planes

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NO SHORTCUT TO AIR POWER — REP. PRICE

U.S. Jets Capture Records; Industry Proves Leadership

Although a late entrant in the field of design and development, jet planes built by the American aircraft industry now hold virtually all the world's recognized performance marks, and the American industry was the first to produce twin-jet night fighters, four-jet bombers and jets capable of landing on carriers.

With the notable exception of Russia, the American industry has built more different types of jet planes and produced a greater number of all types of jet planes than all the rest of the world combined.

First in Combat Planes

At the present time, the only nation which has put a jet bomber into combat operation is the United States. Already a more advanced jet bomber is coming off America's production lines in increasing numbers. These are the first multi-engine large bomber aircraft to be put into production in the world, although there have been unsubstantiated rumors that Russia is beginning production of bomber type jet aircraft, and Great Britain has announced production contracts for a jet bomber.

Since late in World War II, 53 different jet types of military planes (three with rocket engines) have been developed in America. They have provided the American aircraft industry with a tremendous backlog of experience from which to develop new advanced types now in the design stage.

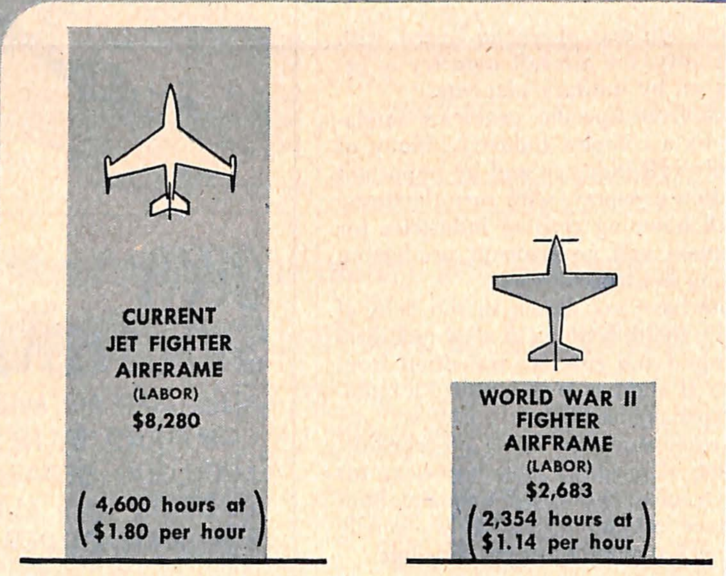
Ready to Make Transports

It is on these new designs that the U.S. expects to base its world leadership in jet development. The experience gained in producing jet aircraft since late in World War II is providing the American aircraft industry with the basic knowledge required to produce and develop superior transport aircraft whenever the markets and financing are available for this new advance in commercial transportation.

America has designed and built 20 different types of jet engines in both the turbo-prop and turbo-jet categories and at the same time has developed a series of rocket engines which give additional performance to more conventionally powered aircraft.

(See "Records," Page 4)

Work Time Doubled...Factory Labor Cost Tripled...On Jet Fighter



Above figures refer only to labor cost. Total cost of a typical jet fighter airframe — including tooling, engineering, overhead, and materials — is $47,954. Total airframe cost of the World War II fighter was $14,117. Figures based on high-production rate of 4,000 planes per year.

Source: Congressional Hearings, July 13, 1951

Jet Planes Soar Higher and Faster But So Do Their Production Costs

It takes about 3½ times as many dollars to build a typical jet fighter airframe today as it did to construct the fighter's World War II counterpart.

For this additional money, the American taxpayer gets a plane that flies more than 1½ times as fast, fights at altitudes over 1 1/3 times as high, has an engine over seven times as powerful at upper altitudes—despite the fact that it weighs over 1½ times as much as the fighter of a decade ago.

Precise Engineering

The clean, deceptively-simple lines of modern high-performance warplanes hide thousands of precisely-engineered parts, each essential if U.S. military craft are to have lethal superiority over potential enemy planes.

