MAY 1958 / 50c

AIR FORCE

• The Magazine of AMERICAN AIRPOWER / Published by the Air Force Association

ALSO IN THIS ISSUE:

The President's Plan for the Pentagon • Blueprint for Tomorrow's Spacecrews

Special Report: The Antimissile Muddle

backing up the SOCK in SAC

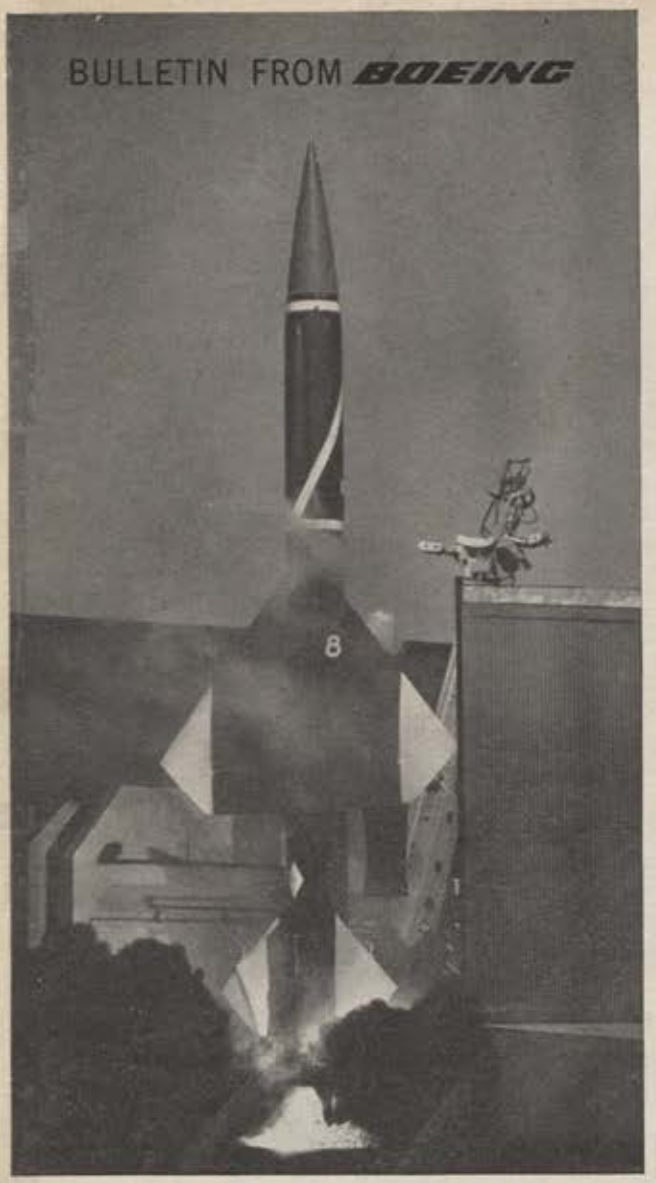
Backing up the atomic Sock in the Strategic Air Command is ***ARMA's*** incredible fire control system for B-52 bombers. Sighting, setting and shooting are all accomplished with deadly, automatic accuracy as these lethal tail turrets seek out hostile aircraft—manned or missile—and blast 'em to earth.

The MD-9 fire control system, *designed, developed and produced by* ***ARMA***, demonstrates ***ARMA's*** continuing leadership in engineering, evaluating and producing advanced electronic and electro-mechanical systems. ***ARMA*** . . . Garden City, N. Y. . . . a division of American Bosch Arma Corporation.

STRATEGIC AIR COMMAND

AMERICAN BOSCH ARMA CORPORATION

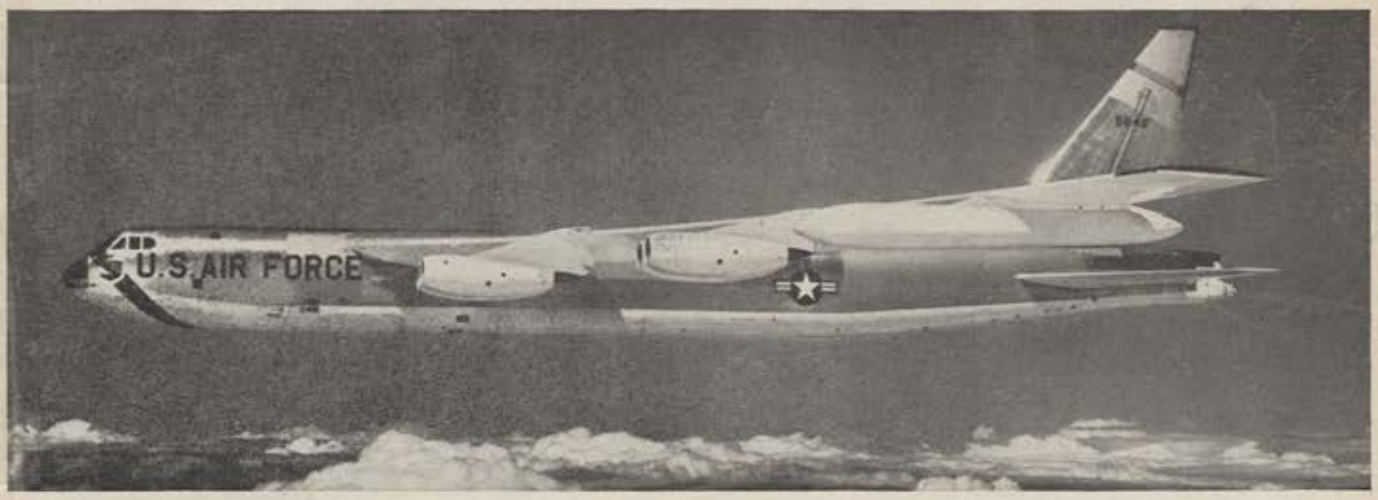
5623



America's longest-range defense missile, the Boeing Bomarc IM-99, shown at start of automatic firing from launching shelter. Supersonic Bomarcs have quick reaction time and can carry atomic warheads. Unique among defense missiles, they can be fired in multiple and directed to intercept individual bombers or air-breathing missiles of a mass attacking force. Now in volume production at Boeing, Bomarcs will be operated by Air Defense Command.

Other Boeing defense projects include an advanced Bomarc, capable of seeking out and destroying enemy aircraft and missiles at distances now associated with manned interceptors.

First jet transport-tankers, Boeing KC-135s, pictured on Air Force base. Their primary function is to refuel the Strategic Air Command's B-47s and B-52s, thus extending the range and effectiveness of the multi-jet bombers. KC-135s hold the world non-stop jet transport record.



Missile bomber. The Boeing B-52 global jet bomber is now, and for some years will continue to be, the one proved retaliatory defense weapon not dependent upon foreign bases. In volume production at Boeing, this Strategic Air Command nuclear weapons carrier is the "big stick" in the nation's retaliatory defense arsenal. An advanced B-52 missile bomber will have capability as a flying launching platform for supersonic air-to-ground missiles. Advantages: accurate long-range guidance, mission recallability, plus supersonic missile speed at the "hot end" of the target approach.

BOEING

This

is the Mrs. behind the

MISSILE

ON THESE TWO PAGES YOU WILL READ HOW SHE HAS SOLVED ONE OF THE GREATEST PROBLEMS IN THE DEVELOPMENT OF GUIDED MISSILES TODAY

. . . and where

AC

fits in this picture

IT TAKES a special kind of woman to be the wife of one of today's missile men.

It takes a woman who can live within shouting distance of Death Valley . . . or the New Mexican desert around Holloman Air Force Base and White Sands. It takes a woman who can pack up the kids at a moment's notice for a few months' stay at Cape Canaveral, Florida . . . or Point Mugu, California.

You'll find these women everywhere in our Army, Navy and Air Force. You'll find them as the wives of scientists, or married to engineers for some of the largest industrial concerns in the nation.

They know more about the problems of raising a family virtually alone than they do about the business of producing the missiles themselves.

This advertisement is a tribute to the courage of such women, and to the very real contribution they are making to the development of a guided missile arsenal for this nation's defense.

Where AC fits in this picture

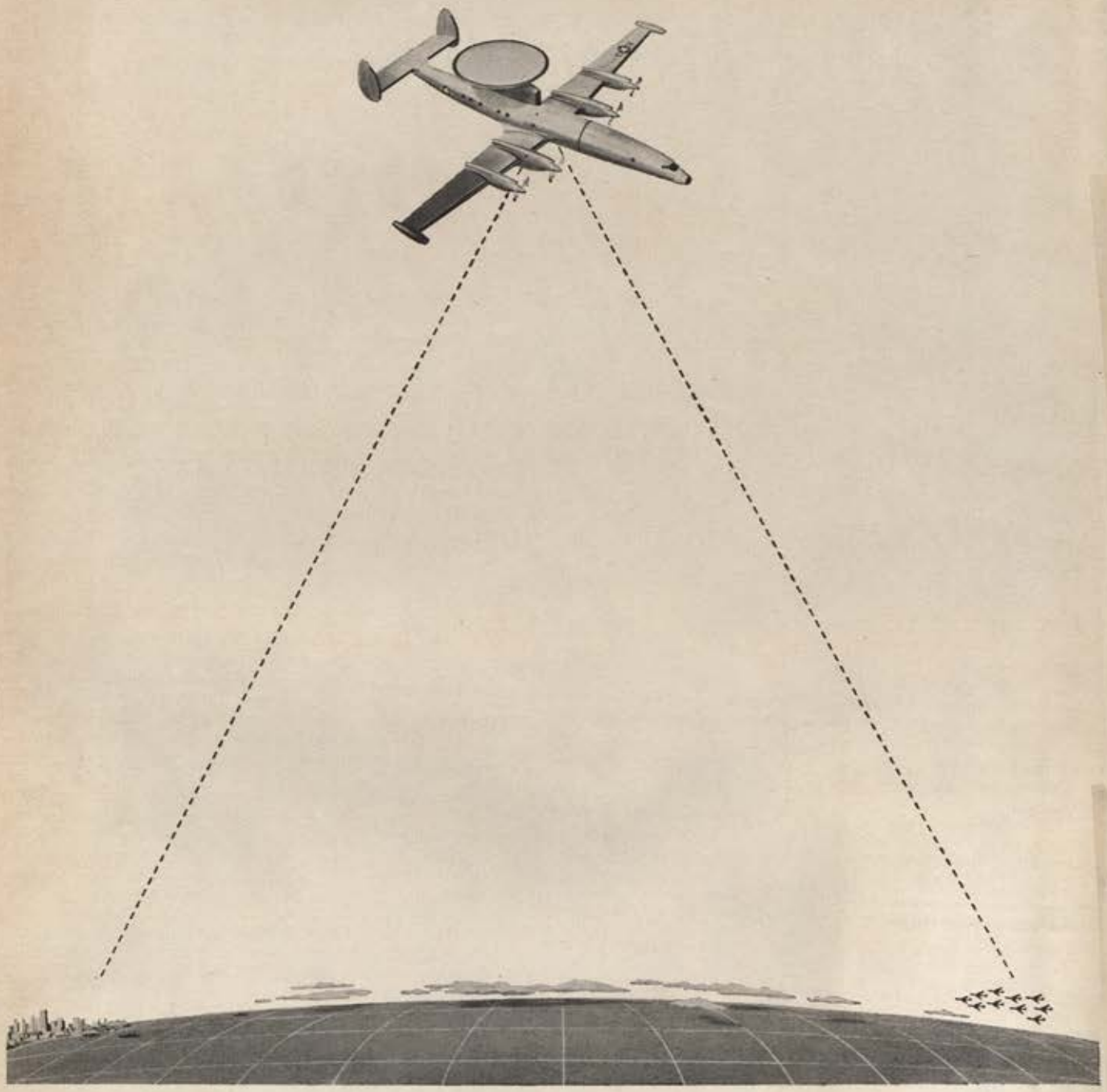
AC has been a leader in the development of an inertial guidance system for use in many types of guided missiles. This system, which we call the AChiever, is now in ballistic missiles and air-breathing missiles developed for use by our armed forces. It has made headlines and proved itself in flight in such missiles as the Air Force's Thor and Matador . . . and in the Navy's Regulus II.

The AChiever has far broader application than most systems developed for a similar purpose. It can, for example, guide a missile far beyond the confines of earth. It could put a satellite into orbit . . . or take a rocket to the moon . . . and it is not subject to interference by any known natural or man-made force. And, AChiever is in volume production.

These remarkable accomplishments have been made possible in large part by the faith and understanding of the wives of the men at AC and their counterparts in the armed forces, in science and industry.

—If you are such a woman, and your husband has engineering or scientific training which could make a contribution to this program, and is not a member of the armed forces, ask him to write—or write yourself—to the personnel section of AC in Milwaukee.

AC SPARK PLUG ⚛ THE ELECTRONICS DIVISION OF GENERAL MOTORS



SELDOM SEEN...ALWAYS THERE

A sneak attack on our nation with airborne nuclear weapons would be vastly more devastating than the holocaust of Pearl Harbor.

To safeguard the United States against surprise attack, Airborne Early Warning (AEW) aircraft patrol our outermost defense perimeters every hour of every day in all kinds of weather.

Equipped with radar that can "see" 150 miles (in all directions) through thickest fog or darkest night, these lonely AEW sentinels of the skies are seldom seen by the people they protect, but at the first hint of possible danger, they will flash a warning to our great Strategic Air Command, our mighty fleets and world-wide retaliatory striking forces.

America's safety depends on keeping our Airborne Early Warning patrols at optimum strength and efficiency.

LOCKHEED *means leadership*

CALIFORNIA DIVISION, LOCKHEED AIRCRAFT CORPORATION, BURBANK, CALIFORNIA

AIR FORCE

THE MAGAZINE OF AMERICAN AIRPOWER

Volume 41, Number 5 • May 1958

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FEATURES

DEPARTMENTS

March Issue—Praise and Correction

Gentlemen: Seldom does a periodical manage to publish an issue whose contents qualify it as a permanent reference file. Yet in the short span of six months, AIR FORCE has managed to accomplish this literary feat twice.

I refer, of course, to your Golden Anniversary issue for August 1957 and the Space Weapons issue for March 1958.

The latter is now being distributed throughout the entire Fourth Air Force with my recommendation that it become the nucleus of a permanent missile file.

Please extend to the entire staff my congratulations for their professional and timely presentation of this complex subject.

Maj. Gen. Sory Smith, Commander
Hamilton AFB, Calif.

Gentlemen: If a member of another service may dare to comment, I would like to be critical of one or two of the statements in your excellent issue of March. On page 51, the contrast between a nearly circular orbit as contrasted to an elliptical one leads the reader to assume a circular orbit is more "efficient" from the standpoint of a satellite remaining aloft for a longer period of time. It should be noted that this is not the case. The drag on a satellite causing its eventual return to Earth is dependent upon the amount of atmosphere it encounters rather than the shape of its orbit. Thus a satellite in an elliptical orbit with a low point equal to the distance for a circular orbit will remain aloft a longer time than will the satellite in the circular orbit. I think what might be meant is that equivalent thrust, thus putting the circular orbit satellite out farther, would produce a more efficient satellite. It might be noted in passing that all of the planets have elliptical rather than circular orbits and they have "stayed up" for some time.

On page 58, the possibility of great battles in deep space is minimized. Such travel is quite dependent, it would seem, on an extremely high-energy fuel. Given this fuel it seems absurd that such space vehicles would be stopped from intensive maneuvering at the cost of relatively small amounts of such propellant. It seems to me that we have here a comparable medium to the high seas, and it should be noted that fairly important battles have been waged some distances from civilization ashore without both fleets starting out from the same port or on simple collision courses. True, the type of weapon used may well be different from a sixteen-inch rifle, but the underlying strategy of defensive operations at a distance from home and the reduction or elimination of the enemy's offensive power would still hold good.

Again, however, an excellent issue on the whole.

Frank E. Childs (LCDR, USNR)
Western Reserve University
Cleveland, Ohio

● *On the first point—right. We should have pointed out more clearly that it's the height of the orbit, in terms of the thinness of atmospheric particles, that determines duration of orbit, rather than the shape, and that a circular orbit far enough out is the ideal. Can't agree with your analogy of high seas and deep space. The seas and supply lines are all on the same planet. The universe is so much bigger. Glad you enjoyed the space issue.* —THE EDITORS.

Gentlemen: Thank you for granting us permission for republication of contents of the March issue of AIR FORCE Magazine (in English and in translation) by the US Information Service and the local press outside the United States and Canada.

Copies will be sent to all US Information Service offices in foreign countries. I am sure that many of our press officers will want to use quotes, excerpts, and in some cases reprint or translate material from "Space Weapons." In some areas the material will be published in newspapers and magazines published by the US Information Service. In other areas, single articles may be reprinted or translated for mass distribution or possible republication in the foreign press. Credit will, of course, be given to the authors—AIR FORCE Magazine and the Air Force Association.

"Space Weapons" is a most effective presentation, and we greatly appreciate your cooperation in making it available for use in the information program.

Thomas L. Cannon
Chief, News & Features Branch
United States Information Agency
Washington, D. C.

Gentlemen: I would like to add my few words of praise to the many that you must have received already. The March issue of AIR FORCE Magazine is outstanding and should be placed on the required reading list at all professional military service schools, noncommissioned and officer alike. "Man in Space," by William Leavitt, was especially interesting. This article was not only well written but also imaginative and provocative. It revealed a remarkable understanding of the physiological and psychological problems of man in the unfriendly environment of outer space.

Lt. Col. Frederick S. Spiegel
USAF(MC)
Washington 25, D. C.

Gentlemen: Your March issue on space weapons was most interesting and timely. However, there were a few inaccuracies, undoubtedly due to the novelty of the subjects.

In the fourth paragraph on page 47, the second sentence should read: One, which the astronomers call "Messier 31," *is contained in* the constellation Andromeda (or the "Chained Lady"). Messier 31 does not appear as a faint pinpoint but as an elongated, hazy spot to the naked eye. It is one of the very few heavenly objects outside of the solar system which does not appear as a pinpoint of light. It was placed on some of the star charts before the telescope came into use, whence came the misnomer "nebula" of Andromeda.

On the same page, a paragraph about the troposphere states that the variation of the height of the tropopause is due to the elliptical shape of

(Continued on page 11)

IR

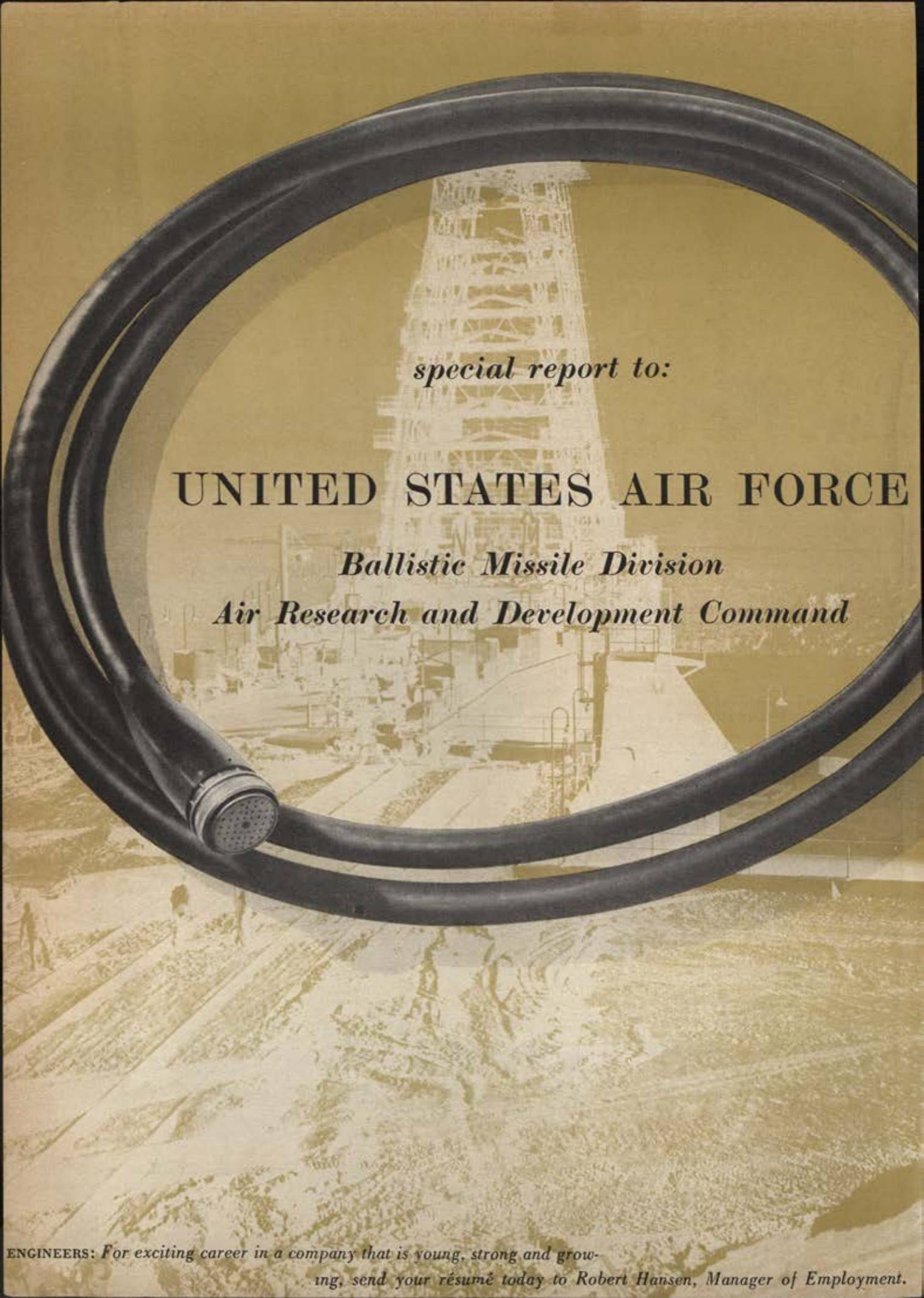
Infrared equipment for gunfire control, missile guidance, and surveillance and warning is developed and manufactured by our Avionics Division at Azusa, California.

AEROJET-GENERAL CORP.

THE GENERAL TIRE

A SUBSIDIARY OF THE GENERAL TIRE & RUBBER COMPANY

Engineers, scientists-investigate outstanding opportunities at Aerojet (plants at Azusa and near Sacramento, California)

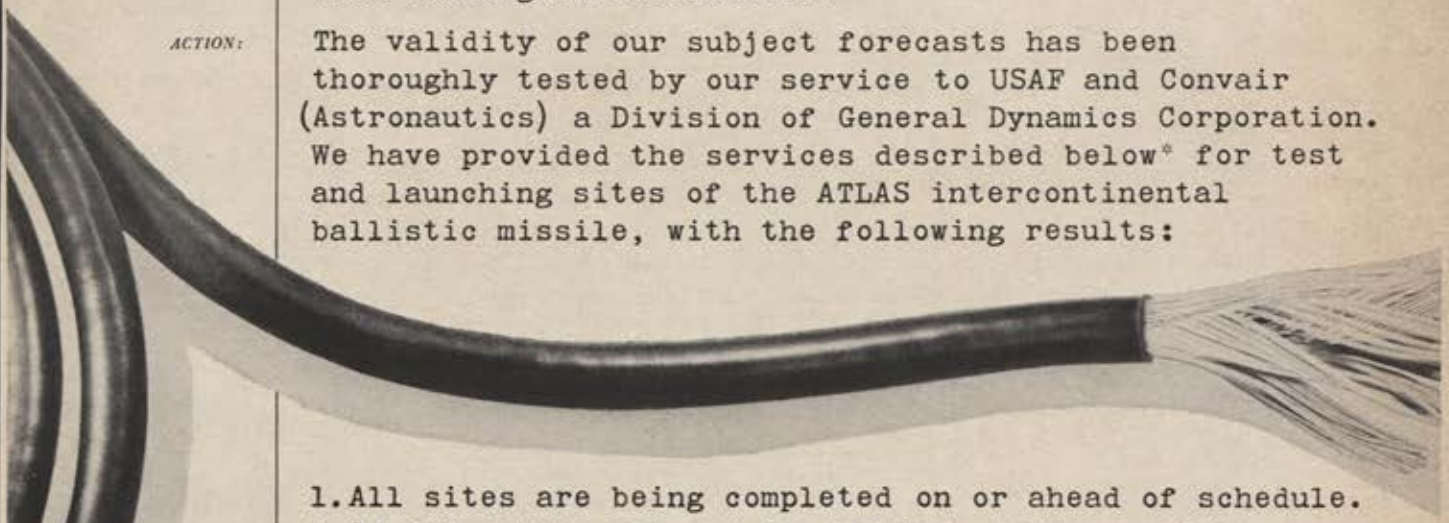


ENGINEERS: *For exciting career in a company that is young, strong and growing, send your résumé today to Robert Hansen, Manager of Employment.*

SUBJECT: PACIFIC AUTOMATION PRODUCTS, INC. Systems Cabling Program

REFERENCE: Fall 1955 forecasts by PAPI of benefits to be derived from establishment of sole responsibility for missile site cabling and activation.

ACTION: The validity of our subject forecasts has been thoroughly tested by our service to USAF and Convair (Astronautics) a Division of General Dynamics Corporation. We have provided the services described below* for test and launching sites of the ATLAS intercontinental ballistic missile, with the following results:



1. All sites are being completed on or ahead of schedule.
2. 14,000 cables are now in service, with no malfunctions due to cabling.
3. Substantial savings are indicated by comparison of actual costs with predictions based upon former techniques and methods.
4. Superior design and simplified operational characteristics of completed sites are due to our integrated approach to cabling and activation.

CONCLUSION: Original estimates of the benefits to be derived from PAPI services have proven to be conservative--actual performance warrants extension of PAPI services to other missile projects of USAF.

*HERE IS THE COMPLETE SYSTEMS SERVICE OF PAPI—THE SERVICE WHICH WE ARE NOW FULLY PREPARED TO OFFER TO ALL MISSILE AND MISSILE SYSTEMS CONTRACTORS

SYSTEMS DESIGN: *Test Instrumentation, Launch Control* SYSTEMS FABRICATION: *Cable Components, Special Hardware and Checkout equipment* SYSTEMS INSTALLATION: *Instrumentation, Recorders, Transducers Controls, Consoles, Accessories, Inter-Unit Cabling* SYSTEMS CHECKOUT: *Conformity to Circuit Specifications, Instrumentation operation (by systems), Fire and Launch Control Validation* SYSTEMS DOCUMENTATION: *Complete Operational Information in Approved Form*

Address Inquiries to Arthur P. Jacob, Executive Vice-president

PACIFIC AUTOMATION PRODUCTS, INC.

1000 AIRWAY, GLENDALE 1, CALIFORNIA *Phone: CHapman 5-6871 or CItrus 4-8677*

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?

Today ERCO is building training devices for this very project. A system which will permit accelerated, highly specialized training for individual personnel and teams assigned to the operation and maintenance of the guidance system. These ERCO designed devices will quickly, and economically permit the military to obtain skilled technical personnel with maximum specialization on a minimum time basis—or the term we use "effectivate*" the system.

If you are a contractor and you are in need of someone to solve the problem of the "Man-Machine Data Link"— contact us today. Our leadership in the creation of training devices has been gained with field proven equipments.

Write to ERCO PLANT, Nuclear Products—ERCO Division, ACF Industries, Incorporated, Riverdale, Md., Dept. MT.

SYSTEMS INDOCTRINATION

GUIDANCE RADAR

EMERGENCY PROCEDURE

EQUIPMENTS FAMILIARIZATION

ERCO TRAINERS

FAULT DETECTION

LAUNCHING PROCEDURE

LAUNCHING AND TRAJECTORY COMPUTERS

INSTRUCTORS CONSOLE

* Effectively Activate

DESIGNED AND BUILT BY ERCO

NUCLEAR PRODUCTS — ERCO. DIVISION ACF INDUSTRIES. INC.. RIVERDALE. MARYLAND

AMERICAN CAR AND FOUNDRY • AVION • CARTER CARBURETOR • SHIPPERS' CAR LINE • W-K-M • ADVANCED PRODUCTS

Earth. The consensus of the meteorologists here at Massachusetts Institute of Technology is that the latitudinal variation of the height of the tropopause is due, primarily, to the fact that the earth is heated less at the higher latitudes than at the lower latitudes; i.e., it is cooler at the poles than at the equator.

1st Lt. Arnold A. Barnes, Jr.
USAFR
Cambridge, Mass.

• *Our thanks for your comments. We're checking our star charts re Messier 31 and our experts on the tropopause.*—THE EDITORS.

Gentlemen: I would like to add formal congratulations to the many you must have received on the interesting and well managed Jet Age Conference and on the March issue of AIR FORCE.

One area in the latter has created a number of questions, both internal and external, which should be brought to your attention. In the "Directory of Ballistic Missile Prime and Subcontractors," the identifications of key Space Technology Laboratories personnel deserve clarification.

As AIR FORCE has such a wide distribution among both the associated prime and major subcontractors in the Air Force ballistic missile program, it might be worthwhile to correct these listings editorially. In any event, below is a revised listing which follows the format of your directory:

ATLAS ICBM

Systems Engineering and Technical Direction

Ramo-Wooldridge Corp., 5730 Arbor Vitae St., Los Angeles 45, Calif.; Pres.: Dr. Dean E. Wooldridge

Space Technology Laboratories; Pres.: Dr. Simon Ramo
Exec. V-Pres. and Gen. Mgr.: Dr. Louis G. Dunn
V-Pres. & Ass't Gen. Mgr., & Dir., Systems Engineering Division: Dr. R. F. Mettler
Dir., Physical Research Laboratory: Dr. M. Y. Clauser
Dir., Electronics Laboratory: Dr. J. C. Fletcher
Dir., Aeronautics Laboratory: A. F. Donovan
Dir., Administration & Finance: F. W. Hesse
Program Dir.: Dr. E. B. Doll

TITAN ICBM

Systems Engineering and Technical Direction

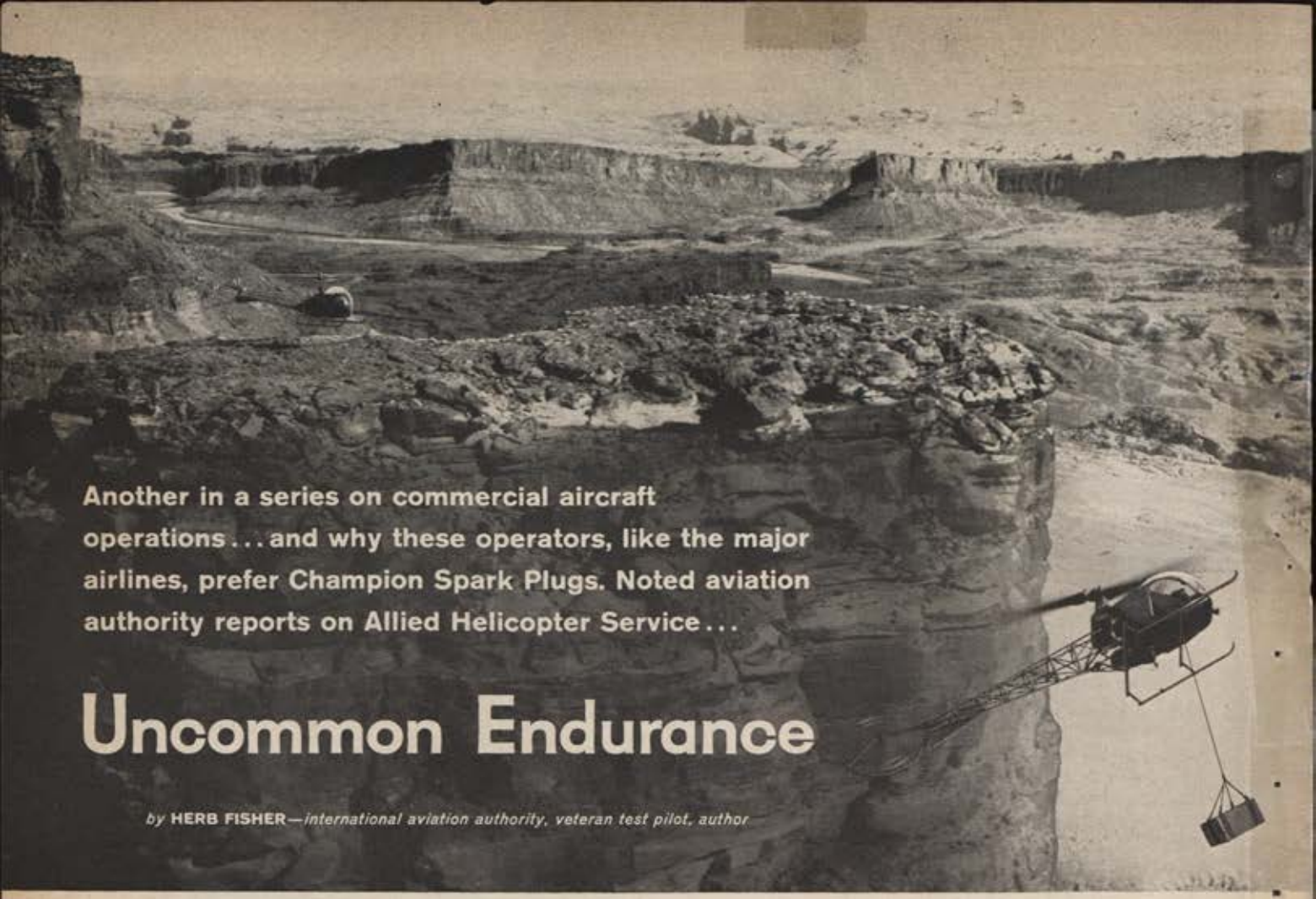
Ramo-Wooldridge Corp., Space Technology Laboratories (see "Atlas")
Program Dir. & Assoc. Dir., Systems Engineering Division: W. Duke

THOR IRBM

Systems Engineering and Technical Direction

Ramo-Wooldridge Corp., Space Technology Laboratories (see "Atlas")
Program Dir.: Dr. A. K. Thiel
William C. Tracey
Head, Information Services
Ramo-Wooldridge Corp.
Los Angeles, Calif.

• *Companies were asked to fill out a questionnaire following roughly the pattern used for the subcontractor section. At the last minute we decided to use a different format for the primes, breaking them down by weapon systems rather than straight alphabetical listing. Ramo-Wooldridge didn't fit that pattern, since it was the only corporation involved in all three Air Force missiles, so we printed the basic information furnished under the first weapon system listed and merely cross-referenced on the other two missiles. The other prime contractors were handled on exactly the same basis.*—THE EDITORS.



Another in a series on commercial aircraft operations... and why these operators, like the major airlines, prefer Champion Spark Plugs. Noted aviation authority reports on Allied Helicopter Service...

Uncommon Endurance

by **HERB FISHER**—*international aviation authority, veteran test pilot, author*

"Surveying, lifting machinery . . . bucking winds to hot, thin heights . . ."

The romance of the whirlybird is a dead duck so far as Allied Helicopter Service is concerned. Allied *works* its unglamourous craft—murderously.

Headquartered at Tulsa, this unusual eight-year-old "rugged-duty outfit" hires out on a world-wide basis—spraying, exploring, patrolling, surveying, hauling . . . frequently under almost unbelievably grueling conditions, jungle to Arctic.

As Roy B. David, Allied's President, told me: "For men, it's all *work*. For machines, it's just plain hell."

Herbert O. Fisher

A colorful Oklahoma attorney whose work in corporate aviation law led him to the founding of Allied, David speaks with undisguised admiration for his toiling helicopters:

"These are no dolled-up glamour birds. We tear them down, here in our shops—airframe to engine—down to the last nut and bolt. We custom-overhaul them from the ground up. We weld and innovate. We don't care how pretty they are. They've just got to be tough, beefed up to withstand terrific punishment.

"No engine goes in service until we've made it precision-perfect—able to take almost incredible overwork despite abrasive sand and humidity, subzero weather and hot, thin altitudes. That's why Champion Spark Plugs are so vitally important to us: *They insure dependability* of a good engine. Without a 100% dependable engine, you can wash out in short order in an operational grind like this."

SPRAYING, SEEDING

Allied's main operation now is crop and reclamation spraying—herbicides on pasture lands, forests, rights-of-way, canals and ditches, rice fields; insecticides on croplands, forests, cities—plus seeding of broadcast crops, pine forests, strip mines, grazing lands.

On the foreign front, Allied is spraying 50,000 acres of bananas per *month* in Guatemalan river-bottom. Eight 'copters plus pilot and mechanic crews are on the job. This operation represents a 5-million-dollar-a-year crop savings to banana growers, David said.

Rugged duty, for certain: With skids ofttimes touching banana leaves—darting in and out of jungle-bordered corners, day after day—each second of flight is critical. There can be no margin for error. Pilot, airframe and engine must be superbly *fit*:

"We pull our custom-tailored engines every 600 hours, clean spark plugs every 50," David said. "And fortunately for us, we can buy Champions in Guatemala City—as well as nearly any place else in the world.

"Helicopters, you know, work plugs much harder than do other aircraft, subject them to much severer operating conditions. When you consider that helicopter engines operate *constantly* at the high RPM that airplanes use only on takeoff — which means high electrode erosion and shorter plug life—this

Allied on oil survey . . . swamp near Morgan City, La.

should floor you as it has us:

"*Our plug life is 600 hours.*"

One of Allied's more spectacular home-front projects involves spraying 1,000,000 acres of mesquite in Texas and dense scrub in Oklahoma: "Remove that worthless mat and you'll have the best cattle country and farmland in the U.S.," reclamation experts had predicted.

"Carving farm and rangeland out of backcountry like that really gives our grasshoppers a workout," David told me. "And already a lot of that 'worthless mat' is cow-belly-deep in grass!"

On an "ordinary" herbicide and insecticide spraying job, I watched Allied 'copters clipping along the ground and shuddered. I watched them snuggle into corners of fields—right up to border vegetation and obstructions—then pivot sharply "at the last minute," spraying again, without drift, a return swath in three to five seconds. They'd land anywhere, anytime—taking on fuel and chemical in mere minutes. Then off again.

"That's real precision work," David said pridefully. "It's more than teamwork. Like the old cowhand and his horse, the helicopter pilot and his machine *must* operate as *one unit*. The man out there, Herb, is a *part* of his 'copter—and that engine is his heart. He wants it strong—fired to life by *dependable* spark plugs."

Allied has sprayed several thousand

"Spraying, skids raking foliage . . ."

miles of power line and railroad right-of-way from Texas to Illinois. A special controlled width device—developed by Ozzie York, Vice President-Maintenance and former RAF pilot—cuts a swath without harming valuable crops or timber to either side.

In Allied's vast forest and range reclamation projects, this equipment is used with chemicals that kill certain plant species without harming desirable vegetation: pine stands aloof and healthy, for example, while other trees and underbrush die.

SURVEYING

From Arizona to Alaska and Iceland, Allied has done government surveying and transplanting of heavy equipment and manpower where it's ofttimes impossible by other means.

In Iceland, Allied operated with the U.S. Army Map Service.

In Government uranium exploration in Alaska, Allied had to heat motor oil before it could be used: "I swear, when it's 40 below up there, I think we must have sometimes drunk the oil and poured hot coffee in the 'copters, so *un*romantic was *that* duty!" David said.

With the U.S. Geological Survey and Atomic Energy Commission, Allied 'copters invaded 17,000 square miles of some of the most inaccessible wilderness on earth—the Four Corners country of Utah, Arizona, Colorado and New Mexico. Here, Allied helicopters bucked wind currents from gorge bottom to heights where hot, thin air made hovering nearly impossible. They shuttled surveyors to hundreds of these pinnacles—averaging 8 to 10 miles apart — so they'd have abundant triangulation points for mapping 20- to 40-foot contour intervals. They lugged up machinery, explosives and timbers, and, between tasks—to test thermodensity lift—they'd haul boulders several thousand feet up from the canyon floors.

In Alaskan Geological Survey operations, 'copters pitched among icy mountains to cut field costs for mile-to-inch mapping from $25 a square mile to less than $8.

OIL EXPLORATION

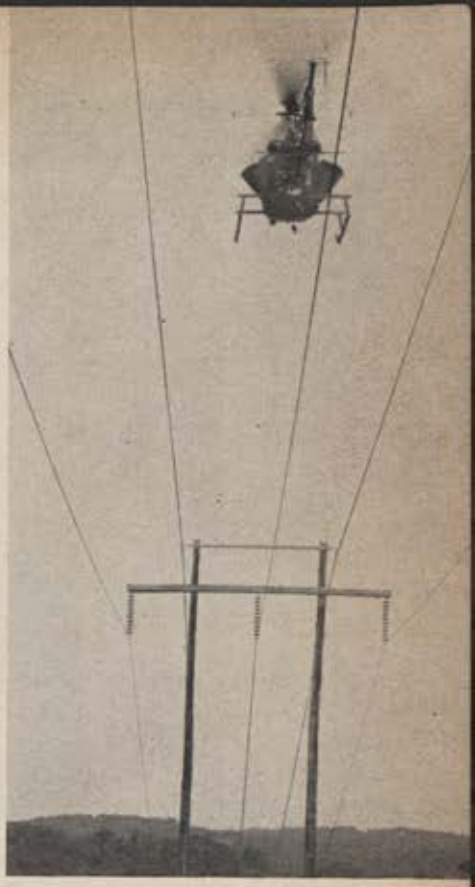
Allied has operated under contract to major oil companies from South American jungles through Louisiana swamps to the Canadian Rockies and Alaska.

Before first wells came in on now productive southwestern United States test sites, Allied whirlybirds were scouting the badlands for Gulf Oil. Explosives used in refraction shooting were shuttled quickly from "shot station" to "shot station" in this almost impossible country. Such treks previously took 100 men, each packing one case of dynamite, three days.

In Alaska and the Canadian Northwest, Allied's "grasshoppers" opened previously inaccessible areas for Phillips Petroleum, hauling supplies as well as flying geological survey missions.

In South America, Allied packed instruments, drills, explosives and camp supplies through dense jungles—covering in 45 minutes what had taken natives six

Night patrol . . . (r/l) Roy B. David, Allied President; Osvil York, V.P.-Maintenance



"Hustling along hazardous hot-wire trails . . ."

days to traverse. Here, Champions protected against hazardous flashover caused by hot, moist operating conditions.

In our own Gulf States, Allied air-lifted to isolated swamps everything from drilling apparatus to explosives. Seismograph crews didn't even get wet feet: the pontooned 'copters dragged surveyor chains, held the stake and flew sideways, up, down and backwards at the surveyor's signal.

PATROLLING

"Rugged" characterizes Allied's patrol duty, too.

With the Tennessee Valley Authority, for example, Allied 'copters skittered along 8,000 miles of high-voltage transmission line for 3½ years for a close check of line or insulator damage—impracticable by ground inspection.

On frost control projects in Oklahoma and Kansas, Allied flew low along telephone-telegraph lines so powerful rotor downdraft would jar accumulated ice off wires threatening to snap!

"Whether hopping about a pocked desert or combing bugs out of the jungles, it's *rugged duty* that you have to live with every day to really comprehend," David said. "It takes quite a crew, quite a craft, quite an engine—and, quite a spark plug. You can't buy a more serviceable, dependable spark plug than Champion. *We know*. We've got the operation to *prove* it —as I used to say in the courtroom—'beyond any shadow of a doubt.'"

CHAMPION SPARK PLUG CO.
TOLEDO 1, OHIO

THE MAN BEHIND THE GREASEGUN . . . The exploits of the fliers and aircraft that are keeping our nation secure can not be written without proper credit to the unheralded man behind the greasegun. He is a member of a maintenance crew . . . a crew chief . . . a plane captain who is content to enjoy the reflected glory of his ship. Something of him flies with every aircraft, and when ship and crew return safely he knows his job has been well done. For he knows that nothing could fly, no pilot could climb aboard without his contribution. Kaman Aircraft recognizes the job these men are doing and gives them a tangible salute by designing helicopters which require minimum maintenance and make the man behind the greasegun whistle while he works.

THE *KAMAN* AIRCRAFT CORPORATION

PIONEERS IN TURBINE POWERED HELICOPTERS

BLOOMFIELD, CONNECTICUT

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.

It is significant that Russia's Konstantin Vershinin, who heads the air forces, has been little heard from since Zhukov's downfall. He joined the others in criticizing Zhukov at the time of the Marshal's fall.

This lessening in prominence could signify a switch in emphasis in favor of the Red Army over the air forces which might indicate the Army's control over missiles.

• • •

Russia has opened an air route from Moscow to the Kamchatka Peninsula, which juts into the Pacific Ocean above Japan. A TU-104 has made the flight, a distance of about 5,600 miles, in ten and a half hours. The announcement by the Russians suggests that they definitely have a major airfield at Petropavlovsk on the Peninsula, from which they could make even more significant flights across the North Pacific.

