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planes

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SIX-POINT PLAN CAN CUT AIR 'LEAD-TIME'

Air Force Accepts 10,000 Jet Planes In 10-Year Period

Overcoming countless engineering and production barriers in a period of 10 years, America's aircraft industry has delivered 10,000 jet planes and 40,000 jet engines to the United States Air Force since the first turbojet was flown in this country in 1942.

In addition, several thousand more jet planes have been produced for the Navy and for U. S. allies.

Rising from a mere trickle of jet planes coming off the assembly lines just a few years ago, output of late-model aircraft and their revolutionary powerplants has reached the point where today more than half of the industry's aircraft output is jet powered — and the proportion is increasing.

New Planes Are Jets

Although every combat plane being built for the Air Force today is jet-powered, it has been pointed out that the USAF's present jet inventory is less than 10,000 planes, as a result of normal attrition, obsolescence of some of the earlier models, and losses in the Korean War.

Twelve of America's leading manufacturers are currently building a dozen different types of these new Air Force planes — and nine manufacturers are producing the engines to power them.

Two of the first American-built jet powerplants, rated at only 1,250 pounds of thrust apiece, flew a little over 10 years ago at a California test-center.

Old Records Beaten

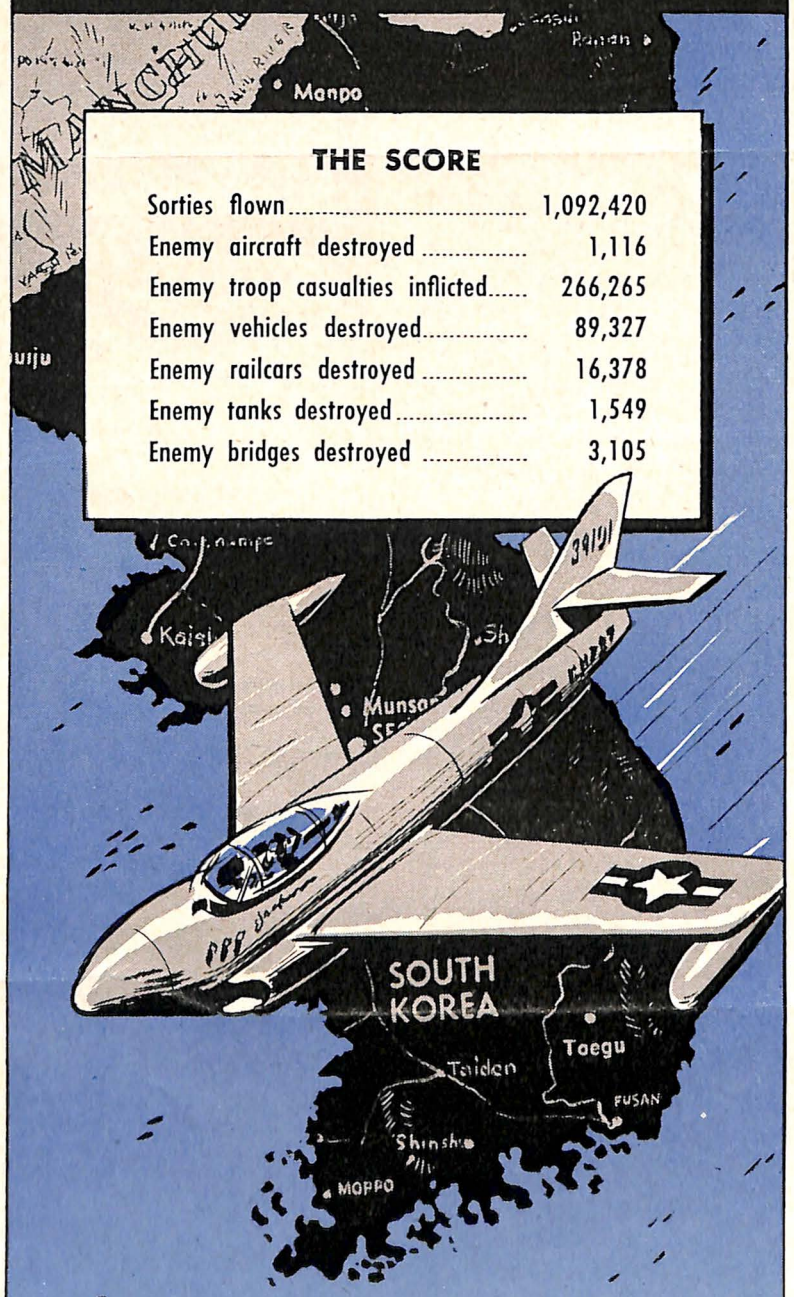
While older model jets were in the primary stages of production in World War II, U. S.-built piston driven fighter planes — with top speeds of just over 400 m.p.h. — were knocking Hitler's vaunted air force out of the skies over Europe. And America's bombers — which were pushed to go much beyond the 300 m.p.h. mark — were reducing the Nazi war-making machine to rubble.

