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planes

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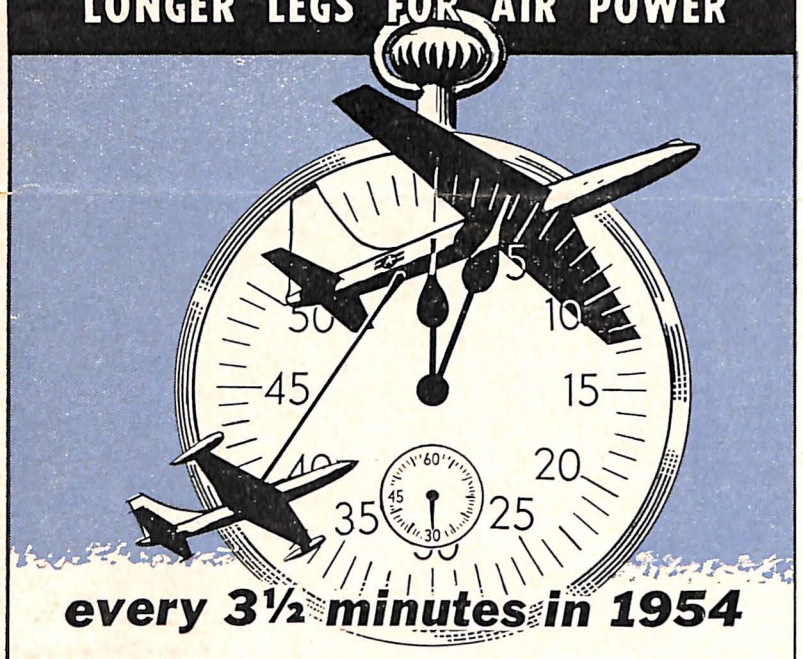
AIR POWER MULTIPLIES IN TEN YEARS

LONGER LEGS FOR AIR POWER



every 3½ minutes in 1954

On an average of every 3½ minutes, fighting planes of the U.S. military services were refueled in the air during 1954. The development of aerial refueling provides greater range for our combat planes and greater protection for America's freedom.

'PLANES'

Costly Electronics Systems Help Maintain Air Safety Record

So commonplace has the term electronics become to the average American that few realize its tremendous importance to the defense of the nation, its contribution to U. S. air superiority or to the safety of civil air transport.

When one looks skyward at a giant jet bomber winging through the skys or a swift jet interceptor rising to an air defense patrol mission it is difficult to understand that often more than half the cost of those guardians is bound up in the cost of complex electronic devices to aid the crewman seek and destroy.

And, in the air or on the ground one form of electronics—radar—that contributes immeasurably to the accuracy and precision of military aircraft and aerial weapons and to the safety of civil aviation is seldom noticed.

The rotating antenna that may be seen sweeping the skys at the larger airports of the nation may not seem unduly impressive in itself. But it represents an investment in the safety of air travelers of as much as $300,000. Below that antenna is a complex array of electronic equipment that sends and receives a signal, builds the power for its interpretation and translates that signal into a picture for the control operators. That equipment if packaged for movement would easily fill 16 full size tractor trailer trucks.

Today, in civilian work-clothes, the form of radar in use most extensively is GCA, or ground-controlled approach radar. A new version of GCA is now being made standard by the Civil Aeronautics Administration for civilian airports all over the country, and soon all our principal city airports will be equipped. This new radar will practically eliminate landing delays due

(*See ELECTRONICS, page 4*)

Decade Since World War II Brings Startling New Developments

On August 14, ten years will have passed since Japan, gazing in horror at the wreckage of Hiroshima and Nagasaki, surrendered without her main armies having ever been engaged.

Although Twentieth Century civilization has long since come to expect industrial miracles, it is interesting to pause and contemplate what has happened in aviation alone in these past ten years—a veritable moment in history.

Speeds and altitudes of all aircraft have increased at fantastic rates. In the realm of military aviation, World War II fighters, which had to be pushed to hit 450 m.p.h. and altitudes over 30,000 feet, have given way to slim jets that in level flight exceed the speed of sound and maneuver faultlessly at altitudes of more than 50,000 feet.

Research aircraft, constantly probing into the unknowns of speed, heat and height, have flown two and one-half times the speed of sound (over 1650 m.p.h.) and have topped 90,000 feet altitude — 17 miles, straight up!

