JULY 1958 / 50c

AIR FORCE

● The Magazine of AMERICAN AIRPOWER — Published by the Air Force Association

F-105 Thunderchief

'Any Target– Any Size– Anywhere'

SEE PAGE 57

ALSO IN THIS ISSUE:

Think small

Mechanical brains for missiles must be as tough and tiny as possible . . . a design problem that calls for experts skilled in both electronic computers and miniaturization.

ARMA's computer group has shrunk a digital computer module until it's the size shown above . . . a feat comparable to squeezing the contents of a steamer trunk into a cigarette package.

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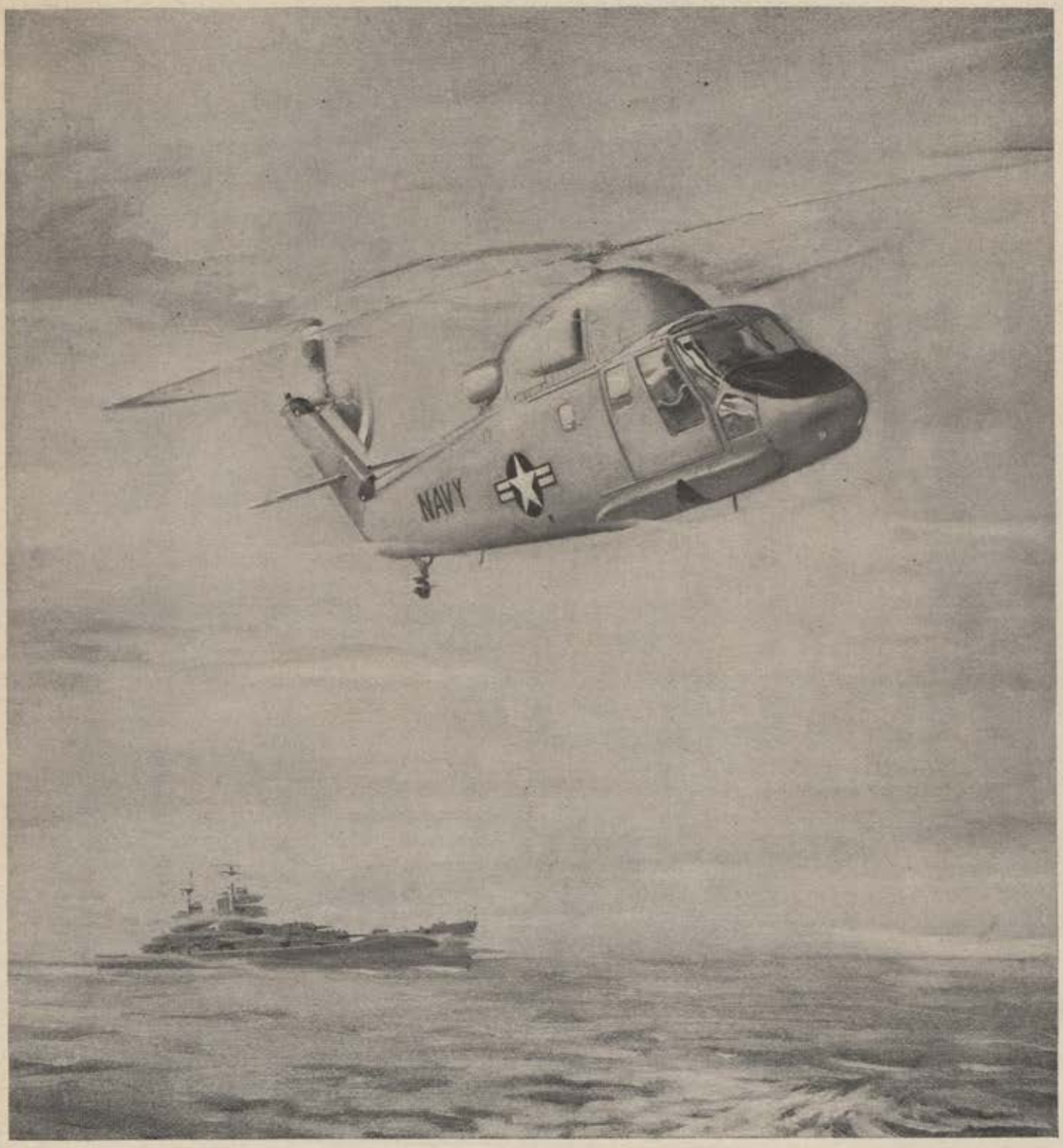
5836

AMERICAN BOSCH ARMA CORPORATION



Helping Hand for the Navy's Air Arm — Kaman HU2K-1

The most delicate job in the free world is entrusted to the men of the United States Navy. They must demonstrate to those who would extend the iron curtain that we have not mothballed preparedness. They must also teach the kids in the shadow of the iron curtain that fists clenched in defiance can also hold a baseball. Much of this assignment falls to Naval Aviation which maintains an endless global vigil, yet stands ready to rescue and evacuate injured. On these important missions Kaman utility helicopters extend a helping hand to the Navy's Air Arm.

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NORTH AMERICAN AVIATION, INC. & PHILLIPS PETROLEUM COMPANY

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In the formation of Astrodyne, their new jointly owned corporation, North American Aviation and Phillips Petroleum Company have brought together two broad backgrounds in rocket propellants and rocket hardware.

From Phillips comes advanced research and manufacturing experience in solid propellants and JATO units. From North American comes demonstrated competence in missile systems design and the manufacture and fabrication of America's largest rocket engines.

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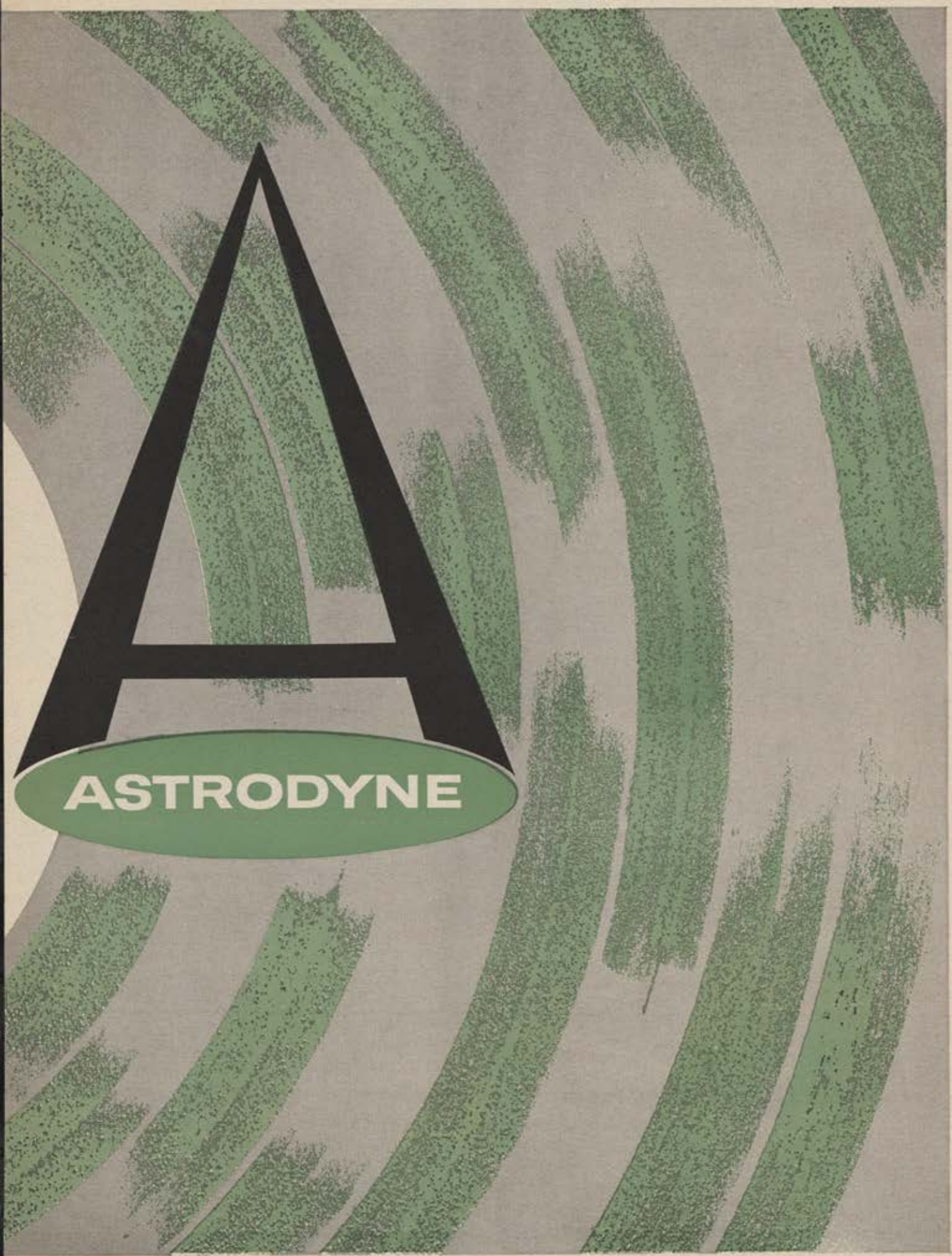
Today Astrodyne has the experience and the facilities to design, develop, and manufacture complete propulsion systems, extruded and cast propellants, rocket engines, missile controls and hardware, boosters, gas generator charges, and auxiliary power units.

Inquiries are welcomed on any phase of the solid-propellant field—from preliminary design to quantity production. ASTRODYNE, INC., McGregor, Texas.


ASTRODYNE

ANTI-MISSILE SYSTEMS

A Research Project of Dr. Harry Nyquist,
Senior Scientist, Stavid Engineering, Inc.

Dr. Nyquist is a pioneer in advanced areas of electronics such as Information Theory and circuit noise, and is credited with nearly 150 patents in the field of communications. He is now contributing his exceptional analytical ability to Stavid's work on a far reaching anti-missile system. Men like Dr. Nyquist are typical of Stavid's outstanding scientists and engineers who are working on advanced concepts . . . years ahead of actual systems development.

In Stavid's objective engineering atmosphere, scientific, development and manufacturing teams are producing a wide range of electronic systems for all branches of the military. Typical of such projects is the REGULUS missile command guidance system, designed, built and maintained in operational status by Stavid.

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- High Power Air Search Radar

STAVID Engineering, Inc. Plainfield, New Jersey

Imaginative Electronics . . .

Systems Engineering Team.

AIR FORCE

THE MAGAZINE OF AMERICAN AIRPOWER

Volume 41, Number 7 • July 1958

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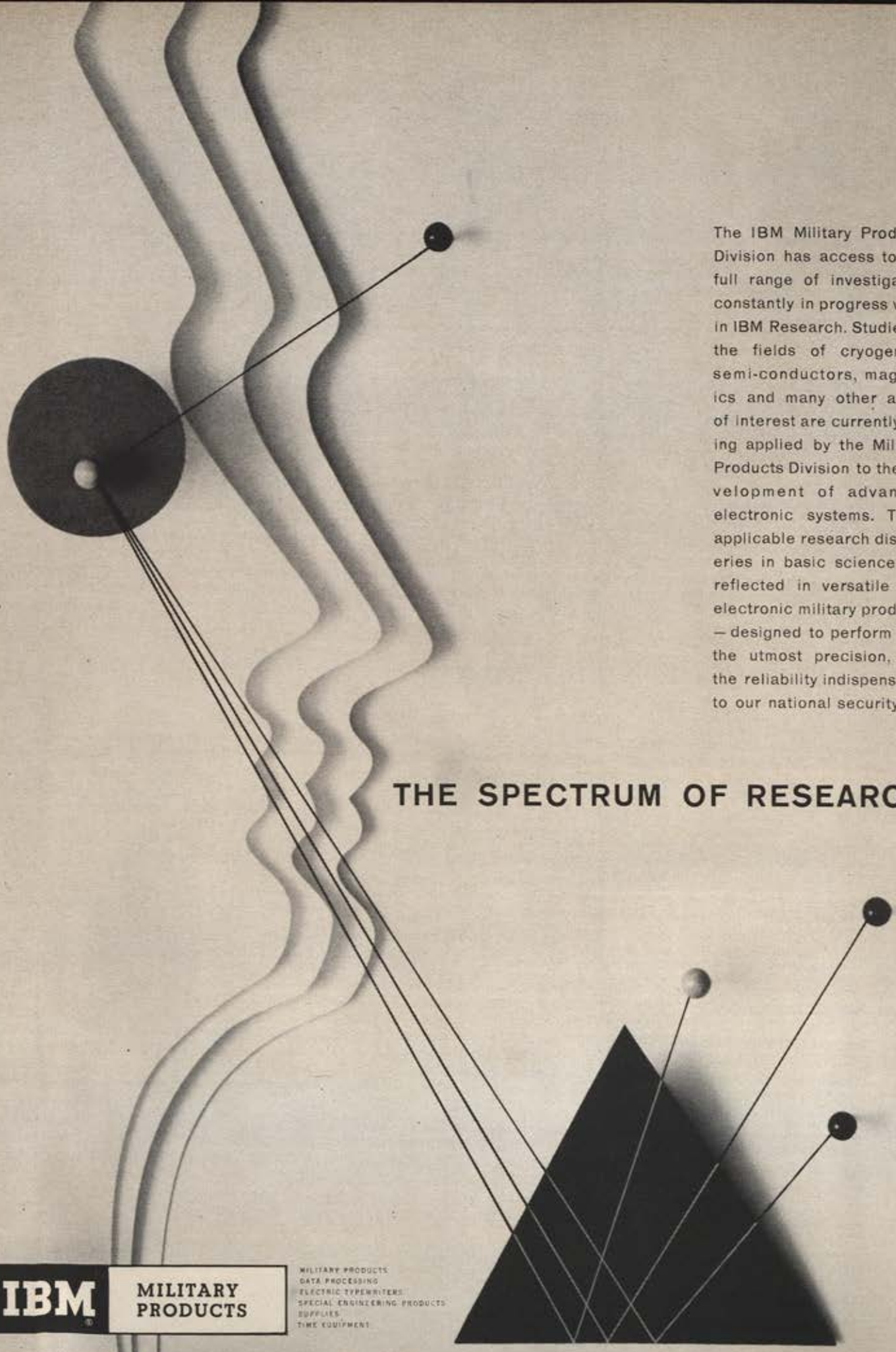
FEATURES

DEPARTMENTS



The IBM Military Products Division has access to the full range of investigation constantly in progress within IBM Research. Studies in the fields of cryogenics, semi-conductors, magnetics and many other areas of interest are currently being applied by the Military Products Division to the development of advanced electronic systems. Thus, applicable research discoveries in basic science are reflected in versatile IBM electronic military products — designed to perform with the utmost precision, and the reliability indispensable to our national security.

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Changed Meaning

Gentlemen: I always go through a fit of anxiety whenever I don't have an opportunity to look over the galleys of my articles. My fears are founded not so much on possible editorial mischief as on my own errors, mostly typographical, and which somehow never become obvious until they are seen in print. My current article, "de Seversky on Strategic Organization," in the June issue of AIR FORCE, is a case in point.

If you glance at page 88, second column, paragraph 4, line 7, the sentence *should* read: "But if they *do make* fundamental changes, they will antagonize. . . ." Through a typographical error, the word "not" was inserted, completely reversing the meaning of the sentence.

Because the error is so obvious, my only hope is that the intelligence of the readers would automatically restore the true meaning.

Maj. Alexander P. de Seversky
New York, N. Y.

● *Here is how Major de Seversky intended the paragraph to read.*—THE EDITORS.

"Pressure *must* be brought on the Congress because in this fight our representatives find themselves between the devil and the deep blue sea. On one hand, if they fail to drastically reorganize the Department of Defense, they will antagonize their constituencies—the popular vote—which, through common sense, realize that competition and rivalry between the armed forces must be stopped and our military effort unified. But if they *do* make fundamental changes, they will antagonize the entrenched vested interests behind the orthodox military structure. These vested interests control political districts and, therefore, the organized vote. As a result, the Congress shies away from the issue, endeavoring to maintain *status quo*, and will do nothing until compelled by the swell of popular demand to take action."

Reprint Request

Gentlemen: My appreciation is extended for the very fine article "AFOSR—Exploring the Universe," by William Leavitt, in the June issue. General Gregory has been away, but I am sure he will be well pleased with the excellent treatment accorded this organization.

I understand that reprints of AIR FORCE articles are not usually available. If this is the case, I should appreciate receiving your permission for AFOSR to reproduce Mr. Leavitt's article in quantity with, of course, full credit to the source.

Mel White, Chief
Information Services, AFOSR
Washington, D. C.

● *Permission gladly granted.*—THE EDITORS.

Importance of Wind Tunnels

Gentlemen: Congratulations on the excellent article "Tunnels Into Space," by Willard A. Hawkins, in the May issue of AIR FORCE. It is a well-written account of some of the important work being done at the Arnold Engineering Development Center.

I believe that this article may have an important side effect that may not have occurred to you. The way in which the article describes the Center's test capabilities, coupled with the fact that AIR FORCE has such wide readership throughout the Air Force, may prompt a number of individuals directing current development programs to make more extensive use of wind tunnels and engine test cells in accelerating their development work. Significant gains in the dimension of time have been made by means of wind tunnel and high-altitude engine cell tests.

Thank you for publishing this and the many other timely and significant articles always found in AIR FORCE.

L. J. Sverdrup, Pres.
ARO, Inc.
Tullahoma, Tenn.

Air Age Education

Gentlemen: This letter is addressed to you but it is meant for Carol Smith of Kirkwood, Mo. ["Air Mail," April '58], and many other far-sighted teachers who realize that the space age is suddenly upon us.

While we wish her luck in her quest for extra copies of your Space Weapons Handbook, we would like to take this opportunity to inform her, and all of her associates, of the special training available through the medium of Aviation Education In-Service Workshops, sponsored in part by the Civil Air Patrol. These workshops are of varied types. Some provide for additional college credit, others provide for an increase in salary, but all provide a wealth of experience and knowledge to help the teacher and pupil become closer in their daily contacts.

An exceptionally fine primary source of aviation educational materials for the youth in school is the National Aviation Education Council (NAEC), 1025 Connecticut Ave., N.W., Washington 6, D. C. Under the able direction of Dr. Evan Evans it has compiled an excellent bibliography of air age materials prepared especially for use in the classroom. An individual or school may become a member of NAEC and receive curriculum or library service for one year for $5. Anyone interested in aviation or careers in aviation will receive materials, pictures, pamphlets, etc., of tenfold value for his investment.

In addition, the NAEC has a *Professional Packet* for superintendents, principals, guidance counselors, and teachers which includes an *Aviation Education Source Book* (855 pages), *plus* twelve separate books, *plus* the Civil Air Patrol series of six manuals used as the basic text for most aviation education courses in high schools throughout the country, *plus* a bonus package of over six pounds of aviation career information including more than fifteen books totaling over 800 pages and, *in addition*, colorful pictures, pamphlets, and charts! All of this for only $10.95.

Since the aim of AFA is to promote airpower, I can think of no better way to accomplish this than through the strong support of aviation education in our public schools. The CAP stands ready with experienced educators to assist in placing aviation education

(Continued on page 9)

CAPABILITIES . . . Manpower, Tools and Experience

BEECHCRAFT XKDB-1
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"Up Where the Shooting's Done"

This Beechcraft target aircraft, the XKDB-1, holds the world's record for altitude for a remote-controlled, propeller-driven target. The record is in excess of 39,500 feet.

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The XKDB-1 is now being evaluated by the U. S. Navy. It has speeds up to 320 miles per hour, and can be ground or air launched.

Other Beech projects include research and development work on launching and recovery systems for missiles and target aircraft, emergency escape systems and classified projects in the advanced fields of aerodynamics, cyrogenics and high-energy fuels, thermodynamics and aircraft range extension.

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courses in schools, from elementary through high school levels.

For additional information on this subject, contact the Air Force Liaison Officer, Civil Air Patrol, in your home state.

Maj. William E. Burgin
AF-CAP Liaison Office
Minneapolis, Minn.

Gentlemen: Through the kindness of AFA's National Secretary, Julian B. Rosenthal, I was able to obtain a copy of the March issue of AIR FORCE Magazine. In my judgment, this is one of the most comprehensive treatments of topics related to man's conquest of space that I have seen in one issue of this type of publication.

As you may know, the general subject of astronautics was not a part of the academic background training of most science teachers. This is an example of how scientific exploration and development has advanced beyond what most science teachers are competent to handle. Publications such as your March issue help to overcome this void providing these publications are available to science teachers. In my judgment, the Air Force Association would be performing a great service to teachers if they would bring together in pamphlet or reprint form, articles from the March issue and make them available to science teachers.

The distribution could be handled through the National Science Teachers Association, an organization with which I am sure you are already familiar. I hope that you will find it possible to do something about this proposal.

Dr. J. Darrell Barnard
New York University
New York, N. Y.

The National Aviation Education Council is reprinting two sections of the March issue—"The Space Frontier" and "The Glossary." This will be a twenty-four page paperback pamphlet which will be sold at a nominal cost. Members of NAEC, of course, will receive the reprint free of charge.—THE EDITORS.

Historical Material

Gentlemen: For many years now historians over here have been compiling a history of the United States Eighth and Ninth Army Air Forces. Over this period much information has been gathered, but much is still to be done.

This, therefore, is the reason for this letter. Perhaps this request may be rather out of line, but after many years of research in our area, we have decided to try and enlist help from other sources.

We are interested in information on the following, and help of any sort will be appreciated, however small or vague it may be.

1. Squadron codes used by squadrons in each bomb or fighter group.
2. Individual aircraft serial numbers, codes, color schemes, nicknames, and other markings.
3. Missions, where to, what target.
4. Group and squadron histories.
5. Last but far from least, photographs of individual aircraft, or any other subject with aircraft in them.

The latter are almost as important as all the rest, as one photograph is worth more than a hundred words.

The history we are writing will take quite a while to compile, but when finished will be as complete and as interesting as possible, so you will appreciate how important personal biographies are.

T. J. Allen, Historian
American Aviation Historical Society
110 New John St.
Blackheath, Birmingham
England

Another in a series on aircraft operation and maintenance . . . and why major service organizations, like the world's airlines, use **CHAMPION SPARK PLUGS.** *Noted aviation authority reports on* **LOCKHEED AIRCRAFT SERVICE . . .**

the LAS word

by HERB FISHER

International aviation authority, veteran test pilot, author

Lockheed Aircraft Service is the largest and oldest company in the world devoted to the maintenance, overhaul and modification of all aircraft types. Its facilities are said to be the most complete in the industry.

Since its founding in 1938 as the service division of Lockheed Aircraft Co., LAS has processed more than 55,000 aircraft — helicopters to 4-engine airliners, single-engine jets to 10-engine bombers.

Eleven years ago, Lockheed's service division was incorporated as a separate but wholly owned subsidiary company—LAS—to provide even better service for Lockheed planes as well as independent service for all types of other aircraft. Today, LAS itself has two subsidiaries—LAS-International and LAS-Overseas.

The accumulated technical experience of LAS is vested in four ultra-modern overhaul bases: at New York International; Oakland and Ontario, Calif., International Airports; and Honolulu Airport.

LAS has pioneered complete engineering and manufacturing functions in several significant post-war developments:

First Constellation and DC-6 conversion to high-density interiors . . . The first U.S. military cycle-reconditioning program . . . First airline fleet maintenance and overhaul on a fixed-price-per-flight-hour formula . . . First helicopter conversion to scheduled passenger service . . . First major military jet maintenance program . . . First major airframe conversion of radar picket aircraft . . . Maintenance and overhaul support of airline and military fleets on the Berlin and Pacific Airlifts . . . First B-26 conversion to executive aircraft.

Military and commercial aircraft serviced by LAS are flying in every corner of the world—over all oceans, deserts, jungles, the Antarctic. LAS-O follows up with world-wide technical assistance. LAS emergency teams repair damaged aircraft at accident sites anywhere.

Herb Fisher

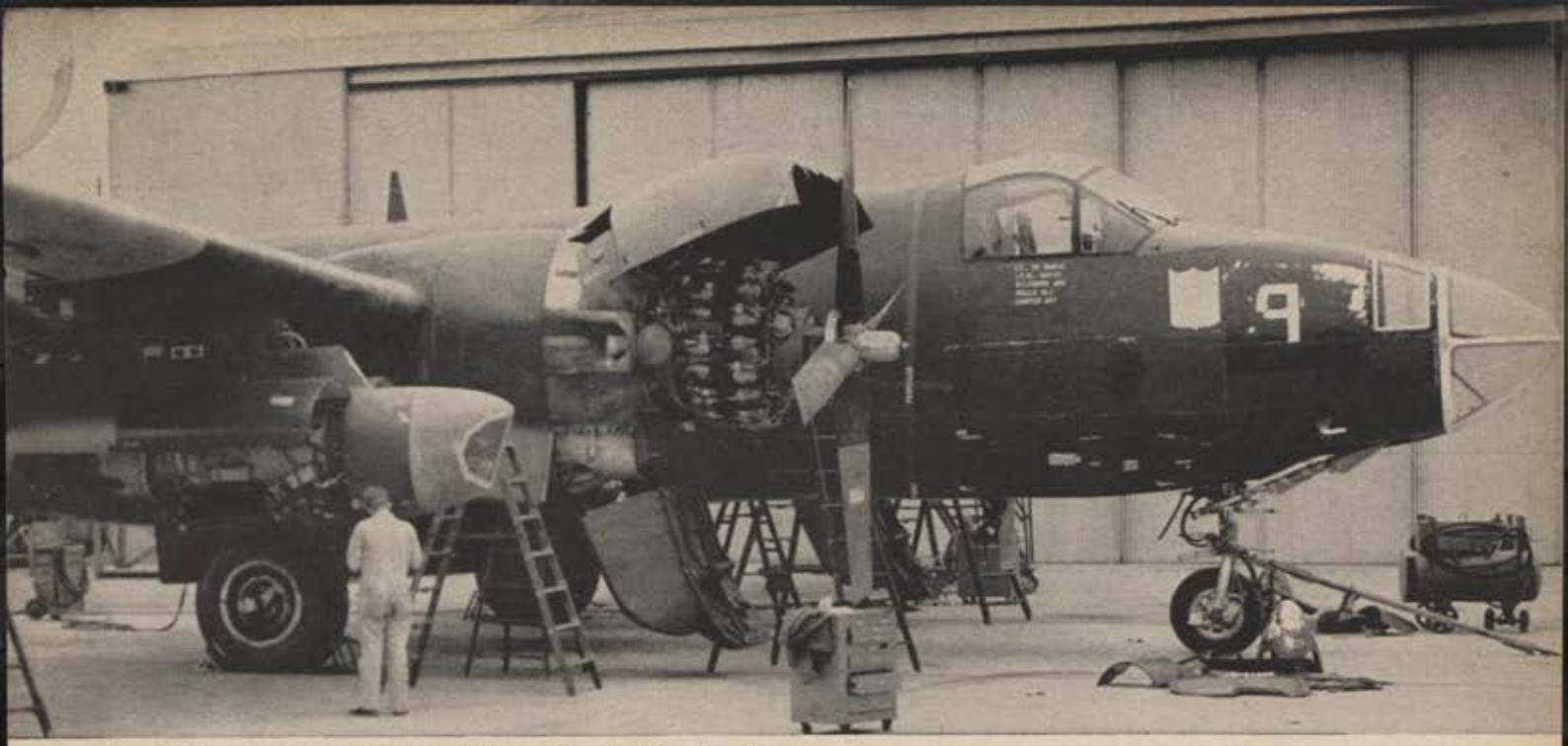
LAS' customer roster since the war has embraced almost every major international air carrier flying into the United States, as well as major U.S. domestic carriers and the Air Force and Navy, including the entire East Coast fleets of Airborne Early Warning aircraft. Overseas, LAS-O has assisted Japan in major aircraft and jet-engine overhaul programs, plus manufacture of T-33 trainers. A current technical assistance and materiel program involves Japan's 22-million-dollar manufacturing of anti-sub patrol aircraft.

In World War II, LAS operated seven major overhaul and modification installations, repairing 22,500 battle-damaged craft alone plus modifying and servicing thousands of others.

In the Korean War, LAS modified and rebuilt hundreds of planes.

This extensive variation in aircraft type and operational pattern by LAS

New 400-hour maintenance cycle for WV-2 Early Warning picket aircraft is performed at LAS-Honolulu, which has 27 shops.



Navy P2V-7 is modified at LAS-Ontario for 100-below "Operation Deep Freeze" in Antarctica.

customers is testimony to the company's experience level and the ready adaptation of its personnel and facilities to individual maintenance requirements. In this, the Champion Spark Plug plays a vital dual role:

First, LAS services a great many of the major airlines of the world. *In their exhaustive flight evaluations of every available spark plug, the airlines have repeatedly proved that Champions are best for reliability, service, economy. All the major airlines of the world fly with Champions.*

Fisher (l) interviews LAS President J. Kenneth Hull (r) and W. J. Weisbruch, Acting Plant Superintendent.

Second, as LAS President J. Kenneth Hull told me: "At LAS we must couple diversified know-how with only the finest first-line quality products in order to maintain our record of on-schedule deliveries of airworthy aircraft."

H. J. Chase, Vice President and LAS-I Base Manager, said: "Our customers depend on the finest quality plugs for peak engine performance throughout a *wide* heat range, whether operating in dry desert heat, jungle humidity or severe Arctic cold."

Foreign and domestic commercial planes plus U.S. military aircraft are serviced at LAS-I, New York International, largest East Coast independent maintenance facility.

Paul Kovac, Senior LAS-I Powerplant Engineer, said: "Plugs may be affected by anything that goes wrong with an engine. If a plug is out of heat range, if it has a tendency to preignite or foul, schedule delays will follow. *Champions have proven their excellent quality control on our test- and flight-lines.* They're mechanically strong and do not experience core nose ceramic failures. We've found Champion a quality standard in an industry that *knows* high standards."

LAS' unique service program — Equalized Maintenance, Aircraft Rotation, planned spare-parts inventory and fixed-price-per-flight-hour formula — assures commercial and military operators maximum flight utilization through minimum ground time. The LAS Equalized Maintenance plan was applied to Early Warning aircraft, a marked departure from traditional military maintenance programs, to provide the USAF with higher utilization and operational flexibility.

Among Lockheed's earliest service jobs were modifications for such aviation greats as Amelia Earhart, Lindbergh, Sir Hubert Wilkins. Recently, LAS "royalized" a plane for His Majesty Haile Selassie, Emperor of Ethiopia, by installation of luxurious movable compartments — one of the most unusual conversion jobs in air transport history.

CHAMPION SPARK PLUG CO.
TOLEDO 1, OHIO

J. L. "Pete" Peters (l), Flight Line Dept. Head, recommends Champions for cars and planes. His Champion-fired Thunderbird won 35 trophies. Pilot is Capt. Edward Schonk, LAS-USAF Acceptance Officer.

INDEX TO ADVERTISERS

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.

The Russians have worked out more than 600 different trajectories for flights to or around the moon, according to some of their technical literature. These were tested on electronic computers to determine their accuracy. The trajectories included: Flight to the moon to hit it; flight around the moon and return to Earth; several flights around the moon and return.

° ° °

Another project the Russians have put some thought into is how to keep the Earth under continuous television surveillance. According to one popular Soviet science writer, only three satellites equipped with TV equipment would be required. They would have to be about 22,000 miles from Earth, spaced at equidistant intervals. "Started at eight-hour intervals along an orbit passing in the plane of the equator, the satellites would be separated from each other by a distance of 45,000 miles. Each of the satellites would carry on reception from the Earth as well as from its westerly neighbor and would rebroadcast the latter's transmission to Earth." Presumably the rebroadcasts would be timed so as to take place as the satellites took successive turns over the USSR.

Only two reasons are given for not establishing such a satellite at this time: The rocket to put such equipment into orbit isn't yet available, and neither an atomic nor a solar power source suitable for the TV equipment has been developed.

° ° °

The Russians say of their atomic aircraft engines, that they will use "water, mercury, or sodium" to transfer heat from the reactor to the turbine.

° ° °

Buried in their comments on the International Geophysical Year is a Russian admission that they have rocket-firing sites on Franz Josef Land (east of northern Greenland.) The Soviets say they are firing vertical rockets in this region to learn more about the upper regions of the atmosphere. Some twenty-five firings are scheduled to take place on Franz Josef Land this year. In addition, the Soviets propose to fire thirty high-altitude rockets from Mirny, one of their new bases in the Antarctic. They will be investigating cosmic radiation and micrometeorites, which have a bearing on future space travel.

° ° °

The huge weight of Sputnik III—about that of a light American automobile—indicates confirmation that the Russians have first- and second-stage rockets whose engines produce upward of 250,000 pounds of thrust. There have been several reports indicating that in their arsenal the Russians have rocket engines developing between 250,000 and 300,000 pounds of thrust.

° ° °

Under new government organization recently announced in Moscow, Aeroflot, the civil airline, no longer is directly represented on the Council of Ministers. Instead, it apparently comes under the Minister of Transportation, B. P. Beshchev. This could mean a further demotion for Air Chief Marshal Zhigarev, who once was chief of the Soviet air forces and now heads Aeroflot. Zhigarev long has been identified with Stalin and his regime.

Meanwhile, P. V. Dementyev, former head of the Ministry of the Aircraft Industry, has been made Chairman of the State Committee on Aviation Technology, but apparently continues to head aircraft production as well. It would appear that Dementyev has gained greater control over research and development as a result of the shake-up which put Khrushchev at the head of the government as well as at the head of the party.

° ° °

Contrary to some expectations, the Russians have not given up bomber development as a result of their successes with missiles. A large, new bomber is believed to be under development. Whether or not it is nuclear-powered is not known. The Soviets have indicated that they have a nuclear-powered aircraft pretty well along, too, which would indicate two new, large military aircraft in the works.

° ° °

Belated reports from the USSR indicate that party and government chief Khrushchev addressed the graduates of the Zhukovsky Air Force Engineering Academy of Moscow and the Mozhaisky Air Force Engineering Academy of Leningrad at joint graduating exercises this spring. "Aircraft are of great importance in the defense of the country," he told them, but added:

"The modern weapons of war are very powerful. We know that the role of winged, piloted aircraft has been somewhat reduced and that they are being replaced by rocket aircraft and rocket technology. It is necessary to go forward to perfect all types of weapons and to develop new rockets without rejecting existing weapons. This should be done so that we will always be able to repel any attack. . . ."

° ° °

The Soviet Ministry of Defense has decided that Russian Army and Air Force uniforms should have the same color and cut. This means that the Soviet Navy is the only branch that can sport a different uniform among the Russian armed forces.