The F.A.I. records for these piston-type aircraft show the fastest speed ever officially attained to be a shade over 469 m.p.h. and an extreme altitude approaching 48,000 ft. was the limit.

These records were rapidly shattered as American manufacturers

(See AIR BUILDERS, page 2)

KOREA — PROOF OF AIR POWER



THE SCORE

Sorties flown	1,092,420
Enemy aircraft destroyed	1,116
Enemy troop casualties inflicted	266,265
Enemy vehicles destroyed	89,327
Enemy railcars destroyed	16,378
Enemy tanks destroyed	1,549
Enemy bridges destroyed	3,105

Graphic proof of the dominant role played by the nation's air arms in modern warfare is given by the air power box-score when the Korean truce was signed. With the tremendous added effectiveness of atomic weapons, not used in Korea, air power has become the key to victory—or defeat.

In terms of enemy troop casualties alone, air power cost the Communists the equivalent of 38 divisions.

'PLANES' Source: USAF (as of July 27) USN (as of May 31)

Production Time And Plane Costs Can Be Reduced

By George F. Hannaum

Director, Industry Planning Service
Aircraft Industries Association

(*Note chart on page* 3)

At least six general steps can be taken by Government and industry to speed production of military planes, and at the same time to reduce their cost, according to studies by the aircraft industry.

Production of modern military planes is one of the most complex manufacturing operations of all time, involving thousands of interrelated actions and months of time in assembling needed parts, materials and components. Some elements of production time are irreducible; others already have been shortened by manufacturers through continuing advances in manufacturing techniques.

Joint Action Suggested

Aircraft Industries Association studies indicate, however, that the most significant reductions in aircraft lead-time (the time it takes to procure military planes) can be achieved through joint Government-industry action in six general areas, leading to increased production efficiency and decreased procurement time. Even more important, such action would increase the aircraft industry's ability to accelerate production in event of attack or other national emergency.

Objectives Can Be Met

It is, of course, true that lower costs do not always result from a shortening of the production time-span. In fact, costs can be *increased* if production is accelerated through use of such expedients as overtime labor, substitute materials, inefficient makeshift tooling, or extensive modification of aircraft after they come off the assembly line.

The combined objectives of cost-reduction and a shorter manufacturing time can be served, however, by improved practices and policies in the following general areas:

1. **New contracting techniques.** For aircraft already in production, substantial savings in time can be realized if manufacturers are authorized to place advance orders for aircraft components which take the longest time for suppliers to produce. A major airframe manufac-

(See AIRCRAFT, 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.

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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 Unchanged Task

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

A few weeks ago — on July 27, 1953 — hostilities ceased in Korea. A truce was signed, and quiet settled over a war-torn peninsula whose troubles were symptomatic of a world in convulsion.

The fighting was arrested, but the underlying cause remained—and the task assigned to the U. S. aircraft industry, and to other industries supporting the buildup of the free world's strength, was unchanged.

