



January, 1955

Vol. 11, No. 1

planes

OFFICIAL PUBLICATION OF THE AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA

★ All material may be reproduced with or without credit.
★ Mats of all charts available free.

SCIENTIST SHORTAGE MAJOR PERIL TO U.S.

Aircraft Industry Now Building 91 Types of Planes

To maintain U.S. leadership in military and commercial aviation, the American aircraft industry today is producing 91 different models of airplanes, exclusive of pilotless aircraft.

A recent survey made by the Aircraft Industries Association shows that 28 different airframe manufacturers have a total of 65 military aircraft models in production—ranging from light liaison types to supersonic bombers. In addition, 26 models of civil aircraft are being built for the world commercial market.

For the first time, engine manufacturers are building more different models of jet engines than of piston engines.

Under production schedules required for the nation's expanding air power, and to maintain modernization of the air services, it is essential that the armed forces keep several models of the various types of planes under construction at the same time. As older models are phased out of the production program, new models are phased in, assuring steady production of the latest and most efficient models at all times.

The AIA survey also shows that nine models of military helicopters (See AIRCRAFT, page 3)

When Is an Inch Equal To One Hundred Miles?

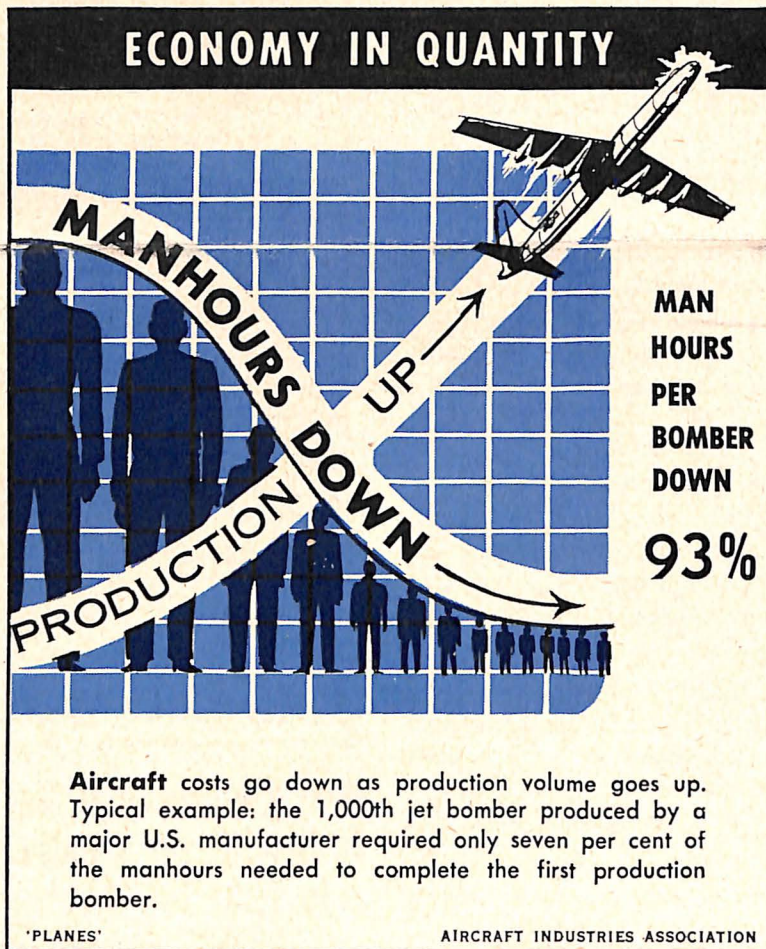
One inch can mean 60 to 100 miles on a modern U. S. transport—if the inch is in the right place.

A new turbo supercharger used on a high-speed airliner reduces engine temperatures so that less cooling air is needed, and makes it possible for cowling flaps to be closed approximately one inch more to reduce drag.

This reduced drag increases the aircraft's range approximately 60 to 100 miles under normal operating conditions.

