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SMALL FIRMS HAVE BIG PART IN AIR POWER

USAF's Expansion Is At A Minimum

The United States Air Force buys from hundreds of U.S. companies—big and small—in a program geared to meet planned expansion to 137 wings. This size force, the Defense Department figures, is about the smallest it can maintain and still be instantly ready to meet the threat of an aggressor.

Equipping the military with the latest jet fighters, bombers, and guided missiles is an expensive proposition today—if you count only the construction dollars. Considered in light of what might happen by way of destruction to the nation's homes, whole cities and their population, if the U.S. didn't maintain aerial superiority, those construction dollars for air power pale into insignificance.

Air Force officials are reluctant to discuss the cost of individual aircraft, which vary according to production quantities and type of mission, but say that the latest heavy jet bombers cost, in round figures, about $7,500,000 each; and that the average production fighter costs about $793,000 each.

Some jet engines cost about $250,000 each in quantity production and

(See *MANY SKILLS*, page 3)

Three-Cent Air Mail Cuts Costly Hours

The highly successful three-cent-mail-by-air experiment being conducted by the U.S. Post Office Department has already saved time-conscious American businessmen in excess of 11.5 billion hours, according to the latest data officially released by the postal service.

Begun in October, 1953, to test the feasibility and cost of transporting first class mail by the fastest means available, the experiment is now being operated between more than 185 cities. The fast commercial transports of the scheduled airlines are already saving millions of hours in time normally consumed in shipping mail from post office to post office.

A typical example is the mail being carried experimentally between New York and Chicago. Each bag

(See *FIRST CLASS*, page 3)

AIRCRAFT SUPPLY SOURCES / U.S.A

ALABAMA	*Aluminum sheet, pipe fittings*
ARIZONA	*Wings, aircraft equipment, copper, aluminum*
ARKANSAS	*Bauxite, aluminum reduction*
CALIFORNIA	*Aluminum forgings, castings*
COLORADO	*Nails*
CONNECTICUT	*Bearings, titanium forgings, machine tools*
DELAWARE	*Explosive rivets, titanium sponge*
FLORIDA	*Miscellaneous hardware, tools*
GEORGIA	*Gum plywood*
IDAHO	*Garnet sand, lumber*
ILLINOIS	*Hydraulic restrictors, view finders, magnesium*
INDIANA	*Fuel cells, hydraulic assemblies*
IOWA	*Aluminum plate, oxygen equipment*
KANSAS	*Castings, instruments*
KENTUCKY	*Aluminum, steel sheet and plate*
LOUISIANA	*Masonite*
MAINE	*Paper*
MARYLAND	*Electric tools, electronic tube shields*
MASSACHUSETTS	*Engine components, switches*
MICHIGAN	*Machined parts*
MINNESOTA	*Ammunition chutes, chemicals, cements*
MISSISSIPPI	*Drag chutes, masonite*
MISSOURI	*Laboratory equipment*
MONTANA	*Copper, lumber*
NEBRASKA	*Flight controls*
NEVADA	*Magnesium, titanium*
NEW HAMPSHIRE	*Sub-miniature blowers*
NEW JERSEY	*Electrical actuators, ceramic terminals*
NEW MEXICO	*Refined ore*
NEW YORK	*Refrigeration equipment, aluminum bar*
NORTH CAROLINA	*Parachutes*
NORTH DAKOTA	*Leather*
OHIO	*Landing gear struts, screws, bolts, jet engines*
OKLAHOMA	*Specification lubricants*
OREGON	*Lumber*
PENNSYLVANIA	*Fittings, control gears, switches*
RHODE ISLAND	*Aluminum tube, machine tools*
SOUTH CAROLINA	*Asbestos cloth*
SOUTH DAKOTA	*Eye bolts, rod ends, bushings, spacers*
TENNESSEE	*Aluminum sheet*
TEXAS	*Thermocouple testers, fasteners, oil*
UTAH	*Copper, steel*
VERMONT	*Taps, drills, reamers, milling cutters*
VIRGINIA	*Standard and specialized machine tools*
WASHINGTON	*Hydraulic parts, aluminum sheet*
WEST VIRGINIA	*Clips, coal*
WISCONSIN	*Aluminum rivets, circuit breakers*
WYOMING	*Wool*