The everyday uniform is to have an olive drab cap, with a band of piping in colors to represent the various branches of the service. Tunics are to be open at the neck, single-breasted, with soft olive drab shoulder straps, and colored collar tabs to mark the branch of service. Trousers are to be dark blue (the color the Air Forces have been using) and may be worn either inside or out of boots. Ties also are to be olive drab; boots and shoes will be black (as in the past).

The field uniform is to consist of an olive drab cap with crown, band, peak, and chin strap; blouse and trousers of olive drab, without piping; boots and leather equipment. Shoulder straps and emblems on field uniforms are to be olive drab.

Marshals and generals will wear the uniform as well as reenlisted sergeants and first sergeants who occupy appropriate staff positions.—END

Feats of Hercules No. **5**

FROM THE SNOWS OF FUJIYAMA TO THE SANDS OF FLORIDA

The Lockheed C-130 HERCULES, now in service with the United States Air Force at Ashiya Air Base, Japan, won its "go anywhere, haul anything" reputation the hard way.

In snow landing and take-off tests at Bemidji, Minnesota, the "Ski-130" HERCULES performed prodigious feats of strength and power. At 124,000 pounds gross take-off weight the ski-equipped HERCULES was airborne in 2,100 feet. Carrying the same payload it landed and stopped in only 1,200 feet.

At Eglin Air Force Base, Florida, the C-130 HERCULES (weighing 110,000 pounds) landed on sand and stopped in 947 feet. Take-offs from sand, with the same load, averaged only 1,500 feet.

This famous aerial "strongman" can carry 90% of all types of missiles now operational with, and under development for, the U.S. Armed Forces. The C-130 HERCULES is now in world-wide service, or scheduled for delivery to: USAF's Tactical Air Command, U.S. Air Forces-Europe, Pacific Air Force, Air Photo and Charting Service, other branches of the U.S. Armed Forces, and the Royal Australian Air Force.

Lockheed *means leadership*

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Register Now!

More than 2,500 persons will register for AFA's 1958 Convention in Big "D." Make sure that you are in on the big doings by filling out the advance registration form below. We hope to have cowboy hats, and maybe a gun or two, for those who register in advance. The registration fee is $20 per person—for men and women. The briefings and luncheon for industry on Saturday are not included in the $20 fee—a separate $7.50 registration fee will be charged for these events. The briefings for industry will be classified SECRET.

Gen. White
Speaker at the Space-Age Luncheon September 26

Sec'y Douglas
Speaker at the Awards Banquet September 27

Asst. Sec'y Smith
Speaker at the Reserve Seminar September 25

Gen. Rawlings
Speaker at the Industry Briefing September 27

The Program

(Meetings for AFA Leaders, Sept. 24.)
Leaders Workshop ..... Adolphus
Foundation Trustees Meeting ..... Adolphus
Directors Dinner Meeting .. Adolphus

THURSDAY—SEPTEMBER 25

AFA Business Sessions ..... Adolphus
Reserve Forces Seminar ..... Baker
Ladies Fashion Show .. Neiman-Marcus
Reserve Forces Workshop ..... Baker
Panorama Preview ..... Auditorium

FRIDAY—SEPTEMBER 26

Space Symposium ..... Auditorium
Airpower Panorama ..... Auditorium
Space-Age Luncheon ..... Auditorium
Western Wing Ding ..... Auditorium

SATURDAY—SEPTEMBER 27

AFA Business Sessions ..... Adolphus
Briefings for Industry ..... Auditorium
Luncheon for Industry ..... Auditorium
Airpower Panorama ..... Auditorium
Awards Banquet ..... Auditorium

SUNDAY—SEPTEMBER 28

Roundup Brunch ..... Statler
AFA Directors Meeting ..... Statler
Airpower Panorama ..... Auditorium

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(SEE PAGE 89 FOR HOTEL RESERVATIONS)

OBSTACLE COURSE

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No other helicopter ever has been, or will be tested more thoroughly than the Army's IROQUOIS, Bell's all-new turbine-powered HU-1A. Designed to meet the most exacting standards of performance and maintenance ever required of a helicopter, it has already passed through Bell's own rigorous shakedown.

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AIRPOWER in the news

WASHINGTON, D. C.

■ There is no getting away from it. Every once in a while it becomes necessary to report good news from the Pentagon, Capitol Hill, the White House, or other buildings along the Potomac.

To begin with, the evidence is fast growing that Neil H. McElroy of Cincinnati may be the best Secretary of Defense since James Forrestal. This is a broad statement, since both George C. Marshall and Robert A. Lovett were among the predecessors.

But there are now few dissenting voices to the praise for Mr. McElroy. Even those who reserved judgment on the basis of the poor caliber of many recent Defense Department appointments are beginning to hand kudos to the Pentagon's boss. There are still occasions when he does not seem to take full advantage of a ripe opportunity, but this may be due to his lack of experience in the Washington maelstrom. A good example was seen at this year's Armed Forces Day dinner in Washington, where the Secretary had a captive audience of more than 1,700.

Just as certainly as the Pentagon has corridors, every man jack and his gowned lady had a vested interest in the Defense Department and was present in the Sheraton-Park Hotel's giant ballroom because of that vested interest. The Secretary's speech was dull and uninformative. The dinner rated six inches of type on a deep inside page of the Washington *Post* the next morning. The news editor was munificent.

There was a little grumbling, but not much. A few persons, probably those who think Madison Avenue is full of smarties and that they have a voice in this administration, expected Mr. McElroy to announce at the dinner that the Military Pay Act of 1958 had been signed at the White House. He didn't. The bill was sent to the President on May 12; the Armed Forces Day dinner was on May 16. The signature was affixed on May 20. Madison Avenue doesn't sell Procter & Gamble soap products that way.

In his speech, Mr. McElroy did endorse the pay bill and laud congressional forces that made it possible. Actually, he had a good deal more to brag about than his text indicated. To the Air Force, the new law means that personnel quality will be able to keep pace with the requirement imposed by modern weapon systems.

If the Secretary did not make the most out of his Armed Forces Day speech, he did much better on Capitol Hill, where the Army is pushing the doctrine that limited war lies ahead and we may be licked. What he had to say is worth quoting at some length in AIR FORCE because it helps offset the impression, effectively sold in some areas, that a defense policy shift is under way. Of course, all things are under consideration at all times among the Joint Chiefs of Staff, but if you listen carefully to Mr. McElroy you will not get the impression that a lowering of our massive retaliation guard currently is on the hot list.

The Secretary was being questioned by Rep. Robert L. F. Sikes, (Dem., Fla.), of the House Appropriations Committee, who said he was disturbed by the prospect that both the Army and the Reserve may be weakened. Mr. McElroy said he was advised by the Chairman of the Joint Chiefs that it is not necessary to strengthen the Reserves when the Regular Army is reduced. Some of the testimony follows.

Said Mr. McElroy:

"The real question here, in my opinion, Mr. Sikes, is just what likelihood there is of having any substantial size limited war without its becoming a general war. We have as first rate a limited war fighting force as there is anywhere in the world in the US Marines. We have, in addition to that, forces in the Army who have comparable readiness.

"The question we have been asking ourselves is where you are to go to have need for limited war without getting into a situation which would call for the use of the nuclear deterrent. *We just do not find it.* We consider that the size force we have is adequate.

"I know that the Army raises a question about that. This is a matter which probably will be discussed for quite a long time to come, because, as we go further and further with nuclear tactical weapons, which is proceeding, the size of the forces which will be needed will continue to be less and less."

Mr. Sikes: "Then is this the question. Regardless of the recommendations of the Army and of its Secretary, [it is] your belief, based on recommendations of all of the services, that there is less and less likelihood of limited war; therefore, you can safely reduce the size of the Army and of the Reserve components and use that money for greater readiness in other fields? Have I stated it for you?"

Secretary McElroy: "I want to state it a little differently —less and less likelihood of limited wars that would demand sizable forces. I do not say that you may not have limited war, because in countries which are quite primitive in their capability, you may have some limited conflict. But you certainly do not need massive size conventional forces. When you say 'conventional' I presume you mean ground forces."

Later, the Secretary engaged in an exchange with Rep. Daniel J. Flood, (Dem., Pa.). Mr. Flood is a master gadfly and a source of extreme annoyance to most military witnesses. He may be the only man alive who could seriously ask you whether you have stopped beating your wife. He indicated to Mr. McElroy in a lengthy question that he was not satisfied with the provision for Army airlift. Here is what followed:

Secretary McElroy: "The only thing I might say to you which might be a little bit different with respect to the Joint Chiefs from what you have more recently been told is that this subject has again been submitted to the Joint Chiefs for new consideration, and I would suppose that, sometime within the next sixty days, we should have another review of the airlift potentiality in relationship to the requirements. I think of a couple of facts I would like to give to you which, I am sure, you have been given before.

"We in the United States forces have a considerably larger airlift capability now than our opponent or than any other combination of countries on the globe."

Mr. Flood: "That is no analogy. Our opponent does not have that problem. But go ahead. That is not the answer. Go ahead."

(Continued on following page)

Secretary McElroy: "I think it is a valid point that, compared to our requirements, he does not have a comparable requirement."

Mr. Flood: "That is right."

Secretary McElroy: "Unless he is going to move out against our shores."

Mr. Flood: "He 'ain't.'"

Secretary McElroy: "If he were going to do that, then he would have to have a great deal more airlift than he now has.

"The other factor which I think is worth consideration is that the Joint Chiefs do give consideration to this question in relationship to the kind of spot at which they might have to fight a limited war. The fact is that you would not have more than, perhaps, one field in which you would put down heavy equipment of the kind we have without its breaking up after four or five planes were down."

Mr. Flood: "That is one of the questions. That is one of the problems. I know that."

Secretary McElroy: "We cannot put landing fields all over the world."

Mr. Flood: "Of course not. That is one of the important questions. I know that."

Secretary McElroy: "Let me finish the point. I do not know what your point is yet. But my point is that this consideration of the need for airlift is not only in relation to the moving of divisions, but it is also in relation to the kind of place where we might have to fight this kind of war, and our ability to use airlift in such a spot."

Mr. Flood: "Mr. Secretary, I hope that you are better briefed on the problems of airlift. This committee is obviously informed, and I think you understand why—we have spent more time on it. Your information is obsolete. It was two or three years ago that we discussed that part of it."

Secretary McElroy: "No, my information is not obsolete. I am kept up to date on this problem by the Joint Chiefs of Staff."

Mr. Flood: "Today I am talking about the configuration of aircraft to meet the problem that you are talking about.

"The presentation made by you and the Air Force on airlift is much different this year than it has been. Those problems you are talking about are passé. We have eliminated those. I want to know what are you doing to give me an airlift in view of all the problems you set forth. I know all the problems. . . . Where is the airlift, in the face of all this?"

Secretary McElroy: "The airlift is what we have."

Mr. Flood: "Not adequate."

Secretary McElroy: "I do not say so at all. It is a very good airlift."

Mr. Flood: "Where are you going to use it?"

Secretary McElroy: "In connection with any kind of an airlift."

Mr. Flood: "You just told me you could not."

Secretary McElroy: "There are places where we would be operating in the event of limited wars where we think there would be a very limited usability."

Mr. Flood: "Your limited warfare would be very limited, vis-à-vis airlift."

Secretary McElroy: "The use of airlift for limited war in the areas in which we think limited war would be possible would be small until you get to what would be a fairly advanced kind of country where you have airfields that can take larger aircraft."

Mr. Flood: "You are not going to have limited war in Western Europe. Your NATO components are not going to be confronted with limited war."

Secretary McElroy: "That is also our view. . . . Let me tell you what I think had better happen. *We better never let anyone get the mistaken idea that we are not going to use our big weapons if they are needed.*" (Italics ours)

In the face of this kind of testimony from the Secretary of Defense, the Army has continued to pump out material on the limited war threat. About eighteen months after its formation, Army disclosed it has organized a SAC of its own, called the Strategic Army Corps. It was out of STRAC that 500 paratroopers were taken to fly to Puerto Rico when Vice President Nixon's ordeal in Venezuela was interpreted as a threat to the nation. Almost at the same time *Army Information Digest* explained STRAC in detail with a special issue titled "Peace or Piecemeal?—A Special Issue on the Army's Role in Limited War." There is no evidence in the magazine that the Army knew about Mr. McElroy's viewpoint as disclosed in his House testimony.

■ In addition to the assault on the limited war front, Army partisans are maintaining a steady fire with their plans to put a man in space. Here again, the McElroy administration appears to talk sense. Roy W. Johnson, director of the Advanced Research Projects Agency, appeared before the House hearing with Dr. Herbert York, his chief scientist. The latter, a competent man with no interest in the political front, assured the congressmen we are lagging in propulsion. Mr. Johnson had some ideas about who should do the work on man in space.

"I would like to point out," he told the committee, "that in the total budget of $520 million for ARPA, military reconnaissance satellites amount to $152 million . . . all Air Force. The man in space program would be Air Force, very substantially. . . . I would guess that more than half of ARPA's program would actually be executed by the Air Force."

At another point, Johnson was baited about the possibility of empire building. Here is his reply:

"This is not going to be an empire. . . . In the first three weeks we definitely came to the conclusion that . . . ARPA would not establish its own laboratories.

"We saw quickly that there was competence in the services, very high competence in their laboratories. We also became familiar with the private laboratories and the laboratories that are 100 percent supported by military funds, such as RAND, Ramo-Wooldridge, Lincoln, and others. . . . The thing I am concerned about in any laboratory that we could manage is that as the character of the work changed we would be forced to make work of a kind that might not be the most productive."

Here is a doctrine, stated by one of Mr. McElroy's high aides, that is contrary to the most distressing practices of the past few years. If the man was giving an honest answer —and nobody has challenged him—early apprehensions about ARPA were not fully justified. In the March '58 issue of AIR FORCE we cautioned against the danger that ARPA might not stay "upstream" and might concern itself too much with weapon development, not enough with basic research. Mr. Johnson gives us confidence when he defends exploration of space by the military in these terms:

"At the moment I am not quite sure there is a military advantage in the area of the moon. Twenty years from now there may be. Arguments have been made by many of the scientific fraternity that it is ridiculous to drop bombs from outer space. A bomb will not fall from that height but [I] presume a death ray could be created in the next twenty years.

"Getting up 500 miles in the air with a death ray might be a perfect way to use it . . . conversation now that

(Continued on page 23)

The General Motors Matched Power Team of Allison Prop-Jet Engines and Aeroproducts Turbo-Propellers Assures Convair 340/440 Transports Continued Service in Jet-Age Transportation

CONVERSION TRANSFORMS TODAY'S AIRCRAFT INTO JET-AGE TRANSPORTS. Obsolescence facing piston-powered Convair 340/440 transports can be solved by modernizing these popular twin-engine planes to Allison Prop-Jet engines and Aeroproducts Turbo-Propellers. Conversion to Allison Prop-Jet power packages is *economically* and *technically* sound:

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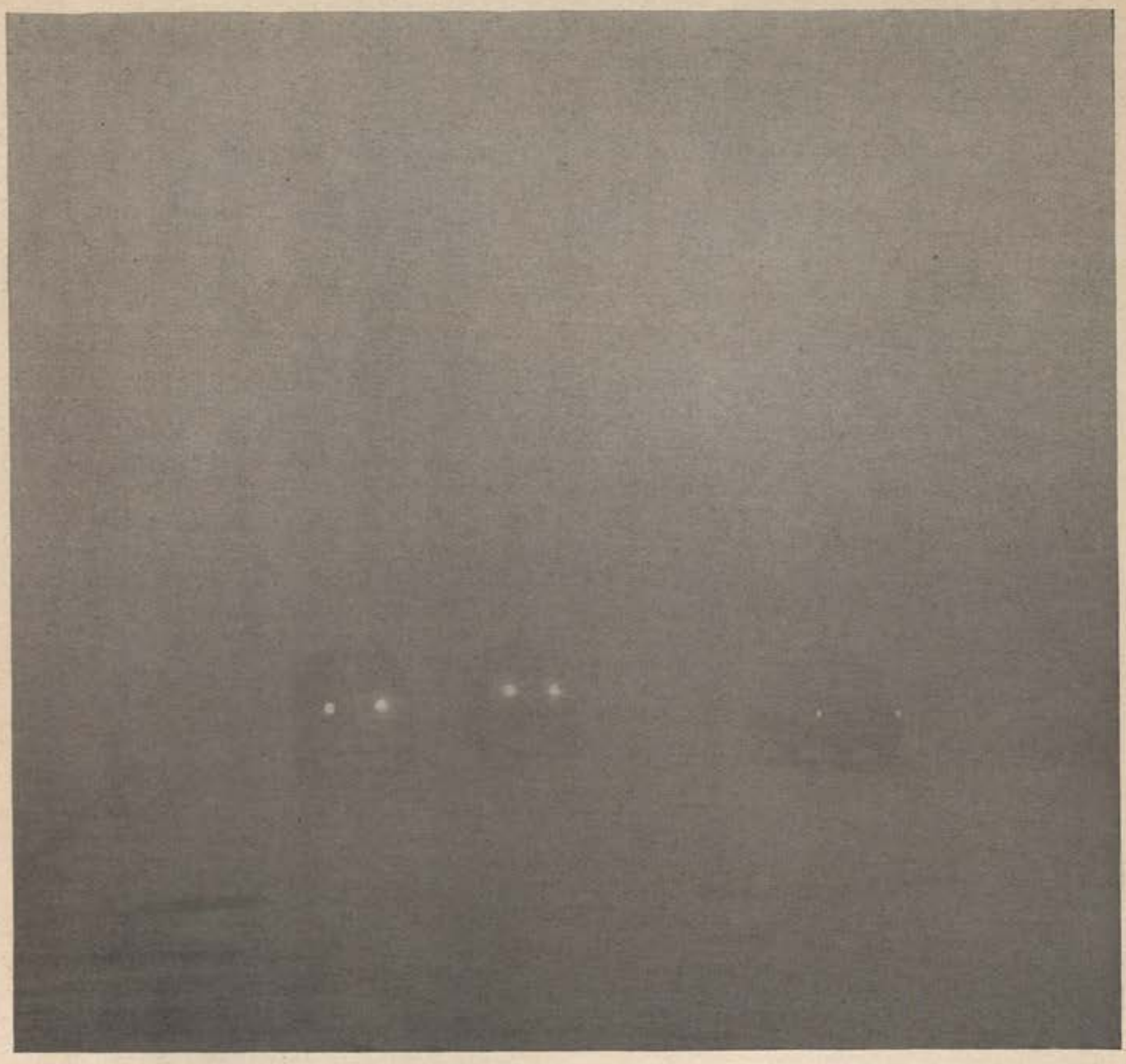

THE HISTORY OF FORD MOTOR COMPANY IN AVIATION

AND THE GROUND VANISHED

The weather socked in tight and the ground vanished—but a steady hum in the pilot's ear told him he was safely on course. The date: February 10, 1927. The occasion: the first demonstration of a radio range system, designed and built by Ford Motor Company.

A Ford Tri-Motor took off from Dearborn, Michigan and flew to Dayton, Ohio guided entirely by radio. Most of the flight was through extremely bad weather, but the plane flew *on course* and landed safely.

Ford Motor Company was issued the basic patent on radio range beacons which differ little from those in operation across the country today. This was a major contribution to the development of aviation, as are the dependable J-57 turbojet engines we build for use in many of today's jet fighters and bombers.

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says because a bomb will not drop from 500 miles assumes that that weapon, twenty years from now, is the only formidable weapon. . . . We have to think of weapons we do not dream of now."

There's no doubt on the basis of those words, that ARPA is upstream and intends to stay there. And this is the best of news.

Further, probably more important testimony on the general subject of space and what we will do about it was given before the House and Senate committees studying the administration's proposal to create a National Aeronautics and Space Agency. In a first rewrite of the bill, now passed by the House, the congressmen changed this to the National Aeronautics and Space *Administration*, but the initials remain the same—NASA.

Among the men who have distinguished themselves on the stand in defense of the program were Dr. Hugh L. Dryden, Director of the present National Advisory Committee for Aeronautics, and, to the surprise of many sophisticated observers, Maurice H. Stans, Director of the Bureau of the Budget. Both of these witnesses appeared before the Senate Committee to make it clear there is no objection to improvements in the text. Mr. Stans offered a list of five proposed amendments. Dr. Dryden said the administration "is far more interested in the accomplishment of a national space program, that, except for the space technology efforts of the Military Establishment, will be under civil direction, than it is in the precise language of any part of Senate Bill 3609." He emphasized that space is full of unknowns and for this reason general terms are considered better than specific ones.

Mr. Stans, under whose supervision the original bill was drafted, gave an effective rest to most of the specters raised by critics in the House hearings. He was impressively supported on the stand by William F. Finan, who seemed to prove that he knew as much or more about legislation than his elected inquisitors. Mr. Finan is an assistant director of the Bureau and obviously a competent lawyer.

In addition to a minor change in NASA's name, the House bill says it will control space projects in cooperation with the Defense Department, Atomic Energy Commission, and other Federal agencies. Two divisions would be required in NASA, one on military and the other on nuclear applications, and the director of the former would be an officer from the armed forces. Makeup of the National Aeronautics and Space Committee is altered to include nine members from the government, at least three of them from the Pentagon. AEC membership is not stipulated, however the bill provides for an Atomic Energy Liaison Committee as well as another liaison group to work with the military forces.

An interesting angle of the House action on the NASA bill was the apparent intent of the lower chamber to establish a separate committee on science and astronautics. In the earlier version of the House bill, there had been a provision for establishment of a joint congressional committee to oversee the activities of the new space agency. Such a committee would have been similar in function to the joint committee that watchdogs the Atomic Energy Commission. But House leaders persuaded the NASA bill planners to eliminate the provision.

Meanwhile, at this writing, the Senate is busy on its version of the NASA legislation, and observers are hoping to see an early conference, which will give the green light for a bill to go to the President.

House passage of the space agency legislation coincided with passage of a resolution calling for an international agreement to limit the use of space to peaceful purposes.

■ Getting back to the pay bill, which USAF's Gen. Thomas D. White says is the best advance for servicemen he has seen in thirty-eight years as a soldier, there is a necessary word of warning. All men in uniform are not headed for a raise. Some of them are headed out. The ones retained will be competent people. They will have an incentive to make a career out of military service.

For its part, USAF already has personnel quality control almost as definitely as it is found in aircraft manufacturing plants to ensure reliability of equipment. The selective reenlistment program is almost two years old and has been effective in discouraging men who do not have the capability to train in new areas. On top of this, USAF has been giving aptitude tests since April 1, in an effort to meet the strong demand for able technicians.

So far as officers are concerned, the dead wood will be removed and younger men offered more money to prove their worth and move into better jobs in the service.

"We have been hard pressed," General White said, "to retain the necessary numbers of qualified officers. With the incentive provided by the new pay bill, it is expected this condition will change.

"With this change, it will become even more important that commanders continually emphasize the importance of accurate effectiveness reports. Only through this strict control can we promote the more deserving and eliminate from the service those who are not contributing to its effectiveness."

Starting July 1, the new law permitted introduction of a proficiency pay program designed to reward outstanding performance by enlisted men with technical skills. USAF plans raises for 35,000 of these personnel in fiscal 1959, distributing $7.6 million extra in their pay envelopes. The bonuses will range from $50 to $150 a month.

In addition, two new grades, E-8 and E-9, will provide an elite layer in the non-commissioned ranks. There will be 5,000 E-8s by the end of fiscal 1959 out of an authorized 14,286. The E-9 category will be launched next year. All of these men will be selected out of present E-7s. The purpose of this program is to avoid having so many men with widely divergent responsibilities and technical skills receiving the same pay. The pressure will be put on commands to upgrade or demote, ending the old practice of keeping a percentage of dead wood in almost every unit.

The provision of added responsibility pay for selected captains, majors, lieutenant colonels, and colonels—mentioned in last month's AIR FORCE—now appears to face a dim future. Authorized but not required, administration and top USAF officials are not in favor of exercising the provision at this time.

■ With the US Supreme Court under fire from conservative critics, far be it from us to add new woe to the lot of Nine Liberal Gentlemen. But it should go into the record, both for the Court and the aircraft industry, that California has been outstripped again. You may recall that local communities out there are taxing government-owned work in process and government-owned manufacturing facilities. The aircraft firms naturally are paying the bills and their protests fall on deaf ears.

The pertinent news is that the Supreme Court of Canada has ruled that US contracting concerns working for the US in Canada on projects for the common defense of North America are not subject to real and personal taxes by local governments. This gives a US contractor working in Canada a form of immunity he is not able to find in California. One man's tax meat is another man's tax poison.

—CLAUDE WITZE

NAA is at work in the fields of the future

THE DAY AN AMERICAN RETURNS FROM OUTER SPACE...

...will be another V-day for the free world —greater, perhaps, than any it has yet known.

In the inner offices of the Pentagon... in secret areas of our defense industries... no effort is being spared to speed the day.

For it will be a human pilot—in command of a craft that will bring both him and his secrets safely home—that will truly conquer Outer Space.

The first American craft to attempt this conquest is now in its final construction stage. It's the X-15... missile-shaped and rocket-powered... product of a scientific project sponsored by the National Advisory Committee for Aeronautics, the Air Force, and the Navy. It will discover what man encounters when he enters space—and when he returns to the earth's atmosphere.

America is closing the gap

The Army's Explorers give us dramatic

Back from beyond, the pilots of NAA's X-15 rocket plane will report on the new problems they discover in Outer Space.

Outward bound, USAF's Thor vaults into space on the mighty thrust of a rocket engine built by the Rocketdyne Division.

proof that America had not been lagging in the race to space. The rocket engines that put the Explorers into Outer Space were minor modifications of the same engine NAA's Rocketdyne Division has been delivering to the Army since 1952. Four of America's major missiles use engines built by Rocketdyne: the Air Force Atlas and Thor, the Army Jupiter and Redstone.

Missiles of all types use principles discovered by Missile Development Division in its 12-year research program. This division is now at work on the GAM-77, advanced air-to-ground missile for the Air Force B-52.

Both missiles and aircraft depend on automatic control systems—the electronic eyes and ears of the Space Age. Autonetics Division is producing these vital systems in quantity—with complete reliability.

The new weapon-system concept

America now shapes its defense around complete weapon systems, each designed for a specific role. Some will be guided to target by electronics; others will have a human pilot's ability to change plans or report results. NAA builds both—and both are needed for complete security.

Los Angeles Division is building two advanced manned weapon systems for tomorrow's Air Force: the B-70, which will have global range and fly more than 2,000 mph; and the F-108, which will intercept would-be invaders far from our shores—and give us the reach to quash little wars before they become big.

Toward a brighter tomorrow

Many of North American's people are working on projects that promise a more abundant life for a world at peace. The Atomics International Division, for example, is developing practical methods for turning atomic energy into low-cost electricity. Two major power reactors are already in operation; a third is on the way for fifteen Southwest utility companies.

Today, in North American and its divisions, you'll find as potent a combination of scientists, engineers, and production men as any in American industry. Because they are constantly forging ahead into vital new technologies, much of their work holds immense promise for science and industry.

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VIEWS & COMMENTS

Some Sensible Views on Limited War

Limited war, its shape and frequency hard to predict, is a definite part of Air Force thinking, and USAF Chief of Staff Gen. Thomas D. White spelled out some of that thinking in his Los Angeles Armed Forces day speech:

THE Air Force has closely studied its capabilities to fight local wars. We have examined local wars from the standpoint of possibility, the conditions apt to prevail, and the dangers involved in the conflicts themselves.

Our tactical air forces, used independently or in conjunction with other arms, provide a potent force which is particularly well suited for such actions. We have perfected a procedure to quickly employ selected effort from these forces, wherever required. This effort could consist of a few aircraft of a single type or a larger number of aircraft of several types. In all cases, the force would be hand-tailored for the job to be done. The speed with which Air Forces can move about the world and adjust to different operational requirements makes them well adapted for such use.

Their capabilities for quick reaction—measured in hours not days, their firepower, and their flexibility are all factors which make them valuable. Airpower is particularly suited to applying the right amount of force at the right place and time with a minimum of cost and effort.

Our global airpower also contributes to deterring local wars. Any aggressor in a local war runs the risk of incurring retaliation on a large scale should his local successes be unacceptable to us. Thus, our general war deterrent and capability, indirectly deters local ventures by leaving us with a trump card and the initiative should the aggressor be unduly successful. On the other hand, if the local aggression fails, the same airpower stands as a deterrent to his extending the conflict in the hope of recovering initial losses in a larger arena.

If atomic weapons are used in local war—and an aggressor must be prepared for this regardless of what we actually do—he has little or no prospect of local conquest until he can destroy our atomic firepower. In the face of our global delivery capability, an aggressor must be willing and able to engage our worldwide base complex, which, in turn would be incompatible with his local war objectives. The Air Force feels that the existence of atomic airpower is a strong deterrent to major local war. Nevertheless, the continuing threat of aggression is such that we must constantly be on guard.

There is no way of knowing how successful our deterrence of local wars really is. Unfortunately, successful deterrence—when a war *does not* eventuate—is never as spectacular as failure, when the war starts.

The Changing Map

THE map of the world as we have known it since 1948 is now being rendered obsolete. In that year two great events occurred. The Chinese Communists won their victory, and the United States launched the Marshall Plan. These two events determined the subsequent world balance. For a full decade thereafter, the world was divided into two halves; there were serious frontier incidents between these two halves of the world; but a precarious balance was maintained.

That balance is now breaking down. It is breaking down for the simple, practical reason that the Eisenhower Administration neglected the practical efforts that were obviously needful to sustain the strength of the Western alliance. The current breakdown of the political balance in fact reflects the prior breakdown of the military balance.

The old world map that we have known for a decade will soon be unrecognizable. The division between the great world camps will still exist, but the line between them will run very differently. There will be new elements too—a Gaullist France, for instance, and perhaps a Middle East dominated by Nasser—that will demand new places in the scheme. And, if the cause of freedom is not to be finally defeated, the American government is going to have to find a wholly new approach to the new world map that events are so remorselessly tracing.

From Joseph Alsop's column, "Matter of Fact," in the Washington Post and Times Herald, *May 28, 1958. Reprinted by permission of the New York* Herald Tribune.

Unneeded Conflict

An incisive analysis of the fallacious belief by some that there is an intrinsic conflict between scientists and the military is made by Lt. Burton I. Edelson, USN, in the May issue of the Bulletin of Atomic Scientists. *An excerpt from Lieutenant Edelson's piece, entitled "Mutual Obligations: Science and the Military," follows. It is an interesting discussion of an important problem.*

HOW strange it is . . . to find still apparent in the speech and writing of many professionals [in science and the military] and of laymen too, a tacit and underlying assumption that in basic philosophy [their spheres] are somehow irreconcilably opposed. There seems to be the "military mind" and the "scientific mind."

The two terms hardly have to be described, they are so well conceived in our subconscious reflections. Immediately upon seeing the words "military mind" we conjure up an image of a caricature of the Junker general. We think of the terms bandied about in the public press, as "battleship admirals" and "hidebound brass." We sense a dogmatic personality, a rigid caste orientation, and a pompous indifference to moral niceties. The so-called "scientific mind," on the other hand, belongs to the longhair, the dreamer—possibly a security risk, or at any rate a dweller in an ivory tower so far from reality that his views on anything so mundane as the challenge of communism or military strategy must certainly be of little importance.

It is this conscious or subconscious antagonism between the two spheres of interest which is deplorable. Certainly

the foregoing descriptions are false, almost ludicrous, in black and white. Probably neither the thoughtful scientist nor military officer would harbor such harsh impressions, nor would he produce them if directly questioned. Nevertheless, the image occurs in careless reference in writing and in speech.

It is advantageous to both groups to cast off such spurious impressions, in thoughtless reference as well as purposeful action. The true military mind inevitably must be in fact a scientific mind, the military approach, scientific in nature, and all military leaders scientists of a sort. The broadest implications must be drawn from this statement—that leadership must be a form of applied psychology; tactics, the theory of games; logistics, an adaptation of linear programming; grand strategy, a combination of all the various disciplines; and so on. Indeed, this is recognized, and agencies within the military establishment have been created and are presently operating to implement such advanced thinking. . . .

The very futures of science and the national defense being so closely entwined, there must be the closest harmony of effort between the two spheres.

Progress, Yes, but Problem Still Exists

The very important point that the successful reentry of the Jupiter IRBM nose cone means only that a reentry problem, *not* the *reentry problem, has been solved, was made in the New York* Times *editorial marking the feat. As the* Times *points out, there is much to be done still on the much bigger problem of ICBM reentry, since ICBMs travel farther, rise higher, and come down faster. The* Times *also remarks on the fact that the much publicized reentry nose cone shown by President Eisenhower on television to the nation last winter was nothing more than a scale model.*

It's interesting to note the timing of the Army's widely publicized Jupiter reentry story. The news was released just as the possibility of reversing the Holaday decision to produce both Thor and Jupiter was running through the Washington rumor mill.

THE Army released good news yesterday when it told of the successful recovery of the fully instrumented nose cone of a Jupiter missile which had apparently gone over 1,500 miles before landing in the sea. Much of the Jupiter's flight, of course, was through space, so that the nose cone recovered yesterday had to survive successfully the immense heat generated as it plunged down through the atmosphere. The significance of yesterday's event is therefore quite clear. The Army now has solved the problem of delivering nuclear weapons by means of an intermediate-range ballistic missile.

President Eisenhower called attention to the importance of this problem in his television and radio broadcast late last year. It now turns out, however, that the nose cone displayed to the nation then was only a scale model, so that additional problems have apparently been solved between the time of that broadcast and the present.

Gratifying as this progress must be, it would be dangerous to assume that the problem of safe reentry into the atmosphere has been solved for all long-range missiles. Rather there is reason to suppose that an intercontinental ballistic missile poses even more serious problems for the makers of nose cones, since such a longer-range missile travels farther, goes higher into space, and reenters the atmosphere at a higher speed—thus generating more heat—than did the Jupiter fired yesterday. Yet the fact that the reentry problem has been solved for the Jupiter must strengthen reasonable expectation that the same problem will be solved for the ICBM weapons such as Atlas and Titan.

The inspiration for the present research on the reentry problem is, of course, military, but sight must not be lost of its other implications. Men already look forward to the time when rockets will carry first instruments and then human beings into space and then return them to Earth. Put another way, the reentry problem must be solved for peaceful space research as well as for military purposes. We may hope that the historians of the future will look upon yesterday's breakthrough as having been a milestone in the conquest of space for peace.

