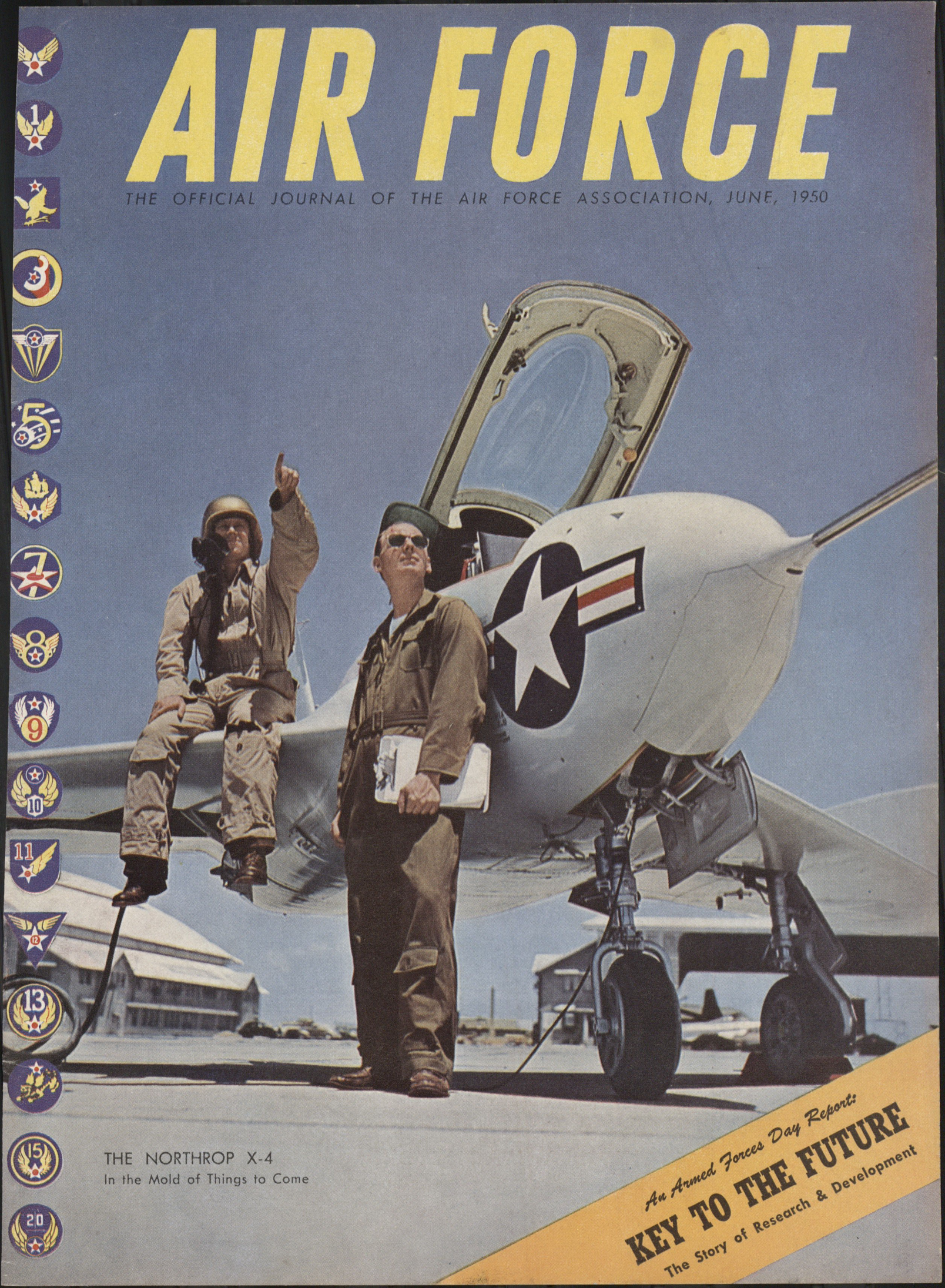
AIR FORCE

THE OFFICIAL JOURNAL OF THE AIR FORCE ASSOCIATION, JUNE, 1950



THE NORTHROP X-4
In the Mold of Things to Come

An Armed Forces Day Report:
KEY TO THE FUTURE
The Story of Research & Development

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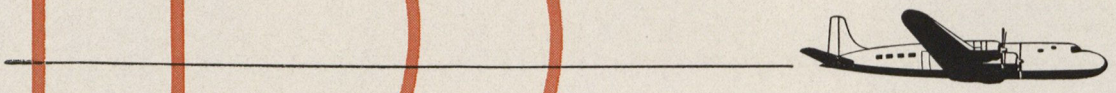

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The job of designing and manufacturing a successful refueling device was tackled with characteristic Boeing thoroughness. Designers, engineers and mechanics worked night and day as a well-coordinated team, compressing years of painstaking effort into months.

They dedicated to the task the same imagination in design and engineering, the same production skills and capacities that go into all Boeing products. "Built by Boeing it's bound to lead."

Built by Boeing for the U. S. Air Force are the new B-47 Stratojet bombers, B-50 Superfortresses and C-97 Stratofreighters; for the Army, the L-15 Scout liaison planes; and for five of the world's leading airlines, the twin-deck Boeing Stratocruisers.

BOEING

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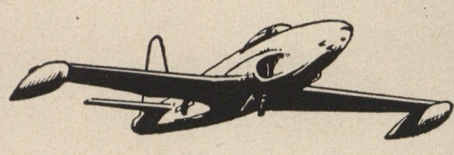
AFA's 4th National Convention



BOSTON, MASS.
AUGUST 25·26·27

Make the Convention Your Summer Vacation

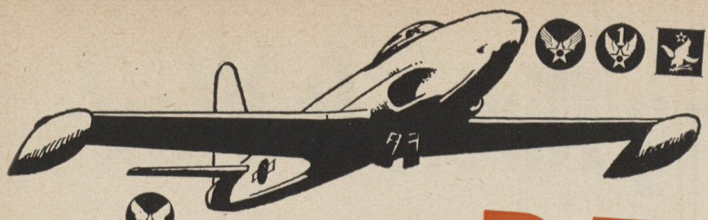
This year's AFA convention has been scheduled to coincide with the season's most popular vacation time. We picked Historic Boston, cradle of the Revolution, so that you can combine fun, business with the pleasures of this old New England city.

There will be all the thrills of last year's great convention in Chicago—reunions of wartime outfits, AFA's annual awards, banquets, cocktail parties and all the rest. From the Boston Commons to Scully Square, the town will be yours.

And don't forget: There will be important business meetings, too. There are new officers to elect and new policies to be drawn. The fight for adequate airpower needs your support more than ever before.

So come to Boston. Bring the family or grab a seat in your buddy's jalopy. Walk, ride, fly or swim but:

COME TO BOSTON



REUNIONS!
REUNIONS!
REUNIONS!
REUNIONS!

WHO WON THE WAR!

The argument still rages!

Everyone thinks his outfit did more than anyone else to defeat the Axis. And everyone is right!

This is your chance to meet again with all your wartime buddies—to pick up the argument where you left off last year, over a glass of beer.

Many wartime units have already scheduled their reunions for Boston to coincide with AFA's gala event. In addition to the main banquet and cocktail parties, units are planning parties of their own as well as sight-seeing trips to Bunker Hill, Faniell Hall, the house where Paul Revere lived and dozens of other hallowed spots which make Boston such a fascinating city.

Has Your old outfit got its reunion scheduled? If not, there is still time to get one going. Write AFA Headquarters, 901 16th St. N. W., Washington 6, D. C.

Clip and Mail to:

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HOTEL STATLER
ATTENTION: AIR FORCE ASSOCIATION
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For each additional person in Double or Twin-Bed Room the extra charge is $2.50 per day.

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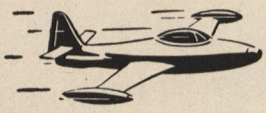

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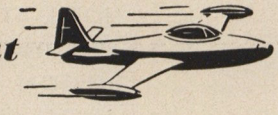

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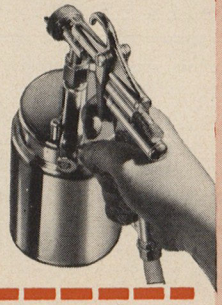

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AIR FORCE

THE OFFICIAL JOURNAL OF THE AIR FORCE ASSOCIATION

JUNE, 1950 VOL. 33, NO. 6

THIS IS AFA

The Air Force Association is an independent, non-military, airpower organization with no personal, political or commercial axes to grind; established and incorporated as a non-profit corporation February 4, 1946.

Active Members are men and women honorably discharged from military service who have been assigned or attached to the US Air Force or its predecessor services, or who are currently enrolled in the Air Force Reserve or Air National Guard. **Service Members** (non-voting, non-office holding) are men and women currently assigned or attached to the US Air Force. **Associates** (non-voting, non-office holding) are men and women not eligible for Active or Service Membership who have demonstrated an interest in furthering AFA's aims and purposes, or in proper development and maintenance of US airpower.

ITS OBJECTIVES

To preserve and foster the spirit of fellowship among former and present members of the Air Force, and to perpetuate the identity and group solidarity of wartime Air Force units large and small.

To assist in obtaining and maintaining adequate airpower for national security and world peace.

To keep AFA members and the public at large abreast of developments in the field of aviation, and to stimulate community interest in Air Force activities and installations.

CONTENTS

FEATURES

DEPARTMENTS

THE COVER

Latest of a series, the Northrop X-4 is the smallest research plane ever built for the Air Force. Like its famous predecessors, the X-4 is not a fighter prototype but a research instrument to probe the sonic barrier. It is an important part of the Research and Development program to which this issue is devoted.

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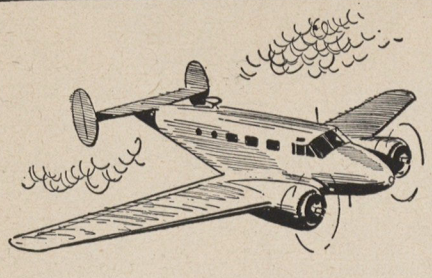

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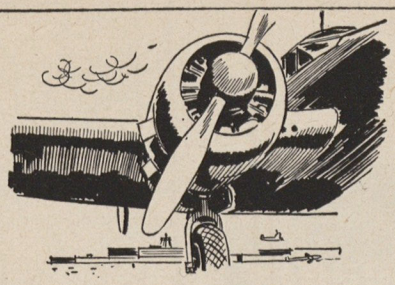

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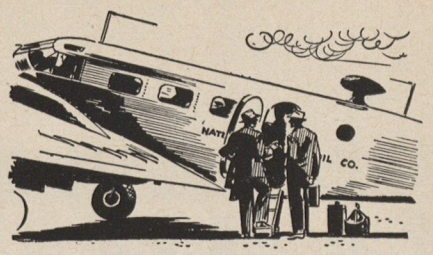

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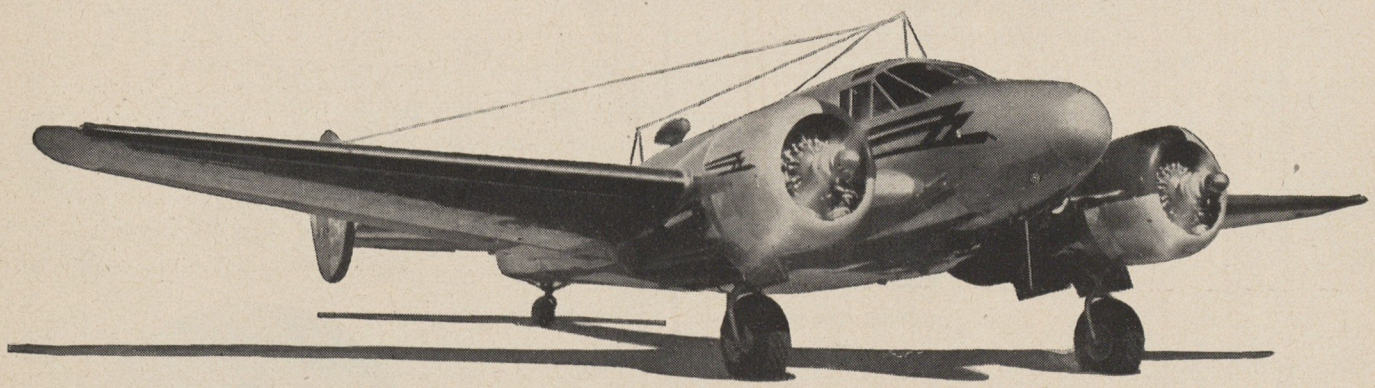

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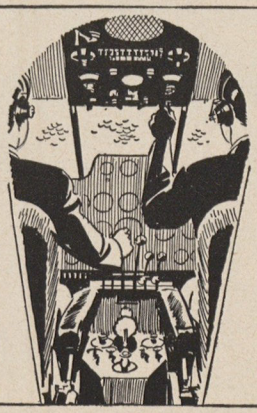

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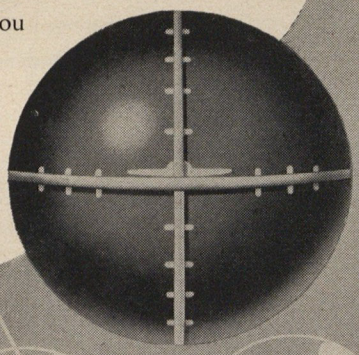
• The Zero Reader shows on one indicator . . . heading, attitude, altitude and instrument landing information . . . data normally supplied by five essential instruments. By merely keeping the two pointers of the instrument at *zero*, the pilot has at his fingertips the only manual system approaching the performance of stabilized automatic flight control.

• This simpler technique for flying, navigating and making manual instrument approaches is another step in the attainment of all-weather operations.

• Our nearest district office will be glad to give you full information.



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AIRPOWER IN THE NEWS

VOL. 33, NO. 6 WASHINGTON, D. C. JUNE, 1950

AN INCREASE OF $200,000,000 FOR USAF AIRCRAFT PROCUREMENT and $100,000,000 for Naval Air Arm in fiscal '51 has been recommended by House Armed Services Committee on advice of Sec'y Johnson. This supplemental program was seen as a sure thing by virtue of an endorsement by Rep. Vinson who stated that he would withhold his own amendments.

FORMAL HONORS AND AN AERIAL SALUTE by jet aircraft on April 24 marked the departure from Pentagon of retiring AF Sec'y Symington who now heads the National Resources Security Board. AF publicity director Steve Leo and AFA's Tom Lanphier, Jr., an adviser to USAF, will go to NRSB with Mr. Symington. . . Presentation of an Air Medal for Gen. Spaatz and AF Exceptional Medal to retiring Under Sec'y of AF Barrows were among Symington's last official acts . . . New AF Sec'y Finletter's views on the need of a 70-group AF will be withheld until he has examined today's needs in light of overall present day situation.

AIRLINE USE OF JET-POWERED USAF BOMBERS, such as B-45, in long-haul civil cargo operations as a means of developing basic information on day-by-day use of jet transports was advocated by C. R. Smith, president of American Airlines and Chairman of AFA Board, in April issue of "Planes," publication of AIA . . . Canada's Avro Jetliner, America's first jet transport, made its international debut when it flew from Toronto to N. Y. on April 18. Jetliner carried first jet transport airmail.

FIRST ANNUAL NATIONAL ARMED FORCES DINNER on May 19 at Washington's Statler Hotel will have Mr. Truman and Sec'y Johnson as speakers. Dinner is being jointly sponsored by Navy League of U. S., Military Order of World Wars, and AFA . . . Gen. Vandenberg will speak in Detroit, Mich., May 19, at luncheon in Book-Cadillac Hotel, and Ass't AF Sec'y Harold Stuart will speak at an open house at Tinker AF Base, Oklahoma City, on Armed Forces Day.

REPUBLIC'S F-84F, swept-wing version of Thunderjet, has been redesignated YF-96A . . . Conversion of one piston engined Northrop YRB-49 into six jet aircraft is nearing completion and plane is expected to be flown to Edwards AF Base, Calif., soon. . . USAF has increased range of its Republic F-84E "Thunderjet" fighter to an operating radius of more than 1,000 miles by installing two additional 230-gallon fuel tanks mounted on bomb shackles beneath the wings. . . Glenn L. Martin Co.'s three-jet XB-51 bomber has completed its first test phase, and plane has been turned over to USAF for phase two testing. . . Northrop has been awarded order for more F-89 all-weather interceptors.

AF'S NEWEST LIGHT TRANSPORT--NORTHROP RAIDER C-125--made its debut in April before AF and Army personnel participating in "Operation Swarmer" at Fort Bragg, N. C. . . . If all aircraft in Swarmer were in a normal airlift formation--in a line with four minutes separation between planes--they would have extended a quarter of the way around the world, or almost twice across the U. S. Aircraft totals are high because this exercise combined for first time aerial reconnaissance, bombers, fighter cover and radar-directed interceptors with a full-blown strategic airlift.

NAVY STILL WANTS AND EVENTUALLY MUST HAVE FLUSH-DECK SUPER-CARRIER of type which Sec'y Johnson scuttled last year, Adm. Sherman told House Armed Services Committee on April 27. . . Navy has modified its aircraft marking specifications to authorize painting the word "Navy" or "Marines" in large letters

(Continued on page 10)

on both sides of the fuselage and on the under surface of the left wings of Navy or Marine Corps planes. . . New Navy attack plane that is believed to be largest single engine aircraft in world, Grumman AF Guardian now in production, will be assigned to duty in Navy's newly designated air anti-submarine squadrons. . . 60-ton experimental Navy seaplane, built by Convair and powered by four Allison turboprop engines, passed its initial flight test recently.

USAF HAS ENROLLED FIVE AIR NATIONAL GUARD OFFICERS in its one-year pilot training program as first quota to enter flying training under provisions announced recently. . . USAF in near future will begin regulating promotions to top four airman grades by releasing monthly quotas to major AF commands, Gen. Vandenberg announced last month. . . Horace Heidt with cast of his Musical Variety Revue Show and his Original Youth Opportunity Program departed from Washington on April 16 for a 28-day tour of USAF bases in Europe. . . More than 62 Protestant religious missions, to be conducted at AF bases in U. S., have been scheduled for 1950 as part of USAF Religious Program. . . WAF Director Geraldine P. May left on April 27 for a 15-day tour of United Kingdom. . . USAF has announced that limited number of women will be accepted each year for postgraduate training from among qualified applicants who desire to become dietitians, occupational therapists, or physical therapists in USAF's Women's Medical Specialist Corps. . . AF Strength totaled 412,300 on March 31, compared with 414,600 on February 28.

AF REVISED REGULATION GOVERNING INTEGRATION OF RESERVE OFFICERS INTO REGULAR AF. Screening and selection of applicants, normally accomplished once each year, may be accomplished more often if considered necessary to meet a particular requirement; an individual who has submitted two applications since June 16, 1948, when regulation was first issued, is not eligible to reapply; and six months of active Federal commissioned service will no longer be required immediately prior to screening of an applicant.

PROPELLERS ARE CAPABLE OF DRIVING AIRCRAFT AT SPEEDS OF 600 MILES AN HOUR, engineers of Hamilton Standard division of United Aircraft said on May 3. And, they predict, propellers may soon be able to operate efficiently at speeds beyond that of sound.