Aircraft Industries Association

Lion's Share Goes To U. S. Suppliers

By DeWitt C. Ramsey
(Adm., USN, Ret.)
President, Aircraft Industries Association

The security of the free world, economically and militarily, rests in substantial part squarely on the shoulders of American industry, large and small. Without their skilled capabilities and productivity, the vast industrial complex of the United States could not exist.

In the world of economics the mutual dependence of big and little business long has been an accepted fact. And nowhere are the mutual benefits derived from cooperation of big and little business more keenly understood than in the aircraft industry, and by the Defense Department.

The Aircraft Industries Association currently is conducting an extensive survey of subcontracting and supplying in this industry. The results will not be known for a month or two. But spot checks of major companies indicate that from 45 to 60 per cent of dollar volume of prime contracts goes to subcontractors and suppliers. The largest proportion of this goes into the tills of small business.

There are those who would promote dissension in this nation between segments of all industry which, through teamwork, have given this nation an economy, a standard of living, and a productivity unequalled by any other nation in the world. This teamwork has been a normal evolution of business. Only confusion could result from attempted regulation and control of these relationships.

U.S. Produces Most Aircraft

The United States aircraft industry, during World War II, in 1944 alone, produced more than 96,000 planes for the defense of the free world. This was more aircraft than had been produced by all of the nations of the world in the history of the airplane prior to World War II.

This single accomplishment was not achieved solely by a few "big" airframe and engine manufacturers. It was the joint effort of big business and small business. There were thousands of items produced in "back-yard garages" that found their way into the military aircraft on

(See *BASIC 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.

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The Priceless Commodity

The past year has seen a wealth of news of fantastic new aerial weapons. Included, have been announcements of supersonic fighters and bombers, engines of incredible power, and intercontinental guided missiles.

These are not achievements of the past year. They represent only the fruition of many arduous and expensive years of research and development on the part of the aircraft industry and the government. The knack for inventiveness, the genius of its men of science and the unparalleled productivity of its industry has tended to lull America into a popular platitude that time can be bought. This is both fallacious and dangerous.

The powerful jet engines that hurl a modern giant 175-ton bomber through the air at far more than 600 miles per hour took almost five years to produce—from the time the power plant was conceived on the drawing board to first production model. The complete bomber, as an integrated weapons system, was nearly nine years in incubation from design to production.

The swift jet fighters and interceptors of our Air Force and Navy—planes that can climb to 10,000 feet in less than one minute and slip easily into speeds beyond the speed of sound—are not simply the product of a military decision to buy and a few months' production time. Their contribution to American aerial supremacy is the product of years of design research, development, testing, engineering, and tooling leading to production. This is called lead time. The average jet fighter, today, requires 42 months—nearly four years—from design acceptance on the part of the military to first production delivery to the military.

Guided missiles, incredibly swift weapons of destruction to enemies on land, in the sea, or in the air, are just now becoming militarily potent. Their design, development and manufacturing intricasies have, in most cases, required even longer lead time than our piloted aircraft. For example, one guided missile upon which our military places great emphasis was conceived in 1946, but nearly ten years later, still is not considered an operational weapon for quantity production.