Lightning-Fast Jets

The terrible destructive retaliatory power that has been built into American bombers since Nagasaki has been the free world's greatest deterrent to aggression by unfriendly powers. A single bomber in the U.S. Air Force's modern fleet packs more destructive power than did *all* World War II aircraft.

In addition, there are the new jet fighter-bombers, lightning fast atom bomb carrying planes that can strike and return almost before detection. And the awesome new guided missiles which can carry devastating bomb loads at speeds that defy interception.

Equally impressive are the giant strides made in civil transports. The airliners of just a decade ago cruised at top speeds of around 225 m.p.h. and at 10,000 feet. Today's luxurious commercial planes cruise at more than 350 m.p.h. and at altitudes sometimes over 28,000 feet in pressurized comfort.

Even faster and more comfortable planes are on the production lines to meet the demands of growing public acceptance of air travel.

In air commerce, essential not only to intercourse between free countries but vital in our domestic transportation, no nation can match the system and equipment of America's airlines.

In 1945, the scheduled airlines flew 3.9 billion passenger miles. Last year this traffic totaled 20.4 billion. Ten years ago, approximately 7.1 million people flew the airlines, but the 1954 passenger traffic climbed to over 34.1 million and equaled 70 per cent of the number of passengers, excluding commuters, carried by the railroads.

In the same period of time the number of certificated scheduled air carriers grew from 20 to 32, and airways mileage stretched out to 72,097 miles from the 1945 total of 43,285.

During this same period the airlines have established themselves as

(*See TODAY'S, page 4*)

National Aircraft Show

Philadelphia, Pa. September 3, 4, 5

More than 300,000 persons are expected to visit the National Aircraft Show during the Labor Day week-end at Philadelphia's International Airport, September 3, 4, and 5, 1955.

The show, in effect industry and government's report to the nation of the status of air power, will feature a glittering array of America's military air might with fighters, interceptors, bombers and transports of the military services, as well as civil air transports and utility planes.

Virtually all major segments of the United States aircraft industry team — airframe, engine, and electronics manufacturers; component builders and accessory suppliers—will display their contribution to American aerial supremacy.

On each of the three days the military services will demonstrate prowess of American air power in a three-hour aerial show of precision flying.

Climax of the National Aircraft Show will be the annual Allison, Bendix, General Electric, and Thompson special military jet flight events.

PLANES

Planes is published by the Aircraft Industries Association of America, Inc., the national trade association of the manufacturers of military, transport, and personal aircraft, helicopters, flying missiles and their accessories, instruments and components.

The purpose of *Planes* is to:

Foster a better public understanding of Air Power and the requirements essential to preservation of American leadership in the air;

Illustrate and explain the special problems of the aircraft industry and its vital role in our national security.

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That Youth May Learn

Beginning this month, thirty-one major colleges and universities will hold aviation education workshops in all sections of the country. From New England to Florida and California, and from Hawaii to Puerto Rico, these workshops will be meccas for hundreds of teachers. Having sent their young charges home for the summer, they themselves turn student to learn more of the tremendous impacts of the airplane on modern civilization.

Here is a laudable example of the determination of American education to keep pace with a changing world. These workshops will vary in length from two to seven weeks, with most of them over a month in duration. True, they offer academic credits, but these teachers have stronger motivation for giving up much of their vacations, many of them paying expenses out of their own meager purses. They want to equip themselves better to teach young America the facts of life in a shrinking world.

These workshops are one facet of an astonishing national movement which has gained increasing momentum over the last five years. Education and aviation have teamed to bring into the nation's classrooms an awareness and understanding, not only of the effects of aviation on their regular curricula, but of the broader social consequences in the everyday lives of the world's citizens.

Three things are necessary in such an undertaking—recapture of the lost interest and enthusiasm of youth in aviation, materials of instruction for classroom use, and superior knowledge of aviation and its impacts by the teachers who must guide such a program. It is to remedy the latter deficiency that the workshops are being held year by year, for many teachers have found that casual knowledge of aviation by their pupils exceeds their own. Coordinated by the Civil Air Patrol, the workshops have grown in number and enrollment each year.