About 30,000 separate parts are manufactured for one jet fighter airframe alone, not counting hundreds of thousands of such items as rivets which are purchased by the pound. To mould these parts into a smooth-performing, ultra-high-speed fighter demands more technical know-how — and more money.

As a result, the aircraft industry constantly faces serious cost and manpower problems. For example, draftsmen no longer can be used on many engineering jobs. Highly trained scientists and engineers are essential for creation of giant and complex fighters.

Back in 1941-42, it took 414 engineering hours to build each of the first 600 airframes for a typical piston-engined fighter. Average cost for these engineering hours was $1.69.

Cost of Complexity

But by 1948-50, when the first 600 airframes were ordered for one of today's operational jets, the added complexity of the aircraft resulted in a need for eight times as many engineering hours. And the cost per hour had jumped to $4.20. Today's engineering costs

(See "Costs," Page 4)

Long Range Plan Assures Buildup, Cuts High Costs

Written especially for PLANES

By
Rep. Melvin Price
Democrat, Ill., Member Armed Services and Atomic Energy Committees

As long as the very real menace of Soviet war hangs over us and the whole world, we will be inviting national suicide unless we keep militarily strong enough to meet attack and decisively defeat the enemy.

Rep. Price

Since military leaders freely admit that the first blows in any war would be struck from the air, and that no armed force of modern times may win without air superiority, it is obvious that we must build our air power to a point of safety, and maintain a capacity of production to meet any threat.

Recognizing this, it becomes doubly important for us to realize that the building of air power cannot be achieved quickly. First, we must recognize and understand the inescapable time factor in aircraft development and production. Second, it is tremendously important that we project that factor into a stable long-range procurement program.

Fluctuations Costly

In design, tooling, research, supply, and manpower the aircraft industry could save untold millions of the taxpayer's dollars if it could avoid the erratic fluctuations which have marked its course since we first called for military planes in World War I. In Congress, where authorizations and appropriations establish the scope within which this industry can operate, we need to learn more about the vast complexity of manufacturing modern aircraft.

Production of aircraft cannot be turned on and off over night. A minimum of 24 months is required to put bombers in production, 18 months for a new fighter. This is in addition to the design cycle, which requires from two to three years. It adds up to three and one-half to five years before new

(See "Air Power," 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.

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Why Aircraft Production Is Behind Schedule

By DeWitt C. Ramsey (Admiral, U.S.N., Ret.)
President, Aircraft Industries Association

One year and three months after the outbreak of war in Korea, with World War III still a menacing possibility, the aircraft industry is behind schedule in relation to the goals set by military planners.

The slippage in production stems from specific problems fundamental in any large expansion effort by a complex industry. Many of these problems were foreseen by the aircraft industry and by important suppliers. But under a semi-mobilization economy, with manufacturers of military equipment competing with booming civilian industries for materials, controls have been inadequate and government production agencies have not succeeded in avoiding bottlenecks.

The most serious problems to date have not arisen in the field of the manufacturer of airframes. Despite the difficulties of semi-mobilization, this basic industry has made a rapid and effective transition from the low levels that followed World War II and has accomplished a build-up comparable to the first stages of expansion in the early 1940's.

There are a number of elements responsible for being off-schedule. By far the most serious is the shortage of machine tools necessary for the manufacture of jet engines, electronics and other precision-built components of modern high-performance military planes. It is officially estimated that the jet engine industry is six months behind schedule.

Materials shortages, particularly aluminum, copper and steel, are now being felt in the aircraft industry—in some places severely. Indications are that these shortages will be general and far more severe by the fourth quarter of this year and may cause sizeable reductions in schedules of airframe production. The tight supply of structural steel already is holding up many construction projects for urgent expansion of some aircraft plants and related facilities.

In World War II we eventually overcame the materials shortages for aircraft and it can be done again. Meanwhile, however, the urgent problems created by machine tool bottlenecks cannot be easily relieved.

