and "peaceful" uses of astronautics . . .

From *United States Foreign Policy, Developments in Military Technology and Their Impact on United States Strategy and Foreign Policy*, a study prepared by the Washington Center of Foreign Policy Research of the Johns Hopkins University for the Senate Foreign Relations Committee, submitted in October 1959.

IT IS . . . apparent that foreseeable technological developments will sharpen existing tensions between the United States and the Soviet Union and provide fruitful sources of new ones. . . . Certainly the competitive exploitation of space opens a new arena for the conduct of cold, limited, and even hot warfare. The past controversy over satellite radio channels for the International Geophysical Year is a forerunner of these space disputes; other predictable controversies will involve the extension of national sovereignty and territorial boundaries into space, conflicting utilization of radio transmission frequencies, the identification of "dark" satellites, electronic, and perhaps even physical interference between rival space systems, and conflicting activities on the moon and planets. Of these the reaction of both adversaries to the satellite "spies in the sky" now being groomed for their maiden flights will provide an early example.

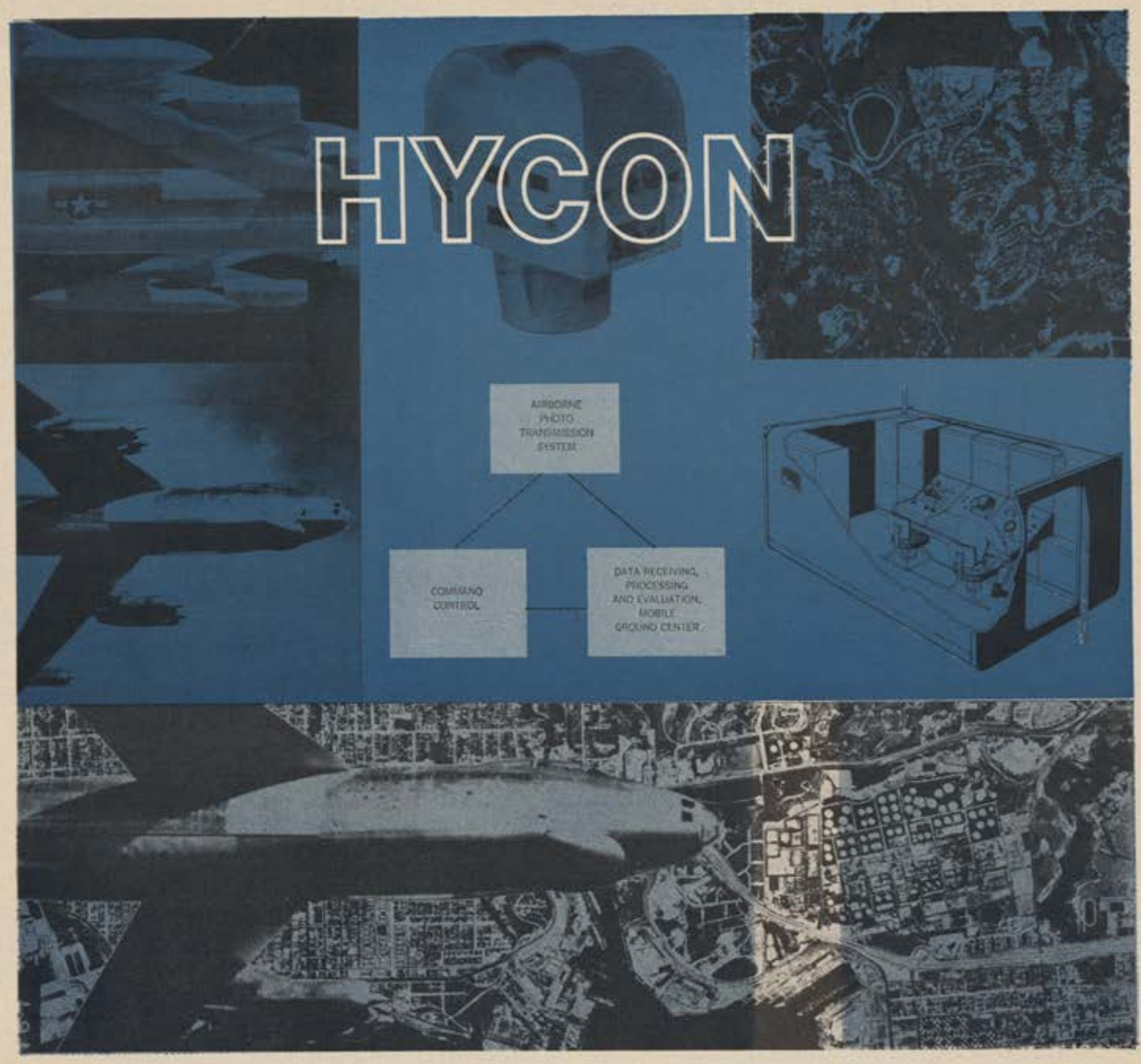
These problems cannot be evaded on the assumption that some clear distinction exists between military and "peaceful" uses of space. In an age when global warfare is possible and weather control anticipated, even the geographic and meteorological mapping of the earth from satellites is clearly related to the employment of existing weapon systems and the development of new ones. Satellite and satelloid reconnaissance systems are obvious military tools. The purpose of navigation satellites has been slated as that of enabling ships, combat aircraft, and submarines to determine their position with great precision, a capability requisite to the accurate launching of ballistic missiles. The very uncertainties which now pervade predictive thinking on the military utilization of space make it the more difficult to divide space research into military and peaceful areas.

Like development of the intercontinental missile itself, man's growing ability to utilize space may make international cooperation and control the more desirable, but the more difficult to achieve. The surrender of national sovereignty now believed necessary for an effective international warning system against missile attack is indicative of these problems.

The anticipated weapons will also heighten existing tensions by increasing uncertainties about enemy intentions while multiplying both the means and the speed with which devastating attacks can be launched. It is now impossible to distinguish a missile submarine from other nuclear submersibles underwater, and the same may soon be true of an IRBM-armed merchant ship, a Minuteman-equipped train or barge and, possibly, a satellite bomber. The destructive potential of these weapons, their small size, and their numerous possible disguises also increase the degree of sovereignty that must be surrendered to make feasible their control.

These observations lead to the conclusion that the speed and potential decisiveness with which war can be initiated will be increasingly facilitated by the anticipated progress of military technology during the next decade. This refers to the unilateral mechanics of projecting military force, not necessarily to the utility, rationality, or the probability of such action (which may well continue to recede). But since it is the requisite mechanical capability that makes initiation of war possible, initiation of war will remain a course of action open to the potential aggressor for at least the next decade.

The problem for military and foreign policy is therefore how best to remove or avoid the incentives and temptations that might lead the Soviet Union to take such a course. In part, but only in part, this may be done by the utilization of military technology to increase the retaliatory hazards to that nation of a surprise attack.—END



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The current minimum approach to a British space program, involving not much more than firing of British instruments aboard US rockets, has excited controversy—reflected in views such as . . .

British Space Policy . . . A Dissent

KENNETH W. GATLAND

The Royal Society and Advisory Council on Scientific Policy recommend for Britain a small-scale upper atmosphere research program using US rockets. The following, excerpted with permission from The Aeroplane and Astronautics, *questions this policy, calls for a strong UK space effort.*

OF ALL nations outside Russia and America, the [British] are in the best position to embark on a useful program of astronautics for, within the Commonwealth, not only have we an excellent overland range [Woomera, Australia], but also a most potent rocket system in the Blue Streak and Black Knight. . . .

We . . . have all the basic ingredients of a space program which could effectively carry us into the province of practical developments, from communication satellites to the beginnings of manned spaceflight—all existing and paid for under the military budget. The necessary additional work to adapt the Blue Streak and Black Knight would be small compared with the sum already invested, but the experience we should gain in new techniques would be immeasurable.

This does not, of course, mean that where the opportunity exists we should not cooperate with other countries. But can we expect real cooperation with the United States, or anyone else, unless in turn we have something to offer? . . .

The alternative to entering the spaceflight picture is that we should continue to develop instruments and allow the Americans to fire them into orbit; and, no doubt, this would satisfy the Royal Society's purely scientific interest in space research. But by no stretch of the imagination would this allow our industry to gain the experience it may need in the future.

Thoughts of a common interest among various nations raise the question of whether, in fact, Britain and the Commonwealth might join forces with European countries in astronautics, on the lines in which several nations are already cooperating in nuclear power. Certain projects, by their nature, seem certain to affect other European countries—ground stations for TV and other radio-repeater satellites, for example—and some enterprising nation could easily become the main link in a comprehensive system of communications.

Once again, Jodrell Bank has shown the way experimentally, for communication links have already been made with a station in America using the moon as a "reflector" for radio signals. This spring, the giant radio-telescope is expected to be used again in providing a European link with North America, during experimental transmissions in which 100-foot diameter inflatable satellites will serve as reflectors at 1,000 miles' altitude. However, if we are to take advantage of this pioneer work, it is essential that our electronics industry is enabled to get to grips with the problems of helping to develop this system for commercial use.

There are, of course, many other ways in which we may share research activities with other countries. In aviation, for example, the [obsolescence] of military aircraft has been inevitable and much useful experience will be lost when it comes to designing supersonic—and, dare one say it—hypersonic transports. Yet it is difficult to foresee any really major technical advance in aviation which does not involve higher speeds and altitudes, and the demarcation line between aeronautics and astronautics may be difficult to find in the future. The boost-glider is a case in point. A rocket, or rocket/ramjet combination, is required to accelerate it to hypersonic speed, and the vehicle itself owes something to both aeronautics and "space ballistics."

Can we afford to be without experience in the new era of flight? If we neglect it, our design and research teams will be starved of experience, and the associated electronics and light engineering industries which depend on high-performance aviation will also suffer. . . .

It seems inevitable . . . that lack of initiative

in the space sciences will be reflected all down the line in a wide variety of fields outside . . . aviation and spaceflight.

How, then, could we go about shaping a program of astronautics? Mercifully, we are spared the turmoil of a "prestige" race and can be selective in what we attempt. The last thing we should want is a space program striving to cover every possible field of interest, and it is for this reason that we should be very sure of our objectives. A comprehensive technical assessment, conspicuously lacking at the present time, is needed to determine all the opportunities for space research and development, and the authorities could very well spend the next twelve months in obtaining one from people who really know the subject. . . .

So far as launching vehicles are concerned, the same combination of Blue Streak and Black Knight as used to launch research instruments or a communications satellite could equally be used in developing boost-glide techniques. Within three to five years, half-scale vehicles on the lines of the . . . "pyramid" reentry glider could be launched using these two rockets. . . .

[The accompanying chart] gives a summary of a possible ten-year program of spaceflight based on rockets already developed in the UK military program, with further developments which might stem from this basic equipment. A cooperative program would not necessarily restrict its development to existing vehicle combinations. In the years ahead, the addition of a high-performance upper stage for Blue Streak, using, perhaps, liquid hydrogen/liquid oxygen, would enable a useful space program to be continued for perhaps a decade using this one basic booster. A vehicle of this kind would probably be capable of launching a manned reentry glider capable of ascending into orbit, making a few orbits of the earth followed by reentry and landing.

Neither would this be the limit of available booster hardware, for the development of a vehicle clustering four, six, or eight Blue Streak engines could follow as the program got under way. Thus, heavier payloads could be lofted into orbit, or deep space missions could be planned, as the need arose. All this should be within the province of a joint British Commonwealth-European program, linked with the United States. . . .

One . . . point concerns the fate of such expensive military projects as the Blue Streak if nuclear disarmament becomes a reality. Without its thermonuclear warhead, the missile would be virtually useless as a weapon, but under the space-budget, its [useful] development could continue. . . .

Neither should the point be overlooked that, under full disarmament, a nation may agree to put away its military rockets and space projects but would legitimately maintain to the full its experience in the most advanced techniques of space ballistics and boost-glide flight. Thus, in the future, America and Russia could agree to disarm without either dropping its guard too far.

In the final analysis, a nation such as our own, which lives so largely on the initiative and ingenuity of its scientists and engineers, cannot afford to allow its technology to come to a halt in any direction. The facts speak for themselves. There is clearly a technological case for space development as well as a scientific case.—END

Opportunities open to a Commonwealth, or Commonwealth-European, astronautical program integrated with UK ballistic missile program over the next ten years (in-being projects italicized).

Vehicle	Date	Purpose	Notes
Skylark	1956	Upper atmosphere research (altitude approx. 100 miles; payload 50/150 lb.).	First British high-altitude rocket.
Black Knight	1958	Reentry research; upper air physics (altitude approx. 500 miles).	No failures in five consecutive launchings.
Black Knight two-stage	1960	Reentry research; higher velocities.	Addition of solid-propellant top stage.
Black Knight three-stage	1961	Orbit 10 lb. at 300 miles.	Simple development from existing two-stage vehicle to satellite launcher.
Blue Streak	1960	Intermediate-range ballistic missile; approx. range 2,800 miles.	Approx. equivalent to US Titan ICBM first stage.
Scout	1961	Orbit 150 lb. at 300 miles.	American 4-stage all-solid vehicle; to be used to orbit British instruments.
Blue Streak/ Black Knight	1962	Orbit payload of 1,000 lb. plus at 300 miles.	Straightforward adaptation of two existing rockets, making possible initial experiments with communication satellites, etc.
Blue Streak/ high-energy top stage	1965	Orbit payload of 4,000 lb. plus.	Manned reentry research. (Boost-glide prototype).
Booster with clustered Blue Streak engines/ Blue Streak/ high-performance top stage	Late 1960s	Orbit payload of several tons.	Large satellite research; development of boost-glide techniques. Experiments in booster recovery.

Kenneth W. Gatland is a founder member of the British Interplanetary Society, a veteran aircraft designer, and the author of many articles and a well known book on missiles and astronautics.

Stairway to space

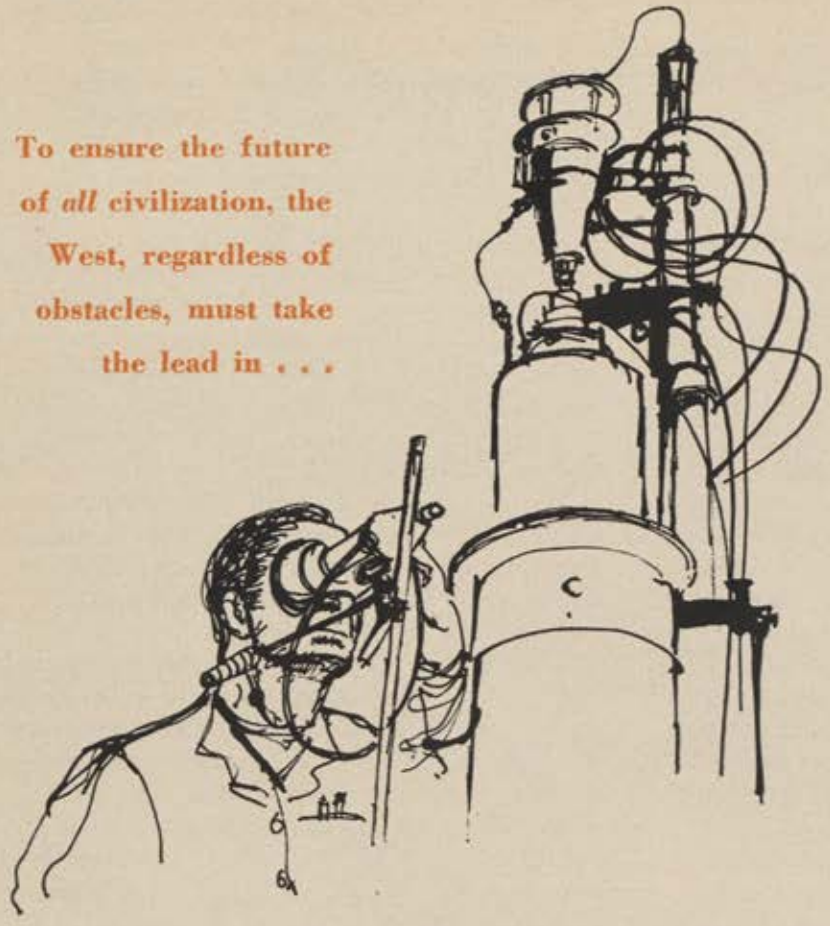
Sometime in the 60's, America may have a manned station in space—and it could look a lot like this scale model by Lockheed.

We have much to learn before it can be built. Research is our stairway to space—basic research that seeks to discover the new rather than develop the known. We cannot predict what such research will discover, or when—but we delay it or curtail it at our peril.

Today, at Lockheed's Missiles and Space Division, more than 5,000 scientists and engineers are engaged in one of U.S. industry's broadest research and development programs. One group is conducting private industry's largest, most diversified program of fundamental research in space physics. Already they have made massive contributions to America's space technology—particularly in the Discoverer, MIDAS, and Samos satellite programs of the U.S. Air Force.

LOCKHEED MISSILES & SPACE DIVISION

To ensure the future of *all* civilization, the West, regardless of obstacles, must take the lead in . . .



BRINGING THE *SPACE AGE* TO THE *HAVE-NOT* NATIONS

C. P. SNOW

THERE is no getting away from it. It is technically possible to carry out the scientific revolution in India, Africa, Southeast Asia, Latin America, the Middle East, within fifty years. There is no excuse for Western man not to know this. And not to know that this is the one way out through the three menaces which stand in our way—H-bomb war, overpopulation, the gap between the rich and the poor. This is one of the situations where the worst crime is innocence.

Since the gap between the rich countries and the poor can be removed, it will be. If we are shortsighted, inept, incapable either of good will or enlightened self-interest, then it may be removed to the accompaniment of war and starvation; but removed it will be. The questions are, how, and by whom. To those questions, one can only give partial answers; but that may be enough to set us thinking. The scientific revolution on the world-scale needs, first and foremost, capital: capital in all forms, including capital machinery. The poor countries, until they have got beyond a certain point on the industrial curve, cannot accumulate that capital. That is why the gap between rich and poor is widening. The capital must come from outside.

There are only two possible sources. One is the West, which means mainly the US, the other is the USSR. Even the United States hasn't infinite resources of such capital. If they or Russia tried to do it alone, it would mean an effort greater than either had to make industrially in the war. If they both took part, it wouldn't mean that order of sacrifice—though in my view it's optimistic to think, as some wise men do, that it would mean no sacrifice at all. The scale of the operation requires that it would have to be a national one. . . .

The second requirement, after capital, as important as capital, is men. That is, trained scientists and engineers adaptable enough to devote themselves to a foreign country's industrialization for at least ten years out of their lives. Here, unless and until the Americans and we [British] educate ourselves both sensibly and imaginatively, the Russians have a clear edge. This is where their educational policy has already paid big dividends. They have such men to spare if they are

needed. We [British] just haven't and the Americans aren't much better off. . . .

These men, whom we don't yet possess, need to be trained not only in scientific but in human terms. They could not do their job if they did not shrug off every trace of paternalism. Plenty of Europeans, from St. Francis Xavier to Schweitzer, have devoted their lives to Asians and Africans, nobly but paternally. These are not the Europeans whom Asians and Africans are going to welcome now. They want men who will muck in as colleagues, who will pass on what they know, do an honest technical job, and get out. . . .

That is why scientists would do us good all over Asia and Africa. And they would do their part too in the third essential of the scientific revolution—which, in a country like India, would have to run in parallel with the capital investment and the initial foreign help. That is, an educational program as complete as the Chinese, who appear in ten years to have transformed their universities and built so many new ones that they are now nearly independent of scientists and engineers from outside. Ten years. With scientific teachers from [Britain] and the US, and what is also necessary, with teachers of English, other poor countries could do the same in twenty.

That is the size of the problem. An immense capital outlay, an immense investment in men, both scientists and linguists, most of whom the West does not yet possess. With rewards negligible in the short term, apart from doing the job: and in the long term most uncertain.

People will ask me . . .: "Can you possibly believe that men will behave as you say they ought to? Can you imagine a political technique, in parliamentary societies like the US or our own, by which any such plan could become real? Do you . . . believe . . . any of this will happen?"

That is fair comment. I can only reply that I don't know. On the one hand, it is a mistake, and it is a mistake, of course, which anyone who is called realistic is specially liable to fall into, to think that when we have said something about the egotisms, the weaknesses, the vanities, the power-seekings of men, that we have said everything. Yes, they are like that. They are the bricks with which we have got to build, and one can judge them through the extent of one's own selfishness. But they are sometimes capable of more, and any "realism" which doesn't admit of that isn't serious.