More Basic Research

Slowly but surely, the men who know are selling the vital idea that basic research, broadly based, is an absolute essential to US safety in the technological war. Following are some views of Dr. James R. Killian, Special Assistant to the President for Science and Technology, as expressed at the recent conference on R&D and its impact on the economy, held under the auspices of the National Science Foundation in Washington, D. C. They are significant thoughts on a vital subject.

WE need a letter allocation of efforts and funds among the several categories of research and development. Recent estimates of expenditures for research and development indicate that more than ten billion dollars are being spent annually by industry, government, universities, and other nonprofit institutions on research and *development*. This represents a phenomenal increase during the past decade, and we can rejoice in this impressive record of growth, provided we understand what we are rejoicing over. By far the major total of the ten billion dollars is expended for development, and over the past decade there has not been a comparable increase in basic research. While our means and methods of measuring research effort and discriminating between basic and applied research are by no means as refined as they should be, nevertheless there is clear evidence that basic research is still underemphasized and undersupported. As the 1957 report of the National Science Foundation concluded: ". . . Economic incentives assure the immediate future of applied research and development. But these incentives do not have direct and immediate impact on basic research, and redoubled efforts are required. . . ."

The need, relatively, for more basic research drives to the heart of the qualitative problem we face. Our great effort in the field of development can be made more useful and productive if it can be enriched by the vitamins of basic research activity of greater scope and higher quality than we now support. The situation is not unlike that which has obtained in education. We have done a fine job in educating large numbers while relatively neglecting the education of our most talented and intellectually gifted. In both education and research, we face the necessity of emphasizing quality and depth as never before . . . to do more and better work [in] basic research.—END

An Editorial

Scientists, Not Cultists, Will Conquer Space

John F. Loosbrock, Editor

THERE is a dangerous theory being peddled to the American people today, one which does this nation a grave disservice. It is a theory which makes a cult of space—complete with self-appointed prophets. These prophets talk of space as something beyond the ken of ordinary minds. They cloak space in synthetic mystery and encourage the belief that only a chosen few really understand its implications and can lead the way to its conquest.

The peddling is being done through an outpouring of wild claims, gross exaggerations, and extremely fuzzy thinking by those who have done much more of the talking about space technology than the actual doing.

Spaceflight appeals to the adventurous spirit of man. It is a challenge to this spirit. And it is also a very practical scientific and military challenge because the Free World must, in the interest of self-preservation, surpass the space accomplishments of the Soviet Union.

But here is a case where wishing *won't* "make it so." Man cannot project himself into the cosmic void through some mystic process of self-hypnotism. Peter Pan, in an appealing fantasy, flew by thinking happy thoughts, but this flight technique is not to be recommended as a practical means of travel.

The mind of man has already invaded space, in the shape of satellites—big Soviet ones and little American ones. That man himself will ultimately travel in space is inevitable. The march of technology moves at an ever-quickening pace. But man's path will be prepared by the hard-working scientists and engineers—military and civilian—who are applying to space technology the basic principles emerging from the knowledge and developments that have gone before.

Space is not new. Our world has been whirling in it for millions of years. The main new thing about it is that more people are quite suddenly aware of it.

Actually, we know a good deal more about how to reach into space than we do about space itself. We know we need a vehicle; we need a propulsion system to move it; we need a guidance system to make it go where we want it to go. Man has been traveling from place to place for a good many years and in so doing has accumulated a considerable store of knowledge as to how best this can be done. It would be the height of folly, as some suggest, to fail to take advantage of this store of experience.

Today there are no real space experts. There are only experts in the various fields which impinge on spaceflight. These experts are clustered in a comparatively few places, the bulk of them concerned with the long-range ballistic missile program. Here the problems of vehicles, engines, and guidance systems are wrestled with every day. Here, concurrently, the supreme problem of ensuring man's survival in spaceflight is being worked out. Here is being created a solid foundation of space technology on which a successful space program can be built at a minimum of cost and with a maximum hope of achievement in the shortest possible time.

Each of the military services has much to offer to the effort, as do other government agencies, private industry, universities, and privately endowed research organizations.

The President's plan for a space program, soon to become law, recognizes these facts and wisely chooses to utilize as the nucleus for a new space coordinating agency the capable, respected, and long-contributing National Advisory Committee for Aeronautics. This is sensible use of an existing store of knowledge, talent, hardware, and facilities.

How successful this nation's space program will be is not a matter to be decided by philosophical meanderings or hair-splitting definition of air and space, aeronautics and astronautics.

It is a matter that will be expedited by deciding what we want to do and providing the necessary financial support. We have the resources. We dare not waste them in duplication and dissipation.

For we have a few other matters to worry about as well. We cannot fall blindly in love with space for its own sake. The tyrannical character of Communism does not become diluted, like the atmosphere, with increasing altitude. We cannot afford to become "spacebound" any more than we can afford to be Earthbound, seabound, or airbound. We cannot hope to see free men traveling in space unless we preserve a free world from which such flights may be launched and to which they may return.

We need prophets, apostles, and evangelists for the Space Age—but not witch doctors and soothsayers.—END

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SHOOTING THE BREEZE

WITH THE EDITORS OF AIR FORCE MAGAZINE

In some ways, history doesn't seem to change at all; it just gets bigger. Note this quote:

"It is a gloomy moment in history. Not for many years . . . has there been so much grave and deep apprehension; never has the future seemed so incalculable as at this time . . . In France the political caldron seethes and bubbles with uncertainty; Russia hangs, as usual, like a cloud, dark and silent, upon the horizon of Europe; while all the energies, resources, and influences of the British Empire are sorely tried . . ."

from *Harpers* Magazine, October 1857.

☆

More news on the highly successful March issue of AIR FORCE—the "Space Weapons Handbook." We have signed a contract with New York publisher Frederick Praeger for publication of the handbook as a hard-back book scheduled this fall.

Also, part of the material in the March issue will be included in a booklet to be published and distributed by the National Aviation Education Council. In addition, we have received requests from such diverse sources as Funk and Wagnall's Universal Standard Encyclopedia, the Air University (for inclusion in an ROTC textbook), the School of Education of New York University, and the House Select Committee on Astronautics and Space Exploration. Several Congressmen included material from the March issue in newsletters to their constituents.

Also, several of the charts that appeared in the handbook are scheduled for inclusion in a high school science text being prepared by the Rev. John Scott, S.J., of Campion High School, Prairie du Chien, Wis. The text will be published by Loyola University Press, Chicago.

As everyone knows, the art of celestial navigation is the determination of position by tracking of heavenly bodies. Withal, it is no surprise that Air Force Reserve navigators have chosen Phyllis Keene, Miami National Airlines hostess as the "girl they'd like to fly with in stormy weather." Bloomingly in her twenties, Phyllis has been with National for four years and makes her home in Florida.

☆

Boomerings . . . and tradition a-borning.

From the Denver *Post*:

"Rings scheduled for presentation to the first graduating class of cadets from the Air Force Academy were flown through the sound barrier . . . in sonic ceremonies over Eastern Colorado.

"Col. Benjamin B. Cassidy Jr., deputy commandant of cadets, performed the rites at the controls of an F-86 Sabrejet, carrying more than 200 class rings which will be presented to the Academy class of 1959.

"Spokesmen at the Academy said the ring ceremonies will become an annual affair for all graduating classes."

☆

It could happen to anyone. At the recent Illinois Wing Missile Age conference in Chicago (*see page 65*)**, Krafft Ehricke, chief space planner of Convair Astronautics, was asked by newsmen to assemble a two-foot model of the interplanetary rocket he has proposed.**

Something seemed amiss after Mr. Ehricke had put about half a dozen components together. Although the model appeared complete, there was still one part left over.

Mused Mr. Ehricke, "My goodness, I've forgotten where it goes."

The main section of the Air Force Atlas, which the model approximated, has something like 360,000 separate parts.

☆

We ran across an item the other day which we think helps explain AFA's insistence that a single promotion list for all the services is a vital element of true unification. The quotation is in reference to the organization of the US Army in the 1890's, before Secretary of War Elihu Root reorganized the old War Department and instituted the General Staff, and is from *National Security and the General Staff*, by Maj. Otto L. Nelson Jr., USA (Ret.), published in 1946 by the Combat Forces Press.

The book's author is vice president of the New York Life Insurance Co., and is currently serving as Special Assistant to the Secretary of Defense in connection with reorganization of the Defense Department.

The excerpt follows:

"Another factor which made for the overlapping of duties and the flaring up of jealousies and jurisdictional disputes was the system of promotion in vogue in the Army. Up to and including the grade of colonel, promotion was by seniority within the staff or line branch. That is to say, promotion in the Adjutant General's Department depended upon the number of vacancies created by the death or retirement of senior officers of that department alone. This might be much slower or faster than promotion

Lighter than Air

Our first lieutenant was really a stickler for discipline and cleanliness. And I don't think any of us really minded, except for the fact that the lieutenant would delight in stopping an airman for the slightest reason, just to chew him out. And, mostly, the victims would just stand at attention and hear out the irate officer.

One airman, Jones, seemed to catch it more than the rest of us, and I remember on one occasion, as I was walking out of the barracks, hearing the lieutenant shouting:

"Jones! Didn't you shave this morning?"

"No," drawled Jones, without the usual "sir" in his reply.

"No—WHAT?" shouted the lieutenant.

"No blades," Jones replied solemnly.

The lieutenant walked away.

FREDERICK D. JOHNSON
Turlock, Calif.

in other staff departments or in the line. One thing was certain; promotion would be expedited if Congress made the department larger and gave it an increased quota of officers. Conversely, if the activities of the department were curtailed with a corresponding reduction of its officer quota, promotion would stagnate until the decrease had been absorbed. It was therefore quite natural for all staff departments, and the line branches also, to enlarge their fields of activity whenever the opportunity offered and to resist all attempts to reduce or streamline any of their activities."

☆

Honored recently for his writing contributions to airpower was Lt. Col. W. A. (Lefty) Hawkins, USAF Res., who wrote our cover story for May, "Tunnels into Space." Colonel Hawkins received the Commendation Ribbon at ceremonies held at Little Rock AFB, Ark. Cited for his many articles on SAC and other Air Force activities, he is a technical writer for Chance Vought Aircraft, Dallas, Tex.

☆

Four seventeen-year-old graduating seniors of Tennessee high schools have received the first L. J. Sverdrup Cooperative Scholarships—$500 each for study at the University of Tennessee's College of Engineering. The four will attend the university to work for degrees in mechanical engineering, electrical engineering, or engineering physics.

The scholarship winners will spend some of their semesters getting practical experience at ARO, Inc., contract operator of the Arnold Engineering Development Center at Tullahoma, Tenn., and awarders of the scholarships.

Winners were Gale A. Downs, Shelbyville; Robert G. Chapman, Tullahoma; William E. Brohawn Jr., Manchester; and Charles W. Clardy, Winchester.

☆

We hear a great deal of talk these days about the apparent lack of interest among youngsters in the disciplines and knowledges that—far more than rock and roll—are going to be essential to preserve this country in the Technological War.

There may be *some* validity to the charge, but the plain fact is that—given the chance—American teenagers can develop strong interests in science and mathematics.

Proof of this was amply demonstrated at the mid-May Frontiers of the Space Age Conference in Oklahoma City, an all-day event that featured addresses by USAF experts such as BMD Commander Maj. Gen. Bernard A. Schriever and DCS for Materiel Lt. Gen. Clarence S. Irvine, among a long list of top space age experts who geared their talks to the need for youngsters to prepare for the complex activities of the years ahead. (See page 65.)

More than 6,000 Oklahoma high school students attended the Conference and saw a large array of Air Force space age exhibits, capped by a Thor missile which was erected outside the municipal auditorium.

The conference, which was covered by radio and television, reached nearly a quarter of a million people throughout the state of Oklahoma through those media.

Its tremendous success was the result of excellent cooperation among several groups—the sponsoring Frontiers of Science Foundation, the Oklahoma City Chamber of Commerce, the state and city education authorities, the Air Force, and the Oklahoma City Squadron of AFA.

And AFA is proud that the germ of the idea for the teen-age-geared show came from the February AFA Jet Age Conference held in Washington, D.C. Oklahoma City Air Materiel Area Commander Maj. Gen. Tom Gerrity had headed a delegation to the Jet Age Conference. En route home a discussion took place on the need to inform the people back home—especially the youngsters—of the implications and challenges of the space age. The idea took hold, and in a surprisingly short time, planning was under way.

An unusual approach to the planning for the speaker schedule was taken, in that selected teen-agers met with prospective speakers to provide them an idea of what youth wanted to know. Speakers thought it was a wonderful idea and said later the approach had helped them greatly in the preparation of their presentations.

The Conference results: a large number of Oklahoma youngsters more knowledgeable on the space age and hoping for a similar conference next year.

"Then that slight nose heaviness at Mach One, and.... Oh! more insulation in the cockpit....!"

airman's bookshelf

Add these to your list of rocket, missile, and astronautical literature.

Spacepower: What It Means to You, by Donald Cox and Michael Stoiko (Winston, $4.50), covers some reasons for man to undertake space conquest, the impact of such conquest on our civilization, and what must be done *now* before the great adventure to ensure the Free World maximum benefits from its space investment. The authors call for United Nations action to codify space law but do not explain how such law could be written from our practical knowledge of space at hand. They also plug for a UN "Space Force" to exercise space control, suggest an International lunar project and space program, and say the UN should organize a world space education program to prepare for possible meetings with alien beings. *Spacepower* is written for the layman. It is neither profound nor overly simplified, but is a pleasant discussion of the socio-political-economic aspects of what is—or at least has been —primarily a technical scientific subject.

° ° °

Space Research and Exploration, edited by D. R. Bates (Sloane, $4), includes twelve essays by British experts on the principles of space exploration and the equipment and resources required. Written in terms the informed non-specialist can understand, this is a highly readable and authoritative basic work.

Covering similar ground is *Spaceflight and Satellite Vehicles*, by R. B. Bear and A. C. Rotherham (Pitman, $3.95). This fascinating book surveys the men who pioneered rocketry and the scientific developments leading to spaceflight as a framework in discussing present research, equipment, and space programs.

One of the most widely acclaimed current "space" books is *Satellites and Space Flight* by Eric Burgess (Macmillan, $3.95). Burgess, a respected British science writer, treats rockets, missiles, Earth satellites, and spaceflight from theory through research and development to operational use.

Rocket, by Air Chief Marshal Sir Philip Jourbert de la Ferte (Philosophical Library, $6), is a historical survey of the use of rockets by Germany in World War II and British defenses against the deadly V-weapons.

The second revised edition of *Development of the Guided Missile*, by Kenneth W. Gatland (Philosophical Library, $6), is a comprehensive study of guided weapons and rockets for military and peaceful uses. Gatland speculates on the missile as an instrument of space research and a vehicle for interplanetary travel.

In *The Earth and Its Atmosphere*, edited by D. R. Bates (Basic Books, $6), fifteen geophysical scientists examine the atmosphere, the oceans, and the composition of the Earth in highly readable terms. A good background for understanding the technical programs of the IGY.

° ° °

The Rocket Pioneers on the Road to Space, by Beryl Williams and Samuel Epstein (Messner, $3.75), first published in 1955, is a series of profiles on men such as William Congreve, Konstantin Tsiolkovsky, Robert Goddard, and Herman Oberth, and such groups as the German Society for Space Travel, the American Rocket Society, and the Peenemünde crowd who pioneered rocketry.

Around the World in 90 Minutes, by David O. Woodbury (Harcourt, Brace, $5.75)—a popular treatment of the Earth satellite program. *The World in Space*, by Alexander Marshack (Nelson, $4.95; Dell paperback, 50¢)—examines IGY plans with emphasis on satellites and rockets. *From the Earth to the Moon and A Trip Around It*, by Jules Verne (Lippincott, $1.95)—two of the earliest science fiction tales in a new edition, written by the granddaddy of the science prophets.

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For the technical reader, student, and scientist:

Handbook of Guided Missile Technology, by C. W. Besserer (Van Nostrand, $14)—a technical volume including a good glossary of guided missile terms. *Exterior of Ballistics of Rockets*, by L. Davis, J. W. Follin, and L. Blitzer (Van Nostrand, $8)—a comprehensive, well-illustrated treatment.

McGraw-Hill, in cooperation with the USAF, has produced a commercial version of Air Force Manual 52-31, which has been widely sought by civilian schools and universities and the other services as a basic textbook and primer for training guided missile technicians and science students. *Guided Missiles: Operations, Design, and Theory* ($8) was prepared by USAF's Air Training Command and originally brought out in a limited official edition. McGraw-Hill's attractive version is profusely illustrated and covers in detail the history of missilry.

Atmospheric Explorations, edited by Henry G. Houghton (Wiley, $6.50)—the papers of the Ben Franklin Memorial symposium of the American Academy of Arts and Sciences. *Atomic Physics and Human Knowledge*, by Dr. Niels Bohr (Wiley, $3.95)—seven essays on man's concept of the physical world. *The Exploration of Space by Radio*, by R. Hanbury Brown and A. C. B. Lovell (Wiley, $6.50)—a semi-technical discussion of the potentialities of radio astronomy.

° ° °

Indirectly related to the science of missilry is a new picture study of the universe, *Atlas of the Sky*, by Vincent de Callatay, translated and with a foreword by Sir Harold Spencer Jones (St. Martin's Press, $12.50).

° ° °

For the space-minded younger set:

Space Stations, by Willy Ley (Simon and Schuster, $1) —illustrated story of the theory and design of space stations. *Space, Space, Space*, by William Milligan (Watts, $2.95)—a collection of adventure stories about flight to the stars. *By Space Ship to the Moon*, by Jack Coggins and Fletcher Pratt, revised by Willy Ley (Random House, $1) —an account of spaceflight. *Space Book for Young People*, by Dr. Homer Newell, Jr. (Whittlesey House, $3)—dramatic, factual, and well-illustrated. *Your Trip into Space*, by Lynn Poole, illustrated by Clifford Geary (Whittlesey House, $2.95)—a new edition.

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On the Air

Two new airship volumes give nostalgic coverage to the record of the tragic era of dirigibles. *Graf Zeppelin: The Adventures of an Aerial Globetrotter*, by J. Gordon Vaeth (Harper, $4)—tells the story of one famous airship and its designer, Dr. Hugo Eckener, who gave the author much first-hand material. The "Graf" and its skipper faded into oblivion after the tragic explosion of Eckener's *Hindenburg* in 1938, an event which ended the dirigible era.

In England the airship craze reached its peak with the R-101, largest airship ever built, which was proclaimed in

(Continued on page 35)

MASS RETALIATION—USAF-Northrop Snark SM-62s, world's first and only *proven* intercontinental guided missiles, can reach any military target on earth from U.S. bases. No human crew is carried *and no defensive strategy yet conceived can stop the Snarks in mass attack!* With deadly accuracy—their hydrogen warheads can annihilate an aggressor's defenses, his airfields, his missile sites, his arsenals. They can open paths across an enemy's homelands for the crews of our manned bombers to follow, to attack, and return. Today, Snarks are being delivered to our Strategic Air Command, complementing SAC's powerful striking forces. The Snark—our *one* fully developed intercontinental guided missile—is in limited production. Its cost is but a fraction of that of any other intercontinental air weapon under present test or development. America and the free nations of the world need the full deterrent and retaliatory power of the Snark and they need it now.

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1930 by British Air Minister Lord Thomson to be "safe as a house, except for the millionth chance." With only a few trial runs behind it, the hydrogen-filled colossus started a flight to India with Lord Thomson and fifty-three others aboard. Less than five hours out of England the R-101, buffeted by a storm, crashed in northern France and was consumed by flames. Six survived. *The Millionth Chance: The Story of the R-101*, by James Leasor (Reynal, $4), tells the tragic tale.

° ° °

Nature Is Your Guide, by Harold Gatty (Dutton, $4.95), is a fascinating study of the navigational aids nature provides. The author, one of aviation's most famed air personalities, researched this subject the world over, and completed the book shortly before his death. Pilots will find it useful, but it is also of value to anyone interested in the science of navigation.

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Welcome additions to the literature of flight are two new Robert Longo publications: *The Gee Bee Story*, by Charles G. Mandrake ($2 paper cover, $4.95 hard cover); and *The Ford Story: A Pictorial History of the Ford Tri-Motor 1927-1957*, by William T. Larkins ($4.95 paper cover, $7.95 hard cover). Both cover the evolution and history of planes that played colorful roles in American aviation.

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Drawing on his own experience as a radar mechanic and B-36 crew, Malcolm Stevenson tells a story of the mechanics who service SAC bombers in *Radar Trouble Shooter: The Adventures of Sgt. Wilson of the Air Force* (Dodd, Mead, $2.75).

° ° °

The story of Nicholas Alkemade, an RAF gunner who leaped from a burning Lancaster bomber at 18,000 feet over Germany without a chute, and landed without injury in an eighteen-inch snowdrift is told in Ian Mackersey's *Into the Silk* (Norton, $3.95), a collection of the best from the files of the Caterpillar Club. Parachutes have saved more than 80,000 lives since the first successful jump in 1922 by Lt. Harold Harris, Army Air Service. These true yarns fill the book with action and drama.

° ° °

Wartime Italy is the setting of *The Damned Wear Wings* (Doubleday, $3.95), by David C. Camerer, a book that deals with the B-24 crews whose mission was to destroy the Ploesti oil complex.

° ° °

For the model airplane builder *U. S. Army-Air Force Fighter Planes*, by Edward J. Farley (Aero, $2.50), contains three-view and cross-section scale drawings and photos of fighters from the 1925 Curtiss P-1 Hawk to the Republic F-105 Thunderchief. *Experimental Light Aircraft and Midget Racers*, by John Underwood and John Caler (Aero, $2.50) is perhaps the most complete collection on this subject that exists.

° ° °

New additions to the air reference shelf:

U. S. Civil and Military Aircraft for 1958, compiled and edited by Robert Longo (Longo, $5.95)—an illustrated reference book of all American airplanes in current production, civilian and military. *Aircraft Annual*, edited by John W. R. Taylor (Philosophical Library, $6)—an international yearbook of aircraft, airships, rockets, and missiles. *High Speed Flight*, by E. Ower and J. Naylor (Philosophical Library, $10)—a semitechnical discussion. *Bibliography of Recent Books About Jets, Rockets and Space Exploration 1953-1958*, by Willis C. Brown, Specialist for Aviation Education—prepared for secondary school level—can be obtained free from the Publications Section, Office of Education, Department of Health, Education, and Welfare, Washington 25, D. C. *Histories of the United States Air Force*, by C. E. Dornbusch (Hampton Books, $2)—a bibliography of 265 Air Force unit histories of World War I and World War II. *Sourcebook on Atomic Energy*, by Samuel Glasston (Van Nostrand, $4.40)—second edition of a comprehensive and highly technical sourcebook on nuclear science. For the specialist, student, and scientist. *Van Nostrand's Scientific Encyclopedia* (Van Nostrand, $30)—expanded new edition of a definitive work, embracing 100,000 terms plus 14,000 articles in 1,800 pages and with 1,400 illustrations.

° ° °

Much too slowly the "now-it-can-be-told's" are emerging from World War II. Jerrard Tickell's *Moon Squadron* (Doubleday, $3.50) is one of the latest and records the amazing operations of the supersecret RAF Moon Squadrons which roamed the night skies over Europe, making paradrops and air landings and pickups deep in German-held territory in support of the widespread Allied intelligence network.

Ten Thousand Eyes, by Richard Collier (Dutton, $4), takes another look at World War II intelligence, relating the story of how Allied agents laid the foundation for the Normandy invasion by securing information on Hitler's defenses.

The Counterfeit Traitor, by Alexander Klein (Holt, $3.95), describes the major roll Allied espionage played in the strategic bombardment campaign against German oil.

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Worthwhile related professional reading:

In a timely volume entitled *Forging a New Sword: A Study of the Department of Defense* (Harper, $4.50), Army Col. William R. Kintner, J. I. Coffey, and Raymond J. Albright evaluate DOD's organization and operations, its strengths and weaknesses, and advocate lines of reorganization—a thought-provoking, controversial volume.

Strategy and Compromise, by Samuel Eliot Morison (Little, Brown, $3)—a brief survey of Allied military strategy in World War II endorsing the Nimitz-MacArthur actions in the Pacific, but criticizing the over-all Allied strategy in Europe. *Strategic Surrender*, by Paul Kecskemeti (Stanford University Press, $4.50)—analyzes surrender as a political concept through study of France in 1940, Italy in 1943, Germany in 1945, and Japan in 1945. *Choice for Survival*, by Louis J. Halle (Harper, $2.75)—examines problems of mass-destruction weapons and little wars, relating them to political objectives of the big nations.

° ° °

One of the cardinal rules of defense readiness is to "know your enemy." These three volumes help out. *Masters of Deceit*, by J. Edgar Hoover (Holt, $5)—an analysis of the operations of communism in the US. *Inside Russia Today*, by John Gunther (Harper, $5.95)—Gunther's sixth "inside" book, and a valuable look at the Soviets. *Russia, the Atom and the West*, by George F. Kennan (Harper, $2.50)—six lectures delivered in Britain dealing with Anglo-American relations, the Soviet Union, and the division between East and West.

The Berlin Blockade: A Study in Cold War Politics, by W. Phillips Davison (Princeton University Press, $7.50)—a RAND Corporation Research Study giving a detailed look at the elements of the cold war and the tactics, techniques, strengths, and weaknesses of both sides, through a study of the first major post-World War II East-West clash.

—MAJ. JAMES F. SUNDERMAN

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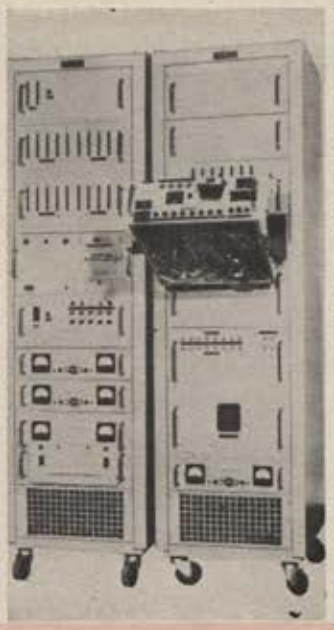

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Products Include:

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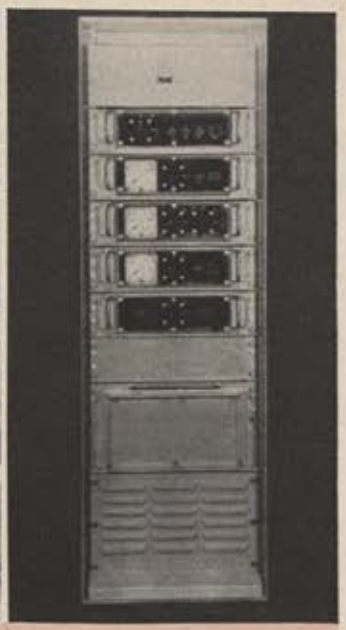

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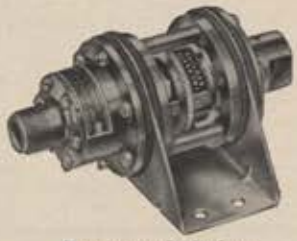

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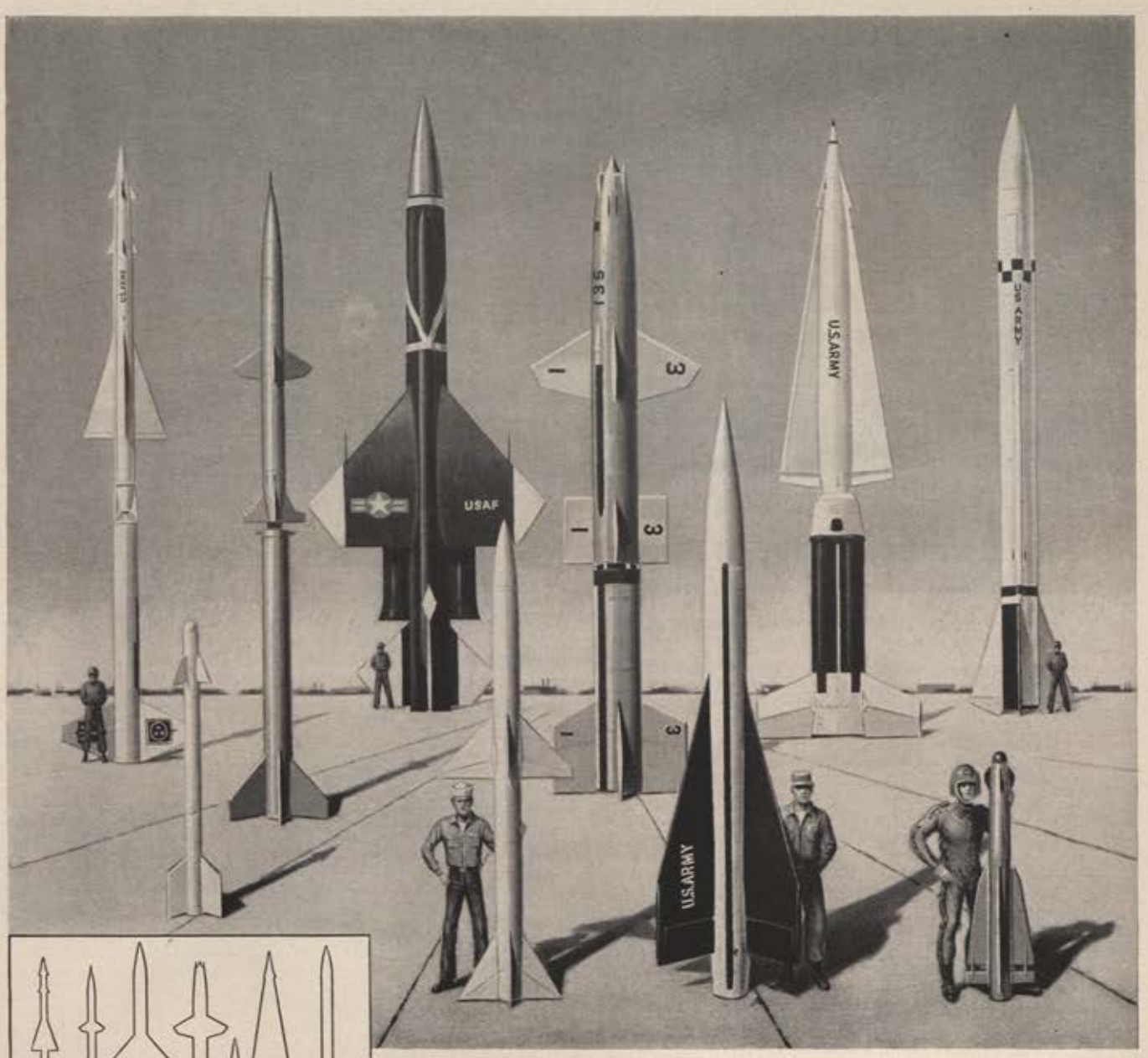

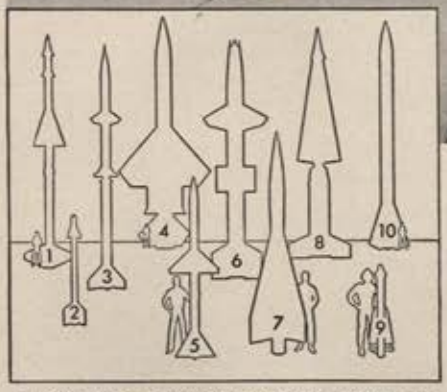

1. **Nike Ajax.** Army. Ground-to-air. Prime contractor: Western Electric.
2. **Sidewinder.** Navy. Air-to-air. Prime contractors: Philco; General Electric.
3. **Terrier.** Navy. Surface-to-air. Prime contractor: Convair.
4. **Bomarc.** Air Force. Ground-to-air. Prime contractor: Boeing.
5. **Sparrow III.** Navy. Air-to-air. Prime contractor: Raytheon.
6. **Talos.** Navy. Surface-to-air. Prime contractor: Bendix.
7. **Hawk.** Army and Marine Corps. Ground-to-air. Prime contractor: Raytheon.
8. **Nike Hercules.** Army. Ground-to-air. Prime contractor: Western Electric.
9. **Falcon.** Air Force. Air-to-air. Prime contractor: Hughes Aircraft.
10. **Corporal.** Army. Ground-to-ground. Prime contractor: Firestone.

10 MAJOR U. S. MISSILES RELY ON RAYTHEON TUBES

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AIR FORCE
JULY 1958

THE LONG-RANGE IMPLICATIONS OF SPUTNIK III

On May 24, the Board of Directors of the Air Force Association, meeting at Dallas, Tex., adopted the following statement. As a service to AIR FORCE *readers, we reprint the statement, in view of its important commentary on the post-Sputnik defense posture of the United States vis-à-vis the Soviet Union, months after the launching of the first Russian satellite and the consequent beginning of the space age. We believe the statement expresses some hard facts that sooner —better than later—must be digested thoroughly by every American.*

SPUTNIK III, as large and as heavy as an American automobile, has been orbiting the Earth for more than a week.

The gloomy, long-range implications of its presence have been largely ignored on this side of the Atlantic.

We are preoccupied with tax cuts and the distance to the Dodgers' left-field fence.

United States prestige is at a new low in almost every part of the world. Spectacular Soviet successes stand out in sharp relief against a backdrop of American complacency in a time of peril.

What does Sputnik III really mean?

- *The Soviet Union is at least a year ahead of the United States in space technology.*
- *The Soviet Union has developed rocket motors powerful enough to deliver megaton bombs on any target in this hemisphere.*
- *At the present rates of progress of the two nations, the Soviet Union soon will be in position to dictate terms to the Free World.*

We must regain world leadership, particularly in ballistic missile capability and space technology. We cannot hope to accomplish these goals under present half-measure programs.

The time for decision is now. Our elected representatives in both the executive and legislative branches of our government must make the painful choices between "business as usual" and "investment for survival."

The American people, today more than ever before in our history, need to be informed of the real facts respecting the position of the United States vis-à-vis the Soviet Union in this many-sided struggle. Its outcome will determine whether the peoples of the world can be free or whether they will be Soviet slaves. We must have candor, to a degree seldom practiced in recent years. We need public dissemination of vital information now locked up by senseless security regulations. Armed with the facts, the people of America have always had the intelligence and the courage to do what is necessary and right.

We call upon the President to place the facts before the people, take us into his confidence, clarify the threat, present an affirmative plan of action to regain initiative for the Free World.—END

Sovfoto

Communist conviviality. Enjoying themselves at a VIP gathering are, left to right, Mao Tse-tung, Red China boss; an interpreter; and designer Andrei Tupolev.