It is simply a case of building new machine tools. And here the priceless commodity of time means everything.

The recently created Aircraft Production Board under the capable direction of Harold R. Boyer, a top production engineer drafted from private industry, is now concentrating its efforts on the machine tool bottleneck to make fulfillment of aircraft schedules possible.

The problems are enormous. Mr. Boyer estimates that jet engine manufacturers alone could use the entire output of the nation's machine tool production capacity. The current rate of tool production is about $675,000,000 per annum. But by the end of this fiscal year machine tool orders to the value of nearly $3,000,000,000 will have been placed for defense production purposes, according to the Munitions Board and Office of Defense Mobilization.

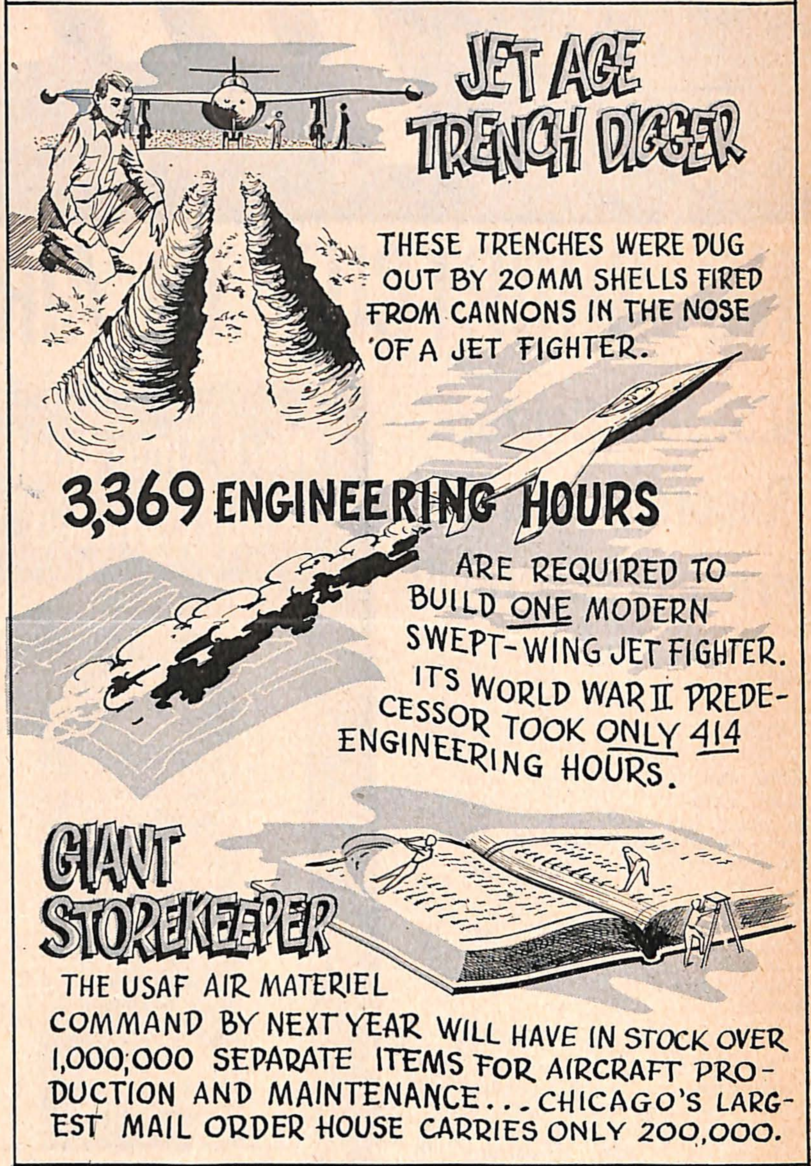
Although there are about 250 firms producing machine tools, the industry is relatively small. When called upon for staggering increases in production, its problems are obvious. They deserve special treatment. The government is recognizing this by increasing profit incentives, allowing higher costs where the tool builders are forced to subcontract, and attempting to insure protection of investment. Even with these measures, the deliveries of machine tools to the aircraft industry will not be significantly increased for at least another 10 months or a year.