On the other hand, I confess, and I should be less than honest if I didn't, that I can't see the political techniques through which the good human capabilities of the West can get into action. The best one can do, and it is a poor best, is to nag away. That is, perhaps, too easy a palliative for one's disquiet. For, though I don't know how we can do what we need to do, or whether we shall do anything at all, I do know this: that, if we don't do it, the Communist countries will in time. They will do it at great cost to themselves and others, but they will do it. If that is how it turns out, we shall have failed, both practically and morally. At best, the West will have become an *enclave* in a different world—and [Britain] will be the *enclave* of an *enclave*. Are we resigning ourselves to that? History is merciless to failure. In any case, if that happens, we shall not be writing the history.

Meanwhile, there are steps to be taken which aren't outside the powers of reflective people. Education isn't the total solution to this problem; but without education the West can't even begin to cope. All the arrows point the same way. Closing the gap between our [literary-intellectual and scientific] cultures is a necessity in the most abstract intellectual sense, as well as in the most practical. When those two senses have grown apart, then no society is going to be able to think with wisdom. For the sake of the intellectual life, for the sake of this country's special danger, for the sake of the Western society living precariously rich among the poor, for the sake of the poor who needn't be poor if there is intelligence in the world, it is obligatory for us and the Americans and the whole West to look at our education with fresh eyes. This is one of the cases where we and the Americans have the most to learn from each other. We have each a good deal to learn from the Russians, if we are not too proud. Incidentally, the Russians have a good deal to learn from us, too.

Isn't it time we began? The danger is, we have been brought up to think as though we had all the time in the world. We have very little time. So little that I dare not guess at it.—END

Author of a number of well received novels and numerous articles, C. P. Snow is that rare combination of skilled writer and knowledgeable scientist. During World War II, he headed recruitment of scientific talent in Britain. The above is excerpted from his book, The Two Cultures and the Scientific Revolution, *Cambridge University Press, N. Y., 1959, and is reprinted with permission.*

R. E. McDonald, General Manager, Remington Rand Univac Military Division, who has guided the development of all the company's significant military systems.

Noel T. Stone, Chief Engineer, Military Division: "Specialized operation enables us to concentrate on the unique demands of military development. Our reliability effort, for example, has no counterpart."

John H. Vye, Director of Manufacturing: "Complete facilities for design, development, testing, production and field service allow us to keep all elements of a program under one roof."

Lawrence Reid, Manager of Military Field Maintenance and Training: "Univac field maintenance is fully integrated with all phases of the military division, drawing at any time on the full resources and experience of the entire group."

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Military Division

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An intensified program to bring Remington Rand Univac's capabilities fully to bear on defense programs has resulted in the deployment of our St. Paul laboratories as the company's MILITARY DIVISION. The division embodies complete capabilities for research, design, development, testing, production and field engineering.

The division is a seasoned, functioning unit, with a depth of experience gained in the development of a distinguished series of defense systems. Equipment developed here has pushed the limits of reliability to the farthest point thus far attained. The division is fully capable of undertaking the most exacting programs involving automatic data processing, control systems and specialized electronic equipment.

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James D. Redding, Director of Military Applications: "Experience . . . We can only point to the work we've already done."

Control and data systems developed by the Remington Rand Univac Military Division include:

ATHENA, the Ground Guidance Computer for the U.S. Air Force ICBM TITAN.

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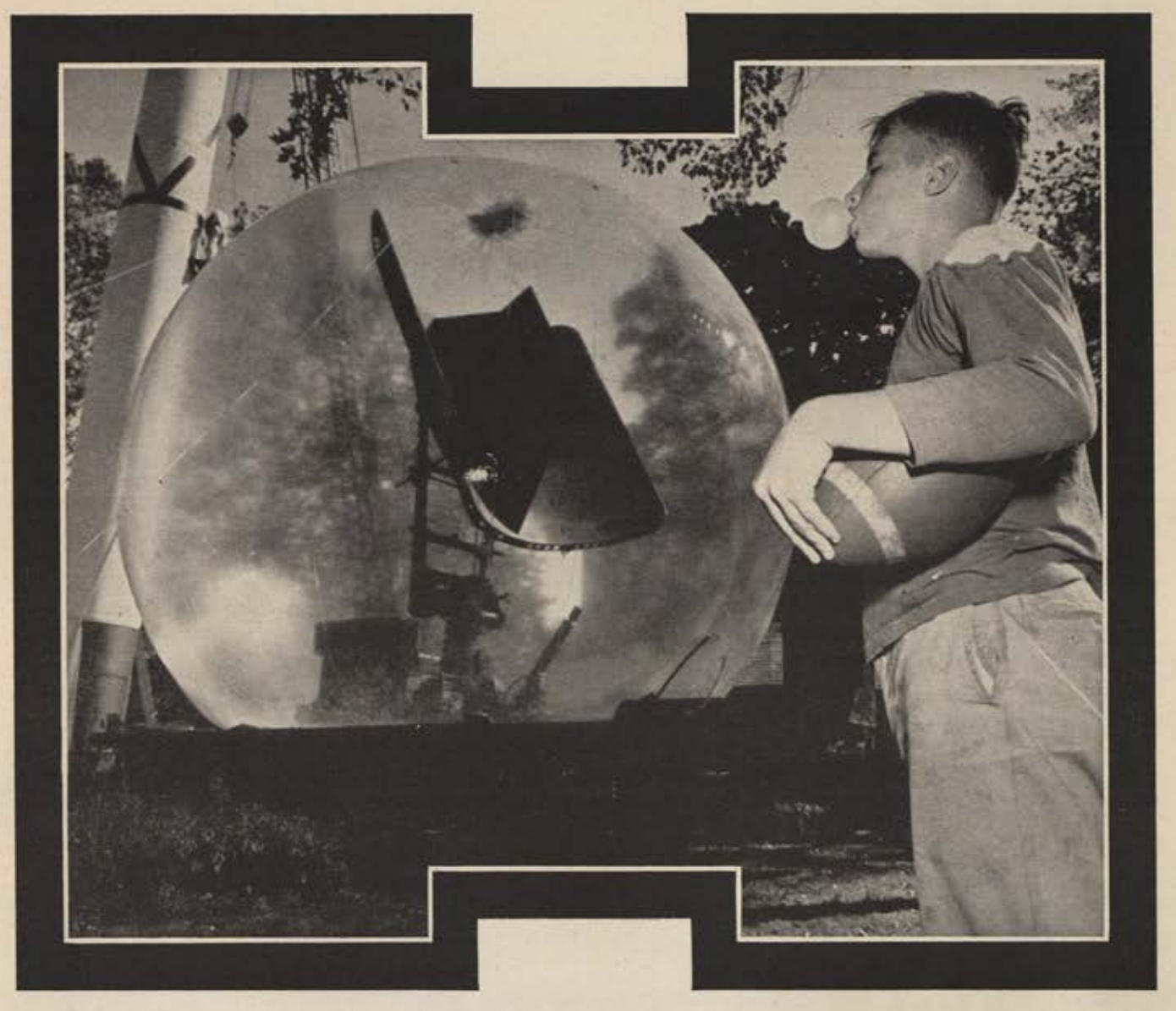
SEA SURVEILLANCE SYSTEM FOR THE U. S. NAVY

AN/TSQ-20 (Advanced Computer for the U. S. Navy)

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

A new dimension in



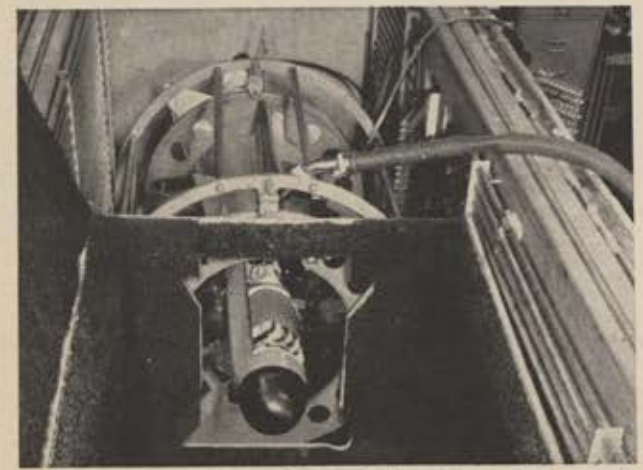
bubble blowing

This transparent plastic bubble protects the antenna of a radically new aerial three-dimensional radar defense system.

The Hughes-Fullerton three-dimensional radar antenna has its pointing direction made sensitive to the frequency of the electromagnetic energy applied to the antenna. This advanced technique allows simultaneous detection of range, bearing and altitude—with a single antenna.

Hughes combined this radar antenna with "vest-pocket sized" data processors to co-ordinate antiaircraft missile firing. These unique data processing systems provide:

1. Speed—Complex electronic missile firing data was designed to travel through the system in milliseconds, assuring "up-to-date" pinpoint positioning of hostile aircraft.
2. Mobility—Hughes "ruggedized" and miniaturized the system so that it could be mounted into standard army trucks which could be deployed to meet almost any combat problem —even in rugged terrain.



Falcon air-to-air guided missiles, shown in an environmental strato chamber are manufactured and tested for reliability by Hughes in Tucson, Arizona for use in our most advanced interceptors.

Reliability of the advanced Hughes Airborne Control Systems is insured with this equally advanced test equipment developed at Hughes-El Segundo.

3. Reliability—By using digital data transmission techniques, Hughes engineers have greatly reduced any possibility of error.

Result: the most advanced electronic defense system in operation! Ready today for Armed Forces deployment anywhere in the world.

Hughes Cost Improvement Program resulted in major saving to the Armed Forces through: *Lower prices* resulting from improved methods, procedures and designs; *better products* developed for greater reliability and serviceability; *timely performance* which reduces the time required for an operation or service, fulfilling contracts without delays; *maximum efficiency* assures most effective use of contractor and customer furnished plant and equipment.

Combine these factors—advanced concepts, low costs, reliable hardware—and you have the reasons why Hughes is a leader in advanced electronics production.

Creating a new world with ELECTRONICS

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Culver City, Fullerton, Newport Beach,
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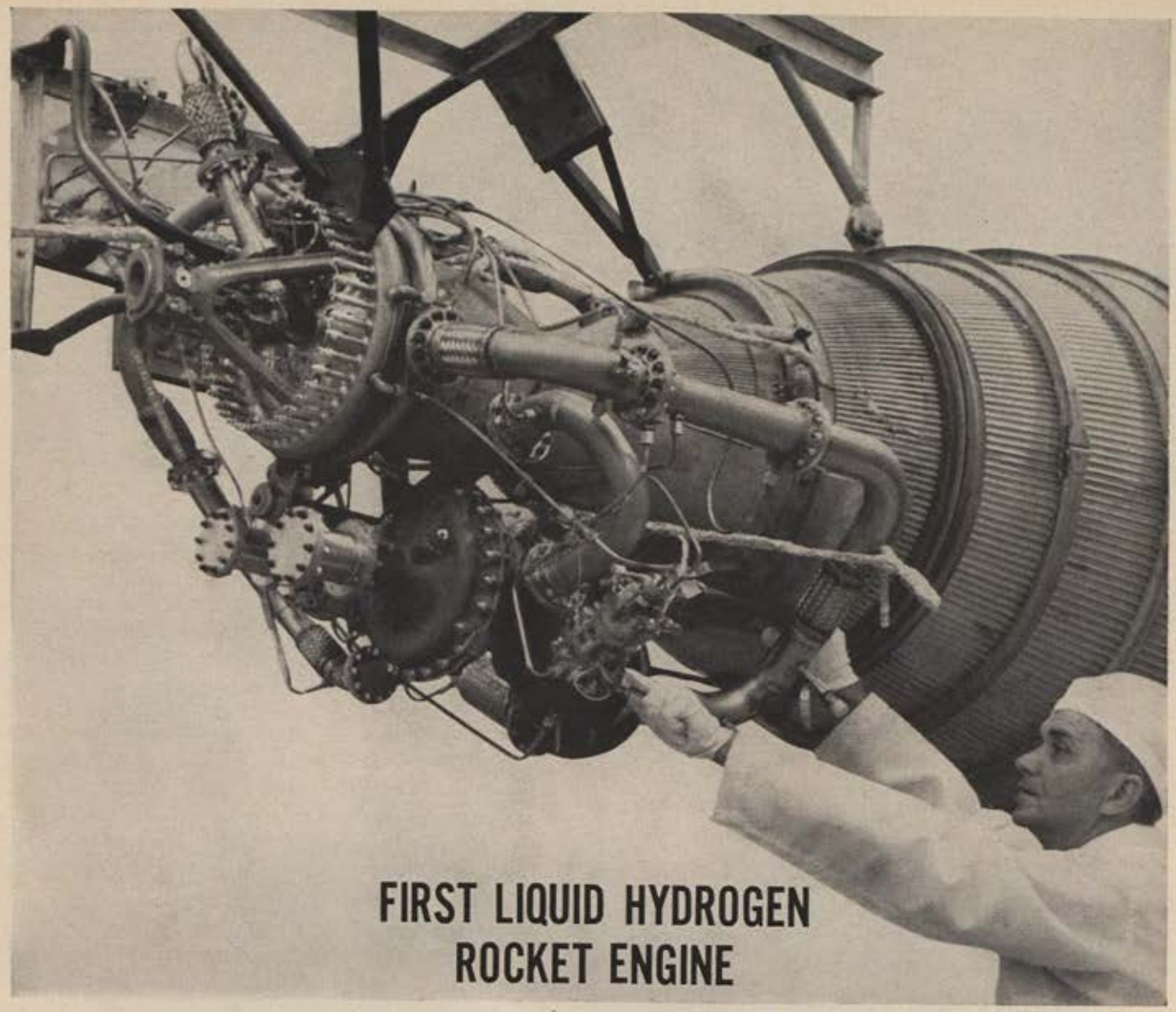
Santa Barbara and Los Angeles, California.
Tucson, Arizona



FIRST LIQUID HYDROGEN ROCKET ENGINE

Pratt & Whitney Aircraft's XLR-115
Develops 30% Greater Specific Impulse... Offers Unlimited Potential in Size and Power

The first of a new family of liquid hydrogen rocket engines for missiles and space vehicles has recently been demonstrated at Pratt & Whitney Aircraft's Florida Research and Development Center. The engine developed 15,000 pounds of thrust under simulated space conditions, and produced 30% higher specific impulse than conventional LOX-kerosene engines. The successful development of this engine opened the way for immediate development of hydrogen engines offering far larger size and power.

The new Pratt & Whitney Aircraft engine has been chosen to power the *Centaur* space vehicle atop a modified *Atlas* missile. It will also power an upper stage of *Saturn*, the booster that will be used to place 35,000-pound satellites in orbit 300 miles above the earth or send a 12,000-pound space probe to another planet. Current developments indicate liquid hydrogen, substituted for LOX-kerosene stages, can multiply payload as much as 3½ times.

A new pumping system — termed "bootstrap" pumping — eliminates the need for an auxiliary gas generator. Pumping power is provided by the expansion of the hydrogen itself.

Pioneering work in liquid hydrogen has been in progress at Pratt & Whitney Aircraft since 1955.

PRATT & WHITNEY AIRCRAFT
DEPENDABLE ENGINES

PRATT & WHITNEY AIRCRAFT

East Hartford, Connecticut

A Division of United Aircraft Corporation

Speaking of SPACE

No Timing Like Good Timing

Success in the high art of comedy, most entertainers would agree, hangs on the proper combination of good material and careful timing. This truism applies in politics too, and in the shrinking world of the space age, it attains special significance.

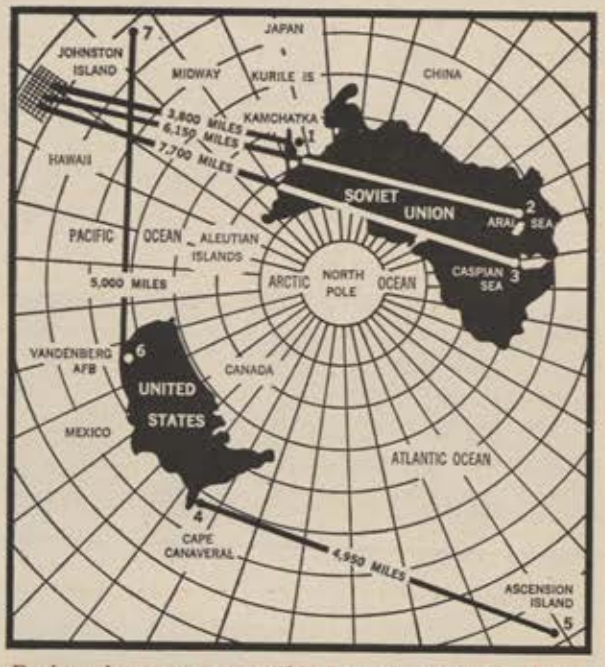
The Soviets, with their January announcement of intent to impact test vehicles of what they describe as a "more powerful rocket" in a large area of the central Pacific (*see map*), managed to steal a valuable share of the headlines the day after President Eisenhower's State-of-the-Union message. At the same time they further unnerved those Western observers who have warned that catching up with the Russians is something we cannot accomplish at a leisurely pace on the assumption that, as we improve, they will, like good sports, stand still.

"Soviet scientists and designers are now working to develop a more powerful rocket to launch heavy earth satellites and undertake spaceflights to planets of the solar system." So went the Russian announcement, tantalizingly uninformative as usual, yet enough to remind us that a Russian shot toward Mars is conceivable in 1960 (October is favorable) or to suggest that "for peaceful purposes" we may see a Soviet eye-in-the-sky observation satellite in orbit during the year. The latter possibility may well have spurred the recent rash of warnings by high but unnamed military planners that our own reconnaissance satellite program, under Air Force development, Samos (the latest tag of what had previously been called everything from Big Brother to Sentry), was in grave danger of delay because of funding lacks.

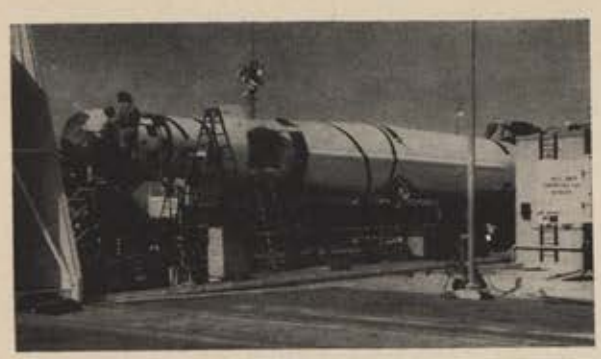
Samos, a polar-orbit observation satellite designed to scan the total earth surface—if it were operational within a year or two—could well be able to give us an accurate picture of Soviet missile capability *before* the Russians could complete a program of camouflage and underground deployment of missiles.

The other half of the observation satellite coin is the Midas program of the Air Force, mentioned in Air Force Chief of Staff Gen. Thomas D. White's recent National Press Club speech (*see page 62*). Midas, designed to detect missile launches by infrared devices, could provide valuable warning time, should a missile attack be mounted against us. *Both* Samos and Midas in operation could add up to a fantastic new deterrent strength, especially important during the first half of the sixties, when, as the Administration itself admits, we shall be behind the Russians in missile totals.

On the general subject of observation and reconnaissance satellites, it is important to stress a point that has not received enough emphasis. Because ours is the open society and the Russians' a



Red rocket range, possible launch points: 1. Kamchatka Peninsula; 2. Aral Sea area; 3. Caspian Sea area. Impact is in Johnston Island vicinity. Path of USAF ICBM launches from Vandenberg AFB, Calif. (6-7) crosses Red range. East Coast launch paths from Cape Canaveral are denoted by 4 and 5.



Vandenberg AFB, Calif., engineers at work on the Agena, or satellite stage of a Discoverer vehicle. Boosted by AF Thor IRBM, Agena stage is injected into polar orbit. NASA will be using Agena soon.

closed one, the flow of information, no matter how hard or skillfully our intelligence people work, is always greater from us to them than it is from them to us. Our need to know their intentions and capabilities, so that we can plan intelligently, is greater—and for one more reason too, the obvious but often-forgotten point that they, not we, are the potential aggressor.