A PLANE WHICH WILL TAKE OFF IN FIVE LENGTHS OF ITS OWN FUSELAGE, which will hover at just over 30 miles per hour, and which lands in less than 125 feet is now in production at Piper Aircraft Corporation plant at Lock Haven, Pa., according to a recent announcement by W. T. Piper, president. . . Growing interest by American public in air power as the strongest and most comforting arm of national defense is expected to lead to continually increasing activity for aircraft manufacturers, Robert E. Gross, president of Lockheed Aircraft Corporation, told shareholders at the company's recent annual meeting in Burbank, Calif. . . Link Aviation, Inc., Binghamton, N. Y., has been awarded an AF contract for 16 of its new type Jet Trainers.

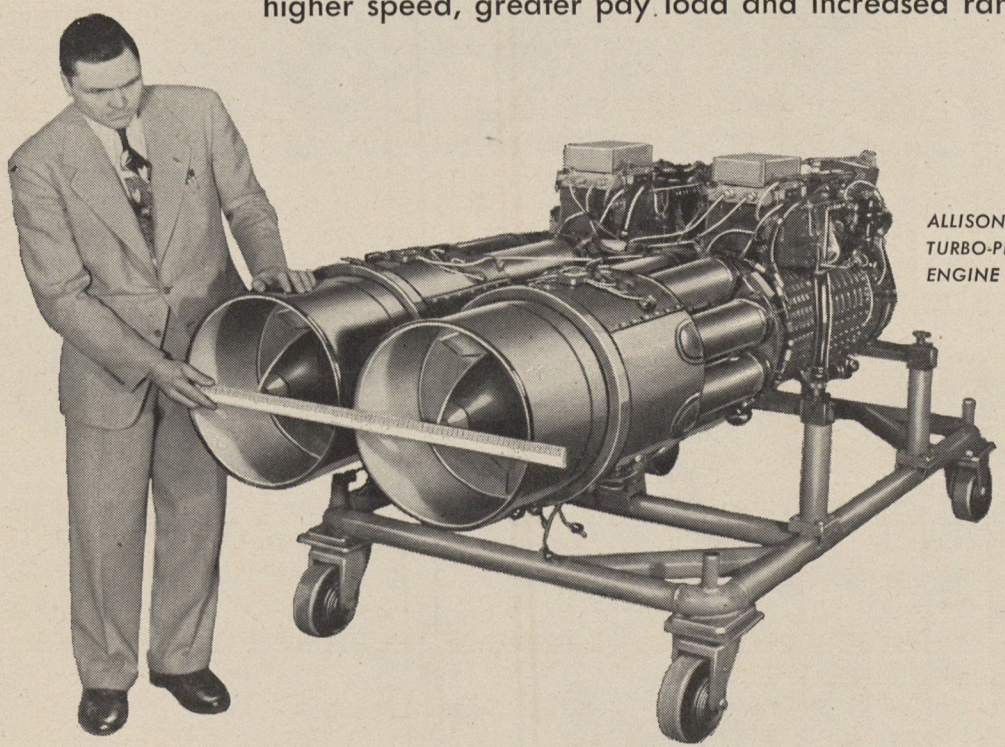
PLANS FOR A 1,500-MILE HANDICAP AIR RACE from Montreal, Canada, to International Airport in West Palm Beach, Fla., on June 15-16--the Florida Ninety Nine's second annual Canada-Florida competition for women pilots--with $2,000 in prizes for the winners, has been announced. . . Beverly Howard of Charleston, S. C., America's top-ranking precision aerobatic pilot and six-time holder of International Aerobatic Championship, has departed for France where he is scheduled to fly against Europe's top stunt fliers in a series of exhibitions. . . Dr. Albert Roper will retire as Secretary General of ICAO in 1951, ICAO Headquarters has announced.

FIRST in high power, low weight and SPACE SAVING!

Allison has developed a world's "first" in the new T40 Twin Turbo-Prop—an engine which, for its horsepower, is the lightest-weight and smallest-size propeller-type power plant ever cleared for flight.

5500 horsepower for only 2500 pounds in weight, with an exceedingly small diameter, the Allison T40 Twin Turbo-Prop engine saves valuable weight and space in the airplane.

These savings mean better aircraft performance in terms of higher speed, greater pay load and increased range.



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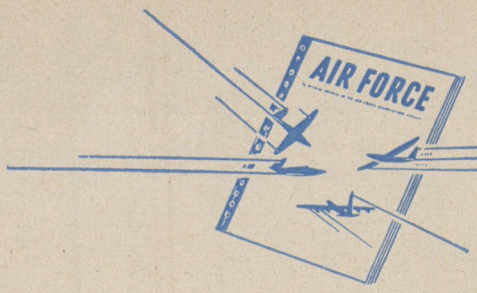

RENDEZVOUS

Where the Gang gets together

REUNION: The 376th Heavy Bomb Group Veterans Association will hold its fourth annual reunion at the Fort Shelby Hotel, Detroit, Mich., July 27-30. For further information write *Wiley Golden, 371 Probasco Ave., Cincinnati 20, Ohio.*

ALTUS AAF: Second reunion of former personnel of Altus AAF, Altus, Okla., will be held at the Calhoun Beach Hotel, Minneapolis, Minn., July 22-23. For further information write *Peter R. Olfelt, 3312 Lee Ave., North, Minneapolis 22, Minn.*

CHECKERTAIL CLAN: Will all former members of the 325th Fighter Gp. "Checkertails" who are not receiving clan bulletins about the fifth annual reunion (Aug. 4-6) please contact me. Particularly eager to hear from active duty personnel who have lost contact with the group due to change of station. *Donald F. Lynch, 208 Elk Street, Syracuse 5, N. Y.*

HISTORY: If demand is sufficient, will publish a history of the 42nd Bomb Sq., 11th Bomb Gp., 7th AF which operated in the Pacific from May 1940 to October 1945. Anyone interested in obtaining this history contact *K. T. Crothers, 710 Pine Street, Perrysburg, Ohio.*

WESTOVER: Would like to hear from any former flight traffic clerks stationed at Westover Field, Mass., especially those who attended the first flight traffic school at Morrison Field, West Palm Beach, Fla. *John F. Driscoll, 59 Pleasant Street, Holliston, Mass.*

BLYTHEVILLE BOYS: A reunion of officers formerly stationed at Blytheville AAF, Blytheville, Ark., will be held June 17-20 at Hot Springs, Arkansas. Wives welcome. For further details write *Carl E. Bailey, Jr., P.O. Box 190, North Little Rock, Ark.*

HEY SMIRNOFF: Would like to hear from S-Sgt. Norman Smirnoff, formerly of the Hq. & Hq. Sq., 34th Bomb Gp., or from anyone knowing his address. *Louis Guttman, 78 Bay 22nd St., Brooklyn 14, N. Y.*

(Acme Photo)

Lt. Gen. Jimmy Doolittle, flanked by some of the men he led on the first bombing attack on the Japanese mainland. This is the fifth postwar reunion for the famous Tokyo fliers. Left to right, M-Sgt. Edwin Horton, Jr., Col. Dean Davenport, Capt. Charles McClure, Maj. Thomas R. White, Comdr. Henry Miller, Doolittle, Capt. J. E. Manch, Col. Ross Greening and Maj. Jack A. Sims.

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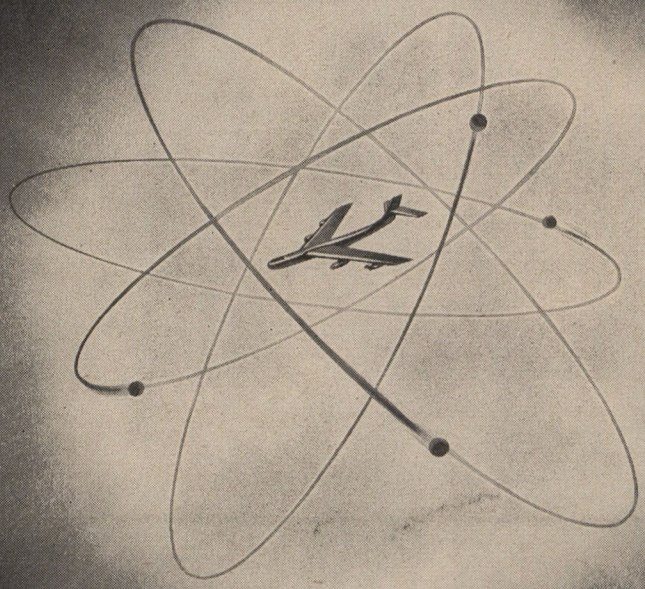
...so that man may find new power to propel aircraft



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Organizations and individuals are at work today —so that Nuclear Energy Propulsion for Aircraft may be realized . . . so that man may have a new and powerful energy to propel the aircraft of tomorrow.

N E P A

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KEY TO THE FUTURE

A special report on Air Force Research and Development

On the morning of September 15, 1916, an incident on the Somme battlefield in France gave the First World War a surprising, and, to the Germans, terrifying turn. At six o'clock on that foggy morning, a new instrument of war—the *tank*, sired by the combustion engine and the caterpillar track—lumbered into No-Man's-Land from behind British trenches to completely devastate (by shock if not by explosives) the German troops through which it waded. For two years prior to that morning the first great war had been a simple, raw-boned test of human endurance. Neither side had been able to produce an offensive plan or a weapon that could overcome the barbed wire entanglements, machine guns and trenches of the other. People had actually begun to talk of the end being determined by famine itself.

Then, from out of "nowhere," came the tank. Not until some time later was the world to learn that in truth a small group of Englishmen, headed by Winston Churchill, then First Lord of the Admiralty, and Col. Ernest D. Swinton of the British Army, had the machine abuilding since October, 1914.

Factually, it must be reported that the first tank attack, measured in terms of physical damage, rather than by the dumb terror it struck in the hearts of the German Army, was not a brilliant success. In all, forty-nine machines set out for the front. Thirty-two actually reached their starting points to take part in the action. Of these, nine had mechanical trouble and broke down, five became ditched, and nine could not keep up with the infantry which was supposed to follow behind. Of the original lot, only nine gave the enemy any real trouble. It was an awkward beginning. But in the months that followed, the tank was destined to distinguish itself as perhaps *the* most decisive weapon of the war. *In retrospect it can be added significantly that when those first thirty-two "land battleships" clanked their way into the muddy, shell-pocked, wire-strewn battlefield the time of winning wars by sheer stamina of the individual soldier had forever come to an end. From that moment on, decisions were to be won by technological superiority rather than brawn.*

The days on which we celebrate great events in American military history are filled with nostalgic remembrance of things past. Memorial Day and Armistice Day turn back the clock to years gone by and bring memories of valor and sacrifice.

This year, for the first time, a new date has been added. May 20th will be observed annually as Armed Forces Day. There will be a natural inclination to observe this day with toasts to the past. We propose, however, to look to the future and so devote this entire issue to Research and Development—the KEY TO THE FUTURE.

World War II, of course, was far more technological in character than the war of 1914-18. In the beginning, Germany's pre-eminence in building advanced weapons made possible the shocking victories she attained with such ease on the continent. Later, her failure to give equal contemplation to strategic bombing and amphibious operations caused her planned attack against England to be stillborn. Thereafter, the mounting tide of Allied airpower became the main factor in the Reich's ultimate defeat.

Today the emphasis that must be placed on achieving and retaining technological superiority is even more pronounced than it was in the last war. The scientist, the manufacturer, and the soldier are now partners insofar as national defense is concerned, and indeed our survival in another war might well depend more on the first two than on the latter. This is not to belittle the soldier in uniform, but to emphasize the importance of placing at his disposal the best weapons American scientists and American manufacturers can provide. To give him anything less would be to risk disaster, for even with superior equipment he is destined most surely to go into another war with an initial disadvantage of inferior numbers.

It has become a truism that the United States will never strike until it is struck. But the initial advantage this gives the enemy is not widely understood.

We are in a period of rapid technological advancement, due largely to new areas of exploration that have opened up in the field of propulsion and nuclear energy. Perhaps never before have weapons become obsolete so fast. Yet new ones can be introduced into our fighting units only gradually, and in smaller increments. We cannot afford to refurnish our Air Force every time a better engine or a more efficient design is introduced. Consequently the best we can hope for is a heterogeneous force in being, part of which is modern, and part of which is at best obsolescent.

Now, assume the position of the aggressor for a moment. Think what an advantage it would be to be able to *select* the day of the attack and then stockpile your most modern weapons against that date. No need to

pursue research and development requirements beyond the needs of that hour. No need to expend your energies groping for weapons that you might need two, five or ten years beyond. As soon as you set the day, your only need is to select the best weapons you have developed and get them into production. When the arsenal is furnished, you can strike.

It's a great advantage. Against it we must put three things: (a) the holding power of our "mixed" forces in being at the time of the attack, (b) the superiority of our most advanced weapons, and (c) our ability to get those advanced weapons into quantitative production with the greatest haste.

Important as technological superiority has thus become, it cannot be denied that until this moment at least, the United States Air Force has given too little emphasis, even within its limited fiscal and personnel abilities (and more of that later) to the R&D requirements at hand. Their concentration has been given largely to building up current operational strength with current weapons.

With the international picture no more comforting than it is, it is perhaps natural for the responsible officers in the Air Force to concentrate their efforts and their money on a force in being. There is good logic to the argument that the time to give your attention to research and development (i.e., *tomorrow's* Air Force) is when there is little likelihood of your needing an Air Force *today*.

Yet it would be difficult to deny that there has been another, more subtle, cause behind the Air Force's preoccupation with today's Air Force.

Many of the men who are now in policy-making positions within the Air Force are men who were in the field during the last war, fighting with great courage and valor, but with airplanes that never seemed to go quite far enough nor carry quite enough bombs. Somehow they got the job done in spite of the limitations of their equipment, but when they came home after the war to assume administrative duties made vacant by older, retiring officers, their first and very natural resolve was to improve upon the weapons they had just laid down . . . to build a fighter that would go faster and turn more sharply, or a bomber that would go farther and carry a bigger load. These were the requirements as dictated by their own first-hand experience on the front. And so Research & Development became a job of perfecting and refining *old* weapons instead of what it was supposed to be—a search for *new* ones. There is a story making the rounds of the Pentagon that explains it this way:

Suppose, for some impossible reason, Country A decides that the most efficient way of defeating Country B is by drying up all her lakes, and that the most efficient way of drying up her lakes is to fill them all with cement. Having made this decision, Country A directs its scientists and its military men to the job of building bombers capable of carrying bigger loads of cement, and to perfecting the cement itself to expand like rice when wet, thereby absorbing more water.

But, quite by accident one day, one of Country A's scientists discovers that by shooting a skyrocket with a certain chemical into the air he could, from his own back yard, redirect the air currents so that all the moisture-laden clouds in the sky would detour Country B, cutting off the source of the lakes' water and thereby accomplishing the objective without even so much as going beyond Country A's own borders. With great joy, he runs to his fellows to tell what he has found, but to his astonishment they are not impressed. They are making splendid progress with their cement, and after all, better *cement* is the requirement. And so, presumably, the little scientist drowns his sorrow in a mug of beer at the corner pub.

Perhaps the story is overdone, but it illustrates the very real error of mis-identifying the means of *accomplishing* the objective with the objective itself.

Another reason for the tardiness of the Air Force in giving problems of Research & Development their due is this: R&D, while it has become the essence of military progress, is not progress down a straight road. In its initial stages at least, it is movement down an ever-widening path, like water running through a funnel the wrong way. In many ways it defies direction or organization, which in many ways, contrarily, are the essence of the military establishment. A military man likes to have his mission stated precisely, the better to organize his forces for its accomplishment. The scientist—at least those concerned with basic research—will likely accomplish more if he is given no particular mission at all. One is basically Bohemian, the other basically West Point. In many ways their habits are diametrically opposed, yet it has been necessary for the soldier to bring the scientist into his home, fit him as best he could into organization charts which have often been straight-backed and most unyielding, and ask him to start producing. The result has not been very successful.

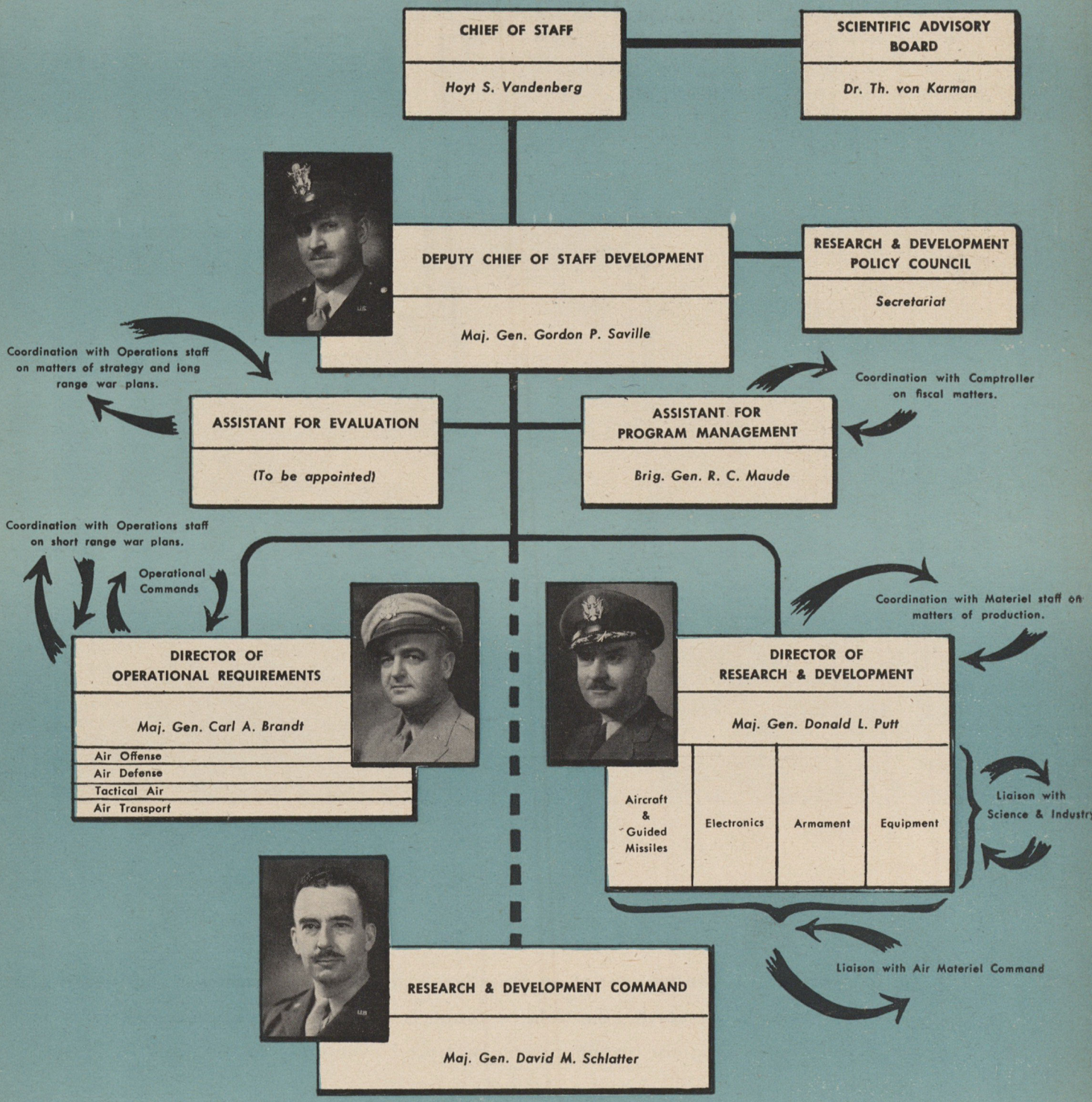
But to his everlasting credit, it must be reported that at last the soldier has taken positive steps to correct the situation. First their are indications that he has come to realize that improving existing weapons is not the whole answer. Second, as shown by the organization chart on the facing page, he has now rearranged his house the better to accommodate his guest.