Ten Trips to the Moon

In a single year, ground vehicles operated by a major airframe manufacturer travel the equivalent of 10 trips to the moon, hauling workers and basic materials and parts used in aircraft construction.



Graduations Drop As Demand Grows For Technicians

Written Especially for PLANES
By Donald A. Quarles
Assistant Secretary of Defense
(Research and Development)

The critical shortage of engineers and scientists in America is potentially a greater threat to our national security than are any weapons known to be in the arsenals of aggressor nations.

Since 1950, there has been a steady decrease in the number of technical graduates from U.S. schools which has now leveled off at less than half the 1950 figure. This alarming decline has occurred at a time when advances in technology have imposed mounting requirements for technical personnel in industry and national defense.

Aviation Requirements Increase

The need for engineers, scientists and technicians has been particularly serious in aviation, where research and development demands have multiplied at an almost unbelievable rate, and where design and production have become infinitely complex operations.

Because the aircraft industry is the backbone of our air power, the present and prospective future shortages of skilled personnel in this industry constitute a grave threat to our continuing air leadership.

As a matter of national policy, the United States has embarked upon an air power program designed to assure qualitative superiority over an indefinite period of years. Reliance will be placed upon our possession of better air power, more effective air power, rather than upon vast numbers of aircraft.

Face Major Problems

It is obvious that this effort to maintain our qualitative superiority in the air will require the efforts of tremendous numbers of scientists and engineers. We face many problems involved in the design and production of aircraft which will, in the not too distant future, fly and fight at multiples of the speed of sound. There are problems of heat, of control, of materials, of electronics, and many others. As yet, we have barely started the exploration of the aeronautical sciences.

(See SCIENTIFIC, page 4)

Survey Shows Civilian Aircraft Play Important Role in Military Aviation

The civil planes produced by America's aircraft industry sometimes play a dual role. As part of the nation's civilian air fleet, they serve to preserve U. S. domination of world airways.

Less well known is the fact that they frequently take their places as important elements of U. S. military air power.

Dozens of civil aircraft models, developed with private funds for commercial uses, have occupied important niches in the gallery of military aviation.

Wide Range of Types

These planes range from patrol bombers to amphibians, from trainers to cargo transports, from helicopters to liaison planes.

They have one thing in common: Each was designed and produced initially to perform key civilian tasks. Their performance was so

high, or their adaptability so great, that they later were purchased for use by the military.

A recent survey shows that since the mid-1930's at least 54 different models of these commercial-type planes have been purchased in quantity by the Armed Forces.

Seventeen Models in Service

In fact, 17 types are still in service today with the Air Force, Navy and Army.

The 54 models include 11 liaison types produced by nine different companies, 17 light transport types built by 12 different companies, eight big cargo transport types built by four different companies, seven training types built by five different companies, seven types of helicopters built by five different companies, two types of amphibians built by one company, one type of

(See CIVIL, page 3)

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 1, New York.

Los Angeles Office: 7660 Beverly Boulevard, Los Angeles 36, California.

ALL MATERIAL MAY BE REPRODUCED—MATS OF ALL CHARTS ARE AVAILABLE FREE

Big Job for Small Business

By DeWitt C. Ramsey (Adm., USN, Ret.)

President, Aircraft Industries Association

In no industrial field is there greater interdependence between large and small business than in aircraft manufacturing.

The complexity of the technological problems involved in producing modern planes, and the vastness of the manufacturing effort, make it imperative that aircraft production embrace thousands of companies in every part of the nation. As members of this manufacturing team, a multitude of businesses—small and large—play key roles alongside prime contractors in contributing to American leadership in the air.

A typical aircraft manufacturer in 1954, for example, spent more than 60 cents out of every sales dollar with other companies. Of contracts going to companies in 42 states and the District of Columbia, 55 per cent of the dollar value went to businesses with fewer than 500 employees.

Another aircraft manufacturer has 1,868 subcontractors and suppliers in 34 states furnishing parts and materials for the airframe it produces. Nearly three-fourths of these companies are small business firms. In turn, these suppliers channel their own purchases through other sources, approximately 79 per cent of which are small businesses.