Not that they ever for a moment would admit such a nasty possibility. Bolstered by their formidable space record, the Russians are now busily claiming their good intentions in the area of international cooperation for the peaceful uses of space technology.

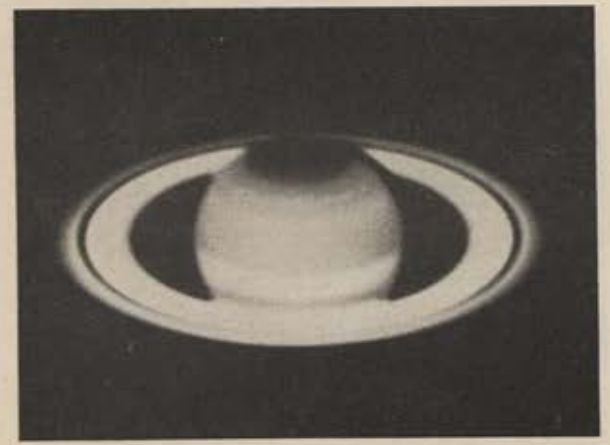
After a lengthy record of haggling in the United Nations on the composition of the international committee to study cooperative research (COSPAR, the Committee on Space Research, established under the auspices of the International Council of Scientific Unions), the Russians showed up at the January meeting of COSPAR in Nice, France, and proceeded to get most of the attendant publicity. One item reported out of the Nice conference that would have pleased the late Joseph Stalin, who believed that Red victory lay in the split-up of the North Atlantic Treaty coalition, was the story that a group of French scientists had approached the Russians about the possibility of a joint Russian-French space project. The Russians showed interest, of course, yet how could we complain if such a program developed. We will probably launch British instruments into orbit. Sauce for the goose.

COSPAR, presently the closest thing to an international "space for peace" operation, is a nongovernmental group designed by the UN to study peaceful uses and international cooperation. It is essentially an extension of the organization of scientists who did the spadework for the momentous International Geophysical Year.

On TV—the Space Story

That television can perform real public service was demonstrated the evening of January 6 by the Columbia Broadcasting System. "The Space Lag," fourth of a series of special CBS reports on vital national and international issues, in a scant hour, managed to relate objectively and without resort to gimmicks the zig-zag story of our national missile and space programs, with special emphasis on decision delays and errors of emphasis, in the past.

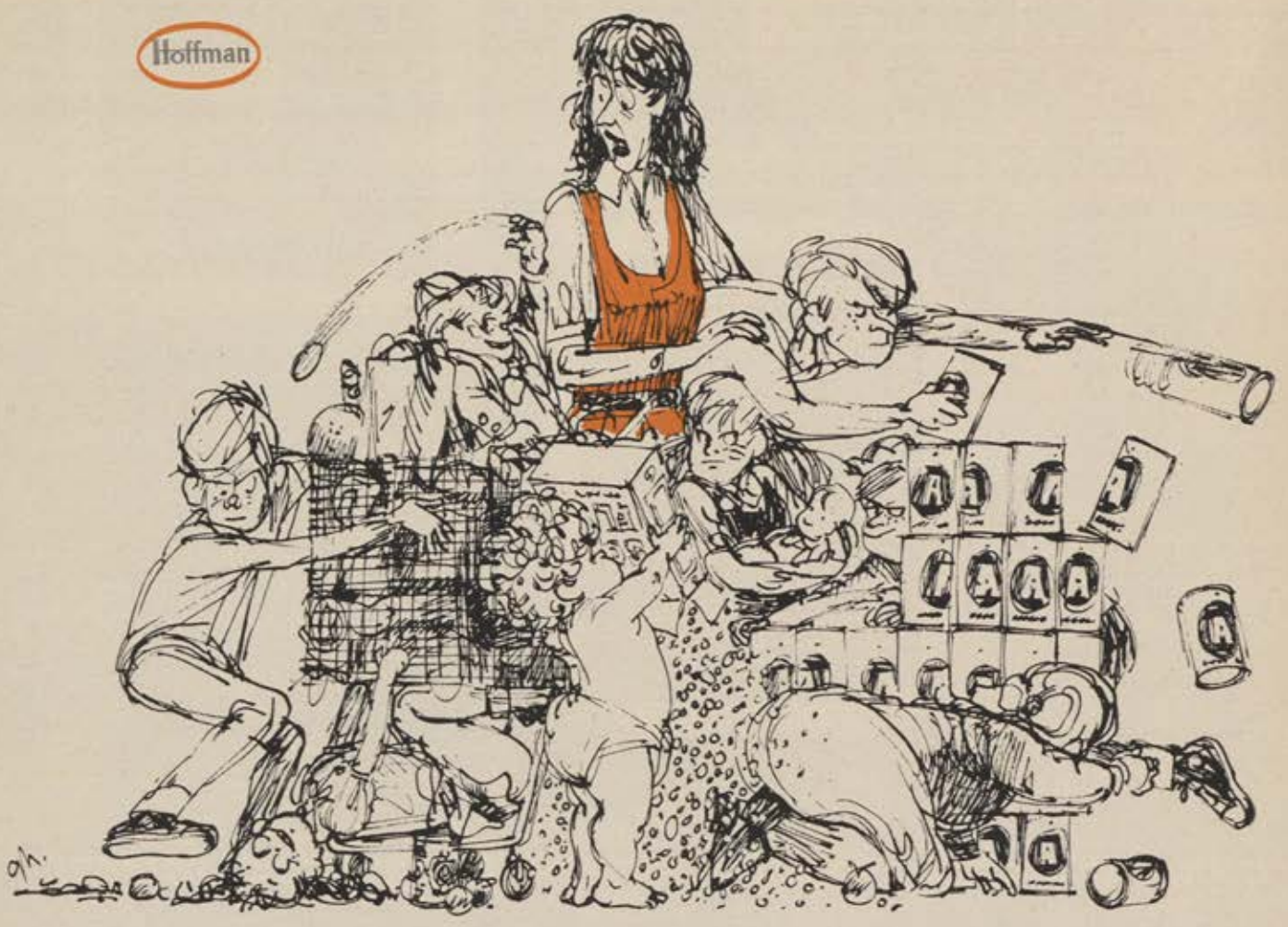
At the same time, recognition was given to



A Russian engineer proposes (see text, page 92) *that ring of particles be fired into orbit around the earth to absorb solar radiation now lost in space. Earth might then resemble Saturn (above).*

GE engineers study movement of atoms with this newly developed simulation device, which is designed to approximate behavior and interaction of particles in solid, liquid, and gaseous states.

Hoffman



systems management problems?

As today's weapons and support systems become more and more complex, the need for teamwork and cooperation among contractors assumes increasing importance. Hoffman, a pioneer in the development of the TEAM concept, has acquired a unique capability in systems management. Hoffman's ability to draw together the specialized talents of several organizations is demonstrated by the success of the eight-company "Tall Tom" Team for the U.S. Air Force—an example of how Hoffman can help solve your systems management problems.

Hoffman / ELECTRONICS CORPORATION

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OFFICIAL U. S. A. F. PHOTO
of the Atlas lift-off
at Vandenberg A.F.B.
on September 9, 1959.
This was the first official
firing by SAC crew to
test operational capability.

A memorable event in the Album of Space Technology

Many significant achievements will be added to those already recorded in the chronicles of military and scientific space technology. Many important milestones in the conquest of space will be passed. None, however, will surpass the realization of America's operational capability in Intercontinental Ballistic Missiles. The threshold of this phase of our national defense was passed on September 9, 1959, with the historic launch of an Atlas by a Strategic Air Command crew at Vandenberg Air Force Base, California. Measured by any standard no event could have been more timely... more rewarding.

Five years ago the free world had no functional ballistic missile rocket engines, no guidance systems, no nose cones, no tracking stations, no launching pads, no trained missile squadrons. Today all those who have contributed to this present state of operational reality may take justifiable pride.

In this effort, Space Technology Laboratories is also proud of its privilege in performing the functions of systems engineering and technical direction for the Air Force Ballistic Missile Division, in close and continuing cooperation with the Air Force Ballistic Missiles Center, Strategic Air Command-MIKE, and such major associate contractors as: Convair, a Division of General Dynamics Corp., for airframe, assembly and test; General Electric Co., and Burroughs Corporation for radio guidance; Arma, a Division of American Bosch Arma Corporation, for all-inertial guidance; Rocketdyne Division, North American Aviation, Inc., for propulsion; General Electric Co., for re-entry vehicle; and Acoustica Associates, for propellant utilization.

All have worked in concert, with vigor and dedication to the objective of providing the nation with this fundamental addition to its defense capability.

SPACE TECHNOLOGY LABORATORIES, INC.

P.O. BOX 95004, LOS ANGELES 45, CALIFORNIA

people in and out of the military who had pushed programs that proved to be fruitful, pushed them in spite of the formidable problems of budget and decision.

Dr. Simon Ramo, a chief architect of the Air Force-industry team that created in record time most of our present ICBM capability, made one of the most telling points during the CBS report.

Discussing the history of the Air Force ballistic missile program, Dr. Ramo commented, disturbingly:

"I think we had an accident, almost a freak, in the way we set up the big ballistic missile program —in the speed [in] which it was accomplished—in the unusual relationships that were set up. That was against the system, and now we're back with the system.

"In fact, if we had had during the peak period of the ICBM program, during '54 and '57, the same kinds of rules and procedures that now are operating, we could never have gotten the program out in the speed in which it was gotten out. In fact, I would have some doubt that we'd have an Atlas flying even now."

The CBS program—which incidentally was described by narrator Howard K. Smith as "not meant to be entertainment . . . but a serious report"—touched only lightly on the activities and significance of the National Aeronautics and Space Administration. NASA coverage was pretty much confined to the last few minutes of the show.

Representing NASA on the program was T. Keith Glennan, the civil space agency administrator. Questioned about our present space capability and prospects for the future, he said in part:

"It's going to be a little time, some years perhaps, before we have the rocket systems that reliably will put up very heavy payloads—payloads that will match and outmatch the Russians. . . .

"In the course of another two years—eighteen months perhaps—we will be able to do anything that they presently have done. But I don't expect them to be sitting quietly on their hands during that same period of time."

Mr. Glennan added:

"I would say . . . that perhaps four years from now, we'll have the kind of thrusts that will allow us to do anything we want to do, at any time."

He also made the important point that space technology is "a matter that has to be carried out with a great deal of constancy. You don't do research and development by having a budget one year that's half the budget you had the past year."

During the NASA phase of the show, the Saturn million-pound-thrust project was billed as the item that would give us the kind of free-wheeling all-purpose spacepower we need. Not pointed out was the fact that Saturn has been touted, half-starved, and honored again during its relatively brief history. The latest indication is that it will get higher priority than heretofore.

But the real omission was deeper discussion of today's decision-making problem: How to balance the "civilian" and "military" space programs, how to extract maximum good from the great potential of both NASA and the Air Force, without reliving the confusions of the Jupiter-Thor controversy.

Here is real meat for a second chapter.

How Many Bulls-eyes When?

President Eisenhower's statement in his State-of-the-Union message that "in fourteen recent test launchings, at ranges of over 5,000 miles, Atlas has been striking on an average of within two miles of the target" spurred speculation as to exactly what was meant by the word "recent." Were the hitherto unpublicized bulls-eyes consecutive? Or were they interspersed with other shots to other distances? Reliable sources report that what the President actually meant was that of the last fourteen shots from Cape Canaveral—shots aimed at 5,000-plus-mile ranges, each was successful. On January 7, the Air Force announced its fifteenth Atlas 5,000-mile-plus success. This is undeniably a happy indication that Atlas reliability is increas-

Reprinted with permission from *The Saturday Review*

THROUGH HISTORY WITH J. WESLEY SMITH

"But, Galileo—why should you study moon craters when right here at home most people don't have satisfactory bathrooms yet?

ingly better. But many observers continue to point out that perfection is still by no means at hand, also that there is continued need for stepped-up Atlas production, both for military purposes and to carry on alive the civilian space program until the big engines are available in the mid-sixties.

The Great Space Monster

The great space monster—radiation—continues to pose imponderables for astronautical planners. Explorer VII, launched in October of last year, has revealed sporadic and temporary additional bursts of radiation in the US-discovered Van Allen radiation belts, apparently due to solar disturbances and resultant magnetic storms in the earth's magnetic field. Some space scientists, notably Navy Commander Malcolm D. Ross, who recently ascended to 81,000 feet in a balloon to view Venus, suggest ominously that such bursts of extra radiation from the sun may be an insuperable obtacle to human space travel. NASA scientists feel, however, that much more needs to be known before such negative conclusions can be certain.

A similar warning against sudden radiation bursts was voiced by Dr. S. Fred Singer of the University of Maryland at the recently concluded USAF "Lectures on Space Medicine" series given at Brooks AFB, Tex.

Meanwhile, on the plus side, physicists at the Brookhaven National Laboratory in Upton, N.Y., have expressed the view that high-energy primary cosmic rays, the high-speed nuclei of heavy atoms such as iron and oxygen, would do *less* harm than previously expected to human tissue. These particles abound in the under-600-mile orbit area. Brookhaven theory rests on the possibility that the narrow path of the high-energy primaries does localized damage to body tissues, which is relatively easy to repair by surviving cells. The matter remains speculative.

Ring Around the Earth

Are we losing too much of our fair share of the sun's radiation? V. Cherenkov, a young Soviet engineer thinks so and suggests that to pick up some ten to twenty percent of solar energy now lost in space beyond our atmosphere, we ought to create a Saturn-like ring of fine dust around the planet, and really "do something about the weather."

He believes, as reported in *Komsel'skaya Pravda,* that 500,000 tons of finely crushed powder would be needed for a ring approximately sixty miles wide changing night into day, while more than 2,000,000 tons would be required to effect real weather changes on earth with a ring some 300 miles wide. To warm up the polar regions, Cherenkov suggests the ring should be fixed in a plane passing through the earth's axis.

More on Machine Translation

The survey of Soviet efforts in machine translation, by Sonya Machelson, which appeared on these pages in December prompted a check on American endeavors in the field. A National Science Foundation report shows an even dozen US organizations to be currently researching in machine translation techniques: Arthur D. Little, Inc. of Cambridge, Mass., Georgetown University, Harvard University, Massachusetts Institute of Technology, National Bureau of Standards, National Physical Laboratory, Planning Research Corp., Los Angeles, Calif., Ramo-Wooldridge Division of Thompson Ramo Wooldridge, the RAND Corp., University of California at Berkeley, the University of Washington, and Wayne State University, Detroit.

Studies are also under way in England at Birkbeck College, London, and the Cambridge Language Research Unit, Cambridge, as well as at Japan's Electrotechnical Laboratory, Tokyo, and at Israel's Hebrew University, Jerusalem.

The Science Foundation is providing financial support to four of the programs, the Air Force two, the Army one, and the Navy one.

Total funding, according to one Air Force information techniques specialist, runs currently at under $2 million. MT, as the experts call it, is not just around the corner. There are still formidable obstacles, such as syntax differences between English and particularly, Russian. Two main approaches seem to be presently under study. The first is the accumulation of sizable mechanical glossaries on punch cards or tapes, supplied to the computer and against which the Russian or other foreign text is fed after being converted into tapes.

The second is a much more complicated attempt to break down the very structure of the language to be translated so that the mechanical brain can make the idiomatic adjustments without having to be helped so heavily by human post-editing.

—WILLIAM LEAVITT

He put a new twist in an old trick

His problem was to take a 3"x6"x 3-foot piece of wave guide tubing made of .08-inch thick aluminum and to twist one end 90° to the other *without buckling or stretching any part of it...so that a cross section taken anywhere along its length remained a perfect rectangle.*

The standard solution for a problem like this: Support the tube internally with a solder-like substance that's melted in, cooled, melted out after twisting. It won't work here because the mass of the substance is too great.

Here's how this AMF production engineer found the answer. First, he visualized the concept that, in any symmetrical twist, *the center axis never moves.* Then he applied this concept by stringing a metal rod through the center of 288 rectangular shims, inserted them in the tube, cushioned them with the same solder-like substance. Jaws clamp on either end. One of them rotates *slowly* (twisting time: over 2 minutes) giving the metal time to flow. The result: Perfect twists, every time.

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This bit of production know-how is a sample of the ingenuity AMF brings to every assignment.

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RADIO CORPORATION of AMERICA

DEFENSE ELECTRONIC PRODUCTS

CAMDEN, NEW JERSEY

Base exchanges perform an essential job on behalf of men and women in uniform. They also benefit the armed forces as a whole and the nation. Yet, scatter-gun allegations against exchanges continue to emanate from powerful retail groups. Are these justified? The following article examines the question: Are BXs . . .

'UNFAIR COMPETITION' TO RETAILERS?

Frederic M. Philips
ASSOCIATE EDITOR

Right, typical Stateside post exchange at Army base. Exchanges provide most nonluxury goods necessary for modern service family "to function comfortably."

THE base exchange is under attack again—unjustly and in the best interests of no one.

The vice president of a powerful retail group has delivered a new blast. In a convention address late last year he called the base exchange, among other things, "unfair competition" to retailers and "a fringe benefit to top brass" that "can murder any retailer in the area."

Such ill-founded charges have been flying about for years. They bear examination.

The fact is, the BX—or, in the terminology of the other services, the PX or Navy Exchange—efficiently performs an essential job on behalf of men and women in uniform, providing necessary, nonluxury goods at minimal cost and plowing the profits back into service welfare programs. Benefited, in addition to the customers, are the armed forces as a whole, and, in a larger sense, national military strength.

Apart from this, the exchanges are not in competition with private business despite allegations to the contrary. Does a housewife compete with restaurateurs when she serves dinner to her family? The suggestion obviously is absurd. By the same token, base exchanges are an armed forces family affair. They serve a small and restricted group whose task it is to serve the nation—often in isolated areas here and abroad.

On the subject of competition: 2,500,000 persons and their dependents make up the armed forces population. There are 180,000,000 persons in today's well heeled United States, and its numbers and needs are going up. Is the service market, every last penny of it, a crucial matter to retailers? Do they need it to keep going?

Further, servicemen on an average spend less than twenty percent of each pay check in exchanges, and most of this, by compilation, on everyday necessities. Private retailers receive a fair proportion of the remainder, particularly since the BX sells no luxury or "large" items—like TV sets, cars, major electrical appliances, fancy clothes, and such. Businessmen do not traditionally lose money on service bases in their locales, and many even sell directly to the BX or have concessions in it.

One of the best ways private businessmen *can* lose the service dollar, it has been demonstrated in the past, is by wild-eyed campaigning against exchanges. Resulting antagonisms have in a number of isolated instances kept service folk away from private stores for periods of time.

Again, have you checked the prices in discount shops, warehouse sales rooms, and the like, across the country? In many cases, they can undersell the BX. These are private enterprises. Where does that leave persons who claim that BXs are unfair to "competition" because their "government subsidies" (which do not exist) enable them to sell at low markup on goods?

Questions along these lines could go on interminably. The facts spell out this theme. Continuing allegations that the exchange system is a wicked monster strangling private business are false. A legion of subsidiary charges ("BXs cater to top brass," "Exchanges blacklist retail merchants in their areas," "Exchanges will sell to anybody, authorized or not,") achieve the rare distinction of being tripe and red herrings at the same time.

Another example in this regard is the oft-heard assertion that hordes of fighting men work in the exchanges instead of manning operational units. The fact: More than ninety-nine percent of the 65,000 Army-Air Force exchange employees are civilians paid out of exchange proceeds; military men hold many of the key executive positions.

Also, you hear that exchanges are a drain on the taxpayers. The fact: They are self-supporting. And they have enough left over each year to put $50 million into the welfare funds.

Congressional committees have taken several long looks at the exchange setup in the recent past. In 1949, after hearings on the subject, the House Armed Services Committee placed limitations on its operations. On at least three other occasions since, in the face of continued retail-group heckling of the BX system, congressional groups have examined it and found it to be doing fine. In 1957, in one of these instances, moderate expansion of the list of merchandise carried was allowed.

(Continued on following page)

Yet the hecklers keep banging away.

Let us glance at recent base exchange history. It is illuminating.

In 1949, the Chairman of the House Armed Services Committee appointed a subcommittee to investigate complaints against the exchanges. Public hearings were held from April to July 1949. About twenty-five businessmen and representatives of retail groups appeared before the subcommittee.