• • •

Russian apartment building is running far behind schedule. Soviet apartments require much cement, and production of this important building material is believed running according to plan.

Where is the cement going? One guess would be into missile-launching sites, which must be built to be atomic-nuclear bombproof. Extensive work on the Kola Peninsula near the Finnish border continues to drive bear and deer into Finland, according to reports from Helsinki.

• • •

It is interesting to note that while Britain and the United States published their first reports on controlled nuclear reactions in January of 1958, the Russians claimed their first successes in this field in 1956 and announced last year that they had succeeded in controlling such reactions. The work is credited to the Soviet physicist, I. V. Kurchatov.

In reports on Russian physicists, Kurchatov's name usually appears just ahead of that of Peter Kapitsa, best known Soviet physicist. This may indicate no more than Kurchatov's rank as a member of the Communist Party. Kapitsa is a non-Party member.

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Latest data reaching AIR FORCE indicates the new Soviet interceptor, the MIG-21, which first appeared in 1956, is capable of Mach 1.9.

This speed would seem to be confirmed by a recent account in the Soviet press that Russia now has test pilots flying at speeds of about 1,250 miles per hour.

But the Russians are having trouble with their jet engines at high altitude. Their best speed performance for the MIG-21 is at 35,000 feet, and the engine and airplane have a ceiling of about 57,000 feet. The Russians are believed to have added a rocket engine to the aircraft to get it up to 70,000-75,000 feet, if the need arises. The rocket is good for only a few minutes.

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There are so many versions of the MIG-17 Fresco in existence that NATO has taken to alphabetical designations to separate them. Fresco A was the prototype version of the MIG-17. Fresco B featured rectangular air brakes on the trailing edge of the wing and was powered by a VK-1 engine of 6,000 pounds thrust. Fresco C, built in large numbers, had a short afterburner that raised total thrust to 6,990 pounds. Two 1,000-gallon tanks below the wings increased range from 505 miles to 1,150 miles. Engine was the VK-1A. Fresco D is the same as the C model, without afterburner but equipped with radar for all-weather interception. Finally, Fresco E is the same as the D model, except that it has an afterburner.

• • •

The NATO-designated, Soviet light transonic speed bomber, Backfin, has been undergoing flight tests at Ramenskoye, the Russian flight-test center near Moscow. The aircraft has two jet engines of 15,000 pounds thrust each, and a speed of 1,000 miles per hour at 35,000 feet.

Air intakes to the engines are above the pilot.

• • •

Soviet research and development of ornithopters, or man-powered aircraft that can be flown by "beating" their wings, indicates an interest in a machine that can be used to move troops silently, at night, into enemy territory. The device is ideal for sneak attacks, though its carrying capacity is very much limited to one man—for the most part, a man not of Nikita-like build.

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About 3,000 Soviet rocket specialists, including rocket-installation construction workers, are believed to be in Albania. They are hastily putting in rocket-launching sites and fuel-generating equipment. The rockets would be aimed at American bases in North Africa and Italy.

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Russians are publicly claiming they have a fighter that has exceeded 1,200 miles per hour. It is not clear whether this was a sustained or only an achieved speed, in which case it could have been done with a short-burst, rocket-boost engine.

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The powerful US Sixth Fleet may be partially matched in the buildup of the Soviet Fifth Fleet in Mediterranean waters. The Russian fleet is believed to have twenty submarines, several patrol vessels, and fast torpedo boats. However, no heavy naval vessels are as yet attached to the Soviet Mediterranean Fleet. Albania provides the Russians with a base from which to operate.

• • •

In East Germany, a little more than seven miles east of Tallin, the Russians have established a launching base for guided missiles. This launching area is directed against Finland, and is one of three major launching sites in East Germany.

Apparently the Russians go in for building missile-launching complexes, with several sites located in the same area, rather than isolating each missile-launching-site from its neighbors. This simplifies their complex liquid-fuel problems, especially for large, long-range missiles.

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On pages 50-51 appears the latest rundown on the Soviets' YAK-25 series, NATO code-named Flashlight.—END

AIRPOWER IN THE NEWS

WASHINGTON, D.C.

■ Regardless of how you feel about the President's program for reorganization of the Defense Department (*see page 39 and page 103*), it does not appear that Mr. Eisenhower can be criticized this time for failing to take a firm stand and test his leadership. According to the headlines, he is ready to go to the mat with Congress and doesn't care how tough and numerous his opponents may be. In less than ninety days he has changed his mind, because on January 15 he said he would tell Congress how he felt about the matter and then seek an agreement. He said he would be "the last to ask for a detailed organization in which I believe." Now he has his sleeves rolled up and doesn't care who is against him.

Defense Secretary McElroy had the first opportunity to find out where the opposition will come from. He was testifying before the Senate Preparedness Subcommittee when the President's message was sent to the Hill. Republican Sen. Styles Bridges of New Hampshire, chairman of his party's policy committee in the Senate, immediately raised the possibility that McElroy, under the proposed new setup, could abolish the Marines or Navy aviation. Sen. Stuart Symington, Missouri Democrat who once served as Secretary of the Air Force, gave it as his opinion that the plan won't work, at least without some changes.

This was only the beginning. Sen. Dennis Chavez, Dem., N. M., said he opposes giving the Secretary of Defense so much power and repeated a rumor that once the law is passed McElroy will retire and be succeeded by Gen. Alfred M. Gruenther.

Rep. Paul J. Kilday, Dem., Tex., gave it as his opinion that the proposal to lump appropriations and give them to the secretary carried "greater economic power than should be possessed by one individual." He also pointed out that the plan does little to clear out the existing jungle of secretaries, assistant secretaries, and deputy assistant secretaries.

Senate Democratic whip Mike Mansfield, Mont., warned of a defense secretary with a czar's powers who could force creation of a single armed service. Mansfield praised the President for laying his cards on the table and predicted there will be a compromise worked out by Congress.

There are a few people around town who think even a compromise will be hard to reach. They cite the firm record of the powerful Rep. Carl Vinson, Dem., Ga., Chairman of the House Armed Services Committee. Mr. McElroy has served notice on Navy officers that he will tolerate no nonsense from them and they can quit if they don't like the Eisenhower program. Well, Mr. Vinson is a black-shoe admiral in mufti, and if Mr. McElroy talks to him like that, he will have his mouth washed out with soap. Vinson and Kilday are sponsors of another bill that would cut down on McElroy's authority instead of increasing it.

Rep. Leslie C. Arends of Illinois, House GOP whip, is closely allied with Kilday and Vinson. He spoke for a number of his friends in both parties when he pointed out that Congress holds the pursestrings and is in no mood to hand them over.

Sen. Richard B. Russell, Dem., Ga., said he thinks McElroy already has the power to achieve many of the Eisenhower objectives. He is chairman of the Senate Armed Forces Committee.

Listening to these Capitol Hill veterans, the press is licking its chops over the prospect of a fight that might make Ike wish he was back in Normandy. Most knowledgeable Pentagon and congressional reporters have the opinion that men like Vinson and Bridges will be pretty firm.

"Having spent some twenty-two years on the Armed Forces or old Military Affairs Committee," Bridges said recently, "we have some very well developed thoughts and ideas and principles, and we don't intend to alter them no matter who is Secretary of Defense."

The newspaper editors in large part are giving General Eisenhower the full credit he deserves for being positive on this issue, and determined as well. The friendly New York *Herald Tribune* hailed the message as "Eisenhower's Finest Hour." At the same time, the editorials take full cognizance of the warning from the Washington press corps that there is going to be a hell of a fight. The *Tribune* and other papers urge the White House to go to the people and predict they will support "the nation's first soldier."

The Washington *Post*, which never spares the rod in lashing Administration weaknesses, said the reorganization message includes "serious measures which are the product of much expert consultation. They merit an equally broad assessment in Congress with strenuous efforts to avoid the provincialism that all too often has nullified past attempts at improvement."

For a more blunt observation, the Baltimore *Sun* must be cited. "This would be a drastic organization," it declared. "It would assert civilian authority with a vengeance. It would stand or fall on the availibility of a civilian secretary qualified not only to determine broad policy but to make technical military decisions. This is a large order."

The Chicago *Tribune* looked hard at the same area. It said anything as big as the Defense Department is bound to resist change and the President's plan will need far more than laws and decrees to make it work. "It will require," said the *Tribune*, "an unusually active, forceful, and courageous Secretary of Defense, supported with full vigor by the President, to arrive anywhere near the goal."

This idea was put more forcefully by Tom Lambert, military reporter for the New York *Herald Tribune*, "The main civilian deficiency in the Pentagon," he wrote, "is guts." (*See page 29 for more from Mr. Lambert.*)

■ The hornet's nest stirred up by President Eisenhower's defense reorganization plan was not duplicated by his proposal for a new National Aeronautics and Space Agency (*see page 101*). In this case, the only oxen being gored are those of the intellectual midgets who called Sputnik a basketball.

Frankly, the President said, we do have an interest in space, and he preceded his NASA message with orders to the Defense Department. The Advanced Research Projects Agency is in charge there, and it has given missions to both the Army and Air Force. The Army Ballistic Missile Agency at Huntsville will make one or two lunar probes and launch two or three more satellites. It will use its Jupiter-C rocket.

USAF has a program calling for three lunar probes, assigned to the Ballistic Missile Division of ARDC. It will use the Douglas Thor for the first stage and an Aerojet second stage from the Vanguard program.

ARPA has the money, about $8 million, and it is dealing

(Continued on page 19)

BEARING FOR THE SPACE AGE—Creation of NORTRONICS, a Division of Northrop Aircraft, Inc., forms a unique combination of scientific knowledge, development techniques, and production experience specifically required for the space age. As any long journey begins with a first step, so the conquest of space begins at sea level. Scientists and engineers of Nortronics, who created and developed the world's first successful automatic intercontinental guidance system for use within the earth's atmosphere, are now applying their knowledge and techniques on a broad front to interplanetary navigation. Daily, also, Nortronics is building "hardware," ranging from precisely-accurate guidance systems in assembly line production, through complete ground support equipment for modern missiles and ordnance. Nortronics' extensive experience, capabilities, and physical facilities are now supporting weapon systems manufacturers to provide "security with solvency" for the free world.

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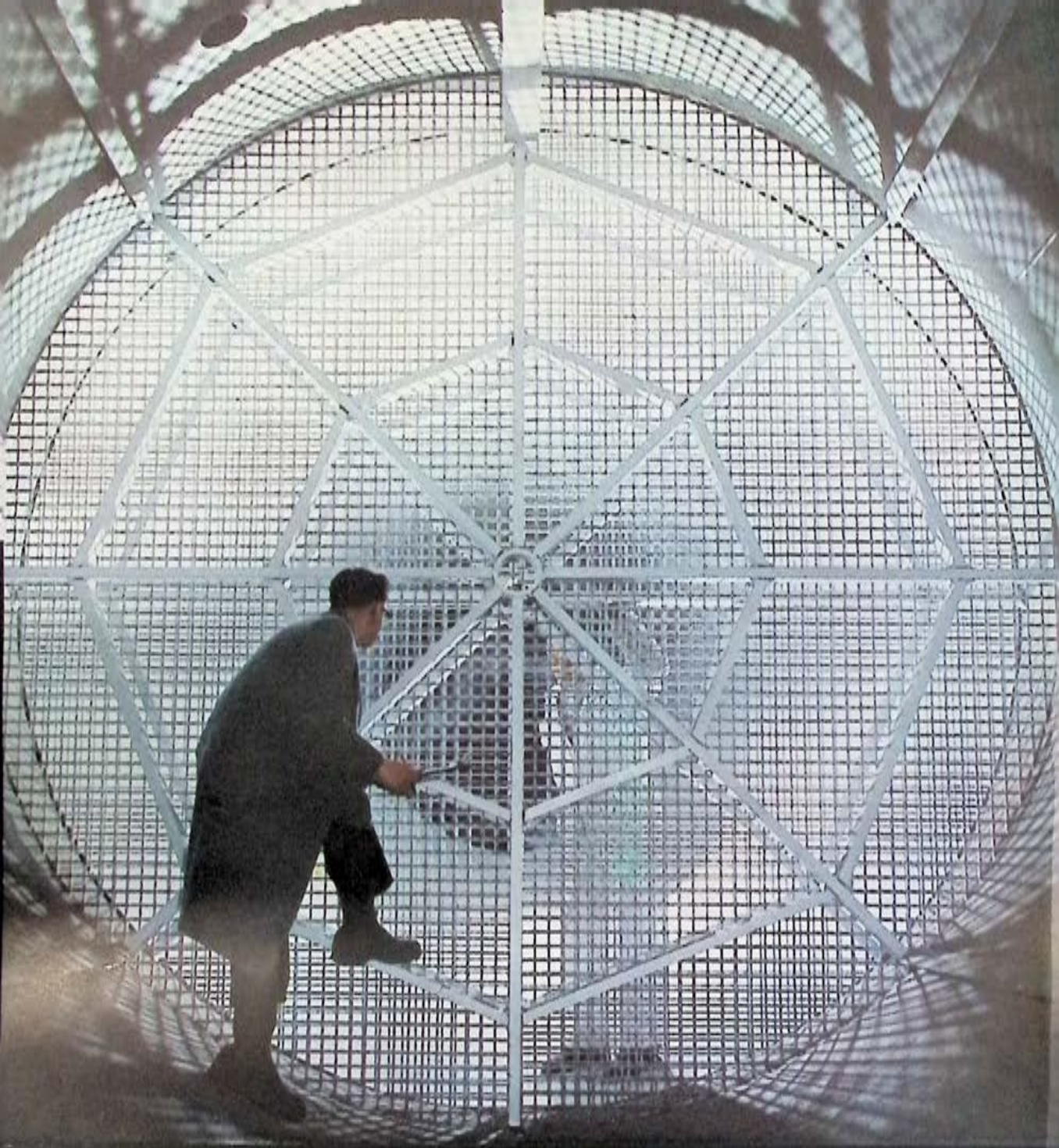

INTAKE TO THE FUTURE

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direct with the two missile commands, in a bypassing of military headquarters. This technique is interesting and significant. USAF, for example, has a number of proposals on the desk, including some that call for quick action to get a manned satellite into space. It now appears clear they will stay on the desk for a while, at least until higher authority has sifted all the space suggestions and separated those with military significance from the purely scientific. It is not clear how anybody can tell the difference, in some areas.

Legislation to create the NASA and build it on the foundation of the National Advisory Committee for Aeronautics is before Congress. Expenditures have been estimated by the Bureau of the Budget. NACA currently is getting about $100 million a year, and to this, big sums would be added, starting with $100 million in fiscal 1959. From there, the estimated additional expenditure would go up to $200 million in 1960, $250 million in 1961, $300 million in 1962, and $300 million in 1963. Next year it would be necessary to add another 1,000 to the present NACA payroll of about 8,000 persons. The total would grow to 10,000 by 1962.

Of major interest to the aviation industry is the fact that the new NASA proposes to be a customer for R&D effort. It will not operate an arsenal. At the present time, NACA is not deeply involved in such subjects as electronics, human factors, and guidance, for example. NASA will use existing talents in industry, universities, and private laboratories to work in these areas.

If the things learned by NASA have military application, they will be referred to the Defense Department just as aeronautical knowledge has been provided by NACA in the past. If the new facts are of primary scientific importance they will be picked up by NASA, which is empowered in this case to exceed the developmental limits always observed in the past by NACA.

In addition to the now-recognized urgency of the space program, the glowing aura of respectability and achievement surrounding NACA is an important factor in the good reception given to the Eisenhower proposal. The agency's forty-three-year record and its aloofness from bureaucratic insanity will give space age research an auspicious launching. Everybody assumes that NASA will be operated by men as competent as those who have been in charge of the mother organization.

■ No matter which way you look, if you are in the business of selling airplanes, you will find new and more insistent clamor for expenditure control. The big reason is that we are in the final weeks of fiscal 1958, and the Defense Department faces the horrible possibility of running short of money to meet its aircraft procurement bills. The magnitude of the shortage runs in the neighborhood of $800 to $850 million. At this writing, USAF fully expects to take responsibility for $446 million. We have heard no exact figure from Navy's Bureau of Aeronautics, but the curbstone guess is $400 million for that service.

Secretary of Defense Neil H. McElroy, who carries prepared answers to questions in his inside coat pocket, was missing one document in his recent appearance before the National Press Club. From the floor, some well informed reporter asked:

"Why is the Defense Department limiting fiscal year 1958 expenditure—as evidenced by Navy's current serious problem in paying contractors for aircraft and missiles—when it is the President's intent to speed up government spending as an antirecession measure? Will this limitation on expenditures prevail in fiscal year 1959?"

In reply, Mr. McElroy said he was opposed to adding funds to the Pentagon budget or altering its spending programs to give the economy a "shot in the arm." The answer was a disappointment because nobody asked him about adding funds to the Pentagon budget. He was asked why there is a ceiling on expenditures. The newsmen wanted to know how the department can fail to pay legitimate bills for delivered goods, ordered with the approval of Congress, particularly at a time when the Chief Executive says everybody should buy, and "buy anything."

There is no doubt about it, Uncle Sam must borrow money and go higher through the so-called debt ceiling *or* tax receipts must soar *or* the aircraft industry is not going to be paid. So far in this fiscal year there has been an increasing amount of company-financed deliveries. At the outset, Charles E. Wilson, who was Mr. McElroy's predecessor, said he would not pay the interest on the debts run up by the industry for this purpose. Well, there has been a change of heart on that subject and interest made necessary because the government does not pay its bills is an allowable cost. The fact that this is the most expensive way to hire cash does not seem to deter the fathers of the policy.

Nobody has brought the subject up in the public prints, but there is a substantial segment of industry that feels a government which orders goods and does not pay for them is unethical, if not immoral. Yet there is no indication this is appreciated by the policy makers.

"Whether or not expenditure targets are established by law," said a USAF assistant secretary the other day, "I can assure you they are here to stay."

While the crisis continues over daily household expenses, the Air Force says the procurement dollars will be stabilized at close to $8 billion a year, up from the $7 billion figure used around headquarters for about five years. To achieve this in fiscal 1959 there will be a beefing up of the USAF over-all budget request of $16,889 million reported in last month's AIR FORCE (*page 20*).

The Defense Department has sent to Congress a proposal that $1,455.7 million be added to the original 1959 budget request. USAF would get $614 million. To procurement of aircraft and missiles this would add $518.4 million to the previously requested $5,888.8 million for a total of $6,407.2 million. Aircraft and missile support is slated to get an additional $49.7 million for a total of $2,195.7 million. To research and development it is proposed to add $9 million, giving that activity a boost to $728 million. USAF military construction funds will be upped by $36.9 million.

Here are a few figures on how the procurement dollars will be spread around: For the solid-propellant IRBM-ICBM, $50 million; for Hound Dog, an air-to-surface missile designated the GAM-77, and to be carried by the Boeing B-52 long-range jet bomber, $91 million; for a twelfth wing of B-52 bombers and the necessary KC-135 tankers to support it, $423 million; for the Titan ICBM, $50 million.

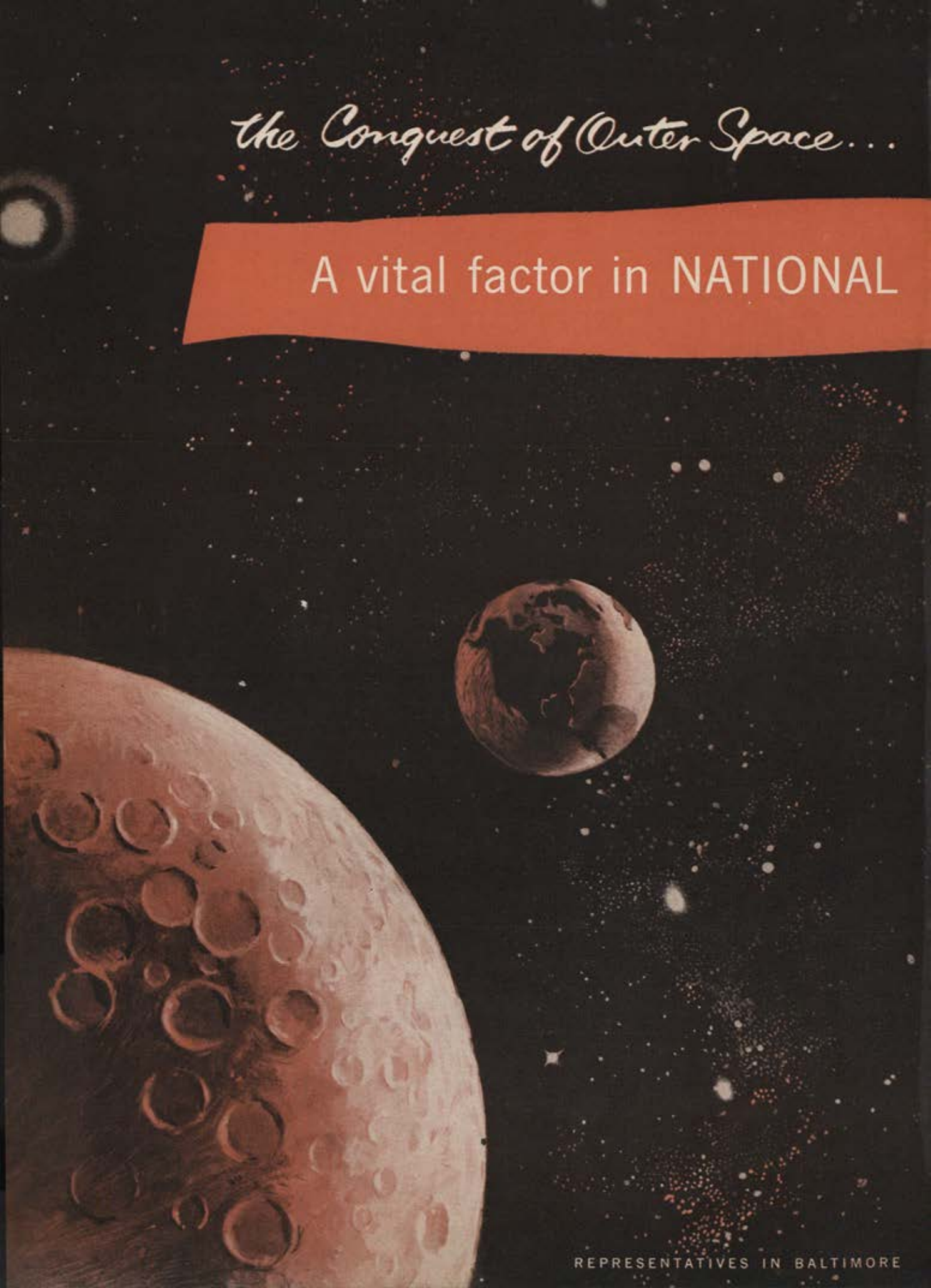
"This planning," says Malcolm A. MacIntyre, USAF Under Secretary, "does not consider any obligation or expenditure ceiling which might be imposed in the future." Like Mr. McElroy, he avoided saying anything about the expenditure ceiling being imposed right now.

■ Under the President's proposed reorganization of the Defense Department it appears that a new office of Defense Research and Engineering will swallow the new Advanced Research Projects Agency, which is preparing

(Continued on page 22)

the Conquest of Outer Space...

A vital factor in NATIONAL



REPRESENTATIVES IN BALTIMORE

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to swallow the military research and development operations. Without denying that something ought to be done about military R&D, there is a growing school of men in uniform who wonder if this cannibalistic trend is in the right direction. As pointed out in last month's issue of AIR FORCE, we pay a lot of homage to free competitive enterprise in this country and then belittle the things we like about it. Profit seems to be one of them. Parallel and competitive research, a characteristic of our progressive industries, is another. When military R&D falters, a current report points out, "we criticize it for precisely those features which it has in common with R&D in the competitive economy."

Now the author of these words is not going to argue th he Air Force should support R&D on submarines, and he probably is irritated by the fact that the Army is treading heavily in space these days, while the poor GI is a forgotten man whose equipment is getting a minimum of attention. Yet he has come up with these precepts, stolen from our very successful private industries, that he feels should guide military research and development:

- Waste is necessary and inevitable.
- Multiple approaches get the quickest results.
- Duplication and waste should increase in direct proportion to the project's urgency.
- The cheaper the multiple paths, the more sense they make. Maximum number of approaches should be in the basic work, and they should be reduced as the project moves into development, on to production.
- Most expert predictions of the results are highly unreliable. Most ideas must be tested.
- The person doing the research is best qualified to pick the path.
- Competition is the most effective spur to R&D accomplishment.

What is needed, according to the skeptics who endorse the above attitude, is less centralization, not more of it. An Air Force officer of some standing recently gave it as his opinion that the Weapon System Project Office (WSPO) on the Boeing B-47 bomber project had more authority over that airplane than the USAF Chief of Staff holds today over the new North American B-70 chemical bomber. Certainly the trend and announced goal of the civilian administration is to further reduce these prerogatives. It is an interesting paradox that in an era when Big Business is decentralizing on many fronts, a government manned largely by Big Businessmen talks so much about the need for "strong central direction," "tough-minded decisions," "czars," and other restraints. The problem is that Russia is catching up with us in the field of weapon development. Yet in the areas outside of the tools of war, where free competition runs the show, can you name an American industry that is not more advanced than its Russian equivalent both in technology and production?

■ There is an item of news from the Army this month that cannot be ignored. The service has given a contract to the Martin Company, an established airframe manufacturer with a history longer than that of some automobile concerns, to develop, test, and produce a major weapon. It is the Pershing, a ballistic missile with range up to 1,000 miles. There is some effort in the Pentagon to soft-pedal the fact that Pershing somehow got away from the arsenal and that the Martin Company got the whole job as weapon system manager, responsible for the ground equipment, engineering, maintenance, training, and field service. It was only last August that the Secretary of the Army said this concept—utilized for years by the Air Force—was no good and that he could not afford to "do business that way." Incidentally, the new Martin plant at Orlando, Fla., where Pershing will be born and built, is the site of the Army's first and only experience with cognizance over an operation by a genuine aircraft manufacturer. The indications are that they like it.

■ Some time late this month the Air Force is expected to announce which contractors have been selected to have a role in the development of the orbital bomber, already popularly known as Dyna-Soar. Presumably this will be the first step toward putting USAF into space with a tool that will help perform its most important mission.

From the viewpoint of the aircraft industry, there is more to it than that. There are serious observers who feel strongly this decision may go down in history as a true turning point, possibly the most important purchase since the Wright brothers won that first Army contract in 1909.

By way of recent background, it is important to recall that only about four years ago USAF spokesmen stirred up some dust on Capitol Hill by narrowing their industry sources. There were only a couple of companies, they told congressional probers, considered fully competent to take over design, development, and management of a modern bomber system. And only about five firms held honest prestige in the field of fighters and interceptors.

Well, we are entering a new era. Space is next, and it is fully reasonable to ask how many contractors will be competent to take these responsibilities for honest-to-gosh spacecraft. We have found competent industry and military figures who believe there will be room for only one. This, it must be added hastily, does not mean a single company, but more likely a single combination or cartel capable of pooling its resources and talents to meet this tremendous challenge. Those who partake of the first orbital bomber contract pie will have a substantial advantage in the years to come.

It is important to point out that USAF's brainiest men feel the weight of this problem grow greater every day. Only in the past few months have they come to realize that their decisions to ensure technical superiority are vastly important in fields remote from test cells and flying fields. Making the right decision influences the minds of men in the cold war.

This factor was pointed out recently by one of USAF's more scholarly generals, who confessed he is finding it increasingly difficult to distinguish between airplanes and missiles as performance, electronic sophistication, and other trends converge.

Largely for this reason Maj. Gen. Victor R. Haugen, ARDC Assistant Deputy Commander for Weapon Systems, says he looks in the future for fewer developments, but bigger advances. The increasing complexity leads General Haugen to conclude that the "weapon system concept" must have its name changed—to merely the "system concept." Surely, he says, this will make it clearer in "the challenging job of developing space research vehicles." The situation has developed, he says, to the point where a system is "something one order more complex than the thing you are working on." And then he quotes an appealing ditty:

Big whirls have little whirls
That feed on their velocity;
And little whirls have lesser whirls
And so on to viscosity.

—CLAUDE WITZE

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The READY ROOM

RESERVE AND AIR GUARD NEWS

Actual **manning of Air Reserve Technician Plan slots** at twenty-one installations **becomes a reality next month.**

ARTP, according to **David S. Smith,** Assistant AF secretary (Manpower, Personnel, and Reserve Forces), will prove to be an **important stabilizing factor in the Air Force Reserve.**

CONAC reports that the number of Regular AF personnel who will revert to the active establishment when ARTP becomes effective will be **in the neighborhood of 7,500.**

Technicians serving in a **dual Reserve-Civil Service status** will perform Air Reserve Flying Center work now accomplished by active-duty personnel.

It's been a long haul—**three years of stumping**—but the plan received a solid boost when the two test bases—**Ellington AFB, Tex., and Davis Field in Muskogee, Okla.**—came through with flying colors. The "guinea-pig" fields proved conclusively that ARTP was workable.

Since early this year, the first technicians were employed at the bases, and from all indications the results were highly favorable. **Lt. Gen. William E. Hall, CONAC Commander,** stressed that the program is based on a **vital need for highly skilled Air Reservists,** who as permanent party personnel, **would be immediately available** to the Air Reserve Forces in the event of an emergency.

ARTP will eventually take in **an additional twelve bases by October.** All in all, some **thirty-five installations** will employ technicians by the fall.

Last month, a CONAC briefing team visited the command's numbered Air Forces at **Fourth Air Force, Hamilton AFB, Calif., Tenth Air Force, Selfridge AFB, Mich.,** and **Fourteenth Air Force, Robins AFB, Ga.,** where key personnel were instructed on how to implement the program.

The twenty-one bases starting to employ technicians under ARTP in June are:

Hamilton, Calif.; **Paine,** Wash.; **Portland International,** Ore.; **McClellan,** Calif.; **Mitchel,** N. Y.; **Alvin Callander,** La.; **Miami International,** Fla.; **Donaldson,** S. C.; **Dobbins,** Ga.; **Memphis International,** Tenn.; **Brooks,** Tex.; **Hensley,** Tex.; **Billy Mitchell,** Wis.; **Minneapolis-St. Paul International,** Minn.; **Selfridge,** Mich.; **O'Hare International,** Ill.; **Willow Grove,** Pa.; **Niagara Falls,** N. Y.; **Youngstown,** Ohio; **Pittsburgh,** Pa.; and **Andrews,** Md.

ARTP, which received **Defense Department's blessing last summer,** makes available the readiest of Reservists. Technicians work as **Civil Service employees five days per week,** then don their uniforms **one weekend each month. Two-week active duty tours** with their units each year further contribute to their readiness in this realistic plan **patterned after the Air Guard's highly successful program.**

* * *

All USAF staff agencies have been directed by the AF Secretary to assist the **Reserve Forces Policy Board** and the **Air Staff Committees on ANG and AF Reserve** policy in performing their **advisory functions.**

The directorates have been advised to keep the RFPB **"fully informed"** with respect to the **initiation or revision of significant policies, plans, programs, and related matters** concerning the Reserve components." The office of the Assistant Chief of Staff for Reserve Forces, headed by **Maj. Gen. Richard A. Grussendorf,** is the communication channel through which this policy will be effected.

The **twenty-sixth joint meeting** of the **Air Staff Committees on ANG and AF Reserve policy,** held at the Pentagon in mid-April, highlighted pending legislation affecting the Air Reserve Forces.

Chairman of the session, held April 10-13, was AFA Board Chairman **John P. Henebry,** a Reserve major general.

Among the important recommendations discussed was one that would permit **selective assignees to choose the Ready Reserve unit** or position in which they will voluntarily participate, even if the chosen unit is in a lower training category than that to which selectively assigned.

AFR 45-35 **prohibits reassignment from a Category "A" unit** or position to a volunteer slot in a lower category such as Category "B." This **results in a hardship** where scarcely populated areas are concerned, since airmen obligors are assigned to distant Category "A" units and are thus discouraged from participation.

CONAC concurred in Air Force's recommendation on this program, reporting that the entire selective assignee program **is being reviewed.** Modification of existing AF directives will be sought based on this review.

* * *

Eight of CONAC's **fifteen Air Reserve troop carrier wings** have completed **conversion from C-46s to C-119s.** The remaining seven wings are in the **process of transition** and are expected to be **completely modernized this fall.**

The TCWs which completed conversion are: the **94th,** Hanscom Field, Bedford, Mass.; **302d,** Clinton County AFB, Wilmington, Ohio; **403d,** Selfridge AFB, Mich.; **434th,** Bakalar AFB, Columbus, Ind.; **440th,** Minneapolis, Minn.; **459th,** Andrews AFB, Md.; **512th,** New Castle County Airport, Del.; and **514th,** Mitchel AFB, N. Y.

* * *

CONAC, composed of both Regular AF and Reserve units, received the **Daedalian Trophy for 1957,** as a result of having the most effective aircraft accident prevention program of all major commands which flew more than 100,000 hours last year.

General Hall was presented the large silver cup, symbolic of the **AF's highest flight safety award,** by **Lt. Gen. Elmer J. Rogers,** USAF's Inspector General (representing Chief of Staff **Gen. Thomas D. White**), in ceremonies at **Kelly AFB, Tex., April 12.**

According to USAF flying safety records, CONAC had but **one fatality in an aircraft accident last year,** while achieving a **fifty-two percent improvement** over its 1956 rate.

* * *

"Those who aspire to **leadership in the Air Force of the astronautic age,**" General Hall told several hundred **Arnold Air Society** cadets at the **Society's ninth annual conclave** in San Francisco recently, "should begin now through self study to acquire the necessary basic foundation."

The Reserve Forces chief urged the AFROTC honor society cadets to consider the **Air Force as a life career.**

"I cannot think of any more rewarding, proud, and vital occupation than for you to serve your country, your families, and yourselves as Air Force career officers in the most critical period of our history," General Hall said.

—The Editors

VIEWS & COMMENT

The Space Force of Tomorrow

A few weeks ago, Lt. Gen. Clarence S. Irvine, Deputy Chief of Staff, Materiel, focused on a space-force weapon system future that is by no means inconceivable. He was addressing the Supervisors Club at the Wichita, Kan., Boeing plant. Some of what he said follows:

FOR the day after tomorrow—when the *Air Force will become the space-force of our defense establishment*—the weapon system requirements will become even more severe. It is imperative that we work *now* toward unmanned reconnaissance satellites, toward piloted space vehicles with weapon deployment capabilities; and toward defense system complexes far superior to anything now envisioned.

Knowledge gained from current ballistic missile programs will be used to create propulsion systems that conceivably launch both free-orbiting and controlled-hovering types of satellites. In fact, the IRBM and ICBM propulsion systems now in use will be the real workhorses for later space vehicle projects.

Also, the X-15 tests will lay the groundwork for piloted space weapon systems. The X-15 program represents a proposed progression of steps for the operational capabilities we intend to possess in the years ahead.

In connection with these space weapon systems, I would like to underscore a thought that appears to be overlooked by some of this country's nondefense visionaries. The Air Force does not expect to marry present day concepts and weapons with space-type vehicles. That is to say, we do not mean for space vehicles of the future to deploy *current* types of weapons.

In fact, it is entirely possible that nuclear warheads of today will be totally obsolete. Devices such as controlled elliptical mirrors and infrared and photon devices may be developed in conjunction with the space vehicles, themselves. It is also possible that fantastic new electronic devices, employing a technical follow-on to radar, will enable our forces to neutralize or paralyze an aggressor force *without loss of life or destruction of property.*

These may be highly imaginary possibilities now—so much so, in fact, that some knowledgeable scientists will flatly declare them to be impossible. To such people, we should direct one simple question: What statistical evidence, based on *hardware experiments,* disproves them? . . .

On a long-range basis, industry must recognize that the trend in production of weapon systems is undergoing rapid transition. Long production runs will no longer be the pattern. Practice will be to buy fewer of a given system. This will permit superior items to be introduced sooner, and at relatively less expense than would be the case if we modernized large quantities of obsolescent systems at one time.

To meet this new set of circumstances, industry must direct its engineering staffs along three paths of effort simultaneously: One aimed at creating significant improvements in operational systems; one aimed at follow-on systems for the immediate future; and the third aimed toward design and development of space vehicles and accompanying support equipment. In addition, industry must make certain that it fully uses the capabilities of engineers and scientists in their technical role, rather than in an administrative capacity.

Europe's Stake in Missiles

A provocative statement on the reasons for Europe's need for missile installations was made by Henry A. Kissinger, writing in the April issue of Foreign Affairs *magazine, which we quote, in part, with permission of the Council on Foreign Relations.*

MISSILE installations on the Continent . . . are required not for the defense of America but for the defense of Europe. They are essential for the very reason that Europeans are reluctant to accept them: because with the increasing speed and destructiveness of weapons *every* country will be reluctant to risk its existence for anything except the most direct challenge to its survival. If Europe is reluctant to participate in an all-out war for the defense of the United States—the only meaningful rationale for rejecting missile bases—so will the United States be reluctant to risk total destruction for the defense of Europe. Our NATO Allies should have every incentive to help develop a strategy which does not force the United States to have to choose between all-out war and inaction in the defense of Europe.

Rather than consider the American offer of missiles as designed for our exclusive benefit, our European Allies should understand that it represents the only means by which Europe can gain a degree of influence over its future. A strong military establishment within Europe and under European control is more than ever essential, less to deter an attack on us than to pose a meaningful sanction against an attack on Europe. Refusal to accept missiles will only increase Europe's dependence on the United States. If the United States assumes the sole responsibility for the defense of the Free World, it will also assume the responsibility for defining the *casus belli.* The decision on how to react to aggression even in Europe would no longer be a European one. As the United States grown more vulnerable, fewer and fewer objectives will seem "worth" an all-out war. Even Europe may not appear important enough, particularly against challenges which are limited or ambiguous. And, given the destructiveness of modern weapons, any attack which is explicitly less than all-out is inherently ambiguous. In time, this situation could bring about what many Europeans fear most—direct negotiations between the United States and the USSR from which Europe is excluded.

(Continued on page 29)

THE BELL.. WORLD'S LEADING HELICOPTER

..in O.D.'s or in Civies

In civilian life as well as the military, the Bell is the world's most widely used helicopter. Bell has produced more helicopters than any other company in the world.. sold more commercial helicopters than any other manufacturer.

Just this January, Bell produced its 2,000th Model 47 helicopter.. the series that includes the famous Army Sioux. Just as the Sioux distinguished itself on the battle front, the Bell 47 G-2 has distinguished itself on the business front. Today, there are over 700 Bell helicopters in commercial use in 52 countries of the world.. more Bells than all other helicopters combined.

Because the Bell has proven dependability based on more than 2,500,000 hours of flying experience .. because it has the most advanced operational features.. the Bell is the pacesetter in the helicopter field. And because it is volume-produced, it has the lowest initial cost.. lowest maintenance cost.. making Bell the *best buy* in the field!

Watch "WHIRLYBIRDS" on TV .. consult your local paper for time and station.

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BELL is *First Choice* With Many of America's Best-Known Companies

These are just a few of the top names that are discovering hundreds of cost-cutting uses for the Bell.

FORT WORTH, TEXAS

Out of advanced research, development and production at **Hoffman**

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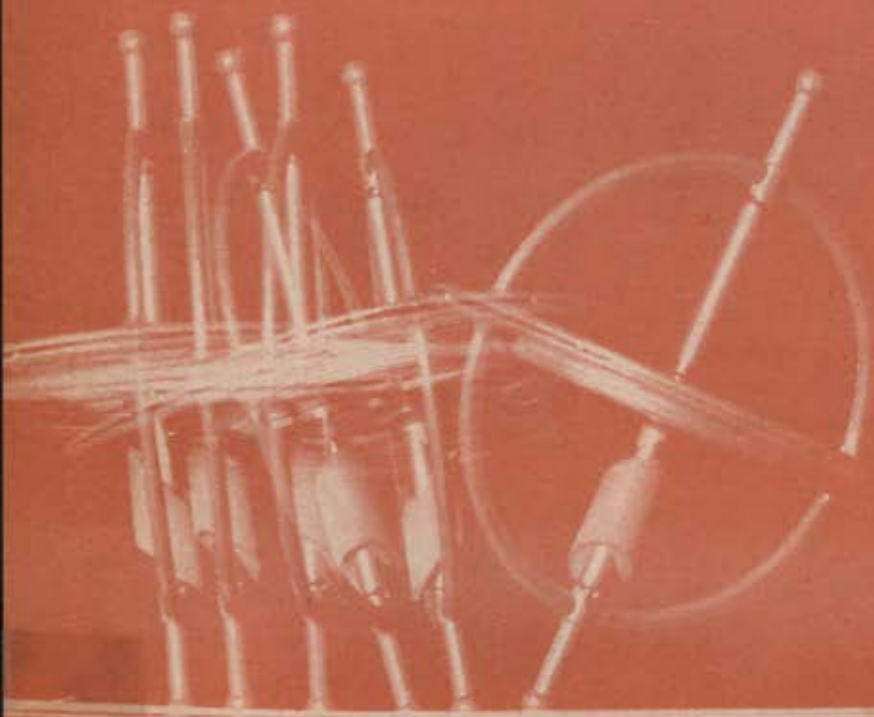

Electro-Mechanical Equipments—such as the Air Force's ASN-6 Automatic Dead Reckoning Navigation Computer now in production at Hoffman—include gyroscopes, inertial navigation systems and components, servomechanisms, fire control systems, and guided missile controls. These are examples of the special Hoffman skills and electro-mechanical capabilities which can help solve your design problems.

Designed and developed by Humphrey, Inc., San Diego, Calif.

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. . . And We'll Need It By Monday

The increasing demands on the ingenuity of American industry and the Air Force's faith in industry's ability to meet them were graphically spelled out recently by ARDC's Brig. Gen. Lee W. Fulton in a presentation to the IRE in New York City. We quote in part:

I DON'T think there is a more striking example of our faith in the reliability of electronic products than the decision to fully automate the final countdown of the intermediate-range ballistic missile, Thor.

The crucial events of the final countdown happen so rapidly, and so much is at stake, that it became apparent in our planning for operational capability that a human operator could not be depended upon to perform these functions manually. The human being, remarkable as he is in his intelligence and his humanity, is mechanistically a non-linear and slow-reacting device so we have included in the Thor ground-support equipment a final checkout and countdown control system that will be fully automatic. So you can see that I mean it when I say that we have entrusted the most crucial missions in the entire program to electronic devices. I have no doubt—and neither do you, I suspect—that one of these days we'll be sending out a specification that reads something like this: Build us a precision device, capable of measuring all of the parameters, known and unknown, of the complete missile system. This device must be accurate to within one part in infinity, and have a drift of one part in eternity. It must be capable of operating instantly, in three reference planes simultaneously, at all temperatures stably, and have a readout in technicolor motion pictures. Of course, it will have to be of modular construction—about the size of a thumb-tack. It will have to operate itself, check itself, repair itself, and—if it's not pushing the state of the art too far—manufacture itself. We will place the order some Friday and ask for delivery the following Monday—and the costing will have to be on the basis of a forty-hour week.

Courage—The Scarcest Coin of All

Courage, the scarcest coin of the times, comes in for some serious discussion by the New York Herald Tribune's *Tom Lambert, who wrote a recent column of what he called the seemingly universal refusal on the part of administrators to say, on any question, "this it is, and this is how it's going to be." Excerpts from Mr. Lambert's piece follow:*

THE main civilian deficiency in the Pentagon, and in other than Pentagon civilians who control our defense establishment is guts, the courage to make clear, swift and unequivical decisions. Settlement of defense problems ranging from fundamental strategic issues to how many aircraft we shall buy in a given period are delayed because nobody up to and beyond McElroy will say flatly "this is it, and this is how it's going to be."

Do we produce Thor or Jupiter as our first IRBM? We ducked the issue. We produced both.

Does the Army or Air Force develop the antimissile missile? We ducked again, and kept both services in the program. Naturally, both are going to continue fighting to take over the program. . . . These are what the military people call "waffled" decisions, which don't resolve problems. . . .

I'm saying, in effect, that you can reorganize from here to breakfast and still be no better off if you can't get courageous men to run the national defense establishment from the White House down to a rifle squad.

Now, how you can reorganize or legislate courage into men, I don't know.

Not an End But a Means

IN TERMS of military organization, we are in another period of crisis, when national survival may well depend on our ability to respond instantaneously but responsibly to enemy moves. . . .

What makes the danger so profound is that changes in the world balance of power, and in the military technology which is one manifestation of power, have coincided with the development of an alien and hostile ideology. In the Soviet Union and its allies we face not just an aggregation of militarily-powerful nation states but a threat to our entire political and social system. Although military strength is by no means the sole answer to that threat, it constitutes the shield behind which we and our allies can progress economically, socially, and politically. It is not an end in itself, but a means to a larger end: the preservation and ultimately the peaceful triumph throughout the world of democratic and humanitarian principles and ideas.