On the day the armistice went into effect, the 750,000 Americans who build military planes, the aircraft plants in 22 states, and their subcontractors and suppliers throughout the nation continued their long-term assignments.

There was no easing of effort, no slackening of production.

The hard fact remains that Soviet ambitions of world domination give no indication of lessening. The USSR continues to possess the world's largest standing army — and, even more ominous, an air armada of 20,000 active warplanes with at least an equal number in reserve.

As a result of this fact, the attitude of the people of the United States on July 27 was in sharp contrast to that of only eight years before, when World War II ended. Then, for the second time in as many generations, Americans believed they had fought a war that ended wars. The nation's military forces, and their supporting industries, were wrecked by almost overnight demobilization. In the case of the aircraft industry, which had been engaged in the largest single production effort in world history, the effect of helter-skelter disarmament was crippling — and cost millions of dollars. Backlogs of orders were wiped out, factories were dismantled, irreplaceable engineering and labor teams were scattered. The industry's production, measured in airframe weight, was cut from 540 million pounds in 1945 to less than 13 million pounds in 1946.

The resultant loss in military strength and productive capacity was incalculable. Certainly, the free world's military capacities were not sufficient to deter Communist exploitation of neighboring countries — or to forestall the decision to strike in Korea in 1950.

The unprovoked attack on South Korea, however, aroused the nation from its complacency — and spurred into action a concerted effort aimed not only at repelling the invaders but at creating strength over a period of years.

Following outbreak of the Korean War, the first report of the Office of Defense Mobilization made this objective clear:

"In the spirit of national unanimity, we resolved to vastly strengthen our military resources — not only to meet the situation in Korea, but to do our part in the much larger task of building the defenses of the free world against aggression elsewhere. The assault on Korea demonstrated that Communist imperialism would not hesitate to risk world war in pursuing its goal of world domination. In response to this hard fact, we in the United States embarked on a definite, long-term program to increase the level of military strength we shall maintain."

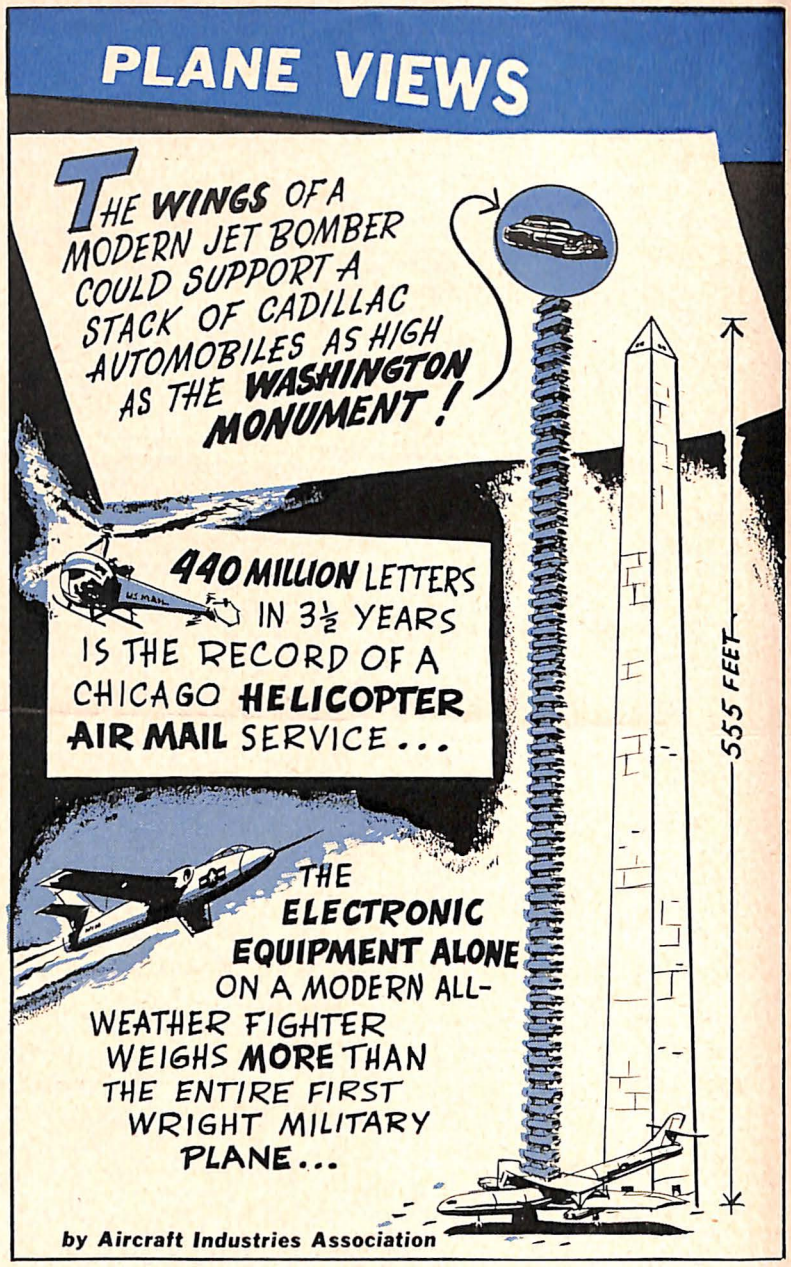
Production schedules given the aircraft industry since 1950 have been based upon this need for a buildup to a level of preparedness that can be sustained so long as the present era of international tension continues.