Having surveyed the whole broad problem of meeting aircraft schedules, Mr. Boyer stated: "If I don't do another job here, I'll be satisfied if I get the machine tool industry expanded."

This situation, one of vital concern to the nation, illustrates how the aircraft industry is absolutely dependent upon its suppliers. It is fruitless to fill up factory ramps with airframes for which there are no engines. New and improved engines cannot be turned out in the quantities required until the machine tools are produced and installed.

Finally, among the aircraft industry's problems, great segments of American industry all across the country must synchronize their production efforts to keep continuously improved and refined planes coming out of our factories at the rate desired by the military. While machine tools are the crucial problem now and in the months to come, the aircraft industry depends also on many other industries, small and large. The latest survey showed orders placed with more than 61,000 subcontractors and suppliers in every state. The lack of one small, complex component in a modern plane could render it useless for combat.

PLANE VIEWS

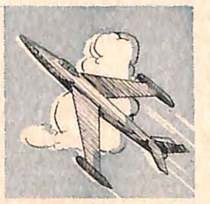


By AIRCRAFT INDUSTRIES ASSOCIATION OF AMERICA

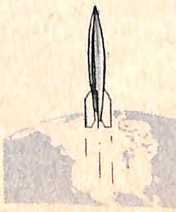
PLANES QUIZ

Seventy per cent score on this quiz is excellent. Sixty per cent is good. Answers on Page four.

1. Airplanes in service on U.S. scheduled airlines have increased since World War II at a rate per year of (a) 50; (b) 75; (c) over 100?



2. How many jet fighters has the U.S. built since World War II: (a) 3,500; (b) 4,500; (c) 8,500?
3. Jet fighter planes are too fast to be guided by automatic pilots. True? False?
4. This year is the 25th anniversary of commercial airlines in the U.S. How much has the coast-to-coast time and fare been reduced?
5. Where can the speedy services of ambulance planes be obtained by doctors or average citizens?
6. The U.S. leads in the number of people with private flying licenses. Can you name the next five leaders?
7. A medium bomber requires in its construction about (a) 50,000 rivets; (b) 400,000; (c) 1,000,000?



8. The altitude record for a single rocket is (a) 100 miles; (b) 130 miles; (c) 150 miles?
9. In military aviation, what is meant by a sortie?
10. The longest aviation radio-telephone system is (a) 5,000 miles long; (b) 12,000 miles; (c) 19,000 miles?

AIR POWER

(Continued from Page 1)

design concepts can be translated into combat aircraft.

Just recently the Air Force awarded what it calls "Phase I," or design study, contracts to three firms for a new high-altitude interceptor. Eventually, one or more of these studies may be accepted and a prototype plane or two may be ordered. If it meets the performance and other requirements of that future date, it will be put into production. But that prototype won't fly before 1954. And remember that special tooling will then be required for its production. Right now, with semi-mobilization, aircraft factories sometimes can't hope to get delivery on a relatively simple machine tool for at least 36 months!

That interceptor we may need against the Russians in 1954, 1955 or 1956 has to be planned *now*.

The expansion we can get in the aircraft industry is determined by the base size of the industry at the time expansion begins. World War II experience gave us a rule of thumb that under the impetus of all out mobilization production rates can be accelerated three times within 12 months from the date the go ahead is given, and can again be tripled by the end of two years. It is impossible to increase this curve of acceleration in production activities.

Inescapable Time Lag

Here's another current example of the inescapable time lag: Two of our finest aircraft companies have been working for months to put into operation stand-by plants held over from World War II at Marietta, Ga., and Tulsa, Okla. Yet neither company will deliver a plane from those factories until the spring of 1953.