From Forging a New Sword, *a study of the Department of Defense by Cols. William R. Kintner and Joseph I. Coffee with Raymond J. Albright, copyright 1958, Massachusetts Institute of Technology, published by Harper and Bros., New York.*—END

...speaking of

Missile Ground Support **MOBILITY**

HERE'S WHY FMC CAN

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Amphibious Personnel-Cargo Carrier

1942...LVT (A) 1
Amphibious Armored Assault Vehicle

1942...LVT 2
Amphibious Personnel-Cargo Carrier

1943...LVT (A) 2
Amphibious Armored Personnel-Cargo Carrier

1944...LVT 4
Amphibious Personnel-Cargo Carrier

1944...LVT (A) 5
Amphibious Armored Assault Vehicle

1945...LVT 4 Lightweight
Amphibious Personnel-Cargo Carrier

1949...LVT (A) 5 Modified
Amphibious Armored Assault Vehicle

1951-1958...M59
Armored Personnel Carrier

1954...LVT P6
Amphibious Armored Personnel-Cargo Carrier

1955...LVTR-1
Modified Vehicle for recovery duty

1957...M-84
Mortar Carrier Vehicle

HANDLE MISSILE LAUNCHER PROGRAMS

1957...HAWK
Mobile loader Vehicle

1958...THOR
Transporter-erector Launching Mount & Power Control Trailer

FMC's development of ground support equipment for major missile projects stems from over 17 years experience in producing mobile surface equipment for the Armed Forces

Since 1941, FMC has designed and built more types of military-standardized tracked vehicles than any other company in America. This extensive and versatile background in the field of mobility can be applied to your missile ground support project.

FMC is uniquely qualified to handle every phase of the job from design concept through development, engineering, and production on any size project. Long familiarity with military requirements enables FMC to approach basic design with standardization in mind. With fully integrated facilities devoted exclusively to the production of defense equipment, contract delivery requirements are met – on schedule.

Do what others have done. Provide for the over-all success of your missile system, by contacting FMC at the very beginning of your program. This will insure perfectly coordinated development and delivery of required ground support equipment. Contact us today for more information.

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Putting Ideas to Work

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WITH THE EDITORS OF AIR FORCE MAGAZINE

SHOOTING THE BREEZE

In an age of cosmic alarms and excursions, it's refreshing to reflect on the human attribute that may yet save us all, or at least keep us laughing in the face of mounting mayhem—humor. We reprint, courtesy of *Punch*, that journal's "Spaceupplement: the Busy Man's Guide to Everywhere Else," which originally appeared last fall. Its British zaniness is formidable.

INTRODUCTION

"Stone Age . . . Bronze Age . . . First and Second Ice Age . . . Wat Tyler . . . Renaissance . . . Sham Tudor . . . and now at last the Space Age! Restless Man, in his constant quest for something fresh to have a special supplement about, has stumbled on yet another circulation-builder.

"Where is Space? Are You Sure? What's in it for Father? Whither Betelgeuse? Can We Harness the Ionosphere? Do You Get Seasick in a Vacuum? Is Gravity Finished? What Can Matter Be? These are just a few of the anxious queries being bandied about today on the tops of buses.

Two models, one live and attractive, the other shrouded for security, point up North American Aviation's contributions to US deterrent strength. Concealed for security and identified by pretty Aletha Hilton is a model of the USAF-designated B-70 chemical bomber, Weapon System 110. After an intense two-year design competition, it was announced late last year that North American had won the contract for development of the B-70, expected to be able to fly faster than 2,000 mph above 70,000 feet. "We are well into preliminary design engineering," reports Ray Rice, a North American vice president.

This Guide sets forth in plain, straightforward language some of the more important answers. (Not all, of course, for security reasons.)

WHAT IS SPACE?

"Space is what everything is in. It is all over the place. If it were not, there would be nowhere to put things.

"More simply, if Space did not exist everything would be all jammed up together in a great big lump—Saturn, the Earth, the Milky Way, East Croydon, the Plough, the Sun, and everywhere, so that a train leaving St. Pancras at, say, 10 a.m., would eventually reach a siding in the Andromeda Galaxy by way of Jupiter, and a man walking backward down the corridor toward the guard's van, relatively speaking, would make things very difficult all round.

HISTORY

"Space was discovered by Fred Hoyle shortly before the war, although its existence was also shrewdly suspected by Giordano Bruno before him (1548-1600). Nicholas of Cusa (1401-64) said it was a product of the mind, and didn't reckon much to it at all.

"Space is very old. It is either shrinking or expanding, according to how you look at it, and either coming or going by the same token. It has a great future behind it. It has never been conquered, which makes it an obvious target. Its famous battles have been described by Wells, Verne, etc.—but not, so far, by Churchill.

IS SPACE NECESSARY?

"Yes. (*See* WHAT IS SPACE?)

GEOGRAPHY

"Space is divided into three main parts:

(a) Space Proper
(b) Outer Space
(c) Infinity

"It is in effect a large body of room entirely surrounded by itself, and containing worlds. Principal exports are meteorites, radio waves, manna, and It. Apart from the occasional expedition by monkeys, dogs, and mice, little serious exploration has been done, and several people on Earth have said they wouldn't go there for a big clock.

"Geographically speaking, Space is different from practically anywhere else you can think of: it is curved.

FLORA AND FAUNA

"These occur mostly on Earth, a football-shaped place somewhere near the bottom left-hand corner of Space, and include women and mushrooms. There may be some moss on Mars and even lichen, but the presence of mushrooms (*Agaricus psallioter campetris*) is very doubtful; they need an even temperature of between 55 degrees

(Continued on page 34)

A Red Airpower Feature

That Curious Beast—

THE RUSSIAN YAK-25

ONE thing the Russians are counting on in the event of an all-out war with the United States is that they will be able to defend their homeland from aerial invasion by the US Strategic Air Command. One important set of tools they have in their defense system is the YAK-25—models A, B, and C.

The first of the YAK-25s appeared in 1951. It soon was code-named Flashlight by NATO, following its appearance over East Germany. Then the type disappeared from the scene for nearly four years, only to reappear again in 1955 in a somewhat souped-up version. The 1955 version had a rounded or blunt nose that stuck well forward of the two engine pods mounted beneath the sweptback wings.

In 1956, two additional versions appeared—the B and C models. Apparently the first and third models, the A and C, were assigned to the Russian equivalent (more or less) of our Air Defense Command. The YAK-25B, which has a "greenhouse" nose for good visability, is considered as a light bomber, and acts either in support of ground-troop operations or as a reconnaissance airplane.

The YAK-25s — designed by the youngest of the major Soviet airplane designers, Alexander Yakovlev — have large fuselages to handle radar equipment and extra fuel. The wings of the A model are swept back forty-two degrees along the leading edge. The outer sections of the wing have constant chord and grow progressively thinner toward the tip. Those who have seen the A model airplane say it exhibits good flight stability and is reasonably slow on takeoff and landing. There are two boundary layer fences on each wing, attached at the one-third and two-thirds marks.

The vertical stabilizer is large and starts about two-thirds of the way back on the fuselage. The horizontal stabilizer is mounted about halfway up the vertical stabilizer.

Like the French S.O.-4050 Vautour, the YAK-25A has a tandem landing gear which can be retracted into the fuselage. Auxiliary wheels at the ends of the wings retract into the wingtips.

The fuselage is cylindrical, with air brakes on each side about two-thirds of the way back.

The B and C models of this aircraft are distinguished from the A model by longer engine nacelles, by more sweepback in the inner panels of the wing, a slightly larger wing, and their different noses. The A model has a blunt, rounded nose that apparently houses radar; the B model has the greenhouse nose to afford good visibility; and the C model has a pointed nose that appears to house radar and seems to be constructed of the same material as the A model.

Total wing area of the B and C models has been increased by thirty-two square feet. The change in sweepback undoubtedly has increased the plane's Mach level, and it also has reduced wing loading while increasing the space available for fuel.

The C model is a little faster than the other two *(see accompanying table)*, with a top speed of 770 miles per hour, compared to 705 and 695 for the A and B models respectively. Cruising speed for the three designs, in alphabetical order, is 600, 607, and 640 mph for an altitude of 23,000 feet.

Flashlight A has an operational ceiling of 50,840 feet; Flashlight B will achieve 53,000 feet; and the C model, 57,700 feet.

The B model is slightly heavier when assigned its usual operational load, which includes four one-ton (metric) bombs. All three models are equipped with 76-mm. remotely controlled rockets as well as two 37-mm. Nudelmann guns. Russian rockets, particularly those used in aircraft, are believed to have reached a high state of development, fully competitive with the West.

The rather good range and speed of these all-weather interceptors and support craft is in keeping with the fact that Russia has few airports (compared with the West) from which aircraft of this type can operate, which means they must be capable of striking an invading bomber force from a considerable distance. Also, Russia must protect a vast border area, which stretches air defenses—and so interceptors must have more range.

Their training—in addition to subjection to isolation tests, zero gravity, periods in pressure suits, and centrifuges—will include survival tests in the field, continuous physical conditioning and psychological testing.

Diet, an important factor in physical conditioning, will be carefully followed, since, as General Flickinger points out, every possible means of exploiting the *plus* factors of each spaceflight trainee will be used. Performance checks will be constant throughout the program, aimed at screening out any candidates whose weaknesses reveal themselves at any stage. For a key to the success of the program is the reliability factor of each space candidate. The nucleus of successful candidates to emerge at the end of the two years of training will have eaten, slept, and breathed spaceflight and will be ready for assignment. Their number—anyone's guess. Their quality—the absolute best.

This planning for the human requirement of tomorrow's spacepower is nothing new to the Air Force. It is, rather, an orderly progression of events, which has proceeded as aviation has reached higher and higher in and to the edge of the atmosphere. As USAF Chief of Staff Gen. Thomas D. White has asserted, air and space are indivisible.

Months before Sputnik I, for example, a dispassionate and highly readable study was completed by an Air Command and Staff College student group at the Air University at Maxwell AFB, Ala., on the subject of human requirements in future airpower. One of its conclusions was the strong statement that "man is an integral part of the weapon system [and that] engineers must consider man more and more as a prime factor in aircraft design."

Recognizing possible human limitations, the Maxwell study's conclusions suggest the realistic view that the men who are eventually trained for spaceflight missions will not be mass-production items, but the elite, end product of highly specialized training. This is an indication of how proportionately great will be the individual contribution of each man who does serve as spacecrewman when space vehicles become manned.

The continuity of Air Force advancement from the early days of flight to the threshold of space is further borne out by another study which provides actual specifications for the ideal spacecrewman.

To quote from that second study, produced recently by two veteran aviation psychologists:

"The space pilot must be able to perform the following functions with alertness, speed, and accuracy: pilot a high-performance, ultrasonic aircraft through the atmosphere during boost, control the vehicle in orbit and reentry glide, and guide it to a landing; obtain and interpret information concerning vehicle operation, cabin environment conditioning, personnel functioning, and external conditioning; and make rapid and accurate computations and decisions, anticipating difficulties by advance planning and action; check, test, and observe and report for scientific study, data concerning the spacecraft, its personnel, and the [cabin] environment."

The report goes on to suggest that it would be "uneconomical to consider any personnel for this program who are not already highly experienced in high-performance or jet or rocket aircraft . . . proficiency in high-performance flight and in the engineering, physiological, communications, scientific, and navigational skills required would reduce the selection problem greatly."

The report talks realistically, too, of the problem of "making up the difference" between the absolutely reliable sealed cabin environment that will some day enable "sport-shirt" travel minus protective suits and the early manned vehicles that—for safety—will require protective gear.

Such gear puts time limits—in terms of hours—on present-day spaceflight. And it requires personnel to have tiptop cardiovascular (blood circulatory) systems. Other areas of training and indoctrination suggested by the report include the preparation of spacemen for unusual work cycles, possible deprivation of such comforts as tobacco, and strange new diets. The list is long. Again, Air Force experience is ideally suited for such training. For who but today's jet pilots have shown the aptitude, motivations, and tolerances that will be called for in the space age?

No one can say exactly, of course, what tomorrow's spaceman's training program will be like, but the stages following suggest a picture:

First, a careful check of experience, based on careful evaluation of personnel and flying records, effectiveness reports, recommendations and ratings by fellow pilots and superior officers; second, physical examination, review of medical records, detailed medical history, comprehensive flight physical examination, special tests for tolerance to accelerations, heat stress, and pressure-suit wear; psychiatric examination, including testing to check personality, conflicts, and such important items as psychological dependencies on others; psychological tests for intelligence and aptitudes.

After initial screening, all this data would be retained for constant checks during the actual training program. Many good men would fall by the wayside, an indication of the elite qualities of the survivors of the course.

Using many of these techniques and certainly others that will emerge as the program advances, the training that will start at Edwards will be a milestone in education and in aviation medicine—a giant leap in the history of flight that started at Kitty Hawk.

The men at Edwards who emerge successfully from these long months of arduous and unique training will—pending their actual service in manned space vehicles—be as close to the ideal of trained spacemen as is possible to produce today.

In their curriculum, they will have learned to face and *want* to face fear and the unknown, to accept such unrealities as the weightless state, to control their physiological and psychological functions and attitudes. They will have learned to observe their own reactions coolly and scientifically, to cope with all foreseeable emergencies, to survive deprivation, and to tolerate fatigue.

They will be the very best of the best—combining intelligence and health and genuine motivation.

In great part, they will meet the stringent specifications of one science writer, Ernst Stuhlinger, who in a recent magazine article called for men: ". . . in excellent health, . . . [of] great stability." Stuhlinger added: "They will be persons of the scientific type who combine the love of adventure with the craving of scientific knowledge . . . men who can set aside their personal desires in favor of the idea of a great technical and scientific achievement."

In those areas, they will be idealists, as every man who has embarked on great adventure is an idealist of one kind or another. So, in a sense is the skilled craftsman.

Not long ago, Maj. Gen. Dan C. Ogle, Surgeon General of the Air Force, wrote down his conception of the ideal spaceman. It is accurate and eloquent.

He spoke of the USAF spaceman as "all that the best aviator is today as well as constitutionally and emotionally suited to the physical and emotional traumatic influences of sealed cabins, speeding heaven knows where, through the awful silence of a timeless and darkened sky."

Airmen being what they are, there should be no shortage of volunteers.—END

THE HISTORY OF FORD MOTOR COMPANY IN AVIATION

INTO THE NIGHT

As they taxied to take-off position that May afternoon in 1919, the nervous waters of Trepassey Bay, Newfoundland, licked at the hulls of Navy seaplanes N.C.1, N.C.3 and N.C.4. Within three minutes all were airborne and on their way.

Man was trying to conquer the Atlantic. Three brave crews and aircraft flying into the night with land nearly 1200 miles away and only the steady throbbing of their Liberty engines between them and———.

Ford Motor Company built the Liberty engines that made this flight a success.

We're proud of having a continuing hand in helping make aviation history—from this successful first flight over the Atlantic to building the dependable J-57 turbojet engine used today in many of our advanced aircraft.

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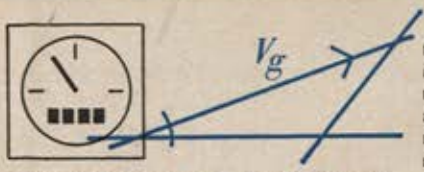
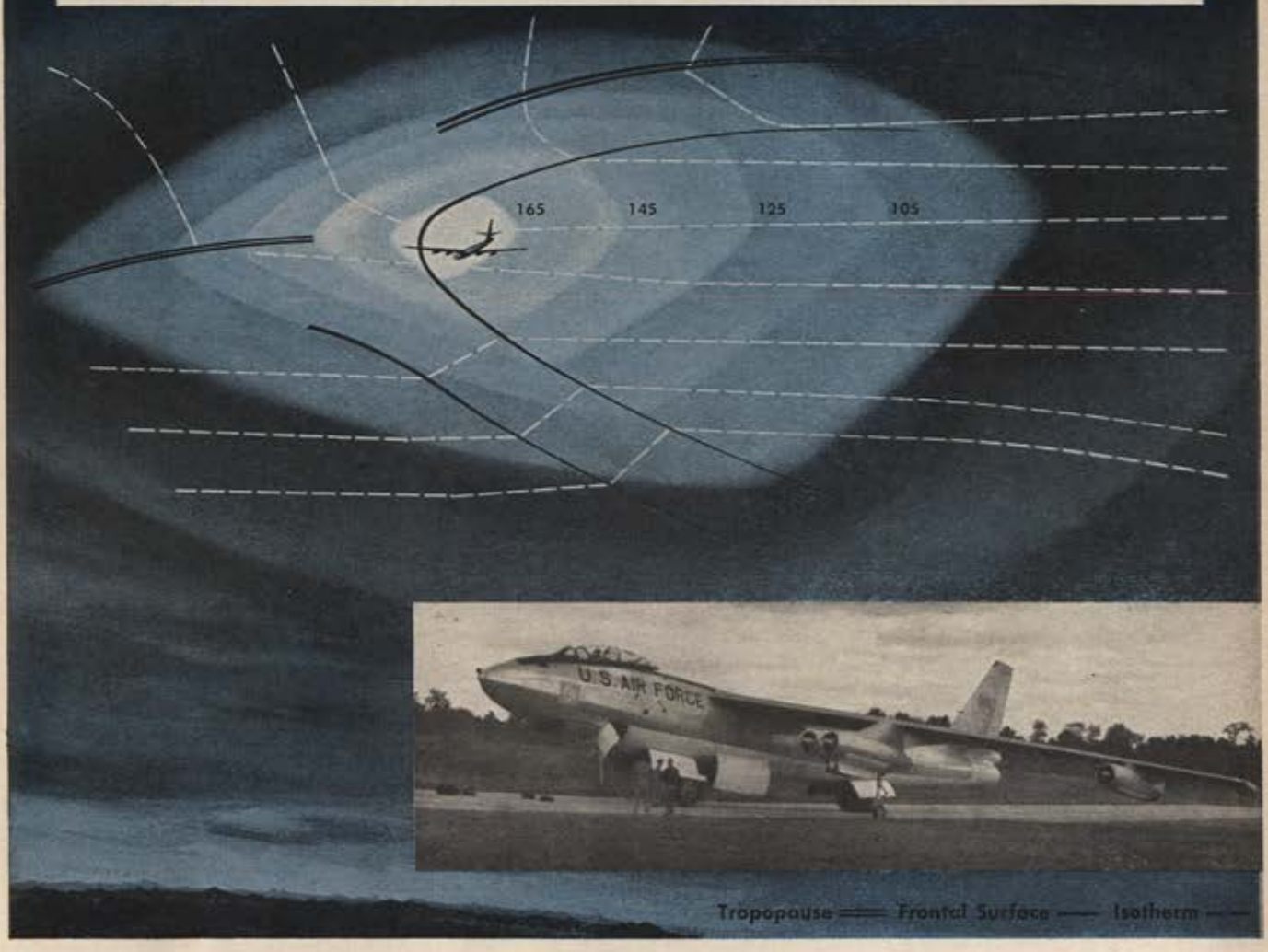


Ground Speed & Drift Angle
Any Time, Anywhere, Any Weather

Jet streams were cross-sectioned for the first time using the capabilities of GPL auto-navigators. Now these same ground speed and drift angle measuring equipments make riding aerial "express-ways" easy for military and civilian fliers.

A leading news magazine's story on the record-setting B-47 flight defined jet stream flying this way:

"To find the jet stream the pilot flies in its general direction . . . When the '66' tells him that his drift angle is increasing, he knows that he is getting into the jet stream . . . When the drift angle reaches a maximum, he turns downstream until the drift angle falls to zero... When the '66' is hooked to the autopilot, the airplane will follow the stream automatically, getting maximum benefit."



Cross-section of a headline

Headlines were made the day a GPL auto-navigator guided a USAF B-47 into the jet stream over California, set her down only 3 hours and 47 minutes later in sight of the Atlantic!

This dramatic use of GPL Doppler Navigation Systems is just one application of their basic function – precise point-to-point navigation – any time, anywhere, any weather. The systems work without ground aid or celestial fixes, have proved themselves over many millions of operational miles. They offer military and civilian pilots continuous, accurate navigation information, including velocity.

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What kind of men will be chosen for pre-spaceflight training? What kind of stresses will they have to undergo? And what qualities will be required of them to be considered for even initial screening?

If any quality is supremely required, it is motivation—the "want-to" factor. All aeromedical experts agree space-aspirants must have the most genuine kind of motivations. Their desire for the training must be associated with an intense scientific curiosity and must *not* be of a primarily romantic nature, or, even more risky, a neurotic desire for withdrawal from the earthly problems of home, family, finances, and the like. Indeed, the spaceman—when he reaches the void of orbital or interplanetary flight—will have to retain a strong and realistic connection with the home planet, since to a great degree, it will be a frame of reference that will, above all else, be meaningful to him. He will have to be a person fully and continuously knowledgeable of the purposeful quality of his mission, who, though he has left Earth physically, knows Earth as the origin and final destination of his trip once his mission has been performed.

In the psychological sense, spacemen will have to be persons who—more than most well-adjusted people—have resolved the ordinary conflicts of their everyday emotional lives. This is a rare quality, the experts agree, but not unattainable.

Lt. Col. Robert I. Williams, staff psychiatrist and neurologist to the Air Force Surgeon General, suggests that intensive research will have to continue in such speculative areas as the "anatomy of boredom," the loss of the usual sensory stimuli that earthbound people enjoy every day, the interpersonal relationships of crew members on extended missions, the possible deterioration of crew alertness, and the fascinating question of whether a man could endure the destruction of what doctors call the "self-image."

In the zero-gravity state in spaceflight a man is weightless. Without special pre-training he might easily suffer real psychic disturbances. Dr. Williams points out, since on Earth we walk under the influence of gravity and thus have weight, our picture of ourselves, our "self-image," is of a vertically oriented mass. We know our legs are at the bottom of us and our feet are on the ground and our arms are at each side and our head is on the top, supplying us through our senses with the information we need to get around. This picture and its reassurances would not obtain in zero gravity. Our eyes alone would be able to serve to orient us. And generally reliable as they are, experiments indicate that the eyes need special training and much practice to overcome the confusion of the zero-gravity state. There are additional problems with the eyes, a notable hurdle being a pseudo-nearsightedness often experienced by high-performance pilots who at high altitude lose the usual landmarks and develop a tendency to focus on the nearest points available. How much of a problem this would be in spaceflight—in view of the contemplated heavily automated equipment—is still another question, and it is being explored.

Another important problem—in many ways the most important of all—is what many aeromedical people call the "breakoff" point. Dr. Williams defines "breakoff" as "the critical point at which a person is unable to distinguish his inner [psychological] life from his outer [physical] environment." Lt. Col. David G. Simons—who last year ascended to 102,000 feet in a balloon—and others have described "breakoff" in varying terms. To Dr. Simons, it was a somewhat exhilarating experience. When he reached an altitude from which he could see the curve of Earth, he felt a kind of peace and detachment. But he has warned that such detachment could be dangerous, leading to an "I-don't-give-a-damn" attitude. And it is significant that the colonel had to be prodded occasionally to check his oxygen and other requirements during his flight. Such loss of alertness may have been due to increased carbon dioxide in his atmosphere, and the matter is being studied.

For others, "breakoff" has been a good deal more unpleasant. In experimental isolation chambers, subjects have reported hallucinations and feelings of confusion. The subject is fertile for research.

The psychological problems of spaceflight are simply the extremes of stresses we all experience every day. For example, anyone who has ever spent a few days bedded down with a cold in an empty house has had to cope with the loss of his usual frames of reference—the people he normally sees, the regularity of his meals, the sounds of conversation. The greater his psychological strength, the easier the experience. And as long as he knows and continues to know and feel that soon the cold will be better and that he will resume his everyday functions and relationships, his daydreams will not take over completely.

In fact, Dr. Williams suggests, for most of us the everyday problem of stimuli is one of *too much*, not too little. We get addled or upset because we have too many stimuli, too many things to think about and act upon. But since, even in the briefest initial flights of the orbital vehicles, "breakoff" could be a problem, the need for high and healthy motivation in spacecrewmen is again indicated.

The beauty of scientific research is that it constantly enlarges our knowledge of scientific problems. For example, General Flickinger believes that the projected training program for spaceflight will add significantly to medical knowledge of the chemical and psychological combinations that could indicate a person's ability to face extraordinary stress situations of all kind.

Glandularly speaking, says the physician-general, people fall into two general categories, in terms of the secretions of the vital hormones that nature uses to fortify the body for situations of stress. These two categories are roughly analogous to the beasts of the field—those who run away and those who chase or stand and fight. In human terms, these two types are called regressive and aggressive. Regressive types are generally resistant to change and often react with strong fear at new and stressful situations. Aggressive types react less emotionally to change or hazardous situations.

Research indicates that persons whose hormonal secretions under stress show a heavier proportion of adrenal hormone tend to fall into the first regressive category. Conversely those who show a greater proportion of what doctors call the "nor-adrenal" hormones under stress fall into the aggressive category. We all secrete the adrenal hormone in stress; it is the proportion of nor-adrenals in the total secretion that matters.

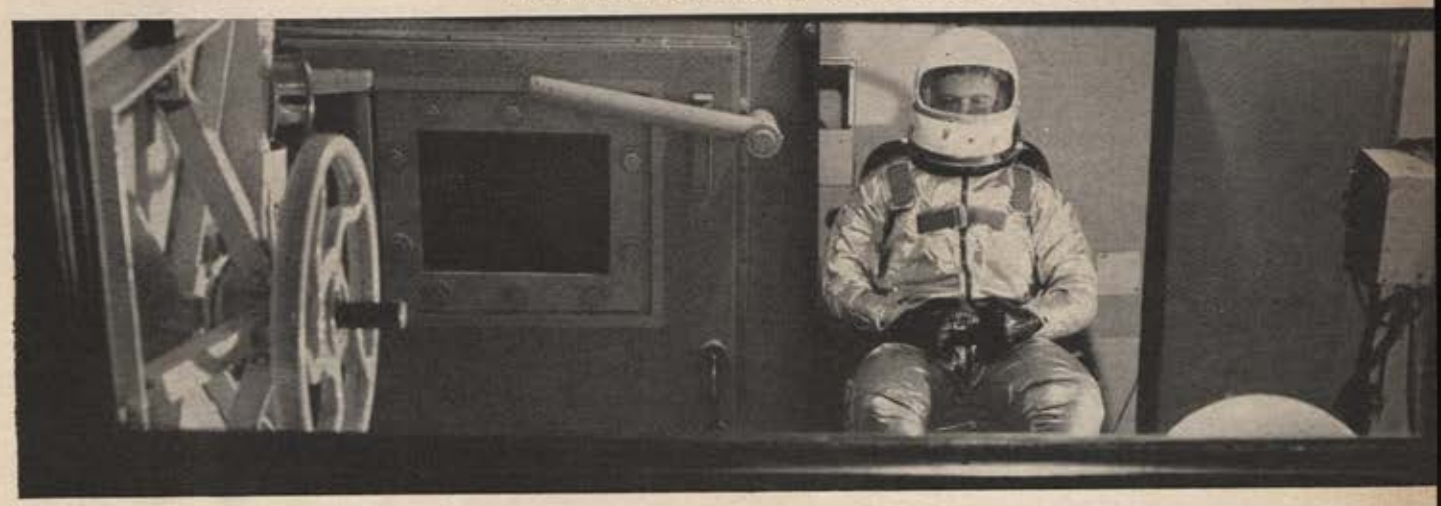
These nor-adrenal secretors, in the view of General Flickinger, indicate a greater potential for successful training in spaceflight. In terms of their glandular functions, they start with a *plus* profile. But that is only a beginning. At Edwards, such a group, which will also have passed the intensive screening tests for motivation, their flight science knowledge, and their general well being, will enter a training period that will repeatedly subject them to maximum stress simulations. It is hoped that eventually all the needed simulation equipment will be available at Edwards. Probably at the outset, the trainees may have to go to other centers such as Wright-Patterson and Randolph for part of their exercises, pending installation of the best possible equipment at Edwards.

(Continued on page 49)

Thermal stress is under constant study at Wright Air Development Center. Here subject is carefully weighed on delicately balanced scale prior to an experiment.

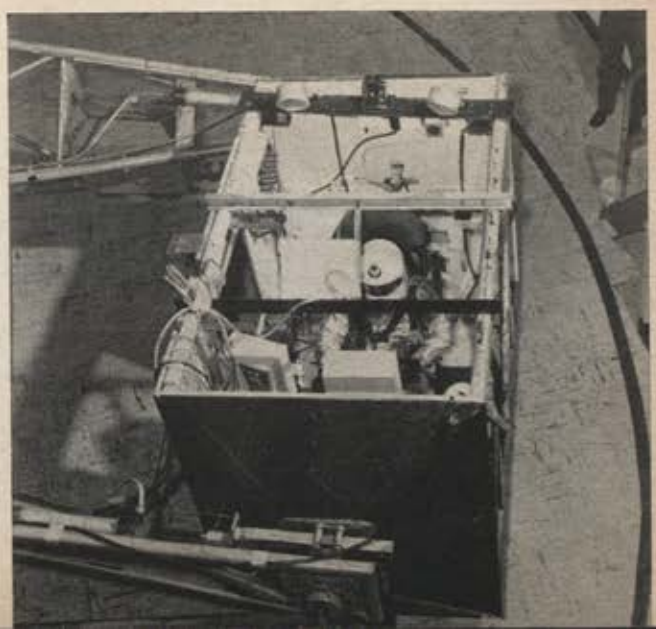
To test reliability of protective equipment, Dr. Edwin G. Vail, WADC, project scientist, enters an F-86 cockpit in the altitude chamber. He is wearing the XMC-2 full-pressure suit, to test ability to provide him a liveable atmosphere.

Below, observer's eye view of the XMC-2 full pressure suit under test in the high-altitude chamber. The airman testing the suit is actually seen through a mirror. The top of his helmet is barely visible at lower right.



Above, subject tests ability to operate controls under decelerative multi-G force, exploring reentry problem.

Right, Dr. Vail readies for ride on the WADC centrifuge. He'll experience increased G forces during acceleration.



Two of the five crew members who spent 120 hours at WADC in closed-craft simulator testing group reactions and strain of long missions.

The five crew members at the Wright Air Development Center test pose for "after" picture at conclusion of the five-day mission. They showed no serious strain, a trace of weariness. Left to right, Maj. R. Brewington, Capt. W. D. Johnston, Capt. J. V. Kennedy, Capt. D. D. Vulgham, Capt. L. J. McEachera.

will have been under concurrent development by the Air Force.

For, as the men at Edwards train for the extra-terrestrial flights they may some day perform, more immediate answers to man's ability to function and "pay his way" in judgment will be gained in vehicles like the North American X-15 and such successor projects as the Dyna-Soar boost-glide bomber.

As General Flickinger and colleagues like Lt. Col. Frederick S. Spiegel, Chief of the Air Crew Standards Branch in the Air Force Surgeon General's office, point out, the men who will fly the rocket-powered X-15 and its successors—USAF's Capt. Iven C. Kincheloe, Jr., North American's Scott Crossfield, and NACA's Joseph Walker—are themselves undergoing training programs for what is certainly space-equivalent flight. The difference between their intensive preparations and what is contemplated at Edwards is that Captain Kincheloe and his colleagues are readying for flight in a scheduled *vehicle*. Hence their regimens, partially prescribed, partially self-designed, are for specifically planned missions, while the Edwards training program aims for the day after tomorrow—for the day when it will have been proved that man *is* needed and that no "black box" computer can replace him in the business of purposeful spaceflight.

The question of man's ability to withstand the heavy stresses of spaceflight and to contribute to the functioning of the vehicle has now become crucial as the Air Force speeds development of hardware. The question must be answered definitively, because innumerable special provisions and modifications will be required to accommodate personnel.

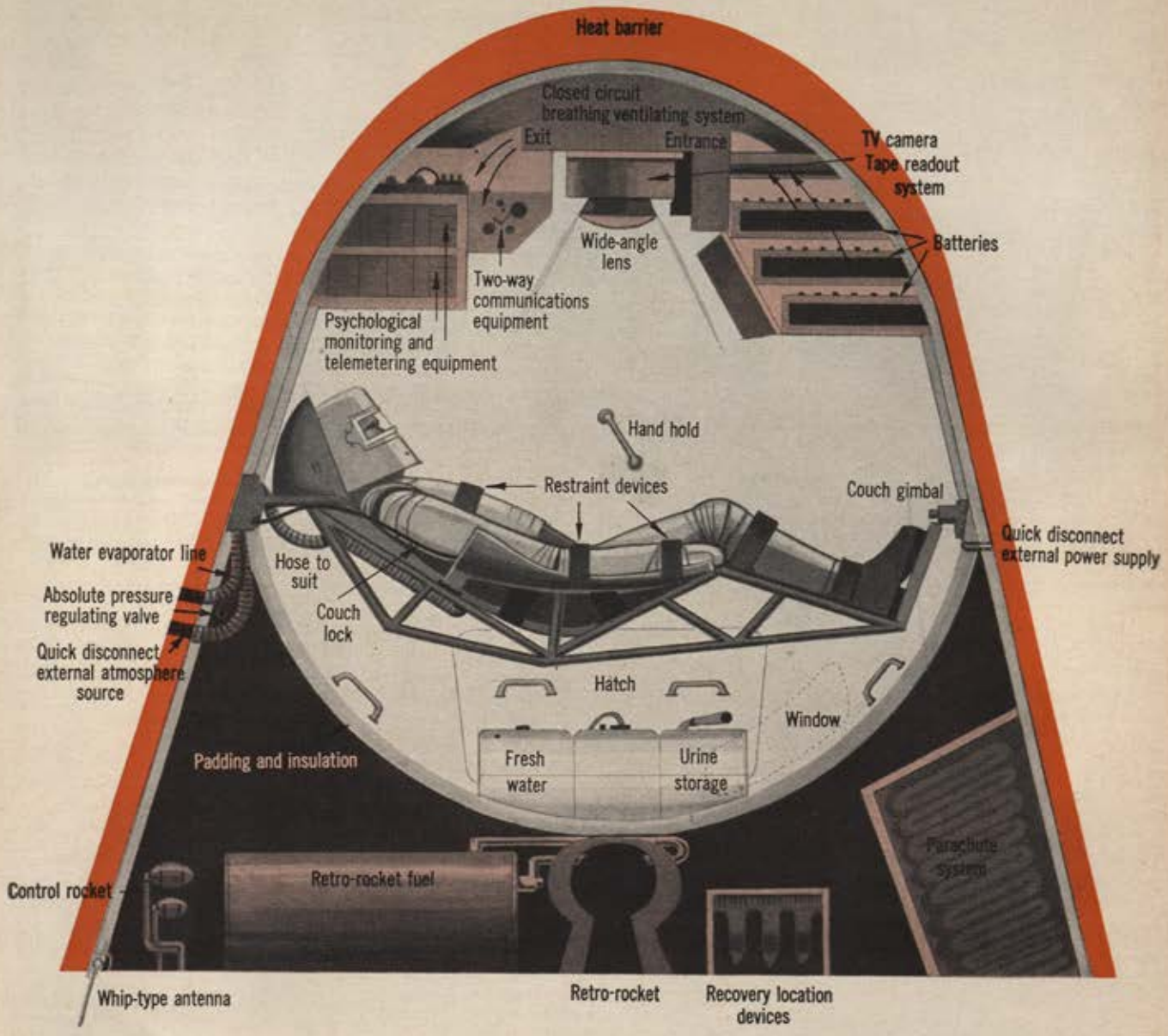
As of today, most aeromedical authorities believe man can and should be fitted into tomorrow's spaceflight. Much of the evidence on which they base their faith emerges from Air Force experimentation at such centers as ARDC's Aero Medical Laboratories at Wright-Patterson AFB, Ohio (*see photos*), at Holloman AFB, N. M., at Edwards AFB, at Randolph AFB, Tex. (*see* AIR FORCE, *March '58*), and at other military research facilities and university centers across the country. The list of researchers is enormous.

But as Col. Charles H. Roadman, a veteran flight surgeon and command pilot and Chief of the Human Factors Division in the office of the USAF Deputy Chief of Staff for Development, stresses, no human being will be sent into an orbital vehicle before an unoccupied vehicle has been launched, has orbited, reentered, and been recovered, and before the same process has been repeated with a primate passenger to observe the reactions of an animal similar to human beings.

And even after these operations are carried out successfully, the first man to board an orbiting vehicle will be going along primarily for the ride. So far as is humanly possible, his flight pattern and reentry will be automated so that full attention can be paid to his physiological and psychological reactions, since these factors will have great bearing on his potential contribution to the space mission.

But, the Air Force points out, there will have to be provision for the man's "taking over" to a limited degree should the automatic system fail in any way. He will have to be able to respond to signals from the ground, delivered directly if possible, or to cue devices built into the vehicle, which would be geared to starting him on a program of earlier-than-scheduled descent. There is no question of the enormity of the problems of successful operations of this kind, but the answers are being searched for daily.

And in keeping with the Air Force concept of concurrency, as the hardware people speed ahead on the vehicle projects for today and tomorrow, the men—not supermen—for the spacecrews of the now foreseeable future will be trained to meet the known general requirements of the space mission. As the answers to the question of what man will be required to do and his ability to do it are gained in the X-15 and later projects, the data will be incorporated into the training concepts of the Edwards group. Men like Kincheloe, Crossfield, and Walker will certainly be contributors to the shaping of the spacemen's training program. Their subjective reactions, in terms of what their successors will face in space, will be invaluable. And to the data they produce will be added continuing research results of experimentation at every center in the country where man-in-space is under study.



Interior of a Manned Orbital Vehicle

When USAF spacemen take the giant step in manned vehicles, every foreseeable comfort and device will be built into the container to allow for maximum reliability of man and machine. The spaceman will probably be seated semi-prone on a specially padded couch, giving needed protection against increased G forces. Provision will be made for telemetering to the ground the pilot's physiological reactions, his heart action, temperature, and the like. He will breathe a closed-circuit atmosphere and wear protective body gear. And no spaceman will be sent aloft until the system he rides in has already shown extreme reliability in automatic operations minus any passenger, and has carried a primate passenger into space and back safely and with no ill effects. This artist's conception shows what the first manned orbital vehicle might look like with its USAF passenger on board.

BLUEPRINT FOR TOMORROW'S SPACECREWS

By William Leavitt
ASSOCIATE EDITOR

BY LATE summer, on the dry and sun-baked terrain of Edwards AFB on Southern California's Mojave Desert, a precisely chosen group of Air Force pioneers is scheduled to enter the world's first pre-spaceflight training program.

Selected for their superior mental and physical attributes, their knowledge of flight sciences, and for motivations so strong that their interest in spaceflight—in the words of one Air Force doctor—will be "something they can taste," these airmen will eventually undergo at Edwards and at other Air Force aeromedical centers the closest simulations of spaceflight experience feasible on this Earth.

The Air Force's plan for what will probably be called an "experimental crew selection unit" was described to AIR FORCE Magazine by Brig. Gen. Donald D. Flickinger, head of the Air Research and Development Command's Directorate of Life Sciences. The general is one of the Air Force's top aeromedical experts who have been hard at work now for several years on the fantastic problem of preparing man for his important role in the newest and greatest unknown.

The men of the Edwards test unit will be subjected to constant stress simulations and indoctrination over a period of approximately two years, and their responses will provide further answers to the question of man's ability to perform adequately in planned orbital vehicles and their interplanetary successors. Under the pressures of intense training, both physical and psychological, the number of men in the test unit will decrease, and at the end of the program the survivors of the pre-spaceflight course will provide a nucleus of pioneers to man the hardware that

(Continued on page 44)

Strengthened Management Authority of Secretary of Defense

"We must remove all doubts as to the full authority of the Secretary of Defense. . . .

"I regard it as fundamental that the Secretary, as civilian head of the Department, should have greater flexibility in money matters, both among and within the military departments. . . .

"I recommend eliminating from the National Security Act such provisions as those prescribing separate administration of the military departments and the other needless and injurious restraints on the authority of the Secretary of Defense. I specifically call attention to the need for removing doubts concerning the secretary's authority to transfer, reassign, abolish, or consolidate functions of the Department.

"I anticipate that the Secretary of Defense and his deputy will require, in addition to a Director of Defense Research and Engineering and various special assistants, seven Assistant Secretaries of Defense plus a General Counsel of equivalent rank. I conceive of these assistant secretaries as having full staff functions: that is, they are empowered to give instructions appropriate to carrying out policies approved by the Secretary of Defense, subject at all times to the right of service secretaries to raise contested issues with the Secretary of Defense. This is the usual concept of the powers of principal staff assistants. It is essential to the work of the Assistant Secretaries of Defense."

COMMENT: The gravest fears of the Airpower Policy Committee are focused on the above provisions of the President's plan, for the entire success of his proposals may well stand or fall on the spirit in which these provisions are approached and the legislative wisdom which the Congress applies to the enabling legislation. Certainly we can expect restrictions to be imposed by the Congress on the freedom of the secretary to transfer funds. Mr. McElroy himself has said he expects no blank checks and that the amount of expenditures left to his executive discretion will probably be limited at least in terms of percentages of the budget.

The Airpower Policy Committee also seriously questions the open door to centralized administration created by the provision that the service be no longer "separately administered" and the retention of a hierarchy of no less than seven Assistant Secretaries of Defense.

This position is based on the attitudes and practices that have developed in the Office of the Secretary of Defense during the past five years. The Assistant Secretaries of Defense have, with rare exceptions, exercised essentially repressive authority over service programs without assuming responsibility for the adequacy of such programs as they emerge from the gantlet of bureaucracy. The swollen civilian staffs of the Assistant Secretaries of Defense have, by and large, taken the attitude that the services, including the service secretariats, would run wild with the taxpayers' money unless controlled rigidly and in detail.

Service programs, already checked and approved by the service secretariats, have faced a presumption of guilt in OSD rather than a presumption of soundness. Rejustification and reprogramming have been repeatedly required, with attendant delay in decision and waste of precious time.

As a by-product, the Assistant Secretaries of Defense have concerned themselves with the most minute details of service administration. The widely publicized directive prescribing the types, times, and methods of garbage disposal is far too typical. In an organization as large as the military establishment such dabbling in detail is simply bad administration.

The President's proposal, as constituted, will tend to give further sanction to these tendencies. We should like to believe that an overhaul, reorientation, and major reduction of staffs in the Office of the Secretary of Defense could and would be accomplished administratively. But we cannot see this as a serious possibility. Therefore, it appears incumbent on the Congress to insure these ends by legislative restrictions on the numbers of Assistant Secretaries of Defense, on the total number of OSD personnel, and on the funds make available to run OSD.

These views are not inconsistent with our belief in the soundness of true unification as an ultimate goal. We continue to advocate concentration of policy-making authority.

The above criticisms likewise apply to the proposal to centralize public information and legislative liaison in the Office of the Secretary of Defense.

Selection of Top-Ranking Officers

". . . I will consider officers for nomination to these top ranks [three and four stars] only on recommendation of the Secretary of Defense submitted to me after he has received suggestions of the Secretaries of the military departments and the advice of the Joint Chiefs of Staff. I also will base my assignments of these officers to high command, staff, and departmental positions on recommendations of the Secretary of Defense. I will, in reassigning or removing them, follow the same procedure."

COMMENT: While praiseworthy as a first step toward the single promotion list favored by the Air Force Association, this policy contains certain built-in dangers unless the single list for all ranks is set up as a comparatively short-time goal. The general or admiral of two-star rank will be torn between his service loyalty (and the service staffs he will have working for him) and the desire to be tagged as the broad-minded type qualified for three- and four-star rank. There could well be a tendency for high rank to gravitate to the best politicians rather than the best commanders and staff officers. It might also be well to consider a mechanism to protect the junior officer from the discrimination he now often encounters when he returns to his parent service after long assignment to a joint command.

Conclusion

The Airpower Policy Committee of the Air Force Association recommends wholehearted support of the principles embodied in the President's message concerning defense reorganization. It recommends caution, however, in the implementation of these principles so as to insure that centralization of authority be not accompanied by a concentration of detailed administration into an unwieldy top-heavy bureaucracy at the Department of Defense level. The Committee trusts that the Congress will exercise its legislative prerogative to insure that this will not occur.

We urge the Congress, in its forthcoming study of the President's plan, to seriously consider the fundamental principles embodied in Air Force Association policy, as put forth in our 1956 Policy Statement:

"The goal must be one program for utilizing national resources in the national defense. We must have one defense plan. We must have a single military service with one secretariat, one Chief of Staff, one promotion list."

—END

mander in Chief and the Secretary of Defense with the professional assistance they need for strategic planning and for operational direction of the unified commands. . . .

"In keeping with the shift I have directed in operational channels, the Joint Chiefs of Staff will in the future serve as staff assisting the Secretary of Defense in his exercise of direction over unified commands. Orders issued to the commands by the Joint Chiefs of Staff will be under the authority and in the name of the Secretary of Defense.