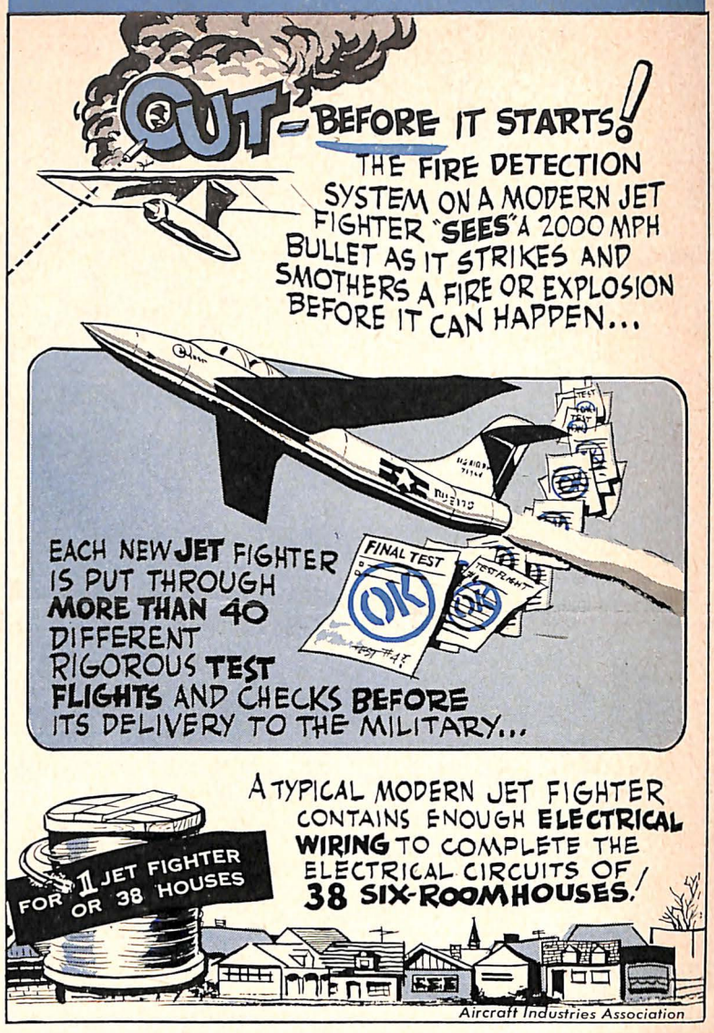
The Germans, in World War II, fell victim to the false premise that time could be bought. During the 1930's, German industry produced a technically advanced military force. The Luftwaffe plainly had the time to plan carefully and mold new military air techniques which were the basis of German war planning. Fortunately for the free world, Germany did not enter the war with an active and mobilized long-term development program. She entered the war with the most modern military air force, but without the capacity to maintain her qualitative superiority.

Germany was able, at the end of the war, to produce some remarkable aerial weapons but only on a frantic experimental basis. But time had run out and she was completely unable to exploit those gains into operational use. As a result her entire scientific and production structure was either destroyed or captured.

Fortunately, this nation's leaders, with the lessons of World War II and the scars of battle in Korea still fresh, are firmly convinced that we live in an age of peril. Their plans for the defense of this nation are geared to air power. As a result, the aircraft industry and the military, together, are building their research and development and production programs into a more healthy state, recasting them in terms of realities. Both military and industry know that the size and impetus of research and development programs cannot be adjusted up or down in accordance with what an enemy may or may not be doing.

Money cannot buy the priceless commodity—time.

PLANE VIEWS



Studies Published On Air Industry

Two up-to-date studies of the U.S. aircraft industry, both official publications of Aircraft Industries Association, have just been released.

The Aircraft Year Book is the thirty-sixth edition of the standard reference work of American aviation. The current edition contains 472 pages of the latest information on the aircraft manufacturing industry and the vital role it is playing in the economic and military welfare of the United States today.

The book contains 14 chapters of information on all types of civil and military planes, engines and missiles being produced in this country, a review of the industry and interesting aeronautical highlights which occurred during 1954. It is amply illustrated with drawings and photos.

Aviation Facts and Figures is being published in a paperbound edition for the first time this year, making an easily handled, inexpensive reference book of the very latest facts and figures concerning all facets of aviation.