These were their basic objections:

- The armed forces, through the exchanges, were actively competing with established private business.
- Merchandise was being sold which could not be fully justified on the basis of necessity and convenience to military patrons.
- A special order provision at exchanges permitted purchase of an unlimited range of merchandise.
- Unauthorized civilians were acquiring merchandise, either directly or through members of the armed forces, in violation of military regulations.
- Exchanges were not collecting and paying the federal retailer's excise taxes.
- Exchanges were not subject to state and local tax laws and so had a cost advantage over civilian retail merchants.

One-man exchange at Nike air defense site. Exchanges extend to hosts of small, isolated air defense radar sites dotted throughout North America, overseas as well.

Another smaller-scale exchange operation. Airmen take coffee break at Lowry Air Force Base mobile canteen. A prime exchange feature: The customer gets the profits.

After weighing these complaints and testimony of service spokesmen explaining operations of the base exchange system, the subcommittee made the following recommendations:

- That the exchanges narrow the price differential with civilian enterprise by including in the cost of operations certain items not previously included, such as reimbursement for cost of utilities, maintenance, equipment (except surplus government equipment), and collecting and paying the federal retailers' excise tax.
- That the services properly indoctrinate military personnel so that exchange operations do not jeopardize public confidence in retailers, their prices, and their integrity.
- That the list of items authorized for resale in domestic exchanges be curtailed by placing new and comparatively stringent limitations on the value of merchandise to be sold.
- That the special order privilege be curtailed.
- That abuses of the exchange privilege be more effectively policed by a more effective means of identification for authorized persons; more completely informing sales personnel as to categories of authorized persons and their respective privileges; more thoroughly informing exchange patrons of their responsibilities and liabilities in the enjoyment of their privileges; and frequent inspections by appropriate military authorities to prevent abuse of privileges and ensure that violators are appropriately punished.

The subcommittee concluded its report with this observation and warning:

"The privileges which we have preserved are very substantial and are sufficiently attractive to encourage future violations. It is obvious that such violations cannot occur unless military personnel, and other authorized persons, become a party to the violation.

"We stress this word of warning, that if such violations continue they will inevitably result in further congressional investigation. The future of resale activity privileges in the armed forces is entirely within the hands of those who will continue to enjoy those privileges. They shall either protect them and keep them or abuse them and lose them."

This subcommittee report, it is easily seen, contained a slate of provisions that could well have been considered harsh from the serviceman's viewpoint. Prices went up, the range of purchases was cut sharply, "luxury" goods were effectively eliminated, the special order privilege was out the window.

The services subscribed to these recommendations in both spirit and letter, in the sincere belief that the complaints were legitimate in terms of private retailers. With acceptance of what came to be known as the "gentleman's agreement" of 1949, the services believed themselves to have corrected any excesses and abuses that existed in the exchange system.

But it soon became apparent that, so far as others were concerned, the warning with which the subcommittee concluded its recommendations was an invitation for new charges against the BXs.

In 1953, for example, one retail group hired investigators to attempt to shop in Army, Navy, Air Force, and Marine Corps exchanges in various parts of the country. The group reported that its people managed to put it over on exchange employees in a number of cases, thus proving that exchanges sell to unauthorized persons.

The House Armed Services Committee directed its Defense Activities Subcommittee to investigate. The sub-

committee found the charges substantially ill-founded and characterized them as "loose and reckless."

It took a rather searching look, in fact, at the other side of the picture, noting that the government and the exchanges were obliged to make sure the serviceman is "not mulcted of his small pay by many unscrupulous characters who, in the past, have preyed on them."

The congressmen criticized investigation tactics employed to discredit the exchanges, including the hiring of a Reserve officer on inactive duty to misuse his ID card and make a purchase.

A few other passages from the subcommittee findings in this case are also of interest:

"The exchanges are competently managed by responsible officers and trained personnel. The educational campaign being conducted [to eliminate abuses of BX privileges] is to be commended. It is presented in all suitable forms of informational media."

In regard to goods stocked in exchanges at this time, the subcommittee reported:

"The list was agreed to by the services and represented the maximum in compromises and reconciliation of conflicting views. It represents, in our opinion and after a review, the maximum of tolerance on both sides."

Over-all, this was the legislative group's summation:

"The post exchange is the enlisted man and woman's club. Many times it is the only thing that stands between them and complete stagnation. Servicemen and women are shifted from place to place as the needs of training and deployment for military advantage require. They are captives of the government as to place and duty during the periods of their service. They have no opportunity to integrate themselves with the local communities.

"Let it be kept clearly in mind that we owe the serviceman or woman the duty of providing them with the decencies of life and living not only when we are scared to death and at war, but as well when we are merely preparing against those days of uncertainty.

"The greater part of the patrons of exchanges are young and inexperienced. Most of them are away from home for the first time. They are in no position to drive shrewd bargains; nor have they the money with which to do it.

"Neither ought we to forget that these patrons of the exchange are the beneficiaries of the exchange (through use of exchange proceeds in welfare funds). And military personnel away from home are also taxpayers. What is more important: They are all the sons and daughters of American taxpayers."

In sum, the subcommittee in 1953 gave the exchanges a better-than-clean bill of health and determined that the recommendations of 1949 were being carried out implicitly.

Again, a year later, Congress brought the exchanges under scrutiny. This time, a subcommittee of the Senate Committee on Armed Services surveyed BXs as part of a study of national preparedness. How did things stand with relation to continuing retail group charges of "abuses," "excesses," and "unfair competition?"

The senators reported:

"The exchange services are being efficiently operated on a substantially self-sufficient basis and provide revenues to help finance entertainment, recreational, and welfare programs for the servicemen and their families."

And once more, in 1957, BXs were the subject of study in Congress, this time again by a subcommittee of the House Armed Services Committee. Reason this time was a request by the services for moderate expansion of the list of merchandise carried.

Major commands had been asked by Army and Air Force Exchange Services headquarters to compile a list of items not stocked by exchanges but requested most often by customers. The list came to sixty-seven, was pared to twenty-three, and was presented to retail organization heads at a meeting in line with the "gentleman's agreement" attitude of the services toward the 1949 rapprochement.

Women's Wear Daily, a well read retail trade newspaper, characterized the list as "enabling the BX to provide the serviceman and his dependents with virtually all non-big-ticket wares they need to function comfortably as an up-to-date family unit."

That, we must note, doesn't really seem too much to ask for a service family.

The list included such tame items as maternity brassieres, girdles, garter belts, bedding, inexpensive watch straps, dinnerware costing less than $25 for a four-place setting, drinking glasses to cost no more than fifty cents each, baby furniture, and the like. Also included were such mild-luxury items as radios costing less than $50, movie projectors of similar cost, automotive accessories, and portable typewriters.

The retail groups okayed all items on the list but baby furniture, children's clothing, men's sport coats and jackets, and automobile tires and batteries. Then, when the matter went to the subcommittee, the retailers withdrew approval of the entire list and the exchanges had to justify all items.

Maj. Gen. Harlan C. Parks, USAF, is Chief, Army and Air Force Exchange Service, the organization charged with operation of global network of BXs, PXs for services. Exchange Service has 175 main BXs in US, fifteen BX networks serving more than 200 bases, facilities overseas wherever US personnel serve.

At the same time, some retail interests renewed a whole string of old charges against exchanges as a backdrop to the congressional deliberations.

The outcome was that the subcommittee approved all items but sport coats and tires. It also ruled against Strategic Air Command and Air Materiel Command proposals for a credit system in military exchange purchases.

The subcommittee described exchanges as "vital" to armed forces personnel and an "obligation." This 1957 series of events, to quote once more from *Women's Wear Daily*, provided "the biggest rebuff" to the retail critics of BXs.

Which brings us up to date—or should. Unfortunately, the old pianola seems ready to start cranking it out all over again, words and music unchanged. With a new session of Congress getting under way, this latest attack could well mark the opening of another campaign against the exchanges.

We, for our part, are weary of these trumped-up attacks. So, we think, are the services and the men and women who serve in them. And the general public. And the vast majority of retailers. And Congress.—END

Philco has designed and built the world's largest 3-axis tracking antenna

The world's largest 3-axis tracking antenna was recently completed at the Philco Western Development Laboratories in Palo Alto. It will be used at one of the world-wide satellite tracking stations to receive vast amounts of scientific information from outer space. By employing the unique design feature of tri-axial mounting, this extremely accurate and complex instrument, designed and built by Philco, has complete flexibility of movement and can provide continuous coverage of telemetered information and data from satellites and missiles during any phase of flight.

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This Philco 3-axis antenna stands 80 feet high and weighs over 130 tons. One of its most unique features is the 60-foot reflector—a solid aluminum skin paraboloidal structure manufactured to a tolerance of 65/1000 of an inch over its entire surface to provide maximum reception under the most severe environmental conditions. The antenna maintains its accuracy in winds up to 60 miles per hour and mechanical efficiency in winds up to miles per hour.

The READY ROOM

General White on Reserve Forces

Gen. Thomas D. White, Air Force Chief of Staff, gave the **Reserve forces a new boost** when he addressed the National Press Club in Washington on January 11 *(see page 62).*

In a question period following his talk, General White was asked what future he saw for the Air National Guard as we move further into the aerospace age. The general replied that both Reserve components **"are very important to the over-all Air Force posture and strength"** and can do **"almost all the things the Regular force can do."**

"The Air National Guard can do a great many things," General White said. "There is really no reason why the Guard can't do almost all the things the Regular force can do. Now, it sometimes is true that where you must have a twenty-four-hour full-scale readiness, then the National Guard effort becomes probably more expensive than the Regular because you have so many technicians on duty that you might just as well have Regulars.

"But, in my opinion, the Air National Guard as well as the Air Reserve can play a very important role in the present age. I spoke earlier of the many missions I foresee to continue for the manned aircraft. These are readily taken on by both the Air National Guard and the Air Reserve—fighters, transport, airlift is a particular one.

"As we go down the line in the aerospace age, I am sure that there will be other missions which will be suitable and within the capabilities of these two components, which I consider very important to the over-all Air Force posture and strength."

Air Guard Gets C-97 Transports

Four-engine transport aircraft are being assigned to the **Air National Guard** starting this month. **Secretary of the Air Force Dudley Sharp** has announced that a number of **Boeing C-97 Stratocruisers** are being turned over to the Air Guard by **MATS** to give the Guard a combat support transport capability.

At least **six, and possibly nine, Air Guard squadrons** will change over from air defense and tactical fighter roles to take on the new cargo carrier mission. Other four-engine aircraft types may be added later.

The **Air Force Association** has an **important share in this historic event,** which puts the Reserve forces into four-engine aircraft for the first time. In a **resolution approved at the Convention in Miami Beach** last September, AFA had urged that transport aircraft be assigned to the Air Reserve forces to **augment USAF's airlift capability. AFA's Air Guard and Air Reserve Councils** have long pushed for such action on the resolution.

Further, AFA's Washington staff has been waging **an aggressive campaign** before Air Force leaders and the Reserve Forces Review Group **for C-97s to be assigned to the Reserve forces.**

The Stratocruisers went to the **Guard** rather than the **Reserve** because the latter is scheduled to continue in the troop carrier field. C-97s are unsuited for air dropping paratroops and cargo. Instead, the Reserve is expected to receive **more C-123s as well as C-124s** and other four-engine carriers.

The Air Guard will receive the transports as soon as arrangements are worked out between the **National Guard Bureau and MATS's Western Transport Air Force** at Travis AFB in California. MATS will also provide transition training there for Air Guard crews and maintenance technicians.

Assignment of C-97s to the Air Guard is expected to be followed soon by **other major changes** in the force structure of the Air Reserve forces.

Active-Duty Reservists

If you are a **Reserve officer on extended active duty,** particularly if you have passed or are approaching **twenty years' active service,** including at least **ten years' commissioned service,** your future is affected by **Project 20-10.**

This is the title USAF has given a program to reduce the number of Reserve officers who are retained on active duty after reaching the twenty-year mark.

Boeing C-97 Stratocruiser, similar to those being turned over this month by MATS to at least six Air Guard units to give the ANG a combat support transport capability.

During fiscal year 1961, which begins in July, USAF will retire **3,280 officers** who will have completed twenty years' service before the end of that fiscal year.

This is **about half the number of Reserve officers** now on active duty who already have twenty years' service. But if you want to stay, the odds are about two to one in your favor.

Eligible Reserve officers who **voluntarily apply for retirement** will reduce the number of those who will be mandatorily retired. USAF estimates that **about 1,600** will apply for voluntary retirement, leaving **about 1,700** of the **remaining 5,000** to be selected for mandatory retirement.

First mandatory retirements will take effect on **September 30, 1960.**

Of those who do not voluntarily apply for retirement, major commands may designate **up to fifty percent** who should remain on active duty because of their importance to the command and the Air Force. Names of the other fifty percent will be submitted for consideration by a **board of senior officers** who will select those to be mandatorily retired.

Officers selected for retention will, barring unforeseen circumstances, be **exempted from further screening** for involuntary retirement until **FY 1964.**

Project 20-10 sets up **four categories of officers** within the eligible zone:

Category I is for those who do not want to retire and are recommended by the major command to be kept on active duty.

(Continued on following page)

Category II is for those not recommended by the major command for retention. Those to be mandatorily retired will be selected from this category.

Category III includes officers who apply for voluntary retirement, having completed twenty years' active service before December 31, 1960.

Category IV is made up of those officers who will become eligible and want to apply for twenty-year retirement between January 1, 1961 and June 30, 1961.

USAF has notified **major commands** to interview eligible officers to see if they want to apply for voluntary retirement. But it emphasizes that this action is intended only to get a line on how many mandatory retirements will be required to **bring the total to 3,280.** USAF is not urging anyone to apply for retirement.

There are good reasons, from USAF's standpoint, **not to solicit voluntary retirement** applications. First, it wants to keep well qualified officers who are vital to its mission accomplishment. Conversely, it would prefer a free hand in selecting those officers who can be spared.

In announcing Project 20-10, the Air Force paid **tribute to its senior Reserve officers** who have served in World War II, Korea, and the cold-war period. However, it explained that **some pruning is essential** each year to permit an orderly input of junior officers. If all officers who entered the Air Force during World War II were permitted to remain until they completed thirty years' service, the losses then created would exceed USAF's replacement capability.

In FY 1962 the number of twenty-year Reserve officers to be retired **increases to 3,770,** and in FY '63 and beyond it **jumps to 5,050.**

This bears out the view expressed by **Lt. Gen. Truman H. Landon,** DCS/Personnel, at the Reserve Forces Seminar last September, that in succeeding years comparatively few Reserve officers can expect to remain on active duty beyond twenty years.

USAF notes that Reservists have had **ample opportunity in the past** to apply for Regular commissions as USAF expanded its Regular officer strength, and that **incoming Reserve officers are invited to seek Regular appointments early in their career** to assure retention.

Some **3,000 Reserve officers** with five years' service or less will be given **Regular appointments** early this year. Boards met in Washington in January to screen more than **10,000 applicants** and the selection list is expected to go to the Senate for confirmation in March. Only those who are accepted will be notified.

A Big Year for CONAC

In a year-end summary, **Continental Air Command** highlighted its participation in **Exercise Pine Cone II,** its national **search and rescue activities,** and conduct of **Operation Swift Lift** as the **top operational achievements** of the Air Force Reserve during 1959.

Exercise Pine Cone II, a mock "brush-fire" war involving about 15,000 men and 300 aircraft held in the **Ft. Bragg, N. C.,** area last spring, was the **largest Air Reserve forces training maneuver since the Korean conflict.**

Since June 1957, when CONAC was assigned federal coordinator of US inland search and rescue activities, its **search and rescue centers** have been instrumental in **saving more than 1,244 lives.** Some 62,000 flying hours were logged on 31,569 sorties on these mercy missions.

Throughout 1959 CONAC's troop carrier wings continued to carry out **Operation Swift Lift**—biggest airlift ever undertaken by the Air Reserve. In continuous operation since April 1957, Swift Lift has completed more **than 3,350 missions,** flown **68,670 military passengers,** airlifted **25,915,000 cargo pounds,** flown more than **17,655,000 ton miles,** and traveled **60,451,000 passenger miles.**

The Command and its Air Reserve forces flew a total of **662,063 hours** from January 1 through November 30. The Air National Guard **logged 413,982 hours,** the Air Force Reserve **174,886,** and CONAC's active units **73,195.**

During the summer months, some **18,000 Air Reservists** manning CONAC's fifteen troop carrier wings underwent **two weeks' active-duty training** at Air Force installations across the country.

Despite busy training schedules, maneuvers, and operational airlift missions, CONAC's Reserve troop carrier transports flew **many mercy missions** during the year—including airlifting **iron lungs, flying blood in emergencies, dropping fodder to stranded herds, and ferrying firefighters to disaster zones.**

The **National Safety Council** during the year presented CONAC with its highest award, the **"Award of Honor,"** for the Command's outstanding ground safety program.

Winding up the year, CONAC in November received a citation for distinguished and exceptional service from **New York City.** The tribute cited the men and women serving in CONAC as **"protectors of the peace of the world,** guardians of our American way of life, and of the way of life of the entire free world."

Col. Russell W. Tarvin, who was recalled to active duty in 1958 as Executive Secretary of the AF Reserve Policy Committee, has been named Chief of Information and Liaison in the Office of the Assistant Chief of Staff for Reserve forces, under General Eaton.

Notes From Here and There

The **F-100Cs** which had been scheduled to go to **Air Guard** squadrons in **Van Nuys, Calif.,** until C-97s came into the picture, will wind up instead on the **opposite coast**—in **Boston's 101st TAC Fighter Squadron,** commanded by **Capt. James R. Ramsey, Jr. . . . Col. Russell W. Tarvin** *(see cut),* recalled to active duty in 1958 as executive secretary of the Air Force Reserve Policy Committee, has joined **Gen. Bob Eaton's team** as chief of information and liaison in the Office of Asst. C/S for Reserve forces. He succeeds **Col. Leland D. Perry** who was named chief of the operations division under **Brig. Gen. Felix Vidal,** who heads the Air Reserve staff under General Eaton. For the present, at least, **Col. I. G. Brown,** executive secretary of the Air Guard Policy Committee, will handle chores for both committees. . . . **AFR's 433d "Alamo" Troop Carrier Wing,** which has been at **Brooks AFB, Tex.,** is now moving to **Kelly AFB,** a few miles away in San Antonio. Brooks's runways are being closed. . . . **Defense Secretary Thomas S. Gates** has instructed the Joint Chiefs of Staff to look into **roles and missions of all Reserve forces.** It may bring Reserves more definitely into **civil defense. . . . Casper, Wyo.,** is now officially **deleted from the list of ANG permanent summer training sites.** The decision was reached reluctantly, because Casper townspeople have always been especially friendly to Air Guardsmen, but absence of a suitable range in the vicinity required expensive and time-wasting restaging for fighter units. **Wendover AFB, Utah,** replaces Casper. It has excellent range facilities.—END

The Middle Years...

These are the career-building years. These are the years when *everything* you do is weighed in the balance. The success you will merit in the later years is being built right now.

If you are one of those young officers selected for a full Air Force career, you will find these middle years a period of challenge—a period for great strides career-wise. You will be able to take advantage of the excellent opportunities for further education and training. Your advancement will depend on you. And during this time your family's financial status and general sense of security will be assured. Equally important to their happiness—they will be building lasting friendships.

Later a man looks back at these middle years. He questions if what he did with them was important and meaningful. As a comfortably retired Air Force senior officer you will recognize them for what they were... *a preface to success.*

There's a place for tomorrow's leaders on the Aerospace Team

A new Division of the Air Force Association is being formed for Arnold Air Society members. As a result, the Arnold Air Alumni Association gets . . .

OFF THE GROUND

Thomas E. Cindric (left), 1959-60 National Commander of the Arnold Air Society, talks over formation of the new AAS alumni organization with Lt. John D. Johnston, who is first President of the Arnold Air Society Division of AFA.

AN ON-CAMPUS AFA. That's the Arnold Air Society. A string of Society units stretches across the country —at colleges and universities where there are Air Force Reserve Officer Training Corps outfits.