Air age education is not a new idea. Only its organization into a pattern and program is new. There has been an uneasy feeling for years in many segments of aviation that the surge of the aeronautical sciences, the application of the airplane to modern commerce and travel, and the tremendous growth of military air performance was not being assimilated in formal education. A few tried to do something about it. But organized aviation made no united effort to remedy the lack.

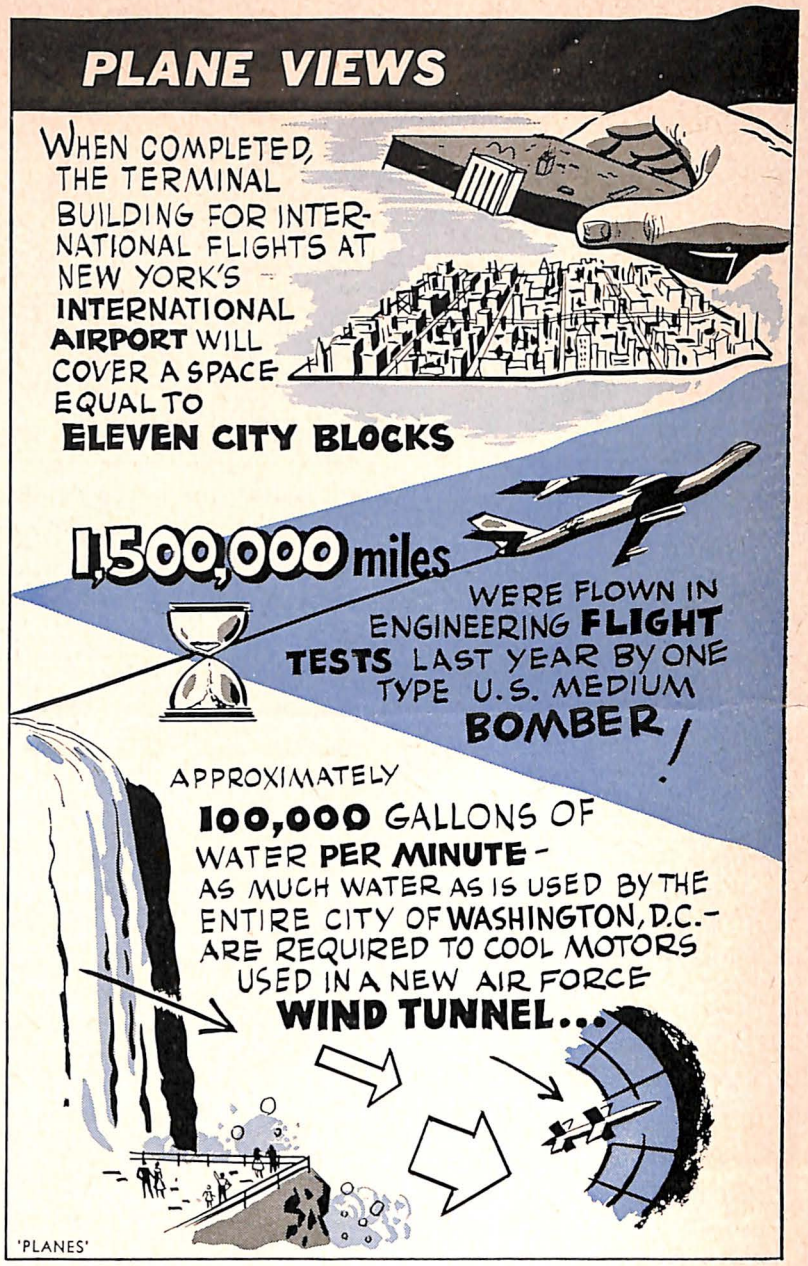
Fortunately, it was the educators themselves who finally sought the solution. The older and larger educational organizations tried separately to solve the problem. Then, five years ago, there was formed the National Aviation Education Council, an outgrowth of the Aviation Education Committee of the National Education Association. Organizers were a group of distinguished educators who were firm in their belief that the inclusion of aviation in school studies was vital to the welfare of youth. The council rapidly gained membership among teachers and support from industry and government.

Late in 1952, the Aircraft Industries Association was approached by this group with a definite plan which would supply much-needed materials of instruction for classroom teachers all over the country. They wanted sound basic materials on the many phases of aviation. They wanted wholehearted cooperation and a ready supply of information, and they needed financial support to get started. But they wanted freedom of selection of materials and the unbiased judgment of educators to prevail. The AIA agreed and there began in 1953 the Materials of Instruction Program of the NAEC.