Both books may be ordered from Lincoln Press, Inc., 1143 National Press Building, Washington 4, D. C. The prices are $6.00 for the *Yearbook* and $1.00 for *Facts and Figures.*

PLANE FACTS

- Tests to prove the dependability and superior quality of American built engines are exhaustive. One engine manufacturer has just completed run-up tests on a new turbo-prop engine which would be equivalent to a twin-engined turbo-liner circling the earth four times non-stop.
- Fighter production of a typical aircraft manufacturer, during 1954, required 12,140,000 pounds of aluminum, 1,517,000 pounds of stainless steel, 168,000 pounds of rivets, and 5,202 miles of electric wire.
- During 1954, 99.6 per cent of all employees of a major east coast aircraft manufacturer worked nearly 56 million man-hours without a lost-time accident in production of aircraft.
- One modern jet fighter plane carries an atomic bomb load equal to the destructive power of all of the bomber planes based in Great Britain during World War II.
- Airports serving 22 metropolitan areas in the United States last year accounted for more than 65 per cent of the 34 million passengers who flew the scheduled airlines, more than 73 per cent of all mail and over 78 per cent of all air freight.

Dearth Of New License Applicants Is Causing Serious Pilot Shortage

There's a shortage of pilots.

Last year there were 20,000 fewer American applicants for civil pilot's tickets than there were in 1953. The Air Force and Navy had considerable difficulty recruiting pilots sufficient to meet Korean War needs and the services are still faced with the problem. Many of the nation's airlines, for some time, have found it necessary to advertise for co-pilots.

But a real pilot shortage is developing in one of America's most important industries — agriculture. Today, one of every 12 acres under cultivation in the United States is treated in some way from the air. In 1953, more than 80 million gallons of liquid sprays and 644 million pounds of dust-type chemicals were dispensed on the nation's crops from aircraft.

Aerial pest and weed control and fertilizing now add an estimated $3 billion dollars to farm and ranch income each year. In Oregon, planes are used to spray hormones on fruit trees to keep the apples from falling until they can be picked. In Texas and other Southwestern states, aircraft are used to spray thousands of acres of cattle ranges blighted with mesquite (mesquite takes four times as much water per pound as range grass). In other sections of the south, aircraft spray thousands of acres of cotton fields killing insects which could destroy the growing crop. Later these same planes spray the ripened cotton killing the foliage so that mechanical cotton pickers can do a better, faster job.

Thousands of acres of the nation's farms lands are seeded with alfalfa and barley from low flying aircraft —and dessiccants are also applied at harvest time so that the alfalfa can be dried rapidly, while standing, avoiding the loss of seed from prolonged drying on the ground.

Need Special Training

The pilot training program for agriculture aviation is in a field by itself. Pilots who have acquired their skills in other aviation activities are not necessarily good spray and dust pilots. Today's military pilot, for example, although thousands of dollars have been spent on him in flight training, generally cannot convert to this specialized work. His training has been in jet fighters and multi-engined bombers and transports. But his ability in military aviation as a "hot" pilot in heavy aircraft makes him unsuitable for handling light, but heavily loaded, agricultural planes that skim just a few feet over the farms and ranches they work.

In an effort to answer this particular pilot shortage, the Civil Aeronautics Administration has teamed up with the Texas A & M College and the Texas Association of Aerial Applicators in offering a six-weeks course in aerial applicator pilot training.

Electronic Co-Pilot Thinks For Pilot

The speed and performance of fighters and bombers produced by the United States aircraft industry are so great that their pilots can't think fast enough to keep up with themselves.

So, to help them out, the aircraft electronics industry has developed an electronic brain, which will fly "co-pilot" in new supersonic fighter planes. It is a real genius when it comes to solving pilot's flight problems. It can do 60,000 additions or subtractions, or 3,000 multiplications or divisions in *one second.*

Today's U.S. military pilots, although expert in the field of electronics, engineering and mathematics —to a degree which would dumbfound the pre-World War II pilot— still would be unable to keep up with the complexity of the current aerial weapons if it weren't for a great many automatic devices to make his job easier.