Society objectives are almost identical with those of the Air Force Association. And AAS has been an active and effective organization. But one disadvantage has always been apparent. College students graduate; and while the cadets are very active in AAS Squadrons, the percentage of them who remain in AFA after they leave college has been woefully small. One big reason for this is that there hasn't been an organization they could belong to, and feel a part of, similar to AAS.

Although there is no real "solution" to this problem built into any school organization, a new move by AFA's Board of Directors now gives the graduates an opportunity to remain, in effect, members of the vital, purposeful Arnold Air Society. The directors have approved formation of the Arnold Air Society Alumni Association as an official Division of AFA.

The idea had been kicking around for several years. The 1958-59 AAS staff, at the suggestion of Lou Ciccoli, AAS Executive Secretary, came up with the present plan.

Lt. John D. Johnston, a 1958 graduate and past mathematics instructor at the University of Pittsburgh, has been selected as the first President of the new Division. He has set things well in motion from his duty station at Kirtland AFB, N. M. Already he has made two trips to Washington to discuss operations with AFA staff members and Colonel Ciccoli, in addition to appearing before the AAS Executive Board in December at Maxwell AFB, Ala., to explain the new group's objectives.

The alumni society is devoted to maintenance of adequate airpower for security and education of its members in current aerospace developments.

As a full-fledged Division, the alumni group will not assess dues, other than the $6 annual AFA dues, which will include Division membership privileges. A portion of this amount will be refunded to the Division for its operating expenses.

Three classes of alumni society membership are available: **Active,** the category reserved for Arnold Air Society graduates; **Associate,** for those individuals who desire to support the Society but do not meet the ex-AAS qualifications; and **Honorary,** which is granted by the Division's Executive Committee. It must be remembered that, while active-duty personnel may be Active members of the Division, this does not automatically qualify them for Active membership in the Air Force Association, a category limited to individuals not on active military service.

An annual conclave is planned for the Division. Present thinking indicates that this meeting might be held at the same time and place as AFA's National Conventions.

Officers elected for this year include, in addition to Johnston: **Lt. William Simon, III,** State College, Pa., and **Lt. Charles Evans,** Pittsburgh, 1st and 2d Vice President, respectively; **Eugene Ross,** Indianola, Pa., Secretary; **Lt. Merl Baldwin,** Pittsburgh, and **Lt. Alvin T. Schiff,** Los Angeles, Public Relations; and **Lt. Ralph Tartaglia,** Pittsburgh, Comptroller. Additionally, the current National Commander of AAS, Cadet Tom Cindric, along with members of his AAS National Headquarters Staff at Pittsburgh, has been a tremendous help in the first struggles to get the new Division off the ground.

Maj. Gen. E. S. Ligon, Jr., Director, Personnel Planning, USAF Hq., has accepted the title of National Advisor of the alumni group.

Membership benefits in the alumni society are:

- **Membership** in the Air Force Association.
- **Subscription** to AIR FORCE Magazine and SPACE DIGEST.
- **Subscription** to the Arnold Air Newsletter.
- **Invitation** to the AFA and AAS National Conventions.
- **Access** to the AAS and AFA Insurance Programs.
- **Various Air Force publications** of special interest.
- **A free** $1,000 Travel Accident Insurance Policy.
- **Access** to the Scholarship Loan Fund, which will be funded from the $6 dues and will be available to any alumni member or AAS Cadet.
- **Annual directory** of alumni members (addresses, family, etc.).
- First 150 applicants become **charter members.**
- All this for **$6 dues** per year.

For membership information, apply to: AAS Alumni Association, 1219 Hermosa Dr., S. E., Albuquerque, N. M.

This newest Division of AFA seems to be getting off the ground in fine style. We're sure everyone in the Association wishes them well and looks forward to a long and rewarding relationship.

—GUS DUDA

Maj. Gen. Elvin S. Ligon, Jr., Director of Personnel Planning, Hq. USAF, who has accepted the title of National Advisor to the Arnold Air Society Alumni Association.

AFA NEWS

SQUADRON OF THE MONTH

Lincoln, Neb., Squadron, Cited for effectively dramatizing to the community the peacetime preparations necessary to the maintenance of the deterrent power of the Strategic Air Command.

AFA's excellent squadron **in Lincoln, Neb.,** has come up with another first-rate program.

A B-47 crew representing **SAC's 307th Bomb Wing,** stationed at **Lincoln AFB, Neb.,** took top spot in December at SAC's "World Series of Bombing and Navigation." This event each year pinpoints the most proficient flight crew in a highly proficient global command.

This year's competition was held over the southeastern part of the country, with takeoff from McCoy AFB, Fla. **Col. Elkins Read, Jr.,** Commander, received the **Fairchild Trophy** in token of the 307th crew's victory.

Then AFA moved into the picture.

After Colonel Read and his crew returned to Lincoln, the AFA Squadron, led by **Walter Black,** Commander, **Frank Sorenson,** and **Glenn Yaussi,** headed a civic-night dinner in their honor at the Lincoln Country Club. The entire roster of the SAC Wing was on hand, along with their wives. The Fairchild Trophy was on display behind the speakers rostrum, and two additional awards were presented: a **citation from the Nebraska Wing,** and an **honorary membership in the Great Navy of the State of Nebraska.** The former was presented by **Gus Duda** (*see cut*), who represented AFA President **Howard T. Markey.**

This dinner is but another example of the **fine community spirit** that has long been a hallmark of the Lincoln Squadron.

Back in **1946,** when **Gen. Jimmy Doolittle** gave his then-secretary, **Mary Gill,** permission to organize an **all-girl AFA Squadron in New York City,** we doubt that he had any idea it would be **one of the most active outfits** in the Association for years to come. This month we're proud to pay tribute again to a great bunch of gals, all of whom are veterans of service in the WAF.

The **New York City Squadron** has interested itself in a great many projects, such as **working in hospitals** and **sponsoring campaigns to raise funds** for worthwhile objectives, and at the same time has performed nobly in aerospace activities.

The latest program of the Squadron, which is headed by **Dorothy Wadsley,** is the **Airman-of-the-Month program,** which honors the outstanding airman from **Mitchel AFB, N.Y.,** each month with a **weekend "on the town."** The photo below gives some idea of the complimentary services given the lucky airman. We extend our congratulations to this fine group on another good program.

As this issue goes to press, the Squadron is undertaking another program that **may well turn out to be a "first" in AFA.** On January 30, the Squadron is sponsoring its **thirteenth annual anniversary banquet** and dance at the **Sheraton-Atlantic Hotel** in New York. **President Markey** is to be guest speaker, while our Board Chairman, **Julian B. Rosenthal,** is toastmaster.

Col. Elkins Read, Jr., SAC 307th Bomb Wing Commander, accepts Nebraska AFA Wing Citation for his unit from Gus Duda, AFA Organization Director.

Cleveland's Squadron, "Unit of the Year" for 1959, shows no signs of letting up in its program series this year. On October 26 the Unit sponsored the **third annual "Outer Space Day"** in the Grand Ballroom of the Sheraton-Cleveland Hotel, featuring a luncheon which was addressed by **William H. Godel,** Director of Policy and Planning for the Department of Defense's **Advanced Research Projects Agency.** His address was titled **"Where Are We Going in Outer Space?"**

The program was sponsored by the Squadron and the Cleveland Air Reserve Unit for the **Sales Executive Club of Cleveland.** It attracted a crowd of almost **400 civic leaders,** making this the largest program to date of the Sales Executive Club.

During his stay, Mr. Godel also appeared before the faculty and students at **Case Institute,** and made several radio and television appearances. They were arranged by **Squadron Commander Ray Saks and Regional Vice President Will Dougherty.** During the day of the program USAF missiles were on public display downtown, and the Squadron pitched in

(Continued on following page)

Dot Wadsley, left WAF Squadron Commander, and Emma Haubrich explain to Airman 1/C Ronald D. Franklin the various benefits he will receive as Airman of the Month. Some of the contributors are indicated by the cards ***(see text).***

TAC's Operation William Tell II included jet orientation flights in TF-102s for selected news representatives. One of these, Muriel Tolle, San Diego Squadron member, is shown above with Maj. William T. Creech, Commander of the 4756th Air Defense Squadron, Tyndall AFB, Fla.

Maj. Donald Nelson accepts AFA check for $552 as the 504th claimant in the Flight Pay Insurance Program. Dayton AFA Squadron Commander Morris Ribbler presents the check. Major Nelson, who is stationed at Dayton Air Force Depot, is a member of the Dayton Squadron of AFA.

with a "display" of a different sort when they chose **Miss Rochelle Malecki** as "Miss Outer Space."

Hardly pausing long enough to rest, the Squadron next jumped into a **city-wide observance of "Air Reserve Week,"** which it climaxed with a luncheon, at which the guest speaker was **Maj. Gen. John P. Henebry,** AFRes., from Chicago. Of course he's better known to all of us as "Jock" Henebry, **President of AFA in 1956-57,** and a very active member of the board now. He chose as his subject **"The Futuristic Air Force."**

The Squadron also honored **five area firms** for their **contributions to the Air Reserve program.** They were **Thompson-Ramo-Wooldridge, Cadillac Tank Division of General Motors, Parker-Hannifin Corp., Weatherhead Co., and the American Steel & Wire Division of U. S. Steel.**

Oahu Squadron, in Honolulu, Hawaii, announces its most recent affair was a big success. It was a luncheon meeting held in December, and co-sponsored by the **Aeronautical Affairs Committee of the Chamber of Commerce.**

Gen. Emmett "Rosie" O'Donnell, Jr., Commander, Pacific Air Forces, was guest of honor at the luncheon, and was welcomed by more than 125 civic leaders of the community. General O'Donnell's command is spread over some forty percent of the world's surface. He assumed command on August 1, 1959, after a tour as DCS/Personnel.

Roy Leffingwell, AFA's Vice President in the region, and **Howard Bourell,** Oahu Commander, put this program together. We commend them, and the rest of the members, on another fine program.

Erie, Pa., Squadron members recently toured Wright-Patterson AFB, and in the process were briefed on the USAF Orientation Group's operations. The members, shown here with Col. Reginald Cram, Commander of the Group, were also shown the North American-built F-107A, USAF experimental all-weather fighter plane.

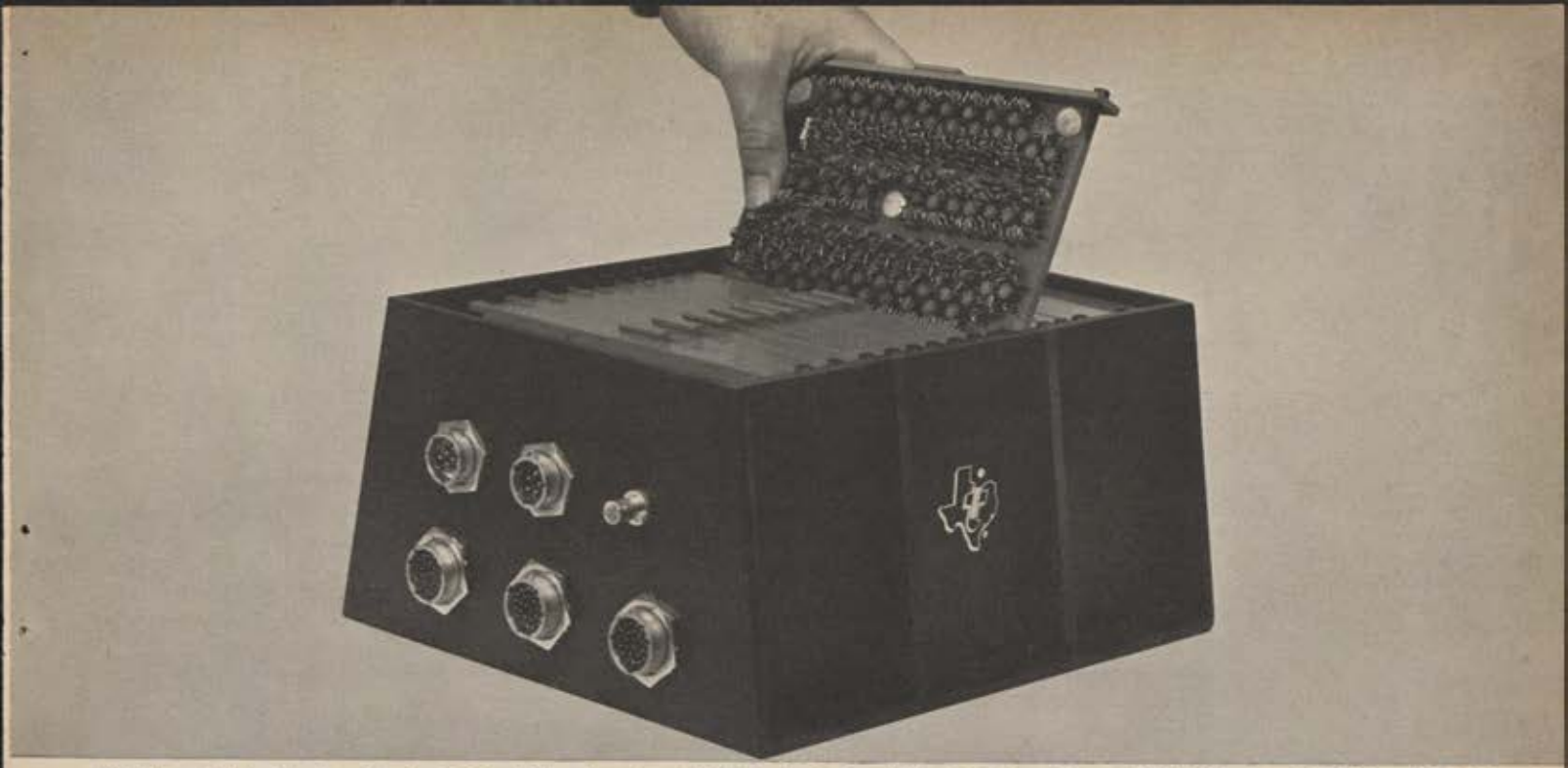
Ohio's Wing Executive Committee recently took a step that may rank in importance with the establishment of the first AFA Wing there in 1947. It decided that the true objective of the annual Wing meeting is **internal education** and that social affairs rank far below. So, the 1960 meeting will be an **"AFA Conference,"** without banquets or receptions.

All Wing Conventions begin as small efforts, some of them growing to large-scale events requiring a lot of time and money. Ohio feels it's time to **reverse the trend,** deemphasize the Convention, and leave more time to **promote programs designed to achieve basic AFA objectives.** It will be interesting to see the results, which we'll pass along to you.

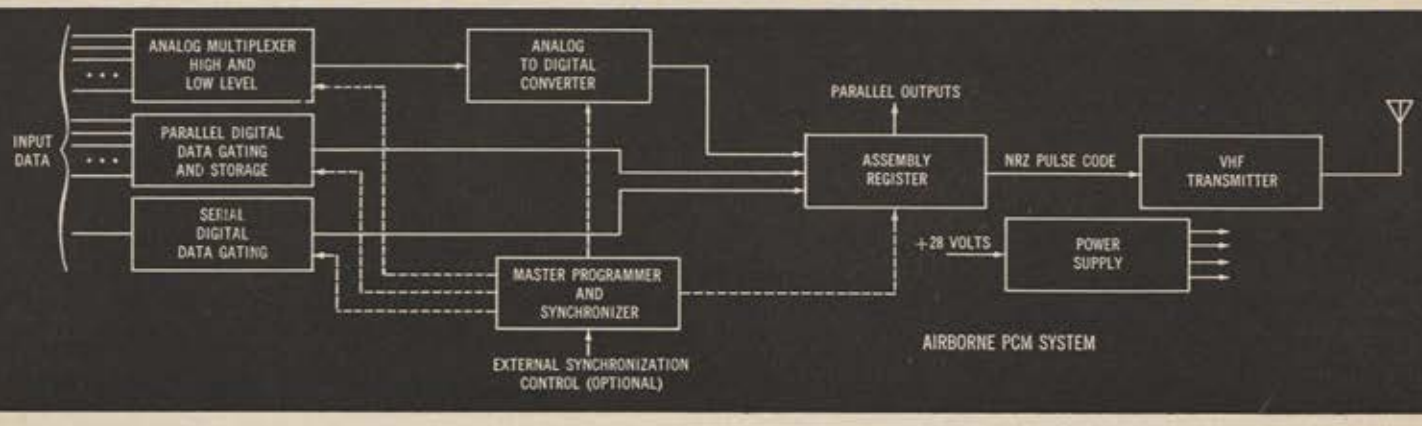
When plans were announced for the **Air Force Academy football team** to come to Yankee Stadium to play **West Point** in November, our **Manhattan, N.Y., Squadron** hoped to be able to sponsor some sort of program for the visitors, but found that almost every free moment the Cadets from Colorado had was taken up with some **official event,** so they had to content themselves with just going to the game.

Then it was discovered that someone had forgotten that even AF Cadets have to eat. **No provisions** had been ordered for the plane that was to take the Cadets home to the Academy. This matter was taken care of by the Squadron, which **arranged for donations from its members** to purchase meals for the Cadets. Each of these meals, when it was opened, bore

(Continued on page 107)



NEW FROM TEXAS INSTRUMENTS!



High capacity, ½ cu ft, PCM telemetry system ...with system drift nulled out!

Now you can get the benefits of digital techniques — accuracy, speed and reliability — in compact pulse code modulation telemetry systems from Texas Instruments. The 25-pound, ½ cubic foot package shown uses only solid state devices, and may be used to drive any of the compact TI transmitters dictated by the application. The system multiplexes and encodes 64 analog channels; and processes five 8-bit parallel digital data channels plus a serial digital data channel at a nominal bit rate of 200 kc.

A key feature of the system is its high-speed analog multiplexer which handles low- and high-level data, or a combination of both, with *only a single low-level amplifier*. Overall accuracy of the system is ±0.25% — made possible by a unique bi-directional servo loop that nulls out system drift. The system is packaged in individual modules so that it can be rapidly modified to fit the needs of other missiles or space vehicles.

PCM is only one of several advanced telemetry projects at Texas Instruments. Others include the development and/or production of analog systems and equipments for Bomarc, Corvus, Pershing, Minuteman, Titan, Centaur, and Project Mercury.