ANDREI TUPOLEV, Soviet airpower's

A profile of the Russian who stood up to Stalin . . . and got a formal apology from the late tyrant

By Michael Gladych

ONE winter day in 1937, Andrei Nicolaevich Tupolev, a portly and graying Soviet aircraft design wizard, faced a Moscow "purge" court on trumped-up charges of high treason. The sentence, approved by Stalin, was death.

Yet, twenty years later, on September 4, 1957, the same Andrei Tupolev stood in the Kremlin's inner sanctum. His shoulders stooping with age, his white, bushy eyebrows raised over horn-rimmed glasses, the sixty-nine-year-old master builder of Soviet aviation was basking in praise from a beaming Nikita Khrushchev. It was the day Tupolev's famous brainchild—the TU-104 Soviet jetliner—had scored a significant coup in the cold war by landing at McGuire AFB, N. J.

To the Soviet people Andrei Tupolev is now a living legend. From his drawing board have come scores of the world's "first" aircraft, which set or broke records and carried the Red Star to the North Pole, Tokyo, and New York. Moreover, Tupolev is one of the very few Russians who publicly defied Stalin and lived to receive an apology.

But to the Free World, Tupolev's name is synonymous with the threat of Soviet airpower. Two of the Red global jet bombers now in service bear Tupolev's signature—"TU." And his civilian progeny, the TU-104 passenger jet and the giant TU-114 transoceanic turboprop airliner, are helping to wage the propaganda war against the West. Almost all of the modern Soviet aircraft show the unmistakable touch of Tupolev. And in Soviet missilry, Tupolev's "mass development" helped greatly in the Sputnik breakthrough.

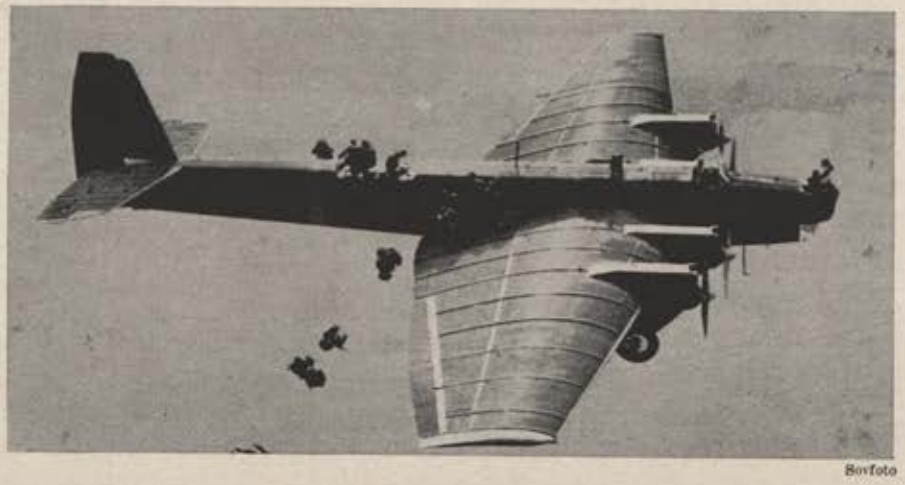
The career of Tupolev is amazing by any standards. A member of the despised intelligentsia, a man whose only revolutionary struggle was a drawing-board rebellion against the orthodox, Tupolev became the "czar" of the Soviet aircraft industry, a rugged individualist in proletarian Russia enjoying such "capitalist" privileges as unrestricted travel abroad and unlimited personal credit at the Bank of the Soviet Union.

The singularly dramatic facet of Tupolev's story is his forcing of the Kremlin to recognize him as an individual, thus proving, at least partially, the failure of Communist regimentation techniques.

In 1918, when pioneering aircraft were built by guess and trial and error, Tupolev, then thirty, a graduate of the Moscow Technical Institute, conceived an ambitious plan for a national aviation research establishment. Tupolev resolutely marched into the Kremlin and demanded to see the Red dictator. He argued for his plan with such conviction that Lenin forgave the young man's temerity and gave his blessing to Tupolev's idea. The Central Institute of Aero-Hydrodynamics (ZAGI) was founded to become the heart of Soviet airpower. It is roughly analogous to our NACA.

Research was one thing and building aircraft another in revolution-devasted Russia. While Tupolev badgered the Kremlin to import machine tools, he surprised his learned colleagues with his ingenuity. "We can't wait for tools," he said. "A good engineer should know how to use his hands—and his head." Tupolev proved his theory in practice. His first-born, a small sports plane, was built entirely by hand. And it was designed to fly amazingly well on a puny two-cylinder engine—the only one available.

In those early days, an aircraft designer was helpless without piano wire to hold the wings in place and without fabric for the plane's skin. But not Tupolev. "Damn the wire and fabric," he said, pounding his draw-



Sovfoto

The ANT-6, Tupolev-designed four-engined bomber. Photo shows craft in action, with group of Russian paratroopers en route downward for mass drop. Note thickness of bomber wings.

rugged individualist

Sovfoto

The enormous four-engined turboprop transport, TU-114, was built for Aeroflot, the Red airline, under supervision of Tupolev. Reds say it will soon be in service.

ing board. He designed his aircraft with built-in stiffness and covered them with aluminum, pioneering in construction methods for modern all-metal planes.

Tupolev's imagination and unorthodox methods attracted many engineers whom he indoctrinated in his design philosophy. "Our aircraft must be simple to build, simple to maintain, and simple to fly," he told them. "We must design within the technological budget of the country." This triple-S simplicity became a credo of all Soviet designers. Much later it was directly responsible for the surprising strides Soviet aviation made in jet aircraft.

To an American mechanic or pilot weaned on hot rods and do-it-yourself electronic gadgets, Tupolev's doctrine of total simplicity would be just short of an insult. But to the Russians, it has been a godsend. In spite of their Sputniks and Muttniks, the Russians still suffer from machine phobia. A Red mechanic gladly drops a riveting machine if he can pound the rivets with a hammer. And he tosses the hammer aside if he can do the job with his bare hands. Had it not been for Tupolev's understanding of that horse-and-buggy hangover, the Red

(Continued on following page)

Part of the growing Communist airpower arsenal, the Badger TU-16 bomber, first unveiled in May Day flyover four years ago. Craft's design is Tupolev inspired.

Air Force might still be trying to sling H-bombs under piano-wire biplanes.

Soon Tupolev gained fame as a designer of aviation's pace-setters. In the twenties he built a plane that made a record hop from Moscow to Tokyo. Another of his aircraft traversed Siberia, the Pacific, and the United States to land in New York City. Ten years later, Tupolev's "Maxim Gorki" became the world's biggest passenger plane, while another of his numerous creations was among the first to fly over the North Pole.

But perhaps the greatest contribution Tupolev made to Soviet aviation was his unique "mass development" scheme. Incredibly prolific, Tupolev found that even working a twenty-hour day he could not follow through on all the concepts that crowded his mind. Frustrated, he hit upon a solution. He organized "design brigades" which developed several of his ideas simultaneously. While his brightest "disciples" headed the design brigades, Tupolev supervised them all and still had time for fresh ideas.

This mass exploitation of his brainpower explains how Tupolev, during his nearly forty years of designing, has been able to do what probably no other designer in the world has done—produce more than 100 original aircraft and influence almost all other Soviet plane builders. For example, Gurevich, a codesigner of the famous MIG jets, once worked under Tupolev. And Pavel Sukhoi—the supersonic delta wing specialist—once headed one of Tupolev's brigades.

Cheerful and endowed with a good sense of humor, Tupolev often cracked jokes with his draftsmen or rolled up his sleeves to work alongside his mechanics. But if anyone disputed his orders, the good-natured "Papa" Tupolev suddenly became a tough, unyielding despot.

Tupolev legend has it that when a foreman questioned the strength of a fitting, Tupolev had him pound the part with a sledge hammer for two days. The fitting didn't break although the foreman's back almost did. And the test taught everybody not to doubt Tupolev's designs.

By 1936 Tupolev had reached the top. His design brigade system was adopted by the Soviet industry. He received the highest Soviet awards and became the vice director of the powerful Aviation Industry Board. He lived in a luxurious Moscow apartment and had a palatial summer home in the country. He was one of the most admired and respected heroes of Soviet aviation—"the man who gave the Soviet Union wings."

Tupolev enjoyed all this, though sparingly. He used his unrestricted passport only to visit the aircraft industries of Western Europe. He drew only what he absolutely needed from his unlimited bank account authorized by Stalin. And typically, instead of riding in one of the three limousines at his disposal, he often walked to work, "for health," as he said.

Nor did these privileges change Tupolev in any way. He still joked with his mechanics and never forgot his friends. In fact, it was his loyalty to his friends that almost cost Tupolev his life.

During the infamous "purge" of 1936, some of Tupolev's engineers were brought to trial on trumped-up charges. The irate Tupolev went to the Kremlin where, ignoring Stalin's attempt at bribery, he demanded that his friends be freed and vindicated.

Realizing that Tupolev could make a lot of trouble for the regime, Stalin had him arrested on charges of high treason. As evidence, the court accepted fake blueprints of a fighter plane Tupolev allegedly was trying to sell to the Germans. Tupolev laughed in the prosecutor's face. But the "evidence" was found overwhelming and Tupolev was sentenced to die.

However, Stalin evidently thought twice before giving the nod for the execution. Without Tupolev's inspiring leadership, the design brigades had already slowed down. Besides, Tupolev's prolific genius was a trump card in the armament race with Nazi Germany. Covertly, Tupolev's sentence was commuted to life imprisonment. Tupolev the individual scored a victory over the totalitarian system.

He was shorn of his decorations and privileges. His famous initials "TU" were removed from all his planes. He was escorted daily from prison to his office where he worked at his drawing board and directed his design brigades.

It was during that time that he designed the TU-2, the attack plane that was to help defeat the Germans in World War II. So formidable was that aircraft that just before the German attack in 1941, Stalin summoned Tupolev to the Kremlin. Bitter but unbowed, Tupolev received a full pardon and the apologies of the Red dictator.

Tupolev again assumed his place in the Soviet aircraft industry. His decorations were restored and so was the "TU" signature on all his planes. He was promoted to lieutenant general of the Red Air Force Technical Services and received a $25,000 cash prize for his versatile TU-2. A formidable accomplishment in a totalitarian society.

In 1945 he plunged into the jet era with the enthusiasm of a youngster fresh out of college. He limbered up by designing several smaller jets. Then from his drawing board came an intercontinental bomber code-named Bear. Later came the Badger—a medium-range jet bomber—and two passenger jets.

Although Tupolev remained a classical aircraft designer, his design brigade system, proved most successful in aircraft, was adopted to cut down the development time of Russian missiles. Thus, immediately after the war, several brigades started work simultaneously on the captured German rocket projects.

Coordinated by Chief Marshal of Artillery Voronov (later aided by Marshal of Artillery Yakovlev) Tupolev's brigade system saved time, especially in working on the long-range rockets. For example, while one brigade groomed the German V-2 into the Soviet M-101 (T-1), other brigades developed such projects as the M-102 (T-4)—a winged version of the old V-2; the Red ICBM—the M-104 which was probably used for launching the Sputniks; and the M-102A—the 10,000-mile rocket skip-glide bomber. Tupolev's only direct work in the missile field is his rumored supervision of the airframe design of the M-102A. Indirectly, however, he has helped the mass buildup of the Red missile arsenal.

Today, in his seventieth year, Tupolev still puts in a full day working at his drawing board and teaching a new generation of Soviet aircraft engineers. But his amazing career indicates the paradox that may one day destroy the lethal power he helped to build. For while Tupolev, the designer, gave the Kremlin its air might, Tupolev, the individual, is another proof of the fallacy of totalitarianism.—END

ABOUT THE AUTHOR

Michael Gladych, who contributed last month's article, "The Bolt Catchers," is one of AIR FORCE'S *busiest authors, a writer who has made a full-time job of chronicling the unsung heroes of today's very complex USAF air-defense operation. A veteran airman, he has flown in air forces of four different countries.*

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PETER J. SCHENK

JAMES M. TRAIL

1959 AFA Nominees

PETER J. Schenk of Washington, D. C., has been selected by AFA's Nominating Committee to serve a second term as Association President. The unanimous nomination, made at Dallas, Tex., May 23, will be presented with other names on the slate at the National Convention in Dallas.

The team nominated by the committee included James M. Trail, Boise, Idaho, for Chairman of the Board; Julian H. Rosenthal, New York City, for Secretary; and Jack B. Gross, Harrisburg, Pa., for Treasurer. Names of nominees for vice president and directorships are listed below.

Schenk, who recently joined Raytheon Manufacturing Co., with offices in Washington, D. C., in the field of government planning and marketing, is a lieutenant colonel in the Air Force Reserve. A graduate of Lafayette College, he has served on several AFA committees and on the Board of Directors. Father of three sons, he lives in McLean, Va.

Trail, currently Northwest Regional Vice President of AFA, has served as Air Force representative on the Department of Defense Reserve Forces Policy Board. An Air Force veteran, he is a graduate of the University of Idaho, and is a colonel in the Idaho Air National Guard, in which he serves as Chief of Staff for Air.

A member of AFA for eleven years, he is a former Squadron and Wing Commander. Father of three sons, he makes his home in Boise, Idaho.

PRESIDENT

PETER J. SCHENK

Washington, D. C.

Electronics management executive; age 37; married. AFA record: Squadron Officer, National Director, President. Member 7 years.

SECRETARY

JULIAN B. ROSENTHAL

New York, N. Y.

Attorney; age 49; married. AFA record: Assistant Secretary, National Secretary, Constitution Committee Chairman. Life Member, AFA Man of the Year 1953. Charter Member.

CHAIRMAN OF THE BOARD

JAMES M. TRAIL

Boise, Idaho

State aviation official; age 40; married. AFA record: Squadron Commander, Wing Commander, Regional Vice President, Vice Chairman Executive Committee. Member 11 years.

TREASURER

JACK B. GROSS

Harrisburg, Pa.

Automobile dealer; age 47; unmarried. AFA record: Squadron Commander, Wing Commander, Assistant Treasurer, Treasurer, National Director, Finance Committee Chairman. Charter Life Member.

AFA NOMINATING COMMITTEE'S SLATE FOR 1959

REGIONAL VICE PRESIDENTS

NEW ENGLAND REGION

(Me., N. H., Vt., Mass., Conn., R. I.)

PHILIPE F. COURY

Mattapan, Mass.

Investment counselor; age 41; married. AFA record: Squadron Commander, Wing Commander, Vice President. Member 4 years.

NORTHEAST REGION

(N. Y., N. J., Pa.)

LEONARD A. WORK

State College, Pa.

Postal supervisor; age 43; married. AFA record: Squadron Commander, Wing Commander, Vice President, National Committeeman. Charter Member.

CENTRAL EAST REGION

(Md., D. C., W. Va., Ky., Del.)

GEORGE D. HARDY

Hyattsville, Md.

Sales director; age 34; married. AFA record: Squadron Commander, Wing Commander, Vice President, National Director, National Committeeman, AFA Man of the Year 1957. Member 11 years.

REGIONAL VICE PRESIDENTS

SOUTHEAST REGION
(Fla., Ga., N. C., S. C.)
ALEX G. MORPHONIOS
Miami, Fla.

Sales engineer; age 37; married. AFA record: Squadron Commander, Wing Commander, Vice President. Member 8 years.

GREAT LAKES REGION
(Ohio, Ill., Wis., Ind., Mich.)
HOWARD T. MARKEY
Chicago, Ill.

Attorney; age 37; married. AFA record: National Committeeman, Vice President. Charter Member.

NORTH CENTRAL REGION
(Minn., S. D., N. D.)
MERLE S. ELSE
Minneapolis, Minn.

Sales director; age 40; married. AFA record: Squadron Commander, Wing Commander, Vice President, National Director. Charter Member.

SOUTH CENTRAL REGION
(Tenn., Ark., Ala., La., Miss.)
FRED O. RUDESILL
Metairie, La.

Salesman; age 51; unmarried. AFA record: Squadron Commander, Wing Commander, Vice President, National Committeeman. Member 6 years.

SOUTHWEST REGION
(Tex., N. M., Okla.)
HARDIN W. MASTERS
Oklahoma City, Okla.

Investment specialist; age 59; married. AFA record: Squadron Commander, Wing Commander, National Director, Vice President. Member 5 years.

ROCKY MOUNTAIN REGION
(Colo., Wyo., Utah)
DALE R. ERICKSON
Ogden, Utah

Aviation executive; age 34; married. AFA record: Wing Commander. Member 2 years.

FAR WEST REGION
(Calif., Nev., Ariz.)
CURTIS E. CHRISTENSEN
Encino, Calif.

Insurance counselor; age 41; married. AFA record: Squadron Commander, Wing Commander, National Committeeman. Member 9 years.

NOTE: The Nominating Committee made no nomination for the office of Vice President in these Regions: Northwest, Midwest, and Pacific Ocean.

NATIONAL DIRECTORS

GEORGE A. ANDERL Oak Park, Ill. Sales director; age 40; unmarried. AFA record: Squadron Commander, Wing Commander, Vice President, National Director, National Committeeman, AFA Man of the Year 1954. Member 11 years.

WALTER T. BONNEY Silver Spring, Md. Government aviation executive; age 49; married. AFA record: National Director, National Committeeman. Member 8 years.

J. ALAN CROSS Miami, Fla. Insurance counselor; age 51; married. AFA record: Squadron Commander, Wing Commander, National Director, National Committeeman. Member 10 years.

JAMES R. DEMPSEY La Jolla, Calif. Aviation executive; age 36; married. AFA record: National Committeeman. Member 8 years.

A. PAUL FONDA Hagerstown, Md. Aviation executive; age 49; married. AFA record: Wing Commander, National Director, National Committeeman. Member 8 years.

J. WAYNE FREDERICKS Bronxville, N. Y. Foundation executive; age 41; married. AFA record: Squadron Commander, Wing Commander, National Committeeman. Charter Member.

SAMUEL M. HECHT Baltimore, Md. Department store executive; age 50; married. AFA record: Squadron Treasurer, National Treasurer, National Director, National Committeeman, National Convention Chairman. Charter Member.

W. BARTON LEACH Cambridge, Mass. Professor; age 58; married. AFA record: National Director, National Committeeman. Charter Member.

STEPHEN F. LEO Alexandria, Va. Engineering company executive; age 48; married. AFA record: Squadron Commander, National Director, National Committeeman. Charter Member.

CARL J. LONG Pittsburgh, Pa. Consulting electrical engineer; age 49; married. AFA record: Squadron Commander, Wing Commander, National Director. Charter Member.

JOHN B. MONTGOMERY Cincinnati, Ohio. Aviation executive; age 46; married. AFA record: National Committeeman. Charter Member.

CHARLES O. MORGAN, JR. San Francisco, Calif. Attorney; age 36; unmarried. AFA record: Squadron Commander, Wing Commander, Vice President, National Director, National Committeeman. Charter Member.

MSGR. WILLIAM F. MULLALLY St. Louis, Mo. Pastor; age 67. AFA record: Squadron Officer, National Director, National Division Commander, National Chaplain. Member 9 years.

WILLIAM W. SPRUANCE Wilmington, Del. Age 41; married. AFA record: Vice President, National Committeeman. Charter Member.

ARTHUR C. STORZ Omaha, Neb. Brewery executive; age 68; married. AFA record: Squadron Commander, National Director, National Committeeman, AFA Man of the Year 1955, National Convention Chairman. Member 5 years.

W. THAYER TUTT Colorado Springs, Colo. Hotel executive; age 46; married. AFA record: Vice President, National Director, National Committeeman. Charter Member.

ALDEN A. WEST DeWitt, N. Y. Electronics company executive; age 36; married. AFA record: Squadron Commander, Wing Commander. Member 8 years.

PAUL S. ZUCKERMAN New York, N. Y. Investment counselor; married. AFA record: National Director, National Committeeman. Member 8 years.

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AROUND THE WORLD WITH SIKORSKY HELICOPTERS

TURBINE-POWERED SIKORSKY S-62—With an empty weight 700 pounds less than an S-55's and a turbine engine producing 200 more horsepower, the S-62 outperforms the earlier aircraft while offering the extra benefits of using proven S-55 components. A completely watertight boat hull provides takeoff and landing capability on water, land, and snow. The power plant is a G.E. T-58 gas turbine. The S-62, which will carry 12 passengers, has many advantages for both commercial and military operators.

ASSAULT AIRLIFT FOR 6000 MEN—Sikorsky helicopters flew 2000 sorties in a recent amphibious exercise on the Atlantic Coast. Flying from naval vessels, they carried ashore a Marine Corps regiment, 100 vehicles, and hundreds of tons of cargo. Hardest workers were HUS (S-58) and twin-engined HR2S (S-56) helicopters, above.

HELICOPTER "SKYHOOK"—The Army has found that disabled light aircraft can be successfully brought back to their home bases by helicopter. Above, an Army H-34 (Sikorsky S-58) from Fort Huachuca, Arizona, brings home an L-19 damaged in a landing accident at Tucson Municipal Airport, about 100 miles away.

SIKORSKY AIRCRAFT
STRATFORD, CONNECTICUT
One of the Divisions of United Aircraft Corporation

Probing the NORTHERN RADAR SHIELD

The only way "upstairs" to the radome on bleak St. Lawrence Island is this 3,600-foot-long cable car ride. Technicians take the ride as part of routine.

Author Jim Doherty examines weir looking high-frequency radio antenn

By T/Sgt. James R. Doherty

INSIDE the windowless room you could almost hear the stillness. It was oppressive, as was the too-warm darkness, and Air Force Capt. Leon B. Stephens was beginning to feel the strain.

For the past six hours, he had been chairbound in the artificial twilight—the central figure in a dress rehearsal for disaster, on an island very near the Soviet's Siberian mainland. And somewhere in between, a giant four-engined bomber was thundering toward the room in which Captain Stephens was sitting.

Stephens blinked, then redirected his gaze at the pizza-sized radar scope in front of him. The object of his attention: A tiny blip of green light moving slowly across the glass. Behind Stephens another man leaned forward expectantly.

"That's about where he should be, all right. What do you make of it?" The speaker was Lt. Col. Dale Bocock, head of Alaskan Air Command's 5040th Radar Evaluation Squadron.

"One way to find out," Stephens replied. He picked up a microphone at his elbow. "Air Force 845, this is Lambert Control. We have you at angels twenty. Request you authenticate able whisky."

The response was quick, positive. "Lambert Control, 845. Roger angels twenty; authenticate baker mike. How do you read me?"

Captain Stephens leaned back in his chair and glanced at the huge Plexiglas board that dominated one wall of the room. Featuring an outline map of Alaska and the Siberian coast, it glowed softly in the darkness. Between the two land masses, well to the east of the International Dateline, a thin, luminous line indicated an aircraft "track."

The officer watched as a technician, writing backward from his position behind the Plexiglas board, confirmed the line as "845"—a TB-29 belonging to Colonel Bocock's command. "Angels twenty" was translated to "altitude 20,000 feet." Finally, the aircraft's speed and course were carefully noted at the head of the track.

Captain Stephens pressed his mike switch again. "Eight-four-five, this is Lambert Control. Authentication affirmative, reading you five by five. Request you begin procedure turn and head outbound from station. Test complete."

Stephens returned the microphone to its hook, continued staring at the light-speckled scope.

Half an hour later, the captain and his commanding officer stepped out into the glare of an arctic moon at St. Lawrence Island. At their backs, sixty minutes' flying time to the east, lay Alaska. Toward the west, past the buildings housing the radar sites' personnel, lay the ice-choked Bering Sea.

Stephens cast a weather eye skyward. "Hope this good stuff holds," he muttered. "For a change we might get home on schedule." He jerked a thumb toward the Alaskan mainland. Home—Elmendorf AFB—lay a half-day's travel by air to the southeast.

En route, Captain Stephens, Colonel Bocock, and the remainder of the 5040th Radar Evaluation team began compiling their report. In a matter of days the document would find its way to the desk of Brig. Gen. Kenneth H. Gibson, Commander of the Alaskan Air Command (*see* "Top Cover for America," *January '58* AIR FORCE). Its contents: A minute analysis of the state of radar defenses on St. Lawrence Island, one of our nearest points of contact to Soviet soil.

And before the ink on the report had a chance to dry, the 5040th's team of electronic experts would be on the road again—its aging B-29s once more airborne, probing for weak spots in the multi-million-dollar high-frequency wall that guards the approaches to North America.

This is the mission of the 5040th Radar Evaluation Squadron, Alaskan Air Command's grease-smeared band of aerial troubleshooters. Their planes, converted World War II B-29s, ushered in the atomic age more than a decade ago. But they're still flying, keeping America's guard up along the northern frontier. As durable as the

Covered passageway leads from summit tram terminal to the bubble itself.

CO Lt. Col. Dale Bocock checks lights that keep radome wall ice free.

Superforts are the men who fly them.

Most of the outfit's work is done in the shadow of the Siberian mainland, along the air corridors that an aggressor bent on attacking the continental United States would be forced to travel.

For any chance of success, a hostile air armada—or a single nuclear bomber—must first penetrate our far northern radar screen. It's the job of the 5040th to see that the screen remains holeproof.

It's a mouthful of mission—for a handful of troops. Currently the outfit's strength is seventeen officers and thirty airmen, an indication of the austere manpower situation within the Alaskan theater. It is unlikely that any other forty-seven technicians in uniform have a more important assignment.

The mission of the 5040th is a significant phase of the job of the Alaskan Air Command, its parent organization. The latter, with headquarters at Elmendorf AFB, near Anchorage, prides itself on flying "top cover for America," and is a part of the joint Alaskan Command made up of Army, Navy, and Air Force components, alert against enemy air invasion and committed to defend Alaska's population centers and likely target areas from hostile air attack.

While it's a tossup as to which facet of the mission is most important, it is obvious that if hostile forces can avoid detection, the problem of defense becomes tremendously involved and retaliation is delayed. That's where the 5040th RES comes in.

Principally, the 5040th concerns itself with AAC's network of aircraft control and warning stations, as opposed to our Distant Early Warning Line. The latter, strung along the rim of the arctic slope, gets a continual workout from the Strategic Air Command's far-ranging jet bombers. SAC, flying its incessant polar training missions, keeps DEW Line operators on their toes, with but an occasional assist from the 5040th.

AAC's aircraft control and warning network is webbed about Alaska's interior and the length of the shoreline facing Siberia. Equipped with long-range search radars, AC&W stations backstop the DEW Line, but also are able to direct vocally intercepting aircraft.

In the event of attack, fighter control would be passed from station to station as the air battle progressed. DEW Line's automatic alarm system, on the other hand, indicates only that our airspace has been violated.

Complicating the task of the 5040th in evaluating AC&W performance is Alaska's geography. This piece of real estate, nearly one-quarter the size of the continental US, is studded with the highest mountains in North America, and sprinkled with lowlands vaster than the midwestern prairies. It is iced with glaciers larger than the state of Rhode Island, mantled with forests and tundra, laced with freezing streams, and surrounded on three sides with the world's most varied coastline. All this territory is populated with fewer than 250,000 people, living in a much-diversified climate.

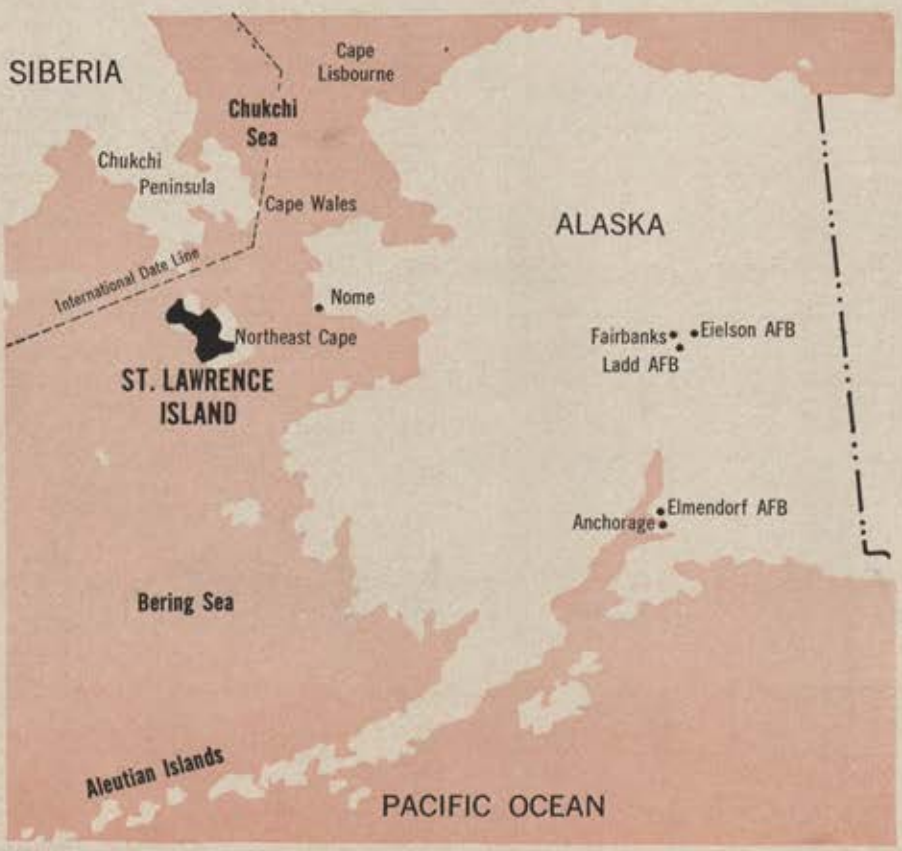
To make things even more difficult, a number of AC&W stations are spotted offshore. The one on strategically located St. Lawrence Island is a case in point. Treeless and perpetually frosty, the island lies roughly east and west in the Bering Sea between Russia and Alaska. It is approximately 95 miles long.

At the island's westernmost extremity, the Eskimo village of Gambell is within fifty miles of the Siberian mainland. AAC's radar installation is situated at the island's opposite end. Sheathed in midwinter snow, the site perches on the edge of an icy sea and resembles nothing so much as a tract on the moon.

Recently, a 5040th inspection team gave personnel at the Cape their semi-annual shakedown. The operation, a typical evaluation test, was a two-way affair.

Captain Stephens, Colonel Bocock, and S/Sgt. Donald S. Burke composed the team's ground echelon;

(Continued on following page)



Map shows proximity of St. Lawrence Island to what it must watch—the USSR.

During the three-day evaluation tests, Captain Stephens spent much of his time watching this pizza-sized radarscope.

When unknown "tracks" show themselves on the Plexiglas board in the control room, it's AAC's job to check them fast.

later, to climax the tests, a TB-29, commanded by Capt. Elmer E. Kirchner, was slated to make a series of airborne penetration thrusts.

As usual, however, reams of preparatory work preceded the junket afield. Back at the squadron's Elmendorf headquarters, days were consumed poring over performance records, calculating desired radar coverage, predetermining antenna tilt and azimuth.

Charts were drawn relating expected coverage to terrain in an effort to establish limits of operation. The complete mission was "profiled" in advance. To pass muster, the site's personnel, equipment, and methods of operation must match the profile exactly.

It was late when the team touched down on St. Lawrence; the island was bathed in shadow and a numbing, sub-zero wind whipped across the frozen water. Stephens, intent on a figure racing toward them over the ice, scarcely noticed the blast. The runner was an Eskimo homeward bound with his dog team after a day's hunting. His destination was the village of Savoonga, half the length of the island away.

Newcomers to Northeast Cape are invariably impressed by the excellence of living accommodations offered site personnel during their one-year remote-duty tours. Living quarters are attractive and comfortable. At some of the newer AC&W installations, they border on the "plush." AAC, it would seem, has spared no expense to bring main-base facilities to the Alaskan "bush."

Brooding over Northeast Cape like an angry topkick is a 2,000-foot-high ridge. Atop it, connected by a tramway to the living quarters below, sits the all-seeing radome, hallmark of AAC's wilderness outposts.

This huge "bubble," only three-sixteenths of an inch thick, is the rubber envelope that protects the site's rotating antenna from the savage onslaughts of polar storms. It is the tilt of this revolving monster that largely determines the extent of radar coverage. A "tilt check," therefore, was the first item on the evaluation team's agenda.

They began it on a cold midnight, when the flickering green of the northern lights was making an Irish picnic grounds of the snowfields. Halfway up the 3,600-foot-long tramway, Captain Stephens rose from his seat in the car to stare out at the landscape. As far as he could see, each snowswept outcropping on the ridge above wore its brilliant emerald topper.

Winds in excess of 100 knots buffeted the car as it lurched to a stop twenty-five yards below the dome's

(Continued on page 53)

Dominant landmarks on St. Lawrence Island are "White Alice" system antennae resembling huge outdoor movie screens, located, if possible, near AC&W sites.

AEROJET-GENERAL CORP.

THE GENERAL TIRE

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Still earning their keep, and in a climate that's tough enough on new aircraft, are TB-29s like this one being prepared for a midwinter mission by personnel of the 5040th. Temperature was 39 degrees below zero when shot was made.

cave-like entrance. Clinging to a manila lifeline, Stephens and his crew hauled themselves to the summit. A long covered passageway led from the entrance to the bubble door.

Aceess to the dome itself was gained through an airlock, for it is pressure alone that keeps the mammoth balloon from being deflated by outside forces. Only a little thicker than the skin of an orange, the dome resists wind gusts up to 165 knots by virtue of only a half-pound-per-square-foot difference between inside and outside pressures. Stephens and his crew got right to work. First order of business was to level the giant antenna "sail."

A "feed horn" sprays electronic signals against the screen; the signals then are reflected into the atmosphere. Any dense object in space causes part of the signal to be reflected back to the antenna. This "return" is depicted on the radar scope as a blip.

Occasionally, antenna modifications knock the huge mechanism out of alignment. As sensitive as the movement of a Swiss watch, its dimensions are extremely critical. With tape measure in hand, Captain Stephens and Sergeant Burke determined that tolerances had not been exceeded. It was three a.m. when the party made its way back down the mountain.

The following night, the trio conducted an involved series of electrical measurement tests on various pieces of radome equipment. By now their evaluation report was an inch thick. It included azimuth and contour checks, power measurements, video presentation checks, a chapter on blip/scan ratio, and "minimum discernible signal." And there were numerous notes on the individual efficiency of assigned technicians.

Several of the latter are civilian specialists, under contract to the Air Force. Site Engineer Carl Roberts, employed by the Philco Corporation, is typical of the dozen assigned to Northeast Cape. A native of Georgia, Roberts has been stationed at a number of AAC radar installations. He recalls vividly a recent winter he spent at Cape Wales, Alaska. Two-hundred-knot winds collapsed the Wales radome, swept rubber envelope, antenna, and all into the Bering Sea. Fortunately, no one was injured but Roberts calls the experience "hairy."