"I think it important to have it clearly understood that the Joint Chiefs of Staff act only under the authority and in the name of the Secretary of Defense. I am, therefore, issuing instructions that their function is to advise and assist the Secretary of Defense in respect to their duties and not to perform any of their duties independently of the Secretary's direction. . . .

"I have directed the Secretary of Defense to discontinue the Joint Staff committee system and to strengthen the Joint Staff by adding an integrated operations division.

"I ask the Congress to assist in this effort by raising or removing the statutory limit on the size of the Joint Staff. By authorizing the Chairman of the Joint Chiefs of Staff to assign duties to the Joint Staff and, with the approval of the Secretary of Defense, to appoint its Director, the Congress will also be helpful in increasing the efficiency of this important staff group. . . .

"I propose that present law be changed to make it clear that each chief of a military service may delegate major portions of his service responsibilities to his vice chief. Once this change is made, the Secretary of Defense will require the chiefs to use their power of delegation to enable them to make their Joint Chiefs of Staff duties their principal duties."

COMMENT: The purpose of the above is to give the Joint Chiefs the staff backup needed to perform their role as the Defense Secretary's staff for unified operations and to allow them to devote more time to their Joint Chiefs job by divesting them of as much service responsibility as possible. Here the Airpower Policy Committee sees a clear violation of the old military principle that "you can delegate authority but not responsibility." As long as a Chief of Staff has to wear two hats—one as chief of his service, the other as a member of the Joint Chiefs of Staff—he cannot perform either task with the required detachment. A better solution, perhaps, would be to divorce completely the members of the Joint Chiefs from all service responsibility and make them a full-time staff for the Secretary of Defense. In this case, it would be well to limit the tours of the Joint Chiefs to two years, with the thought that a longer tour would tend to remove them from service realities and foster an "ivory tower" attitude.

Status of the Military Departments

"We must continue the three military departments as agencies within the Department of Defense to administer a wide range of functions.

"Under the new command procedures I have described the secretaries of the military departments will be relieved of direct responsibility for military operations. Thus, under the supervision of the Secretary of Defense, they will be better able to perform their primary functions of managing the vast administrative, training, and logistics functions of the Defense Department. The military departments will remain permanent agencies within the Department of Defense, and their Secretaries will continue to report to and be directly responsible to the Secretary of Defense. . . .

Each of these secretaries will continue to need the assistance of an under secretary and not less than two assistant secretaries. It should be possible, however, to eliminate at least one and perhaps two of the four assistant secretaries now authorized for each military department. The duties of these assistant secretaries should be left to the determination of each service secretary rather than fixed by law."

COMMENT: The Airpower Policy Committee here takes issue with the proposal to reduce the number of assistant secretaries in the several services. As far as the Air Force is concerned, these officials have quite generally performed useful and necessary functions and have been noted for their "get-it-done" attitude. There is no evidence that they have had too little to do or have engaged in improper activities. Indeed, the present Assistant for Installations might well be made a fifth Assistant Secretary of the Air Force.

Centralized Research and Development

"We must reorganize the research and development functions of the department in order to make the best use of our scientific and technological resources. . . .

"The secretary must have full authority to prevent unwise service competition in this critical area. He needs authority to centralize to the extent he deems necessary, selected research and development projects under his direct control in organizations that may be outside the military departments and to continue other activities within the military departments. I anticipate that most research activities already under way would continue within the military departments. Such new undertakings as require central direction can be centralized with far less difficulty than projects already assigned to military departments.

"To give the Secretary of Defense the caliber of assistance he requires in the research area, I recommend that the new position of Director of Defense Research and Engineering be established in place of the Assistant Secretary of Defense for Research and Engineering. . . .

"This official will have three principal functions: first, to be the principal adviser to the Secretary of Defense on scientific and technical matters; second, to supervise all research and engineering activities in the Department of Defense, including those of the Advanced Research Projects Agency and of the office of the Director of Guided Missiles; and, third, to direct research and engineering activities that require centralized management."

COMMENT: In this area, also, the Airpower Policy Committee expressed certain grave reservations. The role of the Department of Defense in research and development to date is not a glorious one. It has been essentially repressive, rather than creative. The tendency has been toward indecision and nitpicking over ways and means, rather than broad policy making and direction. Over the years the services, and particularly the Air Force, have built up technically capable research organizations and installations. Any centralization of research and development authority in the Department of Defense should be accompanied by a firm resolution to take full advantage of the technical capabilities now residing in the services, to foster technical competition and discourage political competition in this area and to be content with broad policy direction and decision-making without mixing into petty housekeeping details. Much will depend, of course, on the technical ability and decisiveness of character of the individual to be chosen as Director of Defense Research and Engineering.

The President's Plan for Defense Reorganization

A CLOSER LOOK

By Peter J. Schenk
PRESIDENT, AIR FORCE ASSOCIATION

AT THIS writing the big defense news from Washington is, of course, President Eisenhower's proposals to reorganize and streamline the Department of Defense *(see complete text of the President's plan beginning on page 103)*. Since the Air Force Association is squarely on record for a truly unified defense effort, as stipulated in our 1956 Statement of Policy and reiterated last year, AFA has much more than a passing interest in the Pentagon reorganization plan.

Consequently, I called a special meeting of our Airpower Policy Committee, which met in Washington on April 8 to consider the plan. Herewith I present the consensus of the Airpower Policy Committee as regards the proposal in general, with specific comments on specific issues.

Insofar as the plan represents a considerable advance in the direction of true unification called for in AFA policy, it clearly should be supported in principle by the Association. It does not go as far as we would like. It falls short of attaining a single promotion list for all services, a single Chief of Staff, or a single military service. But it represents the most vigorous and imaginative step yet made in these directions by the Executive Department. And the door is open for the Congress to press even further when the time comes to translate the plan into the law of the land.

For the sake of simplicity, I would like to break the proposal into its main elements and comment on each in turn, wherever the Airpower Policy Committee felt it was not in complete agreement with the plan:

Unified Operational Commands

"We must organize our fighting forces into operational commands that are truly unified each assigned a mission in full accord with our over-all military objectives. . . .

"I recommend, therefore, that present law, including certain restrictions relating to combatant functions, be so amended as to remove any possible obstacles to the full unity of our commands and the full command over them by unified commanders.

"This recommendation most emphatically does not contemplate repeal of laws prescribing the composition of the Army, Navy, Marine Corps, or Air Force. I have neither the intent nor the desire to merge or abolish the traditional services."

COMMENT: This is a specific area in which the plan does not go far enough in terms of AFA policy on unification of the services. In the sense, however, that it requires unified commands oriented toward the accomplishment of a mission, rather than toward the element in which a given service operates, i.e. land, sea, or air, it clearly is a firm step in the proper direction and would make sense out of such organizations as the North American Air Defense Command under General Partridge.

Clear Command Channels

"We must clear command channels so that orders will proceed directly to unified commands from the Commander in Chief and Secretary of Defense. . . .

"Clearly, secretaries of military departments and chief of individual services should not direct unified operations and therefore should be removed from the command channel. Accordingly, I have directed the Secretary of Defense to discontinue the use of military departments as executive agents for unified commands.

"To facilitate this effort I ask congressional cooperation. I request repeal of any statutory authority which vests responsibilities for military operations in any official other than the Secretary of Defense. Examples are statutory provisions which prescribe that the Chief of Naval Operations shall command naval operating forces."

COMMENT: In this instance, you will note that part of the President's proposal has already been implemented by Executive Order, as indicated by the words "I have directed." The effect of the Executive Order is to require a commander of a joint command, such as General Partridge or Admiral Stump in the Pacific to report directly to the Secretary of Defense instead of to the Department of the Air Force or the Department of the Navy as executive agent. Existing law will have to be amended before the chiefs of the military services can be divorced from their command responsibilities. Theoretically the proposal would make the Secretary of Defense solely responsible for military operations. In practice he would perforce rely for operational decisions on the corporate recommendations of the Joint Chiefs of Staff, and Mr. McElroy has made it clear that he intends to do just that.

Changes in Joint Chiefs and Joint Staff

"We must strengthen the military staff in the office of the Secretary of Defense in order to provide the Com-

(Continued on following page)

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The Hydrogen Dog and the Cobalt Cat
Side by side in the Armory sat.
Nobody thought about fusion or fission,
Everyone spoke of their peacetime mission,
Till somebody came and opened the door,
There they were, in a neutron fog,
The Codrogen Cat and the Hybalt Dog;
They mushroomed up with a terrible roar—
And Nobody Never was there—Nomore.

The footnotes are in verse, and there's a glossary that includes such diverting definitions as: "Stereophonic. Sounding in both ears, analagous to babies."

Buy a copy for yourself and one for your scientist friend. It's a gasser.

☆

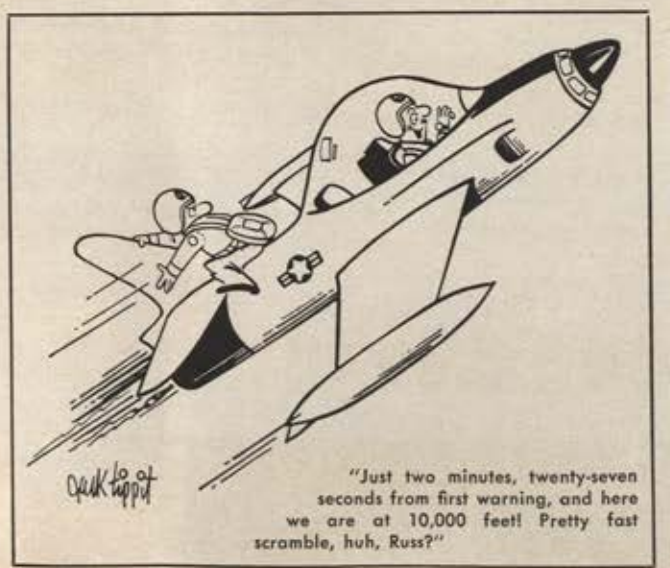
A gentleman who has contributed heavily to the preservation of the vast photographic history of the Air Force, Joseph L. Albright, Deputy Chief of the USAF Photo Records and Services Division, a few weeks ago marked his fortieth year of service in his important work. Mr. Albright was feted by his colleagues with a "forty-year" pin made from two twenty-year pins welded together. His career in photography has paralleled the development of flight from the Jenny days of World War I to the dawn of the space age.

☆

AIR FORCE Magazine readers who took part in the air battles of D-Day have an opportunity to contribute their reminiscences to a book being written by famed author Cornelius Ryan. Mr. Ryan's book will cover the period from 2400 hours on June 5, 1944, to the same time on June 6. Drop a postcard to Mr. Ryan, care of *Reader's Digest*, 1300 Connecticut Ave., Washington, D.C. State your name, current address, your D-Day organization, and type of aircraft on which you served, and the author will contact you by letter.

☆

An intriguing assertion which caused heads to shake among aeromedical experts who gathered at Washington's Statler Hotel for the 1958 meeting of the Aero Medical Association was a recent widely quoted statement by Dr. James B. Edson, Army Assistant Director of Research and Development, who recently wrote in *The Bulletin of the Atomic Scientists* that space medicine experts were working on a synthetic substance that could be injected into the bloodstream, making eating, drinking, and breathing unnecessary.



"Just two minutes, twenty-seven seconds from first warning, and here we are at 10,000 feet! Pretty fast scramble, huh, Russ?"

"What happened?"

☆

The Air University at Maxwell AFB, Ala., has recently published an excellent glossary containing thirty-five pages of terms and definitions for the missile and space age. Edited by Woodford A. Heflin, the glossary received wide publicity on publication. The item that intrigued us was the tongue-in-cheek entry, "Unobtainium," defined as a "substance having the exact high test properties required for a piece of hardware or other item of use, but not obtainable either because it theoretically cannot exist or because technology is insufficiently advanced to produce it."

☆

How true the following is, we couldn't say, but it makes a point.

There is an elementary school on Merritt Island, across the Banana River west of the Air Force Missile Test Center at Cape Canaveral, Fla. A class was at recess in the schoolyard. Suddenly the sky began to throb with a missile's roar. Two small boys watched a great rocket flip over in flight and fall in flames.

One said casually to the other, "There goes another ICBM."

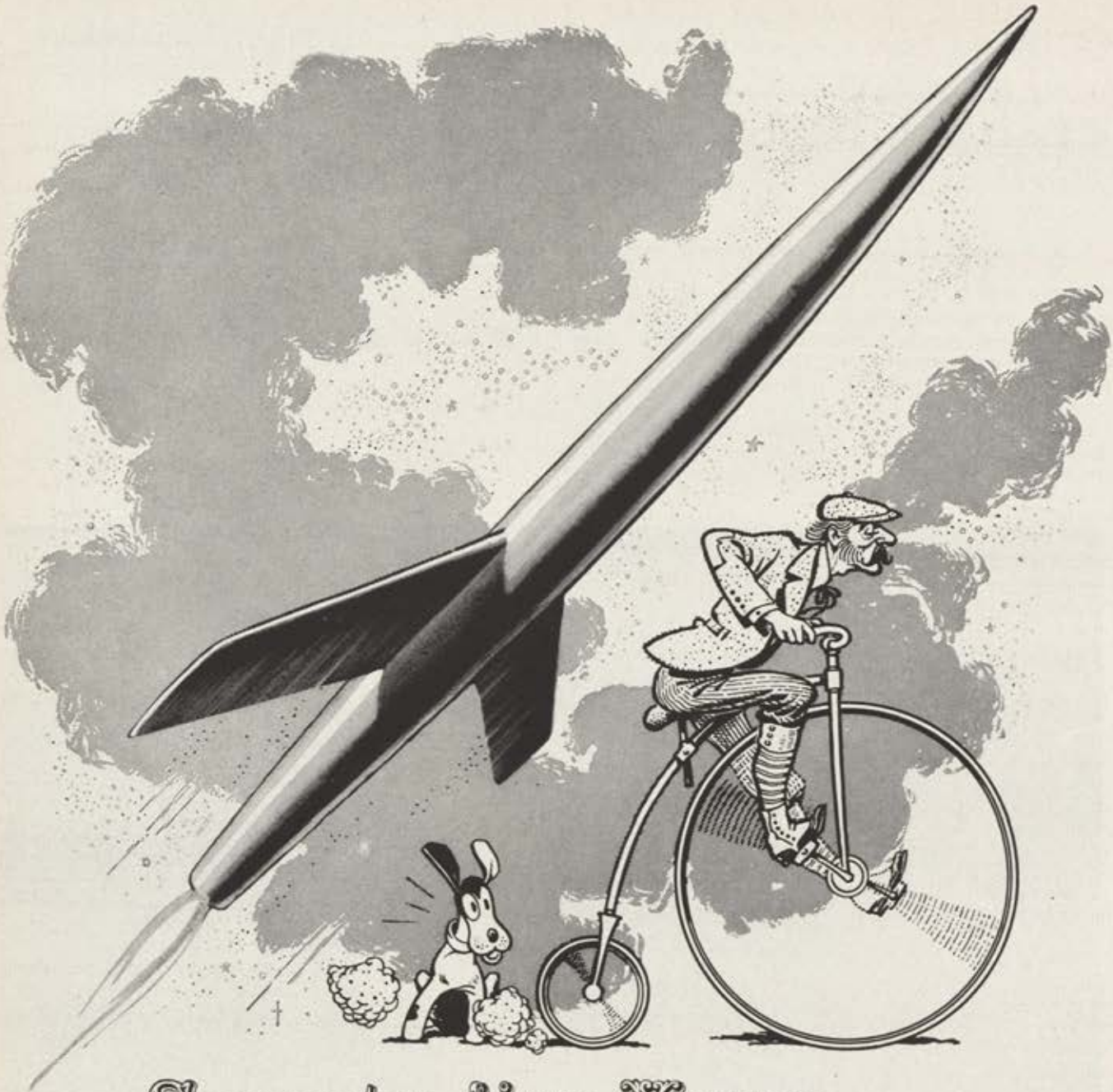
The other extricated his bubble gum and replied, "Yeah, it should have gone 5,500 miles."

The first boy put in, "It stands seventy-five-feet tall. It's about ten feet across, and it weighs one hundred tons."

"Don't forget the thrust," said his friend, just as laconically. "Sixty thousand pounds plus two boosters of 150,000 each."

"Too bad they had to blow it up from the ground," the first boy answered.

Then the end of recess sounded and the second boy sighed, "Well, we'd better get back and string those doggone beads."—END



Seventy-five Years ◇◇◇

TEN MILES an hour was "speed" in 1883 when Wyman-Gordon started to make forgings for the high-wheel bicycle. Through the 75 intervening years forgings have made important contributions to the phenomenal advances in propulsion. Progress from the first "horseless carriages"...from the early "flying machines"...to the supersonic speeds of today ...would not have been possible without forgings produced by the most advanced techniques of the day.

Wyman-Gordon is proud of its achievements in these fields and, as the largest producer of automotive and aircraft forgings, is prepared to accept the challenge of the future. Today, as for 75 years, there is no substitute for Wyman-Gordon quality and experience.

WYMAN-GORDON COMPANY

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Vought Vocabulary

re·lent′less: *inertial guidance keeps a Mach 2 bird locked on target for a nuclear strike*

When a target's latitude and longitude are marked on this missile's brain, an appointment has been made.

To keep its rendezvous, the Chance Vought *Regulus II* will launch stealthily from submarines – nuclear and conventional – from surface craft or mobile shore launchers. Its advanced inertial guidance will compensate for wind, weather and the earth's rotation. It will detour enemy strongpoints, outfox known counterweapons, follow any one of a hundred trajectories. Closing in on its quarry, it can descend from over 60,000 feet to smokestack height to escape radar detection.

At Mach 2-plus, *Regulus II* can pierce over 1,000 miles of hostile sky in minutes to score a nuclear bull's-eye.

This relentless bird – in the air now – is the product of a pioneer missile team that provided the Navy with its first operational attack missile. *Regulus I* joined the Fleet in 1955. In a weapons field so new that its ranks are still forming, Chance Vought's backlog of working knowledge is exceptional.

CHANCE VOUGHT AIRCRAFT
INCORPORATED · DALLAS, TEXAS

Lighter than Air

During the Berlin Airlift, air traffic at Rhein/Main Air Base was very heavy, landings on occasion being only one minute apart. One night in addition to the usually heavy load, a commercial airliner was cleared for a landing, and a military aircraft was requested to "do a 360" and "lose one minute." In a rather anxious voice, the pilot replied, "But, tower, it takes two minutes to do a 360." After a moment of thoughtful silence, a new voice from the ground added somewhat sarcastically, "Why don't you do a 180, and back in?"

CAPT. CHARLES J. GALLATIN
487th Bomb Squadron
Whiteman AFB, Mo.

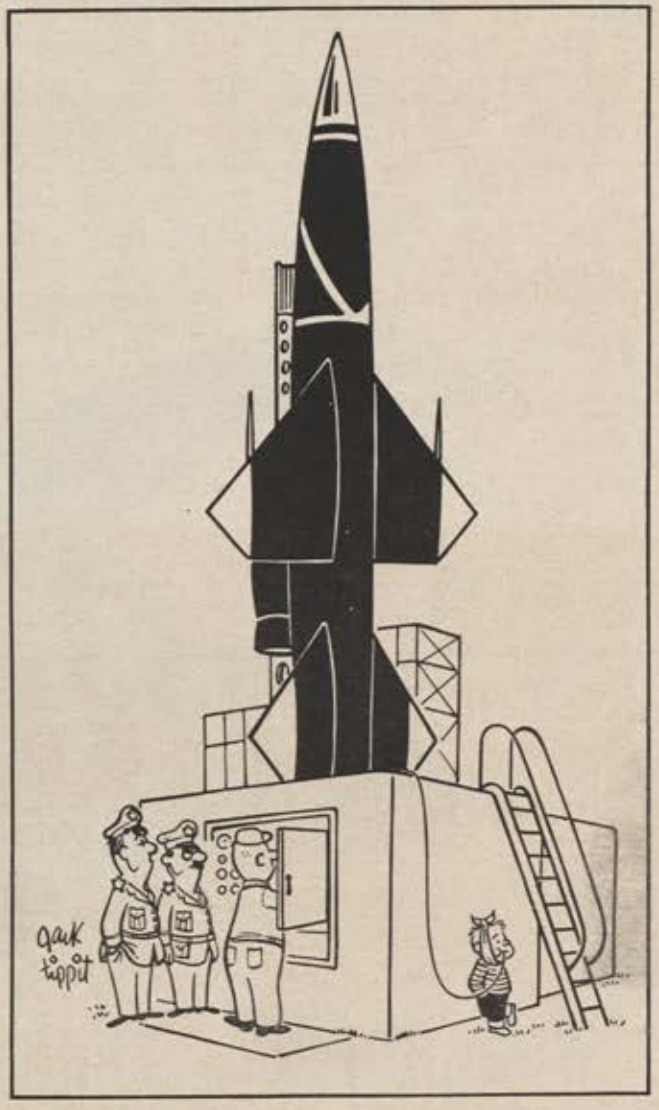
• • •

This chuckle-and-snort corner is devoted to true unpublished anecdotes about Air Force life. Send us yours. We'll pay five bucks for each one published. All stories that we use become the property of AIR FORCE Magazine.

and 60 degrees in fermenting manure from horses fed chiefly on corn, and neither Ritchie Calder nor Copernicus have supported the claim that there is any corn on Mars at all, let alone horses.

"There are no women on Mars either and precious few on Neptune, where the atmosphere is full of methane and ammonia. On Saturn there are eleven small people shaped like bats. Their heads light up. Nobody knows their names. They pick their teeth.

"You've heard of 'Fly now—pay later'? Well, we pay you!"



THE MOON

"There are still some simple-minded people about who will ask you, 'Why should we go to the Moon if it hasn't even got any atmosphere?' The next time this happens you can be ready with the following answers:

1. It may have.
2. To get to the other side.
3. So that we can find out when it's going to stop raining.
4. Because it is there.

"The cost? Somewhere between fourteen and a hundred-and-eight million at a rough estimate, depending on number of tickets sold, amount of fresh meat carried, wear and tear, and other variables.

CONCLUSION

"So much then for Space."

—ALEX ATKINSON

☆

Punch's tour de force is matched in the mad verse of the *Space Child's Mother Goose* (Simon & Schuster, $3.50), a delightful collection of science-spoofing verses by Frederick Winsor, charmingly illustrated by Marian Parry, a copy of which crossed our desk a few days back. A sample of the rhymes:

(Continued on page 37)

TOUCHDOWN...*EVERY THIRTY SECONDS*

The weather has closed in. You peer out the window and see nothing – perhaps not even the wingtip.

You are orbiting. "Stacked" over the airport. Waiting your turn to land.

"We will land in 12 minutes"

The Captain's reassuring words come over the intercom. "We will land in 12 minutes."

Now you are being brought down in easy stages–safely –over the Outer Marker Beacon . . . the Middle Marker . . . the Inner Marker . . . then *touchdown* . . . on the runway.

Every 30 seconds, somewhere in the free world, a plane is landed safely by "ILS," the Instrument Landing System developed by IT&T, and installed in every major airport here and abroad.

Air passengers relax–pilots too!

Air passengers everywhere know this feeling of security.

The pilot likes it too. Because he controls the landing at all times. Once he is on the glide-path he needs no further instructions – nothing except the electronic information he sees before him on the instrument panel, and the meaningful "beeps" in his earphones.

Another "first" for IT&T

IT&T has long been a pioneer in radio aids to air navigation. IT&T laboratories developed the first radio compass. The first distance-measuring equipment. For the Navy and the Air Force they developed and perfected TACAN (Tactical Air Navigation), the system that gives military aircraft their pinpoint position in the air–at every instant of flight.

Last year the Civil Aeronautics Administration accepted VORTAC – an application of TACAN for all civil aircraft. The CAA has awarded to IT&T the contract to build 132 VORTAC ground stations throughout the U.S. Thanks to VORTAC the nation's airways will soon be ready for the fastest jet transports.

The next time you are aloft in bad weather . . . remember IT&T and relax. Your skilled pilot will bring you to a smooth touchdown . . . with "ILS."

IT&T

. . . the largest American-owned world-wide electronic and telecommunication enterprise, with 80 research and manufacturing units, 14 operating companies and 128,000 employees.

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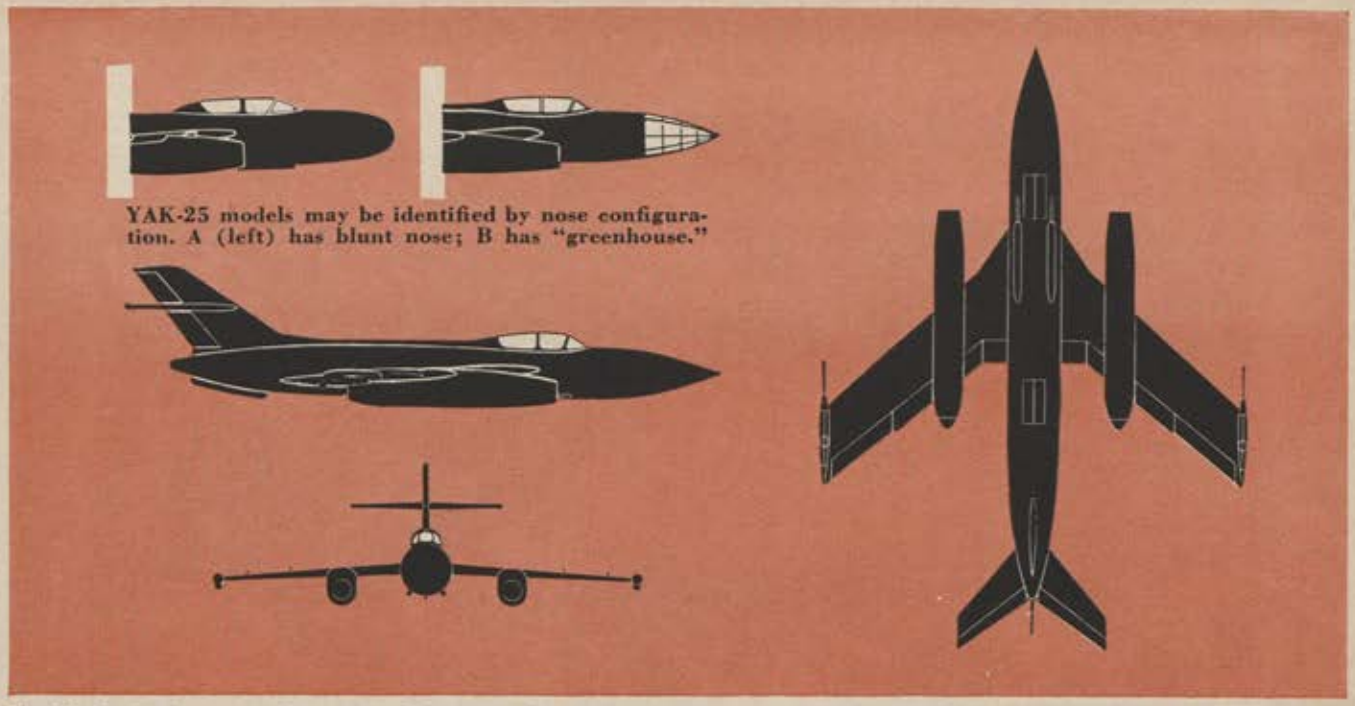


YAK-25 models may be identified by nose configuration. A (left) has blunt nose; B has "greenhouse."

Flashlight C, shown in three-view silhouette above, was observed by General Twining during his June '56 Moscow trip.

For example, because most targets in Russia are rather more inland than those in the United States, invading bombers would have a longer period over Soviet territory. This would give the YAK-25A and C a greater period of time in which to find and hit SAC's bombers.

The engines in Flashlight A are designated TA-10s, possibly indicating that they are the work of engine designer Tamasov of the Mikulin engine design bureau. They have ten compressor stages, and a single-stage turbine. They have a static thrust rating of 8,000 pounds each.

The engines in the B and C models are somewhat longer, as judged by the nacelles. This may indicate afterburning, or it may indicate a longer compressor (up to twelve stages, possibly a dual rotor and two turbine wheels). If there are short afterburners, then the B and C models should be able to achieve supersonic speeds with no difficulty. However, this is uncertain.

There are small hoods sticking out from the starboard side of the engine nacelles, presumably to provide air intakes for oil cooling.

In all cases the aircraft carries a crew of two men—a pilot and radar operator or bombardier. The radar equipment is similar to that used in the US in that it can be locked on target and the rockets fired when Flashlight comes within range. The B's rockets can be used against ground targets.—END

DATA ON THE YAK-25 SERIES

DIMENSIONS	YAK-25A	YAK-25B	YAK-25C
Wingspan	40.5 ft.	40.5 ft.	40.5 ft.
Wing area	403.5 sq. ft.	435.5 sq. ft.	435.5 sq. ft.
Aspect ratio of wing	4.1	3.8	3.8
Mean chord of wing	8.2 ft.	8.79 ft.	8.79 ft.
Sweepback, leading edge of wing	42 deg.	42/62.5 deg.	42/62.5 deg.
Horizontal stabilizer span	14.6 ft.	14.6 ft.	14.6 ft.
Horizontal stabilizer surface area	60.3 sq. ft.	60.3 sq. ft.	60.3 sq. ft.
Aspect ratio of horizontal stabilizer	3.55	3.55	3.55
Mean chord of horizontal stabilizer	1.25	1.25	1.25
Sweepback, leading edge horiz. stab.	45 deg.	45 deg.	45 deg.
Vertical stabilizer and rudder area	65.6 sq. ft.	65.6 sq. ft.	65.6 sq. ft.
Fuselage length	51.8 ft.	54.0 ft.	53.8 ft.
Fuselage width	5.0 ft.	5.0 ft.	5.0 ft.
Fuselage, max. cross-section	19.4 sq. ft.	19.4 sq. ft.	19.4 sq. ft.
WEIGHTS			
Empty weight	21,715 lbs.	29,040 lbs.	29,040 lbs.
Fuel weight	10,560 lbs.	13,640 lbs.	13,640 lbs.
Lubricant weight	220 lbs.	220 lbs.	220 lbs.
Payload (bombs, missiles)	1,600-3,200 lbs.	9,240 lbs.	1,600-4,840 lbs.
Gross weight (max.)	28,600-35,200 lbs.	52,800 lbs.	45,320 lbs.
PERFORMANCE			
Top speed	705 mph.	695 mph.	770 mph.
Cruising speed at 23,000 ft.	600 mph.	607 mph.	640 mph.
Estimated average rate of climb	147 fps.	153 fps.	175 fps.
Operational ceiling	50,840 ft.	53,000 ft.	57,700 ft.
Time to operational ceiling	11 min.	11 min.	10.1 min.
Operating radius	1,865 miles	1,500-1,865 miles	1,500 miles
Takeoff distance to clear fifty-ft. obstacle	2,920 ft.	3,400 ft.	2,670 ft.
Landing distance from fifty-ft. alt.	3,400 ft.	3,675 ft.	3,435 ft.
Landing speed	115 mph.	125 mph.	120 mph.
ENGINE DATA			
Nacelle diameter	3.9 ft.	3.9 ft.	3.9 ft.
Nacelle length	16.25 ft.	20.3 ft.	20.3 ft.
Static thrust per engine	8,000 lbs.	9,800 lbs.	9,800 lbs.
Compressor stages (estimated)	10	12	12
Specific fuel consumption	1.08	.96	.96

NAA is at work in the fields of the future

Dress rehearsal for survival

Freedom's defense has reached a new frontier—Outer Space. That is why we need new weapons—missiles ...and men in missile-like planes.

Already America's giant missiles hurtle into space—exploring the new frontier, guarding its ramparts.

And hand-in-glove with missiles are our new manned weapon systems. Compressing years of progress into months, America's military and civilian engineers are jointly pushing our new defenses to completion.

Americans in Outer Space

Today a few chosen pilots are preparing themselves. Donning the new space suits, they sit in altitude chambers, or whirling centrifuges, testing man's reactions to a savage new environment. Their plane, the rocket-powered X-15, is being readied.

The X-15's mission is to take a man into space... and to return him to deliver his report. The secrets he brings back will be shared by the Air Force, Navy, and National Advisory Committee for Aeronautics, joint sponsors of the project.

The sinews of space flight

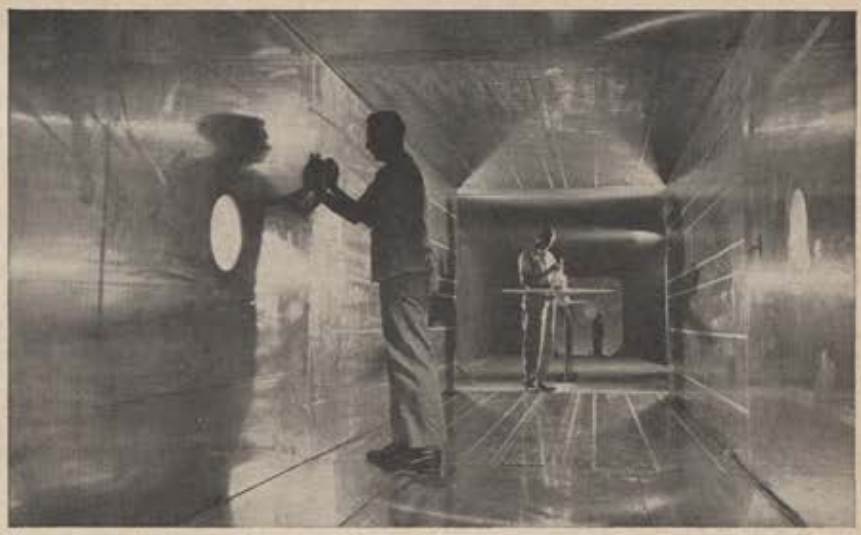
The X-15 is the outgrowth of new technologies developed by North American and its divisions—in guided missiles and supersonic aircraft—in automatic controls and rocket engines. Each is a vital root of the new space flight technology.

NAA's Rocketdyne Division makes rocket engines for the Air Force's Atlas and Thor missiles, and for the Army's Jupiter and Redstone. In fact, every major missile successfully launched in America in 1957 was powered by a Rocketdyne engine.

The Autonetics Division creates automatic control systems for both aircraft and missiles. Only yesterday these tiny fail-proof "brains" were rare technological triumphs. Yet today Autonetics makes them in quantity—with complete reliability.

Weapons—manned or unmanned

Like the Armed Services, North American believes both manned and unmanned weapon systems have their place. NAA's Missile Development Division, backed by 10 years' pioneering missile research, is at work on the GAM-77 advanced air-to-ground missile for the Air Force B-52.



Space Age wind tunnel tests scale models in a 2,500-mile hurricane. It's first of its kind to be built with private funds.

At the Los Angeles Division are two manned weapon systems. The 110A will reach any place on earth at 2200 mph and return to strike another day. The F-108 interceptor's very-long-range radar and atomic missiles will make it lethal to manned bombers and some missiles. It will be a flexible weapon, able to strike at trouble where it starts, before it spreads.

From defense, the arts of peace

North American has not confined its efforts to defense alone. During the past decade it has made great forward strides for the good of all men. The Peaceful Atom, for example, is the field of NAA's Atomics International Division. This division has successfully proved out two nuclear reactors to produce electrical power, both major advances in the drive to put atomic energy to work for mankind.

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, their work holds immense promise for science and industry.

Satellite No. 1. A Rocketdyne-built rocket engine gave the Army's Jupiter "C" satellite the critical first-stage boost toward its orbit.

NORTH AMERICAN AVIATION, INC.

SERVING THE NATION'S INTEREST FIRST—THROUGH THESE DIVISIONS

LOS ANGELES — Los Angeles, Canoga Park, Downey, California
AUTONETICS — Columbus, Ohio
MISSILE DEVELOPMENT — Neosho, Missouri
ROCKETDYNE
COLUMBUS
ATOMICS INTERNATIONAL

TUNNELS INTO SPACE

At Arnold Engineering Development Center, incredible heat and controlled hurricanes are helping shape the future of flight

By Willard A. Hawkins

FOR a fraction of a second, escape velocity—the minimum speed needed to propel a vehicle beyond Earth's gravity into space—was surpassed not many weeks ago in a shakedown run of Tunnel Hotshot II, the newest facility at USAF's Arnold Engineering Development Center, Tullahoma, Tenn.

This giant aviation-astronautics stride was but the latest of countless advances at AEDC, where, from the outset, the emphasis has been on providing answers to some of the seemingly imponderable questions that go with the development of today's, and tomorrow's, super-high-performance craft.

The escape-velocity-plus test run peak, lasting less than one-tenth of a second, achieved 32,400 mph. It was the first time the escape velocity figure of seven miles a second had been exceeded in a wind tunnel.

Although the run was over in less than a tenth of a second, special rapid-response instruments recorded the extreme flight conditions. Temperatures higher than 40,000 degrees Fahrenheit were caused by the friction of the air passing over the model in the tunnel, and pressure resulting from the electrical discharge that heats the air mounted to more than 30,000 pounds per square inch. Such extreme conditions preclude longer runs because of the danger of melting or even vaporization of tunnel components.

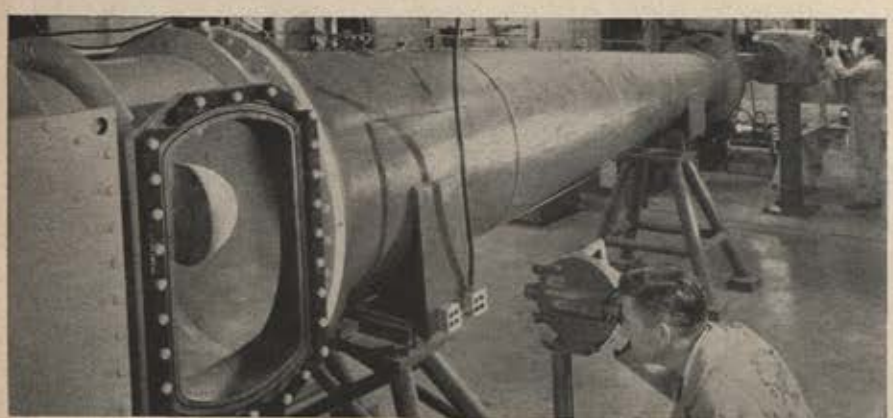
Arc-driven, Hotshot II has a fifty-inch-diameter test section, large enough to accommodate large-scale models of missile nose cones. This tunnel is a larger, improved version of Hotshot I, which has already contributed invaluable data to aerodynamic developments.

Every day at AEDC, in advanced experiments like escape-velocity-plus, incredible heat and man-made winds are shaping the future of flight and helping chart the way to outer space.

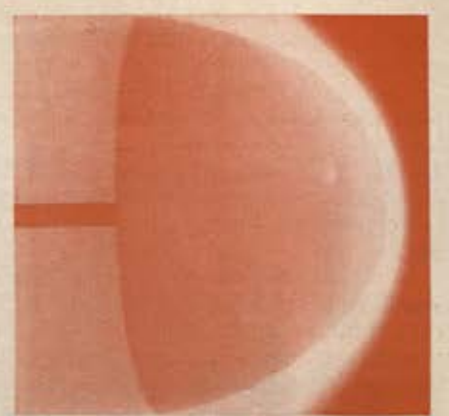
There was a time when completed, air-tested, accepted aircraft were largely the end product of the drawing board. Today, to the layman, this time-honored procedure seems almost to have been reversed at AEDC.

In the tunnels and test cells of this great facility the designer and builder of an engine, an airframe, or, perhaps, a "shape of the future" may spend weeks installing his project. Preparations and arrangements may have been under way for months, or more than a year, before the testing date, and much hinges on the outcome. With their creations on the tunnel "assembly line," these men anxiously await the finished product—cold data on pieces of paper, data that reveals the probable success or failure in flight without the risks and costs of aerial testing.

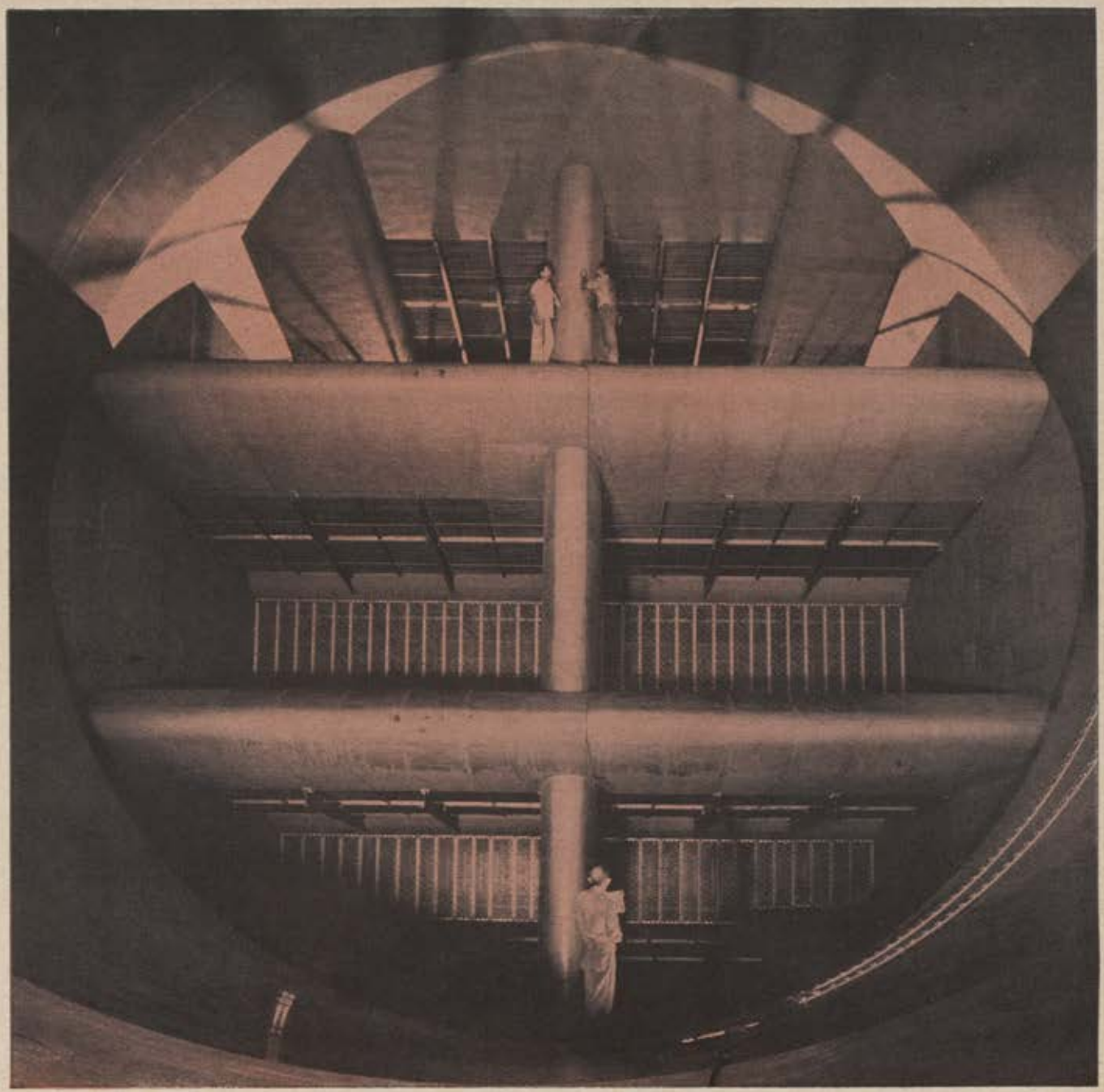
Each development project at AEDC involves a specific task or series of tasks designed to detect and correct various design or manufacturing problems in an aircraft, missile, or engine. This information speeds development during early stages and provides reliable data upon which to evaluate the item being tested. Requirements for testing at AEDC are manifold, and often modification of test sections and special instrumentations have to be devised. Thus, from time to time, engineers



A look inside Hotshot II. Technician in foreground sights camera on test object inside chamber, while man in background works on Hotshot's arc chamber.



Missile nose model undergoing test in Hotshot II. Runs last 1/10 of a second.



More than 100,000 gallons of water a minute are pumped through baffles to cool airflow in Propulsion Wind Tunnel.

and technicians of ARO, Inc., operating contractor for the facility, must improvise completely new techniques in wind-tunnel testing.

Tests are scheduled and monitored by the USAF at AEDC, and engineers for the "user" aircraft and engine companies, who must devise the design corrections, work closely with the ARO test crews while the programs are conducted.

While AEDC is part of the Air Research and Development Command of the US Air Force, it is open to all other branches of the service, governmental agencies, universities, and scientific groups with a "need to know" the answers that this facility may be able to offer. It is, of course, also open to private manufacturers, and their proprietary rights of secrecy from competitors are zealously guarded. The services are much sought, and many AEDC test cells and tunnels are booked solid for two or three years.