These are typical cases of the aircraft industry's reliance upon the approximately 60,000 subcontractors and suppliers which constitute a basic element of this nation's aviation manufacturing strength.

The need for this partnership in aircraft production will not diminish during coming months, despite the fact that the overall level of aircraft output has begun to trend downward. It is true that, under current schedules, the volume of business both for prime contractors and for subcontractors will not be as great this year as in the immediate past. The nature of aircraft production, however, is such that a strong and healthy subcontracting and supplying industry must be maintained.

In the words of Mr. Roger Lewis, Assistant Secretary of the Air Force:

"Often it has been pointed out that the Air Force, even to a greater extent than the other services, relies upon private industry for its weapons. The fact is, we rely entirely upon industry. . . . But let us not lose sight of the fact that in relying entirely upon industry, we mean industry in its entirety, small as well as large. To do otherwise would be to deny our heritage, and in a more down-to-earth sense would mean that we were not making use of that huge reservoir of industrial skills, ingenuity and inventiveness that is available to us. These qualities are found in both large and small establishments, and to carry out the defense production program we must have today, we need every bit of ingenuity and inventiveness that exists in this country. We must encourage more of it. The constant research, the spark of genius, and development of new items have always come from individuals who live under a free economy. These things have always been desirable and have helped to build up this country. Today they are vital to our continued existence as a free people."

PLANE VIEWS

THE TAPERED WING-COVERING OF NEW JET AIRCRAFT IS **TEN TIMES THICKER** THAN THE ALUMINUM SHEETS USED IN WORLD WAR II PLANES

A SCHEDULED FLIGHT **EVERY 40 SECONDS!**

U.S. DOMESTIC SCHEDULED AIRLINES OPERATE APPROXIMATELY **2,155 FLIGHTS DAILY**

400 ELECTRIC MOTORS, GENERATORS AND OTHER ROTATING ELECTRICAL MACHINES ARE REQUIRED TO OPERATE VARIOUS SYSTEMS OF 1 HEAVY BOMBER

by Aircraft Industries Association

New Electronic Brain Is Key 'Crew Member' In U. S. Jet Bombers

A little-known crew member aboard modern jet bombers has a brain made of metal, wires and electronic tubes—and does a job that is too delicate and complex for humans.

Bombing, Navigation System

The "crew member" is an automatic electronic bombing and navigation system, made necessary by today's high speeds and altitudes.

The bomb run of a modern jet bomber, for example, starts about 32 miles from the intended target. In fact, flying at 40,000 feet, a jet bomber would release its bomb more than five miles ahead of the point of impact.

Approach at 800 Feet a Second

A typical bomb run lasts about three minutes, no longer than such a run during World War II. But the approach speed today is 800 feet per second, double that of the last war.

To meet the need imposed by these new speeds and altitudes, a system created by a major component manufacturer is able to navigate the aircraft, "see" the target, aim and release a bomb automatically.

PLANE FACTS

- A new hard-glass electron tube designed to withstand the high heat and stress conditions in modern aircraft can operate at a bulb temperature of 572 degrees Fahrenheit for a minimum of 1,000 hours.
- A fuel-air combustion starter for jet planes can crank a jet engine up to starting speed in three and a half seconds. The unit develops 340 h.p. in 3.2 seconds.
- A new drill (which performs in one operation boring and reaming formerly done in two separate operations) now saves 8,000 drilling operations in production of a jet bomber wing. Use of the tool saves more than \$14,000 annually.
- Zoologists in Alberta, Canada, use helicopters to trace migratory habits of buffalo. Hovering low over herds, aircraft crew members "brand" the animals with squirts of paint from a gun.
- Within 10 days after Hurricane Hazel struck Haiti, the U. S. Foreign Operations Administration rushed 462,700 pounds of relief food to the Caribbean nation. First relief shipments were in the air while the storm was still lashing the east coast of the United States.