Since that time, six books for classroom use have been published. Others are in work. They are planned by educators, prepared by teachers and evaluated by a committee of teachers. These books are not given away, except for sampling purposes. They are sold at cost to the schools, and many thousands have been distributed in this way. During the summer, other materials will be prepared for fall sale.

The National Aviation Education Council is rapidly gaining greater support, and it is believed that ultimately it will coordinate all legitimate efforts in this important field. Recently, the National Aeronautic Association raised a fund to underwrite a badly-needed secretariat for the NAEC for the next three years and engaged Dr. Evan Evans, immediate past president of NAEC, as executive director. Meanwhile, membership is growing rapidly and it is estimated that soon, without any further financial aid from outside sources, the organization will be self-supporting.

Thus are the educators solving a problem others could not solve for them. They deserve the support of all who believe that aviation is one of the greatest social forces in the world today.



"OLE MISS" TO JOIN SISTER PLANES IN AVIATION'S "HALL OF FAME"

"Ole Miss" is on her way to Washington and the Smithsonian Institution to join other famous aircraft like the machine first flown by the Wright Brothers at Kitty Hawk over 50 years ago and the Spirit of St. Louis.

"Ole Miss," a single-engine plane piloted by brothers Al and Fred Key, remained aloft 653 hours and 34 minutes—*20 years ago*—establishing a still unbroken world flight endurance record.

On June 4, 1935, "Ole Miss" climbed into the air over Meridian, Miss., and remained aloft for more than 28 days, landing on July 1, 1935. During that flight the sturdy aircraft travelled the distance of more than two-and-one-half times around the world consumed 6,000 gallons of gasoline and 300 gallons of oil. The Key brothers, to keep their ship aloft, made 438 contacts in air-to-air refueling.

The feat, far from serving merely as a stunt, has contributed greatly to the furtherance of U. S. air power. Refueling of jet fighters and bombers, key to our strategic air strength today, might not be as commonplace were it not for the determination of brothers Al and Fred Key.

"Ole Miss," being groomed all this month for her last flight, will be flown to Washington, July 2nd.

Specialty Motors, Invisible Giants

Specialty motors — tiny engines that perform many herculean tasks in making possible the operation of today's supersonic fighters, bombers, and guided missiles—are marvels of delicate, precision performance, yet capable of withstanding fantastic stresses and strains.

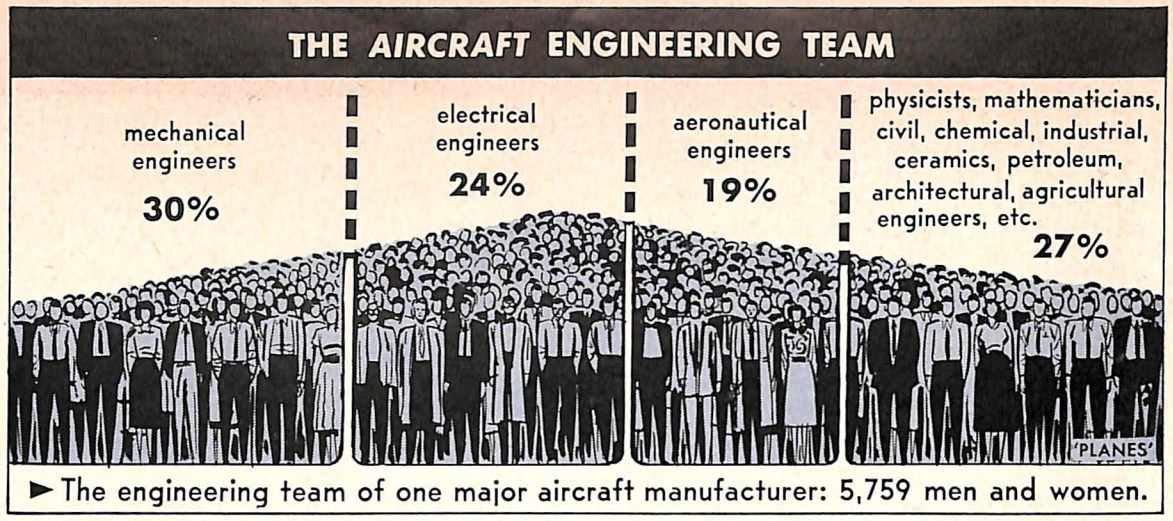
Manufacturers of these miniature power giants, to insure their capability of delivering the fullest measure to the qualitative superiority of U.S. air power subjects each to rigorous test and continuous research.