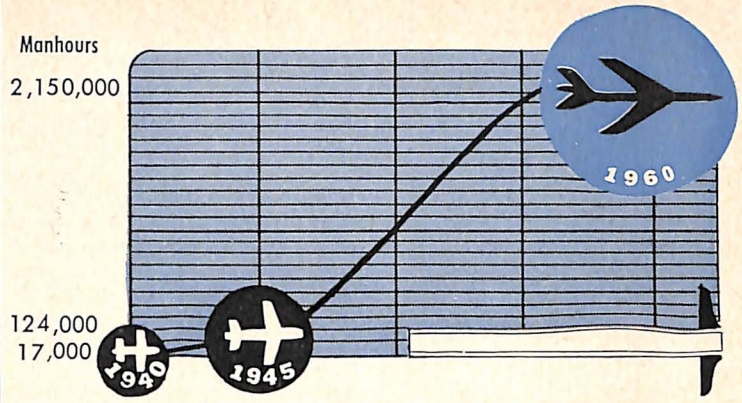
Military pilots, flying at supersonic speeds, need electronic computers to solve problems of navigation, fire control and other technical situations which arise with lightning-like rapidity in military air operations.

Until just recently, however, the electronic brains have, themselves, been so complex and heavy and have required such comparatively large amounts of power that they have been restricted from all but the largest of planes. And, too, these electronic devices depended upon old-type vacuum tubes that went out of order easily—often just as the pilot was "on target." When that happens the pilot and his plane might just as well have stayed on the ground.

Promising to solve that problem is a new type air-borne electronic "thinker" developed by one of the nation's major electronics manufacturers for the aircraft industry. The new computer uses tiny transistors —nearly 800 of them—instead of vacuum tubes. Transistors are small, but tough, and can operate on about one-twentieth of the power required by the old vacuum tube.

PRECISION DESIGN

Aircraft design time increases with performance:



The precision and complexity of today's powerful jet planes require ever increasing engineering skill. A typical manufacturer reports that the engineering manhours needed in designing just the airframe of a modern fighter is 80 times that needed for its 1940 counterpart and estimates that the planes of 1960 will require 127 times as many.

AIRCRAFT INDUSTRIES ASSOCIATION

First-Class-Mail-By-Air Experiment Saving Time And Shaving Costs

(*Continued from page* 1)

of mail carried by air reaches its destination approximately 12 hours quicker when flown between these commercial hubs and the latest records indicate that well over 5.5 billion hours have already been shaved off delivery time between the two points.

Other examples show that mail being flown experimentally between New York and Florida points has saved 1.7 billion hours. Between Washington and Chicago another 1.7 billion hours has been saved and in just the first four weeks of 1954 people living in cities on the West Coast have benefited by a saving of nearly 800 million hours.

Even more impressive is the fact that each letter flown between Chicago and Miami reaches its destination 35 hours and 45 minutes—almost one and a half days—quicker than if delivered by rail.

Although dollars saved by the overall experiment have not been tabulated, recent figures show that the Post Office receives $2,314 for each ton of mail flown between New York and Chicago. Of this amount the airlines are paid $134.66 for their service and the balance is retained by the postal service for its operating ground revenues.

Many Skills Needed To Build Planes

(*Continued from page* 1)

the electronic bombing systems used on intercontinental bombers cost from $200,000 to as much as $500,000 each.

The research and engineering necessary in designing and building the modern military plane, engines and weapons requires the skills of thousands of scientists, engineers and specialists. Just one big bomber requires more than 165,000 tools in its construction of some 184,000 parts. And it takes 8,954 parts and 87 different specialists to build one of the engines which power some of the newer military aircraft.

Because air power is now the principal means of assuring national security and the survival of freedom of the world, the aircraft industry has had to expand tremendously. Last year the aircraft industry became the nation's largest, employing more than 797,000 men and women working directly for aircraft companies with 200,000 more employed by sub-contractors and suppliers.

Despite the great size and complexity of the aircraft industry, its net profit as per cent of sales is lower than the average of all U.S. manufacturing industry. Aircraft Industry net profits as per cent of sales last year was only 3.8 per cent, the steel industry, 6.0 per cent, and the automobile industry, 6.4 per cent. The national all-manufacturing average was 5.9 per cent.