Aircraft Industry Now Building 91 Types of Planes

(Continued from page 1)

are in production, and that three helicopter models are available in the commercial market.

A breakdown of the various types of planes now being manufactured in America:

Air Force: Nine models of fighters, five models of bombers, seven models of transports, two models of tankers, five models of trainers, one model rescue aircraft, two models of utility planes, and two models of helicopters.

Navy: Nine models of fighters, four models of attack planes, five models of transports, three models of trainers, one model special reconnaissance plane, one model anti-submarine warfare plane, four models of helicopters, and two models of patrol planes.

Army: Six models of helicopters, and four models of utility planes.

Commercial: Three models of transports, 20 models of utility planes, and three models of helicopters.

Tool 'Hospital' Cuts Expenses, Saves Time For Aircraft Builder

A tool "hospital" started last year at a large West Coast aircraft company keeps multi-thousand dollar machines on the job—and in top condition.

When any machine valued at \$500 or more needs rebuilding, it is scheduled for a berth in the maintenance shop. The shop rebuilds 13 to 15 major machines per month—lathes, milling and boring machines, grinders and many other types.

Formerly, it cost about \$4,750 to rebuild a large mill—and the machine was lost to the company for three to four months. Under the new plan, workers at the aircraft plant can do the job for about \$3,200 in approximately one month.

Since the shop was organized last year, approximately 280 major machines have been rebuilt.

Civil Planes Perform Vital Military Roles

(Continued from page 1)

autogyro and one type of patrol bomber.

Throughout aviation's history, civil aviation has contributed to the advancement of military aviation, just as military developments have led to increased safety, dependability and performance of civil aircraft.

The privately-financed research and development undertaken by the aircraft industry, both for commercial and for military purposes, plays its part along with Government-financed research and development programs in contributing to the advancement of all aviation.

Air Quotes

"The three biggest problems that confront us in the Air Force today are: Readiness, Quality, and Economy.

"The first of these, Readiness, requires keeping the entire United States Air Force at a peak of efficiency, right now, today, to-



night, and for every day and night of our lives, never to let it lose its edge for a minute, even though nothing happens and

everything seems peaceful. That is a tough thing for fighting men to do in peacetime. It is something new in our country—to keep an alert air defense system and a powerful counter-offensive force, ready to strike at any minute, at any hour, on receipt of a single coded signal.

"But this is what we have to do. Our survival depends largely on the readiness of our air power. I am afraid that the new phrase, 'peaceful coexistence,' means just this: You exist, if you are too tough to tackle. You perish, if you are weak or unready."—*Air Force Secretary Harold E. Talbott, November 24, 1954.*

Fighter's Power 27 Times Greater Than WWII Plane

A new king-sized fighter plane, the largest of its kind ever built for the Air Force, can produce at high speeds enough horsepower to equal an entire flight of 27 World War II fighter aircraft.

The big plane, designed as an escort fighter for the Strategic Air Command, carries only a one-man crew.

Industry Uses Ingenious Methods to Construct Lilliputian Parts for Brobdingnagian Planes

Aircraft workers live in a world of contrasts.

Some of the planes they build weigh over 200 tons when they roar into the skies.

Yet some of the parts for these planes are so tiny that they must be constructed under the lens of a powerful microscope!

For example, the tolerances on tiny steel balls inside the bearings of a modern aircraft gyroscope must sometimes be *ten-millionth of an inch*—about 1,400th the width of a human hair.

Precision Manufacturing

The precision that goes into manufacture of components such as these inevitably means that costs are higher than when planes were built of fabric-and-wood or of thin aluminum sheets as in World War II. But this same precision assures superiority of U. S. aircraft, adding immeasurably to speed, maneuverability and payload.

Some of the production problems faced by manufacturers require techniques and operational procedures unknown in industry a few years ago. The two-thousandth horsepower motor used in the defense system of one modern bomber, for example, has more than two miles of fragile wire which must be wound into place tightly, yet with a featherlight mechanical touch which minimizes stretching. To build it, the manufacturer must wind 40,000 turns of this spider-web wire into coils.