In the missile era, one of the hottest facilities AEDC has to offer is in the field of gas dynamics. Here the tunnel known as Hotshot I helps explore the so-called "thermal thicket."

Much has been written about the heat problem of atmospheric reentry of missiles when they make their downward plunge toward targets on Earth. The problem of devising a nose cone to survive the resulting extreme temperatures has long plagued designers of ballistic missiles.

The problem is this: Friction of air against a missile's nose at hypersonic speeds causes it to heat, literally turns it into a meteor. How should the nose be shaped? What materials best survive? How can accuracy be preserved during this critical flight condition?

For the answers to these vexing questions a series of tests on almost all of the ICBM and IRBM nose cones have been run at AEDC wind tunnels. In addition to general aerodynamic efficiency, rates of heat transfer, pressures, and material durability have been and are being tested at velocities well in excess of 11,000 mph and under conditions where friction temperatures of the airflow exceed 15,000 degrees Fahren-

(Continued on page 57)

GO ••• NO-GO

Automatic checkout equipment is a project of J. G. Ferguson, Senior Staff Engineer, Stavid Engineering, Inc.

Mr. Ferguson has specialized in the development of frequency standards for Loran and other navigation systems, field transmission measuring apparatus, cathode ray tube displays, and many other test and measuring devices for electronic equipment. His current work at Stavid is to develop equipment for reliability studies and automatic testing of electronic systems. Mr. Ferguson is one of a team of Stavid scientists and engineers who are applying their knowledge... from concept through production... to projects of major importance to the defense and progress of our country.

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. A typical project is the development of an Airborne Search, Bombing and Terrain Clearance Radar System.

OTHER STAVID PROJECTS INCLUDE:

- Shipboard and Submarine Antenna Systems
- Electronic Countermeasures Equipment
- Anti-Missile Systems
- High Power Air Search Radar System
- Radar Toss Bombing System
- Missile Guidance Systems
- LANCE Weapon System

STAVID Engineering, Inc. Plainfield, New Jersey

Imaginative Electronics...

heit. This temperature, incidentally, is intense enough to vaporize diamonds, and the air literally burns as it blasts past the shape or projectile under test. Not only metal shapes, but ceramic materials as well have been tested in Tunnel Hotshot.

The center recently announced a new type of measuring device, technically called a "variable reluctance heat transfer gauge," invented by C. C. Morgan, Jr., an engineer for ARO, Inc. It can record temperatures hotter than the surface of the sun in less than 1/25th of a second, or temperatures higher than 15,000 degrees Fahrenheit. This will unquestionably increase the latitude of testing capability at AEDC—and the frontier of space is again pushed backward.

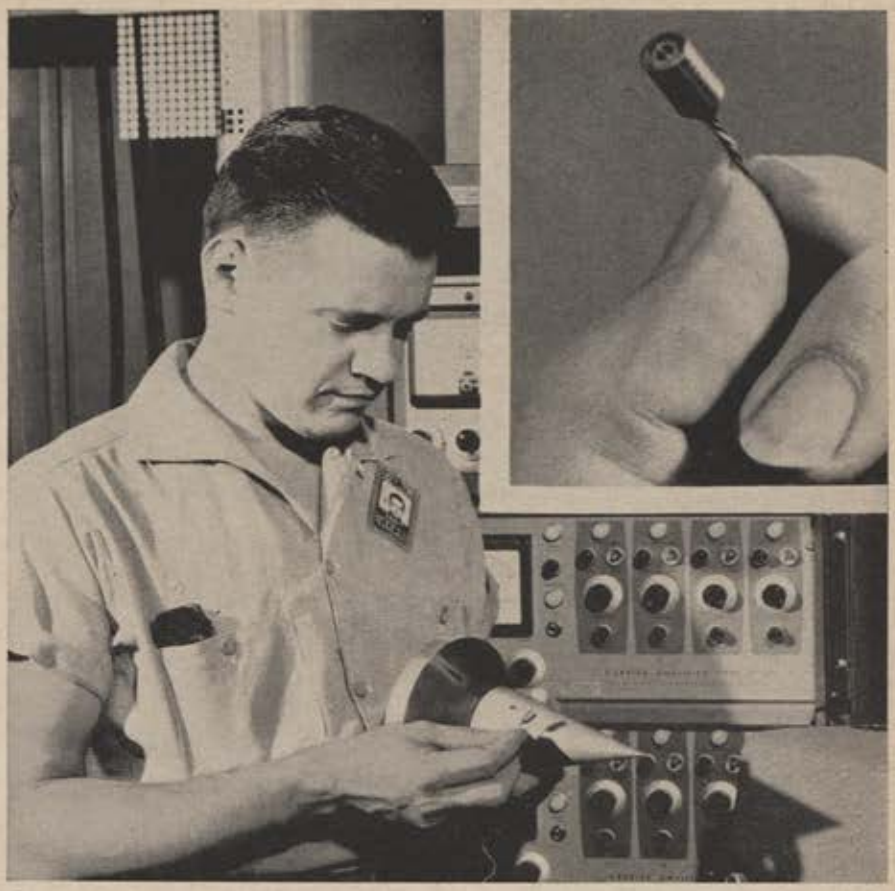
With the announcement that the Air Force has given North American Aviation the go-ahead on a manned bomber designed for speeds three to four times the speed of sound and at altitudes far above 100,000 feet, problems in this area become even more pressing than before.

Such a bomber is expected to require a specially shaped bomb. When dropped at supersonic speeds, will it separate cleanly from the aircraft? Or will the supersonic airstream cause it to bump into the bomber? Here again AEDC is providing pioneer testing.

A scale model of the underbelly of such an aircraft was installed in the ceiling of an AEDC tunnel. A dynamically scaled model bomb was dropped through the miniature bomb bay as supersonic air flowed through the test section. High-speed pictures showed that an ejector was required to thrust the bomb clear of the aircraft in these flight conditions. An ejector was designed and tried—and proved successful.

But what of man? What protective measures are envisioned for crews who fly these bombers of tomorrow? What type of clothing will best protect the pilot when he must eject from an aircraft traveling at hypersonic speed?

The answer serves to illustrate the versatility of the AEDC laboratories. In a few days between regularly scheduled engine test programs, one of the center's test cells was used to determine the effects of supersonic wind blast on a dummy strapped to an ejection seat installed in the cell. High-speed motion pictures showed how the clothing failed and what other safety equipment deficiencies there were as the violent windblast struck the dummy. This information is accelerating development of more protective flight gear for supersonic pilots.



Charles C. Morgan, Jr., an engineer with ARO, Inc., AEDC's operating contractor, with the "variable reluctance heat transfer gauge" he invented (see inset), which can measure temperatures higher than those on the sun's surface.

Many of today's weapons and components have been through the mill at Tullahoma. This inventory includes: Republic's F-105 Thunderchief; Convair's B-58 Hustler; Boeing's IM-99 Bomarc; and General Electric's J-47 turbojet and the J-79, which is used both in the Hustler and in Lockheed's F-104 Starfighter.

The Allison J-71 engine, which powers the Douglas B-66, had extensive development tests on its operating characteristics at AEDC.

ICBM tests have been conducted for General Electric, AVCO, and Ramo-Wooldridge. Two well known missiles, the Army's Redstone and the Hughes Falcon, both were subjected to aerodynamic tests in the wind tunnels. Other missiles tested are the Navy's Lockheed Polaris and Raytheon's Sparrow III as well as the Army's ground-to-ground Little John.

It is safe to assume that more advanced missile shapes and designs are

(Continued on following page)

John Wild, left, Director of Engineering for ARO, Inc., explains a control console to members of NATO Military Committee during tour of the AEDC facility.

being tested and will be tested, though just now secrecy still shrouds what is being done.

Maj. Gen. Troup Miller, Jr., USAF Commander at AEDC, is almost diffident in describing the role these important facilities are playing in our battle for survival.

He has said: "As a part of US Air Force's Air Research and Development Command, it is our job to help develop qualitatively superior airplanes, missiles, and engines. These products are designed and produced—for all the military services—by America's aviation industry.

"The way we run AEDC—our management, operation, maintenance, and the way in which we advance testing techniques and equipment—is of vital assistance to the engineering staffs of the industry companies. Our data helps them design, develop, and produce their products quickly and efficiently. It helps ensure a higher level of reliability when the time comes for actual first flights.

"We are not alone. Our work is combined with that done in other wind tunnels, those of the National Advisory Committee for Aeronautics, of the Army, Navy, and those operated by industrial, scientific, and educational institutions."

Over-all view of Arnold Engineering Development Center shows how the facility is concentrated on a 1,500-acre site, some eighty miles south of Nashville.

"All of us have the same objectives," General Miller emphasizes, saying, "We must provide the superiority required of our military forces, and we must achieve this level of quality with the highest degree of economy.

"The wind tunnel data we produce here is saving, and will save, hundreds of millions of dollars as it helps aircraft, engine, and missile contractors to produce the best weapon systems in the world."

"This data does more than that," General Miller says. "It is a key link in the force that can save this nation—and the world—from the economic, social, and cultural chaos of a third World War."

Essentially, AEDC is a testing laboratory consisting of a complex of wind tunnels to simulate, as nearly as possible on the ground, flight conditions that will be encountered in the air. The complex might be described in the simplest possible terms as a "tool to fool."

A wind tunnel "fools" an engine, a missile shape, an airframe, or any other item under test by "flying" conditioned air past the stationary object in the test cell, simulating the sort of air it would encounter in flight. Altitude, velocity, and temperature can be controlled to create a realistic profile of a flight by ingenious instrumentation. Reactions of the test object can be isolated and reduced to data.

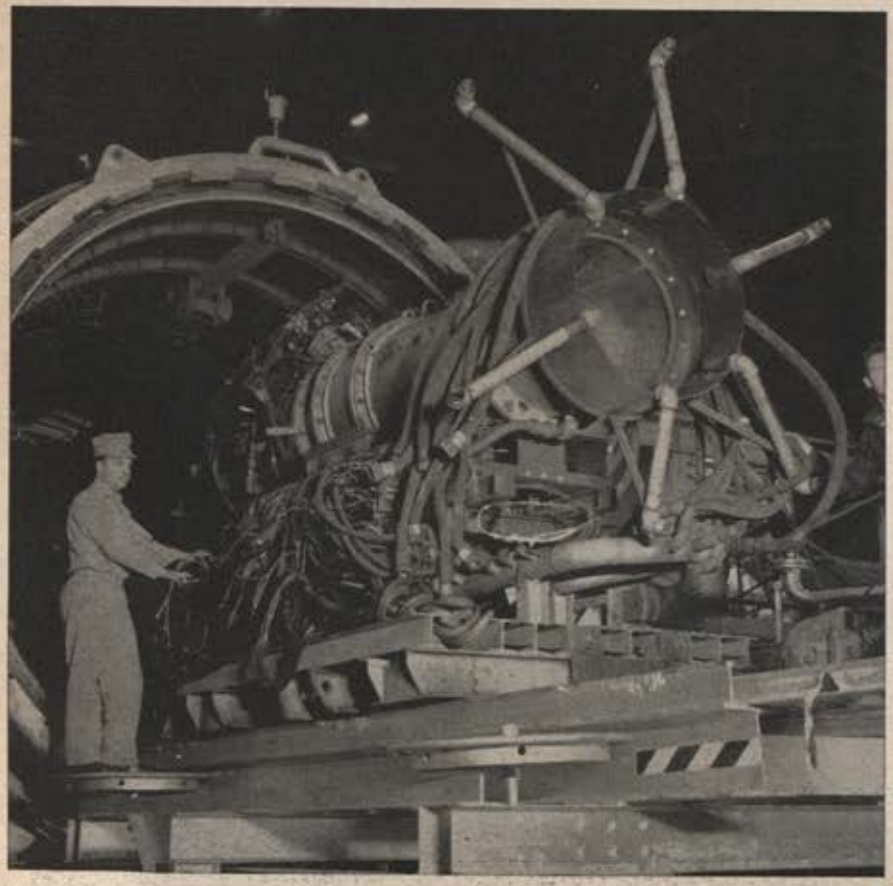
This is an oversimplification of the $250 million USAF aeronautical center which explains the future "before the future happens."

Located on a 41,000-acre reservation once used as an Army training base deep in the heart of Tennessee's famed walking-horse country—some eighty miles south of Nashville—the facility is concentrated on a 1,500-acre site. It is several miles from any residential areas. There is a reason for this. The man-made tempests in the tunnels create a shattering thunder when in full operation.

Many tests are conducted late at night because of the huge demands for electrical power. The center uses enough power each year—up to 700,000,000 kilowatt hours—to serve a city the size of Atlanta. AEDC is the fourth largest consumer of power on the vast TVA system, ranking just behind the two atomic energy facilities at Oak Ridge, Tenn., and Paducah, Ky., and the giant Alcoa Aluminum plant at Alcoa, Tenn.

While some eighty percent of authorized construction of AEDC is accomplished, it may never really be completed because the laboratory must continually anticipate the needs of the

(Continued on page 62)



After hundreds of lines have been attached to measure pressure and heat, this Marquardt ramjet is installed in a test cell at AEDC's Engine Test Facility.

CRYSTAL OF SILENCE... IN A NOISY UNIVERSE!

Philco eliminates unwanted cosmic and terrestrial noise... with advanced crystal research!

The jumble of unwanted sounds that scientists call *noise*, has always put a practical limit on the effective use of radar, microwave and radio. Natural radiation and inherent equipment noise tend to block electronic amplification of vitally important communications signals at high frequencies.

Philco research scientists, working towards practical solutions to this problem, have achieved tremendous success with advanced semiconductor crystals. As early as 1954, Philco produced perfect crystal structures which reduced noise as much as ten times below any other known level . . . and Philco is still a leader in this important scientific area. Here is another example of Philco leadership . . . engineering capacity to solve the most complex problems.

To meet the challenge of advancing technology, support the rapid expansion of scientific education. At Philco, opportunities are unlimited in electronic research and engineering—transistor circuit applications—computer logic design, test and evaluation and input/output equipment design.

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THE BIG WESTERN

Roundup Cocktail Party . . .

Western saloons, brass rails and all, will offer thirsty AFA'ers and friends many varieties of firewater and kickapoo juice to start the evening of wild-west fun and frolic. Never in the history of the flyin' machine will the hairy tales of "flat on my back at 40,000 feet" flow more freely. It will be a neighborly elbow-bendin' party, a real friendly way to get together.

Texas Chuck Wagon . . .

After you have had your share of snake poison, the biggest, tastiest spread of real western vittles, all you can eat, will be awaitin' your pleasure. Only those who have had the thrill of partaking of barbecued ribs, chicken, and beef, hot biscuits, and fried pies, as only Walter Jetton, King of Barbecue, fixes them, can even imagine the treat you are in for.

Highlights of AFA's 1958

SEPTEMBER 25-28

SEE PAGE 85 FOR HOTEL RESERVATIONS.

WING DING

There will be a lot of serious discussions on airpower at AFA's 1958 Convention, but it will not be all work and no play. One special event will make everybody at the Convention feel that he has been a Texan all his life. The Western Wing Ding, Friday evening, September 26, will be a six-hour hoedown, featuring a Roundup Cocktail Party, a Chuck Wagon, and a Cowboy Stomp. Everyone attending the Convention can go—hat, guns, boots, and all.

Cowboy Stomp . . .

Just picture three hours of ridin', ropin', and shootin', mixed with top entertainment from Hollywood and Broadway, add a few Texas cowgirls and strollin' guitars, a whirl or two on the square-dance floor, and you have a small idea of what's in store for you in the way of fun and frolic at what Texans refer to as a Cowboy Stomp. It will be a night to remember.

The Program

WEDNESDAY—SEPTEMBER 24

(Pre-Convention meetings for AFA Leaders)

AFA Leaders Workshop	Adolphus
AFA Foundation Trustees Meeting	Adolphus
AFA Directors Dinner Meeting	Adolphus

THURSDAY—SEPTEMBER 25

AFA Business Sessions	Adolphus
Reserve Forces Workshop	Baker
Ladies' Fashion Show	Neiman-Marcus
Reserve Forces Seminar	Baker
Panorama Preview Reception	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
Buffet Luncheon for Industry	Auditorium
Airpower Panorama	Auditorium
Airpower Awards Banquet	Auditorium

SUNDAY—SEPTEMBER 28

Roundup Brunch	Statler
AFA Directors Meeting	Statler
Airpower Panorama	Auditorium

CONVENTION

DALLAS, TEXAS

REGISTRATION FEE IS $20—excluding the briefings and buffet luncheon for industry on September 27.

future. And the future of flight looms ever larger in military planning.

Tomorrow's flight progress and the tunnels at Tullahoma are irrevocably linked, for here, in the Tennessee countryside, is the greatest single concentration of wind tunnels in the United States.

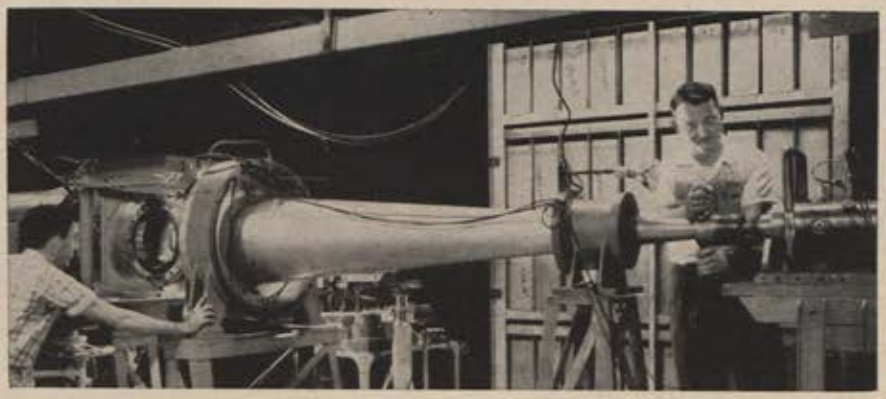
Begun in 1950 and named for the AAF's wartime leader, Gen. Hap Arnold, AEDC now employs some 3,000 people. Most live in the nearby small towns of Tullahoma, Manchester, Winchester, and Shelbyville; some live as far away as Nashville and Chattanooga.

Security surrounding the test facilities at AEDC is such that most employees have never seen a test project in operation. Those working near the tunnels when they are in operation can see and hear the tests, but nothing ever seems to come off the end of the assembly line. Nothing, that is, but paper. In quiet, soundproof rooms nearby, engineers and scientists reduce and evaluate the data tabulated and computed by incredibly efficient machines capable of multiplying 3,000 seven-digit numbers in less than a second. Within minutes after a test they have information which formerly took months and sometimes years of painstaking analysis to obtain. While a project is under test, it is being subjected to all sorts of instrument readings and photographed with high-speed cameras. All of this data is summarized or incorporated in the final product of AEDC test reports. Nearly 150 such reports were produced in one recent year.

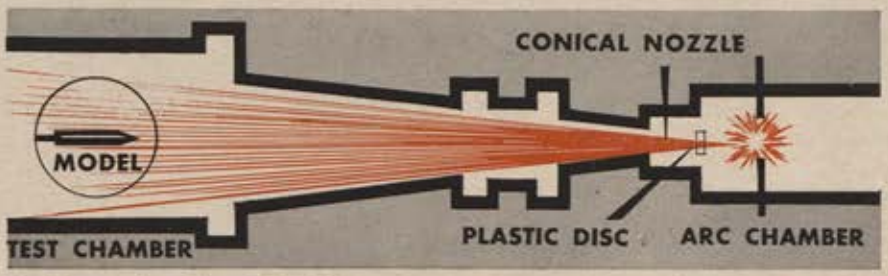
The three test facilities available at AEDC are:

- **The Engine Test Facility and its Ramjet Addition.** This laboratory has a series of test cells and open test-bed areas in which advanced air-breathing turbojets, ramjets, and turboprop engines may be tested under conditions simulating flight up to 2,000 to 3,000 mph and at altitudes of more than 80,000 to 90,000 feet.

For engines designed to operate in these ranges, the gathering of flight-test data is extremely difficult, and for obvious reasons. The duration of the flight may afford only a few moments of engine operation—the X-15 rocket-plane, for example, will run out of fuel in less time than it takes to soft boil an egg. And the system for recovering the test missiles is not always successful.



Hotshot I, in whose test section velocities from Mach 10 to 20 can be generated.



Hotshot works when 1,000,000-amp current creates electrical explosion in arc chamber. Heated air bursts plastic disc, enters test section through nozzle.

Moreover, many measurements — such as analysis of exactly how much thrust is being produced by the engine —are exceedingly difficult to make accurately in free flight. "Flight tested" on the ground at AEDC, the engine can have hundreds of pressure, temperature, and force-measuring instruments attached to it.

Technicians and engineers operate the engine from control rooms. They can take it from sea level to above 80,000 feet at speeds up to 2,000 mph —or several times the speed of sound, and at temperatures ranging from minus 120 degrees F. to higher than 800 degrees. They then study the data that is automatically computed and reported in either tabular or graphic form. All the while, closed-circuit color TV cameras monitor the engine.

When an engine in a test cell is actually brought to the point of failure it may explode violently. However, the cell is designed to withstand the explosion.

The desired result—even in case of failure? No loss of life, no loss of aircraft or missile, and the data is recorded so immediate changes can be made on production-line engines.

Recently, as an example, one engine encountered eighty "incidents" in a

With sidewall removed on Gas Dynamics Facility tunnel, hydraulic jacks may be seen. They change curvature of the nozzle to permit varying airspeeds.

few weeks of testing. Each one of these would have delayed an actual flight-test program, or might even have resulted in a costly or fatal crash.

Planned improvements in the Engine Test Facility and Ramjet Addition will increase its capability of simulating flights at higher altitudes, speeds, and temperatures.

● **The Gas Dynamics Facility** has a series of various size wind tunnel sections in which scale-model aircraft, missiles, or projectiles may be placed. The aerodynamic soundness of their shapes is determined in airflows that range from 1,000 mph to over 30,000 mph in Hotshot II. This facility has both continuous flow tunnels and several intermittent tunnels.

Most dramatic in operation of the intermittent tunnels are Tunnels Hotshot I and II. They use a tremendous electrical explosion as their driving force. In Hotshot I the explosion is generated in an arc chamber by more than a million amps, and is separated from the test chamber by a thin plastic seal, designed to "let go" at pressures of nearly ten tons per square inch. When the seal gives, the air passes through a conical nozzle and spurts through the test section at speeds from Mach 10 to 20—more than 12,000 mph and at temperatures of more than 15,000 degrees F. These extreme test conditions—lasting for only 1/100th of a second per test to prevent the tunnel from melting—prove the fantastic flight conditions of the future.

Construction began on Hotshot II in the spring of 1956. Its fifty-inch-diameter test section is more than three times the size of Hotshot I's. Like Hotshot I, this tunnel is arc driven. The airflow is heated and pressurized by an electrical discharge generated from a unipolar generator developed by the Allis-Chalmers Corp., Milwaukee, and stored momentarily in a huge inductance coil produced by Westinghouse. Hotshot II will, in turn, give way to still another arc-driven tunnel—Tunnel F, whose even larger test section will perhaps accommodate full-scale missile components. Tunnel F is now in the final design stage.

● **The Propulsion Wind Tunnel.** Newest in the family of tunnels at AEDC is the massive and powerful Propulsion Wind Tunnel. Control problems and quirks of instability of missiles and planes are being studied on the ground in this huge tunnel, which can test large-scale models or full-scale mockups for aerodynamic investigations.

Some full-scale missiles can be flown inside the huge test section. Instead of firing a prototype missile out over the South Atlantic and relying on radar, photography, and radio signals to report what is happening in flight, engineers and scientists will be able to make their measurements while the captive bird flies inside the test section. This will provide a more reliable missile and engine when the time comes for actual flights.

AEDC technician at bottom of photo is dwarfed by the fifty-five-foot diameter of the Propulsion Wind Tunnel. Giant vanes help decrease turbulence as the airflow is turned ninety degrees inside the transonic circuit of this huge tunnel.

Matching engines and airframes is not the only function of this facility, which alone will cost about $100 million when completed. It can also help provide answers to such problems as inlets for air-breathing turbojet and ramjet engines. How large should they be? Will they be able to feed enough air to the engine as it flies through the rarefied atmosphere at altitude? Conversely, will they be as small and streamlined as possible so that they will not impose performance-killing drag? Are they shaped so that a shockwave generated by the nose of the aircraft blasts into the inlet under various flight speeds and maneuvers?

Answers to these perplexing questions and even more complicated ones may come from the Propulsion Wind Tunnel.

Impressive aviation development history is being made at Arnold Engineering Development Center. Here man is proving that so long as the human mind is bedeviled by curiosity and discontent in the face of the unknowns of nature, he must go forth to meet them. And among man's weapons are these tunnels into space.—END

ABOUT THE AUTHOR

Now senior technical writer for Chance Vought Aircraft, Inc., Dallas, Willard "Lefty" Hawkins was living in Nashville, Tenn., as public relations representative for a cement association when he wrote this article (his first offering to appear in AIR FORCE*). A native of Arkansas, he served five years in the AAF in World War II and since then has written many articles about the USAF for newspapers.*

Is the Public Being Oversold?

THE ANTIMISSILE MUDDLE

By Claude Witze
SENIOR EDITOR

THE American people and Congress are being oversold on the potentialities of the antimissile missile. This overselling is being conducted in an atmosphere of complete confusion, where it is not clear who is in charge of the mission, who is coordinating the development effort, and who has the responsibility for the results.

As a result, there is a grave threat that this country will launch a multi-billion dollar program in an area filled with both technological and administrative unknowns. If it does, it will waste immense quantities of public money, jeopardize our safety, and seriously imperil both civil and military morale.

A wave of cocky talk, sanctioned and encouraged by segments of both the military and political administrations, is misrepresenting the truth. It is raising false hopes that the Russian ICBM threat can and will be met by electronic, push-button defensive measures. There is nothing in the record of today's state of the art to justify such hopes.

Basic to the whole situation is the fact that mission lines have been blurred until it is not clear whether the Army or the Air Force is in charge of defending the continental United States against the ICBM. In fact, on the basis of the last orders they were given they have been working to develop opposing concepts while supposedly working together in a joint effort.

The blunt truth is that, pending technological breakthroughs, all antimissile missile programs should stay on paper. The Air Force has told Congress the job "is the most difficult this country has ever encountered." USAF studies are where they belong—on paper—and "no one can determine from a paper study how effective we shall be or if we shall be effective at all." The Air Force spokesman was talking, of course, about a ballistic missile defense system that will protect America, not just the points where a missile-age ack-ack is in operation.

In contrast, the Army is carrying out a consistent and strenuous campaign to convince America a "perfect defense" can be provided, at least for limited areas, if we are willing to make the effort. High-ranking Army officers, backed by their service secretary, are fighting hard to convince Congress it is possible to develop an effective antimissile missile within the parameters of reasonable time and cost.

The system Army is trying to sell is the Nike-Zeus, described in its press releases as a logical step in development of what the service calls the "Nike family" of point defense weapons. It is true that Army first developed the shorter range Nike-Ajax and Nike-Hercules, but neither of them has any real technological relation to Zeus.

Zeus is a short-range, point defense missile system. If it works, it will intercept an incoming missile

something less than 100 miles from the target. The system needs four types of radar, one of which presumably would be the Air Force's 3,000-mile surveillance set based at some distant point such as Thule or Turkey. Once an alarm is received, a second radar with a range of about 1,000 miles would have the task of detecting the target and assigning it to the acquisition radar of some 600-mile range, which must distinguish the ICBM from decoys and friendly aircraft, and provide accurate trajectory data. A fourth short-range (about 200-mile range) radar would track the enemy warhead after it gets in range. A similar beam is necessary to guide the Zeus for the intercept.

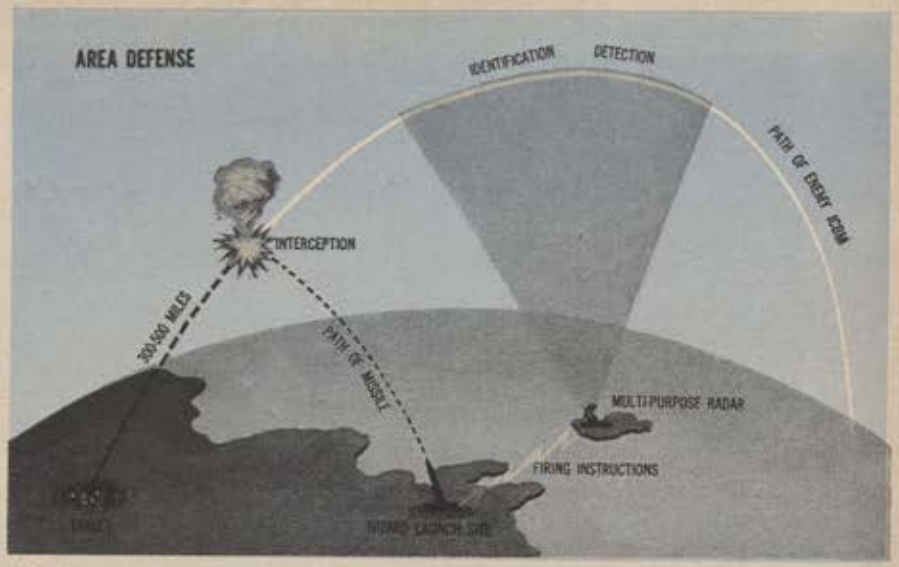
It is highly doubtful that any system could stop an ICBM warhead in the range contemplated for Zeus and at the speed with which it would be approaching. More important is the fact that the Zeus specifications give the potential enemy no credit for ability to improve his ICBM after the first generation.

Knowledgeable technicians feel confident more sophisticated ballistic missiles will spoof both tracking and guidance segments of defense systems, that they will find a way to divert from the ballistic trajectory, and that they will be improved in speed and range. When these improvements come, the point defense concept will be completely frustrated by the unforeseen intelligence of the incoming warhead.

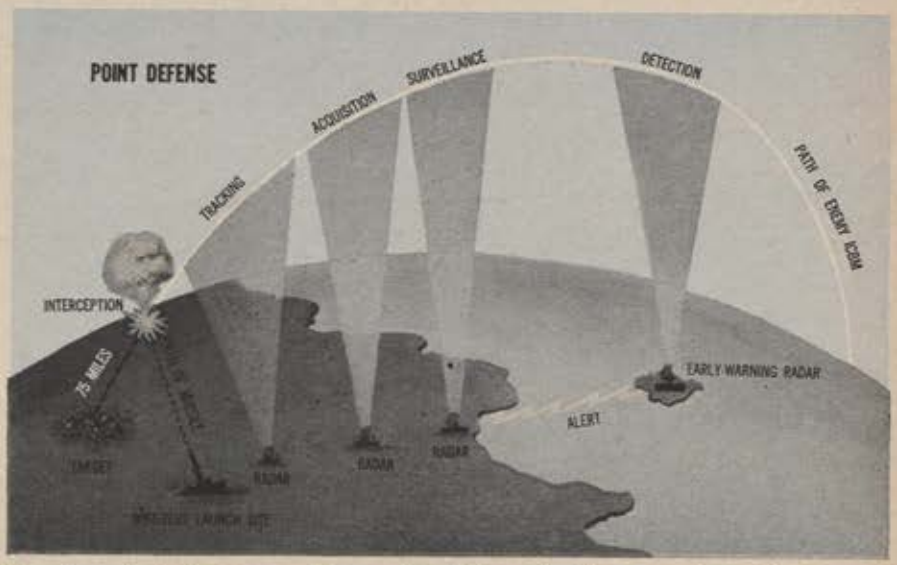
The Air Force holds that it is too late to talk about how we are going to stop the first generation of ICBMs. It is not in favor of investing valuable time, considerable money, and precious brain power to build a system that will be antiquated before we can start to pour concrete and make black boxes.

This approach is fundamental to USAF's missile defense studies called Wizard. They are studies and nothing more, recognizing both the gaps in our knowledge and the advances soon to be made by our own technicians and those who design ICBMs for the potential enemy. Wizard is a broad program, searching for a vastly more complicated and sophisticated system than Zeus. Specifications call for the weapon to have a range of at least 1,000 miles, capable of intercepting a warhead somewhere between 300 and 500 miles from the intended target.

Wizard seeks emphasis on distant interception, accurate discrimination, and an improved ground environment system. The latter must be a super-SAGE to provide instant electronic communication and calculation, universal in its application to any kind of threat through the air. If the job can be done, it may eat up a major part of the development effort.



Air Force approach to missile defense, here greatly oversimplified, envisions 1,000-mile range, ability to intercept enemy ICBM 300-500 miles from target.



Army's antimissile proposal for point defense involves complex radar system, three types at launch site, to intercept incoming ICBMs at pointblank range.

Once perfected, Wizard promises real economy. The goal is to protect the nation, and it should be able to do this for a smaller outlay in cash and effort than required for a point defense system (of which Zeus is the prototype) to protect the country's industrial and military heartland. Wizard proponents, however, do not favor spending any money on hardware until they know where and how to spend it.

At the outset, the battle between Army and Air Force concepts appears to be one for funds and funds alone, with the winner more or less assured of a permanent spot as defender of the republic. But it is more than that. It is a battle for the safety of our cities. Under Army's point defense concept, who is to say we will defend Washington and let San Francisco be blown to smithereens? Or that we will let all the cities go for the present and defend the SAC bases?

The Army today is trying hard to parlay some obtainable hardware, useless for the long-run mission, into justification for a role the Army has not been given by Congress or administrative edict.

Major part of the Army's argument is a voluminous report, put on stage as a scientific evaluation but more realistically described by those who have seen it as an Army-financed rationalization to promote the Nike-Zeus and the point defense concept. The document has been the basis for presentations on Capitol Hill, in the Defense Department, and at the

(Continued on page 67)

T/I-transistorized 'peeping drones'

see better fly farther

Transistorized radar . . . and other Texas Instruments "electronic eyes" can peg the shape, location, motion, heat, and magnetic character of "targets of opportunity" . . . *relaying this vital data for action in those brief moments that the opportunity exists!* In manned or unmanned reconnaissance aircraft, TI's light, tough and compact electronics save fuel, space and weight while trimming maintenance and logistic problems.

Discussion of this advanced reconnaissance capability can be arranged on short notice. Authorized industrial or military personnel write or wire: Service Engineering Department . . .

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White House. It also was the source of a press report last November that the Army seeks between $6 billion and $7 billion to finance its effort to produce an antimissile missile by 1961.

The arithmetic made public at that time and since has been too modest. It has been estimated that pursuit of the Army's program, if the study included answers to a myriad of unsolved technical problems, would need an outlay of $120 billion in the next eight years.

Details of the Army's documentation are classified, and there are no publishable official evaluations of what it says. Its most severe critics say it is a witch doctor's justification for giving the entire air defense mission to the Army. Offered as the last definitive word on the subject and the best technical estimate ever made, it is reported by competent observers to be wrong in its premises, its procedure of calculation, its results, and its conclusions.

Among other things, the report is said to assume capabilities and reliability for electronic systems that are purely fantastic considering the present state of the art. It has ignored electronic countermeasures (ECM) or assumed that the Nike-Zeus system can overcome them with little or no trouble. The possibility of low-level attack was not considered, and there is no evaluation of the state of the art for manned interceptor defense systems.

Even sources outside the Air Force say the Army-sponsored study fails to give sufficient weight to the decoy problem and would provide no proper discrimination between friend and foe in the air. It is said to underestimate Russian offensive capabilities and assume that early-warning techniques are more advanced than is justified.

Basic fallacy of the entire approach is that it does not recognize, as USAF does, that the ballistic missile defense problem today is a research problem. It has been pointed out by reliable experts that this is no time to take an extreme step because it will take six to ten years to install a ballistic missile defense system of any kind, and we are on the verge of vast new discoveries that will have to be ground into the program. A second major point has to do with complexity. The ballistic missile defense system, when it is possible, will have to be a combination of a number of weapon systems. Not all of the threat will be from launching pads on the other side of the North Pole, coming at us from a relatively narrow segment of the compass. Like us, the enemy will have a variety of high-speed nuclear warheads, launched from distant hard sites, submarines, surface ships, airplanes, or manned spacecraft.

In the face of these facts the Defense Department at this writing still has no over-all system engineering supervision in action on the antimissile project. It has set up no procedures to ensure that the numerous and highly complex components of the weapon system will be compatible and properly phased into the development and production program, when one is possible.

For a sound evaluation of the antimissile defense picture, it is essential that we turn a deaf ear to all the arguments over the relative merits of any particular weapon—or service—for this purpose. Discussion of Nike-Zeus vs. Wizard is about as sensible as an argument over which of two unborn baby boys will be the better tennis player. Only the concept is worthy of words at this point.

If there is anything worse than dependence on a pure point defense system in the coming era of highly efficient ballistic missiles, it is split mission responsibility. And, so far as the development stages are concerned, a split mission is exactly what we have got.

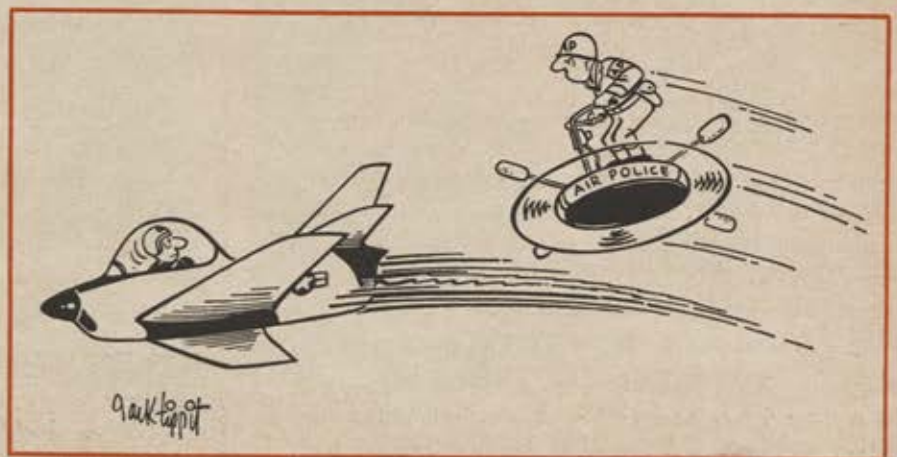
On January 18 Defense Secretary Neil H. McElroy, in a decision that can be pardoned only as an excuse to avoid a decision, gave part of the immediate job to USAF and part to the Army. With the two services working on opposing concepts, the development was divided: USAF will continue work only on the radar and data-handling aspects of Wizard while the Army concentrates on the Nike-Zeus missile system, although permission since has been granted to continue the entire Wizard program until the end of this fiscal year, next June 30.

Immediately, the shotgun wedding of Wizard and Zeus has left us with no clear delineation of responsibility for the necessary compatibility of the radar and data-handling with the weapon itself. In USAF parlance, there is no Weapon System Project Office to make sure there will be a weapon system.

The struggle, of course, will be for funds, and it will be umpired by Roy W. Johnson, Director of the Advanced Research Projects Agency. Before him and Congress, Army will fight all efforts to put aside their program—and their aspirations in the air defense mission—until the state of the art justifies action.

Aghast at the staggering cost estimates of any missile defense system and timid about a firm decision to keep the Army out of the picture, the Defense Department appears to have created a muddle that can wind up only with some resolution as weak as the union of the Thor and Jupiter intermediate-range ballistic missiles. In that case, the Air Force got one weapon it didn't want and is paying an extravagant price to have it in inventory. In the area of defense against ballistic missiles it is being forced to accept part of the cure offered by a witch doctor, while standing convinced that magic is not the answer to our security problem.

And in a time when defense reorganization is being debated vociferously, the air defense muddle points up the fact that unification *per se* does not provide all the answers. In fact, the air defense dilemma has actually been exacerbated by a "unified" decision at the top. So centralization of authority must be accompanied by competence in decision-making or we still wind up confused—even though unified.—END



View of the speakers' table at Utah's Airpower Luncheon shows Arthur F. Kelly, AFA Director; Maj. Gen. P. H. Robey, Military Host; Gen. Edwin W. Rawlings, AMC Commander; Ray Mertes, of United Air Lines; and Lt. Gen. J. H. Atkinson.

Airpower Week in Utah

UTAH'S Gov. George D. Clyde proclaimed it "Airpower Week in Utah," and the phrase well described the Utah Wing's Third Annual Airpower Symposium. From the state-wide fly-in of some fifty lightplanes on March 23 to the crowning of "Miss Missile" at the Airpower Ball on March 30, it was a week of concentrated airpower activity in Salt Lake City.

Dr. Walter R. Dornberger, now with Bell Aircraft Corp., who headed Germany's V-2 program, was principal speaker at the Kickoff Luncheon. He was introduced by Barney Rawlings, a Provo, Utah, native, now with the Las Vegas Chamber of Commerce. Rawlings also emceed the Airpower Ball.

John R. Moore, of North American's Autonetics Division; Lysle S. Wood, Boeing V-P; and Walter B. Sayner, Marquardt Aircraft Co., were the panel for a Missile Industrial Forum on March 28. AFA's Art Kelly was Moderator.

Trevor Clark, of Westinghouse's Air Arm Division, and Jack Loosbrock, AIR FORCE Magazine editor, appeared as panelists during a Missile Information Forum on March 29, with James England, Ogden *Standard Examiner* editor, as Moderator.

A Missile Defense Forum on Saturday afternoon featured Lt. Gen. J. H. Atkinson, ADC commander; Maj. Gen. David Wade, commander of SAC's 1st Missile Division; and Dr. Richard C. Raymond, General Manager of TEMPO, GE's Santa Barbara operation, as panelists. Dr. Carl J. Christensen of the University of Utah moderated.

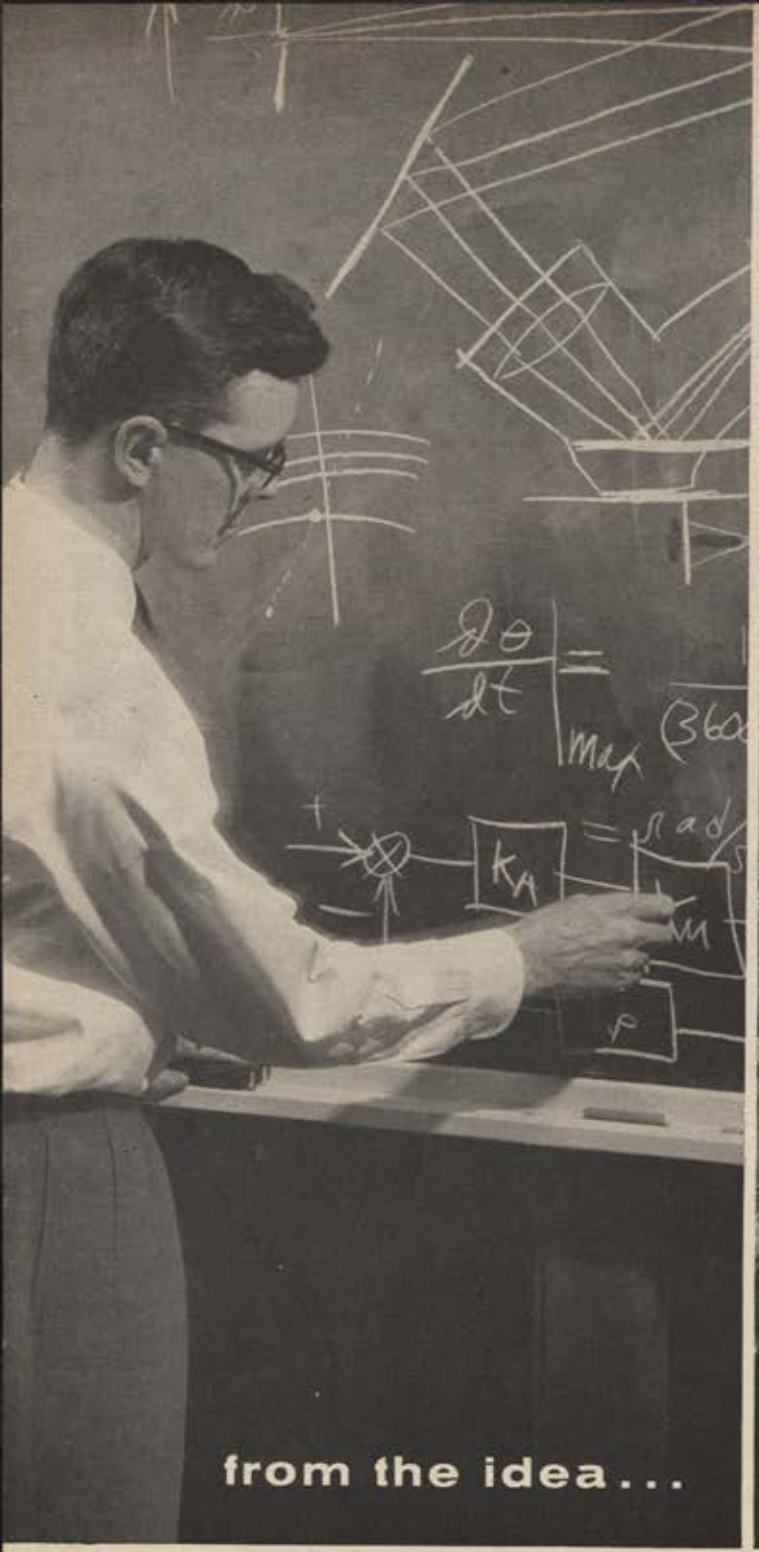
At the Awards Banquet, hard-working General Chairman James R. Bonner was named state "Man of the Year," and received his citation from Utah Wing Commander Dale Erickson. Joe E. Brown was Toastmaster, and guest speaker was AFA President Peter J. Schenk. Both Mr. Schenk and long-time AFA enthusiast Brown received standing ovations.