Unmanned Helicopters May Make Life Easier For Future Ground Troops

Helicopters without pilots may determine what is around the "next corner" or what is on the "other side" of a hill for grounds troops in future wars.

Already successfully flight tested and now being evaluated for the U.S. Navy, one model helicopter is presently going through all the paces peculiar to rotary wing aircraft—without a hand touching the controls.

It is capable of taking off, landing, flying backward, forward, sideways and hovering. In over a year of experimental flying, the aircraft has logged well in excess of 100 hours in the air.

Although operating the remote control 'copter is much more complicated than flying a similarly controlled fixed wing aircraft, tests so far have been highly successful.

Its use as an unmanned air weapon covers a wide range of possibilities. Loaded with nothing but television equipment, the helicopter could be sent far into enemy territory, flashing actual pictures of installations and equipment back to a control center without endangering the lives of personnel.

N.A.C.A. IS KEY TO AIR R & D

Agency Is Entering Its Fifth Decade

Much of the qualitative superiority that has established world leadership for America's military and civil aircraft incubated in the test chambers of the National Advisory Committee for Aeronautics during the past four decades.

On April 14, 1955, the NACA commemorated the fortieth anniversary of its establishment by the U.S. Congress.

Although development was slow at first, by the time of the buildup for World War II this independent government technical agency had established itself in aeronautical research.

During the war years of 1941-1944, the NACA made design studies and tests of 115 types of airplanes and in July, 1944, 78 different airplanes were under study simultaneously.

Working hand-in-hand with the aircraft industry, the military and others vitally concerned, the NACA has contributed either directly or indirectly to every military and commercial airplane flying in this country today.

Even at the outbreak of the second World War the scientists and engineers of the establishment had new high speed propellers, new devices for maintaining stability and control, improved systems for cowlings, cooling of engines at high speeds and advances in fundamental structural designs immediately available.

More recently NACA has pressed forward toward gaining new aeronautical knowledge that will lead to development of aircraft and missiles of even more fantastic capabilities than those available today. Jet and rocket power is being exploited to the nth degree in the Committee's advance research chambers.

In its first year of existence, without facilities of its own, the NACA sponsored research activity at colleges and other scientific institutions throughout the country. Today, it operates three principal research centers and two smaller stations.

At *Langley Aeronautical Laboratory*, near Hampton, Virginia, extensive experimentation is done in aerodynamic investigation of low speeds as well as speeds ranging up to 10 times the speed of sound, 7,600 m.p.h., and in hydrodynamics and structures.

The *Ames Aeronautical Laboratory* at Moffet Field, California, has the world's largest wind tunnel, with a test section measuring 40 by 80 ft., and at *Lewis Flight Propulsion Laboratory*, Cleveland, Ohio, ways and means of providing more efficient and powerful engines are studied.

The *High-Speed Flight Station* at Edwards Air Force Base, Mojave Desert, California, is the scene of actual flight testing with aircraft flying at speeds ranging from transonic to supersonic speeds and the *Pilotless Aircraft Research Station* at Wallops Island, off the Virginia Coast, rocket-powered models are launched in exploratory exercises.

NACA's post World War II research developed the afterburners for modern jet engines, provided the basic research on vertical rising airplanes, developed hulls for modern flying boats that are aerodynamically clean from both the hydrodynamic and aerodynamic standpoints.

Also the all-movable tail, now generally accepted as essential in flying aircraft at supersonic speeds, resulted from NACA research, as did the hydroskis which enable some Navy aircraft to land and takeoff from water, snow or sod.

Basic Industry Depends On Suppliers For Building Nation's Defense

(*Continued from page 1*)

production lines of the prime contractors. Many of these small businesses have since flourished into so-called big business.

That picture has not changed. Absolutely vital, of course, is the basic aircraft industry — the large prime contractors with their great management, scientific, engineering, technical and manufacturing capabilities. But none of these can undertake its entire responsibility alone. Today, small business is more important than ever in the pattern of security and economic stability of the nation. The Air Force, with the greatest procurement budget of the three military services, awarded more than three-fourths of its contracts in fiscal year 1954 to business concerns employing less than 500 persons. These contracts valued at $556,715,000 represented almost ten per cent of the Air Force $5.7 billion purchase program. Naval air procurements through small business, though lower, were proportionate.