To test a specialty motor's reaction to the impact shock of rough landings, violent maneuvers and anti-aircraft fire, a 150 pound hammer is dropped 36 inches onto an anvil on which the motor is mounted. In this way up to 100 times the force of gravity in shock wave is generated.

In other tests, the motors are subjected to blasts of sand and dust at velocities up to 2,500 feet per minute; and placed upon centrifuge wheels and spun at fantastic speeds while the motor is running to determine its ability to withstand violent aircraft maneuvers.

The specialty motors are run intermittently while subjected to extreme temperatures and altitudes ranging downward to minus 112 fahrenheit and at simulated altitudes of 100,000 feet to determine lubrication effectiveness and startability.

These tiny motors, most of which function automatically — unknown and unseen — only when "called upon" for their special job, must meet rigid specifications of performance. They are invisible sinews that provide the muscle for the aerial might of U.S. air power.



► The engineering team of one major aircraft manufacturer: 5,759 men and women.

Air Travel Is Aided By 1800 Experts

Most of the 35 million Americans who traveled safely over the 72 thousand miles of Civil Aeronautics Airways last year never realized that 1,800 electronics specialists were on the ground assuring their safe passage from city to city.

Washington National Airport, Washington, D. C., is an example of the more than 2,000 commercial airports in the United States where these men are on duty around the clock. Duties at National involve routine checking of equipment in addition to any trouble-shooting that may be required.

Some of the equipment that these specialists are required to maintain and operate is so delicate that an error of one microsecond (millionth of a second) could result in a 500-foot error in the distance information furnished a pilot.

To handle the aircraft traffic at Washington National requires the time of 10 of these electronic experts.

Airlines Form Civil Reserve Fleet

Many Americans have never heard the names of some of the nation's 59 certificated airlines, but last year their 1.454 aircraft flew more than 35,184,000 passengers in and out of 543 cities of the United States.

Air transportation has created new business and new payrolls. It has saved old business and developed new products. It has developed new markets and widened old ones. It has aided foreign trade and brought peoples of the free world closer together.

Efforts of the aircraft industry and the scheduled airline operators have provided the United States with the largest, safest, most useful and most competitive airline system in the world. And most significantly during these troubled times the airline stands ready to fly for the national defense.

Today, as a result of planning by the airlines and the Joint Chiefs of Staff of the Defense Department, the airlines have created a Civil Reserve Air Fleet consisting of about half of their modern 4-engine fleet — fast transport aircraft capable of non-stop over-ocean flight. These planes are already partly modified for military operations and are subject to call—*with their crews*—within 48 hours.

This reserve air fleet represents an investment of $400,000,000. It would cost the Defense Department about $30,000,000 a year to keep it in operation on a stand-by status. In number of units, this giant reserve fleet is approximately equal to the fleet now operated by the military Air Transport Service.

PLANE FACTS

The United States, with a total of 311,659 active pilots out of a total 660,449 that have learned to fly, is probably the most air-minded nation in the world.

California tops all other states with 40,707 active pilots and Texas is second with 20,202. New York flies third with 18,713 pilots, and Illinois is fourth with 17,685. Smallest active pilot population live in Vermont where only 574 persons are pilots.

New Reactor Design May End Weight Problem For Atom Powered Plane

One of the knottiest problems in the development of an atomic power plant for aircraft—weight per horsepower—may be solved with a new atomic reactor design now under study by U. S. aircraft industry atomic experts.

The design more than halves the weight per horsepower of conventional reactors and additionally removes many moving parts that are standard in present devices.

Most of the weight and bulk of the conventional reactor was eliminated by 'nesting" a liquid metal reactor inside a cylindrical heat exchanger. This arrangement will eliminate the need for a separate heat exchanger normally used to convert water into steam to drive turbine generators of a power plant.

The new design also eliminates much of the piping, valves and other equipment which must be shielded to protect operating personnel from harmful radiation.

So far, the ingenuity of its engineers and scientists and the skills of its production workers has enabled the American aircraft industry, together with the military services, to maintain U. S. aerial supremacy despite the growing shortage of scientific personnel.