Any substantial expansion in the air forces is determined by aircraft production. The Air Force and the Navy air arm cannot be increased in size and equipped with modern planes for from three to five years following the decision to expand.

Ironically air power is the first and most effective element to be thrown into combat, yet requires the longest time to build. This is all the more reason for a long-range program.

The importance of the time factor in expansion and the necessity for an adequate base from which to start are only part of the compelling reasons for a stable long-range procurement program. Unit costs under a long-range program can be substantially reduced. Here is a graphic example: For one of the top all-around World War II fighters, actual unit cost of the first 620 airframes was $26,700 each; for the first 4,000 the unit cost was reduced to $14,100 each. The same company's outstanding jet fighter airframe today costs $121,132 each for the first 620, but on the basis of 4,000 production the company computes the cost at $47,954 each.

Shortage of Engineers

Another important aspect of the instability of the present year-to-year method of military aircraft procurement is reflected in the requirements for engineers and the inadequate number available. At the wartime peak, the aircraft industry employed two million people; by 1947 it was down to 167,000. Consequently, the industry did not encourage college students to enter engineering courses since the number of engineers required for the small peacetime industry was not high. Now there is an acute shortage of engineers which is becoming increasingly serious and the numbers of engineering graduates from U.S. universities are on a constantly declining curve.

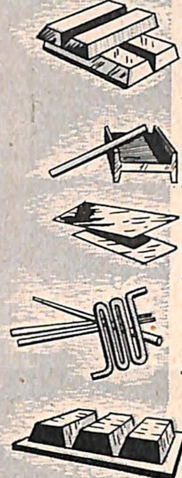
The complexities of the jet-electronic-supersonic age call for scientists and engineers of the highest quality. Their training for this specialized field takes time—a lot of it—but an erratically fluctuating industry can't attract them nor justify their expensive training. Thus, when the nation's need for them is greatest, there are few to be had.

It's time we recognize that our national survival in the foreseeable future may depend primarily upon the aircraft industry. It's time we make provision for its enormous complexities by giving it a chance to do its job on a sound, stable, long-range basis.

It will be expensive to build up and maintain the necessary air preparedness. But we must keep improving our aircraft lest the enemy hurl better ones against us, and keep our aircraft manufacturing industry in all its wide ramifications on a base broad enough to meet emergency needs and sustained production if the shooting starts. The cost of airplanes is high, but as someone has aptly said, in a very real sense they represent the "cost of living."

VITAL CIVIL AIR FLEET TAKES ONLY FRACTION OF BASIC MATERIALS SUPPLY

Maintaining and replacing America's fleet of commercial airliners and utility lightplanes is important to national defense. They take only an infinitesimal portion of the total critical metals available. Chart shows the amounts of these metals available for the 1951 Third Quarter for all productive purposes and the amounts allocated by DPA for commercial aircraft.



	CIVIL AIRCRAFT REQUIREMENTS	AVAILABLE	PERCENTAGE
CARBON STEEL	1,500 TONS	18,300,000 TONS	0.0082
ALLOY STEELS	3,000 TONS	1,800,000 TONS	0.167
STAINLESS STEEL	425 TONS	150,000 TONS	0.283
COPPER	125 TONS	532,500 TONS	0.0237
ALUMINUM	2,750 TONS	269,000 TONS	1.023

SOURCE: DEFENSE PRODUCTION ADMINISTRATION

How Manufacturing Ingenuity and Scavenger Hunt for Metals Sent Jets up to the Yalu

The costly effect of materials shortages in the manufacture of aircraft or their accessories in an emergency is graphically illustrated by the story of wing tanks for the Korean war.

The manufacturer of a jet fighter operating in Korea held a peacetime order for just one supply tank per airplane. These are auxiliary tanks hung under the wings to provide additional range, and are droppable when a pilot gets into a jam. Suddenly in Korea, the Air Force wanted thousands of these tanks.