Add to this the fact that the aircraft industry, with its combined prime Air Force, Naval and Army air contracts, spent approximately $4 billion dollars in sub-contracting for materials, etc., and the importance of small business to the aircraft industry and to the defense of the nation is easily discernible.

Need Small Business Skill

Both the Defense Department and the aircraft industry encourage the participation of small business, both in research and development and in production of end component items. The industry needs the ingenuity and special skills which exist in these concerns from the largest to the very smallest of them.

It is more than likely that a great many of the solutions to knotty problems facing the aircraft industry in development of supersonic aircraft and engines, still on drawing boards, will come from small companies.

One of the most effective deterrents to Russian attack against this nation is our widely dispersed production base, coupled with the visible evidence of our air strength and high state of readiness. The importance of small business in the production of the nation's aerial defense is of tremendous importance in this regard. Competent small business plants supplying the aircraft industry are so widely dispersed that their complete destruction in a future wartime would be virtually impossible.

70,000 Firms To Build Plane

For example, one East Coast engine manufacturer spends approximately 50 cents out of every dollar received for its aircraft engines and spare parts with its sub-contractors. It numbers 2,922 active sub-contractors and suppliers in this group and of that number 80 per cent are small business firms criss-crossing the nation in 32 states.

On the West Coast, a major fighter aircraft manufacturer spends 55 cents of every dollar in sub-contracting and supplying with small businesses located in *each* of the 48 states of the nation. This company purchased materials directly from more than 10,000 firms which, in turn, fanned out their supply needs to more than 60,000 firms.

These are not exceptions to the mutual dependence of big and small business upon one another—in fact, they are the rule. Whole cities and towns throughout the nation can trace their growth and economic well-being to the aircraft industry. In San Diego and Wichita, almost 70 per cent of those employed by manufacturers are in the aircraft industry or among its suppliers. In Los Angeles, almost 184,000 people work in all divisions of the aircraft industry, large and small. In tiny (4,000 population) Roxboro, N. C., an agricultural community, one company supplying the industry has an annual payroll exceeding $460,000 in manufacture of a product unheard of a few years ago—drag parachutes for speedy jet planes.

The aircraft industry has come a long way since World War II. The effective altitude of first-line fighters has been increased from 35,000 feet to considerably over 50,000 feet. And speeds of our fighter planes have climbed from 400 miles per hour to supersonic ranges.

Aircraft engine power has increased fantastically since the late global war when the industry was proud of a 2,000 horsepower engine. Today, jet engine thrusts equivalent to 12,000 horsepower are commonplace.

American ingenuity and free enterprise — big business and small business, as a team — have achieved the quality that is building the nation's air power and aerial supremacy.

BUILT-IN DEPENDABILITY

The reliability and dependability of modern U. S. military planes is illustrated by the fact that one type of fighter-bomber has completed more than two million flight hours, flying the equivalent of 36,000 flights around the earth's equator.

Aircraft Industries Association

Air Quotes

"As our technology improves, our strength tends to become more dependent on quality. A thousand interceptors that could not fly as high as an enemy bomber would not be as good as one that could fly higher.

"Our most important job is to keep our Air Force planes and equipment superior to the Soviets. For this reason we are putting increased emphasis on Research and Development.

"It was a splendid achievement when we pierced the sound barrier. On the other side of the sound barrier we have found the so-called thermal barrier. It is not really a barrier, but it is like a swamp which gets deeper and thicker the farther we travel into it. There is no speed at which we can leave this problem behind, for as we go faster we cause higher termperatures from the friction of the air over the aircraft surfaces. We will lick this problem by developing new materials or new ways of using what we have."—*General Nathan F. Twining, Chief of Staff, United States Air Force, February 16, 1955.*