It is only the beginning, however, to rearrange organization charts and adopt a new philosophy. Little of benefit will come of these things in themselves. The philosophy must be put into everyday application, and the new organizational structure must be allowed to serve its intended purpose of dividing the program into logical functions.

On the pages that follow we have divided the Research & Development program into ten areas of exploration. The divisions were established by the Air Force itself. In each case we have tried to indicate to some extent the problem involved, the effort being directed toward its accomplishment and the prospects for the future.

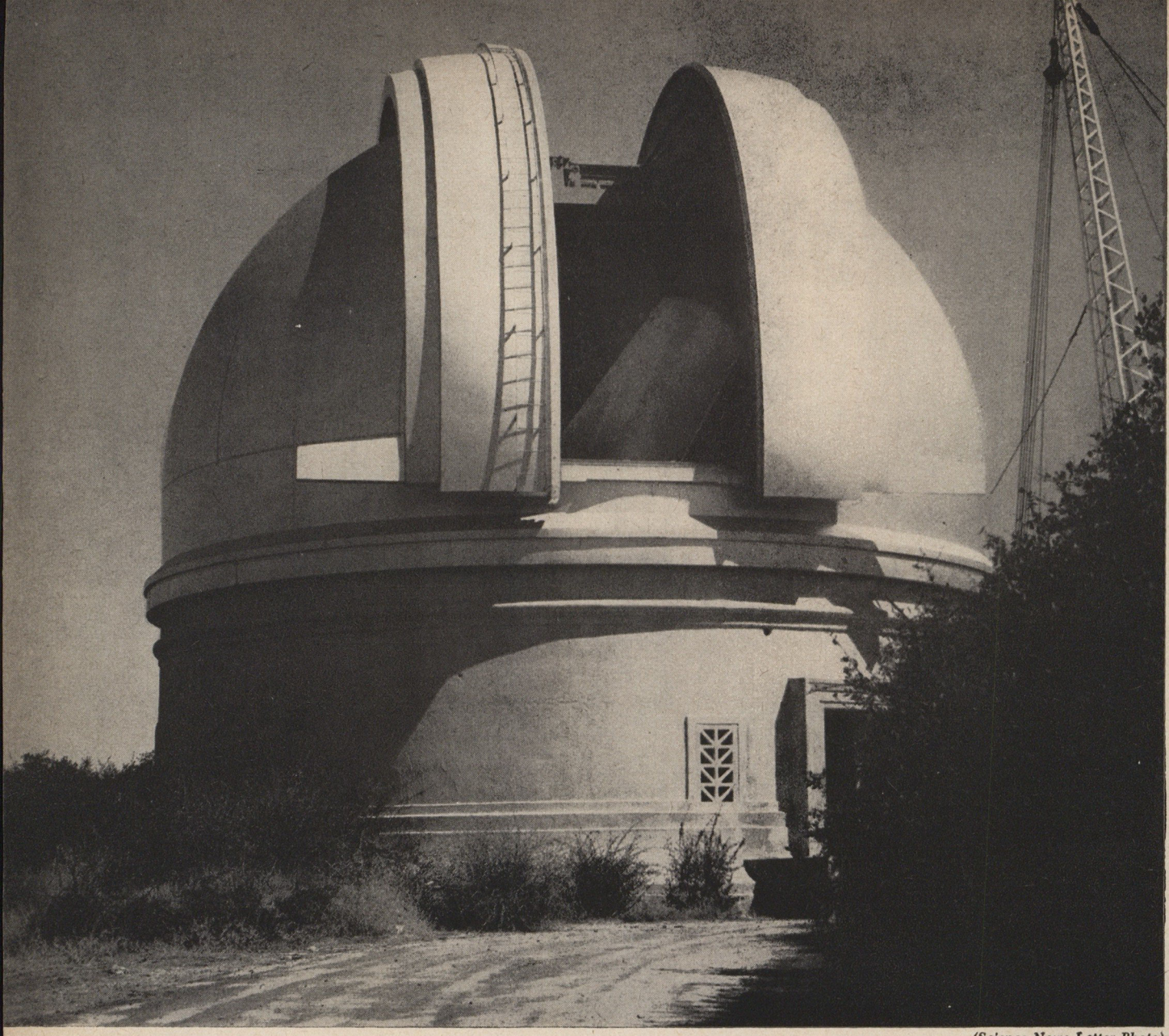
We have not tried to dazzle you with pictures nor stories of the latest missiles or rockets. What we have tried to do in each of the ten areas is to put the program in some sort of perspective so that as time goes on you yourself will be able to judge where the "latest weapons" reported in the morning paper fit into the general scheme—and whether they could be called skyrockets or only improved cement.

USAF RESEARCH AND DEVELOPMENT STRUCTURE



In the military scheme of things, the above chart represents a "new look" far more revolutionary than anything Christian Dior ever dreamed of. Although it isn't indicated here, the new office of Deputy Chief of Staff, *Development* has been placed on a level with such long-established "front" offices as Materiel, Operations, and Personnel. In the drivers' seat is Maj. Gen. Gordon P. Saville, one of the Air Force's top scholars who is noted for using tradition wisely but sparingly in formulating the policies for his commands. The two main sub-divisions of Saville's department are Operational Requirements (formerly under Operations) and Research and Development (formerly under Materiel). In close liaison with the War Plans people, the Director of Operational Requirements will make a constant study of requirements in Air Offense, Air Defense, Tactical Air, and Air Transport.

At the same time, the Director of R&D will study means of improving Equipment, Electronics, Armament, and Aircraft and Guided Missiles. By putting both offices under the same roof to live together day by day it is hoped that henceforth neither one will get ahead of, nor fall behind the other organization.



(Science News Letter Photo)

I BASIC RESEARCH

There is only the whisper of an objective in the ear of the scientist engaged in fundamental research. The field he roams is wide, and the paths are few if any. Yet nearly all great inventions can be traced eventually to the work he does

There is, in the field of basic research, only the faintest trace of what can be called a predetermined objective. In truth, the only real goal is the broadening of man's understanding of natural phenomena. Since the scientist engaged in this field does not know precisely what it is he seeks, it follows that he cannot know what he is apt to find.

On the face of it, it might appear that the Air Force would have little time for sponsoring projects of such obscure delineation when there are more than enough specific problems to which it must give full effort.

Yet experience has proved that almost always the results of basic research are useful for one practical purpose or another. Nearly all great inventions have their roots in basic investigation. Examples are numerous. Heinrich Hertz was doing an experiment to verify Maxwell's theory of electromagnetic radiation when he first generated radio waves; once this discovery had been made, Marconi and others could do the applied research necessary to develop radio communication. Breit and Tuve were investigating the ionosphere when they worked out the technique of pulse ranging which led a decade later to radar. Hahn and Strassmann were investigating the chemical nature of radioactive

elements formed by bombarding uranium with neutrons when they made the basic discovery that led, six and a half years later, to the atomic bomb.

It is clear enough from such illustrations, that the nation that falls behind in basic exploration stands to suffer in very practical regard in the space of a few short years. The Air Force has not been entirely unmindful of this fact, but in the past, first crack at Research and Development funds, which were skimpy enough to begin with, has been given to the departments engaged in the development of hardware. The office of Air Research, parent agency for basic research at Wright Field, got what scraps were left.

Recently, however, the Air Force has elevated OAR to a position paralleling that of the Engineering Division. Henceforth, in theory at least, it will be given the recognition (and the dough) becoming its possibilities.

The Office of Air Research will be a strange bird in the military cage. It will have perhaps a dozen assigned officers and civilians who will act as a secretariat, plus another two dozen rotating civilians who, it is anticipated, will be drawn from American colleges and universities on sabbatical leave for periods of two years. (To keep them longer than that, the Air Force feels, would be to risk miring them irretrievably in the old army game of taking papers out of one basket and putting them in another. Moreover many scientists probably would not be attracted to "permanent" government employment, but would welcome the opportunity OAR would give them of getting out of their own labs for awhile, moving about the country among their associates, and pursuing avenues of special interest to them with more concentration than is allowed by daily campus obligations.)

OAR will not be set up to do extensive "in shop" research. Primarily, the limited staff work done will be to (a) keep OAR's own personnel abreast of things, and (b) covering research bets which are considered important to the AF, but which can't be handled by NACA or contract. Its main purpose will be to serve as monitor and shepherd of a very loosely knit group of scientists engaged in very loosely defined explorations. It will have the assignment—a most responsible one—of determining what broad fields of investigation look most promising, or what fields the Air Force is particularly weak in, and sprinkle the funds at its disposal among civilians and civilian institutions which are expert in those areas. To do the sprinkling, OAR will operate in two ways. First it will place a permanent welcome mat in front of its door for any scientist who cares to drop by even if only to chew the rag awhile. OAR promises to give an attentive ear. If the conversation turns up any worthwhile leads the scientist will be given reasonable support.

Second, members of the OAR staff will spend considerable time "on the road" in a somewhat dignified version of a Hollywood talent hunt. The Air Force scouts will award contracts to universities (and in some cases to individuals) as they are found, with less regard to the detailed description of the project than to the ability of the principal investigators.

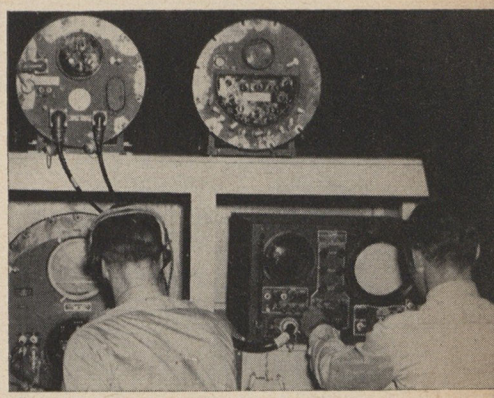
To sprinkle with, the Office of Air Research hopes for a fair but not greedy slice of the AF's total R&D appropriation. They would be happy to settle for something between two and three percent of the annual budget which is now running in the neighborhood of $200 million.

A word about the location of the Office of Air Research. At present it is situated at Wright Air Force Base, in Dayton, Ohio. There is a plan however, to move it to a more metropolitan area such as Washington, D.C., Boston or New York. The Air Force attaches considerable importance to this move, for past experience, not altogether happy, has taught them that it is nearly impossible to attract top-drawer scientists to the cause by lifting them bodily from their elected habitat, transplanting them in a "cultural desert" several hundred miles from nowhere and asking them to go to work.

If the rotating staff of civilians in OAR is to be what the Air Force expects to make of it, the office itself (which, it is hoped, will have a carpet on the floor) must be located where there is comfortable housing, good schools, a reasonably cosmopolitan atmosphere, and the opportunity for the individuals of the staff to go to a concert or a play occasionally if the mood strikes them. These are the things, the AF has found, to which the average good scientist is accustomed, and it is not pampering him to see that they are available while the individual is under contract to the government. Contrarily, it is a little presumptuous to ask him to give them all up. It is a simple case of attracting the brains of the country with sugar instead of the vinegar he has been fed in the past.

Such is the Air Force's plan to widen its understanding of the natural world. As one official put it, it is like plowing the field for diamonds. Sometimes there won't be any. But sometimes there will.

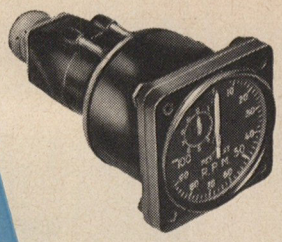
Radio . . .



. . . Radar . . .

. . . and the A-Bomb

GENESIS in ABSTRACTIONS



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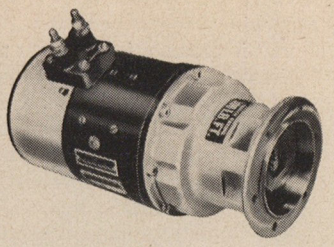
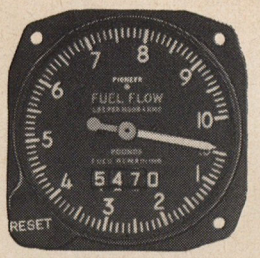
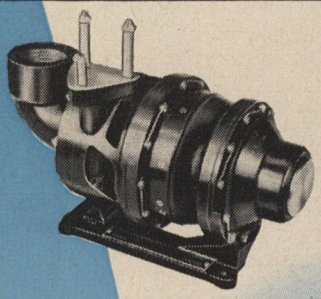


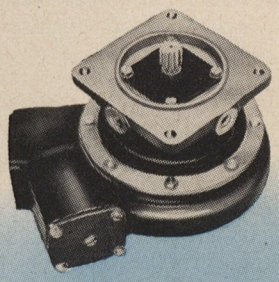
Starters



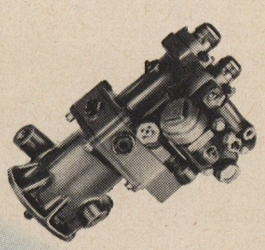
Gravimetric Fuel Flow Totalizing Systems



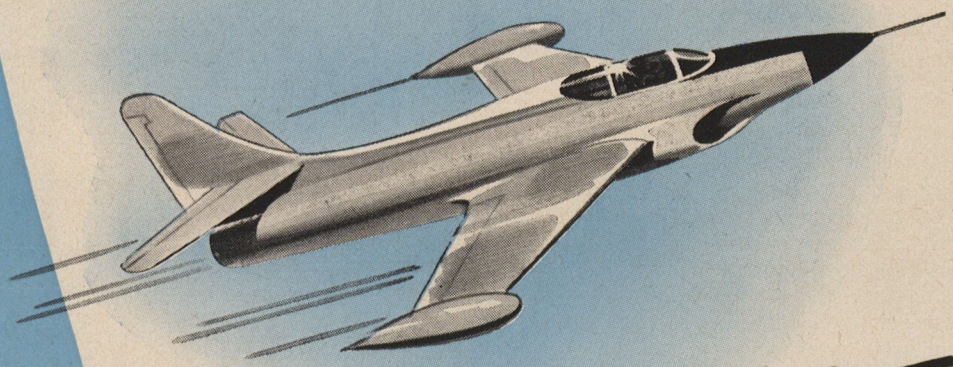
Air Turbine Driven After-burner Fuel Pumps



Fuel Booster Pumps



Lubrication Pumps



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Air Pumps
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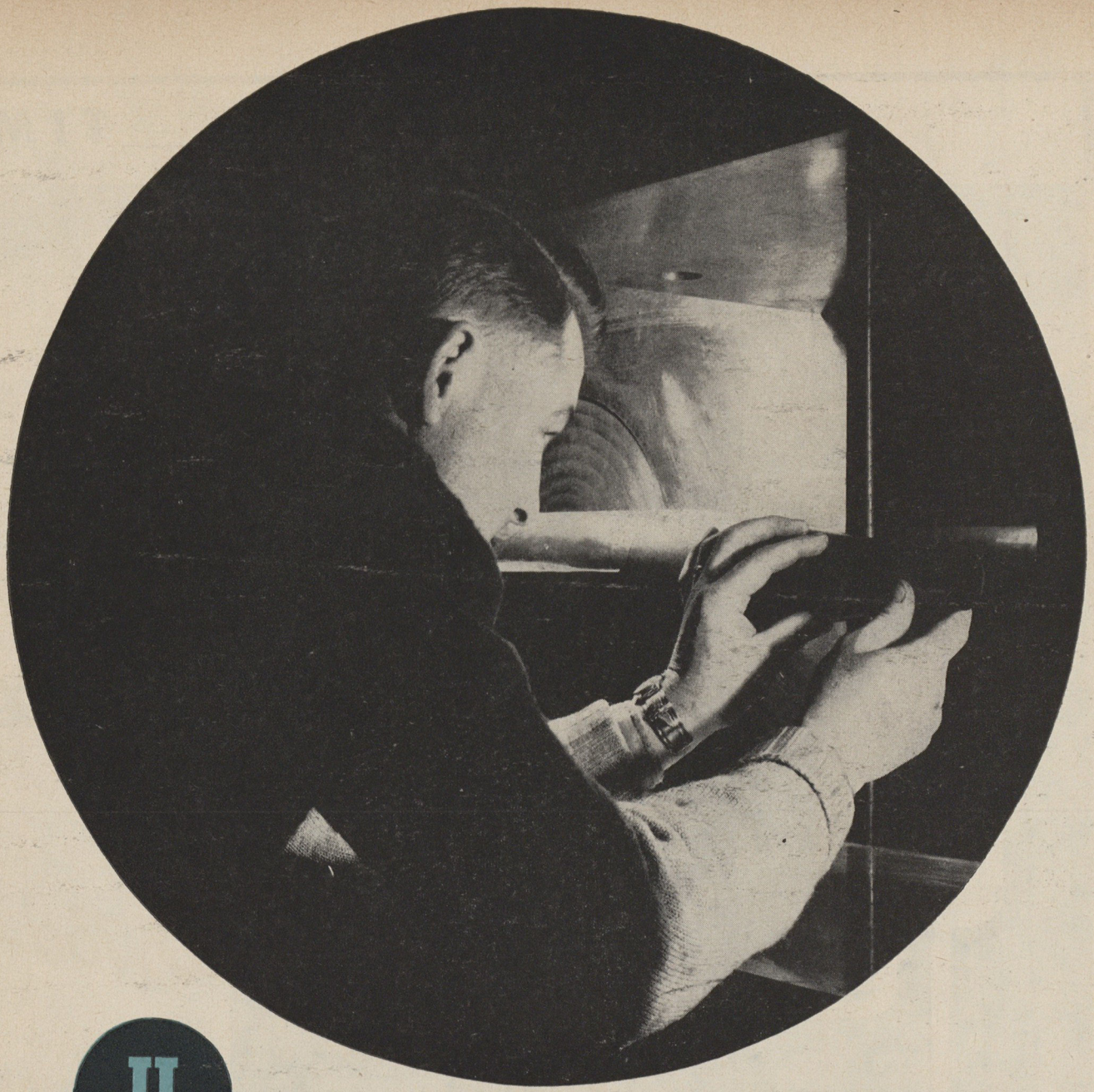
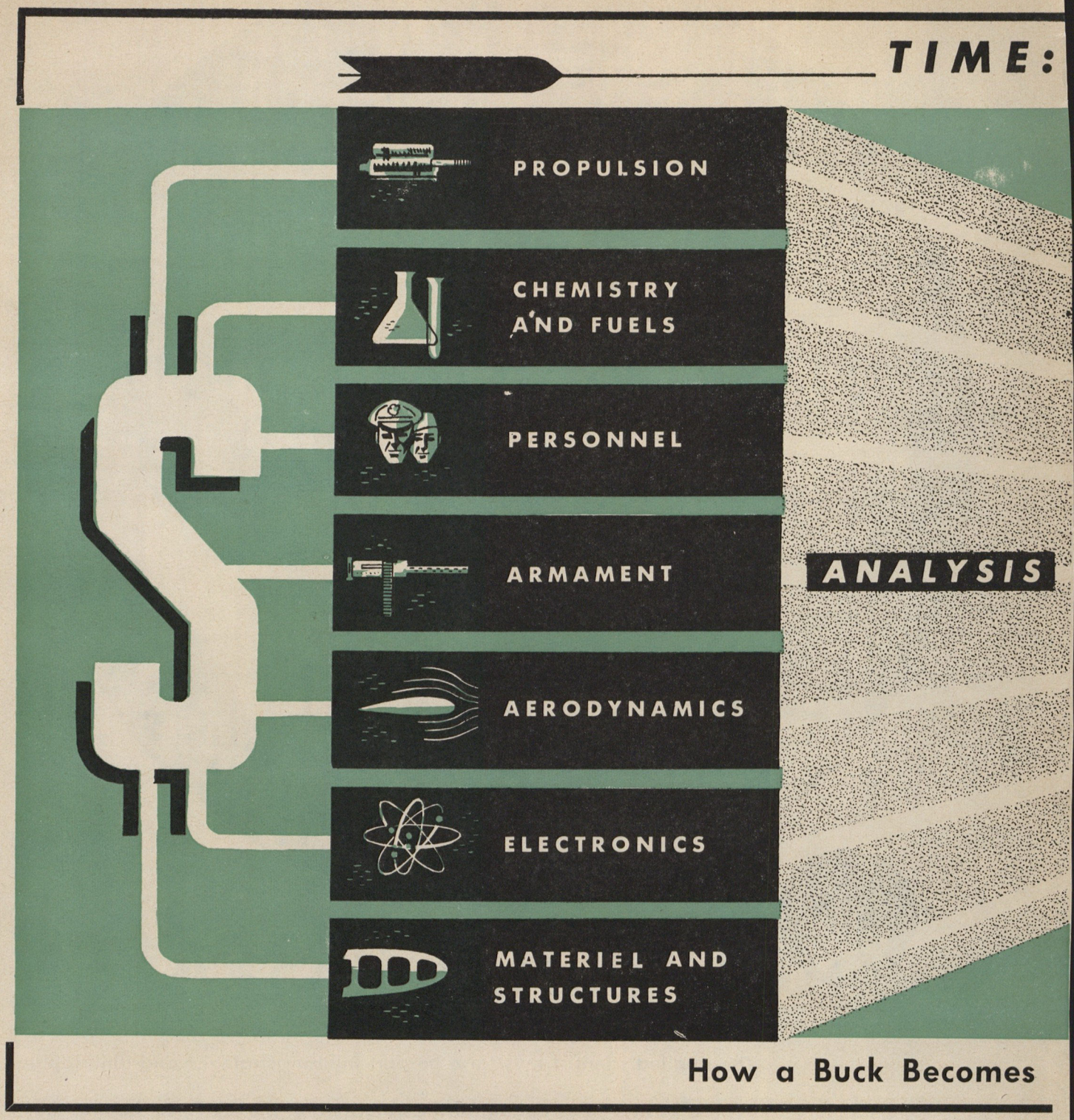


