

February, 1956

Vol. 12, No. 2

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OFFICIAL PUBLICATION OF THE AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA

# **AIR INDUSTRY BOOSTS RESEARCH SPENDING**

DANBS

# **Combat Planes Get New Pilot Aid**

With the development of an electronic device designed to smooth out "bumps in the sky," the U. S. aircraft industry has now succeeded in giving Navy jet pilots an almost superhuman helping hand in controlling their craft.

A jet pilot whose plane hits an "air bump" in the sky at extremely high speed is somewhat in the same situation as the man driving an automobile without shock absorbers over a wash-board road at 80 miles an hour. The plane, under some weather conditions, could be very difficult to control. And at present speeds of more than 600 miles-per-hour, before the pilot could correct the roll, pitch, or yaw, his plane might be miles off the correct flight path. In combat his plane might be rendered ineffective before he could fire a shot.

In order to eliminate this problem, one of this nation's aircraft companies devised an electronic helper, which at the first "bump"\_\_ caused either by natural air currents or by any other air disturbance - immediately analyzes the situation, then automatically adjusts the controls to keep the plane flying level. With this electronic co-pilot, the plane still rolls on the first shock, but then smooths out quick-

ly, returning to level flight. This new flight control system also leaves the pilot free to attend to such important duties as checking instruments and navigation, or to take a well-deserved rest from flying the plane. Once the auto-pilot is set, the plane flies on course automatically.

When the pilot hits an air bump. the device reacts so quickly, that the pilot hardly knows it happens at all; but he knows that his plane flies steadier, easier when he turns n the electronic co-pilot.

### Air Travel A Winner

Las Vegas, Nevada, is one of the top U. S. communities in number of top 0. Sengers it originates in relaair passenget a strainates in rela-tion to population. According to a government survey, 191,923 travelers enplaned from this city of 24,000 during the 1955 fiscal year—as many as came out of Birmingham, Ala-bama, with its 560,000 population.



### CHALLENGE TO SURVIVAL

The Soviet Union produced as many Ph.D's in 1953 as the United States. But U. S. degrees were 2.3 to 1 in favor of the humanities, while the Soviet degrees ran 3 to 1 in favor of science and engineering.

At present the Soviets are graduating two-ond-one-half times as many engineers as the United States.

The record of the United States aircraft industry during the last five years is one of great achievement. Yet, the greatest job lies ahead. If this nation is to retain a safe margin of air superiority over the Soviets, then American youths must be encouraged to follow careers in science and engineering.

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# "Surface Mail By Air" Continues **To Gain Favor With Public**

The phenomenal growth of air mail in the United States stems from an insistence by the public that mail be carried by the fastest means possible.

Air mail had its beginning in 1918 when service was started be-tween New York and Washington. The advantages were so immediately apparent that three years later letters were being flown coast-to-coast in 33 hours. Today, it is pos-sible to mail an air mail letter in New York at the close of business and have it delivered in San Fran-

cisco the following morning. Airlines in 1954 carried more than one billion letters. Use of air mail has increased more than 560 per cent since 1938. Transport aircraft today carry more mail in any 30-day period than they flew in the entire year of 1938.

This amazing gain in service is due to progressive thinking of the Post Office Department and the beneficial partnership of U. S. air-lines and the aircraft industry that has continually produced transport aircraft that fly heavier loads over greater distances at less cost.

Payment to airlines for carrying mail is still confused with subsidy which is paid to the airlines for other services. Subsidy and air mail have been separated since 1951. Air mail today makes a substantial profit for the Post Office Department. During 1954, the Post Office made about \$8,500,000 on air mail carried, and profits since the separation of air mail and subsidy amounted to \$22,000,000 at the end of 1954. Ninety-eight per cent of the mail carried was flown on subsidyfree airlines during 1954.

The most recent experiment in improving mail service was inaugu-rated in September 1953 when the Post Office decided to make the benefits of air transport's speed available to more people. The experiment was known as the surfacemail-by-air plan.