A basic element in this reconstruction of U. S. military strength has been the expansion of the aircraft industry to the point where it not only is capable of meeting present armed forces requirements, but is also able to expand rapidly in event of future national emergency. Since 1950, employment in the industry has almost tripled, floor space has been more than doubled, and the monthly aircraft production rate has been increased by some five times. The industry still, however, must produce some 25,000 additional aircraft before the units contemplated under present strength goals are fully modernized.

The truce in Korea thus has brought no revision in the task ahead.

In the words of President Eisenhower, "The program we are presenting is a long-term program, calling for a steady and adequate flow of men and materials to present a position of genuine strength to any would-be aggressor. . . . Defense is not a matter of maximum strength for a single date. It is a matter of adequate protection to be projected as far into the future as the actions and apparent purposes of others may compel us."

PLANE VIEWS



Aircraft Builders' Production Is Now Half Jet Airplanes

(*Continued from page* 1)

turned to jet propulsion.

Blazing through the skies at Salton Sea, Cal., just a few weeks ago, a production model of an Air Force interceptor set a new world speed record of over 715 m.p.h. and it is becoming commonplace for jet propelled medium bombers to span the Atlantic in less than five hours. Altitudes in excess of 60,000 feet are now reached by jets without attracting attention.

With performance skyrocketing, and the demand for ever-increasing dependability and durability growing greater, the necessary complexity of today's jet planes is staggering.

PLANE FACTS

- Tolerances are so close in manufacturing servo-mechanism valves and valve spools for guided missiles that some assembly work can be performed only under the lens of a powerful microscope.
- A typical piston engine, used in modern transports, has 11,400 parts.
- One of the fastest-known methods of joining two pieces of metal — spot welding — plays an important part in aircraft manufacturing. A single subcontractor's plant makes 213,000 spot welds every day.
- The fuel alone carried by a modern jet bomber weighs more than did a World War II bomber fully loaded for combat.

Aircraft Industry Studies Six Ways To Cut Lead-Time

(*Continued from page* 1)

turer's study indicates that placement of these orders *prior* to receiving continuation contracts for additional quantities of planes would decrease time between receipt of a re-order and delivery of the completed aircraft.