II APPLIED RESEARCH

The applied scientist must also be part military strategist and philosopher. With a basic understanding of the objectives of the Air Force, he must keep the natural world scoured for ways of getting the job done with greater ease

There is a very clear-cut distinction between *basic* and *applied* research. The former is abstract, and moves within certain areas, but without specific direction. It can, and often does, stumble into strange and unanticipated vistas of basic phenomena. Many times it presents the inquisitor with the most surprising variety of new mechanical tools. *Applied* research, on the other hand, is undertaken for the purpose of achieving predetermined and predefined ends. One knows where it is going to begin with, the other has only a vague notion.

Within the Air Force itself, applied research has taken the form of a continual study of weapons and weapons systems to see that they produce maximum effectiveness and minimum cost. The applied scientist, working for the Air Force either in uniform or out starts with a careful orientation in the military objectives of his employer. From there he moves up and down the list of Air Force weapons keeping them under constant scrutiny in regard to performance, reliability, accuracy and costs. In a broad sense he is part military philosopher and strategist as well as scientist. For given a gen-



How a Buck Becomes

eral outline of the Air Force's task, he must not only strive to develop a better turbo-prop engine, but keep constantly alert to the possibilities of *doing away* with the turbo-prop by the invention of something better—something that will give greater facility to the accomplishment of the Air Force's grand objective.

In the exercise of this responsibility however, the past has presented the AF scientist with some difficulties, not all of his own making.

Until very recently he has had only a weak voice in recommending modification of the Air Force arsenal. And even *that* voice became nearly inaudible because his numbers were spread over half the area of the Air Forces organizational chart. Thus, a coordinated presentation became all but impossible. The Operations office had a Requirement division, the Materiel office had a Research and Development directorate, and at least five other Air Staff offices were engaged in research and development activities.

The theory was that the Requirements division in Operations would tell R&D what instruments they needed to fight a war, and R&D would produce. Occasionally the AF's Scientific Advisory Board would send through a memo to keep them posted on how far behind they were falling in the march of science.

For reasons already described (if not apparent on the face of it) the arrangement didn't work. Both Operations and Materiel fell into the trap of concentrating on overhauling

and adding a little more horsepower to the force in being instead of conducting a vigilant and relentless search for entirely new weapons. The AF stood in danger of being overtaken by the fallacy of "military rigidity" which had proclaimed in the early 1900s that wireless would never become important enough to require the full time attention of a *single* commissioned officer.

Faced with the prospect of an Air Force losing its punch in obsolescence, the high command has made several important organizational changes that now stand to strengthen to a considerable degree the authority of the applied scientist. Both the Requirements office (Operations) and the Research and Development office (Materiel) were removed from their parent agencies and placed under a new office headed by a Deputy Chief of Staff for *Development.* A Research and Development *Command* was also established to raise the status of the scientist in the field. Thus elevated, it is anticipated that the scientist will be able to hold his head above the clamoring and tumult of the problems of today's Air Force; that he will be free to occupy himself sufficiently with the urgent task of building an Air Force technologically adequate for tomorrow's job. If it accomplishes its purpose the new arrangement will result in increased striking power of AF combat units reflecting in full the potentialities of American science and technology.

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III Fast Transport of Heavy Loads

Progress has been marked, but the road ahead is long

There are three perennial and obstinate frontiers in the field of flight. They are speed, range and the ability to carry heavy loads. The optimum goal is to incorporate all you want of each into every plane you build. Unfortunately, though, the three characteristics are diametrically opposed.

In a way it is fortunate that the different missions of the Air Force (i.e., bombing, interception, etc.) usually place a premium on one quality over the others so that in building a plane to fit a specific mission there is no serious difficulty in knowing which to emphasize. The first requirement of the bomber is range and load carrying capacity. The fighter's first need in addition to maneuverability is speed. What is developing in the Air Force, therefore, is an expanded family of airplanes—each with its specific job and each with more or less maximum capabilities in one of the several fields.

Modification of the airframe itself is perhaps the most commonly thought of means of extending the speed-range frontier, although it is not necessarily the most effective. To gain greater range, bomber designs have been made larger and larger. But increase in size cannot continue to increase range indefinitely. There are indications that we have reached the practical limit with the B-36. In the attainment of greater speeds there are improvements still to be sought in minimizing airframe drag, but even before drag is reduced to a minimum there are signs that for fighter planes at least some of the "design speed" already attained will have to be sacrificed for greater maneuverability.

The speed-range possibilities inherent in better engines or fuels on the other hand are far from exhausted. The year 1949 may well be termed "The Year of Decision" for future propulsion of Air Force aircraft. Satisfactory progress in aircraft gas turbine development and considerable experience with experi-


R & D's Persistent
Offensive Against
a Durable Barrier
GREATER SPEED
LESS FUEL CONSUMPTION
MORE LIFT LESS DRAG
LESS WEIGHT
MORE POWER
GREATER RANGE

mental jet aircraft have provided a reasonable basis for evaluating the various forms of propulsion for high-speed combat aircraft now under design. In conformance with overall Air Force plans and objectives, the decision was made to concentrate the limited *propulsion development* funds on turbo-jet engines and rocket assist take-off for all new combat aircraft designs of the Air Force. This decision, however, did not eliminate the requirement for continuing the development of propellers for reciprocating and turbo-propeller engines to be used in future transport and certain ground support aircraft.

Studies related to the application of nuclear energy to the propulsion of aircraft are being conducted by the Air Force-sponsored Nuclear Energy Propulsion for Aircraft Project. Considerable progress has been made to further crystallize technical feasibility studies and to integrate a joint program of effort for solving problems in materials, reactors, shielding and power cycles.

Steady as the program in extending the operational frontiers of piloted aircraft has been it must be conceded that the time is not far off when the military requirements for greater speed and range will go beyond the compass of the airplane designer and engineer. At this point enters the guided missile.

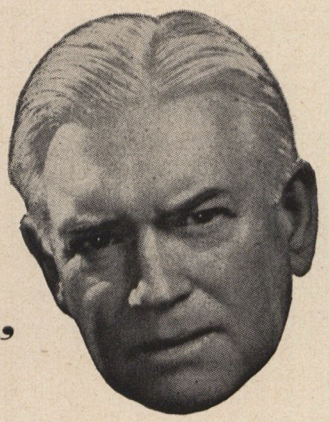
Basically, the requirement for guided missiles is the same as that for piloted aircraft for in the end they are intended to do the same job. The present guided missile program began in 1945 with a detailed study of guided missile requirements and a number of study contracts throughout the industry for the various types of missiles. These study contracts gradually defined the problems and resulted in a number of specific developments which are divided according to operational use into the following four categories: Air-to-air, air-to-surface, surface-to-air, and surface-to-surface.

Progress in the guided missile program during this period has been highlighted by the emergence of the program from the design and study phase into the flight test phase.

Nonetheless we must not misinterpret the progress made to date in the development of guided missiles as indicating the obsolescence of piloted aircraft. According to the category under which they fall, guided missiles have reached varying degrees of perfection but there are still many unsolved problems of design, propulsion and especially guidance before they can be placed in actual production (see Sec. IV). They are not yet a part of our force in being.

"Monochloromonobromomethane?"

"Chloromonobromomethane?"



"Bromochloromethane?"

Whatever you call it,

it's C-B

— and Kidde is the place to get it!

Kidde is prepared, *right now*, to supply lightweight aircraft fire-fighting systems using the improved extinguishing agent, C-B. Exhaustive tests by Kidde, the USAF and the CAA prove that equipment already developed by Kidde for methyl bromide can be applied with complete success to C-B. Aircraft now using *Kidde* methyl bromide systems can change over to C-B without any modifications in equipment.

C-B is a colorless liquid that does not decompose while stored. Its freezing point is −123°F. Pressurized with 400 p.s.i. of nitrogen at 70°F., C-B is released to the area protected in two seconds or less.

Kidde studies show that C-B is at least equal to methyl bromide in extinguishing ability, and is considerably less corrosive. Competent authorities report considerably lower toxicity.

For a fuller summary of Kidde work on C-B, write for a copy of "Research in Aircraft Fire Protection."

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Kidde

IV

LOCATE, RECOGNIZE, AND HIT TARGETS

Bombers, fighters and missiles—each have special problems. But in the end each problem is identical—getting the explosive on target

An accurate system of guiding a plane or missile to a target is no less important than having the range or speed necessary to get there, and as the range and speed of the AF's weapons continue upward the problem of bringing the weapon and the target in coincidence becomes vastly more complex.

There are basic differences in the navigational requirements of bombers, fighters and missiles. Considering first the long range bomber it is convenient to outline the requirement under several headings: (1) reconnaissance or obtaining advance knowledge of where targets are located; (2) navigation or guiding the aircraft or missile from its point of origin to the vicinity of the target; (3) recognition of the target; and (4) guidance of the bomb or missile itself after its release from the mother plane.

Navigation begins with reconnaissance in determining where profitable targets exist, and ends when the target is actually struck by the explosive. In a way navigation can be said to start with Intelligence operations—with the obtaining of factual information on the enemy's industry, transportation and military systems.

With an advance understanding of the location of the opponents' target complexes, the soldier can then bring into use the mechanical instruments necessary for pin-pointing them on the map. Of course it is not often possible to conduct this type of reconnaissance until after war has begun.

Aerial photography is one of the primary means of target location. Great progress in this field has been made by the Air Force in recent years, mostly due to the efforts of George Goddard of the Aerial Photographic Laboratory at Wright Field. Cameras are now available that can take accurate photographs of a precise target at distances upwards of several hundred miles.

In addition to aerial photography, ways are being evolved of making useful maps by photographing the indicator scope of airborne radar.

Having put the pin on the map at the right spot the next problem is to get the plane or missile within striking distance. Air pilotage (steering a course by visual reference) and

Through the Hoops First

dead reckoning are, of course, the most familiar and elemental means of navigation, but they are useful for the most part only under ideal conditions and therefore a great need for mechanical substitutes exist.

In the past, radar has served effectively in this capacity and it is encouraging to note that it is still an infant field and that further research will unquestionably produce instruments that will further narrow the present disparity between mechanical and visual methods. Obviously work on such instruments is a carefully guarded secret but under the direction of the Air Force's Watson Laboratories at Red Bank, New Jersey, various civilian concerns, such as Sperry and RCA, are making notable progress.

After arriving in the vicinity of the target, the bomber crew's next problem is to dispatch the bomb itself so as to come as close as possible to the bull's-eye. This is primarily a job for the bombsight—a problem that has been constantly aggravated by the increased speed and altitude of present day planes. Flying at 400 mph and at 4,500 feet, it is necessary for a free falling bomb to be released six or eight miles *ahead* of the target itself to allow for forward trajectory.

Although keeping exact performance characteristics to itself, the Air Force has let it be known in the remarks of several of its senior officers that it has already developed a sight far superior to anything in use during World War II. Aside from the bombsight itself, considerable effort is being expended to increase the stability of the *bombs* in flight. It has been determined that bombs used during World War II are not satisfactory for release at high altitudes or at high speeds. Tests have shown that the stabilization previously provided has not been sufficient and that the magnitude of bomb errors renders them unusable. New bomb fin assemblies for some World War II bombs have been designed and developed and preliminary tests indicate an interim solution that will offer greatly increased stability and accuracy.

The navigational problems of *interceptor fighter planes* evolve mostly around the extremely difficult task of locating a highly mobile target—the enemy's bomber—in a very short time, and bringing the fighter into position to fire accurately.

Once again major difficulties exist because of the new speeds and altitudes of present aircraft designs. So serious is the problem that the Air Force has had to make drastic modifications in the statement of test requirements for fighters. The "all purpose" F-51 (and its successors the F-80, F-84 and F-86) no longer fill the bill. There is grave need for the development of radar locating equipment light enough in weight to be fitted into the limited space and weight capacities of a fighter, and simple enough in operation to be controlled by a one-man crew—who must also attend to several other chores. Unfortunately, the configuration and size of fighter planes designed up to now do not lend themselves to simple modification for the purpose of installing the required equipment.

Carrying the navigational problem to the extreme of firing the explosive, it has been found that fire control and airborne gun laying equipment available for use (and predominantly of World War II type in which optical fighting and mechanical computers were utilized) are inadequate for the job. New methods of servo-ing and driving these weapons and turrets at very high rates of traverse and elevation are required to cope with high aircraft closing speeds. The answer in terms of production instruments has not yet been found.

There are no interceptor planes in any of the Air Force's operational units which are equipped adequately with both radar searching systems and fire control instruments. The first batch of "modified" all purpose planes changed about to meet the new requirements in half measure are now coming off the assembly lines, but production contracts for new planes built from the ground up as true interceptors in the modern sense of the word have not yet been let, although several vastly improved designs and prototypes already exist.

The navigational problems in the development of *guided missiles* differ from those of the fighter and bomber primarily in that the human being (who can make mistakes in manipulation but can also correct them) is eliminated. The great bottleneck in the development of guided missiles is not so much speed or range as it is guidance itself. There is a great galaxy of missile guidance devices under current examination but as of this moment there is not one of sufficient operational efficiencies to make it possible to go into production on a single missile type. Primary effort (mostly by civilian manufacturers under AF contract) is being given to this program. But it is a great mistake as of June 1950 to regard guided missiles as part of our military force in being—all publicity releases from *mis*-guided Public Relations Offices to the contrary.

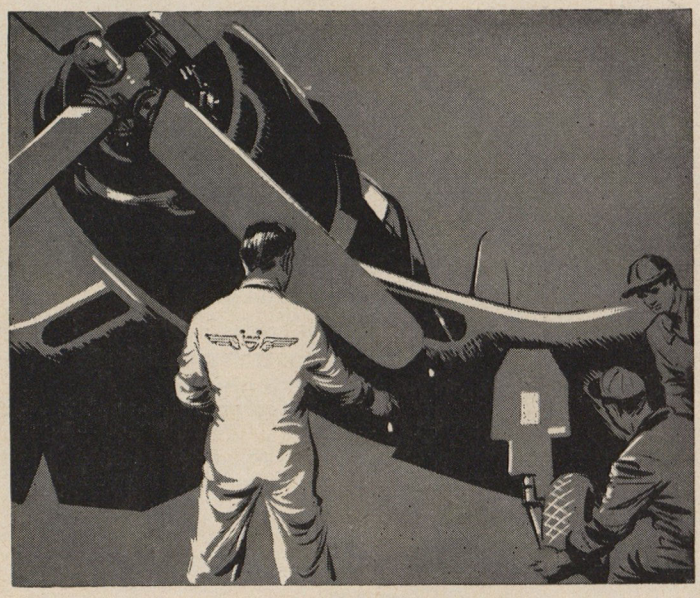
The story of the

In this day of specialists, we'd like to tell you about a 6-in-1 man. He's a technical adviser, engineer, liaison officer, mechanic, educator, expeditor, in one neat package labeled "Chance Vought Field Service Representative".

Wherever Vought airplanes fly, at operations bases, training stations, test centers or carriers, these many-talented field service men are serving in one or more of those roles. They are a most valuable aid to the Navy and Marine Corps in the daily task of maintaining Vought planes at peak efficiency — always ready to fly.

As a combined technical adviser-engineer-mechanic, the field service man is the on-the-spot source of timely facts and figures when a "quick-fix" is required, as well as during major maintenance and overhaul jobs. As liaison officer, he is the direct link for interchange of information between the operating squadrons and Chance Vought Aircraft. As educator, he conducts classes to keep ground crews abreast of maintenance and repair procedures. As expeditor, he keeps to a minimum the time between a demand for spare parts and their installation.

In effect, each service representative is practically a "one-man" aircraft factory. He is a walking encyclopedia of detailed technical information. He knows every rivet and seam, every working part and accessory of



The Chance Vought field service man is on duty where he is needed most — where service squadrons are operating.

CHANCE

6-in-1 man

Corsair, Pirate and Cutlass fighters. And every day he uses that special knowledge to maintain the 30-year tradition of Vought dependability, availability and fly-ability. To Navy and Marine fliers and ground crews, this 6-in-1 specialist *is* Chance Vought.