Meanwhile, scientists of the iron curtain countries are hard at work on the development of superior aircraft, nuclear weapons and power plants.

Nevertheless, government spokesmen within the Department of Defense and the Atomic Energy Commission assure that this nation still holds the lead, not only in the development of nuclear weapons but in the refinement of nuclear applications to power plants on land, sea and in the air for peace or war.

Versatile 'Copter Now a Firefighter

The versatile helicopter, which was first certificated by the Civil Aeronautics Administration just eight years ago, continues to find new and better ways to do old jobs.

One U. S. helicopter manufacturer points out that the helicopter is the ideal "fire truck" for fighting a great many hard-to-get-at fires.

With its ability to rise and descend vertically and travel at speeds of more than 130 m.p.h., regardless of ground conditions, these rotary-wing fire wagons could save many lives and much equipment.

It would be especially suited for establishing a fire break in forest fires and, under appropriate conditions, could be used for fighting petroleum fires, fires aboard ships and conflagrations in multi-story buildings.

In addition to its ability to travel over trees, deep snow, water and other types of difficult terrain, the 'copter fire truck could hover directly over the fire, blowing the flames to the ground with its rotors while attacking the source of the fire with a foam solution.

The type equipment for the helicopter fire truck—hoses, ladders and tanks—would depend on the type service it would be required to perform. It could even act as an airborne pump station, drawing water from a well or lake and pumping it to the location of the fire.

Scientist Shortage Curtails Projects

The present shortage of scientists and engineers is causing many essential industries to curtail projected increases in research and development programs, according to studies now being made by the National Science Foundation.

In a survey covering 200 large companies engaged in research and development, NSF says that at least 50 per cent of the firms indicate a shortage of these essential men and all agree on the need of better qualified, more highly trained specialists.

The survey says that industrial research plays the largest role in the national research effort and that industry conducts about 65 per cent—$2.5 billion — of the $3.9 billion budget.

Today's 'Miracle' Planes Are Result of Many Years of Planning

(*Continued from page* 1)

a safe means of transportation, nearly matching the much slower transport of the railroads. Their safety record in 1954 was .08 per 100 million passenger miles flown. This is within one-tenth of a percentage point of the 1954 record of the railroads.

The growth of the helicopter during this amazing past decade is one of the highlights of aviation history. The realization of many years' experimentation and trial, these rotary wing aircraft fully proved their capabilities throughout the Korean War as they performed one amazing feat after another, saving the lives of countless American men, and giving military liaison, observation, photography and communications a new tool.

The first helicopter was certificated in 1947. Today, there are three U.S. helicopter airlines, carrying either mail and passengers or both, and two larger scheduled airlines are at present conducting exploratory operations with these aircraft. Also, American-built helicopters make up the fleet of a Belgian airline, the first airline in the world to conduct this type transportation commercially, and are flown by other nations throughout the world. Amazing feats proclaim their future — exploration in inaccessible places, use in construction, agriculture, police and patrol work, and even in political campaigning!

Utility Aircraft Use Climbs

It was not until the last half of the forties that utility aircraft found their proper place in U.S. aviation. Before that, low powered, relatively frail craft had limited horizons. Today, private planes fly more miles and hours than do the commercial airlines, and the fleet of utility planes engaging in industrial operations far outnumber the scheduled air fleet.

Most spectacular gain in utility aircraft is in business flying. Today, corporations operate their own aircraft, and the number is increasing greatly every year. But utility planes of all types also have proved successful in various other operations. They have revolutionized such jobs as pipe line patrol, agricultural spraying and dusting, jobs in which the helicopter is also widely used. Although training and sports flying still continue on a large scale, the utility airplane is much more popular today as an instrument of business.

One of the greatest contributions to peacetime living, as well as wartime preparedness, is the development of electronics that has been fostered by the aviation industry.

Through widespread use of miniaturization, electronics are contributing daily to make the life of Americans easier. Such things as refrigerators, radios, and television are much more compact as the result of this new science and operating efficiency of most engines and electrical circuits has been greatly improved.

When applied to aircraft, electronics has made possible such unbelievable things as radar and I.L.S. (Instrument Landing System). It has enabled the aircraft manufacturers to keep down weight and size and yet greatly increase the efficiency and combat potency of American military aircraft.