The aircraft company had on order in a Massachusetts plant a direct welding machine which could speed production of the tanks. This machine was rushed to completion and flown to California. Then came the materials problem.

A one-ounce piece of duraluminum tubing holds the drop tank to the wing—and the supply of duraluminum in this country was very small. The aircraft company soon exhausted the available duraluminum, went to one and then another type of tubing until all tubing in the country usable for this purpose was exhausted. It then began making the part from one and one-half inch steel bars which had to be turned down on the outside and drilled to make tubing. All such bars which could be found were used up.

Finally, in Canada the aircraft company found some large billets of duraluminum. These were sawed into squares, machined down on the outside and drilled to make tubing.

The tanks were delivered and the jet fighters were able to range up to the Yalu river. Though it proved the ingenuity of the industry and made the available air power effective, it was expensive.

Facts and Figures

Four of the six critical labor areas currently listed by the Labor Department are in aircraft and engine production centers—Hartford, Wichita, Indianapolis and San Diego.

Air Quotes

"The incredible fact is that America today is at best a second rate air power. . . Our combat strength when our air arms reach present goals—more than a year from now—will be about 9,000 planes, many of which will be outmoded. By that time the Russian air force will have a strength of 27,000 modern planes. . . This is a far cry from the air power America must have to hold her own, let alone provide the air superiority that is necessary to prevent defeat. . .

Cocke

"The American Legion supports an increase in our Air Force and Naval Air Arm to enable them to carry out their obligations. To do this, an Air Force of 150 groups with 20,000 first-line combat planes is the rock-bottom minimum. For the Navy, 7,000 first-line combat planes are required.

"These planes must be built and production of new models maintained without delay. Their cost will be high but in a very real sense they represent the cost of living. . . .

"We must never again permit a shortage of research and development funds to retard the development of modern planes. All of our combat types in production are based on designs which began before World War II ended. We have a six-year time lag to make up. We have no time to waste. . . .

"To be outnumbered is asking for defeat. To be outclassed as well as outnumbered is sure suicide."—Erle Cocke, Jr., National Commander, The American Legion, July 20, 1951.

Plane Output Faces Early Cuts As Materials Allocations Fall Short

The aircraft industry now is feeling the sharp pinch of materials shortages and during the remainder of this year clearly will be unable to obtain sufficient supplies under the Controlled Materials Plan for satisfactory operation at desired rates.

This is primarily because sufficient percentages of steel, copper and aluminum have not been allotted to meet the total defense production schedules set up by the Armed Services, according to the Industry Planning Service of the Aircraft Industries Association. Unless this situation is remedied, aircraft production schedules will have to be adjusted downward, AIA said.

71st in Group III

The first shortage was in structural steel, all of which is now handled by directive. A number of proposed aircraft plant expansions are at a standstill for lack of steel. One plant, desperately needing additional space for enlarged engineering staffs, is unable to erect a building for that purpose. The Services have classified all proposed plant expansions into groups and many aircraft projects are not in preferential position—in fact some are as low as 71st on the list in Group III.

Forgings will be in very tight supply for the next two months, due to the recent Alcoa strike and the fact the Willys-Overland reactivated plant at Erie, Pa., has not reached a high rate of production. Alcan, a Canadian subsidiary of Alcoa, is providing some forgings. The Munitions Board and the Aircraft Production Resources Agency are studying the possibilities of establishing additional facilities.

Most recent difficulty is a shortage of aluminum castings. All available aluminum ingot for castings is handled by the National Production Administration on directives and no material was set aside in September and part of October allotments for foundries producing aircraft castings. Twenty-one foundries in Southern California have appealed for assistance.

The Civilian "Take"

Critical alloy steels are another major problem. New facilities now being established for the production of titanium, a substitute for columbium which is vital in jet engines, will not be in operation for some time. They will provide only a partial remedy, since the cost of titanium is still excessively high and techniques have not been developed for its utilization on a large scale. Boron steels may soon be available for aircraft structural parts, again dependent upon increased production schedules.