On a space available basis, ordinary first-class mail has the opportunity of going by air over certain East Coast routes. The plan was later extended to major points on the West Coast.

The experiment has proved a success. During the first year, surface mail carried by air saved its senders nearly ten billion hours of de-(See AIR MAIL, Page 3)

#### **Policing The Airways**

Eighty-five planes, equipped with racks of electronic testing equip-ment, are used by the Civil Aeronautics Administration to check the accuracy of the ground aids to air navigation on the 100,000 miles of U. S. airways.

# Aids U.S. To Hold **Air Superiority**

United States industry is currently spending upwards of \$3.7 billion for research and development, according to the National Science Foundation. More than 20 per cent of this total will be expended by the aircraft industry, which is charged with maintaining world air superiority.

Because of the rapid rate of aeronautical progress throughout the world, and particularly behind the Iron Curtain, the American aircraft industry team has had to plow back an unusually large percentage of its profits into research and development.

In 1953, the latest year for which complete figures are available, the aircraft industry spent approximately \$758 million for research and on development projects. This amount is equivalent to 12 per cent of aircraft industry total sales dollars, while the national all-industry average expenditure during the same period amounted to only 2 per cent of total sales dollars.

This large and continually growing expenditure made by the nation's aircraft industry is particularly noteworthy when considering the un-usual primary sales area in which it operates. Biggest customer of the aviation industry, of course, is the United States government. The rate of profit is artificially restricted by government policy, while at the same time, the government is urging greater private investment in aviation research, development and production.

At the same time, because the government is virtually their sole customer, the financial hazards that aircraft manufacturers face in research and development and subsequent production can be awesome. Three years ago, for example, one major aircraft company lost 22 per cent of its net worth as the result of the termination of a single contract.

If this catastrophe had been due to an improper gauging of commercial supply and demand or to poor company management, it could be considered justifiable. In the case of this aircraft manufacturer, however, it was the result only of a change in military requirements.

In order to fulfill current military production requirements as well as to anticipate future demands in production and particularly the devel-

(See AIR INDUSTRY, Page 4)

### 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.

Publication Office: 610 Shoreham Building, Washington 5, D. C. New York Office: 350 Fifth Avenue, New York I, New York. Los Angeles Office: 7660 Beverly Boulevard, Los Angeles 36, California.

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## **Sound Progress**

Through the years the United States aircraft industry has fought for superior military and civil air power. Its record is excellent. It brought man's aeronautical dreams of centuries into reality in little more than 50 years.

But the achievement of flight produced an endless challenge to fly faster, farther and higher. The emphasis throughout aeronautical history in this nation—indeed the world—has been on power, power and more power.

During the last ten years, the gains made in aircraft engine power and horsepower-to-weight ratios by our engine manufacturers, have bordered on the incredible. During World War II, the industry was justifiably proud of its 2,000 horsepower engines. Today, jet engines developing 25,000 equivalent horsepower are commonplace, and engines of far greater power are in prospect. Ten years ago aircraft engines produced one horsepower per pound and-a-half of weight. Today they produce one horsepower per four ounces of weight.

But, riding the tails of these spectacular engines is an unwanted guest noise. This is due to the urgent defense requirements for turbojet engines of greater power. Performance is the paramount consideration and its inevitable by-product—noise—is not a major factor.

The march of civil transport toward turbine powerplants, to meet the demands of the air travelling public, has been inevitable. Recently, piston engine manufacturers, to gain a still higher margin of power, have added the compound feature to their reciprocating engines. In the compound engine, the exhaust gasses pass through a turbine wheel which extracts more energy before their release to the atmosphere. Although today's compound engines are of greater horsepower, their noise is *no* greater.

More recently, new turboprop powered transports have joined our civil air transport fleets. Their reception by residents near airports has been good. There is no quarrel with turboprop aircraft engine noise.

The turboprop aircraft climbs swiftly. As it becomes airborne, the noise that occurs in its engine falls off rapidly. Relatively little energy is left in its exhaust to make noise, and it has none of the pulsations inherent in the piston engine and even less than those in the compound engine. Beneath the turboprop aircraft, and also the turbojet, there is noticeably lacking the sort of vibration that emanates from the piston-powered aircraft passing overhead at low altitude.