Production Problems

In flanges produced for a typical aircraft exhaust system, surfaces must be smooth to within 100-millionths of an inch, on the average. The manufacturer explains that if

100-millionths of an inch were represented by the thickness of one dime, one inch would be 400 times as high as the Empire State Building!

Some parts for aircraft are so small that they can't even be cleaned by ordinary processes. A major company has recently developed a new type of device using ultrasonics—or "silent sound"—to scrub microscopic but critical dirt from precision products like miniature bearings for high-speed gyros, aircraft oxygen system parts, watch-type gear trains, and precision synchros for aviation instruments.

Cost Reduction Efforts

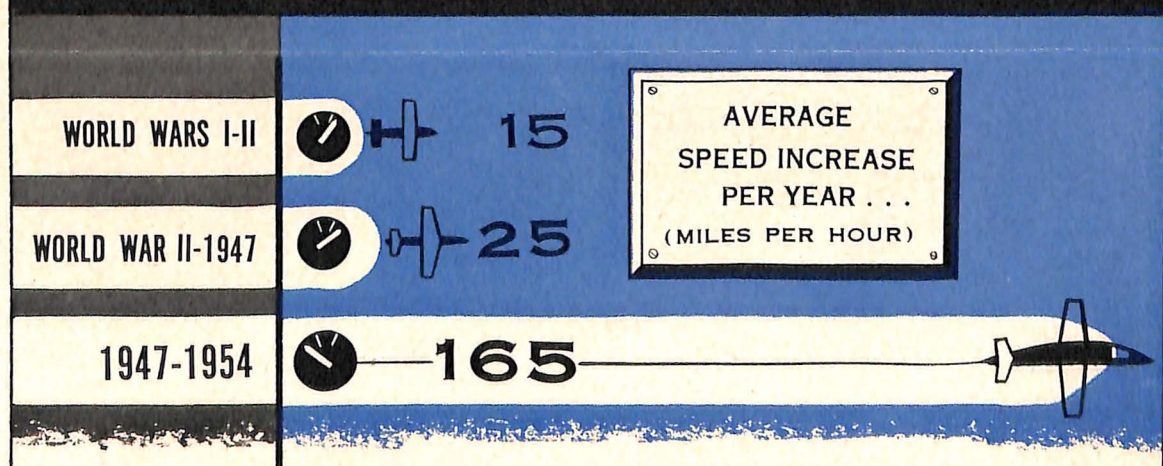
In production of such complex items as these sub-miniature components cost-consciousness and ingenuity pay great dividends. One company has developed a special gauge, with fingers sensitive enough to detect variations in the thickness of a butterfly's wings, to inspect turbine blades and assemblies. The gauge will measure within five ten-thousandths of an inch, doing a job in five minutes that previously took eight hours, thus cutting costs, speeding production and improving quality.

Flying 'Down on the Farm' Turns Into Big Business

Use of agricultural airplanes for aerial pest control, weed control, and fertilization adds an estimated \$3-billion to U.S. farm income each year.

The Civil Aeronautics Administration reports that the total amount of dusts and sprays applied by air each year in the U.S. would more than fill 1,000 freight trains, each 50 cars long.

THE PACE OF AIR PROGRESS



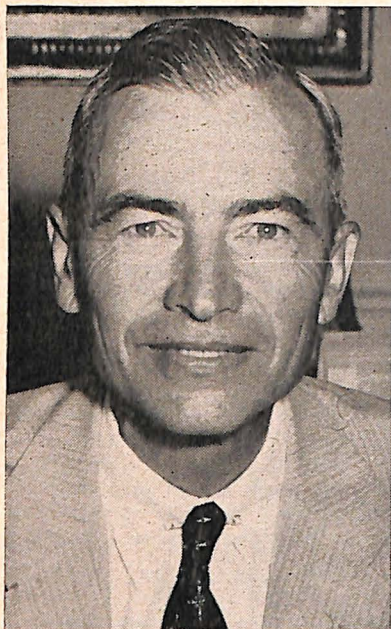
Intensive research and development by the aircraft industry in recent years has led to unprecedented speeds for modern U.S. aircraft, with performance increasing at a rate far greater than at any time in the history of aviation. Between World War I and World War II, the speed of aircraft increased at an average annual rate of about 15 miles per hour. Since 1947, the average annual speed increase has been 165 miles per hour.