Despite industry appeals, APRA has not yet given a restoration of across-the-board reductions in aircraft CMP allotments for the third quarter, nor has it acted on appeals for increases in fourth quarter allotments.

"For the present a good portion of the defense program is going to have to get along on what is left after allotments are made to continue abnormally high civilian production," the Industry Planning Service reported.

COSTS

(Continued from Page 1)

have increased to $5.20 per hour.

The same time and wage pattern prevails throughout the production process as the bigger and more powerful jet fighters come off production lines. It took 2,354 factory labor hours to build one World War II fighter. It takes 4,600 labor hours to produce its much heavier and more complicated contemporary counterpart. And the labor rate his risen from 87 cents per hour in 1941-42 to $1.80 today.

This increase in cost is even more apparent when cost of a World War II fighter is compared with a present-day all-weather fighter, capable of seeking out and destroying enemy attackers at night or in minimum weather. To build an all-weather airframe alone takes over 6½ times as much money today as to build a fighter airframe 10 years ago. It takes, for example, over 12 times as many aerodynamic engineering hours, 21 times as many wind tunnel hours, 120 times as many flight test hours and 200 times as many miscellaneous engineering hours.

Unusual Engineering

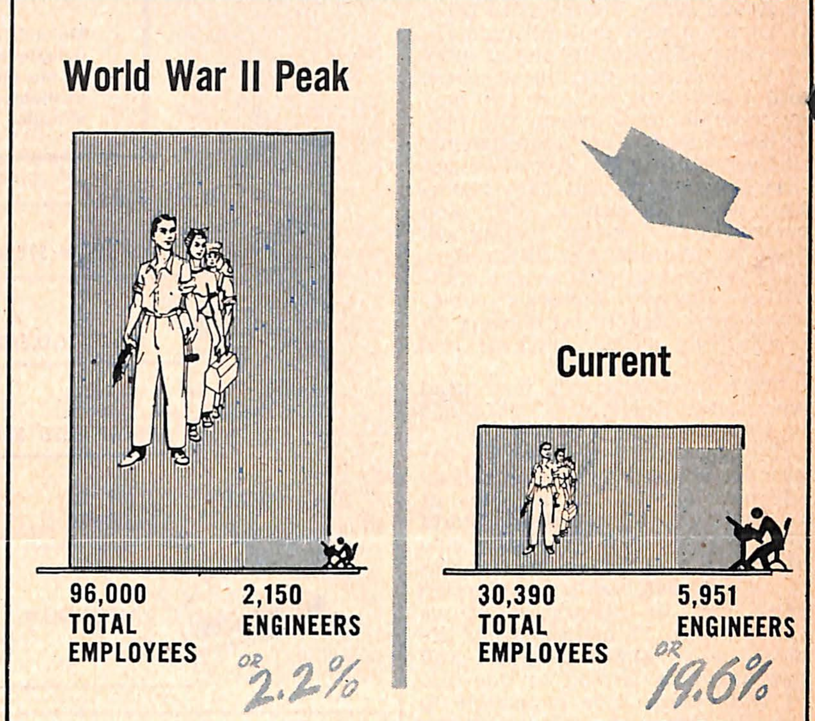
Unusual engineering problems are presented by advanced all-weather aircraft, such as those involved in housing radar in streamlined covers (called radomes) that give a combination of structural strength, aerodynamic cleanness and avoidance of radar interference. To solve the highly-technical radome design problems, one airframe manufacturer spent 6,000 engineering man hours, then an additional 50,000 man hours for design and construction of the necessary precision tooling. Incidentally, radar alone for this particular all-weather fighter costs about $60,000—over $10,000 more than the total airframe cost on its World War II predecessor.