The marvels of aircraft and commercial air conditioning, cockpit cooling, weapons systems, automatic flying and the incredible new guided missiles and pilotless aircraft have all been made possible through application of this new science.

Rocket Powerplants

The V-I and V-II missiles of World War II are as slingshots when compared to the astonishing new missiles that have been developed by American scientists and engineers.

As a result of the constant research and development that is being poured into missile studies, an altitude of 250 miles straight up and a speed of 5,000 m.p.h. have already been obtained in an experimental flight with a two-stage missile. Other flights with single-stage missiles have greatly exceeded 100 miles altitude on a number of occasions.

High-thrust, short-duration solid propellant rocket powerplants have already been produced that deliver as much as 100,000 pounds of thrust.

And there are the newest of all types of aircraft, the vertical take-off planes, that have just recently appeared on the scene of U.S. aviation. Future developments of these experimental aircraft may well foreshadow an entirely new era in transportation, greatly reducing the need for big airports and long runways as they take-off almost straight up and carry their cargo and passengers at great speeds in level flight.

Aviation Frontier Endless

Many of these achievements of aviation during the decade since World War II sound like overnight miracles, but they are not. Most of the major developments—so new today—were on the drawing boards and in the research laboratories even prior to the second War.

Gen. Jimmy Doolittle has described this period in aviation as "The Age of Wonders," but, actually, we just are beginning to get a glimpse of the wonderful things in store in the years ahead.

Only man's imagination can limit the adventures of the future.

At the Sound of An Alert

A late model jet fighter with afterburner can climb eight miles to intercept enemy bombers and fighters in the same time needed to drive an automobile around an average city block.

SAFETY ON THE SKYWAYS

2.8 million miles per fatality...

America's fleet of utility aircraft flew more than 2.8 million miles per fatal accident last year. So precisely constructed and carefully maintained are these modern planes that each one provides thousands of flying hours and hundreds of thousands of miles of travel for busy executives and private operators.

'PLANES'

Electronics Is Key To Air Traffic Safety

(*Continued from page* 1)

to fog and other instrument flight conditions.

Radar operators seeing the "pips" of a dozen aircraft simultaneously on their screens have had to call for specific maneuvers for positive identification of any one of those planes. But a new system in production, automatically "draws a line" on the screen, spotting the plane contacted. Another new development called "video mapping" electronically reproduces a map on the ground operator's radarscope showing terrain hazards, airport runways and proper flight paths.

This new airport equipment is technically capable of assisting the pilot to land any aircraft equipped for normal instrument flight "regardless of visibility," or completely blind. Used to control and expedite traffic around a busy airport, it will permit landings and take-offs at the rate of one a minute during periods of minimum weather conditions.

30,000 Takeoffs and Landings Daily

Few Americans realize that, while there are about 1,450 multiengined commercial aircraft making 30,000 arrivals and departures daily on the nation's airports, in addition there are in operation by business and for executive travel, more than 20,000 other aircraft, with another 10,000 in use by farmers, ranchers, and others. Each day more than 600 aircraft depart or arrive on flights to foreign lands.

Jet Power for Air Power

More than 34,000 jet engines have been built for the U.S. Air Force by one jet engine manufacturer.

Developing more than 10,000 pounds of thrust each, these engines represent a total of 34 million pounds of thrust. At a speed of 600 m.p.h., they would produce 54.5 million horsepower.

AIR QUOTE

"It is important that those who have management responsibilities take seriously their obligation to use engineering manpower to the best advantage; not to waste engineers on jobs others can do, for example.

"It also is important for us to work toward national policies that enhance and conserve engineering manpower. The dilemma we are now in about drafting engineers is a case in point. There are good policy reasons for insisting that no young man escape the sacrifice that other young men must make in military service. On the other hand, engineers are scarce and, if we are to sustain a program that will keep us out ahead in this technological race [*with Russia*] our need for engineers and scientists must be expected to increase rather than decrease.

"This is a problem that we must deal with on a strictly national-interest basis. If we are to win this race, our manpower must be disposed to our greatest national advantage. The military services require some specialists in the performance of their missions. Beyond this, we cannot afford to put engineers and scientists into uniforms."—*Donald A. Quarles, Assistant Secretary of Defense (R&D) October 11, 1954.*