Roberts and his companions spend twenty-four hours at a time on duty in the mountaintop bubble. Their chief concern during winter months are the cables connecting radome and control room far below. Accumulated layers of ice and snow have been known to snap two-inch cables like guitar strings. Repairing them in sub-zero gales is a difficult chore at best.

The control room is located at the mountain's base, connected by covered passageways to living quarters and mess hall. It was in the darkened "CR" that evaluation teams were climaxed on the third day.

Shortly before dawn that morning, Capt. Elmer E. Kirchner lifted his TB-29 from the runway at Elmendorf AFB. Banking gently away from the mountains, he tilted the Superfort's nose upward and began a steady climb northward.

At the other end of the field, T/Sgt. John L. Hanlon watched morosely as 845 became airborne. Crew Chief Hanlon, whose angular face and horn-rimmed glasses give him a look of sadness, had been up all night grooming his big four-engined bird for the day's mission.

A B-29 technician since World War

(Continued on following page)

Like the back of his hand, T/Sgt. John L. Hanlon knows the TB-29. Here he is shown doing some last-minute checking before a mission in Superfort by 5040th.

THE SAFETY RECORD OF THE 5040TH

Despite the advanced age of its equipment, the 5040th has copped a number of flying safety awards in recent years. Only one fatal accident—a heartbreaking crash that took the lives of six of the unit's most experienced aircrew personnel—mars its otherwise perfect operating record under the most difficult conditions.

The men of the 5040th will always remember that gray day last November when a squadron TB-29 slammed into an Alaskan mountainside during a blinding snowstorm. And the four who survived will never forget it either—or the heroism of Assistant Crew Chief Calvin K. Campbell, to whom they owe their lives.

Staff Sergeant Campbell, a thirty-four-year-old Negro airman from San Antonio, Tex., was only slightly injured in the jarring crackup. He hauled himself free of the wreckage, and began rounding up his fellow crewmembers, administering first aid to the two survivors he found, and erecting shelter against the storm.

Suddenly he heard a cry from far up the mountainside. Floundering through waist-deep snow, Campbell located the B-29's sheared-off nose section. Inside he discovered the bodies of Aircraft Commander Maj. Robert A. Butler and three others. But his good friend, T/Sgt. Manuel Garza, a panel engineer, was still alive.

Campbell pulled Garza from the shattered cockpit, somehow managed to drag him to the lee of the shattered fuselage a quarter-mile away. Sixteen hours later rescue helicopters lifted the quartet to safety. All have since returned to duty. For his actions, Campbell was nominated for the Soldier's Medal.

In May of 1956, the outfit's aging airplanes became front-page copy when Alaska's mighty Yukon River went on its annual spring rampage. The Yukon and its sister river, the Kuskokwim, had leaped their respective banks, flooding dozens of Eskimo villages and endangering hundreds of trapped sourdoughs and Indians.

Cause of the trouble was a number of huge ice dams that had formed upstream. One, an immense jumble of arrested floes, was seven miles long. Early in May, the 5040th was ordered to try to dislodge the jams with 500-pound high-explosive bombs.

Two aircraft were in commission, neither equipped with bomb-bay racks. Maintenance personnel rolled up their sleeves. Working around the clock, they scoured the base for equipment, improvised through a long, busy night. A bombardier was recruited from behind a desk in Alaskan Air Command headquarters.

Eighteen hours after orders were received, the 5040th's Dam Busters were in business. Initially, twenty 500-pounders were toggled on the ice above Aniak, Alaska; pressure was relieved and the results were called "excellent." Shortly after, a second B-29 became airborne. As luck would have it, an engine fire promptly put one aircraft out of commission. The other, however, flew six missions in the next forty-eight hours.

Later, Alaska's governor credited the outfit with saving hundreds of lives and preventing untold property damage. When the emergency ended, the two B-29s went back to more prosaic duties.

—Jim Doherty

II, Hanlon has his troubles with 845. Spare parts for the outmoded bomber are hard to come by—and the plane has been through the operational mill. At various periods in its thirteen-year lifetime, 845 has been a tow-target airplane, a Strategic Air Command refueler, and now a radar-evaluation aircraft.

Now, as his aircraft droned through an overcast sky, Capt. Elmer Kirchner was reflecting on the eleven-hour mission that lay ahead. In addition to Northeast Cape, he was scheduled to make penetration runs on another radar site at Cape Lisburne. Before landing, he and his crew would fly more than 3,000 miles above some of the world's most forbidding terrain.

Kirchner knew that, however routine, any mission flown against an AC&W site along Alaska's perimeter was a chancy operation. A mere handful of miles beyond St. Lawrence, for example, lay the International Dateline. Beyond it, Soviet MIGs controlled the skies. Navigation had to be precise, accurate.

But Kirchner, a thousand-hour veteran in B-29s, wasn't overly worried. Most of his runs on Northeast Cape would be made from the direction of the Alaskan mainland. And his navigator was an old hand in the territory.

Captain Stephens, seated in Northeast Cape's darkened control room, picked up Kirchner's zig-zagging plane where he'd anticipated—at maximum radar range. As always, however, his pleasure at a satisfactory test was tempered with something akin to dread. He'd been expecting this target; it was only too easy to envision others—and they'd look exactly the same—that might one day make their appearance on this same scope.

Stephens thought about the chain of events an invasion would touch off. At his elbow sat a red telephone. If attack came, a single "hot-line" call from this room would alert the entire air-defense system. In less than a minute the Cape radar controller could be talking to General Gibson, at Alaskan Air Command headquarters, or to Gen. Earle Partridge himself at North American Air Defense Command headquarters in Colorado Springs, Colo.

AAC's interceptors—fast F-102s and F-89Js—would be lancing into the air, followed by SAC's ever-ready fleet of jet bombers. The fat would be in the fire.

For a long moment Stephens stared at the scope. Methodically the electronic sweep made its rounds, like a clock that never ran down. Slowly the blip that was Captain Kirchner's plane inched across the glass. Soon it would come roaring across the island, thunder away in the direction of the Alaskan mainland, disappear harmlessly from the polished screen. A technician would erase its track from the plot board.

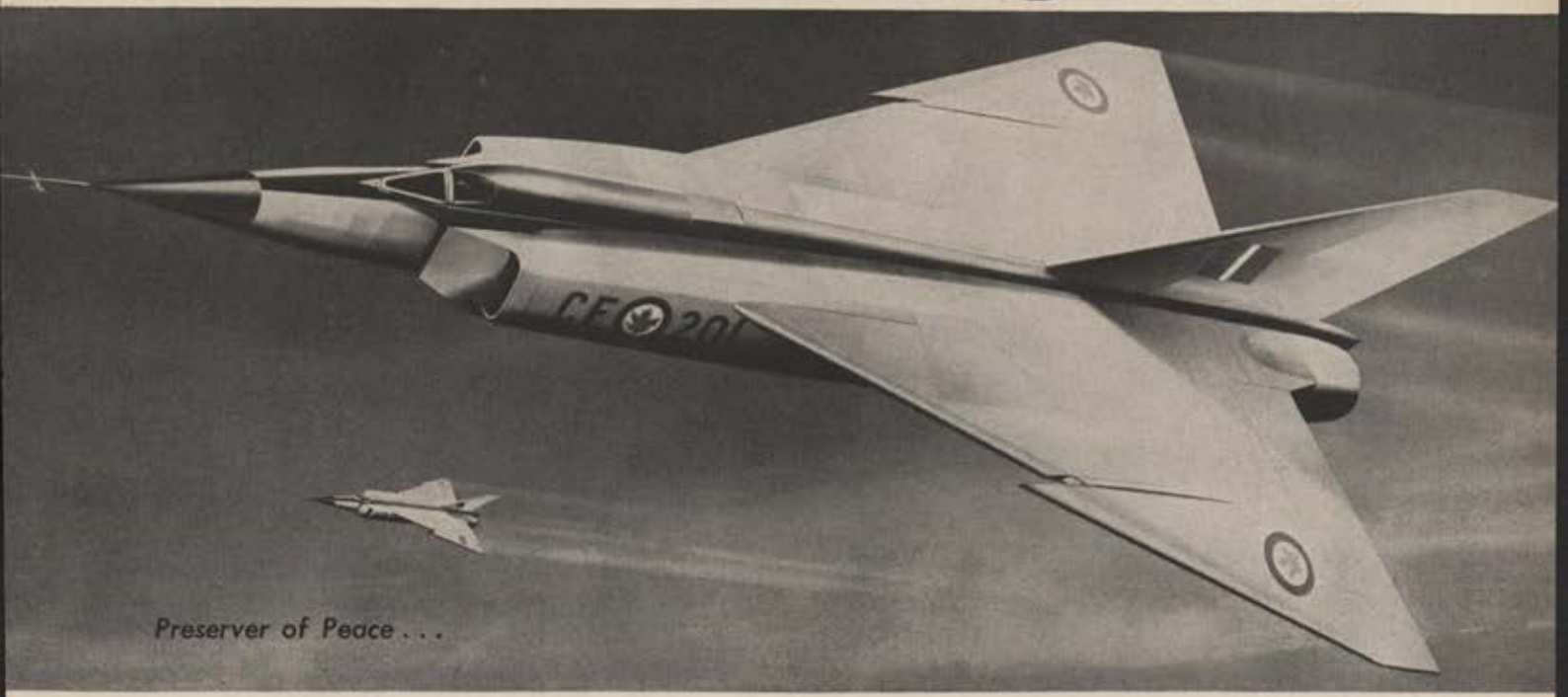
Someone would flip on the lights in the control room. Test complete. But Stephens wouldn't be listening to the congratulations, the good-natured gripes. He'd be thinking instead about the hot-line telephone on his desk and that conversation he hoped would never come with higher headquarters.

—End

ABOUT THE AUTHOR

Jim Doherty has served in the Coast Guard and in the old Army Air Corps. He joined the Air Force in 1954 and is presently serving in the Information Services Office of Alaskan Air Command. He has written for several California dailies and Parade, Flying, Ebony, *and* TV Guide. *He's a native of St. Louis, Mo.*

AVRO ARROW



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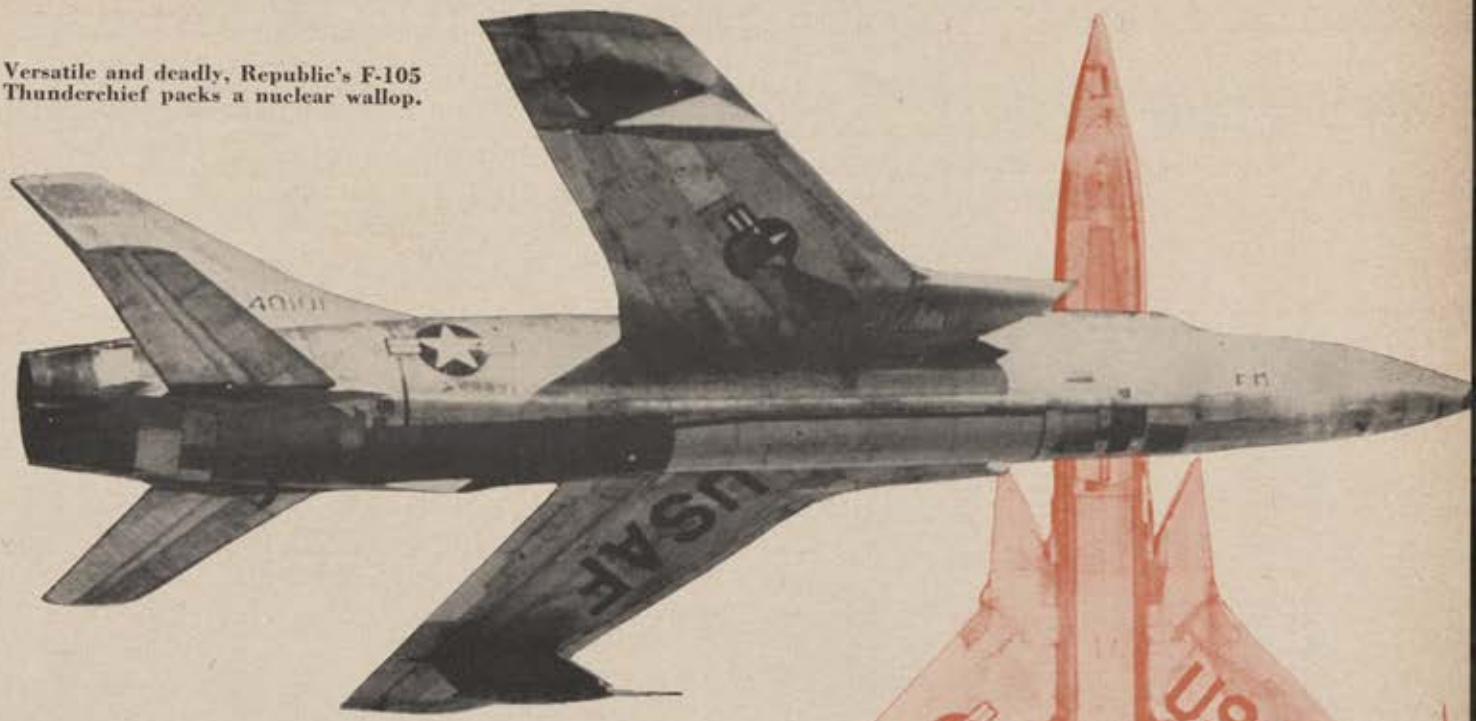


Versatile and deadly, Republic's F-105 Thunderchief packs a nuclear wallop.

F-105 *Thunderchief*

New Global Fighter-Bomber that will take on

'Any Target—Any Size—Anywhere'

Inflight refueling adds range and capability to the supersonic F-105.

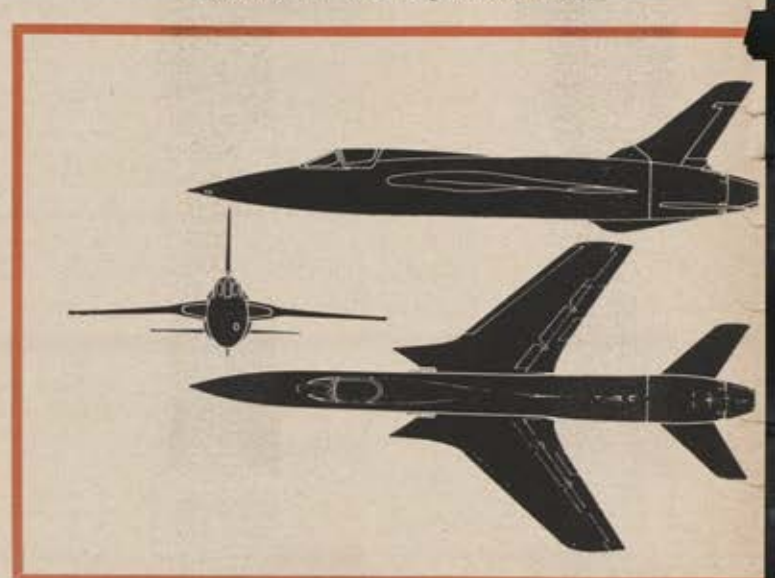
TACTICAL Air Command has taken delivery of the first Republic F-105 Thunderchief—new supersonic jet fighter-bomber that can deliver atomic weapons at speeds nearly twice that of sound.

First production model of the F-105 was accepted at Republic's Farmingdale, L. I., N. Y., plant by TAC Commander Gen. O. P. Weyland, who said TAC's first wing of F-105s would be put into service some time in 1959. Republic's President Mundy I. Peale represented the company at the ceremonies.

General Weyland said that to speed transition of the new jet from test to squadron use, operational testing at ARDC's Eglin AFB, Fla., proving center would be performed by the TAC personnel who will fly the new craft.

Powered by Pratt & Whitney J57 jet engines, the F-105 is equipped to carry rocket clusters, conventional bombs, guided and unguided missiles, and is armed with GE's Vulcan automatic cannon, capable of firing 6,000 rounds a minute. Inflight refueling ups its range.

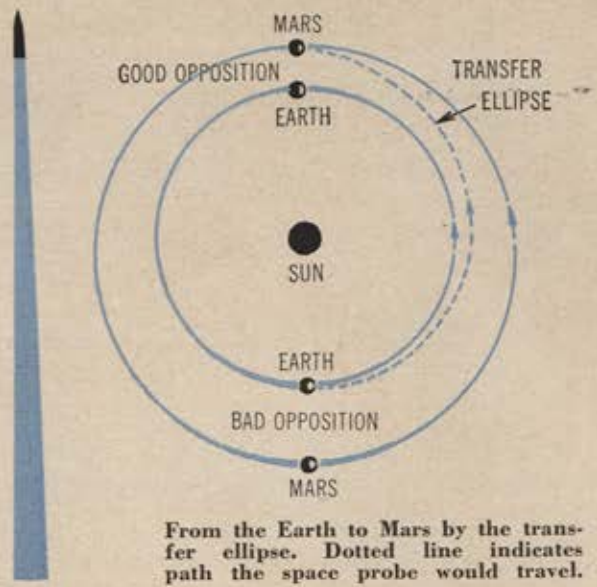
Volume production, Republic said, will begin by fall with schedules running through 1960, possibly into 1961.—END



Deep Space Probes

Paving the Way for Manned Spaceflight

By Eric Burgess



From the Earth to Mars by the transfer ellipse. Dotted line indicates path the space probe would travel.

NOW that Earth satellites are facts and lunar probe vehicles are in an advanced stage of planning, the question is: What is the next step in the development of astronautics? Air Force space medicine people are keeping fast pace with instrumentation engineers, and such projects as the North American X-15 will produce much valuable information for use in the establishment of manned temporary satellites—biosatellites—as a prelude to space stations. But manned *interplanetary* spaceflight is still not around the corner.

There are tremendous problems yet to be solved. Manned flight into space using chemical propellants to supply energy to rocket motors requires the use of suborbital refueling techniques. Although by this process the individual vehicles can be reasonable in size, the combined launching weight of the many freighter rockets is enormous, and the economic and logistic problems are of the first magnitude. Manned flight to and landings on other worlds will probably have to await development of new forms of propulsion.

Manned spaceflight needs solutions to three problems—safe return, high reliability, and a suitable packaged environment. Of these, the last is closest to the solution, which is mandatory for short orbital journeys in satellites containing animals or men. But the reliability factor is only attainable at present with *simple* missions. Add complexity and you increase unreliability. Safe return is eventually the most serious problem and indicates that true interplanetary flight will be extremely expensive in terms of today's fuels.

But even with the above limitations, there are several important and useful space missions which can be successfully accomplished in the coming decades.

These projects would consist of sending instrumented packages deep into interplanetary space to make close approaches to other worlds. Suitably designed experiments will add considerably to our knowledge of the solar system and give us the data we will need for manned trips.

Although we ourselves cannot go into deep space immediately, we can send our instruments to pave the way. This is a proven approach; already satellites are sending us information on near space, and on Earth we have used remotely controlled and instrumented devices to do our work for us in the "hot" areas of nuclear energy sources. And ballistic vehicles are adequate to carry instruments deep into interplanetary space.

How would we accomplish such programs? A planetary probe vehicle is one which ideally is transferred from the surface of the Earth to a satellite orbit around another planet. These are the five steps of the transfer process:

(1) Acceleration to a velocity so that the vehicle can escape from the Earth.

(2) Acceleration to a velocity to change from the Earth's orbit around the sun to a transfer orbit carrying the vehicle to the orbit of the planet of destination.

(3) Change from the plane of the Earth's orbit to the plane of the orbit of the target planet.

(4) At the orbit of the target planet match speed with that planet.

(5) Descend into an orbit around the target planet.

Fairly simple calculations show that great economies in propellant requirements can be obtained if stages one and two and stages four and five are condensed each into a single maneuver. Here is a simple analogy: Suppose we regard the escape from the Earth as being like climbing from a steep-sided gravitational pit by giving the vehicle an impulse at the bottom so that it can coast to the top. We can calculate what its speed must be for it to just reach the top of the pit and escape from the Earth. This is the well-known escape velocity which is about 36,000 feet per second. The gravitational pit can be regarded as being in a great flat plain which slopes gently—at the Earth's orbit—toward the sun. If the vehicle can emerge from the Earth's pit in the right direction and still possess a small velocity, it can travel across this gently rising plateau away from the sun. Because the slope is so gentle outside the pit, the vehicle does not need a very great velocity to travel enormous distances.

In effect, then, *slight increases* of velocity over escape velocity will give the vehicle capabilities of reaching great distances into interplanetary space. For example, sending the vehicle at 1,000 feet per second faster than escape velocity would enable it to reach out to the orbit of Mars.

The vehicle must be sent in the right direction across the gravitational plain. It must possess its velocity in a direction along the orbit of the Earth. The vehicle must change its path around the sun from an approximate circle due to its motion with the Earth to an ellipse which will carry it out to the orbit of Mars. The ellipse which just grazes the two orbits is the tangential ellipse of minimum energy requirements—known as a *Hohmann ellipse* (*see cut*). Actually the orbit of Mars departs from a circle even more than the orbit of the Earth so that at some oppositions Mars approaches the Earth much closer than at others.

(Continued on page 60)

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Although the cut shows the Hohmann ellipse going to Mars to rendezvous when Mars is closest to the sun, some slight reduction in energy requirements is obtained if the voyage is made to Mars when that planet is most distant from the sun.

To travel deep into interplanetary space does not require much greater burnout velocity than does a voyage to the moon. But the advantages in propulsion demand a penalty in control requirements. Guidance becomes a critical problem. While a circumlunar shot requires the burnout velocity be controlled within seventy-five feet per second at about 36,000 feet per second, a Martian probe needs accuracies of 0.1 feet per second in a burnout velocity of approximately 44,000 feet per second. This is even a greater accuracy than that needed to send a probe around the moon and have it return to land within the continental limits of the United States.

An idea of the margin for error is obtained when it is shown that an error of *one foot per second* at the departure from Earth could cause the Martian probe to miss Mars by nearly *25,000 miles.*

It is obvious that some kind of course correction will be needed during the voyage to Mars, especially when we take into account the fact that the distance of Mars is not known with great precision. Course correction could be made by using star-tracking devices to position the vehicle in space and control the application of thrust by vernier engines. Homing on Mars would require the installation of a miniaturized airborne computer to steer a collision course. Planetary diameter measurements cannot be used for a distance scale in the first probes because of uncertainties in the precise diameter. A radar altimeter would suffice.

Because the planetary orbit planes differ, a probe launched toward Mars and ignoring this plane difference would end up at Mars' orbit about four and one-half million miles "above" or "below" Mars. This change in orbit plane needs the expenditure of rocket energy to make a velocity change of about 4,400 feet per second. This can consume a lot of propellants and increase the launching weight considerably. Fortunately, there is a simple answer. The change in orbit plane can be made at the launching from Earth if this launching takes places as the Earth is crossing the plane of the Martian orbit; that is, the Earth is at the ascending or descending node of its orbit relative to the Martian orbit. This takes place once each calendar year but unfortunately the relative positions of the planets in their orbits are not suitable for transfer along Hohmann ellipses. These ideal conditions only take place once in every fifteen years.

The Martian probe would be established by setting up the vehicle in a terrestrial suborbit moving in a plane inclined 1.85 degrees to the plane of the ecliptic—the plane of the Earth's orbit around the sun. The elements of this orbit will be accurately determined by satellite tracking techniques well in advance of the date for breaking out of the orbit and traveling to Mars. As the date approaches, small vernier engines on the vehicle will perturb the orbit so that the satellite will be moving in the right direction at the time the Earth passes through the node. The rocket engines in the probe vehicle will then be fired to break it free of the Earth and send it into the Hohmann transfer ellipse to Mars. At the Martian end, about nine months later, the focusing effect of the Martian gravitational field will be utilized to pull the probe into its satellite orbit around Mars.

A probe vehicle of this type can gather information about Mars that is unobtainable with Earth satellites. Using solar energy to run its transmitters, it could send information to the Earth concerning the magnetic field of Mars and cosmic ray intensity around that planet. With more sophisticated instruments it could complete a radar survey of the planet and check radiation from its ionosphere and from spots on its surface. An optical scanner using facsimile transmission techniques would permit a close-up picture of the planet to be transmitted showing details as small as areas of about ten miles square. By using antenna like that of the Jodrell Bank radio telescope in Manchester, England, facsimile transmissions can be maintained with a three kilowatt transmitted power for over 250 days at a period of good opposition.

What about the sizes of vehicles compared with current military hardware? A ratio of 1:2000 is probably required for a Martian probe vehicle. One ton of payload needs a launching weight of 2,000 tons. Although details of the launching weights of vehicles like the Atlas are still classified, some observers suggest that the Atlas and Titan are in the range of 220,000 to 240,000 pounds. This would mean that such vehicles could permit us to send a payload of 120 pounds to Mars, sufficient for a simplified probe vehicle which would not be designed to become a Martian satellite. Instead, it would be shot along a Hohmann ellipse to make an unperturbed close approach to Mars for data gathering. It would then follow the other half of the ellipse back to the orbit of the Earth. Unfortunately, as the complete Hohmann ellipse takes one and one-half years to traverse, the Earth would be on the opposite side of the sun when the probe returned to the Earth's orbit. So it would have to make another circuit of the Hohmann ellipse. At its second return to the terrestrial orbit, three years after launching, it would rendezvous with the Earth. Control could not be accurate enough to make a landing but at the close approach the probe could be interrogated and its data gathered. Such an experiment would minimize the telemetry power requirements and enable a greater payload of instruments to be carried. As the velocity requirements are also less than those for establishing a Martian satellite the over-all payload-to-launching-weight ratio is improved. A vehicle like the Air Force Atlas could be used for an experiment of this type.

Similar magnitudes of velocities and takeoff weights are required for Venus probe vehicles. Paralleling Air Force biological studies and near space orbital manned flight to produce conditions for man's survival in deep space, instrumented interplanetary probes can develop techniques for guiding vehicles in space and will suggest which interplanetary missions are to be the most fruitful. Meanwhile, parallel space medicine developments will be providing data necessary for true manned spaceships.—END

ABOUT THE AUTHOR

This is the first contribution to AIR FORCE *by Eric Burgess, a native of Great Britain who now lives and works in the US. Mr. Burgess, long interested in the problems of astronomy and astronautics, has written and lectured extensively. He is Fellow of the British Royal Astronautical Society, and can trace his spaceflight interests back more than twenty years, having been instrumental in the formation of an Interplanetary Society in Manchester, England. He is the author of the well-known* Rocket Propulsion, Frontier to Space, *and* Guided Weapons. *Now a resident of California, he is presently associated with the Telecomputing Inc. company of Van Nuys, Calif. Readers who have followed astronautical and aeronautical writing in journals both here and abroad will be sure to find his byline familiar.*

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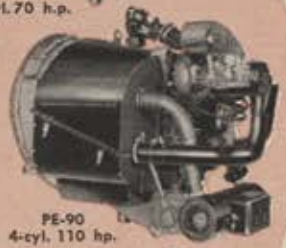

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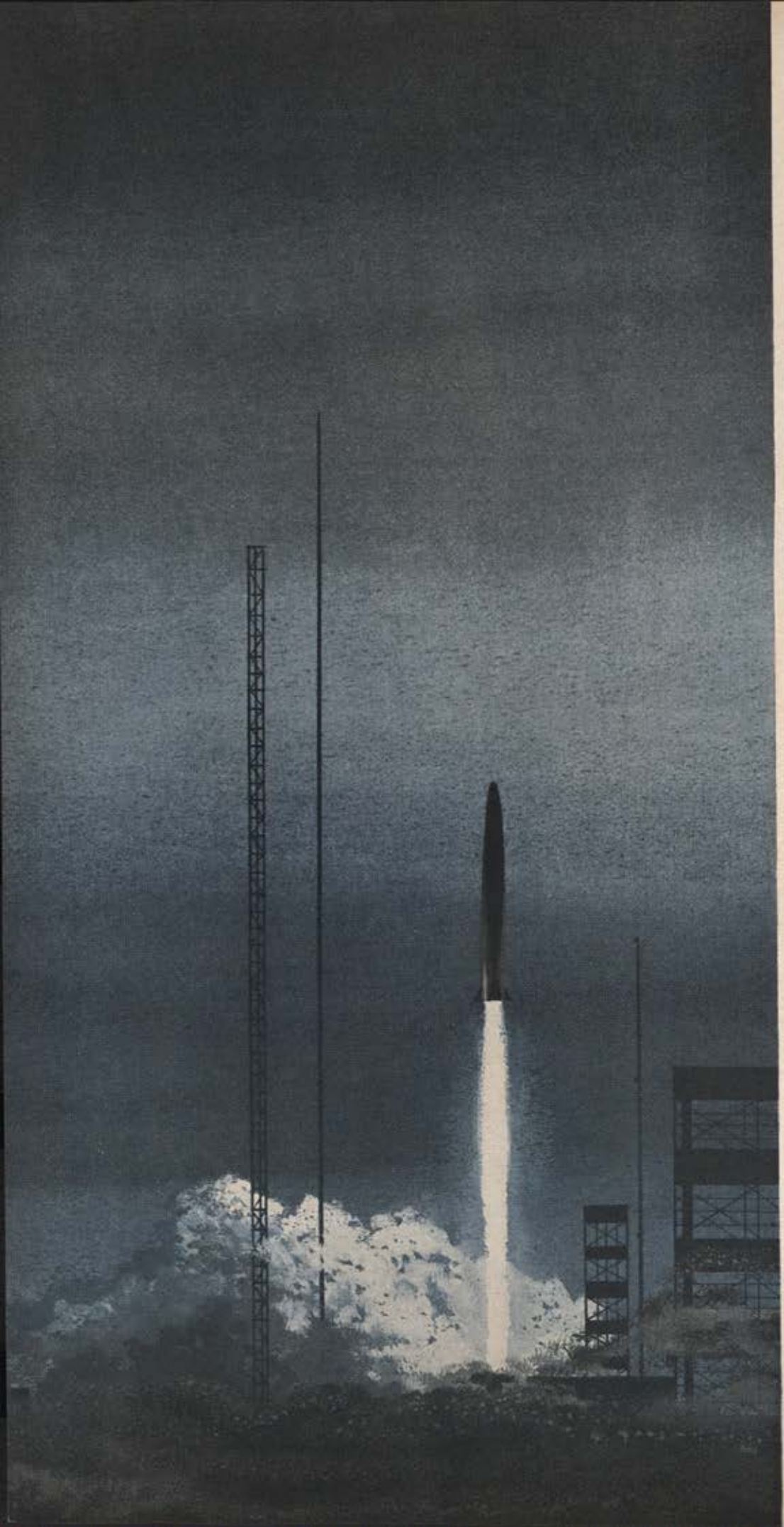

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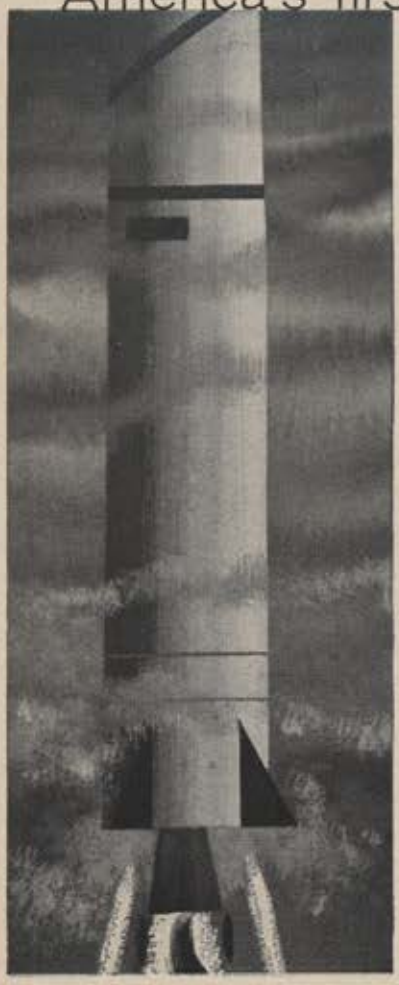

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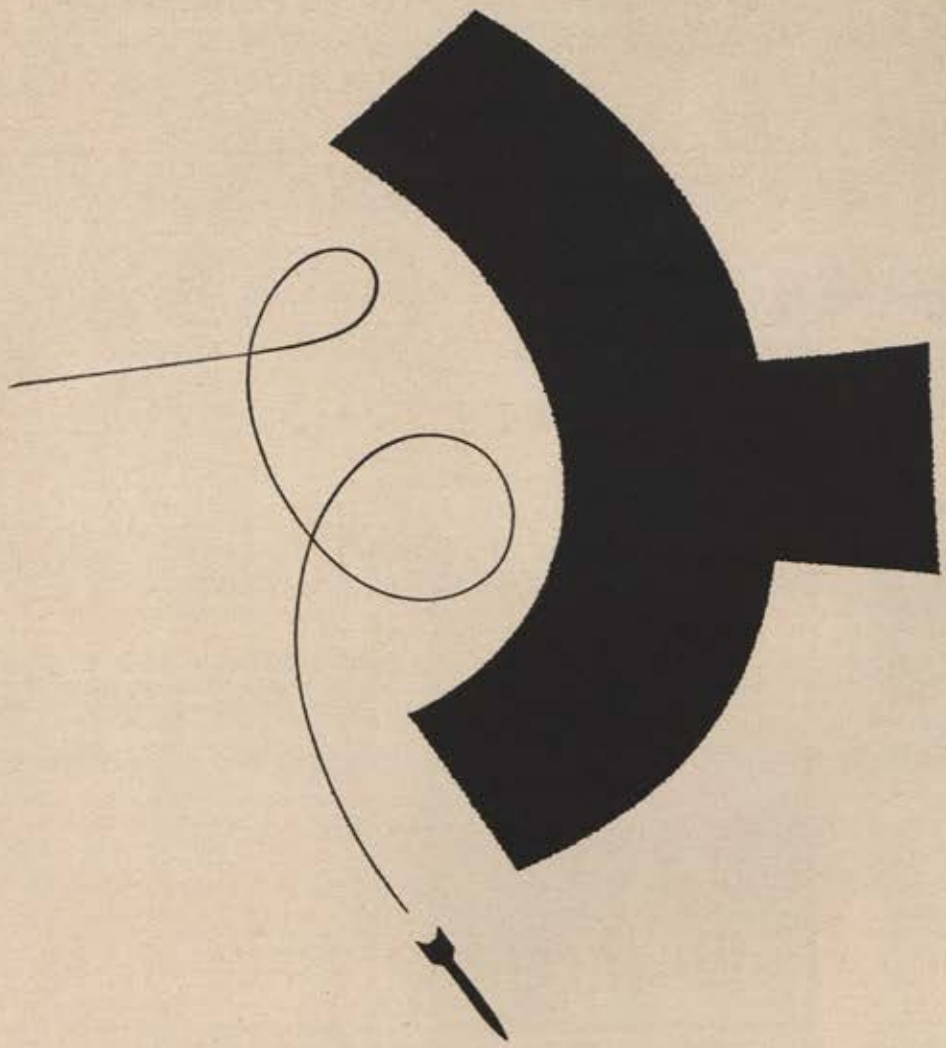

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Many tools are being used – radar, infrared, chemicals, others. Many skills are required – in physics, metallurgy, astronautics, as well as electronics. And thousands of IT&T technicians and artisans are working in these fields.