2. **Streamlined approval procedures.** Under the Armed Services Procurement Regulation, aircraft manufacturers must defer numerous essential operations until they are approved by the military services. For example, if the Government is required to provide machine tools under a facilities contract to supplement a contractor's production line, even an experienced manufacturer cannot order such tools until a detailed review is undertaken by the military services. Time required to obtain such approval varies from one week to three months — and is a factor in lengthened manufacturing time.

3. **Reduction in change-orders.** It is, of course, impracticable to "freeze" aircraft designs in a period of rapid technological advances. Production changes are made for a variety of reasons, such as changes to facilitate production, changes to substitute for unavailable material, changes to correct engineering errors, changes to meet military theater requirements, changes to incorporate improved equipment, and others. Some of these costly and time-consuming change-orders can be eliminated during the initial stages of production, however, through a more intensive service evaluation prior to full-scale production. Such evaluation of prototypes would also reduce the need for extensive modification of aircraft after they leave the production line.

4. **Maximum simplicity commensurate with performance requirements.** The complex and costly equipment in modern aircraft saves lives — and is responsible for air superiority in combat. As aircraft become more complex, however, there is an accompanying increase in engineering design time, manufacturing time, initial and operating costs, and maintenance difficulty. To improve producibility and to decrease over-all manufacturing time, the military services and the industry must continue to give high priority to studies of methods to simplify combat aircraft without sacrificing quality. This is, to a large degree, a matter of compromise.

Efforts are being made to shorten manufacturing costs and decrease production time by standardizing certain aircraft parts and components. Here again, significant progress is a matter of compromise: standardization cuts costs; specialization increases performance.

5. **Production process engineering.** Under existing regulations, a contractor can spend only a limited amount of money on so-called "process engineering" during the performance of a production contract. This restriction prevails despite the fact that development of improved manufacturing processes is a basic factor in cutting both costs and manufacturing time.

For example, the quickest, cheapest and simplest way to make an important part of an *experimental* engine may be to machine it out of solid metal at a cost of $5,000. Such a part might be produced for $500, and in much less time, if it were cast or welded when the engine is put into high-volume production. A great amount of process engineering would be required, however, to determine whether the engine would continue to operate properly under all conditions with such a cast or welded part instead of the original machined part.

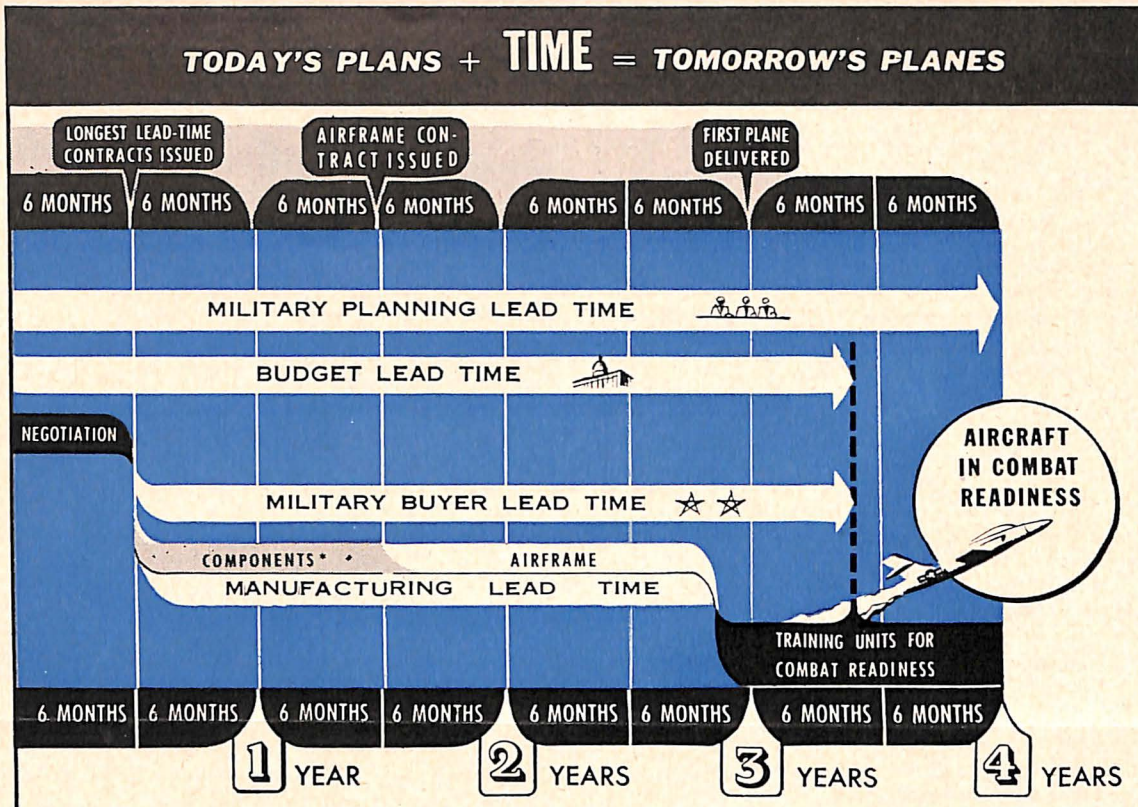
Any tendency to exclude these process engineering costs from a production contract leads to an artificial separation between engineering-for-production and engineering-for-design — and results in high costs and longer delivery schedules.