The impression the public has of the turbojet engine so far has come entirely from military jet aircraft. And the jet afterburner, a device for producing quick bursts of speed, has been a prime reason for the noise produced by military jet aircraft. The afterburner will *not* be used on commercial jet transports.

The entire aircraft industry, conducting its operations always in the public, military and civil interests, is aware of its responsibilities in the field of aircraft engine noise. So from coast to coast, hundreds of engineers are working continually on sound suppression devices for ground test engine operations, as well as for aircraft in flight.

Recently, jet engine sound suppressors have been developed that markedly decrease the noise level with little or no reduction in engine power. Every month shows new progress toward even better engine silencing devices.

Research teams of industry and government are devoting great effort at high priority to engine sound abatement projects. Progress already justifies public confidence that by the time the industry's swift and comfortable jet transports go into airline operation, their engines will be much less disturbing than the transport aircraft engine sounds today.



### Aircraft Year Book To Be Published

The thirty-seventh annual edition of *The Aircraft Year Book*, official publication of the Aircraft Industries Association, will be published March 15.

Known nationally as the standard reference work of American aviation, the current edition's 476 pages are profusely illustrated and completely indexed. There are pictures and three-view drawings of all production aircraft produced in the United States, together with specifications and performance data of each.

In addition, there are twenty pictorial pages of outstanding aviation events of 1955. The book also presents a complete status report of the nation's aircraft industry and the vital role it plays in the economic and military welfare of the United States today.

Ideal for school and college libraries, it is, of course, the standard for professional reference to U. S. aviation manufacturing. The Aircraft Year Book for 1955, price \$6.00, may be ordered from the Lincoln Press, Inc., Publishers, 1143 National Press Building, Washington 4, D. C. PLANE FACTS

The Forrestal, the Navy's newest aircraft carrier, has an airconditioning system sufficient to completely aircondition two Empire State buildings.

More than 44 per cent of the airframe weight of the giant transport built by one U. S. manufacturer is subcontracted. Out of every tax dollar spent for these airplanes, USAF pays 28 cents directly to sub-contractors. Of the remaining 72 cents, the company pays out an additional 47 cents in sub-contracting. Only 25 cents remains with the company for its own operations.

A new high intensity lighting system at New York's Idlewild airport, used to guide landing pilots to the runway, possesses a total of 600 million candlepower. Each of the 20 light tubes, possessing 30 million candlepower (several times more powerful than the largest U. S. lighthouse), is controlled to flash twice each second for one-fivethousandth of a second. Because they each flash too rapidly for the brilliant glare to be retained by the human eye, the lights flashing in sequence appear only as a white glowing arrow in clear night air—or through heavy fog.

### Air Mail Move Gains Favor

(Continued from Page 1)

livery time with hundreds of millions of letters reaching their destinations an average of  $111\frac{1}{2}$ hours sooner than if they had moved by surface.

Income derived by the Post Office from stamp sales on these letters was \$29,500,000. The Post Office paid the airlines \$1,830,000 for carrying those letters and retained \$27,670,000 or 94 per cent for profit and ground costs.

This new service does not conflict with the regular six-cent air mail service. Space is contracted and air transportation is guaranteed for air mail. It continues to have priority over other mail as well as passengers and cargo.

Post Office officials said they "interpret the term 'first class mail' literally to be first class mail that should be given preferential service whenever and wherever possible." This means transportation of mail by air.

The word "subsidy" always has had unfortunate connotations. A more accurate description, as applied to Government payments to certain segments of the air transport industry, would be public service revenues.



These payments are for the benefit of a community or area, rather than for the benefit of the airlines since the money helps to pay for scheduled services at points that need the service but do not generate enough business to support it.

The airlines have made great progress toward becoming subsidyfree. The domestic trunklines today are virtually off subsidy. Subsidy payments are still made to four other segments of the air transport industry. These include local service carriers which serve the nation's important intermediate areas, international airlines, territorial carriers and helicopter services. All are making substantial strides toward lessening the need for subsidy.