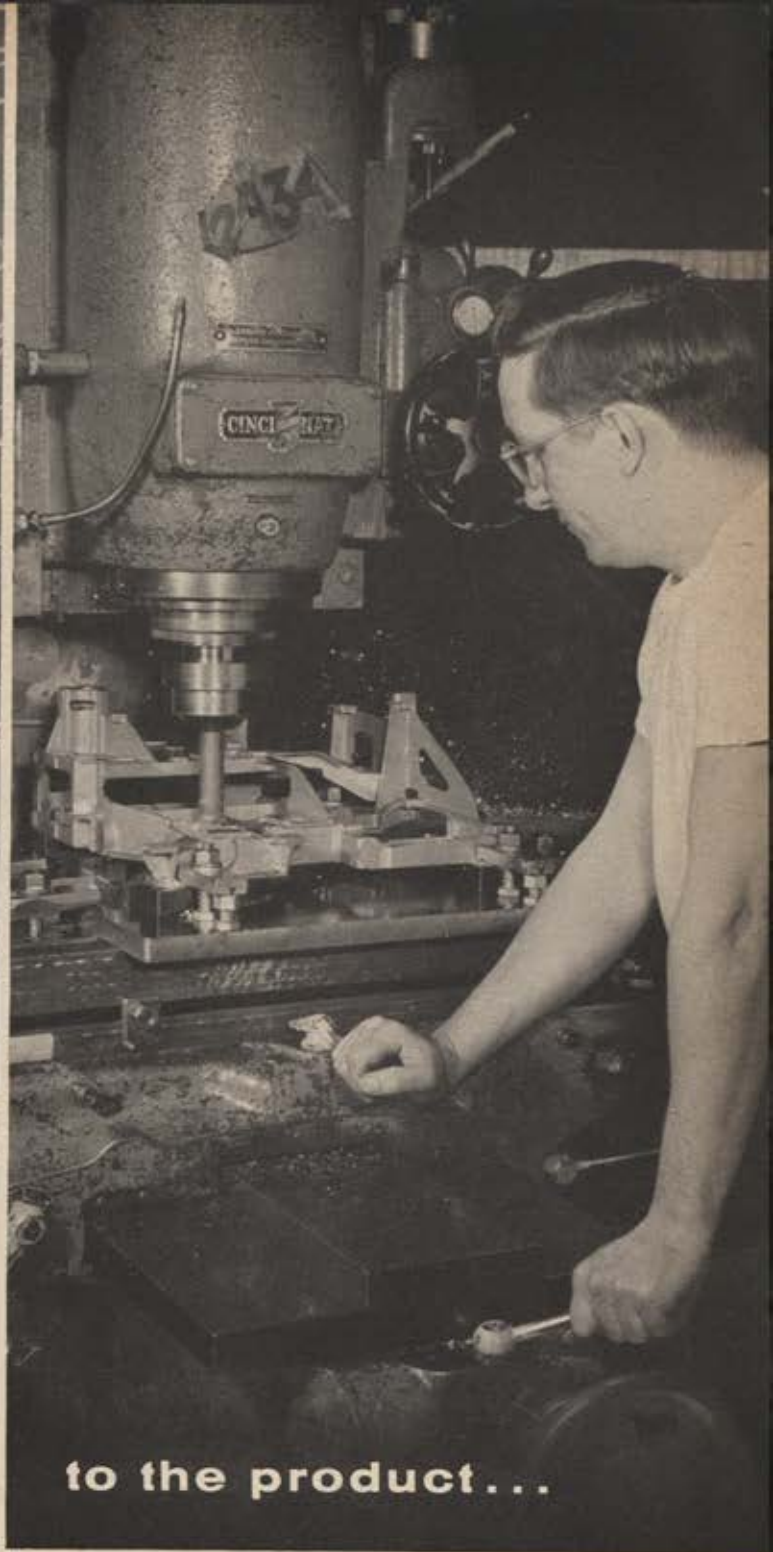
Utah's 1958 Symposium was outstanding. Far too many remarkable efforts were turned in to be recognized individually, so this magazine salutes the entire membership of the Utah Wing and the Salt Lake Chamber of Commerce, who cosponsored the Symposium. Committee work was excellent, and AFA President Schenk summed it up by saying that it looked as though Utah was trying for the coveted AFA "Unit of the Year" trophy it won in 1956.

—GUS DUDA

AFA Utah Wing Commander Dale Erickson, left, with Gov. George Clyde and AF Ass't Sec'y Richard Horner at hospitality dinner before Utah's Airpower Symposium begins.

Jim Bonner, left, general chairman of the Airpower Symposium, chats with Dr. Walter Dornberger of Bell Aircraft, who was the guest speaker at the affair's kickoff luncheon.





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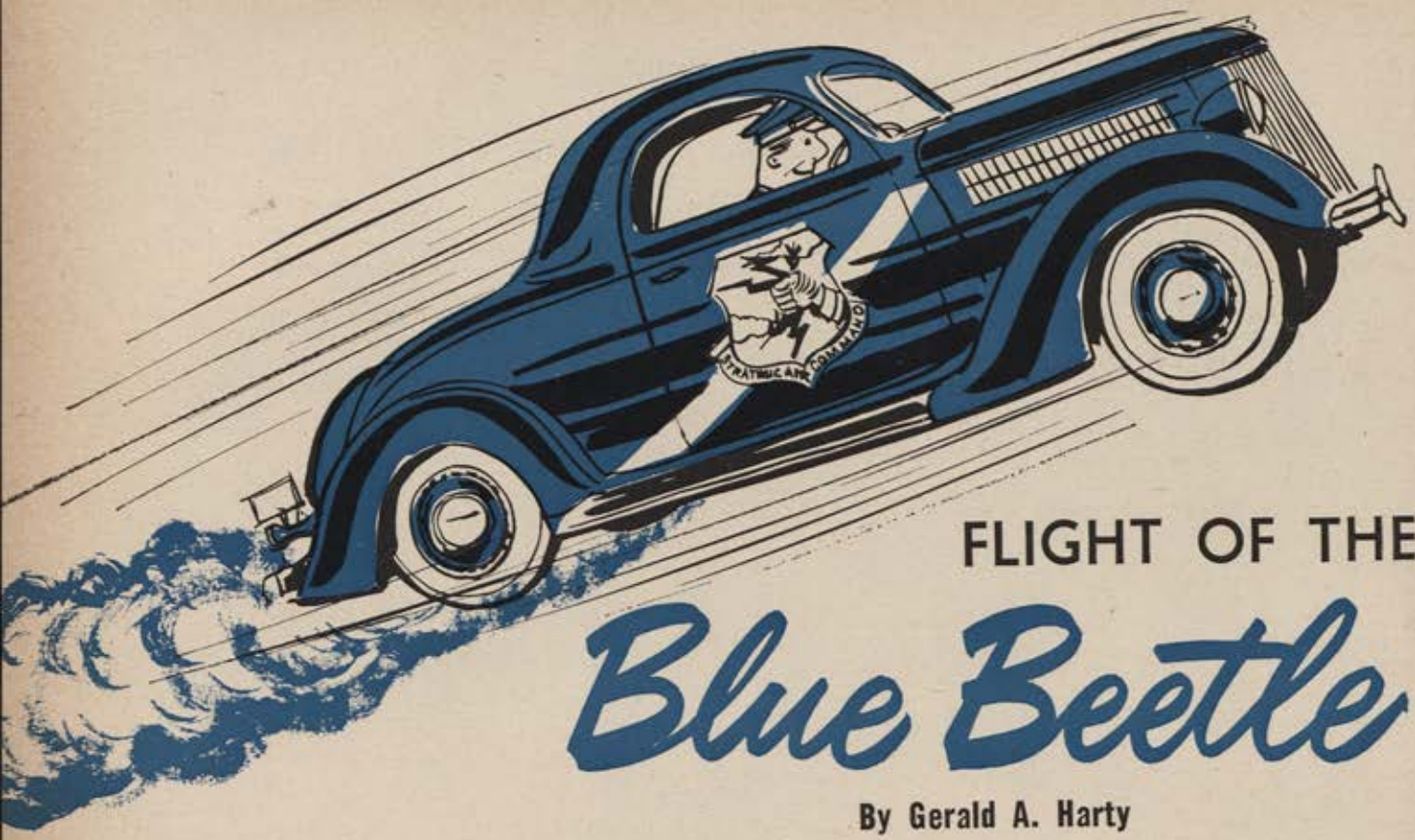


FLIGHT OF THE *Blue Beetle*

By Gerald A. Harty

EVER since cigar-chomping Gen. Curtis LeMay was top dog in the Strategic Air Command, SAC flyers have been a car-conscious lot. When the General thundered off some months ago in his low-slung tumbrel for his new post in Washington, per-capita ownership of sports cars in SAC nearly matched the number of cigar smokers in the Command.

Since imitation is popularly supposed to be the sincerest form of flattery, skeptics claim that this phenomenon reflects an undue interest in rapid promotion among SAC's sports-car *aficionados*.

Having retained my present rank in SAC for the past five years, I hesitate to make affirmation or denial of such cynical observations. However, I know that while the Old Man's taste in cheroots and hot rods may have been a bit too rich for the more humble of his minions, there has been a marked increase in the number of jalopies cruising about SAC bases. Some strange fascination seems to attach itself to these battered buckets of bolts that draw 600-mile-an-hour B-47 and B-52 crews to them like coeds around a red Thunderbird.

Though aware of my colleagues' preoccupation with aged automobiles, I did not appreciate the intensity of their fervor until a week ago when word came of my impending transfer to Europe. Since the government will ship only one car overseas, my wife insisted that we take the family hardtop. Never one for argument, I put an ad in the Carswell AFB daily bulletin announcing that the Blue Beetle was for sale.

The Beetle is probably the most famous old car in SAC, and because of the peripatetic nature of my duties, has cruised the flight lines of almost half the bomber bases in the United States. An Air-Force-blue 1936 Ford sports coupe, the Beetle once sported the SAC shield and a diagonal stripe of white stars across her doors. Her resplendent decorations were removed about a year ago when a regulation-happy colonel declared her not a combat vehicle. While this command decision made it obvious to everyone that the good colonel had never been in a rumble seat in his life, we nevertheless removed the adornment.

As a public relations tool for the Command, the Beetle has had no equal. Carrying some of the most vociferous drumbeaters the services have ever known, she has rolled across Air Force tarmacs like an old familiar friend. Throughout her SAC career, the Beetle has met combat crews, VIPs, the first round-the-world B-52 flight, and a host of lesser callers, including my visiting mother-in-law and a lost Navy pilot who mistook the Gulf of Mexico for Lake Michigan. Into her sagging rumble seat have climbed representatives of the RAF, the RCAF, students from the Air War College, Cub Scouts, Explorer Scouts, Girl Scouts and Brownies, the Chief of Staff of the Royal Thailand Air Force, a bishop of the Episcopal church, a governor, a half dozen mayors, a sprinkling of the more democratic base commanders, newspapermen without number, and assorted members of B-36, B-52, and B-47 crews complete with baggage and "loot" from a dozen different countries. The Beetle could run for President and win in a landslide on only the votes of her passengers.

The full impact of her worldwide popularity was brought home to me this week when replies to my advertisement came flooding in from SAC bases all over the globe. How word got to Labrador within the week, I'll never know, but offers to buy her came from there and from the barren wastes of French Morocco. A buddy in England cabled me to hold her for his arrival in New York next month. Meanwhile, telephone calls from bases across the country have come in to me each day, and messages were pounding in late last night on the base TWX machines begging me for first chance at the Beetle.

I have been in a dilemma. How to select the Beetle's new owner from among the multitude of candidates? Price could not be a deciding factor, for long ago the Beetle became too personal an attachment to be considered a mere chattel available to

"I spotted the Beetle half hidden in a clump of weeds off a Long Island Parkway."

the highest bidder. Profit is almost a naughty word to use in connection with my blue-nosed friend of the past five years.

It was in 1952, while on a visit to Mitchel AFB, N.Y., that I spotted the Beetle half hidden in a clump of weeds off a Long Island parkway. The faded remnants of a bilious green paint job were peeling from her surfaces and her left rear wheel was missing. The owner obviously thought I was crazy when I offered him fifty dollars, but he quickly produced the missing wheel and helped me haul the car to the base. In two days, the mysterious but dependable machinations of a couple of old-line sergeants brought forth the Blue Beetle, sparklingly beautiful in dress of Air Force blue. Immediately, gurgling happily on a tankful of gas, she began the first of hundreds of journeys taken in the interests of Air Force public relations.

Our first port of call was MacDill AFB at Tampa, Fla., which remained home base until January 1956. The Beetle next blazed across the Spanish Trail to Carswell AFB, Fort Worth, Tex., her present home. Between times, I piloted the Beetle on cross-country hops to March AFB, Calif., and up to Washington, D. C., to say nothing of piling up time on countless "local" trips out of Florida and Texas for an added 70,000 miles.

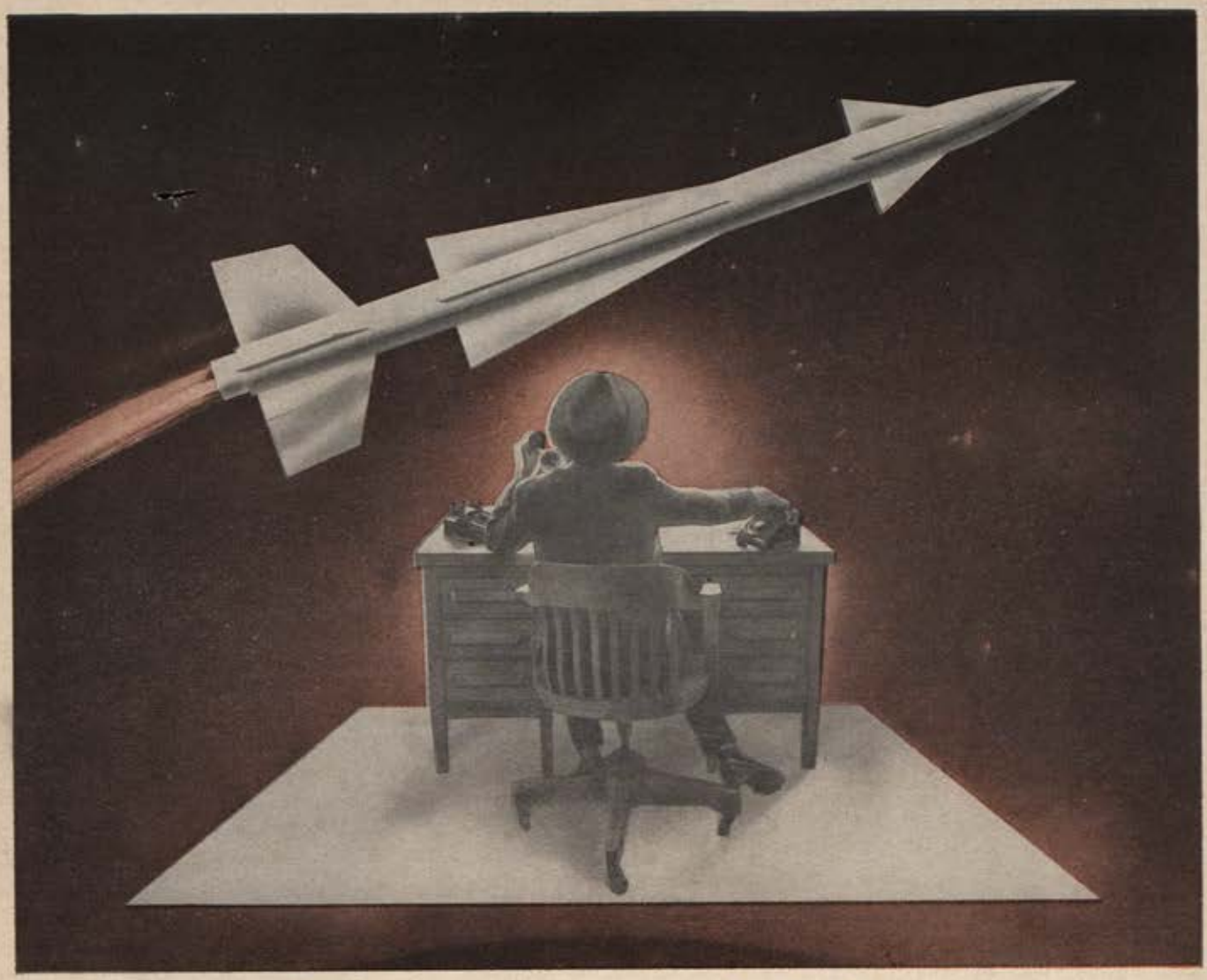
The Beetle's wide acquaintanceship among Air Force great and near-great could be traced by a more cynical chap than I to the parsimonious attitude of various motor-pool personnel we often encountered. These individuals, evidently under the delusion that their stables of motor vehicles are to be used solely for inspections, consistently contrive to find ingenious excuses for refusing all requests for transportation. Ergo, to accomplish my duties, I have come to rely on the Beetle. (An endless bull-session topic in the Air Force, and I suspect in the other services too, is the chaos that may someday result when everyone refuses at the same time to use his private car for official business. But that is another story entirely.)

Lack of cooperation from the motor pool ended the day after the Chief of Staff of the Royal Thailand Air Force made an unexpected visit to the base. The Beetle was the instrument by which this happy armistice was attained. In a not uncommon snafu, familiar to every serviceman and veteran, no word of the visitor's arrival was received until his plane was ready to land. A series of hysterical telephone calls went out across the base in an effort to round up an appropriate and respectable greeting party. The mixup was compounded when I became the only person available to shake the visitor's hand and act as escort. Need it be said that the motor pool had reported "no vehicles in commission"?

Clearly, the situation called for insouciance of the highest order. Never did a protocol officer display greater nonchalance than I, as the Air Marshal and his two aides were led toward the Blue Beetle. She stood beneath the plane's wing, her SAC crest and white-starred stripe shining in the Texas sunlight. Never were solidarity and understanding between nations better exemplified. Possibly it was the disparity in languages, or maybe there was a certain reluctance on my part to explain that the emblazoned Beetle was not representative of official transportation. Anyway, the Air Marshal understood that this was his car. He indicated that he would ride

(Continued on page 73)

"Never did a protocol officer display greater nonchalance than I, as the Air Marshal and his two aides were led toward the Blue Beetle . . ."



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ARCHBALD, PENNSYLVANIA

in the rumble seat en route to headquarters.

To dwarf an otherwise lengthy story, and to avoid recounting the embarrassing consequences of my well intentioned efforts, may I report here merely that I successfully delivered the distinguished party to my commanding general? I have since often wondered whether the Air Marshal's desire to ride in the rumble seat was motivated by an innate sense of modesty, or whether he had expected to acknowledge the cheers of admiring throngs from his vantage point. I sincerely hope it was modesty that moved him to the rear, for the only person we met on the way was an air policeman who informed me that we were traveling the wrong way on a one-way street.

I am sure you understand my reluctance to get rid of the Beetle, now that necessity appears to have presented itself. The more I have listened to offers, the more disinclined I have become to sell. Each time I looked at her pock-marked windshield, her battered bumpers, and yellowing headlights, the more her beauty revealed itself. This morning I was certain that the little devil flirted with me. As I took off for the flight line and gave her a shot of gas, I am sure that I felt her flick her skirts in the air. She has always been a bit on the bouncy side, but lately she seems to have begun to prance. I have come to the conclusion that she is a bit too frivolous for these Air Force types. I decided today that something drastic would have to be done about her.

At noontime I had a little talk with a six-stripe noncom who handles weights and balance on our cargo planes. It seems that there was a big C-124 air freighter heading across the Atlantic this afternoon, direct to my new station. The sergeant usually makes up the cargo, but this flight was an empty and he was going along for the ride. I mentioned my impending transfer and said that I would miss the Beetle. Now, you have to hand it to these old-line sergeants; they are quick on the uptake. He said he could use a set of wheels for the two weeks he would be over there. I remarked on the coincidence of time, for I would be arriving about when he was due to return. We chuckled over that fortuitous turn of circumstances for a bit, and the sergeant got up and measured the Beetle. He noticed a jug of Old Sixty-Seven on the seat and remarked that we both enjoyed the same brand of bourbon, too.

What's that? What about selling the Beetle? Oh, that deal is up in the air just now. Something turned up at the last minute. It always does in the Air Force.—END

"The sergeant noticed a jug of Old Sixty-Seven on the seat . . ."

"The deal is up in the air just now. Something turned up at the last minute."

Here the Blue Beetle, the author behind the wheel, meets an incoming B-52 on the flight line at Carswell AFB, Tex.

ABOUT THE AUTHOR

Gerald Harty was, as he describes it, on "the receiving end of the recent Air Force-wide RIF," and as a result now rides the Blue Beetle from his home in Tampa, Fla., to Tampa Bay, where, he says, he spends hours aboard his sloop "Blarney" freelancing and finishing a book due out later this year. Now a Reserve lieutenant colonel, he is a combat veteran of the Italian theater in World War II. In 1946 he was PIO with the Nürnberg War Crimes trials and later was on hand during the Berlin Airlift, before serving in the Pentagon on the Air Force Press Desk. He taught at the information school at Fort Slocum, N. Y., before joining SAC, to serve at MacDill and Carswell AFBs.

THE MIGHTY ATLAS

1. No ordinary trailer, but a custom-made, king-size one, transports the enormous Atlas cross-country from San Diego, Calif., to Florida test site.

2. Atlas carrying trailer backs up to launching platform at Cape Canaveral and the "bird" is mated to waiting tower.

3. Slowly, carefully, Atlas is raised into position for firing. Specially built cables are used to do this delicate mission.

4. Gantry tower has moved away as time for the launch nears. Giant missile dwarfs crew.

NEARING operational readiness and its addition to US deterrent strength is the Air Force's mighty Atlas intercontinental ballistic missile, tested successfully once again last month at Cape Canaveral, Fla.

This five-shot photo series illustrates the transport and pre-launch preparations for a test flight. The first photo shows the giant Convair-built missile being backed up on the ramp toward the launching platform on the special trailer that conveyed it from the Pacific coast to the Air Force Missile Test Center, Cape Canaveral, Fla.

Next, the big "bird" is carefully installed in the enormous launching tower, after which it is slowly raised into position for firing.

Fourth photo shows Atlas in pre-launch position, towering over its launching stand, so large that it dwarfs the missile personnel, almost invisible in lower right area of the picture.

Final photo shows the missile during the final pre-launch preparations. The tall gantry crane used to service the "bird" has been removed, and at the end of the countdown the Atlas will blaze skyward and over the Atlantic on its flight over the test range.

With the Air Force as a development agency, a varied industry team has worked together to bring the Atlas to successful test, including Convair Division of General Dynamics, North American Aviation, General Electric Co., Ramo-Wooldridge Corp., and American Machine & Foundry Co.—END

5. Moments away is firing time, culminating months of super-skilled work.

CAPABILITIES . . . Manpower, Tools and Experience

This Giant
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How to transport hundreds of gallons of liquefied gases with maximum safety, maintain near-perfect vacuum and hold temperatures approaching 460 degrees below zero without the use of auxiliary refrigeration equipment? This was the problem successfully solved by Beechcraft engineers in only **five month's time** with the design, development, production, and delivery of the Beechcraft Dewar, first of its type ever produced.

Beechcraft scientists and engineers are at work on numerous projects involving transporting and storing of cryogenic liquids, plus projects in many aeronautical fields. A letter today to our Contract Administration Division will bring full information on how Beechcraft's five major plants, 1¾ million square feet of plant area, and 7,000 skilled craftsmen can help solve your research, development, or production problems.

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Official U.S. Air Force Photo

It tracks down an enemy at 300 miles

Described as the most potent of all ground-to-air defense missiles, the Bomarc pilotless interceptor, designed by Boeing, stands poised for the destruction of any "enemy" bomber within a 200-300 mile range. Its booster rocket has the power to hurl it more than 60,000 feet straight up; then, powered by two ramjet engines, it hurtles by electronic instinct to its target at up to 3 times the speed of sound. For this guardian of our homes and way of life, RCA has been privileged to supply important advance components of the guidance system.

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RADIO CORPORATION of AMERICA

DEFENSE ELECTRONIC PRODUCTS

CAMDEN, NEW JERSEY

Tech Talk

America's **first aerial-launching platform for supersonic guided missiles** will be the new **Boeing B-52G**—as a platform for the recently announced **"Hound Dog"** guided airborne missile, **GAM-77.** This missile is described by the Department of Defense as an air-launched weapon to carry a nuclear warhead **"many hundreds of miles"** beyond the bomber's turn-around point. Hound Dog, produced by **North American Aviation, Inc.,** will add a smashing supersonic punch to the bomber's regular nuclear bombload.

A **new fuel system** and **new-type Pratt & Whitney J-57 engines** enable the advanced B-52G to fly at sustained speeds above 650 mph. Principal feature of the fuel system is the wing in which integral tank construction makes virtually the entire wing **one huge fuel tank.** Fuselage refinements also add to the fuel-carrying capacity and help increase the bomber's range even beyond its present unrefueled range of more than 6,000 miles.

As a result of internal improvements, the entire **six-man crew** will operate **from forward positions.** This will eliminate the present manned tail turret position, where the gunner, who moves to a forward position, will be **replaced by a television camera.** In his new forward position, this gunner's ability to see approaching aircraft will be **greatly improved,** as will his control over his quartet of .50-caliber machine guns. The television camera in the tail completes a **closed-circuit TV link** connected with a monitor positioned in front of the gunner. Through the monitor and by remote control of the scanning camera in the tail, the gunner can keep a constant watch behind, above, and below the Stratofortress. The B-52G's new armament system, manufactured by the **American Bosch Arma Corp.,** is one of a number of improvements being incorporated in this SAC bomber.

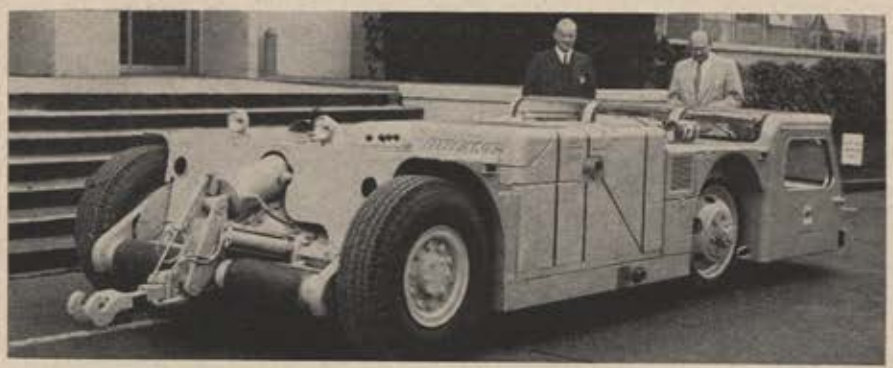
A new concept in moving modern jet aircraft was demonstrated by the **Turbo-Tug,** a development of **Napco Industries, Inc., Minneapolis,** when it moved a giant B-52 Stratofortress about the ramp at Boeing Field, Seattle, recently. The tug is **coupled to the landing gear** of the bomber, and **friction rollers** at the rear of the tug (*see cut*) rotate the airplane's wheels. Since the top of the tug's cab is only **forty-nine inches** off the ground, the tug can be **driven under the aircraft** to make contact with the tires of the airplane.

A powerful, lightweight **Boeing 502 gas-turbine engine** supplies power to the friction rollers. Another Boeing 502 supplies the large volume of air necessary to **start the plane's jet engines.** Thus Napco's Turbo-Tug serves the **dual purpose** by moving the airplane and starting the engines. It weighs only **8,000 pounds,** and traction is provided by the basic weight of the airplane riding on its own tires, with motive force being transmitted through the **roller-to-tire friction drive. No tow bar is necessary,** and the unit is easily **transported by air.** With equal facility it can be moved and start such other airplanes as the Boeing KC-135 jet tanker-transport and the Boeing 707 jet airliner.

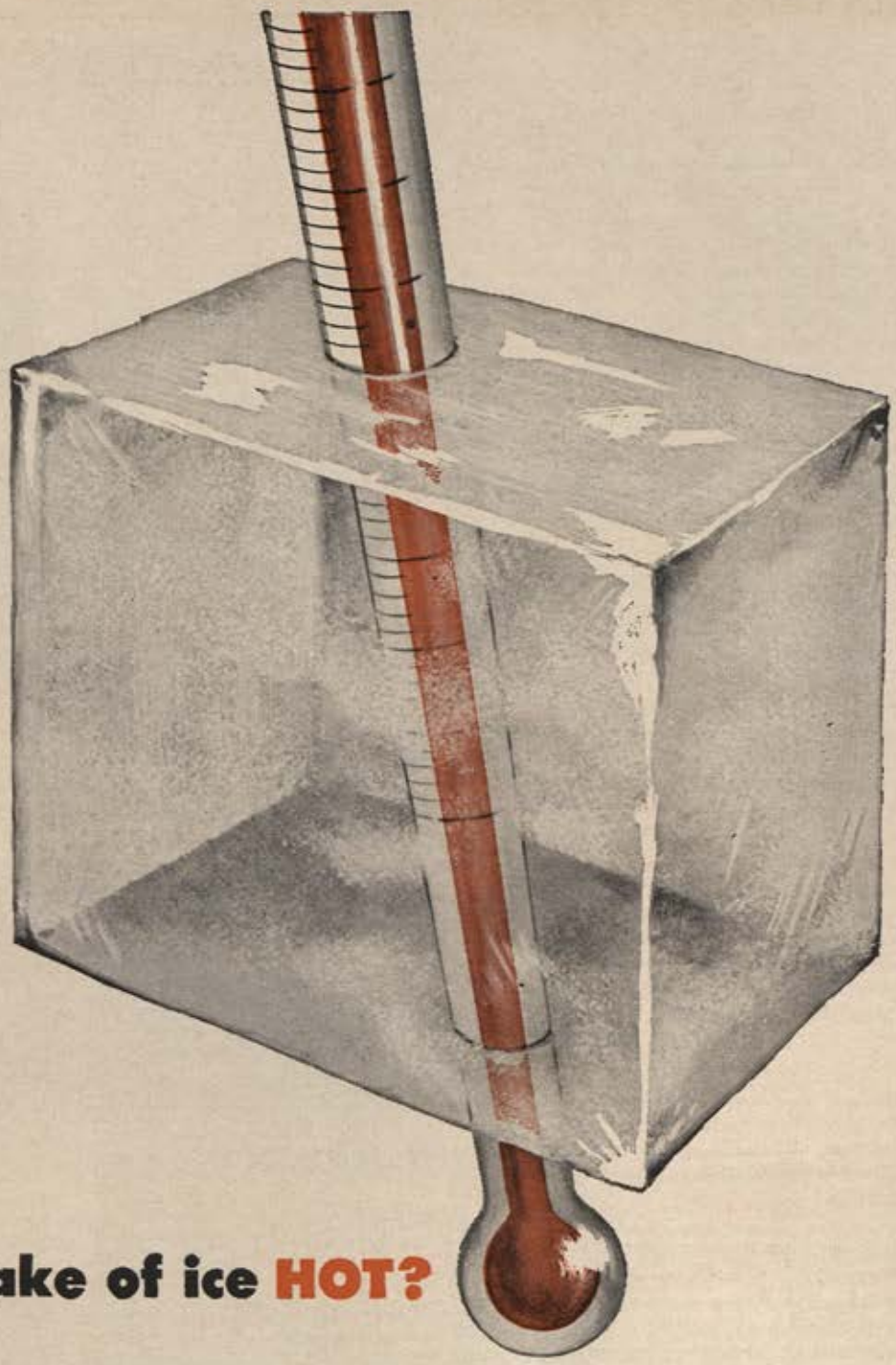
An **electronic guidance system** designed to help the Air Force **test US defenses** against the modern air weapons available to an enemy has been successfully demonstrated. The system is being developed under a contract with the **Air Research and Development Command** and the **Sperry Gyroscope Co.** The **microwave command guidance system** was specifically engineered for use with the **Q-4 and Q-5 supersonic drones.** It is now being considered as a universal system for

(Continued on page 79)

New Northrop T-38 prototype fuselage section being rolled out after rigid instrument check prior to its high-speed rocket-sled testing at Edwards AFB. It will be flight-tested late this year.



Napco Industries' Turbo-Tug has unique system for towing huge jet aircraft. Friction rollers at rear of tug (left) are pressed against airplane's nose wheels and rotate to move bomber. Tug is powered by Boeing 502 gas-turbine engine.



When is a cake of ice HOT?

To the latest infrared sensing devices, *even ice is hot!*

Transparent to a wider range of infrared frequencies than any other IR housing or lens, new Raytheon silicon optics allow even the faint radiations from subzero objects to reach detectors. Formerly, objects had to be 500° F. or hotter for detection at equal ranges. The new silicon optics improve detector performance, permit them to locate targets at greater distances in total darkness!

This latest development typifies creative engineering at Raytheon—constant exploration and experimentation to achieve components and products of utmost efficiency and reliability.

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controlling other target drones for test purposes, pilotless aircraft, and missiles. First scheduled application of the new system will be to control **highly specialized supersonic drones** now in development to provide simulated "attack" situations for our air-defense missiles.

Unique, advance characteristics of the Sperry drone guidance equipment will make possible **exhaustive tests of missiles and aircraft defenses** against a wide variety of both **high- and low-level "attacks"** and, at the same time, help USAF defense personnel attain **new peaks of proficiency.** The system enables a control team anywhere on the ground or in the air to **track a drone, command its engine and flight controls,** and **receive flight data.** It is also the first to provide **remote control of aircraft at low altitudes and great distances,** Sperry says, because it incorporates an **airborne director** (control aircraft), which, like the master ground-control station, is fitted out completely with **radar range, tracking, command, plotting, and data-receiving equipment.**

The ground-director station containing all elements needed for directing a mission is housed in a **specially designed trailer** or van. The van is air-conditioned, heated, and soundproofed for operation under varying conditions, yet is readily transportable by air. A radar operator picks up the flight of the drone to assure its adherence to a preset flight path. The drone, equipped with highly **transistorized transmitting-receiving equipment,** sends **coded information** to either the airborne or ground directors and **receives coded commands** in return.

A **seven-ton rocket-sled** that will **outspeed a low-velocity bullet** is under development by **Rocketdyne,** a division of **North American Aviation, Inc.** It will streak to speeds of **1,700 mph**—nearly two and a half times the speed of sound—powered by a **liquid-propellant rocket engine** developing **160,000 pounds of thrust.** The sled will be delivered this fall to the Air Force for high-speed tests at **ARDC's Holloman Air Development Center, N. M.**

Designated the **RS-2,** the sleek aluminum vehicle will measure forty-three feet long and only forty inches high. It will grip the rails of the **seven-mile track** at Holloman AFB with four steel slippers. With its single-chambered engine, the sled will accelerate with a **force of fifteen Gs,** speeding a **one-ton payload** down the track at **2,500 feet a second.** Liquid oxygen and alcohol will power the rocket engine.

Transporter, built by Food Machinery & Chemical Corp., erects Thor IRBM to firing position at launching site.

The Air Force has disclosed the first details of a system that keeps an **electronic finger on missiles in flight** and continuously predicts where they will land. This system, a **byproduct of the Atlas ICBM development,** is called **Azusa.** Designed and built by **Convair,** Azusa couples a **ground-transmitting station** with the **small receiver transmitter** carried by all ballistic missiles launched at the Air Force Missile Test Center, Cape Canaveral, Fla.

The ground station and Azusa **"talk" to each other** in a rapid-fire exchange of signals. This exchange yields **continuous precision data** on the **position and velocity** of the missile. When the data is fed into an **IBM 704 computer,** the result is an **instantaneous prediction of where the missile would land** if its power were **cut off** at any split second. The output from the IBM computer goes to a **plotting board** that traces this information for the **range safety officer.** If it appears that the missile is straying, the flight is terminated. The Azusa setup consists of a single ground station, having a compact array of eight antennae, and a **"transponder"** carried in the missile.

Bright yellow paint job on Lockheed's X-7 was burned black by searing air friction heat during high-speed test.

A **Lockheed X-7 ramjet missile** has blazed a new speed mark, making it the **fastest "air-breathing" missile in the US,** according to the Air Force, who also revealed that the same missile has zoomed to a **record altitude** for any ramjet-powered vehicle, bordering on the fringe of Earth's atmosphere. The X-7, developed for the **Air Research and Development Command** by **Lockheed's missile plant in Van Nuys, Calif.,** is being used to flight test **powerful new ramjets** that are planned to propel some of the nation's advance defense weapons. Engines flown by the X-7 are built by the **Marquardt Aircraft Co.**

The record speed run was so fast that the missile's bright yellow paint job was **burned black** (*see cut*) by the searing air-friction heat. Launched from a B-29, the missile is driven by a **rocket booster** to a speed where the ramjet takes over. A **pilot on the ground,** operating a small control stick, "flies" the missile through its strenuous paces in the thin air of the upper atmosphere. Although the missile is far out of sight, radar waves track it throughout the maneuvers. The missile is recoverable by parachute and nose spike to permit first-hand study of the ramjet, and also to allow the missile to be flown time and again on other engine development missions.

Each recovery and reflight saves the taxpayers **$350,000 in missile research costs.** Repeated flights of the same bird also saves **valuable development time,** thus speeding the nation's missile program.

—Bob Strobell

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

ANTI-SUBMARINE DUTIES—New weapons systems have immeasurably strengthened the U.S. Navy's capabilities in anti-submarine warfare. A key role is assigned to HSS helicopters (Sikorsky S-58s) equipped with sonar. These are the Navy's only anti-submarine helicopters. Three are shown here operating from a carrier during anti-submarine warfare exercises at sea. S-58-type helicopters are widely flown in both military and commercial service.

AIRBORNE RATIONS—A twin-engined Army H-37 (Sikorsky S-56) lifts a sling load of C-rations during tests at Laguna Airstrip, Yuma, Arizona. The largest known operational helicopters in the world, versatile H-37s have transported heavy Army missiles, vehicles, and artillery pieces.

HIGH ALTITUDE TRAINING—Seventy Marine Corps pilots and crew members tested performance of HUS helicopters (Sikorsky S-58s) at high altitudes and in extreme cold in the mountains of California. Aircraft were flown at 12,500-foot altitude, operating despite snow and ice.

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

AFA NEWS

SQUADRON OF THE MONTH

Squadrons of the Los Angeles Group, Cited for outstanding contributions to the air-age education of the youth of Los Angeles, through sponsorship of an area Model Airplane Contest, thereby publicizing the aviation interests of these youngsters.

Sparked by the **Los Angeles Metropolitan Squadron,** the Squadrons of AFA's **Los Angeles Area Group** wound up their Golden Anniversary celebration with awards to the winners of the group's **first annual Model Airplane Contest. Carl Alford,** Contest Chairman, presented awards to **Michael Christiansen,** Lomita; **Mike Arson,** Glendale; **Nickie Neves,** Rosemead; **Frederick Homenick,** Rosemead; **Sandra Christensen,** Encino; **David Barclay,** El Monte; **Thomas Kovich,** Lomita; **Ronald Hegge,** Lomita Park; **Ray Pingle,** Los Angeles; and **Johnny Fogleson,** West Los Angeles *(see cut, page 82).*

The awards dinner was held in the IAS Building in Los Angeles, and the featured speaker was **Don Pyke,** Director of Technical Staff Placement for the **Ramo-Wooldridge Corp.**

The **Minneapolis Squadron,** under the direction of **Commander Ed Kube,** observed the anniversary with the presentation of several awards to outstanding Minnesota aviation figures, including **John Nyberg** of the Minneapolis *Star,* the Minneapolis Building and Construction Trades, AFL-CIO, of **Col. Dean E. Hess,** USAF Information Services Office, Los Angeles, who heads "HOPE, Inc.," a program to assist **orphans of the Korean War. Helen Watson Chingos,** Squadron Commander, turned over to Colonel Hess a check for $2,000 to be used in his work *(see cut).* Guests included AFA's National Secretary, **Julian B. Rosenthal,** and Wing Commander **A. A. "Bud" West. Mary Gill Rice,** first WAF Squadron Commander and a former National Director, was the main speaker.

Harvey McKay, right, California Wing Commander, accepts "AFA Week" proclamation from Gov. Goodwin J. Knight.

During Minneapolis Squadron anniversary and awards dinner, from left: Richard Hance, John Nyberg, Maj. Gen. Jarred V. Crabb, Mrs. Edwin Kube, David Roe, and Robert Hansen.

After New York WAF Squadron banquet, Commander Helen Chingos presents $2,000 check to Col. Dean Hess for Korean orphans. Korean UN ambassador, Col. Ben Limb, looks on.

Several AFA units commemorated the **twelfth anniversary of the founding of AFA** with appropriate ceremonies. In **San Diego,** the AFA Squadron continued its fine **"Air Base Indoctrination"** series with a tour of **Nellis AFB, Nev.,** taking as guests some fifty of the community's leading citizens. **Bill Durning,** Squadron Commander; **Jim Snapp,** Wing Deputy Commander; and **Frank Brazda,** Group Commander were hosts for the trip.

In **New York City,** the **WAF Squadron** sponsored a dinner in honor and **Richard Hance,** Minneapolis *Star* photographer *(see cut).*

Maj. Gen. Jarred V. Crabb, Commander, Central Air Defense Force, was the guest speaker. Guests included **Robert P. Knight,** Wing Commander; **Bill Kohlan,** Regional Vice President; and **Merle Else,** former Director and Vice President.

In **Philadelphia,** the Squadron sponsored a dinner at which the speaker was AFA's Organization Director, **Gus Duda.** Toastmaster for the evening was **Victor Blanc,** Philadelphia's city prosecutor. Regional Vice President **Leonard Work** and **Mrs. Work** were among the honored guests.

The **Cleveland, Ohio, Squadron** held its anniversary program at the time of its annual installation dinner. **Howard Markey,** Chicago, Great Lakes Regional Vice President, was guest speaker. **Willard Dougherty,** Commander; **Ray Saks,** Vice Commander; and **Grant Wood,** Treasurer, were installed by Markey, who also conducted a Regional Conference the following day, March 30.

In **Lexington, Mass.,** the **Hanscom**

(Continued on following page)

AFA NEWS — CONTINUED

Here are the participants in the Los Angeles Group's Model Plane awards dinner *(see text, page 81)*. **Standing, from left: Mike Arson, David Barclay, Fred Steiffler, Mike Christiansen, Carl Alford, Nickie Neves, Sandra Christensen. Seated: Tom Kovich, Fred Homenick, Ronald Hegge, Johnny Fogleson, and Ray Pingle. The airplane models held by the winners were presented by the Group for outstanding efforts during this first annual meet sponsored by AFA.**

Squadron also combined its annual installation dinner meeting with the anniversary program. Principal speaker of the evening was **A. John Gale,** of the **High Voltage Engineering Corp.,** who compared the fuels of present with future missiles and discussed ion rockets of the future. **Charles Collins,** newly elected Squadron Commander, presided.

At the anniversary dinner of **Pittsburgh's fine Squadron,** National Director **Carl J. Long** gave a rundown of AFA accomplishments. During his remarks, models lighted the **twelve candles** on a huge birthday cake, each candle representing a particular project in each of AFA's years.

Col. Carlo Tosti, ARDC Information Services Officer, made the principal presentation as the **Maryland** Wing observed the anniversary in Hagerstown. He told the USAF research and development story for the audience of more than 200 AFA officials and members of the **Maryland Manufacturers Association,** which cosponsored the program. **Paul Fonda,** Maryland Wing Commander, arranged the program.