While labor and engineering costs have spiraled, raw materials prices also have climbed upward. To get such items as castings for sheet, bolts, nuts, hydraulic pumps, gears and landing gears, manufacturers today have to pay over 3½ times as much as in World War II because quantities are greater and prices are higher. Raw materials cost on one World War II fighter was $7,176. Cost of materials for one type of jet fighter airframe today is $25,543.

Giant Tools—High Cost

The tools needed to transform these raw materials into fighting planes have become bigger and more complicated along with the planes, and the cost of these tools has become a major item in aircraft production. The comparatively simple machine tools used to build the piston-engined planes of 10 years ago have been replaced by giant special-purpose machines that fabricate planes capable of withstanding the buffeting of sonic speeds. A typical skin mill, for instance, costs $150,000. A drivmatic riveter that punches holes, puts rivets into a jet's skin and then heads them over, costs about $25,000. A massive stretcher, necessary to form sheets into fuselages, costs about $250,000. And hydraulic presses cost $500,000.

Complexity of Modern Aircraft Requires Vast Increase in Engineers



Source: Typical Aircraft Company

Answers to Planes Quiz

1. (c) During the period 1946-50 nearly 600 additional aircraft were put in service on U.S. airlines.
2. (b) Approximately 4,500, but some 2,000 are early models, no longer in production and unfit for combat.
3. False. An electrical "co-pilot" has been developed which will even guide jets through loops, rolls and other combat maneuvers with split-second accuracy.
4. Coast-to-coast time has been reduced from 32 hours to under 10; fare from $400 to around $158.
5. Every county medical society has been provided by the Civil Aeronautics Administration a list of 350 ambulance planes, in every state.
6. Italy, Switzerland, Denmark, The Netherlands, England, in that order.
7. (c) A U.S. medium bomber (our heaviest in World War II) requires approximately 1,100,000 rivets.
8. Record for a single-stage rocket is 130 miles altitude made Aug. 7, 1951; a two-stage rocket has gone 250 miles high.
9. A sortie is one mission by one plane.
10. (c) One U.S. international airline has a round-the-world radio-telephone system 19,687 miles long.

RECORDS

(Continued from Page 1)

The first effective use of quantities of jet aircraft for ground support operations was employed by the United States in Korea, substantiating the belief that despite its high speed the jet is a superior performer for ground support operations.

The first jet bomber ever used in combat was built by American industry and flown by American personnel. An American-developed engine powered the first swept-wing jet-propelled fighter which two years ago established the world's speed record of 670.98 miles per hour, a record which has not been broken since. At the National Air Races in Detroit on August 18 an American jet fighter of combat type, fully armed and unmodified, set a new closed course world speed record of 635.41 mph. This took the closed course record away from the British who had flown a stripped-down specially-modified jet at 605.23 mph.

The first successful penetration of the sonic barrier was made by an American research aircraft, and the speed of sound has been exceeded many times by other American designed and developed aircraft.

Late Start—No Funds

This is a truly remarkable performance when it is remembered that America got off to a late start in the jet propulsion race which began early in World War II. America's efforts at that time were concentrated in producing tremendous quantities of the most advanced reciprocating engine combat planes in the world so that the war could more rapidly be brought to an early conclusion. On the other hand, the British started out to develop jet planes, including transports, in 1942. The official U.S. Prototype Advisory Committee, following a recent tour of the British aircraft industry, estimated that the British have spent $400,000,000 in the development of jets, including transport planes, whereas no government funds have been expended on jet transport development in this country. However, U.S. manufacturers have offered several design studies of jet transports without receiving any orders from U.S. airlines to date.

At the present time, America has eight advanced types of jet fighters and five jet bombers in production. In addition, jet pods have been added to our intercontinental bomber to increase its performance. One eight-jet bomber has been tested and two new eight-jet long range bombers are scheduled to fly late this year. On one of these, production orders already have been placed. These are the only known types of jet-powered planes with such great range potentialities under development or close to production.