The air transport industry also is a vital backstop to military air power. Planes used by the airlines can be quickly converted to military use under the Civil Reserve Air Fleet program.

The Civil Reserve Air Fleet (CRAF) consists of modern fourengine aircraft. Totaling approximately half of the entire scheduled airline four-engine fleet, they're valued at \$400,000,000. If the government operated and maintained this fleet it would cost taxpayers nearly \$300,000,000 each year. The fleet is approximately the same size fleet is approximately the same size as the Military Air Transport Servas the Military Air Transport Service which is charged with global aerial logistics for the defense establishment. The CRAF fleet, and their lishment. are subject to call within 48 crews, are subject to call within 48

hours. The air transport industry, backed by the progress continually made by the aircraft industry in producby the aircraft industry in producing better, more economical airing better, more economical airing better, best bargains.



sengers traveling on domestic and internation topping 1954's record by more than 20 per cent. \*BASED ON PASSENGER MILES TRAVELED

# Simulators for Aircraft Saving Taxpayers Millions Annually

Electronic simulators, developed for flight training by the aircraft industry, are saving the taxpayers millions of dollars each year, and even more significantly, have proved of tremendous importance in increasing safety in the air, according to the U. S. Air Force.

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It costs approximately \$400 to keep a four-engine aircraft aloft for an hour. But for less than \$30 per hour, pilots and crews can "fly" the electronic simulator and gain experience identical to actual flight without ever leaving the ground—

#### Hedgehopper Pilots Give Grasshoppers Bad Time

The grasshopper of Aesop's time really had it good compared to his descendents of today. At least he could run to his friend, the ant, for succor in time of need. But there's no place the contemporary little bug can flee to, in order to escape the wrath of today's agricultural aircraft—much to the satisfaction of U. S. farmers.

The Western states might be kneedeep in grasshoppers this year if it weren't for airplanes, which were used to spray more than 1,600,000 acres for grasshopper control.

According to a government survey, 1955 wound up the biggest year in history for agricultural aviation, with more than 4,200 aircraft certificated for dusting and spraying operations. Coverage included, not only the ill-fated grasshopper, but the spraying of more than 3,180,000 acres of forest to control gypsy moth and spruce bud worm, as well. thereby releasing multi-million dollar equipment for earning, not learning.

The simulator is constructed around the actual crew compartment of the aircraft it represents. It is actually a complex arrangement of computers that actuate, through servo-mechanisms, the controls and instruments, thus reproducing all flight characteristics of the prototype. For all practical purposes the pilot is flying.

The feel of flying to the pilot is in the response of Lis controls. His instruments are in action. A "trouble" console can present him with problems he might not encounter in months of actual experience ice, snow, sleet, malfunction of equipment, turbulence. Varying sounds warn him of trouble, and red lights tell him of danger.

To familiarize crews with the weather, geography and seasons which they will later experience, the simulator can reproduce any route in the world, all navigational problems, complete to such things as radio static—all at the flick of a switch.

So effective is flight simulation, and so vital to the economics of crew familiarization, that the Air Force has specified simulators for every type of operational aircraft scheduled for production. Major airlines, as well as the military, have ordered and reordered simulators the most effective and economical means of developing skilled crews.

Recent U. S. Air Force studies reveal that the simulator is saving over \$4,000,000 per year at one training base alone.

### Military Economy With Jet Transport Shown

Utilization of jet transports will permit the Military Air Transport Service to carry out tasks that now require 150 of the largest pistonengine transports, with only 30 jet transports. This is a dramatic example of the surging progress the aircraft industry is making in designing aircraft to do a transport job faster and at less cost.

A savings of \$40,000,000 could be made in direct operating costs in one year by three squadrons equipped with jet transports, according to an industry estimate. Fewer planes for the same assignment also means fewer air and ground crews, fewer spare engines and parts, fewer hangars, fewer stops on long hauls and less costs for aircraft fuel.