For detailed information about PCM telemetry or other TI missile electronic system capabilities, please contact SERVICE ENGINEERING:

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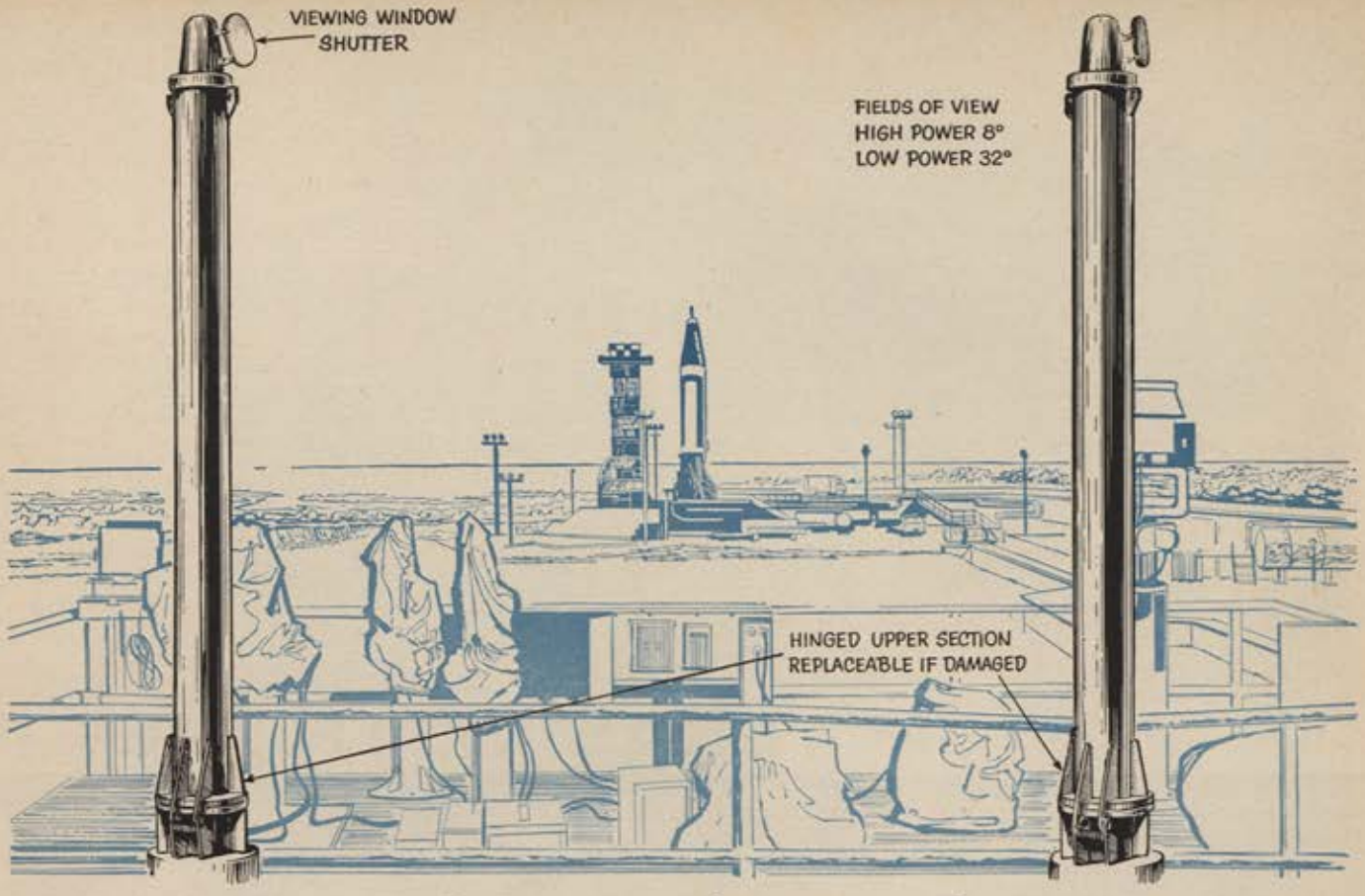


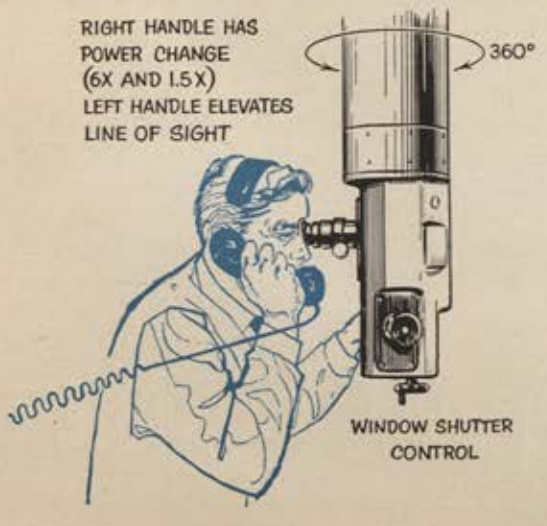
Cape Canaveral count-downs get Kollmorgen close-ups

What happens on the pads at Cape Canaveral is subject to the continuous close scrutiny of experts thanks to Kollmorgen bunkerscopes. During launching operations and static tests the trained observer sees exact detail in his choice of two magnifications and in true color, with complete safety even in cases of power failure.

Bunkerscopes by Kollmorgen require virtually no maintenance and are built to withstand blast forces such as may be expected around missile launching sites. They are easy to operate, even by untrained personnel, and can quickly be adapted to photography and television use.

These instruments are typical of Kollmorgen experience with remote viewing and inspection equipment, wall periscopes, underwater periscopes, micro-photo periscopes, continuous strip fuel-inspection cameras and other optical systems employing mechanical and electronic skills. In this field Kollmorgen is foremost, having served both industry and defense for nearly half a century.

If you are interested we would like to send you our new illustrated facilities brochure. Just write us a note on your company letterhead.



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WESTERN TECHNICAL REPRESENTATIVES—
COSTELLO & COMPANY, LOS ANGELES, CALIFORNIA.

a card advising the Cadet that the Manhattan Squadron had presented it.

CROSS COUNTRY. . . . As you read this, we're just a few days away from the observance of **AFA's 14th Anniversary** as an organization. It was on **January 26, 1946,** that the original group of thirteen men met in New York and got the Association on the road, and just eight days later, **on February 4,** a group met with **President Harry Truman** to celebrate the formation of AFA. In the front office we have a big picture of that historic gathering, which includes **Jimmy Doolittle,** who was first AFA President; **Willis Fitch,** then Executive Director; **Forrest L. "Woody" Vosler,** Congressional Medal of Honor holder, who was a Director; **President Truman; Tom Lanphier, Jr.,** then Third Vice President and later AFA President; **Meryll Frost,** Second Vice President; and **Jimmy Stewart,** a Director.

Looking at that picture, and thinking of the anniversary, prompted us to dig up the very first issue of AIR FORCE Magazine ever published by AFA, which was dated **July 1946,** and contained sixty-six pages. Included among the "hot" items in that issue was one on the **B-35, the Northrop "Flying Wing";** another on the **"first of the jet bombers"—the XB-43,** built by Douglas; and another on the new **Fairchild "Packet"** cargo plane. These were accompanied, of course, by the **very first edition of "AFA News."**

Pictures in that issue included, in addition to the one showing President Truman and the organization's founders, one of **Capt. George Barr,** the last Tokyo Raider to return to the States, participating in a memorial service for AF dead; and a photo of **Gen. Carl A. Spaatz,** first USAF Chief of Staff, discussing AFA plans with **Woody Vosler and Meryll Frost.** The issue also carried an item on the **"intensified campaign in Baltimore** to organize a Squadron." The Squadron there was chartered, of course, and was the **first AFA Squadron in the country,** followed soon after by a rash of others all across the land.

The officers in those days, in addition to those already named, were: **Edward P. "Ted" Curtis,** 1st Vice President; **Sol A. Rosenblatt,** Secretary; **Julian B. Rosenthal,** Assistant Secretary; and **W. Deering Howe,** Treasurer. A three-man Magazine Editorial Board included a name that's pretty familiar to everyone who's been around AFA: **James H. Straubel,** who as an AAF lieutenant in 1942 had been given the rather challenging task of establishing an official magazine for the rapidly expanding AAF, which needed a medium for exchange of information and ideas among Air Force personnel.

Anyone who remembers AIR FORCE during the war when it was available at every base knows that he made a success of that job, just as he did with his work for AFA. Another man on the editorial board was **Corey Ford,** who before and since has occupied a large niche in the field of book and magazine writing.

It's an interesting experience to look through an old issue, and to realize how far the Association has progressed. Throughout our reminiscing, though, we were constantly reminded, through printed or implied statements, that the objectives of the club haven't changed a bit. The manner in which we accomplish things, the size of the Magazine, the expanding belt lines on some of us members, may be different, but AFA still is dedicated to achieving a better public understanding of the role of airpower in maintaining world peace. We are sure this part of the Air Force Association will never change. Happy Anniversary!

—GUS DUDA

airman's bookshelf

Lindbergh as a Hero

***The Hero: Charles A. Lindbergh and the American Dream*, by Kenneth S. Davis (Doubleday & Co., 1959, 527 pp., $4.95)**

Reviewed by C. B. Allen

Good writing is certainly one of the prime attributes of analytical biography. Mr. Davis writes well in his 500-odd-page treatise on Lindbergh, his ancestral and sociological background, and his impact on the era through which he has lived.

But sound reasoning, or an objective analytical approach, is even more important if the writer is interested in doing more than merely building a case for his preconceived personal convictions. On this score, readers may have reservations about the hero.

Early in his book, Mr. Davis implies that Lindbergh, during his brief college days, was "odd" and a "misfit" in the student community. He cites the case of a young lady who got miffed over what she considered Lindbergh's "utter coldness, if not outright rudeness," in refusing to let a friend take her for a ride in Lindbergh's iceboat. Mr. Davis also finds it strange that Lindbergh as a country boy in his late teens and early twenties was serious and reserved to the point of shyness. He shunned girls and took no part in "jazz-age" gin-drinking and other youth "emancipation" activities of post-World War I days.

Mr. Davis evidently was not around then, but there were and still are a lot of country boys who fit the same pattern of nonconformity. The record shows that a lot of them turn out quite well.

Even Mr. Davis' record shows that Lindbergh, in his Army Air Corps flight training, was graduated Number Two man of his class in the primary school at Brooks Field, Tex., and head of his class in the advanced school at Kelly Field. Unfortunately, Mr. Davis fails to give the reader what should be a highly interesting factual comparison of how Lindbergh did as an airmail pilot vis-à-vis his fellow pilots, Phil Love and Tom Nelson, on the Robertson St. Louis-Chicago route. An honest analysis of the performance records of these three ought to throw considerable light on Lindbergh's real stature as a pilot.

The Hero manages to throw almost as much light on the character of the author as on that of his subject. One reads, for example, that Sacco and Vanzetti (who shared the headlines with Lindbergh after his New York-Paris flight) were electrocuted by the Commonwealth of Massachusetts "for the crime of being 'foreigners' and 'radicals.'" One also reads that it was the scheduled airlines' "thievery" from the Post Office Department that brought about the cancellation of their airmail contracts by President Roosevelt in 1934.

One wonders, if this flat assertion by Mr. Davis is true, why no one was sent to jail, and why Mr. Roosevelt, smarting over Lindbergh's characterization of his action as "condemnation without trial," and the public's vigorous support of the Lindbergh accusation, restored the contracts to their original holders. It was done with only a face-saving, and again arbitrary, order forcing Mr. Davis' "thieves" to reorganize their companies slightly and revise their corporate names.

Mr. Davis indicates that Lindbergh "abruptly ceased to be a hero at all" to him when he had the temerity to pit himself against President Roosevelt in the airmail cancellation episode. Mr. Davis' final disposition of the great aviator, however, waits until the next-to-the-last chapter of the book, entitled "The End of the Hero." He works up to this climax through insinuations that Lindbergh had a Nazi-style turn of mind, if he was not an actual Nazi sympathizer, during pre-World War II days when he again stood against President Roosevelt in an effort to prevent the United States from entering the war.

Mr. Davis did not invent the formula he follows, but it is a simple one. Roosevelt was right. Lindbergh and all who felt as he did were wrong. If you were not pro-British, obviously you were pro-Nazi. Thinking in terms of America First was clearly a sneaky and probably a subversive subterfuge. Unfortunately, Mr. Davis' research on this score does not reveal the host of honorable and patriotic persons aligned with Mr. Lindbergh on this point.

But if Lindbergh was and is no hero to Mr. Davis, it seems clear from *The Hero* that Soviet Russia is. One reads in it that in July 1936, "Franco's Fascist insurgents attacked the Popular Front government of Spain and were openly supported by both Mussolini and Hitler. . . ." One looks in vain for any hint that the "Popular Front" may in fact have been a Communist front and for any mention of the support given it by Russia, including the latest-type Soviet fighter planes with crews to fly and maintain them.

Again, Mr. Davis takes Britain and France to task for refusing to join with Soviet Russia in a "strategy of collective security" to contain the growing threat of nazism and fascism in Europe. Here he becomes a clear advocate of "defensive alliances" with the Russians and of their dependability.

Well, Britain and what was left of France, together with the United States, finally made their "defensive alliances" with Soviet Russia. Hitler and Mussolini are gone and no longer trouble the world, but the part of it we call free is still desperately maintaining its defenses against the erstwhile "defensive ally" so staunchly championed by Mr. Davis. What Mr. Davis needs to do, perhaps, is to ask himself whether the Communist bear we have by the tail is more or less of a menace to the world than the Nazi bear President Roosevelt insisted on grabbing by the tail in 1940 and 1941?

It is clear to the reviewer why Marvin W. McFarland, Head of the Aeronautics Section of the Science and Technology Division of the Library of Congress—as Mr. Davis reveals in the "Bibliographical Essay" at the back of his book—aided him in some of his research but "vehemently" disagreed "with certain of my conclusions."

About the reviewer: *C. B. Allen, now associated with the Martin Company, has been observing and reporting aviation news since World War I, first for the old New York* World *and then for the New York* Herald Tribune. *Some of his reporting on the activities of Charles A. Lindbergh is liberally quoted by the author of the book Mr. Allen reviews here for* Air Force/Space Digest.

Man and His Universe

Several new books are devoted to man's origin and destiny, the order of the physical world and the universe,

(Continued on page 110)

CREW EDUCATION in operational procedure includes rundown on Navigation Control Console and NAVDAC—Sperry computer which cross-checks a dozen systems, compares references, records speeds, integrates all data for precise positioning of submarine.

POSSIBLE LAUNCH-SITE: UNDER THE ARCTIC ICE-PACK. Nuclear subs will be able to stay submerged, navigate for months without refueling, launch Polaris under water. Range places new demands on navigational resources and capabilities.

FULL-SCALE SUB SIMULATOR duplicates complex navigational equipment that will guide actual Polaris submarines. To fit systems in restricted space, everything from cabling to 62-ton Gyroscopic Stabilizer must be "engineered" into the hull.

"Dry Run" For The Missile-Launching Subs

Aiming the 1200-mile Polaris missile from a submerged nuclear sub will pose a delicate navigation problem. Engineers are solving it in a unique "underseas" laboratory.

ONE OF A SERIES:

THE STORY BEHIND THE STORY
of Sperry Marine Division

The Navy's goal of "Seapower for Peace" is nearer with each step towards operational capability of the new missile-carrying submarines. When armed with Polaris missiles, these subs will represent an unprecedented counter-punch capable of reaching targets 1200 miles away, from anywhere in the world's oceans.

The Polaris concept places critical demands on the art of navigation. A single degree of error can result in a 17-mile error in a thousand-mile range. To Sperry's Marine Division—appointed by the Navy to Navigation Systems Management of the newest class of Polaris submarines—is assigned the job of assuring highest possible system accuracy.

Working with the Navy's Polaris experts, Sperry engineers are installing, operating and evaluating instruments and systems for the Polaris at Sperry's "Navigation Island"—a shore-based replica of the navigation center in the Polaris submarines. Here installation and operating problems and techniques, maneuvers, emergencies, even the stars for celestial navigation, are "shot" under realistic conditions.

One system is Sperry's NAVDAC (Navigation Data Assimilation Center)—a computer which analyzes information fed to it from the navigation equipment that will eventually position the Polaris subs for missile firing. Basic to a number of the subs is Sperry SINS (Ship's Inertial Navigation System) equipment. These and other advanced systems are being evaluated and refined.

With the Navy's foresight in "interlocking" all aspects of the Polaris program . . . and with the cooperation of the many leading industries which are contributing . . . the Polaris subs will soon be operational. Marine Division, Sperry Gyroscope Company, Division of Sperry Rand Corp., Syosset, New York.

SPERRY

and the marvels of things scientific.

Science writer and editor John Pfeiffer contributes an interesting panoramic view in *From Galaxies to Man: The Story of the Beginning of Things* (Random House, $4.95). Pfeiffer studies the evolution of the universe, recreates the beginnings and development of the planet earth and life upon it, and places man's advent in the time perspective of earth's existence. His style is intriguing, his thoughts a mixture of science, philosophy, and imagination.

• • •

Ninety-nine percent of the atmosphere is compressed within a twenty-mile-thick layer surrounding the earth. This is the air ocean in which man is a bottom-crawling creature, a prisoner who cannot escape unless he takes his breathable atmosphere with him into airless space. No element is more important than air in shaping life, endeavor, and the course of human progress. David I. Blumenstock of the US Weather Bureau lays out an engaging study of the atmosphere and human existence in *The Ocean of Air* (Univ. of Rutgers Press, $6.75). This definitive, brilliant book, more than twelve years in the research and writing, explores, describes, portrays, interprets the air from its outer space fringes to earth's surface where the most simple forms of cell life depend upon it to germinate and grow.

Subjectwise it is divided into three major parts: the physical makeup and behavior of the air ocean; man's observation, prediction, and control of it; and the impact of it upon man himself, on his industry, commerce, agriculture, his social, political, military, and technological pursuits. The narrative is easy reading, combines scientific thoroughness and accuracy with a technical comprehensiveness that serves specialist and layman alike.

• • •

Of all the great celestial bodies, only the sun is required for life on earth. Two new books study our solar phenomenon. Harvard physicist Donald H. Menzel's *Our Sun* (Harvard Univ. Press, $7.50) is a completely revised, up-dated edition with new scientific and illustrative material added.

• • •

The Sun, by Dr. Karl Keipenheuer (Univ. of Michigan Press, $5), is a clear and readable account of what we know about the sun and how this knowledge was obtained. He describes the composition and nature of this "nearest star" and relates its importance to our existence on earth.

• • •

Next to the sun and moon, Venus is the most brilliant object in the sky, our nearest planet, and sometimes called "earth's nonidentical twin." Patrick Moore, British science writer, provides an interesting study in *The Planet Venus* (Macmillan, $3.75). He assembles all known scientific evidence and describes the conflicting theories about the nature of its surface and enveloping vaporous cloud.

• • •

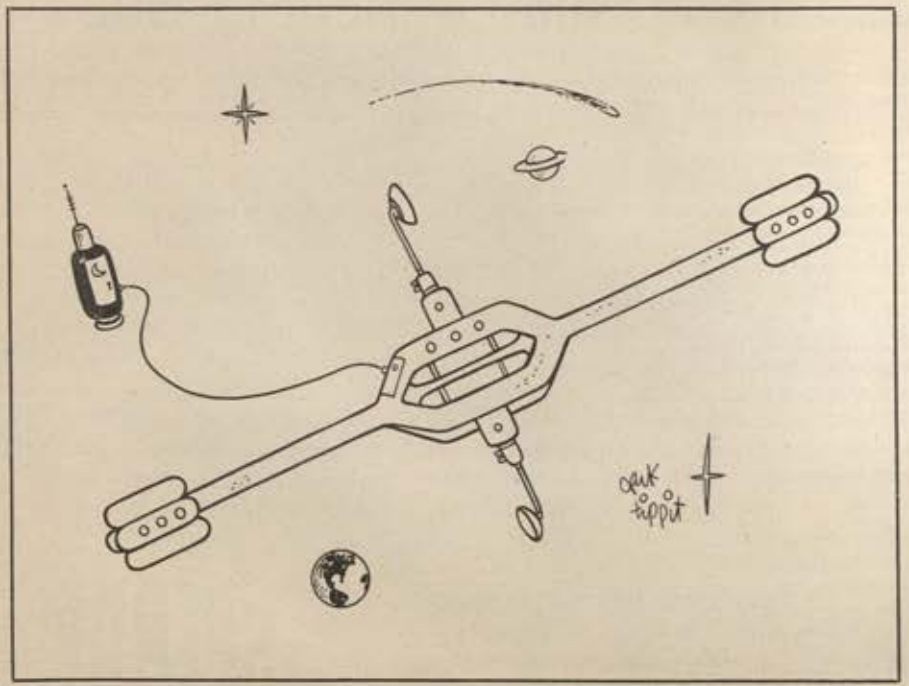
Heinz Gartman, German scientific pundit, traces man's rapid technological pursuits and accomplishments over the past 200 years, beginning with the steam engine and ending with satellites. *Rings Around the World* (Morrow, $5.95) was first published in Germany, and also achieved popular success in England, Italy, Denmark, and Sweden.

• • •

On modern events and in terms of the men who were responsible for them, Daniel Lang's *From Hiroshima to the Moon* (Simon and Schuster, $5.95) gives an intimate glimpse of the past fourteen years. Lang's characters are atomic scientists, missilemen, people big and small, whose lives have been caught up and enmeshed in the technological complexities of the postwar atomic age. The material originally appeared in *The New Yorker*.

• • •

A thoroughgoing report on man's latest studies about his world and his universe is presented in *IGY: Year of Discovery*, by Sydney Chapman (Univ. of Michigan Press, $4.95). Here is an illustrated report on the international effort during the International Geophysical Year 1957-1958. During this period Russia launched Sputnik, the US launched the first Vanguards, and a number of nations sent teams of scientific explorers to the corners of the earth. IGY subjects included earthquake waves, glaciers, oceans, the atmosphere, the ionosphere, cosmic rays, the sun, nuclear radiation, and many, many others. Author Chapman headed the group which directed the program in this country.