Three programs of much more than usual interest are planned by AFA units. First is the third annual **Jet Age Conference** of the **Florida Wing,** to be held in the **Biscayne-Terrace Hotel, Miami,** on April 25. It will feature the problems commercial airlines must face in entering the jet age, and will consist of morning and afternoon forums, a buffet luncheon, and

(Continued on page 85)

At Hamilton AFB open house, showing off Lockheed F-104, from left: Thos. Stack, former AFA national officer; Courtland Gross, Lockheed president; Col. Ray Evans, then 83d F-I Squadron Commander, since killed in F-104 crash; Maj. Gen. Hugh Parker, WADF Commander; AFA's Tom Barbour; E. F. Thompson, of General Electric's Aviation Sales Division; and AFA Director Mike Kavanaugh.

airborne **SABRE*** pierces the shield of counter measures

LMEE is currently developing for the Air Force a version of the AN/APS-75 SABRE—***Secure Airborne Bombing Radar Equipment**—as an essential part of the [redacted] Advanced Strategic Weapons System. As major producer of airborne electronic countermeasures equipment, LMEE is spearheading progress in defensive and retaliatory electronics. For Booklet: "Moves and Countermoves in an unending struggle for the electromagnetic spectrum," **write Dept. 5A.**

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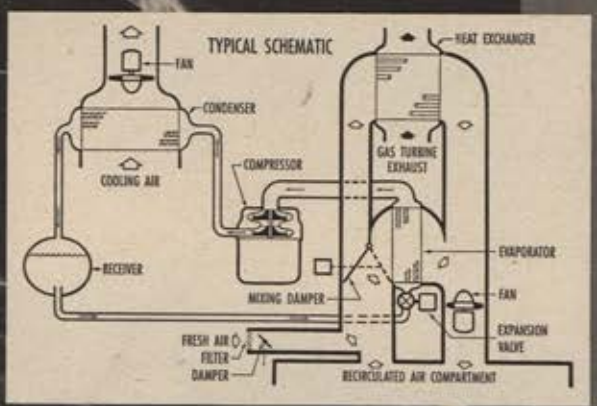
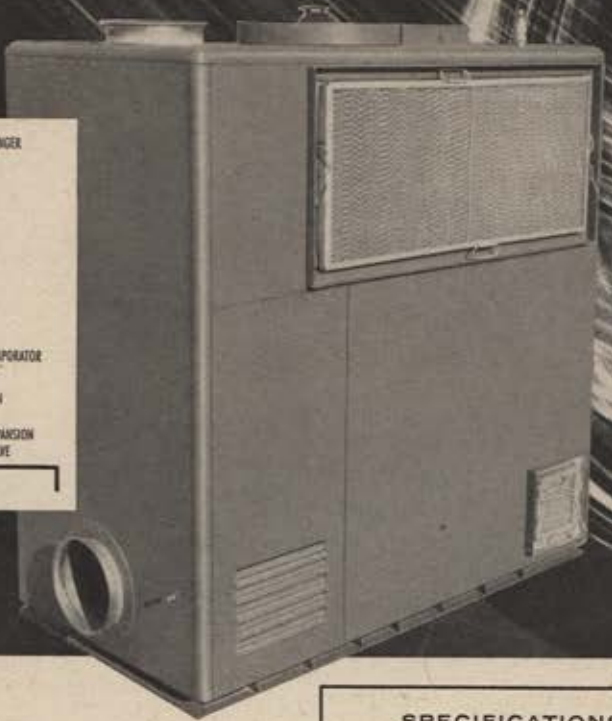
A DEPARTMENT IN THE DEFENSE ELECTRONICS DIVISION

LIGHTWEIGHT

air conditioning for missile support systems





The mobility problem in cooling electronic equipment in vans and for missile pre-launching has been answered by new AiResearch Freon air conditioning units. *One-fourth the weight and one-third the size* of conventional equipment, these lightweight, air-transportable units utilize highly efficient AiResearch Freon components (see diagram) originally developed for commercial aircraft applications.

Heat source for the circuit can be either electrical, or exhaust gas from an AiResearch gas turbine. When the gas turbine assembly includes an alternator, it supplies *400 cycle power to run both the refrigeration unit and all electronic gear in the van.*

Easily operated manually or automatically, this compact air conditioning unit provides from 5 to 12 tons cooling capacity and up to 85,000 BTU's per hour heating capacity. It operates on 400 cycles, 208 volts. The unit shown stands 54" high, 52" wide and 27" deep, with a charged weight of only 452 lbs.! Your inquiries are invited.

SPECIFICATIONS

Performance Data:
Typical operation—cooling

Refrigerant	Freon 12
Evaporator tonnage	7.5
Ambient temperature	100F
Condenser air flow	5000 cfm
Condensing temperature	131F
Evaporator air flow	1230 cfm
External distribution ducting pressure drop	2 in H_2O
Evaporating temperature	48F
Electrical power	26KVA

ENGINEERING REPRESENTATIVES: AIRSUPPLY AND AERO ENGINEERING, OFFICES IN MAJOR CITIES

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AiResearch Manufacturing Divisions

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Dr. Jerome Meyer, center, proudly holds his Wright Memorial AFA Squadron Outstanding Aviation Contribution award. Shown with him are Maj. Gen. Paul Ruestow, banquet speaker, and Morris Ribbler, AFA Squadron Commander in Dayton.

Maj. Gen. Jacob E. Smart, USAF Ass't Vice Chief of Staff, addresses Installation banquet of Savannah, Ga., Sqdn.

banquet. **Alex G. Morphonios,** Regional V-P, will furnish any details.

On April 25, the annual **California Wing Convention,** always one of AFA's biggest, will open for three days, in **Los Angeles' Statler Hotel.** It will feature an all-day **Space Age Symposium** on April 26, under the direction of **John R. Alison,** former National President. **Earl A. McClintock,** 10671 Whipple, N. Hollywood, is Convention Chairman.

On May 1, AFA's **Oklahoma City Squadron** will cosponsor, with the **Frontiers of Science Foundation** and the **Oklahoma City Chamber of Commerce,** a one-day **"Frontiers of Space" Symposium,** featuring outstanding speakers on the subject, including many who recently appeared in Washington before the national Jet Age Conference. **Larry Leffler,** 2208 N. Key Blvd., Midwest City, Okla., is the AFA Squadron Commander.

Reports on these programs will appear in this space when available.

—Gus Duda

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

Seven air-conditioned hotels have set aside rooms and suites for the Air Force Association's 1958 Covention and Airpower Panorama in Dallas, Texas, September 25-28. The Headquarters Hotels are:

AFA Members ..... Adolphus
Reserve & Guard ..... Baker
Industry ..... Statler Hilton

All suites at the Statler, Adolphus, and Baker Hotels have been taken. Each of these hotels has attractive one-room parlors, display rooms, and small banquet rooms which are ideal for entertainment purposes in lieu of suites.

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:

AFA Housing Office

1101 Commerce Street
Dallas 2, Texas

HOTELS	SINGLE ROOMS	DOUBLE ROOMS	TWIN ROOMS	SUITES
ADOLPHUS	$5.00– 7.00	$9.00–14.00	$10.00–14.00	SOLD OUT
BAKER	5.00–11.50	7.00–12.00	8.50–13.00	SOLD OUT
DALLAS	5.00– 7.00	8.00–10.00	8.00–12.50	$16.00–24.00
SOUTHLAND	4.50– 7.50	5.50– 8.50	6.50–10.50	16.50–17.50
STATLER HILTON	SOLD OUT	SOLD OUT	SOLD OUT	SOLD OUT
TRAVIS	5.00– 7.00	8.00– 9.00	8.00– 9.00	15.00
WHITE-PLAZA	4.50– 8.50	6.00–10.00	6.00–12.00	15.00–27.00

HOTEL ROOM RESERVATION FORM
AIR FORCE ASSOCIATION CONVENTION

DATE _____

NAME _____

ADDRESS _____

CITY & STATE _____

HOTEL _____ (First Choice) _____ (Second Choice)

_____ (Type Room) ( ) Low ( ) Average ( ) High (Desired Rate)

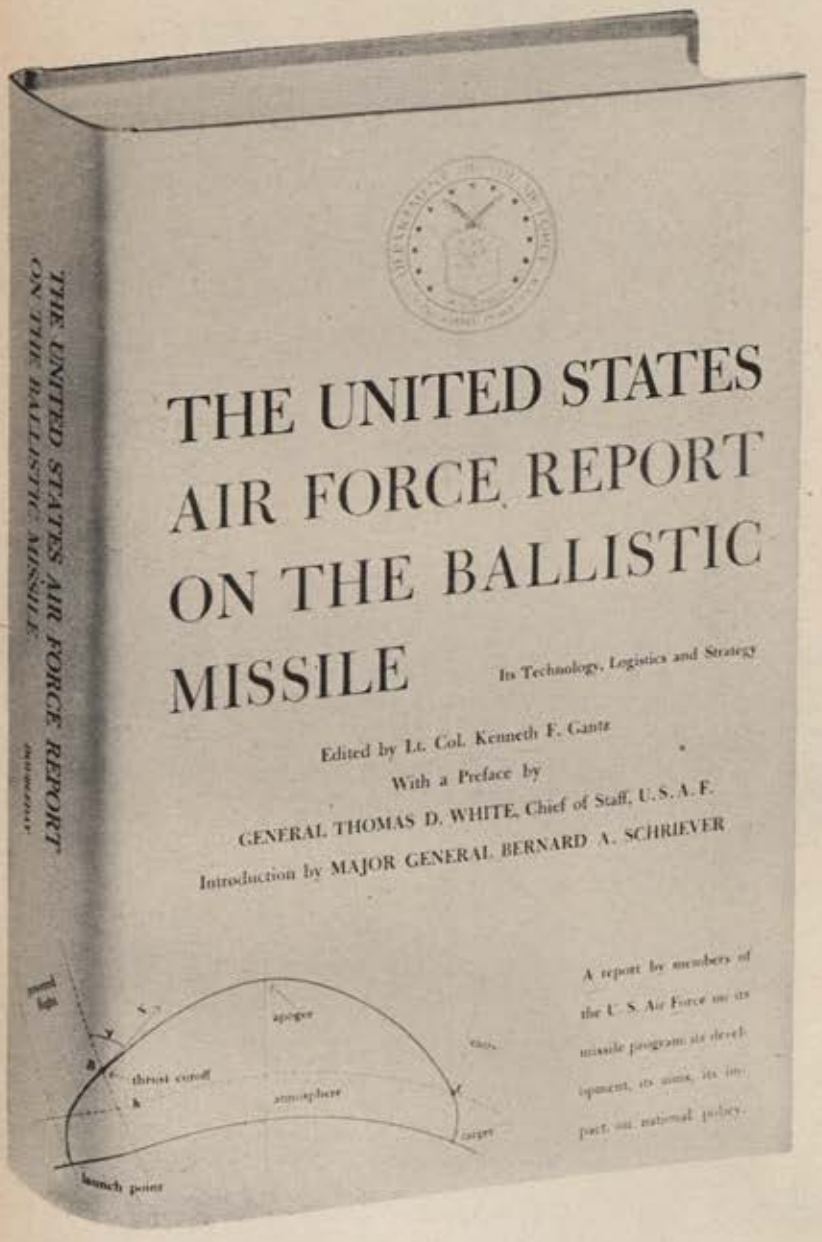
OTHERS IN ROOM _____

ARRIVAL DATE & HOUR _____

DEPARTURE DATE _____

INDEX TO ADVERTISERS

Newest selection of the AIRPOWER



THE *first* professional study of our newest weapon systems—written by the men who design and employ them.

Report on the Ballistic Missile is "action today" reading for everyone concerned in any way with the USAF mission . . . and it will be the standard reference for years to come. Here are extracts from the table of contents—to give you some idea of the range the book covers . . . and the authority it packs. . . .

TABLE OF CONTENTS

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$16.75 worth of books—plus two more selections later in the year—can be yours for only $15. The AIRPOWER BOOK CLUB *guarantees* that you'll get the best in current publishing—books of intense professional interest and lasting reference value—*as they're published*. And since the book club is a service of AFA you *save* on every book.

You can send $15 with your application—or if you prefer, we'll bill you for $6 a month for three months. Either way you have a choice: you can get all three books listed—a $16.75 value—immediately, *plus two more selections* later in the year; or you can start your membership with the *free* History, and the *Report on the Ballistic Missile*, and get three more selections as they are announced. Just check your choice on the coupon below.

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Sets New World Record, with Continental Power

When Capt. James E. Bowman of the U. S. Army Aviation Board flew the Cessna YH-41 to a new helicopter world altitude record of 30,355 feet, he added another to the long list of major performance records already held by Continental aircraft power. Capt. Bowman's mark, exceeding by some 3,400 feet the previous helicopter record, underscores again the wisdom of engineering the power to its job. The YH-41's Continental FSO526 engine is designed expressly for helicopter use . . . fan-cooled for efficient cooling in submerged installation . . . supercharged for maximum power. Its horizontal configuration permits the engine to be located forward, bringing the load directly below the rotors—an ideal situation in helicopter aerodynamics. Finally, the interchangeability of many parts with those of other models in the Continental aircraft engine line tends to simplify service, and reduce its cost.

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AFA's Flight Pay Protection Plan

gets your money to you *when you need it!*

If you're grounded for 90 days . . . you get ***retroactive*** payment from the Protection Plan.

Indemnities continue

. . . for ***12 months*** for groundings due to disease or nonaviation accident . . .

. . . for ***24 months*** for groundings due to aviation accident.

You get 80% of your flight pay monthly—an amount that just about equals your net income from regular, taxable flight pay.

And you pay only **2%** of your annual flight pay for protection.

Your indemnity for just *one* grounding of 90 days or more will pay for *10 years' protection* under the AFA plan . . . and lump-sum payment of three months' indemnities *gives you money when you need it most.*

Here's How the Plan Works

Any person on full-time active duty who receives incentive pay for flying can qualify—provided that he is, or becomes, an AFA member.

When you sign up for protection you pay a premium of two percent (2/100) of your annual flight pay, figured at the current rate. For example, if your current flight pay amounts to $1,800 a year, you pay only $36 for flight pay protection.

(To get your current rate of flight pay, multiply your present monthly flight pay by 12.)

Protection against loss of flight pay due to grounding as a result of accident goes into effect on the last day of the month in which you apply for protection and pay your first premium.

Protection against loss of flight pay for grounding due to disease goes into effect 30 days after the last day of the month in which you apply for protection and pay your first premium.

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.

The insurance is renewable at the option of the Aetna Insurance Company.

° ° °

Policy Form No. 1-620-3A.

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Serial Number **Years Service for Pay Purposes**

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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.

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airman's bookshelf

"The world the SAC pilots live in is a frightening new universe . . . an environ that most people on Earth—the very people whom SAC protects—can never know. It lives entirely within the self-controlled, self-contained metal belly of a giant bomber. . . . Noiseless and invisible . . . in these planes—head enclosed in Plexiglas shells, eyes behind miniature goldfish bowls, mouths masked by oxygen gags, bodies clad in laced-up frogjohn suits—the pilots run their machines with passionless precision . . . [an] elite race which spends a third of its wakening time in a fascinating other world . . . forerunners of the explorers of space [who] live in a pitiless sky above the sky . . . thrive on it, and if need be, escape from it or die."

In such profoundly descriptive, imaginative, and compelling style, Richard G. Hubler chronicles the first informal, detailed history of the Strategic Air Command in its twelve years of existence.

SAC: The Strategic Air Command (Duell, Sloan & Pearce, $4.50) is much more than a chronological narrative, although it compresses in its 280 pages a formidable record. In storybook fashion Hubler traces the evolution of the strategic airpower concept from the decisive bomber offensives of World War II to the creation of SAC in the immediate postwar years. He examines the turbulent formative years featuring such major crises as the B-36 hearings, shrinking budgets accompanied by expanded operational requirements and increased global responsibility, shortage of trained crews and inadequacies of equipment, and friction in organization, operations, and even hardware.

The growth of SAC into today's global nuclear jet force emerges from chapters on the mission, the leaders and the dedicated crews, the air weapons and their awesome potentialities, the missiles now coming into the SAC inventory; the variegated research which underlies and sustains SAC; and the wartime pressures that permeate every segment of the Command.

SAC today—what it means to civilization, how it has preserved peace since 1945, the hopes it holds for the future of the race—is analyzed in terms the layman can readily understand.

The author does not pass himself off as a military expert or an air historian, but he writes from conviction and captures the spirit of SAC in a book that cries to be read. Coming out at a time of heightened world tension, his book is a reassuring story well worth the attention of every thinking American.

• • •

The third one-volume narrative history of American airpower and the USAF to appear during the last year is an illustrated, general account from early ballooning to the ICBM.

U.S. Air Power, by Col. Samuel Taylor Moore, USAF (Ret.), illustrated by Leo Solomon (Greenberg, $5.95), offers a unique personal touch to the documentary record. A lifetime of active duty and press reporting gives Sam Moore a vast storehouse of personal experience to draw from. He adds little-known facts to major air developments and interprets in the light of behind-the-scenes events as he witnessed them.

The book is controversial. For example, Navy carriers get the lion's share of credit for decisive action in the Pacific in World War II—a disputable point with Air Force men. Navy brass, on the other hand, is indicted for impeding development of land-based air operations. The Army in turn is fingered for lack of vision, unwillingness to recognize airpower's potential, and a stubborn attachment to "close-support aviation" in the face of the facts of life of theater warfare.

Moore writes from the level of command, and seldom gets into a specific analysis of air operations. His history falls into the natural chronological compartments. The early years provide his strongest argument, while the tremendous revolutionary post-World War II airpower developments receive little in the way of substantive consideration. From 1946 on—with the exception of Korea, where he was on active duty—he offers little besides a descriptive chronology. Also, the book suffers throughout in the poor quality of photographic reproduction.

But by and large, *U.S. Air Power* adds to the documentary record of the history of the USAF. Sam Moore lived the years of which he writes best. Much of what he says just doesn't exist in the official records.

• • •

The Aircraft Industries Association and editor James Haggerty deserve kudos for the 1957-58 *Aircraft Year Book* (American Aviation Publications, $6). This thirty-ninth annual marks substantial improvement over previous editions in format, content, and coverage. Major categories include captioned-pictorial reviews of the outstanding 1957 events; coverage of aircraft engines and missiles in production with photos, specifications, and three-view drawings; brief histories of civil aviation and the aircraft and airline industries; a survey of military aviation; a rundown on missile and aircraft research and progress; a chronology of significant dates in American aviation from the balloon to the present; and a bibliography of current aviation literature.

• • •

Richard Witkin, aviation writer for the New York *Times*, divides American thought on recent scientific, military, and national policy subjects into four categories. In *The Challenge of the Sputniks* (Doubleday, $1.50) he collects, organizes, and edits post-Sputnik writings and speeches of outstanding American statesmen, businessmen, government leaders, scientists, writers, and news analysts under such headings as "The Shock," "The Reaction," "The Race," and "To the Stars." This connecting commentary provides continuity for the selections and gives the book a perspective on topics of current national and international interest.

• • •

With the surging interest in outer space, books on astronomy are finding wider audiences. Two new ones make excellent fare for the layman, the amateur astronomer, and the future space traveler. *And There Was Light: The Discovery of the Universe*, by Rudolph Thiel, translated from the German by Richard and Clara Winston (Alfred Knopf, $6.95), is an enjoyable, informative history of astronomy, which points out how each astronomical discovery through the centuries contributed to the body of modern scientific knowledge. The great astronomers are presented as humans rather than "eggheads," and their works are framed in historical perspective. An appendix lists astronomical constants, a variety of tabular data, and a chronology of main events in this field through the centuries.

(Continued on following page)

AIRMAN'S BOOKSHELF — CONTINUED

Exploring the Distant Stars, by Clyde B. Clason (G. P. Putnam's Sons, $5), is a readable basic explanation of the universe, a history of astronomy, and a study of the solar system. Tables and charts supplement this descriptive account of tomorrow's frontier.

• • •

One of the many post-Sputnik stirs is the shortcoming of American education *vis à vis* that of the Soviets, especially in the field of the physical sciences. Alexander G. Korol of the staff of Massachusetts Institute of Technology throws new light on this subject with his authoritative study of Soviet education—*Soviet Education for Science and Technology* (John T. Wiley, $8.50).

In analyzing the Soviet system from primary schools through the university level, Dr. Korol examines curricula, teaching methods, teacher and pupil selection, teacher salaries, etc., and compares them with US standards. He believes the *quality* of Soviet education is not the primary danger. Rather, he claims, it is the Communist *capability* to marshall all-out educational resources for certain limited objectives set by a few leaders. Today these objectives are military and scientific. Tomorrow they may be different. Mobilization of education is only one danger we face from Communism. To match it by similar techniques (educational regimentation) in a democracy would only lead to deterioration of our way of life.

Our system and concept of education, he deducts, is adequate to the threat and in most respects superior to the Soviets'. Our weakness is our national emphasis on materialism, which attracts young people into higher-pay, nonscientific professions. The solution lies first in a national understanding of the primary danger to the US and, secondly, in a recognition of our primary goal—the strength to survive. Out of this understanding will come the solution—a de-emphasis on materialism and more science students—in accord with basic principles of a free society. Soviet emphasis on student numbers and their overloading of curricula at all levels is regimentation for the advantage of the state. It would be foolish for the US to ape these measures.

• • •

Former Secretary of State Dean Acheson collects four distinguished William L. Clayton lectures he gave at the Fletcher School of Law and Diplomacy, Tufts University, in *Power and Diplomacy* (Harvard University Press, $3). The first presentation traces the rise of Soviet Russia after World War II and explains why America's future is predicated on a strong Europe. Other lectures discuss the world military situation today, the system of Free World alliances, and the need for an identification of the West's common political and military objectives. Secretary Dulles' brand of massive retaliation, Mr. Acheson believes, lacks the will and determination to make his policies effective. America should be prepared to fight both conventional and nuclear wars. Red China is a fact of life and should be recognized, while the Suez crisis, he claims, was deplorably handled and reflects the poverty of our present foreign policy. This book is a controversial dissertation on current American diplomacy and foreign policy.

• • •

Springtime finds the airman and his family on the move. Whether it's transfer or vacation or a combination of both, two new handy items will be found valuable in planning and conducting Operation Transfer. Rand McNally's *Simplified Road Atlas of the United States, Canada and Mexico* ($1) is tailored to fit in any car glove compartment. It provides maps of principal cities, mileage, radio stations, and motor laws. Along with it, the traveler can use Rand McNally's *Vacation Guide: United States, Canada and Mexico* ($1.95), a practical item for planning, organized into fifty-two areas, twelve geographical regions, and numerous "bee-line" routes with strip maps tying vacation areas together.

• • •

New in the paperback corner:

Samurai! by Saburo Sakai with Martin Caidin and Fred Saito (Ballantine, 50¢)—the story of Japan's top living air ace from World War II.

The World in Space, by Alexander Marshack (Dell, 35¢)—readable, factual scientific examination of the physical aspects of the world and space and the IGY explorations designed to increase man's knowledge of his Earth and the universe.

Maybe I'm Dead, by Joe E. Klaas (Dell, 50¢)—Fiction based on fact about a tragic World War II AF POW death march in Germany.

Rescue, by Elliott Arnold (Bantam, 35¢)—the story of USAF's Air Rescue Service operations worldwide, thirty-three dramatic, exciting accounts of the rescue of civilians of a number of foreign countries.

Aircraft Carrier, by J. Bryan, III (Ballantine, 35¢)—a dramatic tale of combat aboard the USS *Yorktown*.

—CAPT. JAMES F. SUNDERMAN

1942 First effective radar countermeasure was "Window," code name for thin strips of metal foil which reflected spurious radar echoes when dropped from Allied bombers, confusing enemy radar operator.

1943 Next came "Carpet," designation for techniques of radiating "noise" or static from bomber-borne transmitters, each tuned to slightly different frequency. Torrent of "noise" produced "rippling grass" pattern on enemy radarscope.

1944 "Tuba" was a tremendously powerful (50,000 watts) jamming transmitter located in England. Its potent signal blinded German night fighters' radar as they pursued RAF formations toward the island.

THE STORY BEHIND THE STORY

COUNTER-MEASURES

U. S. MAKES PROGRESS IN DECEIVING AN ENEMY

TODAY Shown below is only one of the techniques used in Sperry's integrated countermeasures system. U. S. bomber sweeping inland toward target nears anti-aircraft missile installation. Normally, bomber appears as blip on ground radarscope (1). But new Sperry jammer would transmit countersignal on same frequency as enemy radar, completely obscuring echo of signal on ground radarscope (2). This would make it impossible for enemy to tell number, location, or direction of U. S. planes.

Protecting our strategic bombers from detection is a unique military problem. For example, if enemy radar detects our bombers they cannot accomplish their mission. The problem then is to make the enemy's radar ineffective. Jamming techniques employed in World War II were effective in varying degrees but are inadequate today.

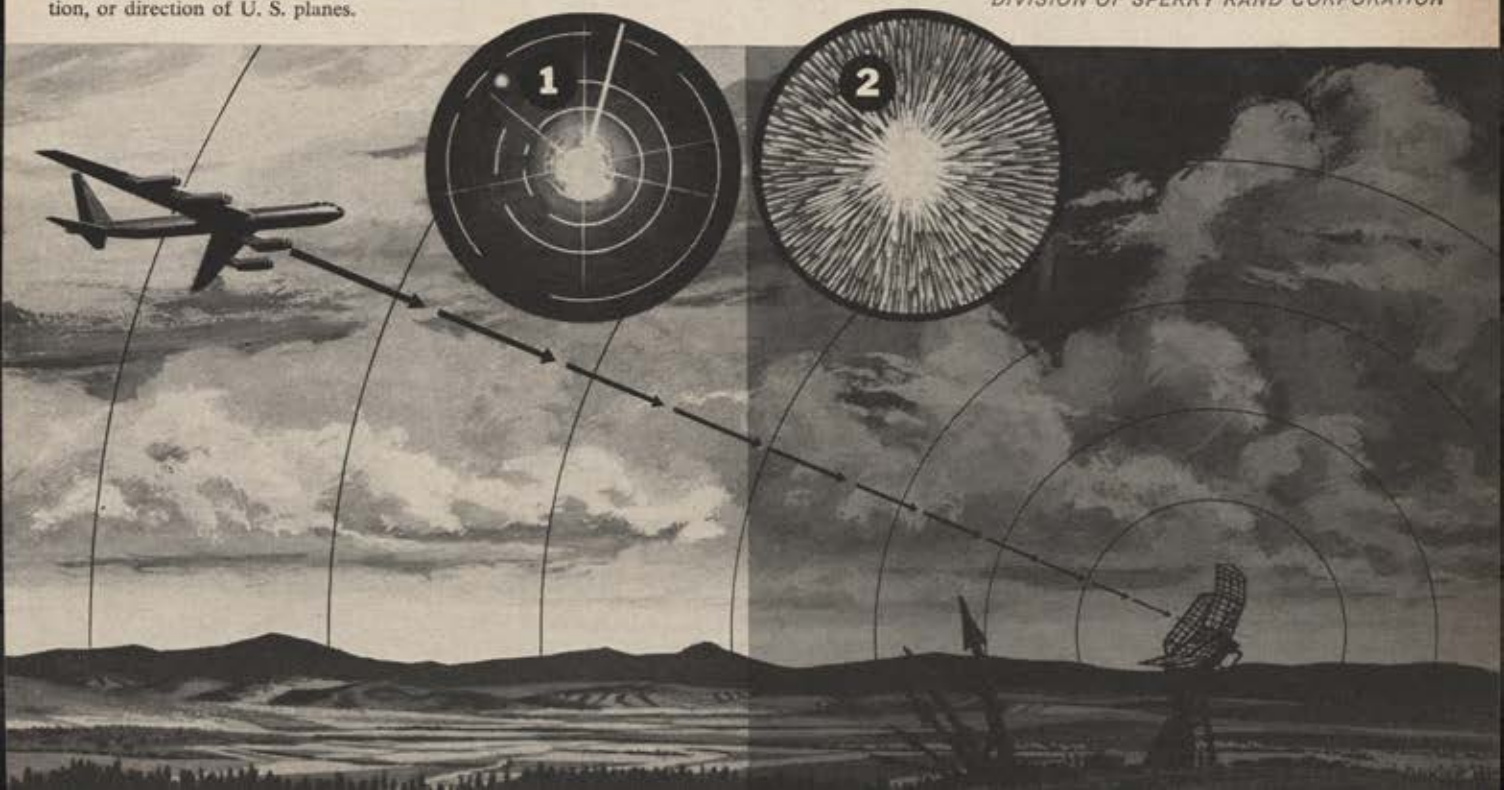
Now Sperry can report a notable break-through in this little-publicized area of electronics, achieved in cooperation with USAF's Air Research and Development Command. An integrated countermeasures system will equip SAC's Boeing B-52s with "a bag of tricks" which not only jams radars but also deceives missiles. This versatile system promises to provide a new measure of protection for our superbombers and will considerably enhance their offensive effectiveness.

ELECTRONIC COUNTERMEASURES DIVISION

SPERRY *GYROSCOPE COMPANY*

Great Neck, New York

DIVISION OF SPERRY RAND CORPORATION



AIR FORCE

a "FOR-THE-RECORD" Service

Primer for SPACE TECHNOLOGY

On the following pages appear three important documents issued during the past month by the White House. We feel that their importance is such that they should be made available *in toto* to our readers for study, filing, and future reference. Future issues of AIR FORCE will continue this practice of documenting important airpower and spacepower source material, in addition to whatever editorial comment we might make elsewhere in the magazine. This "For-the-Record" series will not be confined to White House pronouncements, by any means. Nor do we promise that it will be an every-month sort of thing. But when documents appear in our field which we feel should be studied and saved by serious students of military airpower, we will make every effort to make them available to our readers.—THE EDITORS.

A STATEMENT BY PRESIDENT DWIGHT D. EISENHOWER

"In connection with a study of space science and technology made at my request, the President's Science Advisory Committee, of which Dr. James R. Killian is Chairman, has prepared a brief 'Introduction to Outer Space' for the nontechnical reader. This is not science fiction. This is a sober, realistic presentation by leading scientists.

"I have found this statement so informative and interesting that I wish to share it with all the people of America and indeed with all the people of the Earth. I hope that it can be widely disseminated by all news media for it clarifies many aspects of space and space technology in a way which can be helpful to all people as the United States proceeds with its peaceful program in space science and exploration. Every person has the opportunity to share through understanding in the adventures which lie ahead.

"This statement of the Science Advisory Committee makes clear the opportunities which a developing space technology can provide to extend man's knowledge of the Earth, the solar system, and the universe. These opportunities reinforce my conviction that we and other nations have a great responsibility to promote the peaceful use of space and to utilize the new knowledge obtainable from space science and technology for the benefit of all mankind."

• • •

The members of the Science Advisory Committee, of which Dr. James R. Killian, Jr., is Chairman, include: Dr. Robert F. Bacher, Dr. William O. Baker, Dr. Lloyd V. Berkner, Dr. Hans A. Bethe, Dr. Detlev W. Bronk, Dr. James H. Doolittle, Dr. James B. Fisk, Dr. Caryl P. Haskins, Dr. George B. Kistiakowsky, Dr. Edwin H. Land, Dr. Edward M. Purcell, Dr. Isidor I. Rabi, Dr. H. P. Robertson, Dr. Paul A. Weiss, Dr. Jerome B. Wiesner, Dr. Herbert York, and Dr. Jerrold R. Zacharias.

WHAT are the principal reasons for undertaking a national space program? What can we expect to gain from space science and exploration? What are the scientific laws and facts and the technological means which it would be helpful to know and understand in reaching sound policy decisions for a US space program and its management by the federal government? This statement seeks to provide brief and introductory answers to these questions.

It is useful to distinguish among four factors which give importance, urgency, and inevitability to the advancement of space technology.

The first of these factors is the compelling urge of man to explore and to discover, the thrust of curiosity that leads men to try to go where no one has gone before. Most of the surface of the Earth has now been explored, and men now turn to the exploration of outer space as their next objective.

Second, there is the defensive objective for the development of space technology. We wish to be sure that space is not used to endanger our security. If space is to be used for military purposes, we must be prepared to use space to defend ourselves.

Third, there is the factor of national prestige. To be strong and bold in space technology will enhance the prestige of the US among the peoples of the world and create added confidence in our scientific, technological, industrial, and military strength.

Fourth, space technology affords new opportunities for scientific observation and experiment which will add to our knowledge and understanding of the Earth, the solar system, and the universe.

The determination of what our space program should be must take into consideration all four of these objectives. While this statement deals mainly with the use of space for scientific inquiry, we fully recognize the importance of the other three objectives.

In fact it has been the military quest for ultra-long-range rockets that has provided man with new machinery so powerful that it can readily put satellites in orbit, and, before long, send instruments out to explore the moon and nearby planets. In this way, what was at first a purely military enterprise has opened up an exciting era of exploration that few men, even a decade ago, dreamed would come in this century.

Why Satellites Stay Up

The basic laws governing satellites and spaceflight are fascinating in their own right. And while they have been well known to scientists ever since Newton, they may still seem a little puzzling and unreal to many of us. Our children, however, will understand them quite well.

We all know that the harder you throw a stone the farther it will travel before falling to Earth. If you could imagine your strength so fantastically multiplied that you could throw a stone at a speed of 15,000 mph, it would travel a great distance. It would, in fact, easily cross the Atlantic Ocean before the Earth's gravity pulled it down. Now imagine being able to throw the stone just a little faster, say about 18,000 mph—what would happen then?

The stone would again cross the ocean, but this time it would travel much farther than it did before. It would travel so far that it would overshoot the Earth, so to speak, and keep falling until it was back where it started. Since in this imaginary example there is no atmospheric resistance to slow the stone down, it would still be traveling at its original speed, 18,000 mph, when it had got back to its starting point. So around the Earth it goes again. From the stone's point of view, it is continuously falling, except that its very slight downward arc exactly matches the curvature of the Earth, and so it stays aloft—or, as the scientist would say, "in orbit"—indefinitely.

Since the Earth has an atmosphere, of course, neither stones nor satellites can be sent whizzing around the Earth at tree-top level. Satellites must first be lifted beyond the reach of atmospheric resistance. It is absence of atmospheric resistance plus speed that makes the satellite possible. It may seem odd that weight or mass has nothing to do with a satellite's orbit. If a feather were released from a ten-ton satellite, the two would stay together, following the same path in the airless void.

There is, however, a slight vestige of atmosphere even a few hundred miles above the Earth, and its resistance will cause the feather to spiral inward toward the Earth sooner than the satellite. It is atmospheric resistance, however slight, that has set limits on the life of all satellites launched to date. Beyond a few hundred miles the remaining trace of atmosphere fades away so rapidly that tomorrow's satellites should stay aloft thousands of years, and, perhaps, indefinitely. The higher the satellite, incidentally, the less speed it needs to stay in orbit once it gets there (thus, the moon's speed is only a little more than 2,000 mph), but to launch a satellite toward a more distant orbit requires a higher initial speed and greater expenditure of energy.

The Thrust into Space

Rocket engineers rate rockets not in horsepower, but in thrust. Thrust is just another name for push, and it is expressed in pounds of force. The rocket gets its thrust or push by exhausting material backward. It is this thrust that lifts the rocket off the Earth and accelerates it, making it move faster and faster.

As everyone knows, it is more difficult to accelerate an automobile than a baby carriage. To place satellites weighing 1,000 to 2,000 pounds in orbit requires a first-stage rocket engine, or engines, having a thrust in the neighborhood of 200,000 to 400,000 pounds. Rocket engines able to supply this thrust have been under development for some time. For launching a satellite, or other space vehicle, the rocket engineer divides his rockets into two, three, or more stages, which can be dropped one after the other in flight, thus reducing the total weight that must be accelerated to the final velocity desired. (In other words, it is a great waste of energy to lift one huge fuel tank into orbit when the tank can be divided into smaller tanks—each packaged in its own stage with its own rocket motor—that can be left behind as they become empty.)

To launch some of the present satellites has required rockets weighing up to 1,000 times the weight of the satellite itself. But it will be possible to reduce takeoff weights until they are only fifty to 100 times that of the satellite. The rocket's high ratio of gross weight to payload follows from a fundamental limitation in the exhaust velocities that can be achieved by chemical propellants.

(Continued on following page)

If we want to send up not a satellite but a device that will reach the moon, we need a larger rocket relative to its payload in order that the final stage can be accelerated to about 25,000 mph. This speed, called the "escape velocity," is the speed with which a projectile must be thrown to escape altogether from the gravitational pull of the Earth. If a rocket fired at the moon is to use as little fuel as possible, it must attain the escape velocity very near the beginning of its trip. After this peak speed is reached, the rocket will be gradually slowed down by the Earth's pull, but it will still move fast enough to reach the moon in two or three days.

The Moon as a Goal

Moon exploration will involve three distinct levels of difficulty. The first would be a simple shot at the moon, ending either in a "hard" landing or a circling of the moon. Next in difficulty would be a "soft" landing. And most difficult of all would be a "soft" landing followed by a safe return to Earth.

The payload for a simple moon shot might be a small instrument carrier similar to a satellite. For the more difficult "soft" landing, the carrier would have to include, as part of its payload, a "retro-rocket" (a decelerating rocket) to provide braking action, since the moon has no atmosphere that could serve as a cushion.

To carry out the most difficult feat, a round trip to the moon, will require that the initial payload include not only "retro-rockets" but rockets to take off again from the moon. Equipment will also be required aboard to get the payload through the atmosphere and safely back to Earth. To land a man on the moon and get him home safely again will require a very big rocket engine indeed—one with a thrust in the neighborhood of one or two million pounds. While nuclear power may prove superior to chemical fuels in engines of multimillion-pound thrust, even the atom will provide no short cut to space exploration.

Sending a small instrument carrier to Mars, although not requiring much more initial propulsion than a simple moon shot, would take a much longer travel time (eight months or more), and the problems of navigation and final guidance are formidable.

A Message from Mars

Fortunately, the exploration of the moon and nearby planets need not be held up for lack of rocket engines big enough to send men and instrument carriers out into space and home again. Much that scientists wish to learn from satellites and space voyages into the solar system can be gathered by instruments and transmitted back to Earth. This transmission, it turns out, is relatively easy with today's rugged and tiny electronic equipment.

For example, a transmitter with a power of just one or two watts can easily radio information from the moon to the Earth. And messages from Mars, on the average some 50 million to 100 million miles away at the time the rocket would arrive, can be transmitted to Earth with less power than that used by most commercial broadcasting stations. In some ways, indeed, it appears that it will be easier to send a clear radio message between Mars and Earth than between New York and Tokyo.

This all leads up to an important point about space exploration. The cost of transporting men and material through space will be extremely high, but the cost and difficulty of sending *information* through space will be comparatively low.

Will the Results Justify the Costs?

Since the rocket powerplants for space exploration are already in existence or being developed for military need, the cost of additional scientific research, using these rockets, need not be exorbitant. Still, the cost will not be small, either. This raises an important question that scientists and the general public (which will pay the bill) both must face: Since there are still so many unanswered scientific questions and problems all around us on Earth, why should we start asking new questions and seeking out new problems in space? How can the results possibly justify the cost?

Scientific research, of course, has never been amenable to rigorous cost accounting in advance. Nor, for that matter, has exploration of any sort. But if we have learned one lesson, it is that research and exploration have a remarkable way of paying off—quite apart from the fact that they demonstrate that man is alive and insatiably curious. And we all feel richer for knowing what explorers and scientists have learned about our universe.

It is in these terms that we must measure the value of launching satellites and sending rockets into space. These ventures may have practical utility, some of which will be noted later. But the scientific questions come first.

The View from a Satellite

Here are some of the things that scientists say can be done with the new satellites and other space mechanisms. A satellite in orbit can do three things: (1) It can sample the strange new environment through which it moves; (2) it can look down and see the Earth as it has never been seen before; and (3) it can look out into the universe and record information that can never reach the Earth's surface because of the intervening atmosphere.

The satellite's immediate environment at the edge of space is empty only by earthly standards. Actually, "empty" space is rich in energy, radiation, and fast-moving particles of great variety. Here we will be exploring the active medium, a kind of electrified plasma, dominated by the sun, through which our Earth moves. Scientists have indirect evidence that there are vast systems of magnetic fields and electric currents that are connected somehow with the outward flow of charged material from the sun. These fields and currents the satellites will be able to measure for the first time. Also for the first time, the satellites will give us a detailed three-dimensional picture of the Earth's gravity and its magnetic field.

Physicists are anxious to run one crucial and fairly simple gravity experiment as soon as possible. This experiment will test an important prediction made by Einstein's General Theory of Relativity, namely, that a clock will run faster as the gravitational field around it is reduced. If one of the fantastically accurate clocks, using atomic frequencies, were placed in a satellite and should run faster than its counterpart on Earth, another of Einstein's great and daring predictions would be confirmed. (This is not the same as the prediction that any moving clock will appear to a stationary observer to lose time—a prediction that physicists already regard as well confirmed.)

There are also some special questions about cosmic rays which can be settled only by detecting the rays before they shatter themselves against the Earth's atmosphere. And, of course, animals carried in satellites will begin to answer the question: What is the effect of weightlessness on physiological and psychological functions? (Gravity is not felt inside a satellite because the Earth's pull is precisely bal-

anced by centrifugal force. This is just another way of saying that bodies inside a satellite behave exactly as they would inside a freely falling elevator.)

The satellite that will turn its attention downward holds great promise for meteorology and the eventual improvement of weather forecasting. Present weather stations on land and sea can keep only about ten percent of the atmosphere under surveillance. Two or three weather satellites could make a cloud inventory of the whole globe every few hours. From this inventory meteorologists believe they could spot large storms (including hurricanes) in their early stages and chart their direction of movement with much more accuracy than at present. Other instruments in the satellites will measure for the first time how much solar energy is falling upon the Earth's atmosphere and how much is reflected and radiated back into space by clouds, oceans, the continents, and by the great polar ice fields.

It is not generally appreciated that the Earth has to send back into space, over the long run, exactly as much heat energy as it receives from the sun. If this were not so the Earth would either heat up or cool off. But there is an excess of income over outgo in the tropical regions, and an excess of outgo over income in the polar regions. This imbalance has to be continuously rectified by the activity of the Earth's atmosphere which we call weather.

By looking at the atmosphere from the outside, satellites will provide the first real accounting of the energy imbalances, and their consequent tensions, all around the globe. With the insight gained from such studies, meteorologists hope they may improve long-range forecasting of world weather trends.

Finally, there are the satellites that will look not just around or down, but out into space. Carrying ordinary telescopes as well as special instruments for recording X-rays, ultraviolet, and other radiations, these satellites cannot fail to reveal new sights forever hidden from observers who are bound to the Earth. What these sights will be, no one can tell. But scientists know that a large part of all stellar radiation lies in the ultraviolet region of the spectrum, and this is totally blocked by the Earth's atmosphere. Also blocked are other very long wave lengths of "light" of the kind usually referred to as radio waves. Some of these get through the so-called "radio window" in the atmosphere and can be detected by radio telescopes, but scientists would like a look at the still longer waves that cannot penetrate to Earth.

Even those light signals that now reach the Earth can be recorded with brilliant new clarity by satellite telescopes. All existing photographs of the moon and nearby planets are smeared by the same turbulence of the atmosphere that makes the stars twinkle. Up above the atmosphere the twinkling will stop and we should be able to see for the first time what Mars really looks like. And we shall want a really sharp view before launching the first rocket to Mars.

A Close-up of the Moon

While these satellite observations are in progress, other rockets will be striking out for the moon with other kinds of instruments. Photographs of the back or hidden side of the moon may prove quite unexciting, or they may reveal some spectacular new feature now unguessed. Of greater scientific interest is the question whether or not the moon has a magnetic field. Since no one knows for sure why the Earth has such a field, the presence or absence of one on the moon should throw some light on the mystery.

But what scientists would most like to learn from a close-up study of the moon is something of its origin and history. Was it originally molten? Does it now have a fluid core, similar to the Earth's? And just what is the nature of the lunar surface? The answer to these and many other questions should shed light, directly or indirectly, on the origin and history of the Earth and the surrounding solar system.

While the moon is believed to be devoid of life, even the simplest and most primitive, this cannot be taken for granted. Some scientists have suggested that small particles with the properties of life—germs or spores—could exist in space and could have drifted onto the moon. If we are to test this intriguing hypothesis we must be careful not to contaminate the moon's surface, in the biological sense, beforehand. There are strong scientific reasons, too, for avoiding radioactive contamination of the moon until its naturally acquired radioactivity can be measured.

. . . and on to Mars

The nearest planets to Earth are Mars and Venus. We know quite enough about Mars to suspect that it may support some form of life. To land instrument carriers on Mars and Venus will be easier, in one respect, than achieving a "soft" landing on the moon. The reason is that both planets have atmospheres that can be used to cushion the final approach. These atmospheres might also be used to support balloons equipped to carry out both meteorological soundings and a general photo survey of surface features. The Venusian atmosphere, of course, consists of what appears to be a dense layer of clouds, so that its surface has never been seen at all from Earth.

Remotely controlled scientific expeditions to the moon and nearby planets could absorb the energies of scientists for many decades. Since man is such an adventurous creature, there will undoubtedly come a time when he can no longer resist going out and seeing for himself. It would be foolish to try to predict today just when this moment will arrive. It might not arrive in this century, or it might come within one or two decades. So much will depend on how rapidly we want to expand and accelerate our program. According to one rough estimate it might require a total investment of about a couple of billion dollars, spent over a number of years to equip ourselves to land a man on the moon and to return him safely to Earth.