A recent Air Force airlift operation of ferrying 3,900 soldiers and equipment from Kentucky to Japan and 3,130 other soldiers from Japan to Kentucky required 43 large piston-engine transports. The same job could be done with only 8 jet transports. A typical MATS route from New Jersey to Germany now requires 18 to 24 hours, including two stops. A jet transport can make the flight non-stop in 7 hours.

#### Wings For Business

Many businessmen pilot singleengine planes, but most of those who use multi-engine planes depend on hired professionals to fly them.

An analysis of 1954 business flying shows 16,480 single-engine aircraft used primarily for business transportation, of which only 1,720 were flown by hired professional pilots. In contrast, 1,760 of the 2,080 multi-engine planes used for business flying were piloted by hired "pros."

# **Air Industry Increases Research Spending in Weapons Race**

#### (Continued from Page 1)

opment of new aerial weapons, the aircraft industry has found it necessary to invest tremendous amounts of money in research and development test facilities. In contrast to pre-World War II years, when relatively small investments in facilities were needed, vast sums of private funds have become essential in order

to maintain plant equipment and research facilities required for military design competitions.

It is conservatively estimated that the aircraft industry of this nation during the last five-year period has reinvested considerably over \$1 billion of their sales dollar into brick and mortar for research and development projects.

One aircraft company spent over \$16 million of its own funds in the development of a commercial jet tanker-

transport when the government and the airline industry, as well, evidenced little interest in the project. Today, both are ordering the big jet transport in quantity.

A major aircraft engine manufacturer has recently ordered a \$75 million dollar expansion of its facilities in an effort to speed up research and development, as well as production of new and radically improved turbojet and turboprop powered engines for both military and civil use.

#### **AIRLINE SERVICE**

An over-dressed woman boarded a giant luxurious airliner recently. She found a vacant seat and reclined. But it was not long until she apprehended one of the young hostesses in a strident voice: "Young lady, young lady, come here." The hostess respond-ed quickly, "Yes, madam, may I help you?" "I want another seat," retorted

the woman. With a "Just a mo-ment, madam," the hostess scurried through the plane. She re-turned and said, "I'm sorry, but there are no other seats. Is there something wrong with this one?"

Our traveller declared in a voice that could be heard by all nearby passengers, "Well, I always heard that it was rough riding over the wheels, and I don't want a seat over the wheels."

With no change of expression, the young lady replied, "I think, madam, that you will find this seat very comfortable. The pilot pulls up the wheels when we're airborne."

Still another of our large companies producing both engines and aircraft has reinvested more than \$175 million during the last ten years in plant expansion for production, as well as for its developmental facilities. It has built with these funds what is probably the largest privately owned jet engine development and test facility in the world. These are but a

few of the more

outstanding ex-

amples of the tre-

mendous effort being expended by the United States

aircraft industry

on its own initia-

tive and with its own capital to

keep America supreme in the air-

commercially with the free world and

militarily with the

tion directory lists

50 aircraft manu-

facturing firms in

the United States.

At least 15 of

these are large

companies with

development and

A recent avia-

Soviet bloc.

"Military research and development must be supported and assisted by independent, com-mercial efforts along the same lines.

The military establishment is limited in funds and people. Alone we cannot support the research necessary to keep our armed strength superior to that of any aggressor. Furthermore, research is char-

acterized by success only after many failures. The taxpayer, quite understandably, looks askance at any tax dollar being spent for a failure. Therefore, each year, the military services have a difficult time getting the research funds they believe necessary.

For these two reasons, our civilian industries should be encouraged to devote more effort to research."—Gen. Thomas D. White, Vice Chief of Staff, USAF, October 28, 1955.

production resources sufficient to handle major aircraft programs.

Each of these firms knows that success depends upon its ability to design and develop better aircraft than its competitors. The competition is orderly and efficient because it is guided by Air Force and Navy procurement divisions whose job it is to buy the most effective weapons America can produce.

The competition is keen and continuous, starting with the initial de-sign concept and running through the entire development and production cycle. This strong free enterprise system of the aircraft industry is typically American. Full utilization of its capability through competition is the vital key to technical leadership and survival.