Each of the 21 Vought field service men works at one end of a two-way pipeline that sometimes extends back thousands of miles to the factory in Dallas. They keep tabs on daily airplane performance, listen to fliers and crews and relay information back home. Their reports are frequently translated into engineering changes that pay off in better operational aircraft. And through the same pipeline the field service department pours a steady stream of engineering changes, service manuals, "how-to-do-it" suggestions and answers to urgent questions.

Periodically, Vought's 6-in-1 experts return to Dallas for refresher courses, adding important chapters to their book of knowledge. For some time they have been making exhaustive studies of Pirate and Cutlass jet fighters, learning what makes them tick, preparing themselves to meet the problems that can arise when the planes go into actual service.

The work of our 6-in-1 men really pays off. It helps the Navy and Marine Corps keep Vought airplanes always ready to fly — and at top operating efficiency.

VOUGHT AIRCRAFT

DALLAS, TEXAS

ONE OF THE FOUR DIVISIONS OF UNITED AIRCRAFT CORPORATION

Vought field men are great travelers. Using planes, cars, trains and ships, last year they covered 420,860 miles on land and water, in cold climates and hot, in the performance of their job. More than 65,000 miles of this travel was aboard Navy aircraft carriers.

Vought service men are frequently aboard carriers during maneuvers. They're always ready for the loudspeaker call: "Now hear this — Vought Service Man, report to hangar deck!" It's a summons for their special kind of help as problems arise during the job of getting planes in A-1 shape for flight.

The Field Service Department here in Dallas keeps field men informed of engineering changes and expedites shipment of spare parts. Service manuals are compiled for distribution to military squadrons. Courses are conducted in maintenance and operation of new Vought fighters for our own field men and for Navy and Marine Corps personnel.

GIANT ALL-PURPOSE AIRLIFT!

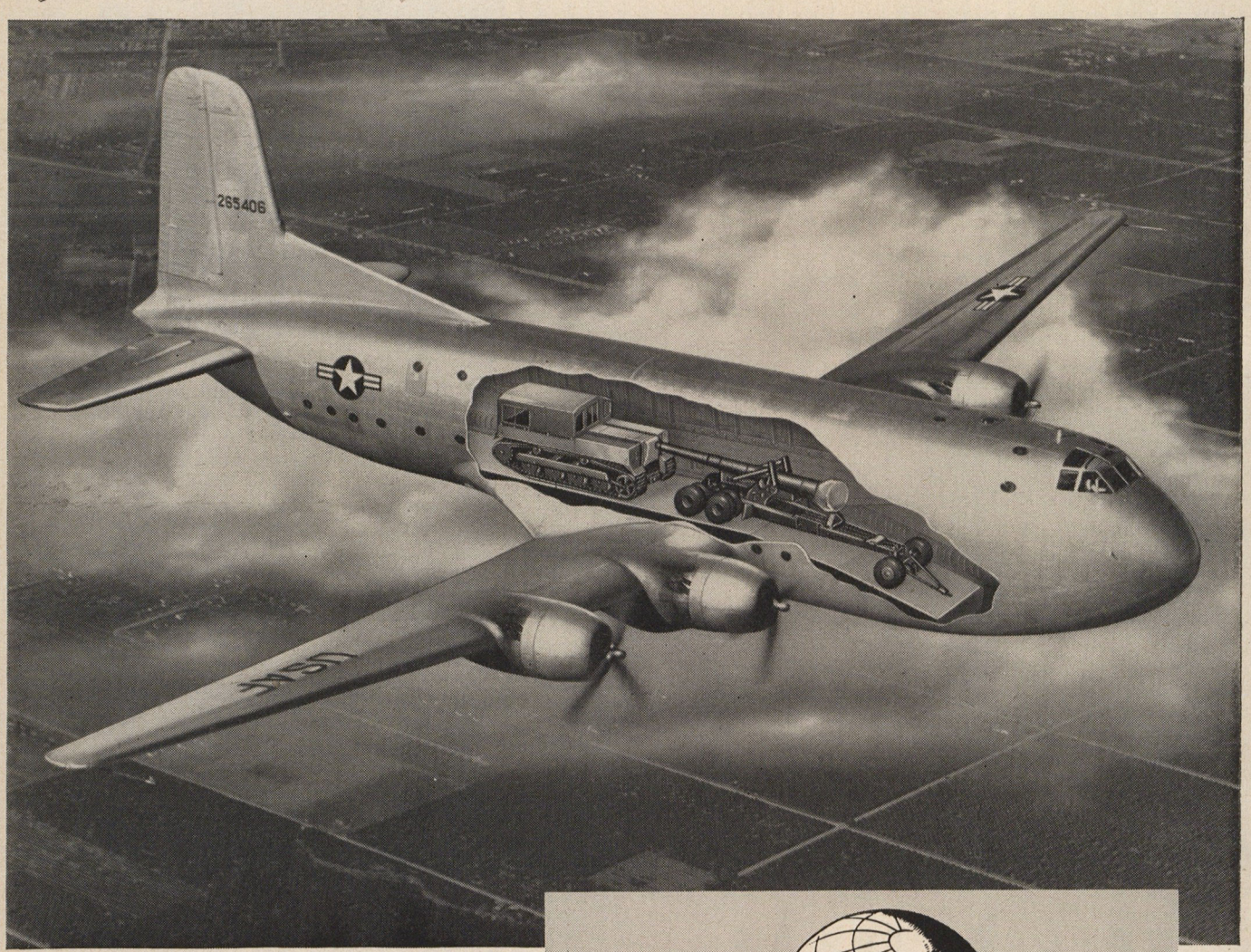
C-124—mammoth transport designed by Douglas—is the most versatile and flexible cargo and troop carrier in the air today.

Sixty-five of these sky giants are in production for the Air Force, with deliveries scheduled soon to Supply Squadrons of the Strategic Air Command.

Each plane is able to carry anything up to 50,000 pounds—diversified general cargo, 200 troops, or 94% of all military vehicles, *fully assembled.* This means that *only* a C-124 fleet can transport by air an entire standard infantry division, including all the millions of pounds of airlift required for its continued equipment and support. The C-124 is also self-sufficient for rapid loading and unloading.

Furthermore, propeller-turbine engines can be readily installed in the current C-124 design, making possible more payload, longer range and greater speed.

LONG BEACH PLANT OF DOUGLAS AIRCRAFT COMPANY, INC.



DEPEND ON DOUGLAS

30TH ANNIVERSARY YEAR

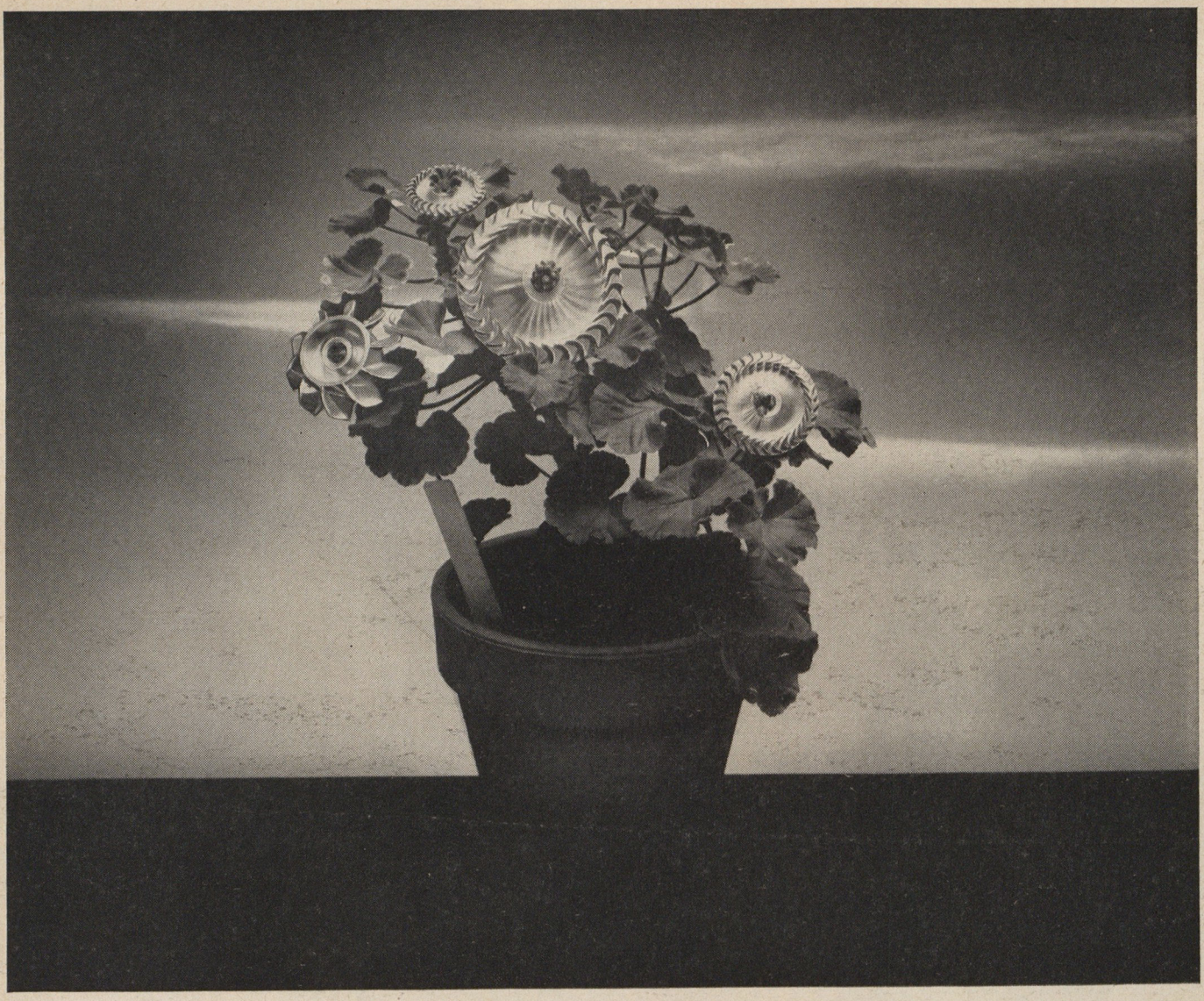
V

IMPROVE MEANS OF DESTROYING TARGETS

Saturation of the enemy with A-bombs is not the answer. The problem is to select a small family of bombs keyed to specific jobs

On the face of it, it might appear that the most efficient means of destroying targets would be to build bigger and bigger bombs. This is hardly so. In the first place the objective of war (which it is now popular to characterize as an extreme extension of diplomatic relations) is not to destroy the enemy's civilization, but to preserve one's own. In the second place even if complete sacking of the enemy was the objective (which it must be emphasized is not the case) there would be many targets which could be knocked out with a conventional TNT bomb as easily (and at far less cost) than an A-Bomb or an H-Bomb or Q- or R-Bombs. The problem then, is not one of building more destructive bombs alone, but of producing a variety of bombs in ranges and sizes adaptable to various missions. The optimum goal would be to have each bomb type designed to release just enough energy to destroy a given target. Too little explosive power requires repeated attacks on the same target. Too much not only inflicts unnecessary damage on the enemy but constitutes faulty utilization of our resources.

Such an objective suggests a great assortment of bombs. Actually, however, the Air Force has determined that the diversity of bomb sizes in existence during World War II and in storage at this time exceed the requirements. A study now being conducted is expected to result in the recommendation to develop a new family of bombs of a limited number of sizes. Such action will be of great benefit logistically in that it will aid in obtaining efficient bomb bay



METAL GROWS, TOO!

Take a block of one of the toughest aluminum alloys known and chisel from it a high-speed turbine fan rotor like that shown above. Grind and polish to tolerances of one ten-thousandth of an inch—and you'd think it would be accurate enough.

But to give lasting performance in the cooling and pressurizing equipment built by AiResearch for today's supersonic jet airplanes, such high-speed wheels must be "grown" to perfection.

Each wheel, fan or rotor is placed in a vacuum test chamber resembling a wall safe. Here it is test-spun at speeds up to 150,000 rpm. Frosted coils control heat of air friction. At this enormous speed, the metal actually "grows" or expands—as much as 3/1000 of an inch—either revealing structural defects or releasing internal tension and achieving complete dimensional stability.

Such pioneering in design, manufacture and laboratory testing of precision equipment is typical of the day-to-day operations of the skilled scientists and engineers at work at AiResearch.

● Whatever your field — AiResearch engineers — designers and manufacturers of rotors operating in excess of 100,000 rpm — invite your toughest problems involving high-speed wheels. Specialized experience is also available in creating compact turbines and compressors; actuators with high-speed rotors; air, gas and liquid heat exchangers; air pressure, temperature, electronic and many other automatic controls.

AiResearch
DIVISION OF
THE GARRETT CORPORATION

● *An inquiry on your company letterhead will get prompt attention. AiResearch Manufacturing Co., Los Angeles 45, Calif.*

designs as well as aiding production, shipment and storage of munitions.

Establishing an optimum number of bomb sizes is not the end of the problem, however. Control of the burst itself, or what is known as predicting and directing the field of force is another requirement. To destroy a submerged sub for example, a bomb that releases its energy straight down is needed. Other targets require a lateral burst, while still others are most susceptible to explosions in the air. In the field of special munitions the Air Force is relying largely on the efforts of outside agencies for its basic research. Principal among these is the Army's Ordnance Bureau which still retains much of the responsibility it had in ordnance matters before the Air Force became an independent organization. There are many promising developments in this field and there are munitions which could be standardized to meet an emergency requirement. At this time, however, the Air Force considers it advisable to permit additional research and development prior to standardization.

A new family of war heads and fuses is also required for guided missile application where extermely rigid weight-performance requirements necessitate research for all possible improvements. The temperature ranges—both low and high—required for tomorrows guided missiles are much more severe than present requirements due to the aerodynamic heating effects at supersonic speeds and to the extremely low temperatures at very low altitudes.

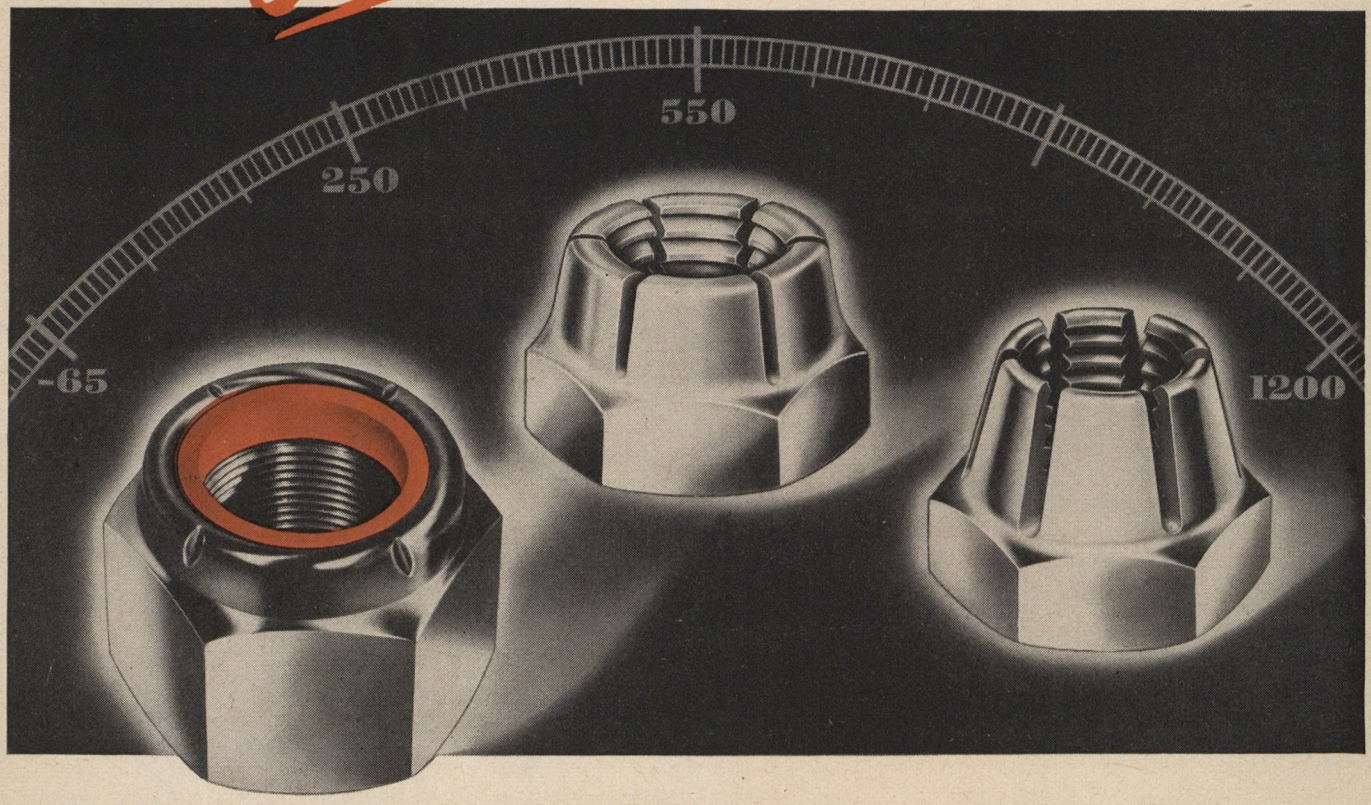
It might be well to note here that the foregoing puts the lie to recent vicious assertions that the Air Force plans to win another war single-handed by the brutal saturation of the enemy with A-Bombs.

NOW!

ESNA spans the temperature field

-65°F to +1200°F

with SELF-LOCKING ELASTIC STOP NUTS



—famous Elastic Stop Nuts protect permanently against VIBRATION! IMPACT!

With the addition of the new Z-550 and Z-1200 series, ESNA now has a specific nut design for all temperatures ranging from minus 65° F. to plus 1200° F. Self-locking, in both fully seated and positioned settings, these fasteners provide permanent protection against *vibration, impact* and *stress reversal.*

The two new nut designs represent the most efficient solution found by ESNA engineers after detailed research and production line studies of fastening problems encountered under elevated temperatures. Both fully meet ESNA standards for controlled quality and full interchangeability on class 3 bolts with minimum torque scatter. This controlled torque which is a feature of all ESNA nuts assures uniform bolt loading and permits more compact design, with resulting weight reduction. It also simplifies maintenance problems and speeds up field replacements.

Specifically, for applications between −65° F. and +250° F., the nut with the famous red fiber collar offers unequalled protection against vibration, thread corrosion and liquid seepage. The ZM and ZE nuts are designed for sustained temperatures up to 550° and the Z-1200 series has been engineered to withstand multiple cycles of exposure to extreme temperatures up to 1200° F. without seizure. Like all Elastic Stop Nuts, these fasteners are readily removed—do not damage threads or gall the finish—and they can be reused.

HERE'S A CHALLENGE: Send us complete details of your toughest bolted trouble spot. We'll supply test nuts—FREE, in experimental quantities. Or, if you want further information, write for literature. Elastic Stop Nut Corporation of America, Union, N. J. Representatives and Agents are located in many principal cities.