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The Air Force has even turned over to IT&T the all-important job of operating and maintaining the Distant Early Warning radar network in the Arctic, (the "DEW LINE").

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Talking space technology at Chicago, left to right, Maj. Gen. Bernard A. Schriever, AFA's John P. Henebry, Krafft Ehricke.

USAF Space Age Projects Described

Chicago, Oklahoma City are Sites of Space Age Conferences

THE unfolding space age and the leading role the Air Force will take in the new era were the themes of two heavily attended AFA events in May: The Chicago Missile Age Conference, sponsored by the Illinois Wing, with the cooperation of the Chicago Association of Commerce and Industry, and the "Frontiers of the Space Age" Conference in Oklahoma City, sponsored by the Frontiers of Science Foundation, with the cooperation of the Oklahoma City AFA Squadron, Oklahoma Department of Education, Oklahoma City Public Schools, and the Oklahoma City Chamber of Commerce, and sparked by USAF's Oklahoma City Air Materiel Area, whose Commander, Maj. Gen. T. P. Gerrity served as host. Both events were stimulated by AFA's National Jet Age Conference program.

Speakers at the Chicago Conference, which attracted more than 1,000, included Maj. Gen. Bernard A. Schriever *(see page 94)*, the Ballistic Missile Division Commander, who told of Air Force plans for a step-by-step program of space efforts geared to putting a man into space by the early 1960s. General Schriever said that to gain needed medical knowledge for safely putting a man into orbit, mice would ride in missile nose cones "until, step by step, we have learned enough to put a man into space."

Fitting space age theme at Oklahoma City Conference—USAF's Thor IRBM.

The BMD Commander also officially announced to the Conference that an Air Force Thor IRBM had flown 2,400 nautical miles, and that the Atlas ICBM which has been tested over ranges up to 600 miles, will be flown its full 5,500 miles this year.

On Air Force plans to shoot missiles to the vicinity of the moon as probes, he said the Thor-Able combination planned for such probes would provide valuable information on the still knotty reentry problem. The General added that such data should lead to long-range missiles capable of moving at greater speeds in the final seconds of flight.

(Continued on following page)

Lt. Gen. C. S. Irvine, Deputy Chief of Staff, USAF, addressed Oklahoma meet.

Some of the 6,000 Oklahoma City younger generation who attended the Frontiers of the Space Age Conference in that city. AFA cooperated in arrangements.

The Oklahoma City Conference, an event-packed, one-day meeting and exhibition, was designed to acquaint high school science students with the vast new space age and their stake in it. It was held at the city's Municipal Auditorium and attracted more than 6,000 youngsters from 234 schools throughout the state.

Opened officially by Oklahoma City Mayor Allen Street, the program started with ceremonies in which Douglas Aircraft President Donald Douglas, Jr., presented the Douglas Thor IRBM missile to the Air Force. Acceptance was by Maj. Gen. Bernard A. Schriever. The morning session heard remarks by Dean A. McGee, President of the Frontiers of Science Foundation of Oklahoma, Inc.; Roland V. Rodman, General Chairman of the meeting; and Gill Robb Wilson, former AFA Board Chairman and editor and publisher of *Flying* Magazine.

General Schriever addressed the large teen-age audience on ballistic missile progress. He was followed by Krafft Ehricke of Convair, who outlined principles of spacecraft and methods for man-in-space operations.

The biological aspects of spaceflight were covered by an Air Force team of three medical experts: Brig. Gen. Don Flickinger, Director, Directorate of Life Sciences, ARDC *(see page 97)*; Col. John P. Stapp, Chief, Aero-Medical Laboratory, Wright-Patterson AFB, Ohio; and Lt. Col. David G. Simons, Chief, Space Biology Branch, Aero-Medical Field Laboratory, Holloman AFB, N. M.

Lt. Gen. Clarence S. Irvine, USAF Deputy Chief of Staff, Materiel, addressed the Conference luncheon meeting on education for the space age. He was introduced by Maj. Gen. Thomas P. Gerrity. Presiding at the luncheon was Frontiers of Science President McGee.

The afternoon session was devoted to technical aspects of spaceflight and the need for training to meet space-age problems. General Chairman Rodman presided and Frontiers of Science Board Chairman E. K. Gaylord keynoted.

George P. Sutton of North American Aviation covered rocket-engine design problems, and fuel and material approaches were outlined by Dr.

Rapt youngsters examine USAF man-in-space display, part of large exhibit.

Dorothy M. Simon of Avco. Space age educational training was discussed by Ramo-Wooldridge's Dr. Reuben Mettler, associated with that company's Space Technology Laboratory.

Final event was the evening's banquet, featuring an address on "Keeping Our Feet on the Ground in the Space Age," by Lt. Gen. E. R. Quesada, USAF (Ret.), and a panel discussion, chaired by Gill Robb Wilson.

Thousands of the science-minded high schoolers who attended the Conference were attracted to the space age displays in the Municipal Auditorium, including exhibits on man in space, human factors research, rocket capsules that have carried mice into space, the "Mars jars" in which Air Force biomedical specialists have cultivated bacteria under conditions approximating those on the red and green planet, space suits of today and tomorrow, an ionic drive motor, a full-scale model of a Far Side missile, and a model of the gondola that Colonel Simons used in project Manhigh.—END

Ted C. Findeiss, Oklahoma Wing Commander; Lawrence E. Leffler, Oklahoma City Squadron Commander; Col. Hardin W. Masters, USAF (Ret.) Regional Vice President, check over plans with Frontiers of Science's Roland V. Rodman.

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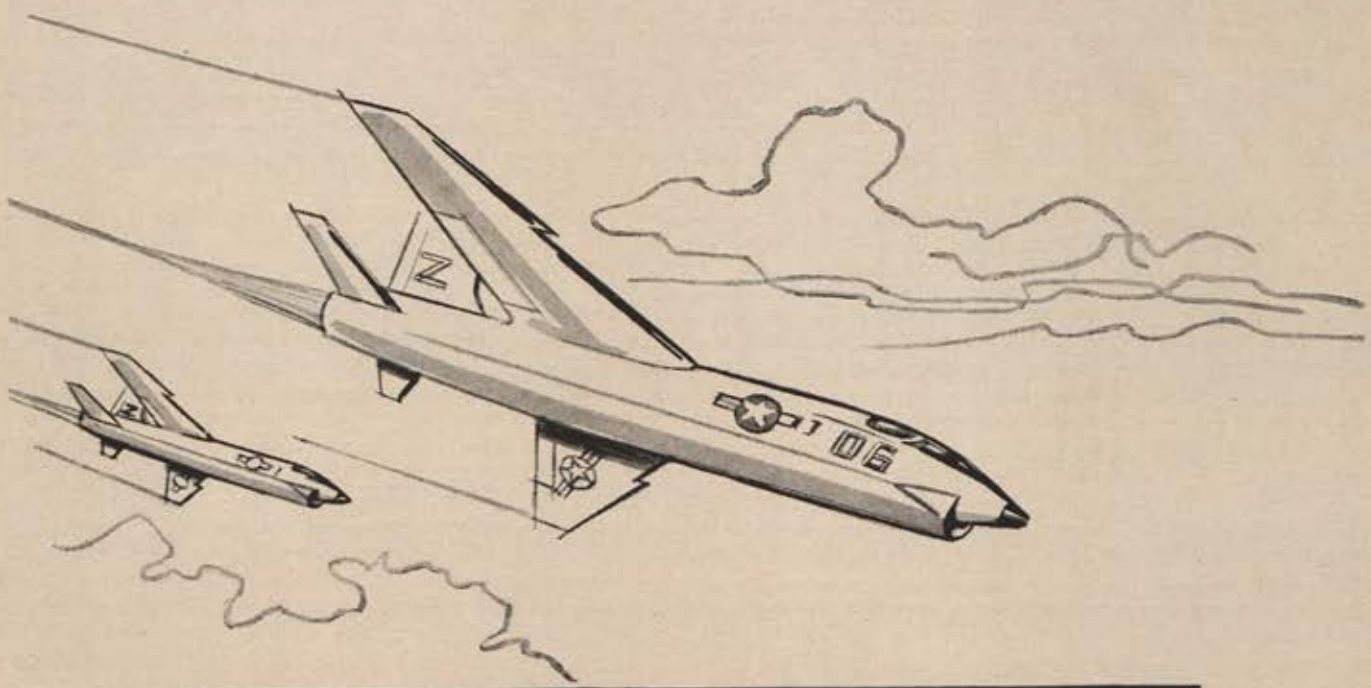

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The READY ROOM

RESERVE AND AIR GUARD NEWS

AFA's **Air National Guard Council** long ago concluded that the Guard, with its thousands of highly trained technicians, could handle the **Bomarc** mission. **The Air Reserve Forces Functions Review Committee**—the Stone Board—also reached this conclusion in February 1957. And an **ARDC study group** last July indicated that the Bomarc weapon system is **well suited** to the ANG technician program *(see* Ready Room, *December '57 and June '58).*

More positive Air Staff thinking in this direction was stimulated last month by a memorandum from Vice Chief of Staff **Gen. Curtis E. LeMay,** which said, ". . . it is the desire of the Air Force to provide Air Reserve components with the most modern and up-to-date equipment consistent with Air Force requirements and capabilities.

"Along this line it is intended that we investigate the Air Reserve Technician portion of the Reserve components for utilization in the Bomarc program."

The LeMay memorandum, directed to the Commander of the Continental Air Command; the Chief of the Air Division, National Guard Bureau; and appropriate Hq. USAF Staff Agencies, outlined several areas of interest for such an investigation and "proposed" that a meeting be held at Hq. USAF on June 17 to "**jointly explore . . . these items of interest.**"

Addressing the **Aviation Writers Association** annual conference in Houston, Tex., **Gen. William E. Hall, CONAC Commander,** said that the character of interceptor missiles may be such that the sites could best be manned by Reservists in their home towns, or by a **combination** of Reservists and Regulars. "It is entirely possible that there will be psychological factors concerning such an operation that can be better met by Reservists than by members of the active force," General Hall suggested.

* * *

AFA's **Air Reserve** and **Air National Guard Councils** met in Dallas on May 23 in conjunction with a meeting of the Association's Board of Directors.

Brig. Gen. Paul Zuckerman, Reserve Council Chairman, reported to the Board that his group was on record in strong support of a separate budget for the Air Force Reserve. The Reserve Council urged the Association to encourage necessary legislation.

The Council also urged the Association to stimulate legislation to provide **retention compensation** to the Reserve airmen.

Their plan would provide $210 to Reserve airmen completing three successive "satisfactory years" in the active Ready Reserve. Payment of $50 would be provided upon completion of the first "good year"; $70 upon completion of the second consecutive "good year"; and $90 upon completion of the third consecutive "good year." The plan also proposes that, upon completion of a three-year cycle, airmen may then enter upon **another three-year cycle,** with the respective amounts to be increased by $10 for each completed cycle.

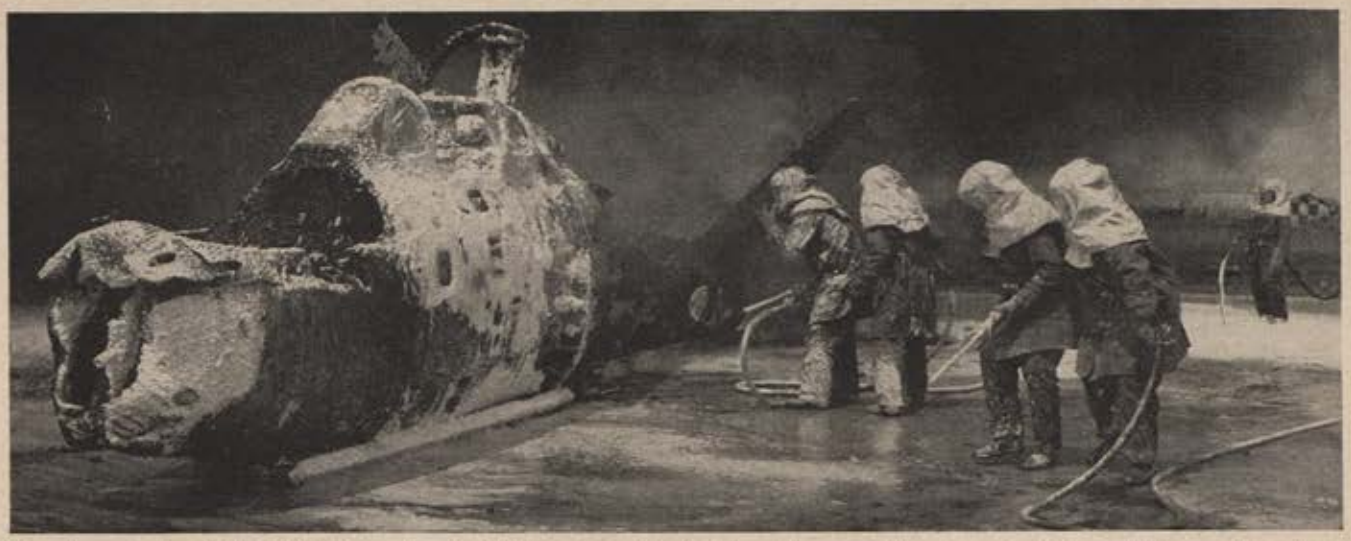
Proposing that the mission of the Air Force Reservist in the **"Center Program"** be augmented to include training for a **civil defense** type assignment as a secondary mission, the Reserve Council asked the Association to request the Air Force to study the feasibility of such an idea.

Brig. Gen. Don Strait, Chairman of AFA's Air National Guard Council, reported to the Board the Council's gratification with the recent interest by top Air Force officials in the utilization of Reserve Forces. In keeping with its policy of staying abreast of advance weapon systems programs, the **ANG Council** will visit **Eglin AFB** early in September for the purpose of viewing a Bomarc site and discussing the operation of Bomarc with personnel presently in training on this new weapon system. ANG Council members also hope to attend the **Air Warfare Systems Orientation Course** at **Maxwell AFB** early this fall.

Strait also advised that, in view of feasibility studies recently concluded on Century Series aircraft and the

(Continued on following page)

Navigation team captains whose teams participated in CONAC's Miami International Airport navigation meet were congratulated by Brig. Gen. J. M. Chappell. Left to right, Maj. George McInerney, First Air Force; Maj. Harry Irwin, Fourth Air Force; Capt. James Murphy, Fourteenth Air Force; Maj. D. Goldsmith, Fourteenth Air Force. Captain Murphy's 8507th Navigation Training Squadron, Hensley Field, Tex., won the meet and Captain Murphy is shown accepting award.



Members of the 111th ADG, Pennsylvania ANG, put on fire-fighting demonstration as part of Armed Forces Day show.

THE READY ROOM — CONTINUED

Bomarc, the Council was preparing specific conclusions and recommendations for consideration by the President and Board of Directors as part of the Association's over-all statement of policy to be announced at the annual Convention in Dallas this September.

Both Councils **reaffirmed their support** of amendments to **ROPA** *(see* Ready Room, *June '58)*. Last month, **Rep. Overton Brooks of Louisiana** introduced H.R. 12304, a bill to **amend ROPA** which has the **identical amendments** contained in S. 3240, the bill formerly submitted by **Sen. Margaret Chase Smith of Maine.** AFA President **Pete Schenk** has advised the Chairman of the House Armed Forces Committee and the Chairman of the Senate Armed Services Committee of **AFA's support of these two bills** and desire for immediate legislative action. The Department of Defense **"Omnibus" bill,** containing **twenty-eight amendments to ROPA,** has finally been coordinated by all military departments and is being reviewed, at this writing, by the Bureau of the Budget before submission to Capitol Hill.

• • •

A major reorganization of the **Air Reserve Center** nonflying training program becomes effective this month. Sixteen newly activated Air Reserve Training Wings will have supervisory control over eighty-two Centers under CONAC's three numbered air forces.

Until now, the three air forces had supervised ninety-three Air Reserve Centers throughout the country. These Centers in turn trained Air Reservists of 1,000 Reserve units. This organizational structure resulted in excessive supervisory control problems for the widely dispersed air forces because of the many units involved and their wide variety of missions.

The inactivation of CONAC's First AF at Mitchel AFB, which supervised Air Reserve training activities in fifteen northeastern states, further compounded the problems.

With the new program, eleven Air Reserve Centers, eight groups, and fifty-six squadrons **have been redesignated or relocated.** No training locations will be eliminated as a result of the reorganization. At each installation where an Air Reserve unit has been discontinued or relocated, Reservists **will be reassigned** to existing units at the same location, or an Air Reserve flight will be activated.

Elimination of the eleven Centers was based on relative productivity and distance from other Centers. The following have been discontinued: **Altoona, Pa.; Dayton, Ohio; New Haven, Conn.; Richmond, Va.; Trenton, N. J.; Akron, Ohio; Yorkville, N. Y.; South Bend, Ind.; Rock Island, Ill.; Green Bay, Wis.;** and **Flint, Mich.**

Revised manning criteria for Air Reserve Center and unit strength criteria for Reserve groups and squadrons will result in a decreased requirement for permanent party support.

The standard composition of each Air Reserve Training Wing includes **five officers, seven airmen,** and **three civilians.** The total of 240 manpower spaces required for the sixteen new Wings will be provided from within the current resources of the individual training program.

Air Reserve Training Wings will be located at or near existing Air Reserve Flying Centers so that military transportation can be used for visiting and inspecting assigned Air Reserve Centers. The Training Wings will occupy existing facilities at ARFCs, Air Force bases, or ARCs.

These unit changes will neither increase manpower spaces nor reduce the number of authorized Reservists training at the specific locations. Civilians affected by the reorganization will be **given the opportunity to transfer to** new locales.

Under the new training program, CONAC's Fourth AF at Hamilton AFB, Calif., will have three wings supervising seventeen Centers. The Tenth AF, at Selfridge AFB, Mich., will have six wings and twenty-six Centers, while the Fourteenth AF at Robins AFB, Ga., will have seven wings and thirty-nine Centers.

A **marked improvement** in the Air Reserve nonflying training program will result from the reorganization, both USAF and CONAC officials feel.

• • •

The average Ready Reservist and Air Guardsman will receive an increase of **up to eleven percent** for officers and **9.2 percent** for airmen with over two years of service, under the new pay raise effective June 1.

A **special provision** in the new bill also benefits Reservists returning home from active-duty tours. Previously, travel pay could not be paid until it "was performed"—that is, after arrival at home. Under the new bill, travel funds would be paid **before beginning** the trip.

• • •

A proposed bill in the House of Representatives would allow Reservists who are **post-Korean War veterans** to receive educational benefits, regardless of whether they served during peacetime or war.—END

MILITARY COMMUNICATION REQUIREMENT

Airborne and ground communication equipment with more channels and greater reliability

Immediately after World War II the military services set equipment specifications for a shift from VHF to UHF airborne and ground communication. Several companies participated in a design competition. Collins equipment was accepted. And today the Collins designed AN/ARC-27 Airborne Transceiver and the AN/GRC-27 ground complement, each with 1750 channels, are standard for military service. Under the multiple source production program, contracts have also been awarded to other companies; however, the original design and development work was done by Collins. Collins' new developments in UHF include a more powerful and compact airborne transceiver, the AN/ARC-52, and two compact transceivers for vehicles and small vessels, the AN/VRC-24 and AN/URC-9.

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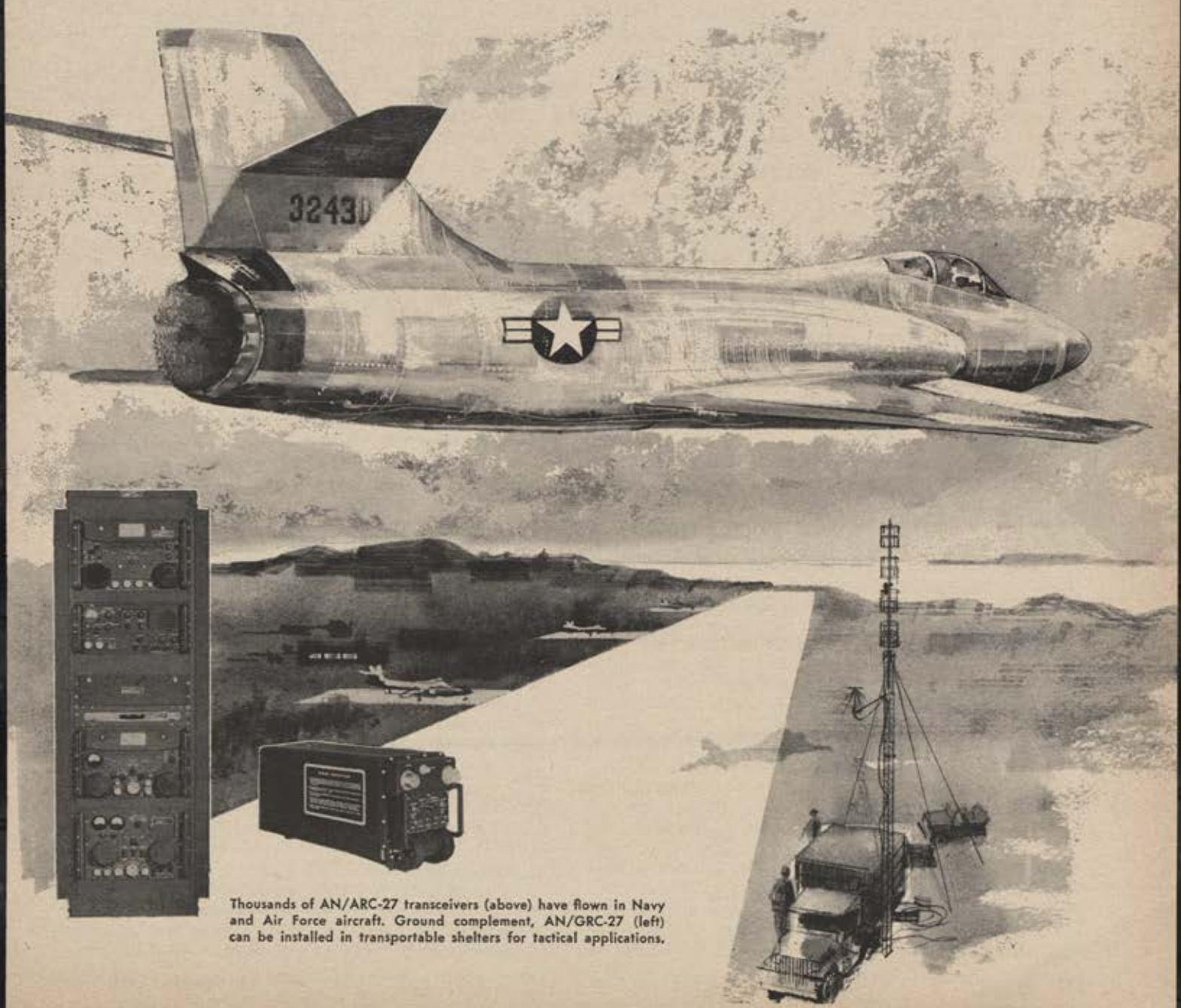


Thousands of AN/ARC-27 transceivers (above) have flown in Navy and Air Force aircraft. Ground complement, AN/GRC-27 (left) can be installed in transportable shelters for tactical applications.

"Black Boxes" Notwithstanding...

Man Is Here to Stay

Lt. Gen. Donald L. Putt

The faith that man himself is the only "ultimate weapon" is firm with Lt. Gen. Donald L. Putt, retiring as the Air Force's Deputy Chief of Staff for Development. He spoke his mind eloquently on this subject in a recent speech to the Aviation Writers' Association at Houston, Tex. An important excerpt follows:

LOOKING into the future there is one thing I feel more certain about than any other. That is about man. I do not believe there will ever be a gadget of any kind perfected that will totally replace man. Regardless of the great advancements made in the past few years and anticipated in the future, electronic black boxes will never be able to think like a man.

Guided missiles will supplement but never totally replace manned weapon systems. The first space vehicles will be unmanned until we get a firm grip on space's problems and the solutions. But we will always have a need in later models for a man on board and in command. However, despite all the great advances in science and technology man remains our great problem in the integration of man and machine—whether man is in control on the ground or in the air. Through sixty centuries of recorded history our store of knowledge has steadily improved until we are now in the actual attainment of some very important steps in equipment. However, we have made little improvement in man himself. Some people may feel that Julius Caesar's man was superior because, in those days, attrition cut down the weak. In our generation we have seen many services provided to man which allow him to live a more full life and to make a more real contribution to his fellow man. Who knows but that exploration of space and other planets in the future may not lead to a much greater knowledge that would improve man himself? It is possible.

In the field of propulsion there will be tremendous strides probably never dreamed of by the average citizen of today. Present engines and means of propulsion will be superseded by more efficient or more effective devices in the future. In particular, propelling devices depending on photon or ion fields for propulsion look very promising. Vehicles boosted away from the Earth with million-pound rocket engines could continue with photon or ion field type propulsion as far as the field persists and this should cover our solar system.

In the meantime, nuclear propulsion should come into its own not only in weapon systems within the Earth's atmosphere and space but no doubt in the commercial aviation field.

There will be much activity in space in the fairly near future. Military activity in the cislunar areas will come first. In fact, this is already pressing upon us. However, in time, the civil use of space will come into its own and we will see space used, enjoyed, exploited, and possibly even taxed. When man once goes beyond our moon he is entering a very large area without much in the way of stopping points. I suppose we must be prepared for interplanetary derelicts on Halley's Comet type orbits.

A powerplant failure during a spaceflight means that the vehicle becomes another planet and orbits in the solar system like the Earth. We will probably have to change our Air Sea Rescue Service to an Air Force Interplanetary Space Rescue Service.

During the era of satellites, both manned and unmanned, communications and weather forecasting, or even weather control, will reach an advanced stage.

Weather forecasting may become such an exacting science in the satellite era that with instantaneous communications people could be warned even in advance of specific tornadoes or cyclones.

With some form of weather control it might even be possible to modify severe weather at its beginning. Weather control could be most helpful and dangerous. Such control would have to be on an ironclad international basis. Imagine the havoc that could be raised if one nation could control the weather over another nation and use it for either economical or military purposes.

Last, but not least, electronics of the future will bring us air traffic control that will make possible aircraft traveling on invisible radar beams that will guide them safely and accurately through the dense air traffic from one point to another. Such future electronic control will prevent the unfortunate air collisions we have had in the recent months as well as avoid other accidents during approaches in weather. But, as I said before, there will no doubt be a man aboard and in command.

In conclusion, I want to stress that regardless of what the future has in store in military applications we will continue to have mixed weapons and strategy in the military services. Relying on a single type of weapon will make an enemy's defensive problems so much easier that he can concentrate on his offensive forces. Both manned and unmanned weapons of various types will continue in the arsenals of the world's military powers. However, we will never have an ultimate weapon.—END

ABOUT THE AUTHOR

A native of Ohio, General Putt received his commission in the Air Corps in 1929. He has served as a test pilot, in engineering posts, and in military intelligence during his long Air Force career. In 1953, he was named ARDC commander and assumed his DCS post in 1954. Recipient of innumerable honors, he holds a B.S. from Carnegie Institute, an M.S. from California Institute of Technology.

Tech Talk

North American Aviation has rolled its new **Sabreliner** (*see cut*) off the assembly line ahead of schedule. The jet utility trainer was designed and manufactured at North American's expense to meet an Air Force requirement for a combat-readiness trainer.

The twin jet will be powered by two **General Electric J85** engines. It can fly nonstop halfway across the United States and operate for one-third as much per nautical mile as such prop-driven, twin-engine aircraft as the **C-47** and **B-25**. In addition to a pilot and copilot, it will carry four passengers. Top speed is **575 mph.**

In these days of mid-air collisions it is interesting to note that the Sabreliner has been built to comply with Civil Aeronautics Administration regulations. It has an extra wide windshield to give the pilot visibility for maximum flying safety under all traffic conditions.

North American's new utility jet trainer, the Sabreliner, has a top speed of 575 mph. It has a wing span of forty-two feet and a gross weight of 15,320 lbs.

Scientists have become more and more concerned with heat as the current crop of supersonic aircraft and ballistic missiles evolves. Today there are many special test instruments designed to produce heat in the search for solutions. Similarly there is laboratory equipment designed to test and develop materials, under intense heat, for future use in aircraft and spacecraft. **Shock tubes** and **plasma jets** are two of them. It is interesting to note that the **world's largest solar furnace** will begin taking shape near Cloudcroft, N.M., soon, to do research in this field for the Air Force. **J. W. Fecker, Inc.,** Pittsburgh, Pa., designed and developed the optics and servo controls for the furnace.

Solar scientists predict that the heat generated by this furnace will be approximately **eighty percent** of that present on the surface of the sun. Temperature at the focal point will reach as high as 7,000 degrees Centigrade, depending upon the nature of the sample. This heat is concentrated into a five-inch circle. It can boil tungsten, platinum, carbon, and can punch a hole through any material known today. Shutters in the giant attenuator, similar to venetian blinds, can open and close in one-half second to control the sunlight and the amount of heat. The parabolic focusing mirror is 108 feet in diameter while the heliostat is 151 feet wide and is mounted on railroad tracks so that it can be moved to capture and reflect the sun's rays onto the mirror (*see cut*).

Model of the world's largest solar furnace. Heliostat (right) reflects sun onto focusing mirror which concentrates energy in a 7,000-degree "hot spot."

Advantage of this furnace is that **heat can be controlled** into a specific area. The heat produced is pure as opposed to that of other sources of heat which introduce the byproducts of the fuels they burn. The solar furnace is economical. Once constructed it is cheap to operate. Under contract with the Air Force, the solar furnace will test materials going into future missiles, spacecraft, and nuclear reactors. The furnace will also permit the study of heat radiation such as that in a nuclear blast without the danger of radioactivity. Fecker manufactures optical instruments.

The **Corning Glass Works,** Corning, N.Y., famous for its artistic Steuben glass, and more recently for its **Pyroceram** contribution to guided missile nose cones, has been awarded a contract to develop high-temperature windshields for supersonic aircraft. The three-year development contract, negotiated at Air Materiel Command, calls for fabrication of windshields that will withstand continuous use at temperatures of 850 to 900 degrees Fahrenheit.

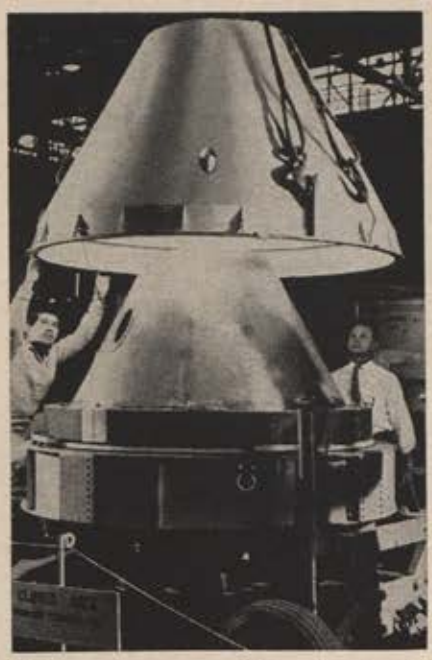
Corning will have to develop new techniques for shaping, laminating,

(Continued on following page)

and mounting both curved and flat windshields. The glass will be ground and processed for high strength, and coated with an electricity-conducting film to act as a deicing and defogging agent and to reflect solar infrared radiation. The operating-temperature range called for in the contract is about double the limit of glasses used in standard windshields. Corning looks to the engineering knowledge gained in this study to be applicable in the future to glasses capable of operating at temperatures up to 1,800 degrees Fahrenheit. We might add that **this could contribute much to manned spacecraft.** Air Force apparently has reached the point in heating problems where special heat-resistant windshields are mandatory.

Reentry continues to pose the most serious problem to successful ballistic missile development, particularly ICBMs. Progress in this complex area, however, is being made, as evidenced by the first photographs of the **Atlas nose cone,** released by **General Electric.** Configuration of the cone is still classified but the blunted shape shows that the high-drag-to-weight design (*see cut*) seems to be the most promising approach. General Electric is prime contractor on both the **Atlas** and **Thor** ballistic missile nose cones.

News of the recent recovery of **Army's Jupiter nose cone** is an additional indication that the problem is being licked. It should be pointed out that this is the first such significant evidence. An earlier recovery of a nose cone announced by the **Army,** and shown by **President Eisenhower** on television, was only a **scale model.** Equally significant were the twenty or more successful reentry flights made by the **Lockheed X-17** ballistic missile which carried nose cones thousands of feet into space and then reintroduced them at high speed into the dense atmosphere. Collectively, these events are evidence of progress—**but the problem remains.**



Atlas nose cone configuration is still classified but first photographs give some indication of size and complexity.

Essentially the problem of reentry starts when the nose section is separated from the ballistic missile at extreme altitude. On its plunge downward it enters denser atmosphere at speeds of about 20,000 feet per second, which creates a temperature of about 15,000 degrees Fahrenheit in the shock wave preceding the cone and increases the nose cone temperature to 5,000 or more degrees Fahrenheit. This occurs in something **less than a minute** and one can imagine the stresses imposed as the nose cone hits this "brick wall." It is subjected to shock waves, vibration, melting, thermal stresses, extreme unequal pressures, and shearing stresses in its brief reentry plunge, yet it must protect the vital instrumentation or warhead to complete its mission successfully.

Both **General Electric** and **Avco Research Laboratory** are making advances in nose cone developments. There are many roads open for improvement of the present production nose cones. Avco is working with beryllium to fabricate nose cones. Copper is being used for the heat sink nose cone of blunt shape. Plastics and ceramics are still other approaches. Avco is studying **magnetohydrodynamics** for its application to reentry "drag" devices. All of these efforts to improve the nose cone and solve the reentry problem will contribute to manned spaceflight.