#### **Flight Test Device** Saves Time, Money

Telemetering-the technique best known for its use in tracing guided missiles, from the ground-will be used for testing many functions of new experimental aircraft in flight.

While the pilot guides the test plane into climbs, dives and other maneuvers at various speeds and altitudes, electronic devices on the plane will sense such things as engine speeds, internal pressures, temperatures and rates of fuel flow. These are converted into radio signals and instantly recorded on the ground.

Developed by the aircraft industry as a method to accurately determine test performance, the new technique will save hundreds of man-hours on urgent military projects.

In the six years of scheduled helicopter passenger service in the U. S. and Europe, there has never been a passenger fatality. Today, all helicopters flown by the world's airlines are of U.S. design and manufacture, or built abroad under U. S. license. This historic record is a tribute to quality of the research, design and engineering teams of the U.S. air

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## **Chicago Air Traffic Tops That of Five Major Foreign Airports Combined**

America's leadership in civil aviation is dramatically demonstrated in a recent survey by the Aircraft Owners and Pilots Association. One U. S. airport, Chicago's Mid-

way, annually handles more total traffic than Amsterdam, Copenhagen, London, Paris and Zurich combined. Midway is the world's busiest airport.

Comparisons of air traffic between major cities of Europe in 1955, and U. S. cities handling comparable

#### **Air Quote**

"We need more scientifically trained people, not only in the Air Force, but in all fields. We need thousands more scientists. I understand that there are important jobs waiting for more than 35,000 engineers. This is easy to believe when we realize that the engineering man hours to produce a fighter airplane have risen from 17,000 in 1940 to 1,380,000 hours in 1955.

"It is bad enough when we fail to meet our own demands. However, this is made even more serious by the fact that we may be on the way to losing our technical leadership to Soviet Russia.

"The Communists have realized that the key to success in this field lies in the hands of engineers and scientists. They are now outproducing us almost 3 to 1 in graduates from science and engineering schools. And the Soviet schools are good schools! Today there are 175 institutions in the Soviet Union which teach engineering exclusively. In contrast, most of our colleges and universities teach engineering merely as part of the over-all curriculum.

While the number of technically educated college graduates in Russia continues to climb, ours declines.

"To me, this trend is almost as ominous as the Soviet production of bombers."—General Thomas D. White, Vice Chief of Staff, USAF October 27, 1955.

traffic in 1954, are even more significant.

For instance, Amsterdam's total air traffic count in 1955 was 51,876; Grand Rapids, Michigan in 1954 registered 51,989. Brussels recorded a traffic rate of 41,520; Binghamton, N. Y., had 41,481. Copenhagen had 52,620; Yakima, Washington, had 52,891. London had 98,808; Tampa, Florida, had 99,363. Paris had 86,-742; Ontario, Calif., had 86,544. U. S. air traffic figures for 1955 are not available, but year-end estimates indicate a 20 per cent increase over 1954.

Not a single major European airport had a traffic rate comparable to one of the 10 busiest U.S. airports.

Another indication of U.S. leadership: the U.S. has approximately 99,000 registered civil aircraft. Great Britain has 655.

Progress of civil aviation has been largely inspired by the U.S. aircraft industry with the design and production of planes capable of economical operation and high performance.

### **Child's Erector Set Aids Air Industry**

The aircraft industry, which uses the most advanced systems of production engineering, has turned to a child's erector set for a solution to reduce costs and speed production of aircraft control instruments.

This unique kit consists of various-sized sheets of perforated fibreboard, an assortment of angle brackets, binding posts, stand-off legs, clamps, wings and hex nuts, perforated metal sheets and strips, bolts and other fixtures. It is used to build wiring and temporary inspection fixtures, electrical testing pan-els, wiring "mock-up" boards and other assembly fixtures to meet shortrun production requirements.

As examples of the savings, the cost of a \$360 cementing fixture was cut to less than \$100; an aluminum holding fixture that might have cost \$100 was built for only \$15.