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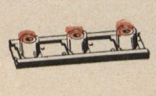
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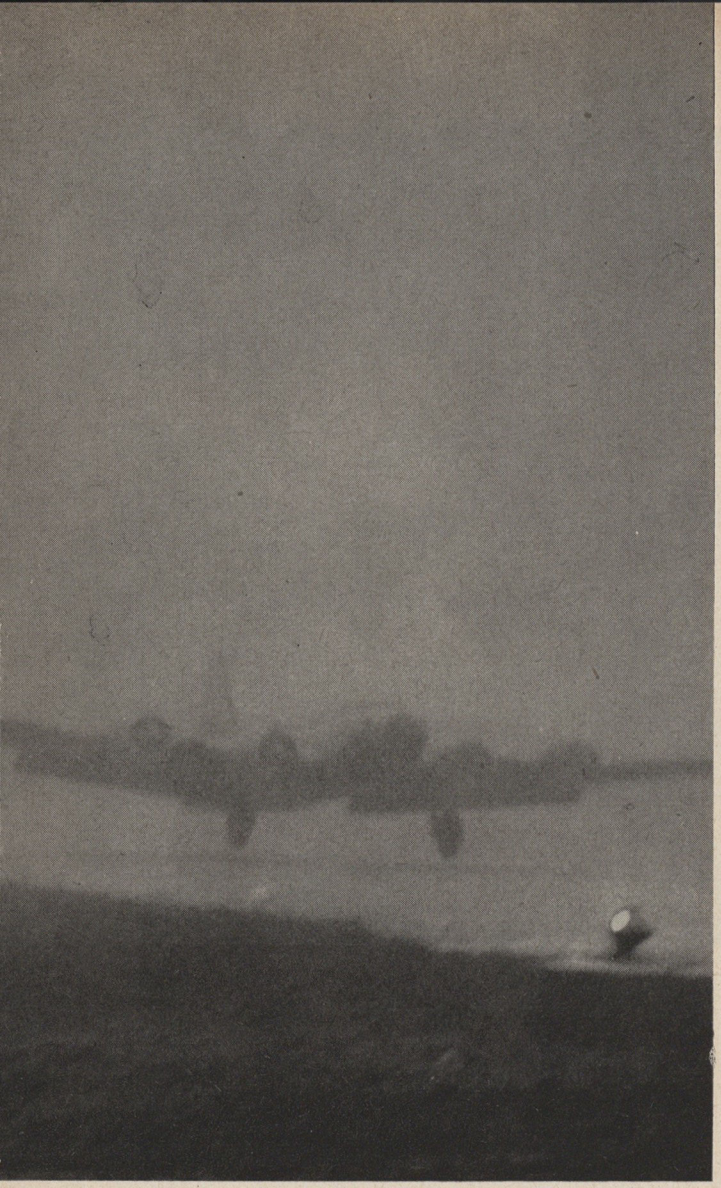

VI

FUNCTION INDEPENDENTLY OF WEATHER AND DARKNESS

Weather can't be ignored, but means can be devised of flying around, through, or over it with minimum interference to the mission. The most serious problem is taking off and landing

The first peacetime objective "Hap" Arnold gave the USAF after the war was to recast its forces into a true All-Weather Air Force. In fact, he had begun his crusade almost before the previous objective of winning the war itself had been obtained.

That was five years ago—more than the time required to crush the Nazis—yet there is still no All-Weather Air Force. Rain, fog and the cloak of night have been tougher adversaries than the Luftwaffe.

Flying completely by instruments (which, of course, is what an All-Weather Air Force does) includes take-off, landing and traffic operations without visual reference, as well as in-flight navigation. It also includes the ability to keep weather and wind at minimum influence over the flight path of the plane itself, which means staying on course regardless of "gales and thunderstorms."

During and immediately after the war, two systems of blind landing, Instrument Landing System (ILS) and Ground Controlled Approach (GCA) were introduced into both commercial and military operations. The two techniques differed basically in this way: In the ILS system a direction of approach and a glide path, were defined over the landing field by radio beams. Through a suitable receiver and indicator the pilot could tell the relative position of his plane to the path. In the GCA system the position of the aircraft was determined by a radar set on the ground, and instructions were given by radio to the pilot by an observer watching the airplane's pip on the ground scope.

Each system had and still has its advantages and disadvantages. For a period of time in the early development stage both had their proponents and their antagonists. Generally speaking, the commercial airlines favored the ILS, while the Air Force considered that GCA held a greater promise. It was the GCA system, parenthetically, which was used with such outstanding success

The Objective: An All-Weather Air Force

during most of the Berlin Airlift operation.

Actually neither system provides a universal solution to the problem. They are still inadequate in keeping large numbers of planes separated in a crowded air space or in providing sufficiently accurate approach paths to effect 100% landings in zero ceilings and visibility. The perfection of such an instrument, which may turn out to be something of a combination of both ILS and GCA, is being carefully persued by the Air Force. Under the supervision of the Air Force's Watson Laboratories in New Jersey, several civilian companies are making substantial progress in the field.

But since it will never be possible to ignore completely the weather regardless of instruments, the need becomes apparent to forecast it accurately the better to make required preflight preparations and compensations. In many respects the key to All-Weather flying lies in knowing what the weather will be, understanding its dangers and avoiding them. Instruments can and are used in flight to warn of immediately imminent weather conditions, but weather forecasting alone can provide the preflight information necessary to the careful selection of flight paths. Unfortunately weather forecasting is not an exact art. There are so many variables in the behavior of a weather front that accuracy of prediction is often extremely difficult to achieve. The trouble is not in gathering physical data. The trouble is that the forecaster is often swamped with too much data, making it difficult to distinguish the relevant information from the irrelevant.

The Air Force's Geophysical Research Program has been designed to reduce to a minimum the error in predicting daily global weather. Until recently the atmosphere above 200,000 feet was practically untouched. The use of the rocket as a sounding vehicle has extended dramatically the range of atmospheric probing, and has

made it possible for scientists to gather a wide range of data in the ionosphere. The Upper Air Laboratory at Cambridge is conducting continual research in this meteorological frontier, designing highly specialized instruments, fitting them into rocket war heads, and arranging for the rockets to be flown at Holloman Air Force Base and White Sands, New Mexico.

An alternative to flying through or around a weather front is flying over it. Generally an altitude of 40,000 feet is sufficient for this purpose and since that is the operational altitude our combat units are now approaching, the problem would seem on the way to solving itself. The problem of getting over weather fronts that *do* exist above 40,000 feet will require some attention, however, for in the low pressure that accompanies altitudes above that the problem of flame propogation in jet engines becomes acute. Several universities are doing applied research under Air Force contract on inherent difficulties of jet operation in thin air, but so far as is known 55,000 feet represents the extreme at which jets can be expected to function.

Flying over the weather also presents problems of aero-medicine of which the Air Force is not unmindful. Pressurized cabins are a crew convenience, but they are not in themselves adequate at the altitudes Air Force planes are now operating and will operate in the future. Furthermore they are susceptible to enemy attack. The Aero-Medical Laboratory at Wright Field is making a continual study of optimum human tolerances, and devising new artificial means of extending the limits.

Like airplanes, guided missiles are also sensitive to the weather. An All Weather Air Force must include missiles that can operate independently of weather as well as planes. Missile guidance calls for a detailed knowledge of the chemical and physical properties of the atmosphere. For example, at speeds several times that of sound a small variation in air density is a large factor in missile control system design. The Atmospheric Physics Laboratory at Cambridge is concerned with supplying these answers, and performs scientific studies on atmospheric composition, motion, energy changes, and atmospheric electricity. Balloon-borne instruments and even astronomical techniques are used to procure basic data. The inter-relation between cosmic radiation and weather processes has also been under study; a parallel study on the correlation of atmospheric ozone characteristics and surface weather promises to give further new clues as to reasons for weather changes.

For some time during and immediately after the war the Air Force gave considerable attention to the possibility of *conditioning* the weather, i.e. dispersing fog, making it rain to clear the sky of clouds and so on. Most widely advertised means of accomplishing this end was seeding the air with dry ice to cause precipitation. After exhaustive testing, however, seeding was abandoned as inefficient, and the whole program is now receiving only minor attention. This does not mean, however, that the Air Force has closed the door on possibilities that may develop as more meteorological data is available.

The atmosphere is of ever increasing importance as the medium through which the instruments of war are launched. To keep abreast of modern military requirements research in all the weather fields is being given the utmost attention.

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In all parts of the world . . .
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More than ten years of specialized
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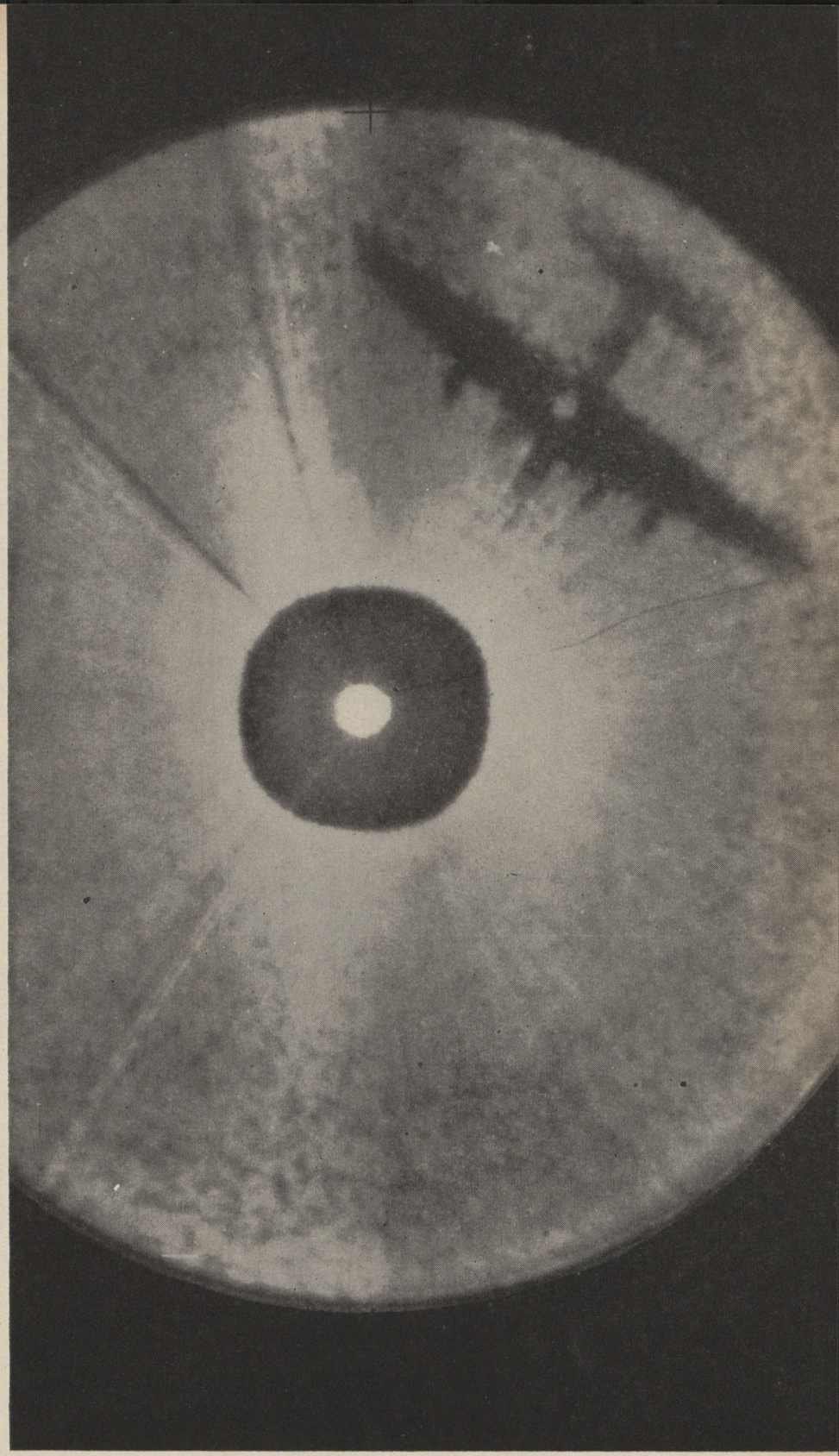
VII

Defeat Enemy Interference

Debate continues over the relative defensive advantages of speed and armament. Both are needed to get the plane on target



Whatever other capabilities the planes of today's Air Force have—range, load carrying capacity, improved bombs—all are to no avail, if, on arrival in the vicinity of the target, they are overcome by an enemy's interception devices. Consequently an efficient offensive striking force must also incorporate adequate defensive qualities. The basic instruments available to an enemy to intercept our offensive thrusts include early warning systems, fighter interception, anti-aircraft guns, rockets and ground-to-air missiles. Against these things our offensive force can employ speed, altitude, armament, maneuverability and varied jamming devices. Broadly speaking, bombing itself is also a defensive measure since it neutralizes the enemy's ability to strike back from his ground positions.

There has been considerable debate since the middle of World War II concerning which is preferable—defensive armament or speed-altitude. The present Commanding General of the Strategic Air Command, Lt. Gen. Curtis LeMay, was the first to put into operation the theory that speed and altitude are better defensive weapons against attacking planes than guns. As Commanding General of B-29 operations in the Pacific he actually had gun turrets removed from many of his planes and he himself was quite pleased with the results. It developed, however, that in some instances he had to re-install the guns, not because of losses due to enemy action, but because too many Air Force gunners were complaining about being taken off flying pay!

The most profitable area of research probably lies somewhere between concentration on either of the two extremes. Significant tests conducted during the past two years with the B-36 have shown the big bomber capable of holding its own with fighters both in speed and ma-

OFFENSIVE MEASURES
VS
DEFENSIVE COUNTER MEASURES

neuverability far better than was once thought possible. This unanticipated discovery has betokened efforts to increase the bombers speed still further on the theory that for the time being at least fighter designs (although faster) will not be able to keep apace proportionately, and that a slight increase in bomber speeds (even for short distances) will give considerable defensive advantage to the offensive planes.

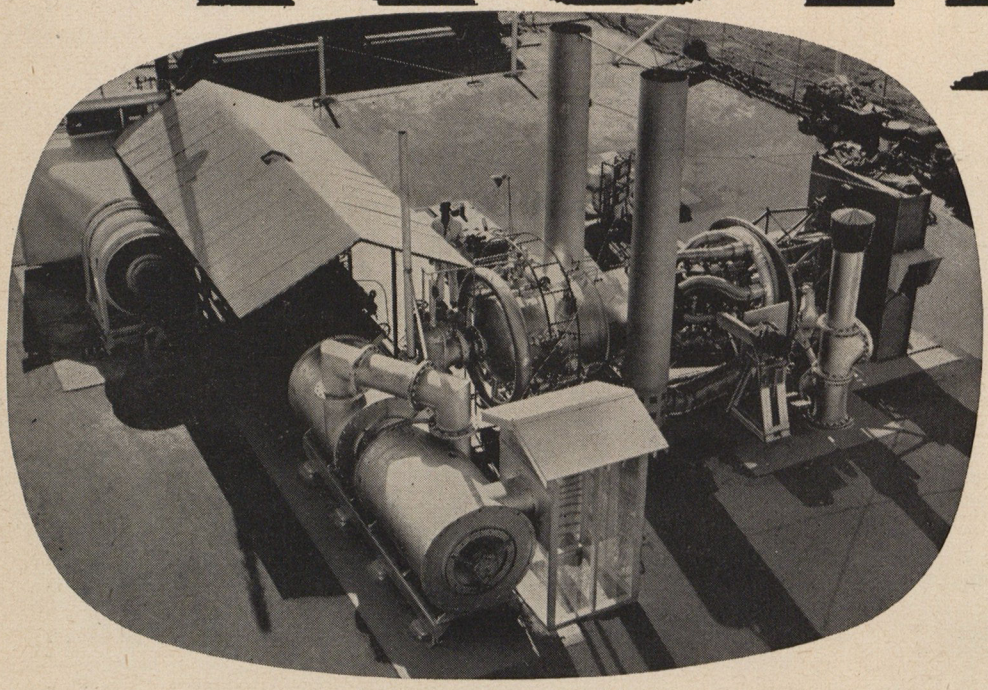
This does not mean that there is no longer an armament requirement. The perfection of air-to-air guided missiles capable of trailing and destroying enemy fighters is an urgent necessity. In addition to developing accurate air-to-air missiles, study must and is being conducted by the Air Force to determine what are the most efficient guns and gun sizes. Primarily this investigation is centered around increasing the rate of fire without too serious compromise of caliber size or muzzle velocity.

Jamming devices, a technique designed to disrupt the enemy's early warning system and deflect his missiles, fall into active and passive categories. Passive measures include seeding the air with inert deflection material, such as the "window" used extensively in the last war. The primary *active* means of throwing his electronic signals off is the use of radio and radar instruments that will transmit intercepting sounds or pulses. The overriding requirement in this regard is (a) the perfection of transmitter of greater range or power and (b) the development of an improved system of keeping up with the enemy's rapid jumping from one frequency to another to escape our jamming efforts.

With the immense distances now contemplated in inter-continental warfare the escort fighter with its highly limited range has been unable to keep abreast of the requirements. Active steps are being taken, however, to develop penetration fighters of far greater range.

Two new penetration fighters, the XF-88 and XF-90, are presently undergoing experimental flight testing and will be evaluated along with the F-93 to meet production requirements for this type fighter. All three aircraft will have swept-back wings and performance superior to our current production fighters. In addition to built-in fighter range, the Air Force is continuing the investigation it began with the parasite XF-85 to determine the feasibility of carrying or towing fighters. Admittedly, however, this is a make-shift answer to the problem and probably will be used, if at all, only as an interim measure.

ROHR



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First of its kind ever designed . . . the ROHR-built test stand for testing exhaust systems. Constructed to test the exhaust system of the B-36 Super Bomber, it simulates temperature, pressure, vibration and other conditions experienced at altitudes *above 40 thousand feet.*

This unique construction offers proof of continued testing by ROHR to build things better! faster! cheaper! When it's made of metal . . . and you want it built properly . . . quickly . . . and at the right price . . . come to ROHR.