Aerospace Books

Several years ago Col. A. M. "Chic" Henderson, Assistant Chief of the Aero Medical Laboratory, WADC, and known as the AF's "parachuting grandfather," pioneered in escape from high-altitude, high-speed jets. Now, from retirement, he sums up a lifetime of specialization in *It's Your Life, Joe: An Expert's Advice on Air Safety* (Vantage Press, $2.95). The book is a gold mine of professional advice on parachuting and personal flying equipment. How to prepare for jumping, how to bail out, what to do during descent, how to land—these and other topics are discussed, described, and illustrated as author Henderson puts flyer "Joe" through an orientation course. Cartoon illustrations enliven the account, an excellent complementary volume to official manuals and guides. Maj. Gen. Joseph D. Caldara, USAF provides the foreword.

(Continued on page 112)

READY

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"Behind each spectatcular launching at Cape Canaveral, Fla., are thousands of human beings, men on whose shoulders rest the outcome of the race into space." These remarks introduce *The Missilemen: A Stirring Picture Story of a New Breed of Men* (Doubleday, $4.95). This exposition of the human element of missilry is primarily a series of informal, intimate photos of the individuals at work, at home, and at play—generals and scientists, laborers, launch console operators, guidance controllers. Actual launches of the Juno, Atlas, and Thor are caught in dramatic camera portrait, the over-all producing a pictorial biography of Air Force missile work at Cape Canaveral.

• • •

Roy A. Gallant's new *Man's Reach into Space* (Doubleday, $3.50) is described by some AF scientists as the clearest expression yet of the AF's research and development in aerospace medicine. The narrative is supplemented by beautiful color illustrations and art, describing and explaining the many areas in which medical military scientists are working to prepare man for physical survival in the hostile environment of space. The history of man's progress spaceward is traced from the early balloon flights of the 1800s. A concluding chapter treats space exploration in sealed spaceship cabins, considers the dangers of meteors, cosmic rays, and other hazards.

• • •

A new, revised edition of *The World's Fighting Planes,* by William Green and Gerald Pollinger (Hanover House, $3.50) features the currently used combat aircraft of eighteen major world air forces. Aircraft appear in photo and three-view silhouette. Captions list design, operational specifications, describe armament, types and models, squadron numbers, and aircraft history.

Also of Interest

Satellites and Space Probes, by Erik Bergaust (Putnam, $2)—A brief, concise picture survey of Russian and US space probes, satellites, and space programs. Describes launchings and discusses operational plans.

The City That Would Not Die, by Richard Collier (Dutton, $4.50)—Reconstruction of the bombing of London, May 10-11, 1941, researched from British and German documents, interviews with Luftwaffe pilots, and British survivors of the holocaust.

German Secret Weapons of World War II, by Rudolf Lusar (Philosophical Library, $10)—A survey of German weapon development for World War II revealing the scope and technical proficiency which produced fantastic results such as the jet fighter and the V-2. Scores of unique weapons, down to small arms, are described and the history of their development and use related.

A Space Bibliography Through 1958, by Dr. Raymond Estep (Research Studies Institute, Air University)—A periodical and book index of 1,832 entries. Each carries brief content description and Air University library call numbers. Covers articles in periodicals and books on rockets, missiles, astronautics, and spaceflight.

For Youngsters

Man in the Universe, by Don Cox and Michael Stoiko (Winston, $2.95)—Explanation of the solar system, illustrated with charts.

Boy's Book of Space, by Patrick Moore (Roy, $2.75)—New edition

(Continued on page 115)

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Alfred Goldberg, Editor

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Soviet Strategy in the Nuclear Age

by Raymond L. Garthoff

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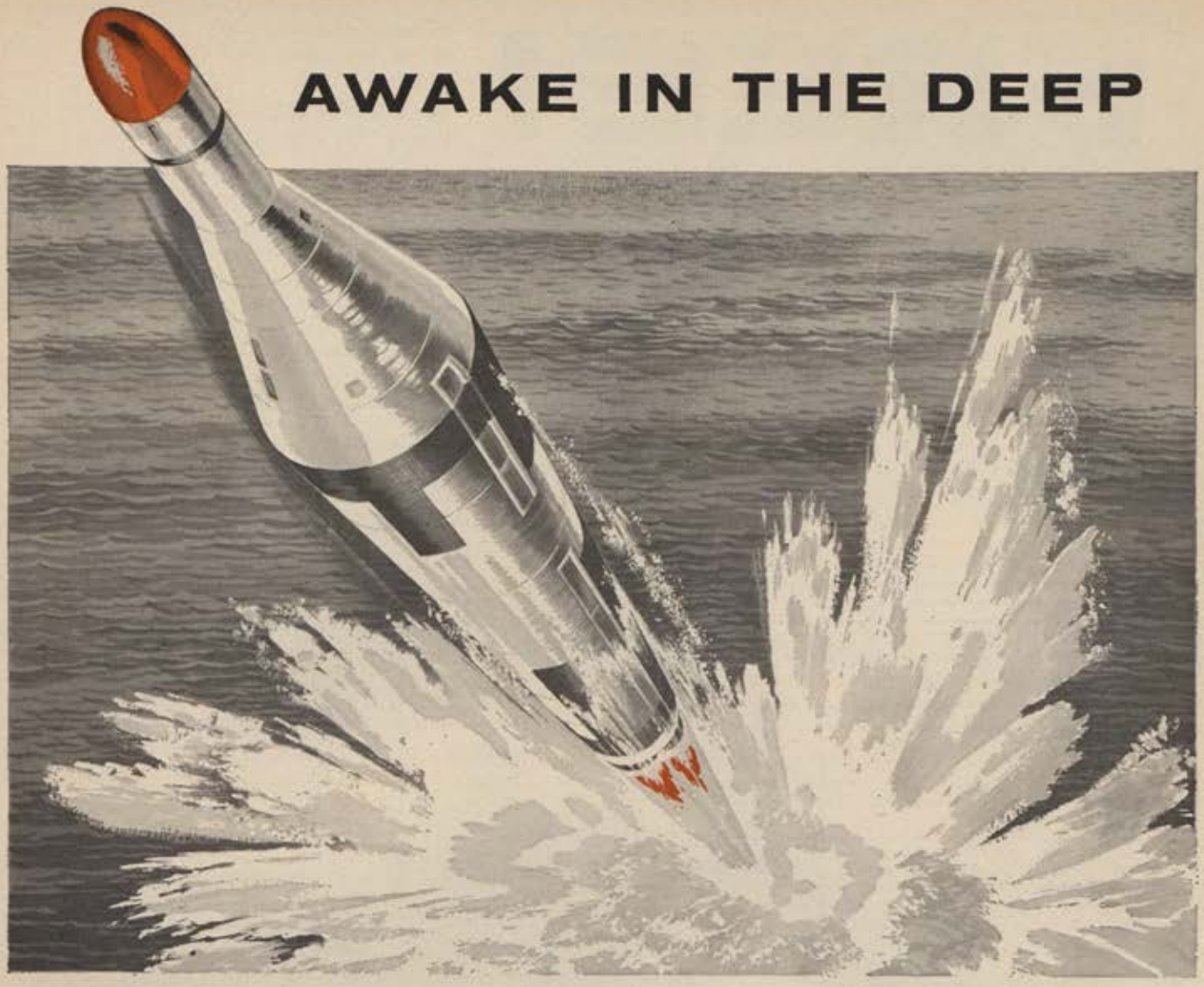

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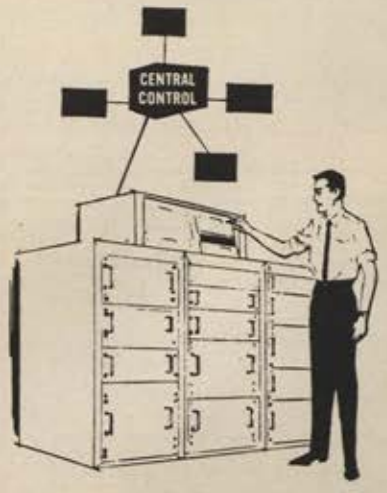
Soon American seamen aboard swift, nuclear-powered submarines will patrol "Awake In The Deep"...armed with the U. S. Navy's devastating POLARIS fleet ballistic missile. Besides alertness there will be readiness, guaranteed by automatic production checkout units designed and built by Packard Bell Electronics for the Missiles and Space Division of Lockheed Aircraft Corporation. The factory checkout system for POLARIS consists of a central control station and remote test consoles for *Receiving Inspection, Package, Flight Control and Systems* checkout. All units are self-powered, self-checked, modular designed, fully automatic and solid-state. All can be adapted for use with any missile, aircraft or other weapon system.



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speculates about space travel, space ships, and trips to the moon, Venus, and Mars.

The Giant Golden Book of Astronomy, by Rose Wyler and Gerald Ames (Golden Press, $3.95)—A beautiful, highly illustrated explanation and study of the universe, of astronomy, and the future conquest of space.

Exploring Science, by Jonathan N. Leonard (World Publishing, $4.95)—Explanation of what we know about the earth, sun, moon, planets, and outer space and a recount of man's scientific accomplishments in these sciences. Highly illustrated in color and black and white.

Atoms Today and Tomorrow, by Margaret O. Hyde (Whittlesey House, $3)—Revised edition discusses atomic energy, fallout, effects of bomb tests on weather, etc.

Fun with the Sun, by D. S. Halacy, Jr. (Macmillan, $2.75)—How to use the sun to make fire, an oven, radio, motors, and conduct many other interesting experiments with sunlight.

Operation Springboard, by John Ball (Duell, Sloan & Pearce, $3)—Science fiction for the teen-ager.

Seeing the Earth from Space, by Irving Adler (John Day, $3.50)—A report on the man-made moons placed in orbit and what they are telling us about the earth and space.

Paperbacks

Air Surgeon, by Frank G. Slaughter (Permabooks, 35¢)—Novel about a flight surgeon and airmen at war, set in World War II.

Falling Through Space, by Richard Hillary (Dell, 35¢)—The personal narrative of an RAF fighter pilot and his combat during the Battle of Britain and the early part of World War II.

Combat: European Theater, World War II and *Combat: Pacific Theater, World War II*, both edited by Don Congdon (Dell, 50¢ each)—Anthologies of the writings of war correspondents, the military participants, and eyewitness reporters of combat actions of both theaters of war. Running commentary provided by the editor. Excellent reading.

Battle for the Rhine, by R. W. Thompson (Ballantine, 50¢)—The tale of the final, frontal attack against the "impregnable" Siegfried Line by the Allied armies.

Pork Chop Hill, by S. L. A. Marshall (Pocketbooks, 35¢)—About ground warfare in Korea and the battle for a desolate mountain position.

The International Geophysical Year, by Walter Sullivan (Carnegie Endowment for International Peace, 25¢)—The story of the IGY from the point of view of the social historian who sees it as the triumph of science over politics in the vast reaches of the Antarctic, beneath the earth's crust, and into outer space.

Reading for Dollars and Sense, by William D. Sheldon and Leonard S. Braam (Syracuse Univ. Press, $1.75)—An effective guide to improving reading efficiency. A digest of a highly successful reading improvement course conducted by the authors.

—MAJ. JAMES F. SUNDERMAN

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Do you make monthly payments on a car?	●	●
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Have you got money put aside for your children's education?	●	●
Have you got enough money in the bank to absorb the financial shock of a temporary grounding?	●	●
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If you answer "no" to any one of these questions, you almost certainly could benefit from AFA's low-cost Flight Pay Insurance.

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for rated personnel

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Payment for a single 90-day grounding reimburses for you the whole cost of 10 years' protection

Maybe you're certain that you're not going to get sick in the next ten years—but remember! Flight Pay Protection covers you for ordinary accidents, too. If you're in a traffic accident—if you trip on the way to the flight line, or fall off a ladder at home, and lose flight pay as a result—*your Protection Plan pays off.*

No matter how healthy you are, *this accident feature alone is worth the whole cost of your Flight Pay Protection Program.*

NOTE

There are some conditions and 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.

For instance, you're not indemnified for illness or accidents which originate before the effective date of your coverage. Your coverage for accidents begins with the effective date of your policy. Your coverage for illness starts 30 days *after* the effective date of your policy. All policies become effective on the last day of the month in which the application is postmarked.

To be eligible for protection, you must have passed your last annual physical . . . be presently on 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 some other specific exclusions, covering 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. Accidents caused while riding or driving in any kind of race.
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. Sentence to dismissal from the service by a general court-martial, submitted resignation for the good of the service, or suspension from flying for administrative reasons not due to injuries or disease.
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 pre-existing the effective date of coverage, or a recurrence of such disease or disability, whether or not a waiver has been authorized by appropriate medical authority in accordance with regulations or directives of the service concerned.
15. Mental or nervous disorders.

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Rank (please print) Name Address

City Zone State $ Annual Flight Pay Years Service for Pay Purposes

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Signature of Applicant Date

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ARMY: Got a TWX already. Out this morning—there now.
NAVY: But that's $8.70 cheaper than . . .
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INDEX TO ADVERTISERS

Grasshopper planes of the Civil Air Patrol share search and rescue missions with Air Force helicopters, other aircraft. Cost of flying CAP planes is far less per hour than higher-performance USAF aircraft. CAP is a good investment.

A military pilot bails out. A party of hikers is lost in wooded hills. Disaster strikes a community. Chances are that the Civil Air Patrol will be called out at once. And search and rescue is but one mission of . . .

THE AIR FORCE'S JUNIOR PARTNERS

Louis Alexander

IN THE control tower at a Tennessee Air Force base, controllers heard a pilot shout "May Day." They knew that a moment later he ejected from his F-104 Starfighter jet into the thin air far above them.

At jet speed, he could have landed anywhere within a hundred miles—perhaps hurt, or dazed, or worse.

The base commander immediately ordered out planes and helicopters. He also placed a phone call to the commander of the local squadron of the Civil Air Patrol.

"We've got a pilot down somewhere northwest of here," he told the CAP officer. "Can you get some planes out on a search?"

"We're on our way," replied the CAP commander. Picking up an adjacent microphone, he began talking rapidly on the CAP radio. Within a half hour a fleet of grasshopper planes —Pipers, Cessnas, Stinsons, and former military L-17s—were fanning out to search segments of the bumpy, forested terrain.

It was a Civil Air Patrol observer who spotted the jet pilot in a clearing among the trees, his white parachute paneled into an SOS. A radio call from the CAP pilot to the air base control tower brought a USAF helicopter to the scene in minutes. A few minutes more and the downed pilot, fortunately uninjured, was back at the base describing the incident to fellow officers.

This kind of teamwork goes on day by day between the Air Force and the Civil Air Patrol, which celebrated its eighteenth anniversary in December. A military pilot bails out. A party of hikers is lost in wooded hills. A commercial airliner goes down. Disaster strikes a community. The chances are that USAF and the CAP will be alerted at once.

During the first half of 1959 the CAP responded to 315 calls throughout the country, an average of nearly two a day. Civil Air Patrol grasshopper planes flew 7,372 hours during these search and rescue missions. Air Force helicopters and SA-16 rescue planes flew just about the same number of hours. Of 6,446 individual sorties, CAP aircraft flew 3,745, AF planes 2,701.

Search and rescue is the most dramatic activity which the Civil Air Patrol shares with the Air Force. It is not, however, the only one.

The Air Force, the other services, civil defense organizations, and police forces often depend on the CAP network of 11,000 radio stations to pass along the word about emergency needs when disaster strikes.

The Air Force provides summer encampment facilities for Civil Air Patrol cadets. One outstanding CAP boy from each state enjoys a week of jet orientation at a pilot training base, and one outstanding CAP girl from

Here members of Washington, D. C., CAP wing load boxes containing blood for transfusions aboard CAP plane that will carry them to disaster area. Prime peacetime job of CAP is rendering aid in cases of disaster, emergency.

Tornado damage at Fargo, N. D. CAP personnel are on the scene, offering whatever assistance is necessary. Air Force's junior partner is always ready to perform such mercy missions. But it has other important tasks as well.

CAP cadets and student pilots. One outstanding CAP boy from each state enjoys a week of jet orientation at an Air Force base each year. One CAP girl from each state spends a week on campus of Air University, Maxwell AFB.

National Headquarters, CAP, moved last year from Bolling AFB, Washington, D. C., to Ellington AFB, Tex., where Brig. Gen. Stephen D. McElroy, USAF, CAP National Commander and Board Chairman Col. Harold Byrd check in.

each state spends a week on the campus of the Air University, Maxwell AFB, Ala.

The Civil Air Patrol returns the favor; ten percent of the cadets at the Air Force Academy last year were former CAP cadets. Some 35,000 CAP "alumni" are in the ranks of the AF.

The Civil Air Patrol provides a haven for young men and women interested in rocketry and other technological developments. By direction of AFR 190-26, air base commanders and information officers may direct eager-eyed questioners who call at their bases to local CAP headquarters.

Following the example set by USAF, the CAP is active in peace as it was in war. It has adapted its roles and missions to the realities of peace. It aids the Air Force in fighting the cold war by keeping alive civilian interest in aviation, space, and national defense. Often CAP cadet activities generate community enthusiasm.

In fact, the national CAP commander, Brig. Gen. Stephen D. McElroy, believes this educational mission is even more important than search and rescue. Search and rescue saves one life now, another a week from now. National support for aviation, space, and national defense programs is necessary to the survival of the free world.

"The Civil Air Patrol has a threefold peacetime program," General McElroy says. "It maintains flight and communications services.

"It provides education and training in aviation for both youth and adults.

"It maintains the capability of responding to either national emergency or local disaster."

General McElroy himself typifies the partnership of the Air Force with the Civil Air Patrol. A USAF command pilot with 132 combat missions behind him, he has headed vital operational units including SAC wings.

Headquarters USAF assigned him to command of the 370 officers, enlisted men, and civilian employees of the Air Force who make up the service's CAP liaison force. Thereupon the national executive board of the CAP Governing Board, which is headed by CAP Col. Harold Byrd of Dallas, named him National Commander of its 35,000 adult members and 35,000 cadets.

While General McElroy can give orders to the officers, airmen, and civilians of his liaison group, he can only *ask* CAP members to carry out directions. For the CAP is a civilian organization of volunteers.

Actually, the CAP is an organization of virtually autonomous units. Each state wing headquarters runs its own squadrons.

"I command by encouraging people to do certain things," General McElroy explains. "The people in the CAP are

(Continued on following page)

At science fair in Cedar Rapids, Iowa. Education is a major concern of CAP. It publishes seven specialized text books along these lines, as well as other material. Texts are used in cadet training, workshops for teachers.

Civil Air Patrol members man impressive communications network. Here CAP member Jane Snellings, a cadet second lieutenant, mans a radio set in Washington, D. C. She is communications officer of her squadron in nation's capital.

voluntarily in its programs. They even pay to be members and participate in some activities. They want us to guide them—to offer intelligent leadership."

The Civil Air Patrol was founded in peace in anticipation of war. Authorized by National Civil Defense Director Fiorello La Guardia on December 1, 1941, the CAP soon found itself bolstering the Navy by flying submarine patrols along the Atlantic Coast soon after Pearl Harbor.

In eighteen months the private citizens of the CAP flew 24,000,000 miles on 86,685 missions. They reported 173 submarines to Army and Navy defenses. They dropped bombs on fifty-seven subs, sinking two. They summoned help for ninety-one vessels in distress and for 363 survivors of submarine attacks. Cost to the CAP and the nation: ninety privately owned airplanes, twenty-six pilots and observers killed, seven seriously injured.

By the time the Navy, aided by the other services, got the sub menace under control, the Army and Army Air Forces were using CAP pilots to fly courier missions between bases. In eighteen months of courier duty CAP planes moved three and a half million pounds of high-priority cargo and mail for the Army Air Forces.

All during the war CAP pilots flew search and rescue missions, totaling 48,000 hours of flight time. During one week in February 1945, CAP pilots and observers located wreckages of seven missing Army and Navy planes.

Twenty-five CAP members won War Department decorations for exceptional civilian service. The Army pinned Air Medals on 825.

After the war, Congress approved a charter which converted the Civil Air Patrol into a benevolent, nonprofit corporation. In May 1948, eight months after Congress established the Air Force as an individual branch of the military services, it named the Civil Air Patrol as an auxiliary. The partnership between USAF and the CAP thus became official.

Later Congress authorized the Air Force to turn over to the CAP property of certain classes no longer of use to the service. Dozens of USAF's lightplanes, mostly L-17s, thus immediately became CAP property. In this fashion the CAP has acquired a fleet of 600 grasshopper-type planes, plus about a thousand buses and other vehicles, radio equipment, and other hardware used in modern aviation and ground support.