The Satellite Radio Network

Meanwhile, back at Earth, satellites will be entering into the everyday affairs of men. Not only will they be aiding the meteorologists, but they could surely—and rather quickly—be pressed into service for expanding worldwide communications, including intercontinental television.

At present all transoceanic communication is by cable (which is costly to install) or by shortwave radio (which is easily disrupted by solar storms). Television cannot practically be beamed more than a few hundred miles because the wave lengths needed to carry it will not bend around the Earth and will not bounce off the region of the atmosphere known as the ionosphere. To solve this knotty problem, satellites may be the thing, for they can serve as high-flying radio relay stations. Several suitably equipped and properly spaced satellites would be able to receive TV signals from any point on the globe and to

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relay them directly—or perhaps via a second satellite—to any other point. Powered with solar batteries, these relay stations in space should be able to keep working for many years.

Military Applications of Space Technology

The development of military rockets has provided the technological base for space exploration. It will probably continue to do so, because of the commanding military importance of the ballistic missile. The subject of ballistic missiles lies outside our present discussion. We ask instead, putting missiles aside, what other military applications of space technology can we see ahead?

There are important, foreseeable, military uses for space vehicles. These lie, broadly speaking, in the fields of *communication* and *reconnaissance*. To this we could add meteorology, for the possible advances in meteorological science which have already been described would have military implications. The use of satellites for radio relay links has also been described, and it does not take much imagination to foresee uses of such techniques in long-range military operations.

The reconnaissance capabilities of a satellite are due, of course, to its position high above the Earth and the fact that its orbit carries it in a predictable way over much of the globe. Its disadvantage is its necessarily great distance, 200 miles or more, from the surface. A highly magnifying camera or telescope is needed to picture the Earth's surface in even moderate detail. To the human eye, from 200 miles away, a football stadium would be a barely distinguishable speck. A telescopic camera can do a good deal better, depending on its size and complexity. It is certainly feasible to obtain reconnaissance information with a fairly elaborate instrument, information which could be relayed back to the Earth by radio.

Much has been written about space as a future theatre of war, raising such suggestions as satellite bombers, military bases on the moon, and so on. For the most part, even the more sober proposals do not hold up well on close examination or appear to be achievable at an early date. Granted that they will become technologically possible, most of these schemes, nevertheless, appear to be clumsy and ineffective ways of doing a job. Take one example, the satellite as a bomb carrier. A satellite cannot simply drop a bomb. An object released from a satellite doesn't fall. So there is no special advantage in being over the target. Indeed, the only way to "drop" a bomb directly down from a satellite is to carry out aboard the satellite a rocket launching of the magnitude required for an intercontinental missile. A better scheme is to give the weapon to be launched from the satellite a small push, after which it will spiral in gradually. But that means launching it from a moving platform halfway around the world, with every disadvantage compared to a missile base on the ground.

In short, the Earth would appear to be, after all, the best weapons carrier.

This is only one example; each idea has to be judged on its own merits. There may well be important military applications for space vehicles which we cannot now foresee, and developments in space technology which open up quite novel possibilities. The history of science and technology reminds us sharply of the limitations of our vision. Our road to future strength is the achievement of scientific insight and technical skill by vigorous participation in these new explorations. In this setting, our appropriate military strength will grow naturally and surely.

A Space Timetable

Thus we see that satellites and space vehicles can carry out a great variety of scientific missions, and a number of military ones as well.

Indeed, the scientific opportunities are so numerous and so inviting that scientists from many countries will certainly want to participate. Perhaps the International Geophysical Year will suggest a model for the international exploration of space in the years and decades to come.

The following timetable suggests the approximate order in which some of the scientific and technical objectives mentioned in this review may be attained.

The timetable is not broken down into years, since there is yet too much uncertainty about the scale of the effort that will be made. The timetable simply lists various types of space investigations and goals under three broad headings: Early, Later, Still Later.

SCIENTIFIC OBJECTIVES

Early

1. Physics
2. Geophysics
3. Meteorology
4. Minimal Moon Contact
5. Experimental Communications
6. Space Physiology

Later

1. Astronomy
2. Extensive Communications
3. Biology
4. Scientific Lunar Investigation
5. Minimal Planetary Contact
6. Human Flight in Orbit

Still Later

1. Automated Lunar Exploration
2. Automated Planetary Exploration
3. Human Lunar Exploration and Return

And Much Later Still

Human Planetary Exploration

In conclusion, we venture two observations. Research in outer space affords new opportunities in science, but it does not diminish the importance of science on Earth. Many of the secrets of the universe will be fathomed in laboratories on Earth, and the progress of our science and technology and the welfare of the nation require that our regular scientific programs go forward without loss of pace, in fact at an increased pace. It would not be in the national interest to exploit space science at the cost of weakening our efforts in other scientific endeavors. This need not happen if we plan our national program for space science and technology as part of a balanced national effort in all science and technology.

Our second observation is prompted by technical considerations. For the present, the rocketry and other equipment used in space technology must usually be employed at the very limit of its capacity. This means that failures of equipment and uncertainties of schedule are to be expected. It therefore appears wise to be cautious and modest in our predictions and pronouncements about future space activities—and quietly bold in our execution.

AIR FORCE

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The President's SPACE AGENCY Proposals

RECENT developments in long-range rockets for military purposes have for the first time provided man with new machinery so powerful that it can put satellites into orbit, and eventually provide the means for space exploration. The United States of America and the Union of Soviet Socialist Republics have already successfully placed in orbit a number of Earth satellites. In fact, it is now within the means of any technologically advanced nation to embark upon practicable programs for exploring outer space. The early enactment of appropriate legislation will help assure that the United States takes full advantage of the knowledge of its scientists, the skill of its engineers and technicians, and the resourcefulness of its industry in meeting the challenges of the space age.

During the past several months my Special Assistant for Science and Technology [Dr. James R. Killian] and the President's Science Advisory Committee, of which he is the Chairman, have been conducting a study of the purposes to be served by a national space program, of the types of projects which will be involved, and of the problems of organizing for space science functions. In a statement which I released on March 26, 1958 (*see page 97*), the Science Advisory Committee has listed four factors which in its judgment give urgency and inevitability to advancement in space technology. These factors are: (1) the compelling urge of man to explore the unknown, (2) the need to assure that full advantage is taken of the military potential of space, (3) the effect on national prestige of accomplishment in space science and exploration, and (4) the opportunities for scientific observation and experimentation which will add to our knowledge of the Earth, the solar system, and the universe.

These factors have such a direct bearing on the future progress as well as on the security of our nation that an imaginative and well conceived space program must be given high priority, and a sound organization provided to carry it out. Such a program and the organization which I recommend should contribute to (1) the expansion of human knowledge of outer space and the use of space technology for scientific inquiry, (2) the improvement of the usefulness and efficiency of aircraft, (3) the development of vehicles capable of carrying instruments, equipment, and living organisms into space, (4) the preservation of the role of the United States as a leader in aeronautical and space science and technology, (5) the making available of discoveries of military value to agencies directly concerned with national security, (6) the promotion of cooperation with other nations in space science and technology, and (7) assuring the most effective utilization of the scientific and engineering resources of the United States and the avoidance of duplication of facilities and equipment.

I recommend that aeronautical and space science activities sponsored by the United States be conducted under the direction of a civilian agency, except for those projects primarily associated with military requirements. I have reached this conclusion because space exploration holds promise of adding importantly to our knowledge of the Earth, the solar system, and the universe, and because it is of great importance to have the fullest cooperation of the scientific community at home and abroad in moving forward in the fields of space science and technology. Moreover, a civilian setting for the administration of space function will emphasize the concern of our nation that outer space be devoted to peaceful and scientific purposes.

I am, therefore, recommending that the responsibility for administering the civilian space science and exploration program be lodged in a new National Aeronautics and Space Agency, into which the National Advisory Committee for Aeronautics would be absorbed. Hence, in addition to directing the nation's civilian space program, the new agency would continue to perform the important aeronautical research functions presently carried on by the National Advisory Committee for Aeronautics. The new agency would be headed by a director appointed by the

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President by and with the Senate's advice and consent.

In order to assist the President and the Director of the National Aeronautics and Space Agency, I recommend that a National Aeronautics and Space Board, appointed by the President, be created. Several of the members of of the board should be from the government agencies with the most direct interest in aeronautics, space science, and space technology. To assure that military factors are considered by the board, at least one member should be appointed from the Department of Defense. Members appointed from outside the government should be eminent in science, engineering, technology, education, or public affairs, and be selected solely because they have established records of distinguished achievement.

The National Aeronautics and Space Agency should be given that authority which it will need to administer successfully the new programs under conditions that cannot now be fully foreseen.

In order that the agency may attract and retain the services of scientists and technicians which it must have to carry out its responsibilities with full effectiveness, it should have the authority, subject to regulations prescribed by the President, to fix the compensation of its employees at rates reasonably competitive with those paid by other employers for comparable work without regard to the provisions of existing classification laws.

The agency should have the power to conduct research projects in its own facilities or by contract with other qualified organizations. It will thus be free to enlist the skills and resources required for the space program wherever they may be found, and to do so under the arrangements most satisfactory to all concerned. Provision should also be made for continuing and further enhancing the close and effective cooperation with the military departments which has characterized the work of the National Advisory Committee for Aeronautics. Under such cooperative arrangements it is expected that the National Aeronautics and Space Agency will perform research required in the furtherance of strictly military aeronautics and space objectives, just as the National Advisory Committee for Aeronautics now carries on important research work for the military services in aerodynamics, propulsion, materials, and other fields important to the development of military aircraft and missiles.

The National Advisory Committee for Aeronautics is already engaged in research directly related to flight outside the Earth's atmosphere and has research facilities adapted to work in space science. Upon the enactment of legislation carrying out my recommendations, all of the resources of the National Advisory Committee for Aeronautics would immediately come under the direction of the new agency. The Department of Defense and its contractors, as well as other agencies, have active programs which should be considered for administration by the National Aeronautics and Space Agency. I recommend that this fact be taken into account and provision made for the transfer to the agency of such functions, activities, and facilities of other departments and agencies as may be found to be appropriate for administration by the new agency, subject to the concurrence of the heads of the affected agencies and with the approval of the President.

The director of the Bureau of the Budget is transmitting to the Congress draft legislation to establish the National Aeronautics and Space Agency and to authorize research into the problems of flight within and outside the Earth's atmosphere. I urge that the Congress give prompt consideration to the draft legislation and that it be enacted at the earliest possible date.

Pending enactment of legislation, it is essential that necessary work relating to space programs be continued without loss of momentum. For this reason, I have approved, as part of an interim program of space technology and exploration, the launching of a number of unmanned space vehicles under the direction of the Advanced Research Projects Agency of the Department of Defense. The projects which I have approved include both scientific Earth satellites and programs to explore space. In taking this interim action, I directed the Department of Defense to coordinate these projects with the National Advisory Committee for Aeronautics, the National Science Foundation, and the National Academy of Sciences. I also indicated that when a civilian space agency is created, these projects would be reviewed to determine which should continue under the direction of the Department of Defense and which should be placed under the new agency.

It is also important that measures be taken to assure the prompt and orderly implementation of the proposed aeronautics and space legislation when enacted.

I am requesting the Department of Defense and the National Advisory Committee for Aeronautics to review pertinent programs of the department and to recommend to me those which should be placed under the direction of the new agency. I have also asked that they prepare an operating plan to assure support of the new agency by organizations, facilities, and other resources of the Department of Defense, either by cooperative arrangements or by transfer to the new agency.

It is contemplated that the Department of Defense will continue to be responsible for space activities peculiar to or primarily associated with military weapon systems or military operations. Responsibility for other programs is to be assumed by the new agency. In this connection, I commend to the attention of the Congress the comments of my Science Advisory Committee, in its statement of March 26, 1958, on the military applications of space technology.

I am also asking the National Advisory Committee for Aeronautics to begin immediate preparation of such detailed plans as may be required to prepare for the assumption by the National Aeronautics and Space Agency of the responsibilities contemplated for it. Those plans are to set forth the specific new space programs to be initiated and are to describe the internal organization, management structure, staff, facilities, and funds which will be required. The National Advisory Committee for Aeronautics is to discuss with the National Science Foundation and the National Academy of Sciences the matter of participation by the scientific community in determining the scientific objectives of our space programs. The best scientific judgment available should be utilized. Matters related to the dissemination of the various data collected should also be considered.

I have also instructed the National Advisory Committee for Aeronautics to assume the responsibility for preparing and presenting to the appropriate committees of the Congress a full explanation of the proposed legislation and its objectives.

The vigorous program contemplated will depend not only on adequate legislative authority but also on adequate financial support. I shall shortly submit to the Congress an amendment to the fiscal year 1959 budget to provide funds that will be needed by the new agency in its first year of operation.

DWIGHT D. EISENHOWER

THE WHITE HOUSE,
APRIL 2, 1958.

AIR FORCE
a "FOR-THE-RECORD" Service

The President's PENTAGON REORGANIZATION Plan

LAST January I advised the Congress of two overriding tasks in present world conditions—the ensuring of our safety through strength, and the building of a genuine peace. To these ends I outlined eight major items requiring urgent action.

One was defense reorganization.

In this message I discuss the administrative and legislative changes that I consider essential to the effective direction of our entire defense establishment. They are not numerous. They are, however, very important. They flow from these principles:

First, separate ground, sea, and air warfare is gone forever. If ever again we should be involved in war, we will fight it in all elements, with all services, as one single concentrated effort. Peacetime preparatory and organizational activity must conform to this fact. Strategic and tactical planning must be completely unified, combat forces organized into unified commands, each equipped with the most efficient weapon systems that science can develop, singly led and prepared to fight as one, regardless of service. The accomplishment of this result is the basic function of the Secretary of Defense, advised and assisted by the Joint Chiefs of Staff and operating under the supervision of the Commander in Chief.

Additionally, Secretary of Defense authority, especially in respect to the development of new weapons, must be clear and direct, and flexible in the management of funds. Prompt decisions and elimination of wasteful activity must be primary goals.

These principles I commend to the Congress. In conformity to them I have formulated and urgently recommend certain changes in our defense establishment. Clearly we should preserve the traditional form and pattern of the services but should regroup and redefine certain service responsibilities. From this will flow these results:

- Strategic planning will be unified.
- Our fighting forces will be formed into unified commands, effectively organized for the attainment of national objectives.
- Military command channels will be streamlined.
- The Joint Chiefs of Staff will be provided professional military assistance required for efficient strategic planning and operational control.
- The control and supervision of the Secretary of Defense over military research and development will be strengthened.
- The Secretary of Defense will be granted needed flexibility in the management of defense funds.
- The Secretary of Defense and Joint Chiefs of Staff will be given a direct voice in the appointment, assignment, and removal of officers in the top two military ranks.
- The authority of the Secretary of Defense will be clarified to enable him to function as a fully effective agent of the President as Commander in Chief.
- The over-all efficiency of the Defense Department will be increased.
- The tendency toward service rivalry and controversy, which has so deeply troubled the American people, will be sharply reduced.

(Continued on following page)

In the following remarks I set forth the background and details of these legislative and administrative proposals.

In recent years a revolution has been taking place in the techniques of war. Entirely new weapons have emerged. They transcend all we have before known in destructive power, in range, in swiftness of delivery. Thermonuclear weapons, missiles, new aircraft of great speed and range, atomic ground weapons, nuclear submarines have changed the whole scale and tempo of military destructiveness. Warning times are vanishing. There can be little confidence that we would surely know of an attack before it is launched. Speeds of flight are already such as to make timely reaction difficult and interception uncertain.

The need to maintain an effective deterrent to war becomes ever more critical. In this situation, we must find more efficient and economical means of developing new devices and fitting them into our defense establishment. We must so revise this establishment as not only to improve our own use of such devices; additionally we must be able to counter their use against us.

The products of modern technology are not, in many cases, readily adaptable to traditional service patterns or existing provisions of law. Thus there has tended to be confusion and controversy over the introduction of new weapons into our armed forces and confusion and controversy over the current applicability of long-established service roles and missions.

Moreover, the new weapons and other defense undertakings are so costly as to heavily burden our entire economy. We must achieve the utmost military efficiency in order to generate maximum power from the resources we have available.

Confronted by such urgent needs, we cannot allow differing service viewpoints to determine the character of our defenses—either as to operational planning and control, or as to the development, production, and use of newer weapons. To sanction administrative confusion and interservice debate is, in these times, to court disaster. I cannot overemphasize my conviction that our country's security requirements must not be subordinated to outmoded or single-service concepts of war.

I

An understanding of the course over which we have come to the present will help determine the path we should follow now and in the future.

When our republic was founded, we had a simple solution to the problem of military organization—at first, only a War Department, then soon thereafter, a Department of the Navy. The Navy's mission was war at sea. The War Department's mission was war on land.

For a century and a half this two-department organization was well suited to our needs. Recently, however, the airplane has added a third dimension to the arts of war. At first, the airplane was integrated into the traditional two-department organization, and there it remained until World War II.

Right after Pearl Harbor we adjusted our organization to accord a fuller role to rapidly growing airpower. Within the War Department, the Army Air Forces were placed on equal footing with Ground and Service Forces. In the Navy, task forces built around naval aviation became the heart of the fleet. The Commanding General of the Army Air Forces became a member of the Joint Chiefs with the Army Chief of Staff and the Chief of Naval Operations.

Immediately after the war, efforts began to build a defense organization based upon the lessons of World War II. A basic theme was to provide an adequate organizational framework for airpower armed with the awesome destructive force of atomic weapons. There emerged three coequal executive departments—Army, Navy, and Air Force. But World War II experience had proved that no longer could warfare be effectively waged under separate Army, Navy, and Air Force doctrines. So, over all our forces the Congress established a Secretary of Defense.

This reorganization in 1947 was marked by lengthy debate and eventual compromise. In that battle the lessons were lost; tradition won. The three service departments were but loosely joined. The entire structure, called the National Military Establishment, was little more than a weak confederation of sovereign military units. Few powers were vested in the new Secretary of Defense. All other powers were reserved to three separated executive departments.

Events soon showed that this loose aggregation was unmanageable. In 1949, the National Military Establishment was replaced by an executive Department of Defense. The authority of the Secretary of Defense over his Department was made specific. He was vested with the power of decision in the operation of several interservice boards in his office. A chairman was provided to preside over the Joint Chiefs of Staff. The Departments of Army, Navy, and Air Force were converted from independent executive departments to subordinate military departments. They became represented in the President's Cabinet and the National Security Council by the Secretary of Defense alone. Other changes with similar effect were made.

The unifying process moved forward again in 1953. The Secretary of Defense was given staff facilities better adapted to his heavy responsibilities. Certain boards and agencies were abolished and their duties transferred to him. Additional Assistant Secretaries of Defense were provided. The Chairman of the Joint Chiefs of Staff was authorized to manage the Joint Staff for the Joint Chiefs.

These various steps toward more effective coordination of our armed forces under one civilian head have been necessary, sound, and in the direction pointed by the lessons of modern warfare. Each such step, however, has prompted opponents to predict dire results. There have been allegations that our free institutions would be threatened by the influence of a military leader serving as the principal military adviser to the Defense Secretary and the Commander in Chief. There have been forecasts that one or more of the services would be abolished. As a result, the Secretary of Defense has never been freed of excessive statutory restraints. As a result of well meaning attempts to protect traditional concepts and prerogatives, we have impaired civilian authority and denied ourselves a fully effective defense. We must cling no longer to statutory barriers that weaken executive action and civilian authority. We must free ourselves of emotional attachments to service systems of an era that is no more.

I therefore propose, for America's safety, that we now modernize our defense establishment and make it efficient enough and flexible enough to enable it to meet the fateful challenge of continuing revolutionary change.

II

I know well, from years of military life, the constant concern of service leaders for the adequacy of their respective programs, each of which is intended to strengthen the nation's defense. I understand quite as well the necessity

for these leaders to present honestly and forcefully to their superiors their views regarding the place of their programs in the over-all national effort. But service responsibilities and activities must always be only the branches, not the central trunk of the national security tree. The present organization fails to apply this truth.

While at times human failure and misdirected zeal have been responsible for duplications, inefficiencies, and publicized disputes, the truth is that most of the service rivalries that have troubled us in recent years have been made inevitable by the laws that govern our defense organization.

Parenthetically, I may observe that these rivalries, so common in the national capital, are almost unknown in the field. Here in Washington they usually find expression in the services' congressional and press activities which become particularly conspicuous in struggles over new weapons, funds, and publicity. It is just such rivalries, I am convinced, that America wants stopped.

Coming now to specific organizational changes, I want first to emphasize the vital necessity of complete unity in our strategic planning and basic operational direction. It is therefore mandatory that the initiative for this planning and direction rest not with the separate services but directly with the Secretary of Defense and his operational advisers, the Joint Chiefs of Staff, assisted by such staff organization as they deem necessary.

No military task is of greater importance than the development of strategic plans which relate our revolutionary new weapons and force deployments to national security objectives. Genuine unity is indispensable at this starting point. No amount of subsequent coordination can eliminate duplication of doctrinal conflicts which are intruded into the first shaping of military programs.

This unified effort is essential not only for long-range planning and decision which fix the pattern of our future forces and form the foundation of our major military programs, but also for effective command over military operations. The need for greater unity today is most acute at two points—in the Office of the Secretary of Defense, and in the major operational commands responsible for actual combat in the event of war.

Now as to the specifics of the revisions that I deem essential:

1. We must organize our fighting forces into operational commands that are truly unified, each assigned a mission in full accord with our over-all military objectives.

This lesson, taught by World War II, I learned from firsthand experience. With rare exceptions, as I stated before, there can no longer be separate ground, sea, or air battles.

Our unified commands (by which term I also include the joint and specified commands which exist today) are the cutting edge of our military machine—the units which would do the fighting. Our entire defense organization exists to make them effective.

I intend that, subject only to exceptions personally approved by the Commander in Chief, all of our operational forces be organized into truly unified commands. Such commands will be established at my direction. They will be in the Department of Defense but separate from the military departments. Their missions and force levels will conform to national objectives.

I expect these truly unified commands to go far toward realigning our operational plans, weapon systems, and force levels in such fashion as to provide maximum security at minimum cost.

Because I have often seen the evils of diluted command, I emphasize that each unified commander must have unquestioned authority over all units of his command. Forces must be assigned to the command and be removed only by central direction—by the Secretary of Defense or the Commander in Chief—and not by orders of individual military departments.

Commands of this kind we do not have today. To the extent that we are unable so to organize them under present law, to that extent we cannot fully marshal our armed strength.

We must recognize that by law our military organization still reflects the traditional concepts of separate forces for land, sea, and air operations, despite a Congressional assertion in the same law favoring "their integration into an efficient team of land, naval, and air forces. . . ." This separation is clearly incompatible with unified commands whose missions and weapon systems go far beyond concepts and traditions of individual services.

Today a unified command is made up of component commands from each military department, each under a commander of that department. The commander's authority over these component commands is short of the full command required for maximum efficiency. In fact, it is prescribed that some of his command powers shall take effect only in time of emergency.

I recommend, therefore, that present law, including certain restrictions relating to combatant functions, be so amended as to remove any possible obstacles to the full unity of our commands and the full command over them by unified commanders.

This recommendation most emphatically does not contemplate repeal of laws prescribing the composition of the Army, Navy, Marine Corps, or Air Force. I have neither the intent nor the desire to merge or abolish the traditional services. This recommendation would have no such effect. But I cannot too strongly urge that our operational commands be made truly unified, efficient military instruments. Congressional cooperation is necessary to achieve that goal.

2. We must clear command channels so that orders will proceed directly to unified commands from the Commander in Chief and Secretary of Defense.

The number of headquarters between the Commander in Chief and the commander of each unified command must be kept at the very minimum. Every additional level courts delay, confusion of authority, and diffusion of responsibility. When military responsibility is unclear, civilian control is uncertain.

Under existing practice the chain of command is diverted through the secretaries and service chiefs of the military departments. The department with major responsibility for a unified command is designated by the Secretary of Defense as "executive agent" for that command. The department's secretary functions through his chief of military service.

So today the channel of military command and direction runs from the Commander in Chief to the Secretary of Defense, then to the secretary of an executive agent department, then to a chief of service, and then, finally, to the unified commander. In time of emergency, the secretary of the executive agent department delegates to his service chief his authority over the strategic direction and conduct of combat operations. Thus, ultimately the chief of an individual service issues, in the name of the Secretary of Defense, orders to a unified commander.

The role of the Joint Chiefs of Staff in this process is to furnish professional advice and staff assistance to the Secretary of Defense.

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I consider this chain of command cumbersome and unreliable in time of peace and not usable in time of war. Clearly, secretaries of military departments and chiefs of individual services should not direct unified operations and therefore should be removed from the command channel. Accordingly, I have directed the Secretary of Defense to discontinue the use of military departments as executive agents for unified commands.

To facilitate this effort I ask congressional cooperation. I request repeal of any statutory authority which vests responsibilities for military operations in any official other than the Secretary of Defense. Examples are statutory provisions which prescribe that the Air Force Chief of Staff shall command major units of the Air Force and that the Chief of Naval Operations shall command naval operating forces.

3. We must strengthen the military staff in the Office of the Secretary of Defense in order to provide the Commander in Chief and the Secretary of Defense with the professional assistance they need for strategic planning and for operational direction of the unified commands.

For these purposes, several improvements are needed in the duties and organization of the Joint Chiefs of Staff.

I consider the Joint Chiefs of Staff concept essentially sound, and I therefore believe that the Joint Chiefs of Staff should continue to be constituted as currently provided in law. However, in keeping with the shift I have directed in operational channels, the Joint Chiefs of Staff will in the future serve as staff assisting the Secretary of Defense in his exercise of direction over unified commands. Orders issued to the commands by the Joint Chiefs of Staff will be under the authority and in the name of the Secretary of Defense.

I think it important to have it clearly understood that the Joint Chiefs of Staff act only under the authority and in the name of the Secretary of Defense. I am, therefore, issuing instructions that their function is to advise and assist the Secretary of Defense in respect to their duties and not to perform any of their duties independently of the secretary's direction.

Under present law, the Joint Chiefs of Staff are provided a Joint Staff of not to exceed 210 officers. It functions under a director selected by the Joint Chiefs of Staff with the approval of the Secretary of Defense. The Joint Chiefs of Staff assign duties to the Joint Staff which is managed for them by their chairman. This staff is subdivided into a number of groups, each with equal representation of officers from the three military departments. In addition, there is a committee system whereby officers, representing each of the military departments, act on documents prepared by the staff groups before they are forwarded to the Joint Chiefs of Staff.

These laborious processes exist because each military department feels obliged to judge independently each work product of the Joint Staff. Had I allowed my interservice and interallied staff to be similarly organized in the theaters I commanded during World War II, the delays and resulting indecisiveness would have been unacceptable to my superiors.

With the operational channel now running from the Commander in Chief and Secretary of Defense directly to unified commanders rather than through the military departments, the Joint Staff must be further unified and strengthened in order to provide the operational and planning assistance heretofore largely furnished by staffs of the military departments.

Accordingly, I have directed the Secretary of Defense to discontinue the Joint Staff committee system and to strengthen the Joint Staff by adding an integrated operations division.

I ask the Congress to assist in this effort by raising or removing the statutory limit on the size of the Joint Staff. By authorizing the Chairman of the Joint Chiefs of Staff to assign duties to the Joint Staff and, with the approval of the Secretary of Defense, to appoint its director, the Congress will also be helpful in increasing the efficiency of this important staff group.

I have long been aware that the Joint Chiefs' burdens are so heavy that they find it very difficult to spend adequate time on their duties as members of the Joint Chiefs of Staff. This situation is produced by their having the dual responsibilities of chiefs of the military services and members of the Joint Chiefs of Staff. The problem is not new but has not yielded to past efforts to solve it. We need to solve it now, especially in view of the new strategic planning and operational burdens I have previously mentioned.

I therefore propose that present law be changed to make it clear that each chief of a military service may delegate major portions of his service responsibilities to his vice chief. Once this change is made, the Secretary of Defense will require the chiefs to use their power of delegation to enable them to make their Joint Chiefs of Staff duties their principal duties.

I have one additional proposal respecting the Joint Chiefs of Staff. It is needed to correct misunderstanding of their procedures. Present law provides that the chairman of the Joint Chiefs of Staff shall have no vote. The fact is, neither do the other members, because they do not act by voting. I think it is wrong so to single out the chairman. This provision should be repealed.

4. We must continue the three military departments as agencies within the Department of Defense to administer a wide range of functions.

Under the new command procedures I have described, the secretaries of the military departments will be relieved of direct responsibility for military operations. Thus they will be better able to assist the Secretary of Defense in managing the vast administrative, training, and logistics functions of the Defense Department. The military departments will remain permanent agencies within the Department of Defense, and their secretaries will continue to report to and be directly responsible to the Secretary of Defense. I am convinced that these secretaries should concern themselves with such vital tasks as bringing greater economy and efficiency to activities which support operational commands rather than with military operations themselves.

The responsibilities of these secretaries—each heading a department much larger than any executive department except the Department of Defense itself—are heavy indeed. In my judgment each of these secretaries will continue to need the assistance of an under secretary and not less than two assistant secretaries. It should be possible, however, to eliminate at least one and perhaps two of the four assistant secretaries now authorized for each military department. The duties of these assistant secretaries should be left to the determination of each service Secretary rather than be fixed by law.

5. We must reorganize the research and development functions of the Department in order to make the best use of our scientific and technological resources.

Our weapon systems five to ten years hence will be the outgrowth of research and development which we conduct today. Unavoidably, we are engaged in a race with potential enemies for new, more powerful military

devices being developed by science and technology. In so critical a contest we must carefully balance our scientific resources between military and civilian needs. I consider it particularly important, therefore, that we improve the Defense Department's organization for military research.

Later in this message I will recommend measures to strengthen the authority of the Secretary of Defense to administer other functions of his department. Referring at this point only to research and development, I consider it essential that the Secretary's control over organization and funds be made complete and unchallengeable. Only if this is done can he assure the most effective use of the research and development resources of his department.

The secretary must have full authority to prevent unwise service competition in this critical area. He needs authority to centralize, to the extent he deems necessary, selected research and development projects under his direct control in organizations that may be outside the military departments and to continue other activities within the military departments. I anticipate that most research activities already under way would continue within the military departments. Such new undertakings as require central direction can be centralized with far less difficulty than projects already assigned to military departments.

To give the Secretary of Defense the caliber of assistance he requires in the research area, I recommend that the new position of Director of Defense Research and Engineering be established in place of the Assistant Secretary of Defense for Research and Engineering. I believe his salary should be equal to that of the secretaries of the military departments. He should rank immediately after the service secretaries and above the Defense assistant secretaries. As the principal assistant to the Secretary of Defense for research and development, he should be known nationally as a leader in science and technology. I expect his staff, civilian and military, also to be highly qualified in science and technology.

This official will have three principal functions: first, to be the principal adviser to the Secretary of Defense on scientific and technical matters; second, to supervise all research and engineering activities in the Department of Defense, including those of the Advanced Research Projects Agency and of the Office of the Director of Guided Missiles; and, third, to direct research and engineering activities that require centralized management.

Further, it will be his responsibility to plan research and development to meet the requirements of our national military objectives instead of the more limited requirements of each of the military services. It is of transcendent importance that each of our principal military objectives has strong and clearly focused scientific and technical support.

With the approval of the Secretary of Defense, this official will eliminate unpromising or unnecessarily duplicative programs, and release promising ones for development or production. An especially important duty will be to analyze the technical programs of the military departments to make sure that an integrated research and development program exists to cover the needs of each of the operational commands. It will be his responsibility to initiate projects to see that such gaps as may exist are filled. In addition, the director will review assignments by the military departments to technical branches, bureaus, and laboratories to assure that the research and engineering activities of the Defense Department are efficiently managed and properly coordinated.

I would charge the director, under the direction of the Secretary of Defense, with seeing that unnecessary delays in the decision-making process are eliminated, that lead times are shortened, and that a steady flow of funds to approved programs is assured. Only under this kind of expert, single direction can the entire research and engineering effort be substantially improved. In these various ways, he should help stop the service rivalries and self-serving publicity in this area.

6. We must remove all doubts as to the full authority of the Secretary of Defense.

The Secretary of Defense is accountable to the President and the Congress for efficient direction of the largest single activity in our nation. We look to him for sound management of programs amounting to well over $40 billion a year—programs that gravely concern the survival of our country. Yet, his authority has been circumscribed and hedged about in a number of ways which not only make the burdens of his office far heavier than they need to be, but also work against the efficient and effective direction of national security activities which all Americans —and especially the Congress—rightly expect.

The following areas in the defense establishment are especially in need of attention:

(1) Appropriated funds;
(2) The organization and distribution of functions;
(3) Legislative liaison and public affairs activities; and
(4) Military personnel.

I regard it as fundamental that the secretary, as civilian head of the department, should have greater flexibility in money matters, both among and within the military departments. I have already commented on the desirability of this authority in respect to research and development. It is desirable in other areas as well. Firmly exercised, it will go far toward stopping the services from vying with each other for Congressional and public favor.

Today most of our defense funds are appropriated not to the Secretary of Defense but rather to the military departments. The Secretary of Defense and the Comptroller of the Department of Defense may place certain limitations on the use of funds by the military departments. Yet they do not have sufficient directive authority over such expenditures.

This method of providing defense funds has worked against the unity of the Department of Defense as an executive department of the government. I strongly urge that in the future the Congress make appropriations for this department in such fashion as to provide the Secretary of Defense adequate authority and flexibility to discharge his heavy responsibilities. This need is particularly acute in respect to his powers of strategic planning and operational direction.

I have accordingly directed, in consonance with existing statutory provisions, that the department's budget estimates for the 1960 fiscal year and thereafter be prepared and presented in a form to accomplish these ends.

In addition to greater authority and flexibility in the administration of defense funds, the Secretary of Defense needs greater control over the distribution of functions in his department. His authority must be freed of legal restrictions derived from pre-missile, pre-nuclear concepts of warfare. Various provisions of this kind becloud his authority. Let us no longer give legal support to efforts to weaken the authority of the secretary.

On this point the law itself invites controversy. On the one hand, the National Security Act gives the Secretary of Defense "direction, authority, and control" over his entire department. Yet the same law provides that the

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military departments are to be "separately administered" by their respective secretaries. This is not merely inconsistent and confusing. It is a hindrance to efficient administration. I do not question the necessity for continuing the military departments. There is clear necessity for the Secretary of Defense to decentralize the administration of the huge defense organization by relying on the military departments to carry on a host of essential functions.

The contradictory concept, however, that three military departments can be at once administered separately, yet directed by one administrator who is supposed to establish "integrated policies and procedures," has encouraged endless, fruitless argument. Such provisions unavoidably abrade the unity of the Defense Department.

An example in just one area—procurement and supply—is evidence of the kind of damage caused. In this area the "separately administered" concept, as well as the needless confusion over roles and missions, impede such techniques for increased efficiency and economy as the single-manager plan, which would provide many of the benefits of a separate service of supply without its possible disrupting effects.

I suggest that we be done with prescribing controversy by law. I recommend eliminating from the National Security Act such provisions as those prescribing separate administration of the military departments and the other needless and injurious restraints on the authority of the Secretary of Defense. I specifically call attention to the need for removing doubts concerning the Secretary's authority to transfer, reassign, abolish, or consolidate functions of the Department.

I anticipate that the Secretary of Defense and his Deputy will require, in addition to a Director of Defense Research and Engineering and various special assistants, seven Assistant Secretaries of Defense plus a General Counsel of equivalent rank. I conceive of these Assistant Secretaries as having full staff functions; that is, they are empowered to give instructions appropriate to carrying out policies approved by the Secretary of Defense, subject at all times to the right of service secretaries to raise contested issues with the Secretary of Defense. This is the usual concept of the powers of principal staff assistants. It is essential to the work of the Assistant Secretaries of Defense.

I should add here that, with a view to reducing personnel and avoiding unnecessary interference with service activities, the Secretary of Defense will critically review the operating methods of the various staffs in the Office of Secretary of Defense. He will also review the interdepartmental committee structure within the department in an effort to accelerate the entire decision-making process.

Earlier I mentioned that a principal outlet for service rivalries is the public affairs and legislative liaison activity within each of the military departments. For many years I have attached the greatest importance to providing prompt and accurate information to members of the Congress. I have the same viewpoint in respect to furnishing information to the press and the public. But surely everyone will agree that personnel charged with such duties should not seek to advance the interest of a particular service at the expense of another, nor should they advance a service cause at the expense of over-all national and defense requirements. Of this I am sure: We do not want defense dollars spent in publicity and influence campaigns in which each service claims superiority over the others and strives for increased appropriations or other congressional favors.

I have directed the Secretary of Defense to review the numbers as well as the activities of personnel of the various military departments who engage in legislative liaison and public affairs activities in the Washington area. I have requested that he act, without impeding the flow of information to the Congress and the public, to strengthen Defense Department supervision over these activities and to move such of these personnel and activities as necessary into the Office of the Secretary of Defense.

I have, in this connection, advised the secretary of my desire that his principal assistant for legislative liaison be a civilian official. On the recommendation of the secretary, I shall nominate a person as Assistant Secretary of Defense to perform those duties. An Assistant Secretary of Defense already holds the responsibility for public affairs activities.

Finally, I believe we can strengthen unification by two actions involving military personnel.

First, I am instituting a new personnel procedure for top-ranking officers. It is my belief that before officers are advanced beyond the two-star level, they must have demonstrated, among other qualities, the capacity for dealing objectively—without extreme service partisanship—with matters of the broadest significance to our national security. I am, therefore, instituting this new procedure: I will consider officers for nomination to these top ranks only on recommendations of the Secretary of Defense submitted to me after he has received suggestions of the secretaries of the military departments and the advice of the Joint Chiefs of Staff. I also will base my assignments of these officers to high command, staff, and departmental positions on recommendations of the Secretary of Defense. I will, in reassigning or removing them, follow the same procedure.

I further believe that the Secretary of Defense should be authorized to establish procedures for the transfer of officers between services, with the consent of the individual in each case. This authority is needed primarily in technical fields so that an officer especially qualified to contribute to the success of an activity of a sister service may be afforded an opportunity to do so without interrupting his service career. I would not limit this authority, however, to technical fields.

At my direction the Secretary of Defense will shortly transmit to Congress draft legislation to carry out those items I have discussed which require legislative action. I urge the Congress to consider them promptly and to cooperate fully in making these essential improvements in our defense establishment.

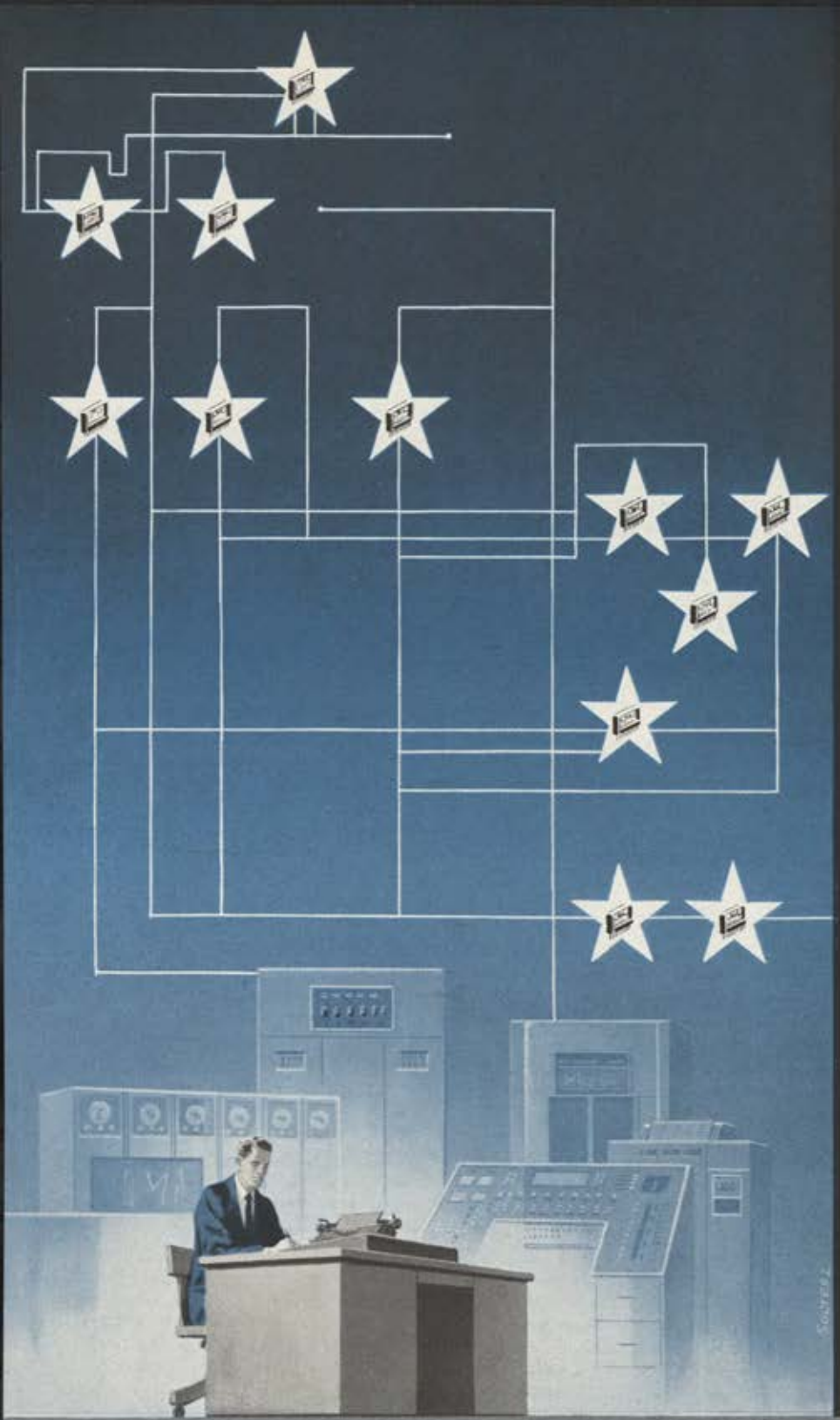
Now in conclusion let us clearly understand that through these actions we will have moved forward in important ways.

- We will have better prepared our country to meet an emergency which could come with little warning.
- We will have improved our military planning.
- We will have accelerated decision-making processes.
- We will have effectively organized our defense programs in the crucial fields of science and technology.
- We will have remedied organizational defects which have encouraged harmful service rivalries.
- We will have improved the over-all efficiency and unity of our great defense establishment.

In our country, under the Constitution, effective military defense requires a full partnership of the Congress and the Executive. Thus, acting in accord with our respective duties and our highest tradition, we shall achieve an efficient defense organization capable of safeguarding our freedom and serving us in our quest for an enduring peace.

DWIGHT D. EISENHOWER

THE WHITE HOUSE,
APRIL 3, 1958.



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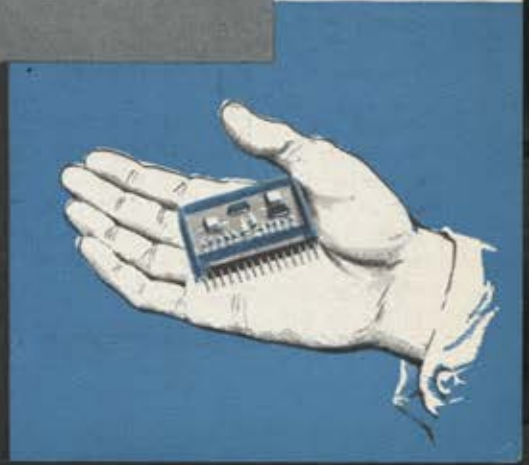
And the smaller computer they make possible can be used in hundreds of new ways . . . in industry and for defense. Avco 'building blocks' are already in production for a U. S. Army-U. S. Air Force *portable* computer.

Full name: Transistorized Logical Building Blocks
From: Avco's Research and Advanced Development Division

Avco today — its products are integral parts of the American scene: in homes and industry, on farms, and for defense. Avco works to give America the most dependable equipment, the most advanced ideas and research.

Avco makes things better for America



Avco

Avco Manufacturing Corporation | 420 Lexington Ave., New York, N. Y.

JET 880

Among airlines to first offer Convair Jet 880 service will be
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CONVAIR'S JET 880

Travel treasure for the new jet age

With superior speed, dramatically stylized interiors, two-abreast seating and the ultimate in engineering, the luxurious *Convair Jet 880* leads the way into the jet-travel era. To the passenger this affords even greater saving of travel time, less travel fatigue, a minimum of possible en route delays, and complete peace of mind and comfort. These dynamic passenger appeals assure untold *travel treasures in the new jet age!*

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