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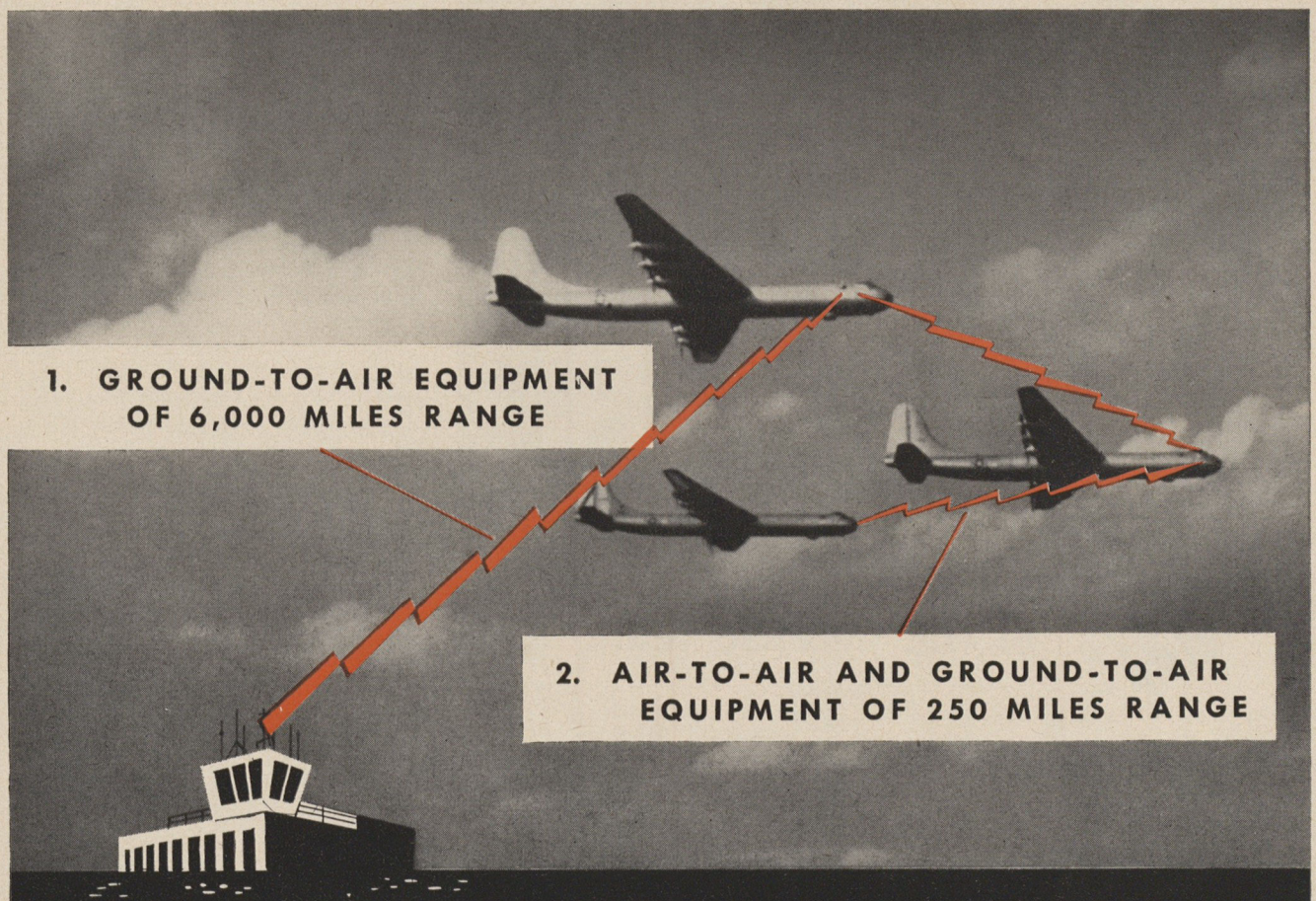
AIRCRAFT CORPORATION

In Chula Vista, California . . . 9 miles from San Diego

PERFECT COMMUNICATIONS
From Ground to Air and from Air to Air

The required integration of any large-scale air operation demands the refinement of communications systems that are adequate in range, clear in reception, and offer the opposing force a minimum prospect of successful interception

VIII



COMMUNICATION REQUIREMENTS FOR INTEGRATED AIR ACTIVITY

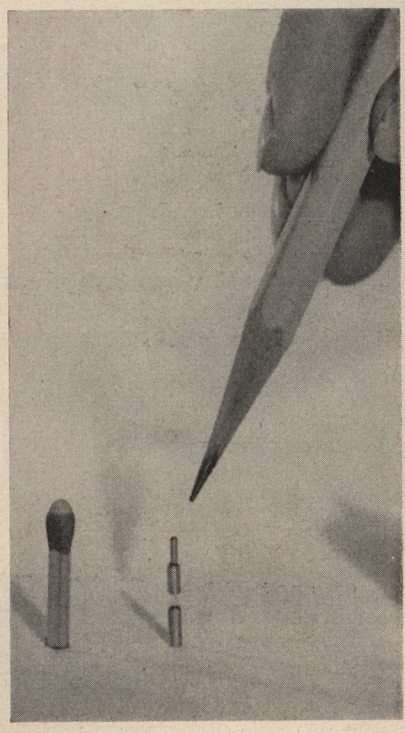
The eighth area of research and development invloves the investigation necessary to meet minimum requirements in communication from ground-to-air and from air-to-air. Obviously, it would be impossible to conduct a well integrated, large scale air effort without communications systems that would (a) permit the transfer of information between individual planes or groups of planes and their home bases, and (b) provide for intra-communication between the members of a formation of planes. To facilitate this requirement in today's Air Force two types of communications are now required: one that will transmit information from ground-to-air for a distance of approximately 6,000 miles, and another with a range of at least 250 miles, ground-to-air and air-to-air.

At the present time the Air Force has under investigation several different communications systems each of which fill the above requirements in varying degrees. Picture transmitters, teletypes and radio and radar are included. In addition to the range requirements the usefulness of a system is also conditioned by such factors as adequacy of presentation (that is, whether the signal reaches

its destination in recognizable shape) and security.

In the latter regard, there is obviously a need for scrambling voice transmissions to keep the message from the enemy, just as there is a need for adequate coding of teletype or radio signals. Moreover, anti-jamming measures must be perfected beyond their present state and the size and weight of the short range equipment for jet aircraft (where space for accessory equipment is almost non-existent) must be greatly reduced. To accomplish this objective, the Air Force has undertaken a miniaturization program at Wright Field which has already produced startling results.

There is still another problem. With the advent of high-speed aircraft and the expanded use of electronic equipment to accomplish a variety of operational functions within the aircraft, the Air Force is confronted with the issue of developing flush antennae. On high-speed aircraft, external antennae present a severe mechanical drag and icing problem. Progress has been made in the design of antennae which enable them to be mounted flush with the skin of the aircraft. However, the system is still experimental and has not yet been perfected to the point of permitting incorporation in operational aircraft.



Miniature radio tubes, about 1/90 the size of those now in use, can withstand vibration, gunfire and shock better than present models.

Ram Jets get a 'Flight Engineer'

▶ A ***human*** flight engineer would have to shrink to the size of a gremlin to operate a ram jet. He would have to withstand temperatures from −100F. to +700F. . . . pressures from that at 100 feet under water to that at 80,000 feet in the air. On top of that . . . calculate and react in less than a second to complex mathematical problems.

▶ Yet the ram jet needs a flight engineer . . . and gets one in Wright Aeronautical's new ***power control system.*** It performs ***automatically*** the functions of a flight engineer on a modern airliner.

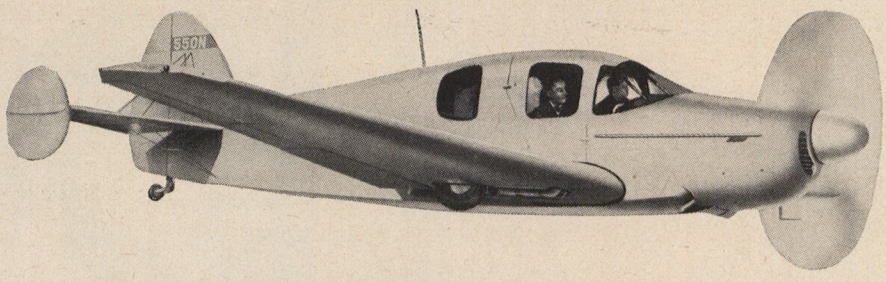
▶ Actually it does a great deal more, for in ram jet operation, where supersonic speeds prevail, much wider ranges of air flow, temperatures and pressures are encountered than in any previous-type aircraft. The power control checks instantaneous changes in air density, determines the jet's fuel requirements, and actuates the missile's controls in a fraction of a second. Result . . . smooth, highly efficient engine performance.

▶ These power control units—and all other ram jet components—are now under development in Wright Aeronautical's new ram jet laboratory. Here is another indication of this company's leadership in supersonic ram jet research and development.

Wright Aeronautical Corporation, Wood-Ridge, New Jersey

CURTISS WRIGHT

BELLANCA



Serves The Aircraft Industry

Since 1908—BELLANCA has been an outstanding name in world-wide aviation. In its forty-two years of continuous management under its founder, G. M. Bellanca, no other airplane has ever equaled the number of awards won or records set by those bearing the name—BELLANCA! A look at the log below cites some of these notable achievements:

1907/1908—Built the world's first tractor biplane. **1911/1912**—Built 25 hp parasol monoplane. **1912-1917** Flying school, Belmont Park, Mineola, L. I., N. Y. **1919**—Built 45 hp 2 seater—(102 mph/32 mph landing speed). **1921**—Built 90 hp 5 seater (110 mph/38 mph landing speed). **1922**—Won thirteen first prizes in National and International Contest. **1923**—Won efficiency contest, National Air Races. **1925**—Won efficiency contest, National Air Races. **1926**—Won all efficiency contests, National Air Races. **1927**—First world's non-refueling endurance record—51 hours, 30 minutes. **1927**—World's long distance record, New York to Germany—3911 miles. **1928**—Won both efficiency contests, National Air Races. **1928**—First non-stop flight, New York to Havana. **1928**—American endurance record, San Diego, 59 hours, 7 minutes. **1928**—Solo endurance record, 35 hours, 25 minutes. **1929**—First non-stop flight, Canada to Cuba, 1404 miles, 12 hours, 56 minutes. **1929**—Second trans-Atlantic flight, 3400 miles, 30 hours, 30 minutes. **1929**—Won five 1sts, three 2nds, two 3rds, two 4ths out of 7 events, entered at National Air Races, including first places in both efficiency contests. **1929**—Won Cleveland to Buffalo efficiency race. **1929**—Won Detroit News efficiency trophy. **1929**—Won first and second places among single engined planes—Ford Reliability Tour. **1930**—Altitude record for commercial planes, 30,453 feet. Altitude record for woman, 27,418 feet. **1930**—Non-stop flight from New York to Bermuda and return. **1930**—Won both efficiency contests National Air Races. **1930**—Third trans-Atlantic flight, Harbor Grace to Scilly, England, 23 hours, 40 minutes. **1930**—Won first and second place among single engined cabin planes in Ford Reliability Tour. **1931**—World's non-refueling record, Jacksonville, Fla., 84 hours, 33 minutes. **1931**—Fourth trans-Atlantic flight, Harbor Grace to Germany. **1931**—Fifth trans-Atlantic flight, Floyd Bennett Field to Cardigan, Wales, 3150 miles, 32 hours. **1931**—Sixth trans-Atlantic flight to establish world's long distance non-stop record, Barren Island, N. Y. to Istanbul, Turkey, 5014 miles. **1931**—First non-stop flight across Pacific, Samishiro Beach, Japan to Wenatchee, Washington, 4500 miles, 41 hours, 13 minutes. **1933**—Seventh trans-Atlantic flight, New York to Pomerania, Germany. **1934**—Eighth trans-Atlantic flight, New York to Lahinch, Ireland.

During the recent war years—other kinds of records were set in vital military aircraft work which won great recognition for the company. Now as then, BELLANCA has the know-how, plant and key personnel necessary to perform and produce any kind of aircraft sub-contracting in both military and commercial aviation.

In its personal plane division—BELLANCA is building the famous CRUISEMASTER, which sells for $9500.00 at the factory. It has a 190 hp Lycoming engine. It cruises at 180 mph from sea level up and lands at 40 mph. It has a range of nearly 700 miles. It comes equipped with VHF (you can have Omnirange, though it's extra). It has a hydraulically operated retractable landing gear. Hartzell Controllable propeller is standard. It is a bigger, real-family sized, built-for-comfort 4 place job that has no equal for sheer beauty. The seats are of foam rubber and the upholstering is done in a Du Pont designed Nylon whipcord and leather combination. You can carry 80 pounds of baggage with all seats occupied plus a full load of gas. You can take this airplane in and out of just about any size field. As for economy, you and one passenger can fly in the Cruisemaster for less than you can in any two place airplane on the market.

Cruisemaster $9500.00

F.A.F. NEW CASTLE

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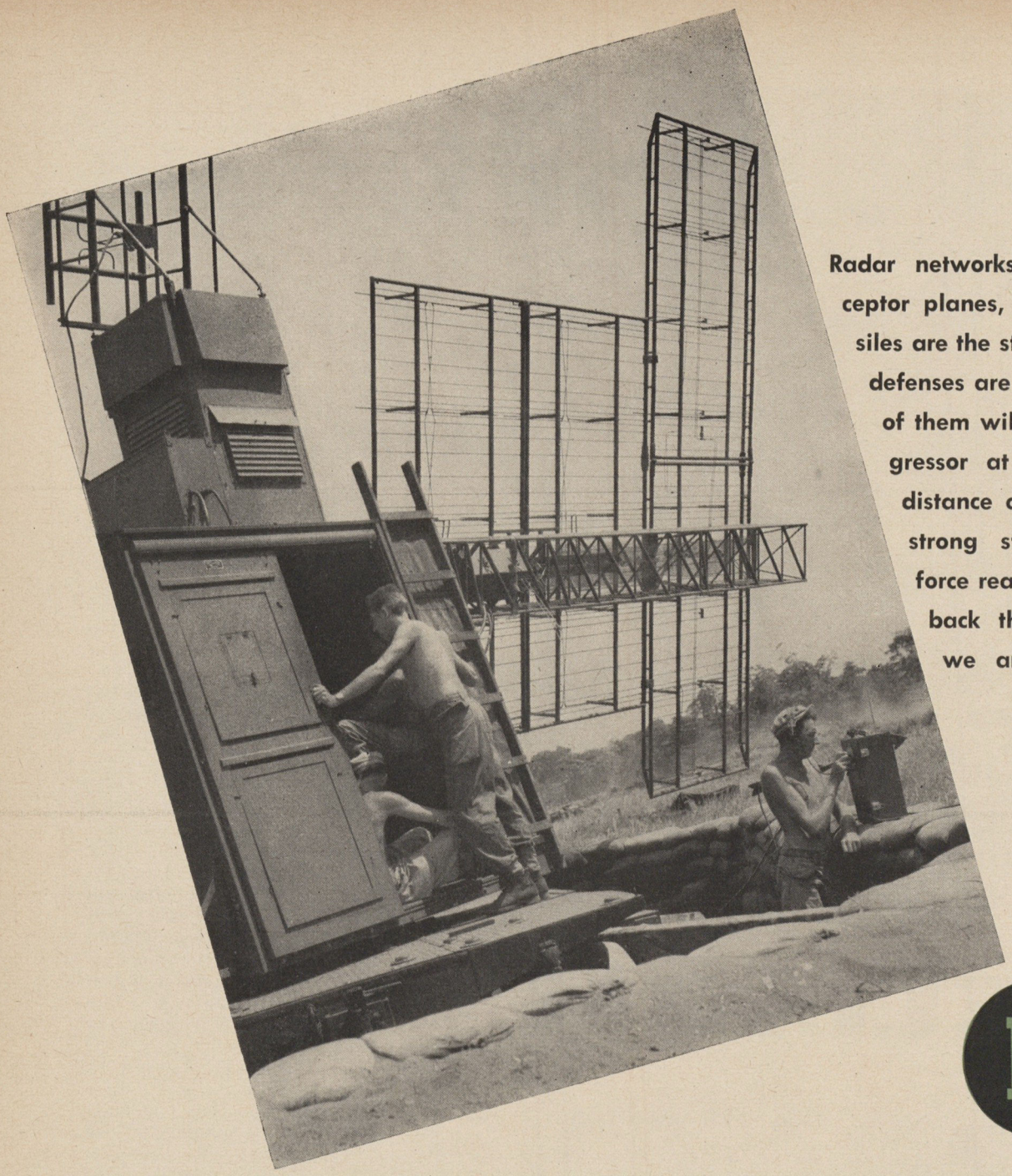

Radar networks, improved interceptor planes, and guided missiles are the stuff of which our defenses are built. But none of them will keep an aggressor at a respectful distance as well as a strong strategic air force ready to strike back the instant we are struck

IX

DEFEND HOME TERRITORY

Considerable space has been devoted in AIR FORCE Magazine in the past to the proposition that now more than ever before, the best, if not the *only* military defense, is a good offense.

Inherent in this argument is the theory that America's only potential enemy has far greater fear of the retaliatory force of a United States counterattack than she does of even the most successful interception weapons we could send against her initial thrust.

An advisory committee on matters of national defense recently stated the issue this way: Russian conduct has suggested that her policy is one of sustained hostility to the western world, especially to the United States. It has indicated that Russia would not be unwilling to provoke armed conflict if her chance of winning was thought to be good. On every recent occasion in which armed conflict has seemed to be the last resort, Russia has yielded. Presumably, this means that she is impressed by our existing and our potential arms; and what impresses Russia can scarcely fail to be our Air Force and its atomic weapons.

It follows then that the first item of defense is the protection and expansion of our strategic air forces. It would be folly to expand a major portion of our wealth and resources in the development of radar nets, interceptor missiles, etc., which could hardly be counted on to give the Russian High Command more than a moment's hesitation if the USAF did not possess sufficient strength for a devastating counter blow. By defending and enlarging our striking force —even at the expense of traditional means of protecting our continental shores—we will actually reduce to a

minimum the likelihood of those shores ever having to be defended to begin with.

Nonetheless measures to intercept an aggressor's thrust cannot be ignored. On the contrary great haste is required in the development and establishment of adequate early warning systems, and in the development of true interceptor planes capable of great speeds, fire power and maneuverability at high altitudes—planes that can also operate at night or in any weather which the enemy might choose to utilize as protective cover.

The basic inadequacy in radar as an instrument for early warning of the enemy's approach is its lack of range and the fact that its beams cannot be "bent" to follow the curvature of the earth, making attacks at low level immune to detection more than a short distance beyond the horizon itself. At the moment the Air Force is exploring several means of overcoming radar's inherent weaknesses. Since characteristic limitations cannot be improved upon in themselves, the only means at the electronic engineer's disposal of extending the usefulness of radar equipment beyond its current state is to adopt novel means of using existing equipment. Because of the highly expedited program of installation of the radar warning network in the United States, considerable effort is being directed towards incorporating the very latest of these unique methods into existing radar instruments so that they can be tied into the control chain with minimum delay.

But a radar network, even if highly perfected, is useless as a protective measure unless it is integrated carefully with operational fighter bases. There is little point in sounding a fire alarm if the fire engine itself is so far removed from the scene as to be unable to get there until the house has burned to the ground. Since the most efficient radar network might provide only a few minutes advance warning of a pending attack, it is imperative that our fighter planes be in the closest possible proximity. It is some comfort to note that if the enemy attack followed a path over the arctic regions we would be provided with a defense in depth, so to speak, in that our radar installations in those areas could pick up the attacking force some time before its arrival over the Continental United States thereby making it possible for our forces to track the invader as he approached. If the attack came by way of our coastal areas, however, no greater depth could be provided than the limited range of our coastal

radar instrument—be they airborne or otherwise.

As for actual interception of the enemy we must rely on specially designed interceptor fighters (which will eventually fire air-to-air guided missiles) and ground-to-air guided missiles. Interceptor studies are presently being conducted by the major aircraft and equipment industries as a result of a hurried call issued by the Air Force last year for a completely new fighter plane that would meet the exacting requirements made necessary by the high performance we have found new bomber designs capable of. Special interest is being given designs with low wing loading to reduce the radius of turn at high altitudes. The fighter of tomorrow may well follow in a general way the configuration of the Consolidated delta wing XF-92 now undergoing experimental flight tests at Edwards Air Force Base, Muroc, California.

At the moment the most advanced airplane in the Air Force's operational units is the North American F-86, of which there are now three groups. It is anticipated that all of the remaining 17 fighter groups in the Air Force will be jet-equipped by the end of 1950, but *none* will meet the new requirements established by the high performance capabilities of modern bomber aircraft.