Atlantic Research Corp. announced that it has developed two solid-propellant rockets for separating stages of the Thor and Atlas ballistic missiles. In multistage rocket systems, such "retro" rockets fire when the stages to which they are attached burn out, retarding it to assure a clean separation from the next stage. Both of Atlantic Research's new rockets are powered by the company's **"Arcite"** solid propellant. The company is subcontracting from **Convair** and **Douglas.**

Atlantic Research developed the 4.8-inch **PET** rockets which separated the final stages of the Vanguard launching vehicle. The PET rockets performed a second function in the Vanguard as well. Two of these tiny rockets, mounted on the perimeter of a circular spin table, fired before separation to impart **ballistic spin** to the final stage that kept the stage on its course. This contributed to the superior horizontal release angle that launched the first Vanguard into the highly favorable perigee altitude of 407 miles in its orbit. Atlantic is a research and development firm.

—Bob Strobell

The manned Lockheed F-104 Starfighter (above right) and the unmanned Chance Vought Regulus II missile have marked similarities. Both are powered by General Electric's J79 jet engine, rated in the 15,000-pound thrust class, which enables them to operate in the Mach 2 range. An Air Force F-104 broke the world speed record last May, setting the mark at 1,404 miles an hour. Earlier in the same month the Starfighter set an official altitude record of 91,249 feet. Late in May the Navy's F4D-1 Skyray (above), built by the Douglas Aircraft Co., topped world climbing records in near-perpendicular climbs from a standing start. Five climb records, in increments of about 10,000 feet, were broken. The lowest was 9,842 feet reached in 44.39 sec. while the highest goal was 49,212 feet in 2 min. 36 sec.

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RICKENBACKER

America's

At height of his glory, bemedaled Captain Eddie beams his famous victory smile. From fame in war, the ace went on to success in peace.

MANY historians consider Capt. Eddie Rickenbacker the greatest air ace produced by the American services. In Great Britain he is highly regarded as an air fighter, and his name is revered by those of his old enemies still alive in Germany.

A man's personal greatness and his degree of fighting skill are, of course, relative. Much depends on the weapons he uses and his theater of operations. Today a man may attain greatness aboard a supersonic fighter armed with rockets able to destroy an enemy a mile away. In World War II American aces ran up their scores flying 350-mph fighters armed with banks of .50-caliber machine guns. But Rickenbacker fought in an age that relied on two rifle-caliber weapons, 100-mph mounts, and a native ability to seek out and destroy the target. Such refinements as radar, automatic sighting, oxygen equipment, and aerial cannon were unimagined.

On the record, Rickenbacker scored twenty-six confirmed victories in only seven months of front-line flying—and more than two months of this time he was hospitalized after a mastoid operation. In combat Rick never suffered a scratch. He was hailed as "America's Ace of Aces," and received a string of decorations, including the Congressional Medal of Honor.

To Rickenbacker's great credit he has never played the swashbuckling hero. As a result, in some ways it is difficult to record his war career. He had little flair for the dramatic, never wore the gaudy birdman garb.

During World War I, as he was building record, "Rick" posed near the famed Spad.

Ace of Aces

By Arch Whitehouse

Even now, Rickenbacker is something of an enigma, despite the fact that today he heads Eastern Air Lines, a pioneering and highly successful air operation. Few World War I air heroes made good in postwar aviation. Many aces came home after the Armistice to wind up on the discard heap or to face trouble in senseless Roman holidays. Too many lacked the courage, or imagination, to face a difficult postwar world.

Rickenbacker had little of the boisterousness associated with the much-publicized hero. In this sense he was the antithesis of Frank Luke, the dashing balloon-buster who proved to be Peck's Bad Boy of the air over the Western Front. Nor had Captain Eddie the lighthearted *savoir-faire* of his fellow flyers, Elliott White Springs, Doug Campbell, or Dave Putnam. And the bulldog ruthlessness of Raoul Lufbery would have been alien to Eddie Rickenbacker.

Daring but not foolhardy, Captain Eddie fought with the same cool intelligence with which he administered his unit—the 94th "Hat-in-the-Ring" Pursuit Squadron. He not only talked the pilots' language but, thanks to his racing-car background, was a better mechanic than any of the squadron's ground crew. But he had won mechanical proficiency the hard way.

Rickenbacker, born in Columbus, Ohio, on October 8, 1890, grew up with much of the reserve of a mid-western boyhood. His parents were of Swiss-German descent, and for months after the start of World War I, he had some difficulty living his heritage down. The family name had been "Richenbacher" and had been anglicized to Rickenbacker.

When Rick was twelve, his father died. The day after the funeral, the boy's formal schooling ceased, and he wangled a job with the Columbus Glass Co. by saying he was fourteen and had working papers. He worked twelve hours a night, six nights a week, turning his weekly pay envelope of $3.50 over to his mother. A nearby foundry offered him $6 a week, and later a local shoe factory hired him at a $4 raise. Eventually he drifted to a garage where he was to have his first brush with the internal combustion engine. That job was to influence his entire life.

Since his education had been limited, he took an engineering course through a correspondence school, and by 1910 was proficient enough to road test automobiles for the then-famous Locomobile Co. In those days, even more than now, autos sold on their reputations for speed. Practically every company took aim on the existing speed marks in such racing classics as the Indianapolis five-hundred-mile race. Rickenbacker drove in three of the Indianapolis races, once pushed a Blitzen Benz to a record 134 mph. A prudent but fearless driver, Rickenbacker became respected as a highly competent racer.

When war broke out in 1914, Eddie happened to be in Great Britain on business with the Sunbeam Motor Co. The Sunbeam, a popular racing mount of that day, had done well in the American Vanderbilt Cup event, and Rickenbacker wanted to represent the company on American tracks. But, unfortunately for Rick the British factory was converting to the wartime production of aviation engines, so the deal fell through. Rick's trip wasn't a total loss, for during his stay in Britain he caught the feel of the war, and at Brooklands, England's noted auto track, he saw some of the activity and training operations of the Royal Flying Corps.

When the United States entered the conflict in April 1917, Rickenbacker proposed that America form a special flying squadron composed of American racing drivers. The plan was turned down by Washington but Army representatives suggested to Rickenbacker that he give up his position as the nation's foremost racing driver and become General Pershing's staff driver. Rickenbacker thought the proposal over carefully and decided to accept, as a means of getting overseas fast and possibly into combat.

Once in France he found himself in a race against time. He argued his way into flight training and after winning a commission in January 1918 took five and a half hours of instruction before being allowed to solo. He was an apt pupil because of his auto-track experience. An amazing judge of speed and distance, he had the racing driver's inherent trick of timing. And, because he was an outstanding mechanic, it was decided he

(Continued on following page)

would make a good engineering officer at the Issoudun replacement depot.

At Issoudun Rick was able to log flight time in several types of planes. Oddly enough he hated violent acrobatics in the air, but like many other new flyers, had to force himself to spin and roll the fragile trainers of the day. He repeatedly applied for a transfer to a combat outfit, and finally his persistence paid off and he was sent to an aerial gunnery school at Cazeau where for the first time he climbed into a plane fitted with machine guns and live ammo. He put in several weeks doggedly practicing on ground targets or drogues fluttering from kite balloons.

One day he landed after a wearying gunnery drill, stared at the muzzle cups of his guns, and muttered: "I can see that aerial warfare is actually scientific murder." From that day Rickenbacker strove to fly scientifically.

Early in March 1918, the tall Columbus boy was posted to the nucleus of the 94th Pursuit Squadron, based at Villeneuve. It was then headed by Maj. Raoul Lufbery, who had become an ace with the famed Lafayette Escadrille. Others in the 94th included James Norman Hall (later, with Charles Nordhoff, to write *Mutiny on the Bounty* and other novels), Hamilton Coolidge, Jimmy Meissner, Reed Chambers, Douglas Campbell, and Harvey Cook. When Rickenbacker arrived, the 94th had lots of talent—but no airplanes.

Another month passed, and gradually the 94th was allotted a few second hand French Nieuports. Thus equipped, they moved up into the Toul sector.

Rickenbacker's first war patrol was flown with Lufbery. Nothing much of interest was logged, but Eddie saw some enemy balloons and caught the pungent smell of antiaircraft fire. And he realized as never before that combat flying was no romantic game.

Unlike the younger members of the 94th, Eddie had no compelling desire to roar over the lines to plaster the Hun. He assayed the situation quietly and concluded that he had learned very little in flying school. He knew, by comparing his airmanship with that of Lufbery, that nothing he did was easy, smooth, or instinctive. His twenty-seven years warned him that in combat his mind would be fully occupied matching decision for decision and maneuver for maneuver with his enemy. He would have to make the right turns, loops, and chandelles with the smooth precision of the bullfighter.

A study of Rickenbacker's patrol reports discloses that his victories were the result of careful planning. Once he spotted a quarry, he calculated the safest combat conditions. It took longer, but these precautions paid off. If Rick made a mistake during a fight he returned to his own side of the line and flew through the necessary maneuver again and again until he had mastered the problem.

Six weeks of front-line flying passed before Rickenbacker wrote his first victory report. Then nearly another month went by before he scored again. Till then, he was just another Air Service pilot. He had little color and was among the less spectacular performers of the 94th. His combat history also shows that, by persistently improving his acrobatic techniques, he gradually added the element of surprise to his attacks. But his first victory provided a hint of what was to come.

Teamed with James Norman Hall, Rick encountered a German Albatros over Pont-á-Mousson. Waiting until Hall went up into the sun, Rick went headlong into what became suddenly an enemy formation. Hall came down out of the glare and made one Albatros break right to evade him. Rick anticipated the move and shot the German down cold. Hall moved in smartly to cover Eddie's tail.

Rickenbacker was never happy about his second kill. He took off with Reed Chambers, but they became separated in the clouds. Patrolling over Toul, Commercy, and Nancy at high altitude, Eddie came on three Albatroses. Hoping they would cross into the Allied area, Rick stalked them, but the German antiaircraft guns put a smoke marker on him so he had to attack over the woods at Montsec. Forgetting his normal caution, he went in too fast. He got his man, but in pulling out he lost much of his upper-wing covering and was fortunate to make it back to his own line.

Rickenbacker's third victim, on May 22, provided tragic drama. Again flying with Chambers, Rick agreed to take a newcomer to combat, a Lieutenant Kurtz, over the line to give him some experience. The Americans met three Albatros D-IIIs, which attacked first. The three Nieuports evaded the German scouts, turned the tables, and began chasing the D-IIIs back toward Germany. Over Thiaucourt, Rick spotted one of the Albatroses making a climbing turn toward Kurtz. With a quick *vrille* (half-turn), Rickenbacker got on the German's tail and downed him. But not before the Albatros had fatally damaged Kurtz's plane, which spun out of control and crashed in flames.

Timing played an important part in Rick's fourth victory. He and Doug Campbell found a pair of Albatros two-seaters escorted by four Pfalz fighters over Mars-la-Tour. Rick and Campbell had a 2,000-foot advantage on the enemy planes. They moved into the sun and waited for the Germans to cross the Allied lines. Once the Nieuports started their dive attack the Albatroses turned for home. The Pfalz escorts covered them until they were safe over Thiaucourt, and the two Americans wondered what the next move would be.

The Pfalz pilots faked leaving the two-seaters, and Campbell rose to the bait—and missed. But Rickenbacker played it cozy and continued to stalk the Jerry fighters. Both sides played this game cautiously, but when a lone Albatros moved out of its formation—again, obviously, as bait—both Rick and Campbell struck so fast the Pfalz pilots had no chance to intercept them. Later Rickenbacker was given credit for the kill, though Campbell had fired a few rounds, too.

Rick became an ace on May 30, 1918. His fifth victory came during an escort show when two flights of Nieuports had gone out to bring in a formation of British two-seater bombers. Rickenbacker had asked permission to go along as a free lance.

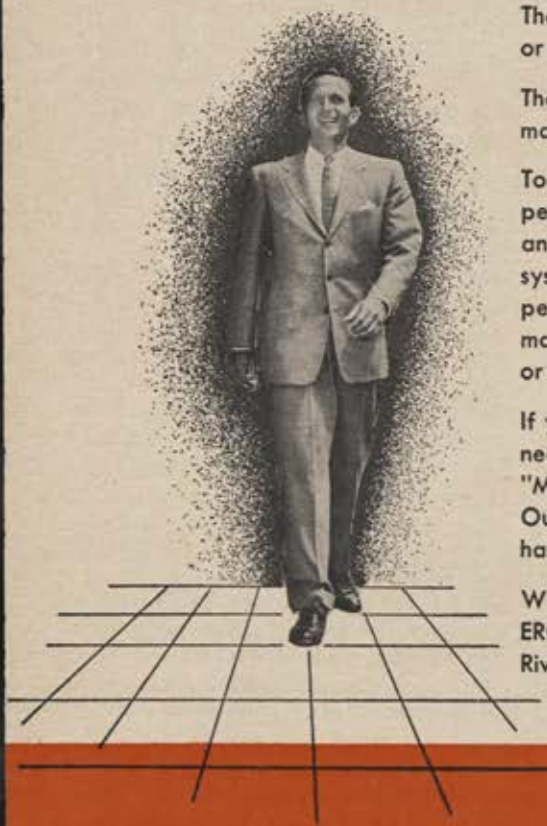
As the Nieuports approached the incoming de Havillands, they were suddenly attacked from below. One Yank scout fell away, out of control. Rick spotted the two Albatroses which had made the climbing attack and turned to intercept them. His first burst nailed one, and then, in a very un-Rickenbacker way, he hurtled on down to chase the other. This nearly caused a repetition of his lost-wing-cover episode, but he recovered in time to drive off another Albatros that was annoying Jimmy Meissner.

A short time later the 94th Squadron turned in their dainty Nieuports for the more rugged and faster-climbing but less maneuverable Spad.

By now his superiors recognized Rickenbacker as a very dependable officer, and he was made a flight commander. Now he had five pilots to worry about, but he accepted the added responsibility in good spirit. Those who served with him remember Rickenbacker for his leadership and his concern for their safety. Had he been able to play the free-lance role

(Continued on page 82)

guidance system experts through ERCO training devices



The guidance system of a missile is critical to its purpose—without the system—or without intelligent handling of the system's equipment there is no effective weapon.

The military must train its "unskilled short-term" personnel to operate and maintain this system—and the question arises . . . How?

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longer, he would doubtless have run up an even more impressive score—one that would have ranked him with the top German and British aces who had many more months to compile their victories.

But Rickenbacker had other handicaps. Shortly after becoming an ace, he caught a severe cold which resulted in an ear infection. The ailment necessitated a mastoid operation, and as a result he was grounded until September 14. He was out of combat more than fifteen weeks, and few who knew Rick's condition believed he would ever fly again. However, once he recovered and got back into action, he managed to score almost daily until the war ended on November 11.

It was during the St.-Mihiel drive in September that Eddie finally got back into stride. The weather was bad, but on the fourteenth, Rick and Chambers went over on a strafing mission and brought back some important information on the progress of the battle. While across the German line they were attacked by members of Baron Manfred von Richthofen's "Flying Circus." By stunting their heads off to escape, the pair not only broke clear but somehow cut off a German Fokker and with a short snapshot, Rick shot it down.

The episode for which Rickenbacker was to receive the Congressional Medal of Honor took place on September 25, the same day he was named Squadron Commander of the 94th. On single patrol over France, Eddie spotted two Halberstadts and was about to go after them when he caught sight of five Fokkers directly above them. Changing his course, he went up into the sun, nosed over fast, and caught one of the Fokkers. Instead of zooming on to clear, he flew through the Fokker formation and tackled the two-seaters beneath. Rick's first burst put the leader down in flames, though the rear gunner peppered the Spad.

The next day Rick had another hairy experience. His flight was ordered to attack some balloons that were spotting for the opening of the Argonne drive. He had Cook, Chambers, Taylor, Coolidge, and Palmer with him. Rick's plan called for three Spads to take on one of the two balloons between Brabant and Dun. His flight potted both balloons before Eddie himself could fire a shot, so he went after another he remembered seeing near Damvillers. But it just wasn't Rick's day for balloons. He found someone else had already torched this new target, so he slipped into a cloud to try to trap an unsuspecting Jerry. To his amazement he found himself flying wingtip to wingtip with a Fokker. They turned together, exchanged shots, made a few maneuvers, and finally Rickenbacker scored with a long burst that raked the German's fuselage.

Almost immediately the Hisso engine on Rickenbacker's Spad began to vibrate badly. He watched the German go down, then turned his attention to his own problem. He headed for home, but the engine continued to act up, and he barely made it. On landing he found the German had shot a piece off his propeller.

And so the war went for Captain Eddie—a balloon on September 28, another on October 1, a Fokker and a Halberstadt the next day, and an L.V.G. and a Rumpler on October 3. He bagged another balloon on October 9, a pair of Fokkers on the tenth, a balloon on the fifteenth, a Fokker on the twenty-second, another the next day, and still another pair of Fokkers on October 27. His last two victories, bringing his string to twenty-six, came on October 30, when he downed an enemy balloon and a final Fokker.

Then came the Armistice. Rickenbacker took his homecoming and his hero's welcome calmly—and went back into the automobile business. A company was established to make a car called the Rickenbacker. On its radiator shell gleamed the old 94th Squadron's insignia—the Hat-in-the-Ring trademark. It was a good car but produced at the wrong time, and Eddie Rickenbacker found himself head of a bankrupt firm.

He became President of the Indianapolis Motor Speedway Corporation, and, while with the Cadillac Division of General Motors Corporation, he was active in the company's purchase of the control of Fokker Aircraft. Fokker, of course, was the brilliant Dutch aircraft designer, Tony Fokker, twelve of whose fighters Rickenbacker had shot down. Subsequently General Motors took control of the fledgling Eastern Air Lines, and in 1934 Rickenbacker was made General Manager. Four years later Rickenbacker raised the money to buy Eastern from General Motors, and today he is Chairman of the Board and General Manager of Eastern.

One episode, in 1942, during World War II, brought Rickenbacker's name dramatically back into the news. A plane on which he was a passenger was forced down in the Pacific. Rickenbacker and six other survivors sat it out for a harrowing twenty-one days on an open raft. Their story of courage and endurance, of unrelenting faith that they would be rescued, has become a classic. And through this ordeal, while the whole world waited for news, Rickenbacker, characteristically, in his quiet way, once again demonstrated the stuff of which heroes are made.—END

Captain Eddie and some of his fellow survivors enjoy first decent meal after their harrowing twenty-one days on a raft in the Pacific during World War II.

ABOUT THE AUTHOR

A veteran writer of aviation fact and fiction since 1927, Arch Whitehouse is a native of England who came to the US at the age of nine. During World War I, he served as a combat flyer, was twice decorated, and won a battlefield commission. During World War II, he volunteered for service and flew with the RCAF on North Atlantic patrols. Later, he went into Normandy with a Navy LST and moved with the troops on to Paris. He has written several books.

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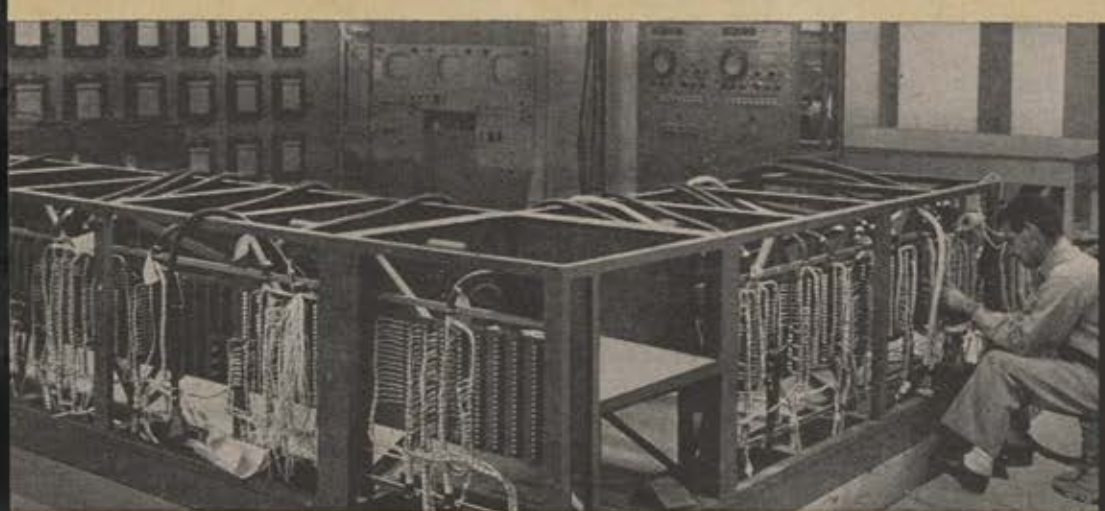

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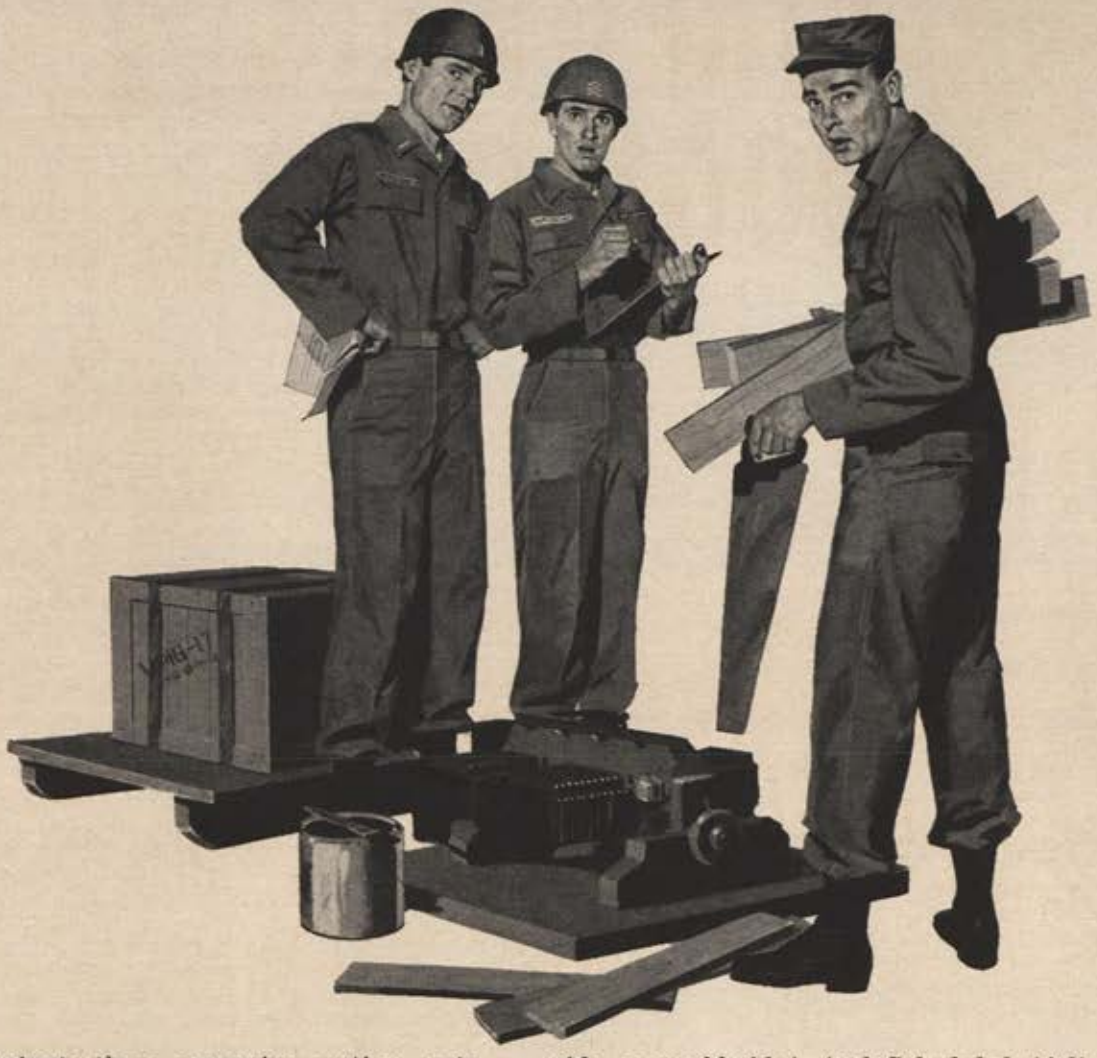

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AFA NEWS

SQUADRON OF THE MONTH

San Fernando Valley Squadron, Cited for

its publication, "Kiwi's Flight Log," a consistently fine bulletin which is at once an informational piece for the general membership and an excellent tool in the Squadron's public relations program.

The 1958 **Pennsylvania Wing Convention,** held at the Sheraton Hotel in Philadelphia, was highly successful. The luncheon on May 10, the awards banquet the same evening, and the "get acquainted" party the previous evening, were all well attended, and received good notice in the press. Unpublicized, but most gratifying, were the accomplishments of the two business sessions on Saturday, May 10. In Pennsylvania the business affairs of the Wing always take much of the members' attention, but this year there was an unusual amount of interest and participation.

The annual judging of the Squadron "scrapbooks," compiled by each unit, gave the **Pittsburgh Squadron** first place and it received the $100 first prize. Newest unit in the state, **Beaver Valley,** was the runner-up, and received $60.

Speaker at the luncheon was **William F. Hammil, Jr.,** Chief of Technical Services, Aviation Division of Philadelphia. Using Philadelphia's modern airport as his theme, Hammil spoke on the importance of modern air facilities for forward-thinking communities in the jet age. **Robert A. Carr,** Pittsburgh Wing Commander, presided.

Principal speaker at the awards banquet was AFA's President, **Peter J. Schenk,** who spoke on AFA facing the "Challenge of the Technological War." Preceding the address, five Wing awards were presented by National Director **Carl J. Long:** to **Gill Robb Wilson,** in the field of arts and letters; to **Martin Decker,** President, Decker Corporation, in the field of industry; to **Dr. I. M. Levitt,** Director of Fels Planetarium, for his contributions in science and medicine; to **Frank N. Piasecki** for his work in rotary wing aviation; and to **Middletown Air Materiel Area,** for military aviation. **Maj. Gen. George R. Acheson,** Commander at Middletown, accepted that award.

At the final business session **Chester A. Richardson,** Pittsburgh, was elected Wing Commander for the coming year. Other elected officers included **Joseph Dougherty,** Philadelphia, Vice Commander; **Cliff Zipf,** Pittsburgh, Secretary; and **Robert Greene,** Harrisburg, Treasurer.

The entire Convention committee, composed of Philadelphia Squadron members under the direction of **Sally Downing,** Commander, deserves commendation for a splendid program.

Omaha's **Ak-Sar-Ben Squadron** has announced the successful conclusion of its annual membership campaign, under the leadership of **Arthur C. Storz.** Setting a goal of **2,000 members** at the outset of the drive, Storz advises us that he has **gone over this mark** by at least two hundred—perhaps even more. The full total won't be known until after this issue goes to press.

While the great majority of the members came from the community, **SAC Headquarters** at Offutt AFB pitched in again in fine style, and produced over eight hundred of the total. Contributing to the enthusiasm at Offutt was the challenge by the Ak-Sar-Ben Squadron, which offered to buy a $250 aluminum boat for every 125 memberships brought in by the Offutt membership team. These boats will be formally presented to the base later in June, for the exclusive use of the SAC personnel stationed there.

This is the fourth successive year the Omaha AFAers have staged this

(Continued on following page)

Maj. Wm. Jones, Hensley AFB, Tex., accepts AFA trophy from Alex Morphonios for placing first in the 14th AF Navigation Competition in Miami.

AFA President Peter J. Schenk accepts Nebraska Wing check for Space Education Foundation from Art Storz as AFA's Frank Sorenson, John Markel, and Walter Black look on.

Pittsburgh Squadron's Falcons listen intently to Robert Carr, Squadron instructor, during regular meeting of the group, held after school at Hamilton Junior High School.

A new and welcome member of the California Wing is US Representative Clair Engle, who has joined the Chico Squadron. Greeting him are Tom Mason, center, and Dr. Harold Parker. Tom Mason heads AFA's Chico Squadron.

At right, taking a look at a model of the Philadelphia airport is AFA President Schenk. With him are Sally Downing and William Hammil. Model was built by the Falcons.

drive, and it has kept the Squadron at the top of the AFA units for that for many years.

Delegates to the annual **California Wing Auxiliary Convention** in April awarded to two high school teachers $50 scholarships to assist them in attending an education workshop this summer. This is the program for which the Auxiliary Units decided to increase their individual dues last fall, advises **Mrs. Helen Dix,** Tarzana, newly elected Auxiliary President for California. The teachers chosen were **Glen York,** Culver City High School, and **Stanley H. Manro,** Tulare High School.

The annual awards banquet featured the presentation of a trophy to **Mrs. Fen C. Taylor,** Woodland Hills, an engineer, as **"Airpower Woman of the Year,"** and another to the **San Fernando Valley Auxiliary Unit** as the outstanding unit of 1957. This is the second year the unit has been recognized, having been previously selected in 1954. A third award was presented to **Mrs. Bob Cummings,** appropriately inscribed: "For her contributions to airpower through Bob."

In addition to Mrs. Dix, the other officers elected included **Mrs. Merle Henderson,** Venice, Vice President; **Mrs. John Beringer,** Pasadena, Secretary; and **Mrs. Tom Fehr,** Covina, Treasurer. Final item on the agenda was the selection of **Sacramento** as the site for the 1959 Convention, and the naming of **Mrs. Eli Obradovich,** Carmichael, President of the Capital City Unit, as Auxiliary Convention Chairman.

On April 1, the **Vandenberg Squadron,** Detroit, announced its first Civil Air Patrol model airplane contest, open to CAP cadets throughout the state. All entries were "U-line" controlled, and the finals were held April 27 in Grand Ledge, Mich. Four cadets, including one girl, were chosen winners in their respective classes.

On June 13, these youngsters were guests of the Vandenberg Squadron on a tour of Detroit, including a trip to the Ford Motor Company plant. They met **Mayor Louis Miriani,** were the personal guests of the Selfridge AFB Commander at a luncheon and for a tour of the base, and then were guests of honor at a banquet at the Officers' Club that evening, where their awards were presented to them by **Russell Lloyd,** Vandenberg Squadron Commander.

This is a fine program and deserves a tip of the AFA cap to the Contest Committee, composed of **John Mort, Mitchel Souligney, John Morley,** and **Paul Marneef,** all AFA Squadron members.

Immediately following its 1958 Wing Convention, the **California Wing** has announced its full program of events for the next twelve months—a fine start for AFA's biggest and most active state. Congratulations to Wing

(Continued on page 89)

Kansas City's Mohawk Squadron sponsored an ADC display in the Sears Roebuck store for two weeks. Shown here looking it over are Dick Green, Vice Cdr.; Sears's Superintendent Gilbert Clark; and Maj. Gen. Jarred Crabb, CADF Cdr.

COMPUTERS

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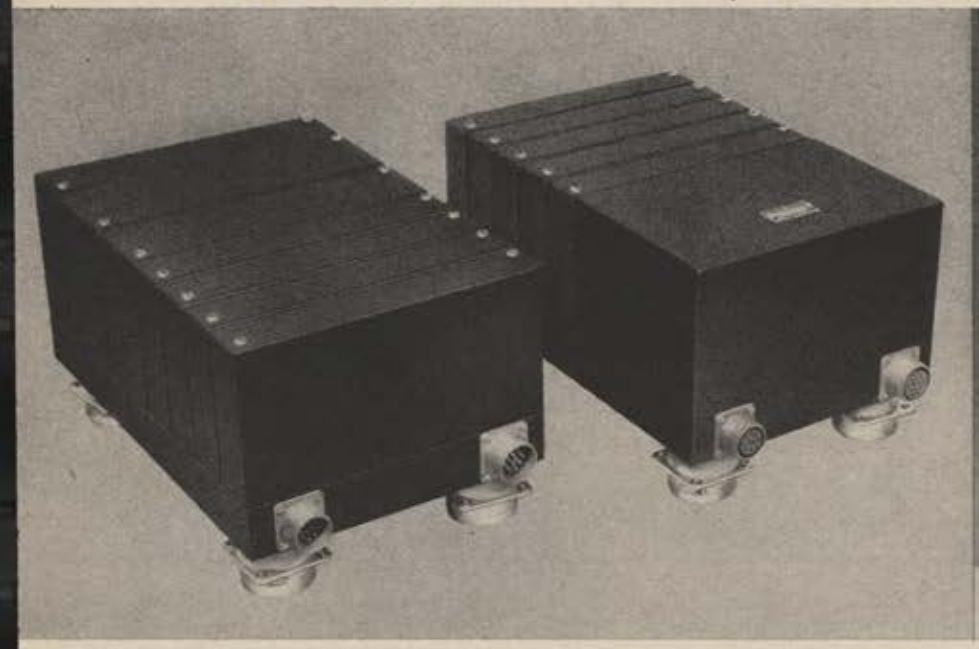

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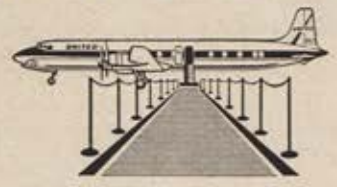
No wonder connecting airlines route so many of their passengers via United. United offers weather-mapping  radar on every plane. Luxurious Red Carpet* Service  on DC-7s. Exclusive DC-7 Custom Coach flights with  hot meals included in the low fares. Convenient schedules along a Main Line route  covering 80 cities coast-to-coast and Hawaii, with over 800 flights each day.

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UNITED AIR LINES

Commander **Jim Snapp** and his fellow officers on this excellent opening of a new year.

First event on the annual program is a Wing Board meeting on June 14 in San Diego. Other Board meetings are scheduled for Pasadena on November 8; Fresno on February 21, 1959, and in Sacramento on May 1, 1959. The November meeting will also comprise the annual mid-year conference which has in recent years grown to the proportions of a Wing Convention; while the Sacramento meeting will be held on the first day of the 1959 Wing Convention, planned for May 1-3.

Of interest to all AFA units is the announcement made at the Dallas Board meeting by **President Schenk** regarding the newest addition to the Headquarters staff. **Louis J. "Chick" Ciccoli,** Executive Secretary of the **Arnold Air Society,** has been added to the Organization Department, and will assist in the many details of this operation. For approximately five months of the year, while the nation's colleges are closed for summer vacation, Chick will spend full time on AFA matters. In the remaining seven months, when he travels on Society matters, he will combine his trips with AFA visits. This gives us a closer relationship with the Society, which is AFA's junior affiliate, and allows us to work much more closely with our Wings, Squadrons, and Flights.

Ciccoli is a retired USAF lieutenant colonel, having served most recently as Assistant Dean of the College of Military Science at the University of Maryland. He has been with the Society since January 1956, and, since AFA and AAS maintain a close working arrangement, Ciccoli is very familiar with AFA problems and programs, and has assisted us with several conferences, conventions, and like programs.