Scientific Manpower Shortage Threat To U. S. Security, Says Donald Quarles

(Continued from page 1)

The only way we can find the answers to these knotty problems is to assure that America has adequate numbers of scientific and engineering personnel, and that their energies are devoted to this end.

Today we have little justification for complacency regarding our relative capabilities as compared with



DONALD A. QUARLES

those of Russia. We must face the fact that technological advantages which we have so long enjoyed could be lost through apathy or through lack of long-range planning designed

Air Bases Bring Business To Nearby Communities

The 179 Air Force bases and installations in the United States provide reassuring evidence that national security is not being neglected in an atomic age.

They also play a key role in the economy of communities in which they are located. Typical examples are Forbes Air Force Base and Topeka Air Force Depot in Kansas. In addition to millions of dollars spent in Kansas on maintenance and operation of the bases, the combined payrolls of the two installations amount to \$30,995,901.70 per year—more than \$2,580,000 per month.

A recent survey shows that more than \$7,129,000 of the annual payrolls goes to grocery stores and restaurants, more than \$5,889,000 for rent and house payments, and more than \$1,859,000 for insurance, entertainment and savings. Additional millions are spent by Air Force and civilian personnel for automobile upkeep, clothing, medicine and other miscellaneous items.

Through the millions of dollars funneled into the Kansas economy, these air bases have become pillars of their communities as well as a constant assurance that America is maintaining its aerial vigilance in an age of peril.

to meet our scientific needs. The element of time, which favored us in past emergencies by giving us many months to mobilize our resources and train our personnel, already has been nullified by the ability of enemy nations to launch all-out attacks against our homeland without warning.

Reds Emphasize Science

Reports on the Soviet Union indicate that the Reds are exerting intensive efforts to channel the interests of Communist youth toward science and engineering. Elementary and secondary schools stress science and mathematics. Incentives are provided for advanced students in engineering and science; and liberal rewards are given to their working scientists and engineers.

It has been estimated that this year the Russians will graduate approximately 50,000 engineers—more than double the number who will receive degrees from U.S. colleges and universities. An estimated additional 50,000 Russians will be graduated as subprofessional engineers, and trained and highly qualified technicians.

Upon this great and growing reservoir of engineering personnel the Soviet Union will depend for future progress in the global competition for technological and scientific supremacy.

Only by matching them in ideas and skills can we expect to achieve a reasonable degree of national security in future years.

Encouragement to Youth

Certainly there is no desire in America to regiment or to mould the minds of youth as do the Russians, but there is a grave responsibility on the leaders of Government, of education, and of industry to provide new motivation and incentive for our youth to enter engineering, scientific and related fields.

Talented young Americans have been called this country's greatest natural resource. It is vital to our security and welfare that those who have been endowed with the talents meet the challenge and build careers for themselves and leadership for their country in science and technology.

Lots of Gasoline Needed To Keep Airliners Flying

The domestic scheduled airlines are major customers of the U.S. oil industry.