If its accuracy can be established on a par, the ground-to-air guided missile has many advantages over the missile-firing piloted aircraft. In the first place the ground-to-air missile does not require an air field for launching. In consideration of the near-impossible task of spotting air strips in all the locations they might be needed to ward off an attack—plus the near-impossible feat of equipping those strips with planes, this single advantage becomes one of considerable importance. In the second place, a missile's rate of climb to the target is far superior to manned fighters. With split seconds as valuable as they would be in an attack of modern, high-altitude, high-speed bombers, the time saved in getting off the ground could be of immense importance. Another obvious advantage of the ground-to-air missile over the piloted airplane is that it does not risk the life of a human being.

Although it is not yet at hand, the time will come when the requirement will be for a weapon to intercept foreign *guided missiles,* rather than bombers. It is not too early to give the matter careful consideration and adequate research. Immediately apparent anti-missile measures are electronic jamming devices, decoy targets (to attract heat or light seekers) and "anti-missile" missiles.

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X EFFECTIVE USE OF HUMAN RESOURCES

Since we may never enjoy the luxury of numerical superiority, the most efficient use of our manpower is of vital importance. The right man for the right job and all jobs reduced to maximum simplicity is the goal

Until some far-distant date, when "pushbutton war" takes over and machines do our fighting, the effective use of human resources is every bit as important as more efficient radar or a new guided missile. The fact that in any future conflict we are likely to be outnumbered numerically has led the Air Force to the realization that the manpower we do have must be utilized to the optimum effectiveness.

Slow to die, but surely on the way out, is the old military axiom that a soldier is a soldier, one like the other, and any job that one can do another can be made to do just as efficiently.

Newest in the Air Force's R&D program, is therefore, the study of how best to use its men and how best to provide its men with tools which will make their tasks easier and their efficiency therefore greater.

Just out of the planning stage, the program has already put into use the most comprehensive classification tests ever to be used on Air Force personnel. Round pegs will henceforth be put in round holes, for while you might squeeze them into square ones, the disadvantages of so doing are two: Firstly, you are not getting the most out of that man by making him work at what he can do best, and secondly, you are not getting the job on hand done with optimum efficiency.

Indeed, efficiency is the key to the whole program. Maj. Gen. Donald L. Putt, Air Force Director of Research & Development, breaks the program down into five general classifications: (1) Human engineering, (2) Personnel and training, (3) Manpower, (4) Human relations and morale, and (5) Planning and Administration. Work is also being done in support of the USAF Career plan, development of improved proficiency measures, and improvement in the training of technical and flying specialists. Other research projects are being undertaken in support of military management, psychological warfare and strategic intelligence.

Men, Money and Facilities

If R&D is the "Key to The Future," they are the key to R&D

THE foregoing account of Research & Development activities in the Air Force has been addressed primarily to the problems of organization, policy, and, to greater extent, to the progress that is (or in some cases isn't) being made in various areas of investigation.

There are several other aspects of the program which are at least equally important, but which have been mentioned only in passing. For the most part they can be listed under three one-word heads: Men, Money, and Facilities. To conclude this article, we can think of nothing more appropriate than to quote from a recent survey made by a highly qualified group of civilians on these three matters:

FACILITIES

Research and development aimed at the creation of new methods and implements of warfare depend on physical facilities that are large, complex and expensive. Much is required to design and construct such facilities, and the rapid pace of modern science calls for the highest type of planning to ensure that facilities are ready when needed.

The time required for the development of new weapons is itself one of the critical factors in technological warfare. Major delays in reaching production are potentially as disastrous as technical inferiority in design. Such delays will inevitably occur when the need for physical facilities for development or test has not been properly forseen, or, if forseen, the facilities have not been provided. . . . It is essential that the Air Force take the initiative in presenting to the nation a plan for research and development facilities that is realistic in budget requirements, constructive in inter-service collaboration, and attractive to top grade technical personnel.

MEN

At the very heart of the problem of improving Air Force research and development and placing it on a firm basis for the future is the urgent need for enlightened policies for recruiting and managing military and civilian technical personnel of high competence. An organization can be effective only when it has competent personnel who are given able, inspiring, and dynamic leadership. . . . Immediate steps must be taken to husband present Air Force resources of technical manpower, to use presently qualified personnel to maximum effect, and above all to institute policies which will strengthen the technical manpower of the Air Force.

MONEY

The research and development operating budget should not be subjected to cutbacks which parallel cutbacks in funds for production and operation; first, because the quality of the Air Force in the future as determined largely by research and development should not be tied to the size of the Air Force as determined by funds for production and operation; second, because the nature of research and development work makes necessary continuity and stability of support to achieve significant results; and third, because the type of personnel needed for research and development, whose caliber determines more than anything else the caliber of work done, cannot be attracted and retained without continuity of support. . . . For the present and the future, the size of the research and development budget should be determined upon the requirements of strategic concepts and the potentialities of scientific discoveries built up through close cooperation between strategic planner and technical worker, than upon any "magic figure" imposed from above.

In general, the rising level of technology will necessitate increasing budgets for research and development and their supporting facilities to keep abreast of the times. In a very real sense, expenditures for research and development represent capital investments in the tools which will fashion the future. An examination of the trends in competitive commercial business shows the strongest recognition of the necessity of increasing budgets for this purpose.

END

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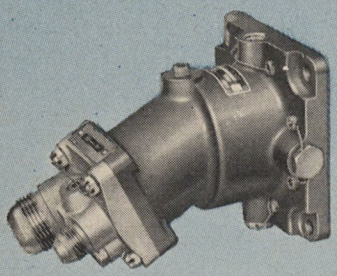

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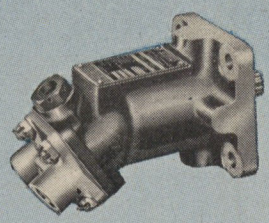

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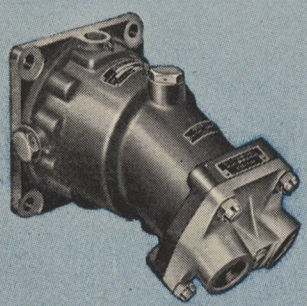

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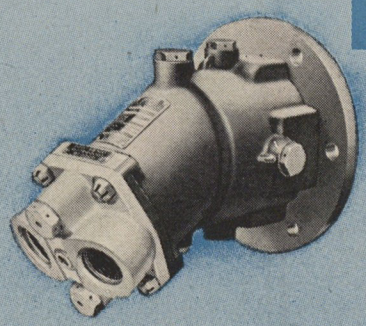

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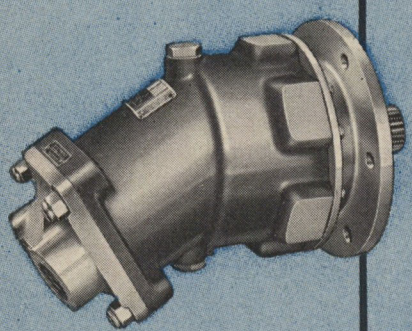

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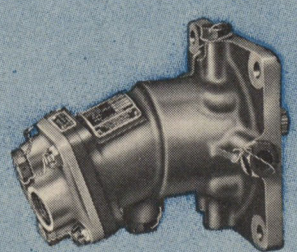

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LOW INERTIA OF MOVING PARTS

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CAN BE STALLED INDEFINITELY WITHOUT DAMAGE

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WIDE VARIETY OF MODELS FOR PRESSURES TO 3000 PSI

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Vickers Aircraft Hydraulic Motors have a very high horsepower/weight ratio . . . some models deliver as much as 2.5 hp per lb. No other motors pack so much power in so small a space. Because of the low inertia of moving parts, these hydraulic motors can be started, stopped and reversed almost instantaneously . . . making them particularly well suited for positioning devices where accurate control is needed. No clutches or brakes are required as these Vickers motors can be stalled indefinitely in any position without damage. Starting or stalled torque can be greater than running torque if desired. They will not cause radio interference.

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AFA STATE ROUNDUP

CALIFORNIA

San Francisco: Dr. John Upton and Tom Stack, the San Francisco AFA Squadron's delegates to the Bay Area Aviation Committee, have been appointed to two of the five key jobs on BAAC. Dr. Upton is chairman of the Airports Advisory Group, and Stack heads the Legislative Advisory Group.

Compilation of factual data of Squadron members for Squadron Directory is approximately 50 per cent complete, Directory Chairman Cliff Griffin recently announced.

DISTRICT OF COLUMBIA

Washington: Raymond Guay, past commander of the Nation's Capital AFA Cardinal Squadron, was named commander of the District of Columbia AFA Wing at a meeting on April 20. Mr. Guay lives at 1437 Lawrence St., N. E., Washington.

Other Wing officers elected were: Lloyd Streifuss, first vice-commander; George Hardy, past Wing commander, second vice-commander; Miss Imily Smith, secretary; and Miss Inez Smith, treasurer.

Congressional Medal of Honor winner Maynard H. "Snuffy" Smith, was selected commander of the Cardinal Squadron, AFA, for the coming year.

Other officers of the Squadron include: David E. Jamieson, first vice-commander; Paul Devine, second vice-commander; Bill Cahill, treasurer; Miss Emmie S. Mertins, secretary; Elmer Bergan, corresponding secretary; Cecil B. Guery, historian; Rev. John M. Walsh, Dean of Men, Catholic University, chaplain; and I. Walter Evans, liaison officer.

The following committee councilmen were appointed: legislation, George Hardy; publicity, Allen McAlwee; program, Joe Bates; finance, Milton Gould; membership, Eugene Caplan. Jack Richey was named official squadron photographer.

ILLINOIS

Chicago: The South Shore Squadron No. 21, AFA, held its annual dance on April 29 in the main ballroom of the South Shore View Hotel. A six piece dance orchestra furnished the music.

Door prizes consisted of such items as record albums, corsages and sightseeing flights over Chicago.

At a meeting of the Squadron on May 1, reports were made on: fund to buy Squadron's own plane, AFA's open house at O'Hare Field on Armed Forces Day, and AFA's dedication on Meig's Field (Lake Front Airport) to be held on June 30.

Installation of officers of the Chicago WAF Squadron No. 1 was held recently in the Parliament Room of the Congress Hotel.

The new slate of AFA officers include: Frances Barzyck, Squadron commander; Lillian Lindskog, vice-commander; Zola Wist, secretary; Marguerite G. Miller, treasurer; Gertrude Pastryk, organization chairman; Dorothea L. Sullivan, public relations; Helen Gorski, historian; Lucy Kelly, membership chairman; Lucille Pederson and Louise Setik, council members.

During the installation dinner, the

Members of Chicago's Squadron 101 and their wives look over a small part of the dozens of door prizes given away at the Squadron's recent third annual dinner dance held at the National Restaurant. Several hundred people attended the party, including Charles F. Stebbings, now Wing Commander for Illinois.

Chicago WAF Squadron No. 1 received its official AFA charter which was presented to Miss Barzyck, Squadron commander. The presentation was made by Mr. Edgar Zimont, past commander of AFA Squadron No. 21.

The Chicago WAF Squadron meets the first Thursday of each month at 7:30 p. m. in the Congress Hotel. The Squadron's membership now totals 33.

W. Bergstrom, 4003 N. Broadway, Chicago, was named commander of the Chicago Squadron No. 41 at the Installation Banquet held on March 11. Other officers of the Squadron are: G. Wilson, vice-commander; L. Kwiatt, secretary; M. Worshill, financial-secretary; R. Hansen, treasurer: B. Arlott, Chaplain; and S. Odahowski, sergeant-at-arms.

The newly-organized Ladies Auxiliary officers include: Mrs. Richard Leidig, president; Mrs. Howard Duvall, secretary; and Mrs. William Bergstrom, treasurer.

A feature presentation of the evening took place when Mrs. Leidig of the Ladies Auxiliary presented C. S. Orr, retiring Commander, and Burt Arlott, past commander, with the new past commander pins.

Evanston: The North Shore Squadron, AFA, sponsored a premiere of 20th Century-Fox's "12 O'Clock High" at the Varsity Theatre in Evanston on April 25.

A Squadron dinner at the North Shore Hotel preceded the showing of the 8th Air Force picture.

Robert J. Noble, 1128 Elmwood Avenue, Evanston, is commander of the Squadron.

MASSACHUSETTS

Worcester: Comdr. Thomas C. Stebbins of Worcester Squadron, Air Force Association, recently announced the following appointments:

Robert Kirkpatrick and Frank Masiolla, Jr., delegates to Worcester Veterans' Council; Stanley J. Davidson, chairman of house committee; Joseph S. Samara, chairman of sick committee; H. Raymond Fife, chairman of entertainment; Albert Nelson, Robert Mee, Chester Holstrom, Glen Rich, John Adams, George I. Alberts, Kimball R. Woodbury and Richard Perkins, improvement recreations committee.

MICHIGAN

Detroit: Stefania Lucyszyn, vice-commander of AFA's Detroit Squadron No. 1, invites Air Force veterans, both men and women, who are interested in joining the local AFA Squadron, to contact her at 19439 Anglin, Detroit 34, Mich.

Battle Creek: The following resolution was adopted by the Michigan AFA Wing at an Executive Board meeting held at Battle Creek on April 23:

"Be it resolved, that the Michigan Wing, Air Force Association, indorses the activity of the Governor's Committee in the selection of a site and its efforts to obtain National approval of this recommended site for a National Air Academy, and offers the support of this organization in its future efforts."

Frank W. Ward, 63 Highland Avenue, Battle Creek, is Michigan's AFA Wing Commander. He recently announced that the Michigan Wing will hold its annual state convention in Jackson in mid-June.

NEW JERSEY

Hawthorne: The Passaic-Bergen Squadron, AFA, held a beefsteak dinner on May 13 as the Squadron's "kick-off" for the Armed Forces Week. The affair was held at the Brownstone House and featured steak, beer and dancing.

Robert Westerveld, 1335 Belmont Avenue, Paterson, N. J., is commander

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While sponsoring the showing of "Twelve O'clock High" in Ashland, Kentucky, the local AFA Squadron found itself unable to obtain Air Force equipment through regular channels. However, by curtain time, the above display had been put together from the souvenirs which AFA members dug from their attics.

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Montclair: An Air Explorer Squadron flag was presented recently to the local Boy Scout group by and on behalf of its sponsor, the Montclair-Essex Squadron of AFA whose name appears on the flag.

The ceremonies were addressed by Lt. Behand, who represented the 1st Air Force, and George M. Parr, Jr., commander of the Montclair-Essex AFA Squadron.

The AFA Squadron was recently presented a charter from the National Council of Boy Scouts of America as sponsors of the Air Explorer Unit.

NEW YORK

New York City: The New York WAC Squadron No. 1, AFA, entertained patients at a nearby Marine hospital with a party on April 22.

The door prizes consisted of a fountain pen, Zippo lighter, wallet containing five dollars, and three envelopes each containing five dollars.

Helena Kennedy was in charge of refreshments, Marian Garrett handled the decorating and Mary Rice arranged for the entertainment.

Miss Allison Smith of 217 47th Street, Union City, N. J., commands the Squadron.

(Continued on page 62)

Members of the Akron, Ohio Squadron now have tangible proof that they can be successful in the movie business, too. The above is a photo of the interior of the AFA Squadron's new home, located at the Akron Airport. Funds received from the Squadron's sponsorship of the Warner Brothers' jet picture, "Chain Lightning," paid for enough paint, lumber, nails and furniture to remodel the old operations building tower into a fine clubroom. Joseph Gabriel, at left, Squadron Commander, and Vice Commander Kenneth Banks look over the project.

ROUNDUP CONTINUED

Niagara Falls: The Niagara Falls Squadron of the Air Force Association played host to the wives and girl friends of Squadron members at a party on April 19 at Marine-DAV clubrooms, Second Street, in honor of the Squadron's second anniversary of successful operation.

The event included moving pictures, a complete buffet style supper and other entertainment.

Lloyd W. Jordan, 1354 James Avenue, commands the Niagara Falls AFA unit.

OHIO

Cleveland: The Ohio AFA State Wing convention will be held at the Allerton Hotel, Cleveland, on June 9, 10, 11.

The program includes a "get-acquainted-again" session on Friday evening. Registration continues on Saturday morning with a business meeting from 10 to 12. AFA President Bob Johnson will be the principal speaker at the Saturday luncheon. Business meetings will be resumed in the afternoon from 3 to 5:30. A banquet will be held from 7 to 9:30 PM with special entertainment following.

Final business meetings will be conducted on Sunday morning at 10:30.

Columbus: During April radio station WHKC broadcasted a series of five programs to give the public an understanding of AF ROTC program at Ohio State University.

Produced in co-operation with AF ROTC and the Columbus Squadron of AFA, the shows were conducted under supervision of Lt. Col. Richard L. Walker, professor of Air Science and Tactics at Ohio State.

Portsmouth: The recently organized Scioto Valley Squadron of AFA has completed arrangements to locate its headquarters at Russell D. Williams Post, American Legion, 605 Front Street.

The Squadron meets the first and third Tuesday nights of the month.

Toledo: Plans are under way for an air show which will be sponsored jointly by the Toledo AFA Squadron, CAP, Toledo Chamber of Commerce and Air Pilots' Association. Tentative date is July 15 with a repeat on July 16.

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28. **MILITARY JUSTICE.** By Louis Alyea. $2.50

29. **U. S. CAMERA ANNUAL 1950.** T. J. Maloney. $6.50

30. **GENERAL KENNEY REPORTS.** By Gen. George C. Kenney. $4.50

31. **AIR FORCE DIARY.** Ed. by James H. Straubel. $3.75

32. **JET AIRCRAFT SIMPLIFIED.** By Charles Chapel. $3.75

33. **BERLIN COMMAND.** By Brig. Gen. Frank Howley. $3.50

34. **A TENT ON CORSICA.** By Martin Quigley. $2.75

35. **ALL THE SHIP'S AT SEA.** By William Lederer. $3.00

36. **OFFICIAL GUN BOOK.** Edited by Charles R. Jacobs. $1.50

37. **GOD HAS SEVEN DAYS.** By Henry Misrock. $3.00

Bargains in Books

38. AIR VICTORY. By Harold Hinton. This is a *must* for your aviation library. Harold Hinton, noted correspondent for the *New York Times*, has detailed the story of how the weapon of airpower was forged from its earliest beginnings through World War II. It is the story of men and machines, of planners and dreamers, fighter and flyers.
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39. THE GERMAN AIR FORCE. By Asher Lee. The story of the once proud Luftwaffe from the time it was secretly established in defiance of treaty regulations until it was swept from the sky by Allied airpower. Illustrated with 32 pages of photographs.
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40 THE AAF AGAINST JAPAN. By Vern Haugland. The story of all the Air Forces of the AAF whose target was Japan. Veterans of the Pacific will surely want this one. The inside story of what the various Air Forces did to bring about the downfall of Tojo and company. Illustrated with 24 pages of photos.
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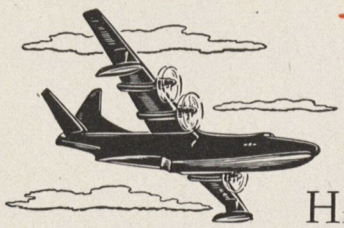

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