The liaison command under General McElroy reports to the Continental Air Command. National headquarters moved recently from Bolling AFB, Washington, D. C., to Ellington AFB outside of Houston, Tex.

Extending down from national headquarters, the AF's junior partner's organization chart runs parallel to USAF's.

Each state has its own wing. So do Puerto Rico and the District of Columbia. There are fifty-two in all. The basic unit is the squadron. Group headquarters exist wherever the size of the organization warrants such. An Air Force officer, and a sergeant or two, are assigned to each wing headquarters as liaison personnel. They suggest training programs, grade and inspect practice exercises, scrounge equipment and materials.

Each wing is autonomous. Nineteen states and Puerto Rico have appropriated money from state funds to help support their wings, which otherwise subsist on Air Force assistance and private contributions. Each squadron commander has independence of action. When he gets a call asking CAP help in an emergency, he makes his own decision as to whether CAP help can do any good. If so, he calls out his own men and women. Then, using the CAP's own radio and telephone networks, he may ask other CAP squadrons or wing headquarters for additional support.

In these cases, national headquarters at Ellington AFB generally doesn't hear about the action till after it is under way, and then basically for information purposes only.

Take the case of the placer miner and his eleven-year-old son up in Alaska this past October. When they didn't return home, their friends notified the Kotzebue CAP squadron. Four lightplanes fanned out to search the snowy wilds and hills of northwest Alaska. On October 13, pilot Glenn Murphy and his observer spotted them thirty miles east of Selawik. No passable roads led to their camping spot. Dog teams then took over to complete the rescue operation. Only then did Miss Betty Wolverton, information officer of the Alaska wing, wire the story to national headquarters.

CAP training missions are almost always taking place in one part of the country or another. Search and Rescue Civil Air Patrol (SARCAP) training missions are conducted by an Air Force coordinator and critiqued by Air Force observers. CAP seniors and cadets pay their own way to the scene of the SARCAP.

An Air Force coordinator generally conducts the real searches and rescues, too. Under those circumstances the Air Force pays for the gas and oil consumed by the CAP's grasshoppers—the privately owned planes as well as the CAP-owned L-17s and others—on all authorized sorties. Gas and oil cost about $3 an hour for a lightplane. It

(Continued on page 125)

FOR "SCIENTIFIC KNOWLEDGE AND ABLE LEADERSHIP" On October 5, 1959, the Army's Distinguished Civilian Service Award was presented to Dr. James W. McRae, Vice President of the American Telephone and Telegraph Company.

The award was given for his aid in directing the creation of a family of small, tactical nuclear weapons while he was president of Sandia Corporation—a non-profit Western Electric subsidiary under contract to the Atomic Energy Commission.

Dr. McRae is presently A.T.&T.'s co-ordinator of defense activities.

The citation was read by Lt. Gen. Arthur G. Trudeau, Chief of Army Research and Development, and said in part: "His scientific knowledge and able leadership have contributed materially to the development for the Army of small, tactical nuclear weapons, thereby significantly increasing the Army's capability to carry out its combat mission."

Bell System people everywhere are proud of Dr. McRae's recognition. And they are proud, also, that the skills and experience they apply in telephone work are also useful in the nation's defense.

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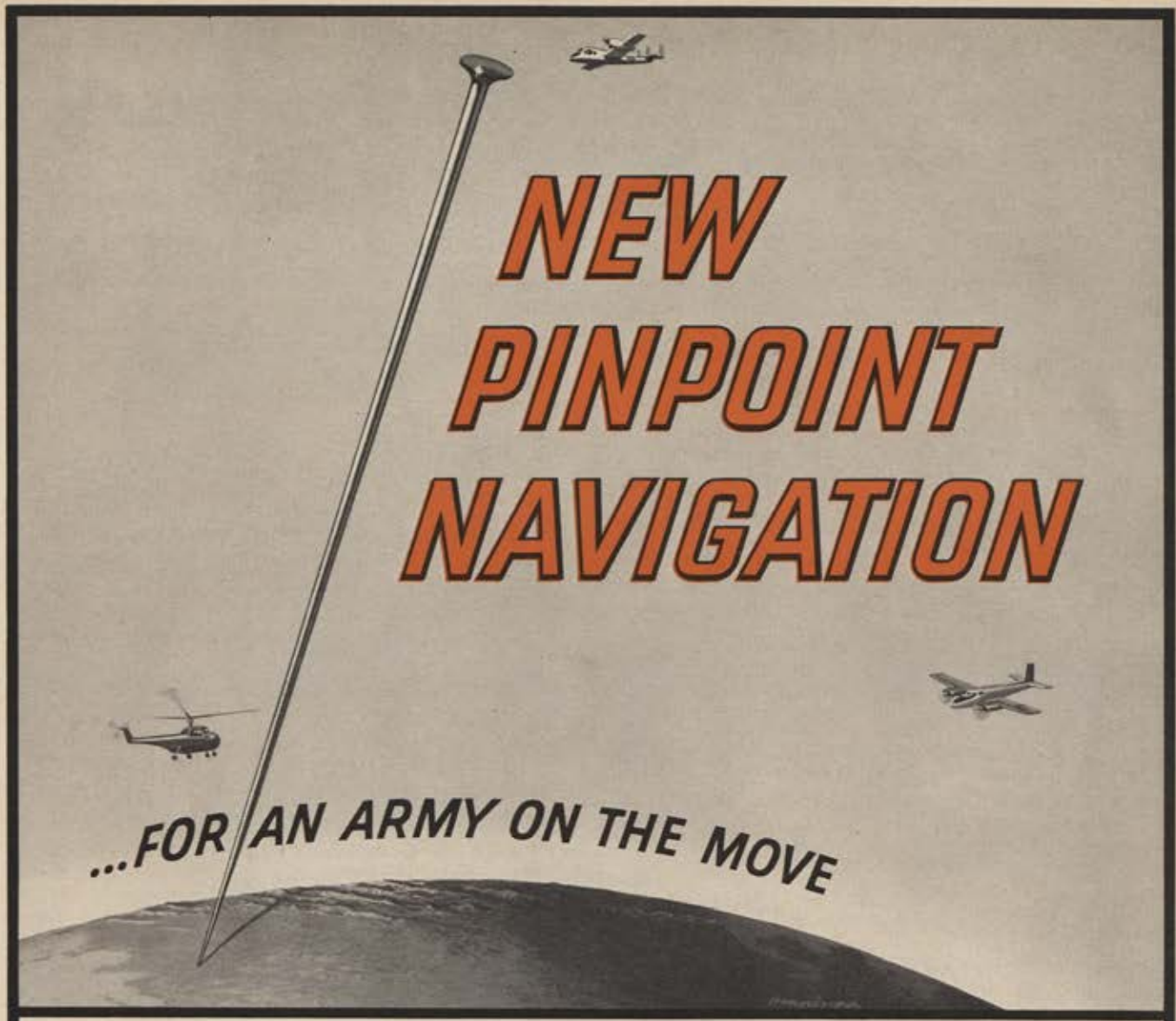

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costs $150 an hour to operate an Air Force SA-16 Albatross.

Cost to the Air Force of the junior partner's gas and oil in one recent year was $36,576. Cost of the equivalent search time in an SA-16 would have been $1,706,000. That year CAP pilots put in 13,400 flying hours on authorized missions, about half of the total time flown by both partners.

Capt. John E. Babcock, USAF, was coordinator of a recent search centered at Bunker Hill AFB, Ind., when the partners went looking for a red and silver Beech Bonanza, with a pilot and three passengers aboard. It disappeared shortly after takeoff from Purdue University airport, Lafayette, Ind., during thunderstorm weather, bound for Lambert Field, St. Louis.

Fifteen planes of the Indiana wing of the CAP joined twenty-five from the Illinois wing in a search that followed the path of the Wabash River Valley southwestward. Air Force planes and helicopters led the search across a fifty-mile-wide path down the valley. Forrest Marchand of New Carlisle, Ind., spotted the plane six days later burrowed into a cornfield. Its occupants were dead.

In a military search early in November the CAP and the Air Force were more successful. Dover AFB, Del., coordinated a search for a large Marine Corps helicopter that had crashed at 11:15 p.m. in southern Delaware. Civil Air Patrol planes were among the first to arrive at the scene. They helped evacuate the nine Marines aboard, five of them injured, to a hospital at Milford, Del., by 1:30 a.m. A CAP radio operator relayed information to the control tower at Dover AFB through the CAP radio net, to report the results and close the search and rescue operation successfully. Only two of the Marines had to be retained at the hospital.

The CAP communications net consists of 11,000 radio stations in garages, attics, automobiles, boats, and aircraft. In more than one disaster the radio station, manned by a CAP family, has been the only link through which the beleaguered inhabitants and rescue forces could request specific supplies of sandbags for flood control, food, and medicine for inhabitants, from the Red Cross, Civil Defense, and state relief organizations.

When an Air Force Sabrejet lost its tail at 30,000 feet in a violent explosion over northwest Florida, the pilot parachuted down into swamp country and dragged his injured body to the security of a dry hummock. Air Force and CAP planes searched for hours, criss-crossing the area. But it was difficult for the coordinator to control search patterns. Regular radio communications conked out.

Mrs. Mildred Tonkin, a Dade City housewife and a first lieutenant in the CAP organization, was picking up all the pilots on her radio. They could receive her transmissions, she found, and soon she was relaying the messages that put the search into coordinated effort. Soon after the various members began to play like a team, an Air Force plane spotted the injured pilot and two paramedic sergeants descended to his aid from an SA-16. Helicopters rescued all three.

At their weekly meetings CAP cadets—fourteen- to eighteen-year-old boys and girls who must maintain a "B" average in school in most squadrons—practice military drill, study navigation, weather, theory of flight, aircraft structures, engines, and military courtesies. Cadets who pass the whole series of six courses and attend a summer encampment receive proficiency certificates. These certificates are signed by the USAF Chief of Staff and by the National Commander of CAP. Holders of this award are given a stripe if they enlist in the USAF.

They prize these certificates, for only those cadets who hold them may compete to represent their states at Jet Orientation and Jet Age Orientation Courses. Fifty-two boys get one week at a jet pilot training school each summer, while fifty-two girls spend a week on the campus of the Air University. Rides in T-33 trainers climax these special encampments. It is not surprising that so many former CAP cadets enter the Air Force.

All CAP cadets are eligible for summer encampments held at various air bases. During a twelve-day stay at Andrews AFB, Md., this past summer, thirty girls and 126 boys put in 6,353 man-hours of work.

"The cadets did some mighty good work for us," M/Sgt. David Blond, hangar chief with a field maintenance squadron, told a journalist. "They were not afraid to get their hands dirty."

Lt. Col. Miriam R. Pierce, chief of the base hospital's nurses, said, "The cadet girls assigned to hospital duty did an amazing amount of work. They were all so enthusiastic and energetic. I was sorry to see them leave."

Possibly the high point for cadets comes to those few who are selected to visit foreign countries under an annual international exchange program. Last year 145 cadets toured the traditional sights, plus some air bases, in eighteen countries while their opposite numbers were visiting Washington, the Grand Canyon, and a number of Air Force bases.

CAP cadets are eligible, it should be noted, to be Air Force Association cadet members, and many are. Annual dues are $3.

Day in, day out, aviation training goes on in high schools and CAP headquarters throughout the country. Last year 350 high schools teamed with the local CAP squadrons in aerospace-age education programs. Hundreds of teachers attended week-end workshops in aviation education.

The high point of this education program has been the summer workshops for teachers. At Montana State University this summer, 168 persons registered for the five-week program. Forty-one teachers signed up for flying lessons under CAP supervision. By the end of the workshop, twelve teachers had soloed.

Activities of members and squadrons have moved into the aerospace age along with the training program. At Camp A. P. Hill in Virginia early this year, CAP cadets participated and the Army was host to over 250 teenagers at a rocket shoot.

To answer many questions from thousands of people, the CAP education staff, headed by Dr. Mervin K. Strickler, Jr., late last year published the seventh of its textbook series, *The Dawning Space Age*. Krafft Ehricke, Convair space-age scientist, was one of many authorities who contributed to the book.

In San Antonio, Tex., one squadron is composed entirely of cadets interested in rocketry. And Col. Jess Straus, commander of the New York wing, granted approval last May for a group in the Borough of Queens to become the first Moon Squadron. When the AF conducts operations from a base on the moon, the junior partner intends to be ready to participate.—END

Readers will recall several earlier articles by Louis Alexander which have appeared on the pages of AIR FORCE. *A veteran newspaperman, Mr. Alexander is an Air Force Reservist. His most recent article for us was "So You're At OCS Now," published in the December 1958 issue.*

This Is AFA

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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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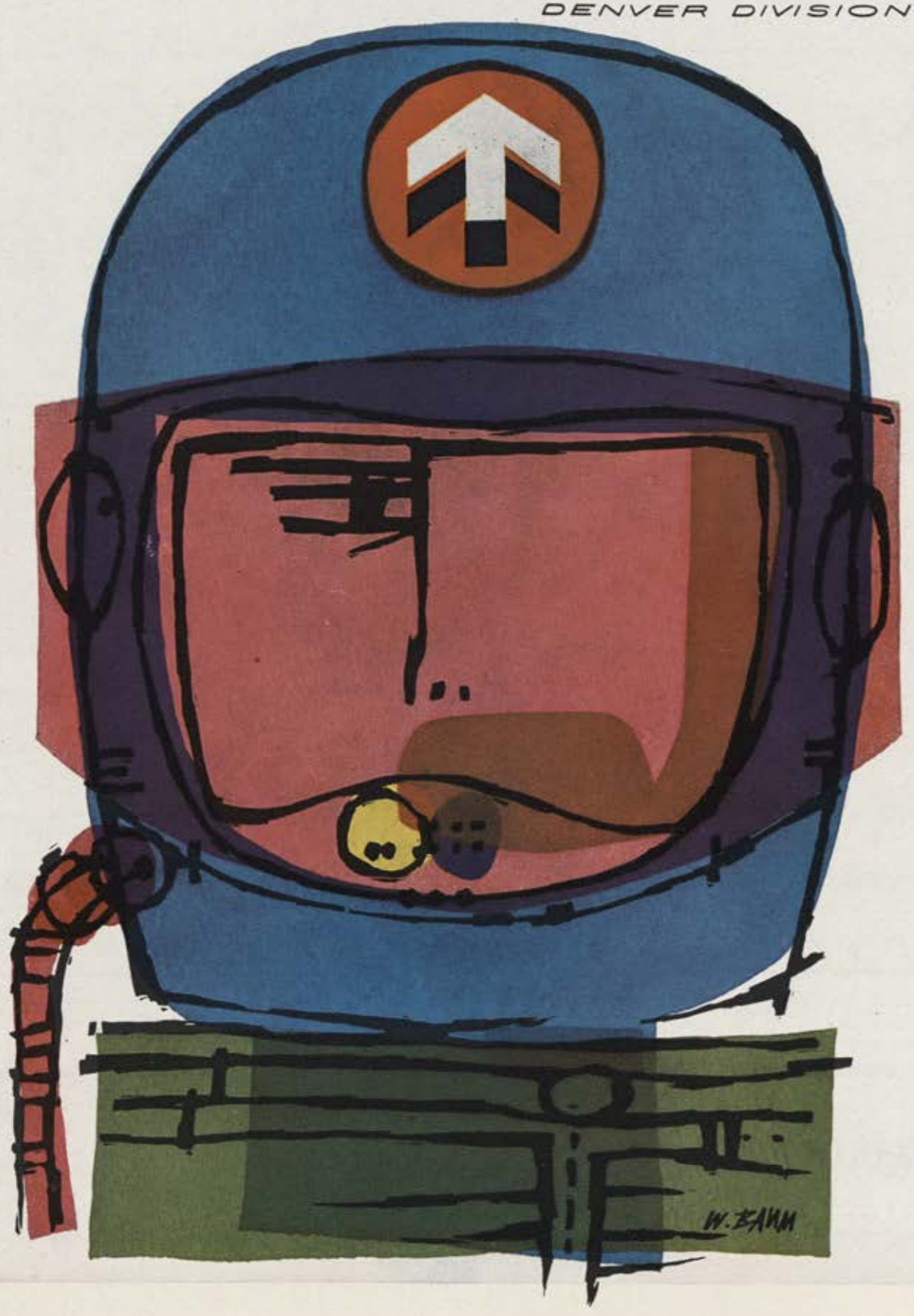

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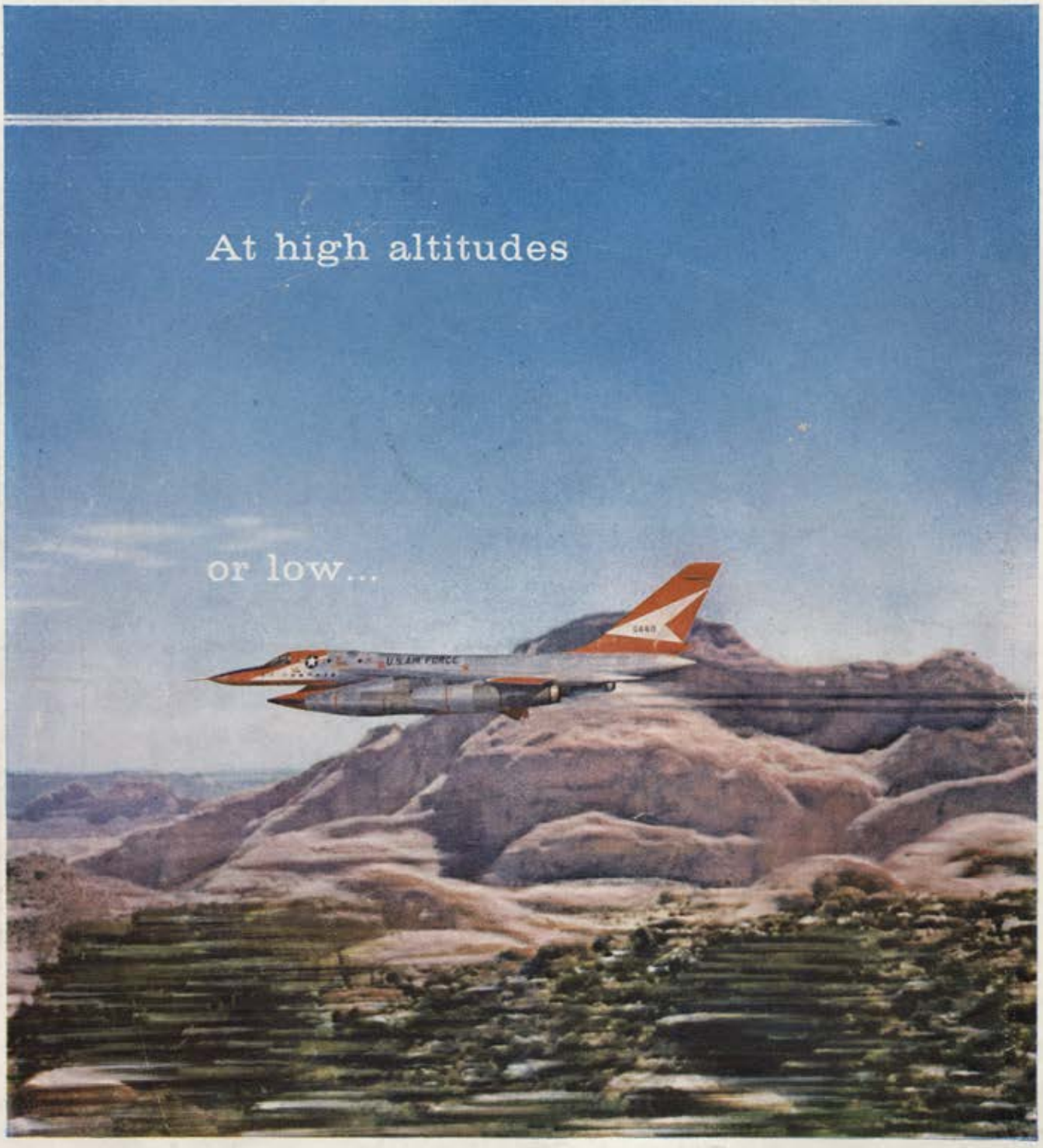

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