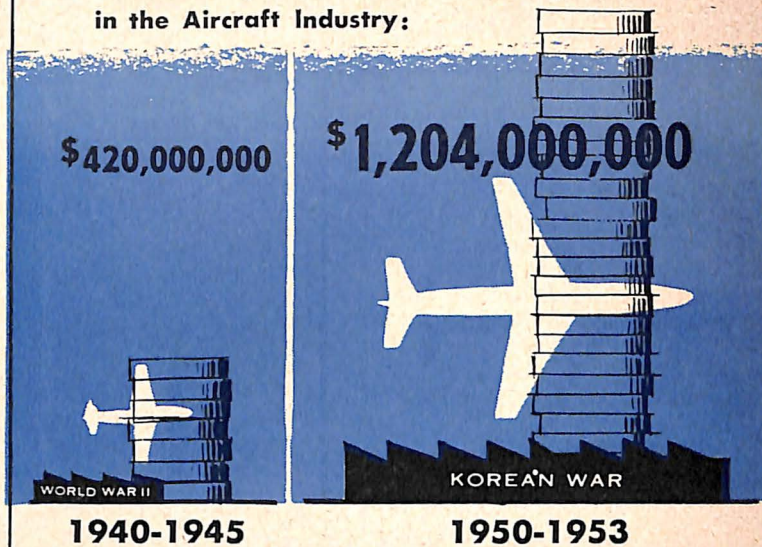
To keep America's fleet of scheduled airliners flying, millions of gallons of gasoline are purchased each year.

Figures for a recent year show that domestic scheduled lines used 685,534,977 gallons of gasoline and 7,145,093 gallons of oil.

That amounts to an hourly consumption, day and night for the entire 12 months, of more than 79,000 gallons of gas and oil. Hourly expenditure for gas and oil amounted to about \$15,024 — or more than \$131,600,000 for the entire year.

BUILDING AMERICA'S AIR ARSENAL

Privately Financed Facilities Expansion in the Aircraft Industry:



1940-1945

1950-1953

Despite the historic fluctuations in military aircraft production requirements and the consequent financial risks imposed, the aircraft industry spent more than \$1.2-billion in private funds in expanding production facilities in 1950-1953. The industry provided a far greater proportion of facilities expansion funds during the post-Korean period than was the case in World War II—34.1% as contrasted with 10.1%.

The requirement for heavy private investment in facilities continues, even though the scheduled expansion of production facilities has been virtually completed. Rapid advances of all the sciences—including aeronautical—have imposed a mounting need for acquiring and modernizing the complex and costly research and test equipment and facilities essential to today's advanced, high-performance military aircraft.

'PLANES'

AIRCRAFT INDUSTRIES ASSOCIATION

Aircraft Industry Spends \$4-billion On Subcontracts, Materials in 1954

Businesses in almost every community in America serve as partners with the aircraft industry in building U.S. air power.

Many of these businesses are subcontractors to major aircraft manufacturing concerns. Others are producers of materials, fuels or electricity essential for the construction of the complex new aircraft that serve as the nation's first line of defense.

Payroll: \$3.54 Billion

Last year, the U.S. aircraft industry spent approximately \$4-billion in all parts of the country for subcontracting, for materials, for fuels, and for electricity used in airplane manu-

facturing. (This \$4-billion was in addition to the estimated \$3.54-billion paid to approximately 800,000 direct employees during the year.)

The industry's purchases, (accounting for about 47 cents out of every sales dollar) went to companies in almost every state. These companies, part of the aircraft-production team, include members of the iron and steel industry, the aluminum industry and other metal industries which provide the sheet and plate and bar and rod which the aircraft industry needs. They include the power plants which furnish electricity, and the thousands of vendors, suppliers and subcontractors which furnish parts for equipment and sub-assemblies.

Expenditures for Raw Materials

A recent conservative estimate indicates that 1954 aircraft expenditures for raw materials alone amounted to some \$688-million. This figure breaks down to about \$300-million for aluminum; \$250-million for alloy and stainless steels; and more than \$100-million for other metals.

The aircraft industry, for example, is the number-one buyer of heat treatable sheet and plate, of hard-alloys, extruded shapes, and of rolled rod, bar, and structural shapes.

Utility Flying in U.S. Eclipses Rest of World

The 64,875 aircraft owned by individuals and businesses (excluding airlines) in the United States outnumber, by far, the total number of aircraft registered in the entire rest of the world.

In fact, the 10,847 planes operated by citizens of California come within 1,094 of equalling the 11,581 civil planes that are the combined total operated in 21 other nations.