We welcome Chick to the staff. We think you will, too, when you have an opportunity to shake hands with him on one of the many trips he has planned.

CROSS COUNTRY . . . . When the new **Civil Aeronautics Administration Center opens** officially in **Oklahoma City** on June 22, a "time capsule" is to be buried. Included among the items to be sealed until June 1978, will be a copy of the **March issue** of AIR FORCE Magazine, "The Space Weapons Handbook." National Director **Hardin Masters** has charge of this. . . . New York's **Niagara Frontier Squadron** sponsored a most successful "Get Acquainted Night" recently, when more than eighty representatives of the Squadron, the Wing, and area aviation industries gathered for cocktails, dinner, and then heard Wing Commander **Bud West** outline the airpower partnership of AFA and the aviation industry. Chairman of the program was **C. W. Walters,** the Squadron Commander.

—GUS DUDA

Make Your Reservations Now for AFA's 1958 Convention in Dallas

Three of AFA's major Convention hotels, Statler Hilton, Adolphus, and Baker, are "sold out," except for a few double rooms and some one-room parlors at the Baker. Nice air-conditioned rooms are available at the other hotels listed to the right, as well as the Stoneleigh and Melrose Hotels, which are a short cab ride from the other hotels.

More than 1,500 rooms and suites have been reserved, and reservations are still pouring in. In order that you won't be disappointed, we suggest that you send your reservation request without delay. It is already evident that AFA will use all of Dallas' first-class hotel rooms.

Major Convention events will be held in the new Auditorium; AFA business sessions at the Adolphus Hotel; Reserve Forces Seminar at the Baker.

The Dallas Hotel Association operates AFA's Housing Office. All requests for rooms *must* be sent to the following address:

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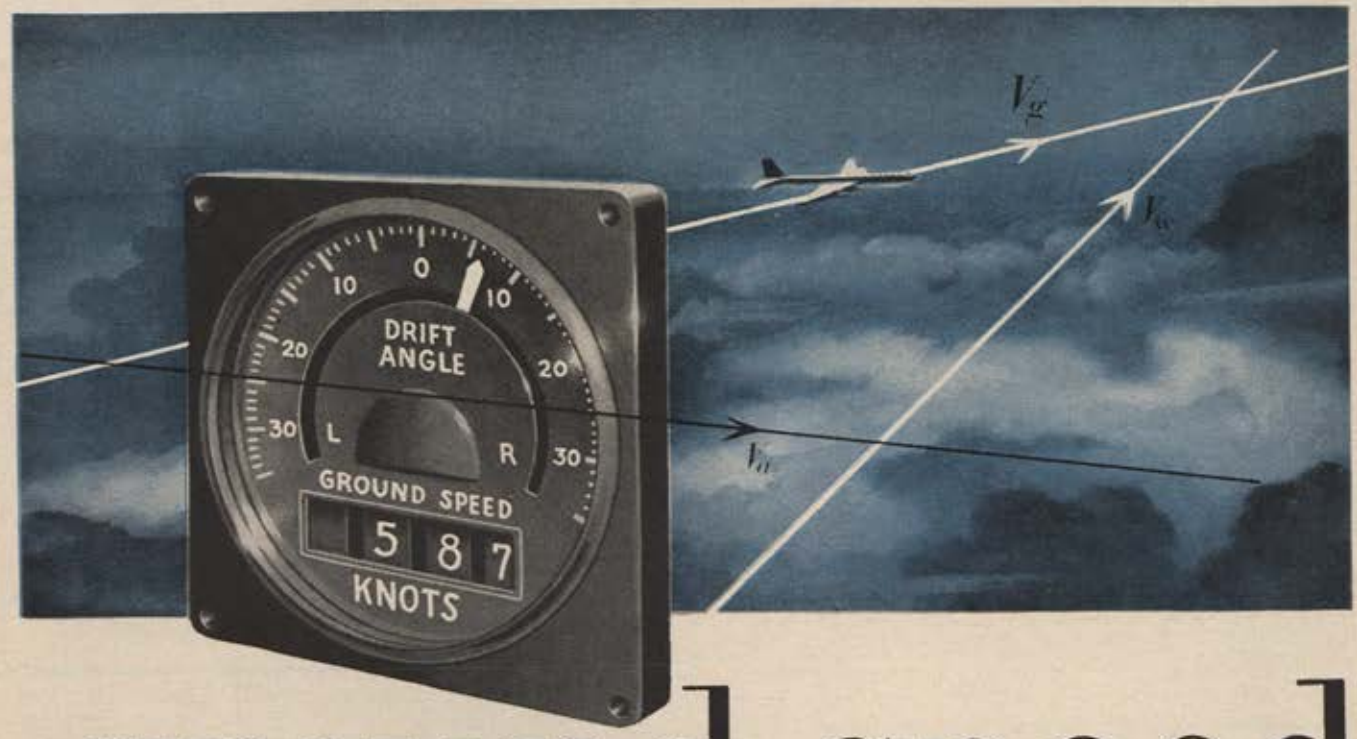

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Missiles in Soviet Strategy

By Dr. Raymond L. Garthoff

The Soviet announcement in August 1957 of their successful tests of an intercontinental ballistic missile (ICBM) called the world's attention to the Soviet missile program. The launching of the first artificial satellite of the Earth in October 1957 dramatically underscored the earlier Soviet announcement on the rocket. Both were but the latest and most publicized of many indications of the extensive and advanced character of Soviet rocket and missile development. What is the role of missiles—in particular, of long-range ballistic missiles, the IRBM and ICBM—in Soviet military strategy?

LONG-RANGE ballistic rockets are, as the Soviets recognize, "intended for firing against strategic targets disposed in the deep rear of the enemy. . . ."

More specifically, enemy air bases and missile-launching bases are indicated to be in the category of strategic targets considered particularly appropriate for rocket attack. The strategic role of missiles is, thus, to an extent merely assignment of an additional capability to implement the strategic concept of achieving military victory by destroying the enemy's military forces located at distant and intercontinental ranges. But there is also a peculiar role of long-range missiles extending beyond that of other weapon systems. It is this distinctive mission which makes it useful to consider the role of missiles in Soviet strategy separately from land, air, and seapower (each of which employs appropriate guided missiles and rockets in defensive and offensive forms as a part of their now "conventional" armament).

Deterrence is the mission to which the Soviet leaders have "assigned" long-range ballistic rockets (and also, apparently, part of the submarine missile-launching capability). Soviet commentaries on their ICBM, including remarks of Khrushchev, have reflected clearly this Soviet concern for a "deterrent" against the United States, and their reliance on ballistic rockets as such a deterrent. There are, of course, no hard and fast separations of missions, and in a very real sense *all* the Soviet armed forces serve in part as a deterrent.

Likewise, the military forces in general, but the long-range ballistic missiles in particular, serve as the basis for actions to deter and to pressure *others*, that is, for *blackmail*. This *offensive* political use of the new missile capability thus complements the *defensive* value of the weapons for deterrence. But the reasons behind the special role for long-range ballistic rockets in these non-hostilities "cold war" missions lie in the peculiar advantages—and limitations—of the weapon system. Both for this reason, and to delimit more clearly the role of long-range missiles from that of long-range aviation, it is desirable to note the Soviet views on the relative advantages of each.

In a number of public statements in the fall of 1957, most notably those of Khrushchev and Marshal of Aviation Vershinin, the Soviets claimed that ballistic rockets make bombers "obsolete." Khrushchev used the term "obsolete," and declared that: "The present period is something of a turning point. Military specialists believe that airplanes, bombers, and fighters are in their decline. Bombers have such speeds and altitudes that they are vulnerable to attack by contemporary rockets." He also declared: "Fighter and bomber airplanes can now be put into museums."

Marshal of Aviation Vershinin more soberly presented the military evaluation which Khrushchev characteristically exaggerated. Vershinin, after noting the abilities of the ICBM to strike any point on the globe, declared: "Under contemporary conditions, of course, bombers also are being built. The USA especially is basing itself on that form of weapon. But rocket weapons now impugn the expediency of development of bomber aviation, since rocket weapons are more reliable and more certain." In particular, Vershinin points out, "For rockets it is almost excluded that they would not get to their targets. Contemporary means of air defense are ineffective in combating these rockets."

The theme that bombers are vulnerable to air defenses, while ballistic rockets are not, runs through the various military and political commentaries which have followed the Soviet ICBM development and announcement. In part, of course, this view is disseminated because of the advantage to Soviet propaganda of claiming superiority in a weapon which, it is said, makes obsolete the weapon in which the United States is admittedly stronger. In fact, it is probable that the *actual* evaluation of the Soviet military leadership is less extreme. For there has been a definite recognition by competent Soviet military technicians and specialists of the continuing importance for some time of manned and unmanned bombers as well as ballistic missiles.

Beyond the statements stressing deterrence, the Soviets have revealed their evaluation of the specific military advantages—and limitations—of ballistic missiles. Thus, for

(Continued on following page)

example, Lieutenant Colonel Tiurnin noted (in early 1957) four particular advantages of guided and ballistic missiles over bomber aviation: (1) the possibility of using mobile launchers, (2) the all-weather capability of guided missiles, (3) the opportunity for the use of missiles even under conditions of hostile general air superiority, and (4) the possibility of launching surprise blows from concealed launching points.

In the general Soviet view, at least as expressed prior to the definite Soviet acquisition of the ICBM (and hence as uncolored by the present propaganda emphasis on the rockets), the role of bombers will decline for certain missions but remain for others. The ICBM and IRBM will assume the burden of attacks on stationary strategic targets such as cities and industrial complexes, and operational targets such as known enemy air bases. Thus Major General of the Engineering Technical Services G. I. Pokrovsky, an authoritative military technologist, as early as March 1955, wrote in the semi-classified General Staff organ *Military Thought* that "the destruction of targets the coordinates of which are known in advance will more and more be accomplished by pilotless weapons armed with atomic and thermonuclear warheads."

Again, in the fall of 1956, General Pokrovsky spoke of this new important role for ballistic rockets in particular. But he also noted that for some important missions the ballistic missiles were not suitable, and that guided missiles and conventional bombers would continue to be necessary for these roles. In his words: "Long-range rockets can only destroy targets the coordinates of which are known in advance. They cannot destroy mobile targets. For this, self-seeking guided missiles or piloted weapons are needed, since a man can pilot or guide by remote control, observing combat targets beyond the battlefield with the aid of television." General Pokrovsky has subsequently (in 1957) reiterated that the future employment of ballistic missiles will be against "targets previously known and precisely located on the map."

Bomber aviation, and guided missiles or pilotless bombers, will in the Soviet view thus continue to have important roles. Again, Major General Pokrovsky has stressed this in a commentary made *after* the Soviet ICBM. The main role of bombers will probably be to find and attack targets not previously identified or precisely located: the traditional mission of armed reconnaissance. And probably still considered valid, in manned bomber systems: "Aviation guided missiles [air-to-surface missiles] can be employed for operations against strategically important targets having strong air defenses."

On the whole, however, the role of long-range bombers will probably be what it has been in the past; to serve as the far-reaching military arm to be employed, in conjunction with all other arms of the military forces, against the armed forces of the enemy.

In discussing the current Soviet evaluation of the relative roles of the ICBM and bomber aviation, it may be useful to note that the apparently continuing Soviet evaluation was first made in the immediate postwar period, prior to the virtual ban on discussion of missiles which prevailed from 1947 until late 1953. Major General of Aviation Tatarchenko was the first to raise the question, in an article in the official Air Forces' journal, in 1946. He posed the issue flatly: "Can long-range rockets replace bomber aviation?" And he answered:

"An underestimation of this new mighty means of missile warfare would be a fatal mistake. To even a moderately educated person it must be clear that this new weapon in 1944-1945 appeared in an extremely primitive early form. One can hardly doubt that it will in the future develop significantly further. *But does that mean that long-range bombs will completely replace the bomber in the air? Of course not!* As the battleship did not replace the cruiser, nor the minelayer, nor the cutter, nor even the rowboat, similarly even the most grandiose development of rockets will not eliminate the necessity for any class of aircraft, least of all high-speed giant aircraft, bomber, and transport.

"High-speed giant aircraft are the foundation of strategic aviation. Missions of this form of aviation are extremely varied and cannot be accomplished with rocket bombs alone. *Rocket missiles are a means for destroying stationary targets which occupy considerable area. The realm of use of rocket missiles is fairly specific. Strategic aviation resolves many times more universal missions.*"

While these may have been Tatarchenko's own ideas, there are indications that these views in general probably represented the attitude of the Soviet Long-Range Air Force staff at that time. Marshal of Aviation Skripko, then Deputy Commander of the Long-Range Air Force, stated in *Red Star* later in 1946: "It is entirely obvious that with the contemporary level of technology the operation of formations of long-range aircraft with well-trained crews will without doubt be more effective than the dispatch of 'blind missiles' alone. Strategic aviation will develop along with the appearance of new weapons." In part, of course, the Soviets may not have foreseen the potentialities of rockets in 1946 (though Tatarchenko was one of the very few who at least attempted to!). Even as late as the fall of 1954, Engineer Lieutenant Colonel Safonov noted in the Air Forces' journal, without giving any sign of disagreement, that foreign sources had said that "even in 1960" ballistic missiles "will have a range not exceeding 500-600 km." and cruise-type guided missiles "not over 1,000 km." range.

The fact that this statement was so obviously a gross understatement is curious and interesting, especially in view of its appearance in late 1954. Colonel Safonov then concluded with a statement which would appear to be at variance with Western calculations of the implications of high-yield weapons for requirements of accuracy, unless gross errors indeed are expected: "An atomic missile, as a big expensive weapon, must be delivered accurately on the target."

But still more curious was the appearance as late as January 1957 of a repetition of the idea that "nuclear, and especially hydrogen, weapons" are so expensive that they must be accurately delivered. Nonetheless, Soviet advances both in rocketry and in nuclear weapons design had evidently led them by late 1957 to conclude that for stationary, known targets ballistic missiles are sufficiently accurate to be the most expedient weapon. Bomber aviation will continue, even after ballistic rockets are available in sufficient operational quantities, to play an important role in attacking untriangulated, mobile, and fleeting targets, particularly the enemy's military forces.—END

ABOUT THE AUTHOR

Dr. Garthoff, a long-time specialist on Soviet affairs, spent seven years with the RAND Corp., in that field, and is a graduate of Princeton and Yale. Readers will remember his comprehensive article, "How the Soviets Organize Their Airpower," published in February 1958 AIR FORCE. *The selection above is excerpted from a chapter of his forthcoming book,* Soviet Strategy in the Nuclear Age, *which covers numerous other phases of the Russian approach to present-day warfare. Dr. Garthoff lives in Washington, D. C.*

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Maj. Gen. Bernard A. Schriever, Commander, Ballistic Missile Division, and Brig. Gen. Don Flickinger, Director, Directorate of Life Sciences, ARDC, made significant statements on Air Force space age plans at the Illinois Wing Missile Age Conference *and Oklahoma City* Frontiers of the Space Age *meeting (see page 65). As a service to readers,* AIR FORCE *reprints condensations.*

USAF Planning for the Space Age

Maj. Gen. Bernard A. Schriever

THE past twelve months have been marked by unprecedented advances in science and technology, both at home and abroad. We have only to recall that during the past year the American public has been made keenly aware of Soviet ballistic missile flights, our own ballistic missile flights, Sputniks, Explorers, and the Vanguard.

Taken together, these have fostered a new climate of concern with outer space vehicles and travel, and the Air Force, through the research and development efforts of the Ballistic Missile Division, is helping to open up new frontiers in space technology. To put what we are doing in perspective, let me very briefly summarize the areas of our responsibility.

Our job involves management supervision of four major weapon systems programs. Our first mission has been the design and production of Thor, Atlas, and Titan. We are now also deeply involved in research and development for the Air Force satellite system, for lunar probes, and for the Minuteman ballistic missile.

In moving toward these objectives, we have had successes and setbacks. We have had our share of triumphs and our share of troubles. We have had our difficulties, and all our problems have not yet been finally solved. We anticipate further difficulties and problems as operational testing increases in intensity and scope. We also feel confident that we will continue to overcome whatever obstacles may arise. In any event, then, here is that check list:

- The flight-test aims of the Thor missile are being accomplished in a way that closely follows or beats a schedule laid down thirty months ago. An Air Force Thor missile has flown [on October 24, 1957] 2,400 nautical miles, or 900 miles in excess of its designed range, and production of the complete Thor weapon system is going forward at an accelerated rate. As a result, plans call for the first Thor squadron, equipped with fifteen missiles, to be deployed to operational sites in the United Kingdom before the end of this year—or just thirty-six months after this project was begun.
- A strong start has been made toward further extending the missile art by means of a new refinement known as "Project Able." Able illustrates the way in which existing hardware can be readily modified and adapted to several new spaceflight purposes. Moreover, Able is a prime example of interservice cooperation in exchanging ideas and coordinating talent and facilities. For in its first stage, Able uses an Air Force Thor missile as a booster, and in the second stage, it uses a Vanguard engine developed by the Aerojet Company for the Navy. This Air Force engine has been especially modified for the Ballistic Missile Division by the Ramo-Wooldridge Space Technology Laboratories. Able will provide us with vital high-speed reentry test data required in the design of more advanced nose cones for Thor, Atlas, Titan, and Minuteman, and will provide us with completely new information in the field of biomedicine. In the months ahead, as each Project Able missile is tested, it will carry a mouse in the nose cone. We expect the mouse's reactions will tell us a lot about the effect of spaceflight on living organisms. We will be gradually replacing such mice with more complex animals until, step by step, we have learned enough to make it safe to put man into space early in the 1960s.

Under direction of the Advanced Research Projects Agency, Able will be among the first US moon vehicles through which we can investigate and appraise many new phenomena in space travel. To put such a vehicle in the vicinity of the moon, 240,000 miles away, we need powered flight for only about the first 500 miles. After this, the missile coasts toward the moon. It will coast for two days. At the end of these two days the missile will have slowed down to a mere 500 miles an hour in contrast to its early initial speed of nearly 15,000 miles an hour. These experiments can provide us with the information on cosmic rays, atmospheric pressure, gravitational, electronic, and magnetic fields previously unattainable. Once you do these things, you open the way to some rather astounding possibilities.

You could, for example, put telescopes into space where lenses would not be blurred in the attempt to see through the Earth's dense atmosphere. One authority in studies of the sun has said that it would be possible to get an entirely new type of space spectograph which could enable us to acquire new knowledge about heavy element thermonuclear reactions in the sun—and that this knowledge could result in some remarkable forward strides in

(Continued on page 96)

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There's a waiting period before payments start—90 days for groundings due to disease or nonaviation accidents, 180 days for groundings due to aviation accidents—because unless your grounding exceeds these limits you can collect back flight pay from the government by putting in the required flight time.

But if your grounding exceeds these limits, the AFA plan not only thereafter provides regular indemnities for lost flight pay, *but indemnifies you for lost flight pay retroactively,* covering the 90-day or 180-day waiting period in the first payment, at the rate reported on your insurance certificate. For example, one colonel, *grounded, got $1,225 indemnity for lost flight pay in his first check.*

Of course, this coverage does not apply in case of war, declared or undeclared, or hostile action, civil war, invasion, or the resulting civil commotion or riots. There are also other exclusions, which may never apply to you, but you are entitled to know them. These exclusions are as follows:

The plan does not cover persons whose primary duty is parachute jumping.

The plan does not cover losses due to a criminal act of the AFA member, or resulting from bodily injury occurring while in a state of insanity (temporary or otherwise); or from mental or nervous disorders; or from officially certified "fear of flight"; or caused by intentional self-injury, attempted suicide, criminal assault committed by the member, or fighting, except in self-defense; or from failure to meet flying proficiency standards unless caused by or aggravated by or attributed to disease or accident; or accidents caused while riding or driving in any kind of race; or by alcohol, drugs, venereal disease, arrest or confinement; or by willful violation of flying regulations resulting in suspension from flying as a punitive measure; or 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 accident or disease; or voluntary suspension.

The plan does not cover losses to any member resulting from 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. Loss of life shall not be deemed as a loss for purposes of this plan.

In the event that you receive the total limit of twenty-four (24) months' indemnity for loss of flight pay due to aviation accident, or twelve (12) months' indemnity for loss of flight pay due to accident other than aviation accident or to disease, your coverage is automatically terminated. You may thereafter reapply for insurance coverage in the same manner as a new member. Coverage, and the payment of indemnities, also end with the termination of membership in the AFA, or with resignation, retirement, or pensioning from the service, or at age sixty.

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Policy Form No. 1-620-3A.

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55 Elm Street, Hartford, Connecticut

SEND REMITTANCE TO AIR FORCE ASSOCIATION, MILLS BLDG., WASHINGTON 6, D. C.

(Please Print) Rank Name

Serial Number Years Service for Pay Purposes

Mailing Address

Amount of Annual Flight Pay

I certify I am currently on flying status and entitled to receive incentive pay, and that to the best of my knowledge I am in good health, and that no action is pending to remove me from flying status for failure to meet physical standards. I authorize AFA, or AFA representatives, to examine all medical records pertinent to any claim I may submit.

Signature of Applicant Date

☐ I want to join AFA, $6 dues enclosed.

Application must be accompanied by check or money order for annual premium. The annual premium charge is two percent of ANNUAL flight pay.

both the military and civilian uses of thermonuclear power.

● Our planned short-range Atlas flights, up to a distance of some 600 miles, have been conducted regularly at Cape Canaveral, Fla., where full-range flights up to 5,500 miles will begin soon, all of them on a progressive timetable laid down more than forty months ago. From the very outset of our ballistic missile program, we have been meeting our flight-test objectives at a gratifying rate. We hope to have operational capability of the Atlas some months before the time thought possible by the distinguished Von Neumann Committee of scientists which, back in 1954, first established the feasibility of the ICBM.

● Our Titan ICBM will be ready for flight testing at the Air Force Missile Test Center in the near future. The Titan was conceived as a backup missile for the Atlas to give us an alternative approach in achieving an ICBM capability. Initiated a year later than the Atlas, the Titan is the beneficiary of the concepts, techniques, and procedures which have contributed so importantly to the success of the Thor and Atlas programs. When it becomes an operational part of our Strategic Air Command, the Titan will be launched from underground sites which incorporate everything we have learned up to now in affording protection against nuclear attack.

● Our first launch facilities at Cooke AFB in California, including stands, blockhouses, photographic and tracking equipment, will be completed by early this summer. Crew training in the launching and logistics of both Thor and Atlas will be well under way at Cooke by late summer of this year. Construction has already begun on a new Pacific Coast range which will enable us to fire our missiles out over the Pacific with the same accuracy we now enjoy in our Cape Canaveral flight testing out over the Atlantic. Another Air Force ballistic missile base near Cheyenne, Wyo., will soon be under construction. Two more such bases have been selected—one near Omaha, Neb., and another near Spokane, Wash.

● The Minuteman solid-propellant ICBM program is emerging from the embryo paper proposal phase into full-fledged research and development. Our hope is to push this program forward as rapidly as the technical state of the art will permit. We expect to have research and development contracts in the hands of selected contractors by the end of this summer.

The foregoing check list, highlighting major items in our record over the past year, shows some very substantial forward steps, always taking into account both our victories and defeats.

We must recognize that the only thing we can be sure of in the military picture is that technical changes will continue at an ever accelerating rate. Thus the criterion of success for a military service has become the ability to conceive, to develop, and to operate weapon systems which take the fullest advantage of scientific and engineering advances.

This means that the weapon system we set out to design today has to be based on accurate forecasts of what operational requirements are going to be four to ten years from now. With these requirements in mind, we must then design the over-all weapon system in such a way as to gain the maximum benefit from anticipated improvements in the performance of the weapon system as a whole, as well as in its individual parts, during, say, the entire four-year period of development. The essence of this approach, in our case, is that there must be projection of the state of the art as it will exist four years in advance of freezing a weapon design, together with action to bring along simultaneously all the elements of our program so that they would be ready, at each successive stage, to be fitted into each other as required.

This has been done in our Air Force ballistic missile program. For example, when we started out four years ago, we did not have a reliable rocket engine. To be sure, we did have some test engines, but they were not very good. Based on development experience, we had every reason to believe that, by means of constant experiment and testing, we would be able to come out with a reliable engine. We therefore decided to go ahead and design the entire missile—including airframe and guidance—around what we believed that engine would be four years in the future.

Similarly, back in 1954, the warheads in existence would have required a gigantic missile to deliver them to the target—a vehicle weighing up to as much as a million pounds. However, using the same theory and principles upon which existing warheads had been produced, we were confident that a much smaller and lighter warhead, delivering a sizable megaton yield, could be ready for use on the ICBM at the same time the engine, airframe, and guidance systems would be ready.

The weight and size of this projected warhead became one of the principal design factors. The combination of such projections made possible the design of a missile one-fourth the size than otherwise would have been required had we designed it around the engines and warheads available in 1954.

We must continue to move ahead with the courage to take the necessary calculated risks. Otherwise we find ourselves equipped with obsolete weapon systems that invite national disaster.

A word about the future. In looking ahead to our future developments in missilry and other phases of space technology, we must temper imagination with realism and daring with objectivity. On this score, I think we should all keep in mind the criteria recently proposed by our Ballistic Missile Division chief scientist, Dr. Simon Ramo. He has pointed out that "we cannot be first and foremost in today's world in every aspect of science. In particular, in space technology, there are so many experiments that are practical to perform, so many attractive systems for military or peacetime applications, that can be brought into being, utilizing outer space, that any country with substantial resources choosing to work in this field must be expected to conceive and carry out some favored project ahead of other nations.

"Thus, if we send up many satellites, for worldwide TV relays, general navigation, communications, and mapping, and land instruments on the moon, and orbit around and take pictures of Mars, that still leaves to another nation during this same period the planet Venus, satellite systems to participate in weather predictions and control, and manned space stations. . . . Scientific experts can help by indicating how much can be accomplished at a given time and at a given cost. . . . But ultimately the people as a whole, through their elected representatives and their government officials, must make these choices."

In making these choices there must be the widest possible public discussion and debate over alternatives clearly defined and understood. This ability to choose alternatives is the cornerstone of our democracy, the core of our faith in freedom. Moreover, we affirm that the values and standards of freedom must be chosen voluntarily in the market place of ideas and never imposed by force on anyone.—END

Preparing Man for Spaceflight

Brig. Gen. Don Flickinger

THE conquest of space, its exploration and exploitation stand now as the last frontier for man to cross and certainly it represents perhaps the greatest scientific and engineering challenge that he has ever faced. The era of space travel was ushered in by the development of large liquid-fueled rocket engines which provided us with the tremendous energies needed to place objects in orbit around our Earth. Because of formidable total weight-to-payload ratio which obtains in our space vehicles using chemical fuels, we have thus far been able to place only relatively small and light objects in space. These have varied from six pounds to an estimated 1,200 pounds in the Russian Sputnik II.

As we increase our capability to put larger and heavier payloads into orbit with enough residual unexpended energy remaining to utilize in initiating the reentry maneuver, then we will approach the point in our exploration of space where man can seriously consider exploring space on a personal basis. Our job therefore as biomedical or bioastronautical members of the Air Force space technology team is to anticipate and resolve all major problems of human tolerance to the space-contained and vehicle-induced hazards and stresses to which our first space passenger will be exposed.

Let us look at some of these major biomedical problem areas as we have analyzed them and found some measure of confidence in the solutions we have already achieved (or hopefully, will have achieved when the vehicle is ready to carry our first man into space).

In an attempt to provide an easy integration of these biomedical problems into the knowledge of space travel, let me discuss them as they occur during an actual planned space mission.

- The establishment of spacecrew reliability in terms of their proven ability to accept spaceflight stresses, both physiological and psychological [*see* May '58 AIR FORCE], is a program itself of considerable magnitude which I can mention only in passing. However, we do expect to have our so-called premium men ready for this premium job.
- Ground-support facilities to provide all necessary control and monitoring of the occupant and his vehicle require no new knowledge but certainly new design and engineering concepts.
- During the launch and boost phases we have two major problems: emergency escape for our space pilot both from the pad and during the boost to orbital velocity. Second, the protection of the individual from the rather large G forces imposed as a result of tremendous thrust upward applied to the space vehicle.
- Provisions for escape appear well in hand for the major portion of the launch and boost periods. G-force protection can be afforded through positioning and protective garments. The work of Colonel Stapp [with rocket sled experiments], of course, has provided the key to the solution of these problems.

Once in orbit, we have two fairly formidable problems. The first of these deals with the fundamental question of simply keeping our occupant alive and functioning by providing a livable atmosphere in the vacuum of space. Man being inexorably dependent on his respiratory functions to keep him alive places a rather formidable problem on us to provide the continuous gaseous and pressure environment which he needs. On this problem, we are fairly confident of our ability to maintain this habitable environment for a period of forty-eight hours with a high order of reliability. This time factor is limited by the amount of weight we can carry into orbit and by the fact that our system of maintaining oxygen and carbon dioxide levels is dependent on replenishment rather than regeneration. Manned interplanetary travel for periods beyond ten to fourteen days must await more research and development to provide workable regenerative systems which we can utilize within our weight, volume, and power restrictions.

The second of these problems in orbit concerns the ability of the space traveler to function in a reasonably normal manner under the conditions of weightlessness, confinement, and isolation from normal sensory inputs to which he is normally accustomed. We know that weightlessness does impose unusual stresses upon normal functions such as eating and drinking and also that for prolonged periods we may run into even greater difficulties in the form of reduced or impaired circulatory and excretory functions. This, incidentally, is one problem area which we cannot simulate completely and therefore our final proving out of our predictions and solutions will take place during the actual first manned orbital flight. Cosmic rays and other space ambient radiations are potential hazards for which we do not have all the final answers, but for the exposure periods we do not consider cosmic rays to present any real obstacle or hazard.

The reentry phase, using the high-drag no-lift blunt capsule, presents a problem of trade-offs which resolves largely around the angle of reentry which our capsule makes with the sensible atmosphere. If our angle is too steep, we have intolerable decelerative G forces imposed on our space pilot, but on the plus side we have a smaller area in which to find and recover him. Also the total heat pulse imposed is of less degree than entering at a shallow angle, which gives us much better G-force time histories, but on the other hand increases considerably our problem of location and recovery.

The configuration of the reentry pattern is dependent entirely on how much and where in his orbit sufficient capsule velocity is destroyed to transfer it into a reentry cycle. The occupant will have little control over this pattern, but we have good assurance from our team members that the energy mechanics of this problem are well in hand. Certainly, with the protection available against both the heat and decelerative forces we look for no serious problem as regards this final phase of our space mission.

In summary, I would say simply that while we on the biomedical side do not in any manner underestimate the scope and complexities of our part of the total job to be accomplished, we nevertheless do feel that when the reliable space vehicle is ready, so will be our first space passenger.

The challenge of space travel is a great one but, like other major challenges which man has faced, the rewards also may be great. If man, in conquering space, can apply the knowledge so gained toward a better world for future generations to live in, then all of the time, money, and effort will have been well expended.—END

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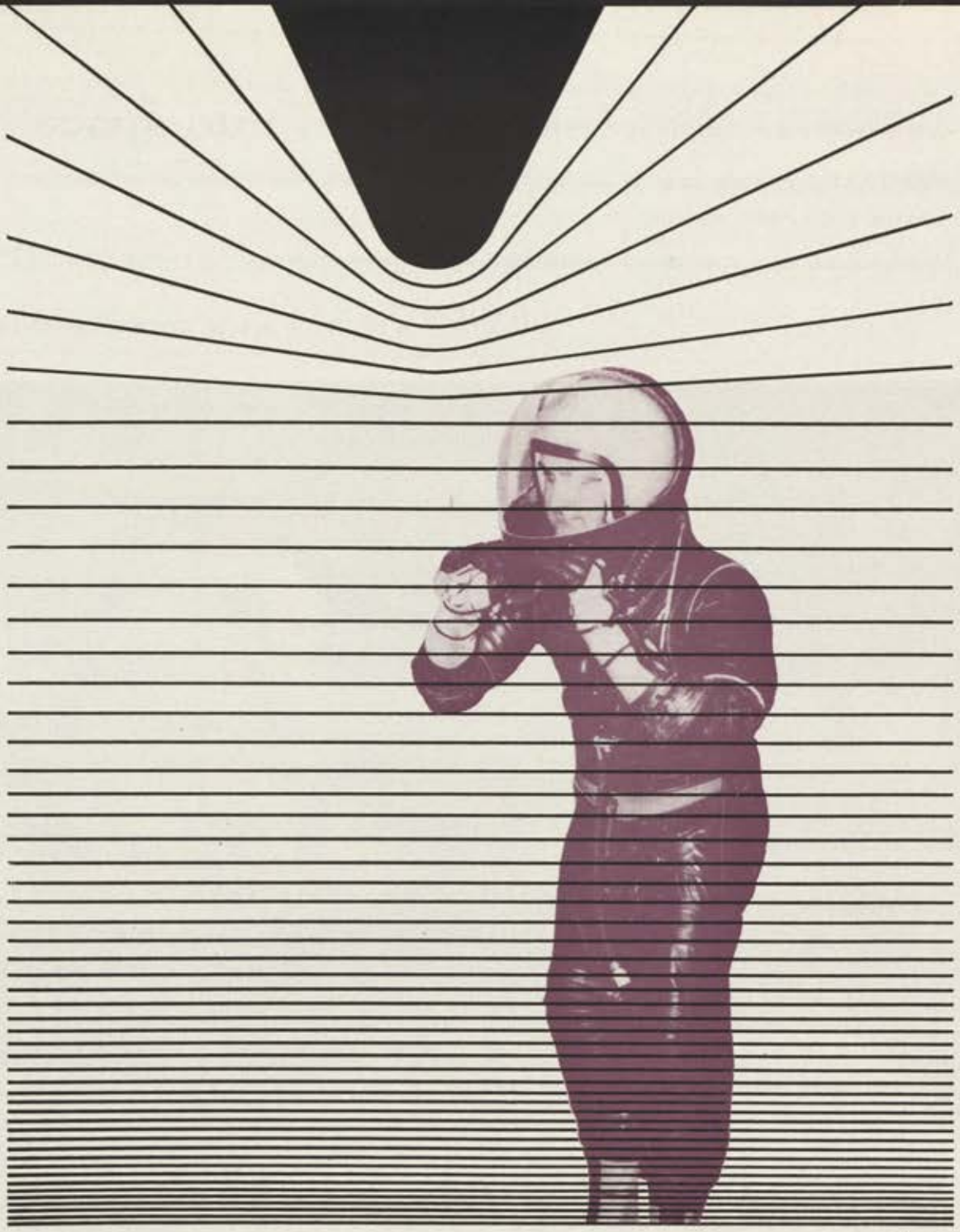

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