6. **Stability of the production program.** The President, in a recent speech, said that the nation today is living in an "age of peril" rather than a "moment of danger." Historically, however, the production programs for military aircraft and related equipment have been based on the concept of a "moment of danger," during which vast sums of money are appropriated, an almost overnight explosion of production facilities takes place, and all-out production of combat aircraft follows.

Invariably, after the period of danger appeared past, sharp cutbacks of aircraft production have followed. These fluctuations have been costly in terms of dollars, quality and military strength.

In the long run, nothing can contribute more to decreased costs, increased quality, and reduced manufacturing time than can a stable and relatively long-range production program for military aircraft and related equipment. Most important, such a program would give the aircraft industry the capability of accelerating production rapidly — a mobilization requirement which, in national emergency, could spell the difference between victory and defeat.

The tremendous amounts of money that will have to be raised by taxation and spent over the years to give this nation adequate air defenses will affect the entire economy of the country. The necessarily high cost of such a program imposes a serious responsibility upon the military services and industry to take all possible actions to reduce costs and improve quality, while sustaining the ability to meet production needs in event of attack.



Why does it take so long to turn defense dollars into defense planes? The above chart illustrates the four basic elements in the 48-month lead-time required to create combat-ready air units equipped with additional quantities of a military fighter plane already in production. This time span varies with the type and complexity of the plane produced.

More years are required to design and develop completely new aircraft—and even longer time to accomplish the essential research and development that leads to air superiority.

* Engines, radar, armament, fire-control systems, etc., procured by the military services and furnished to the airframe manufacturer for installation.

'PLANES' Source: Aircraft Industries Association

Military Airlift Flies Four Billion Passenger-Miles in First Five Years

Imagine the difficulty of picking up every person in the entire state of Kansas and depositing them — along with 632 million pounds of their personal possessions — 2,000 miles away, above the Arctic Circle.

Such a moving job staggers the imagination.

Yet the Military Air Transport Service has accomplished an equivalent task in its five years of existence by transporting 1.9 million passengers almost four billion passenger-miles—and carrying 316,000 tons of cargo and mail.

Since the outbreak of the Korean War, MATS planes have delivered over 152,000 tons of passengers, mail and critical cargo needed to resist aggression in the Far Eastern war. They have made more than 33,000 flights across the Pacific and an additional 11,000 between the United States and Europe and Africa.

418,000 Patients

Shuttling supplies to men fighting a war 7,000 miles from the United States, this huge airlift has given an unmatched demonstration of the strategic necessity for military transport aircraft in times of emergency. The tonnage of goods delivered to bases in the Far East since the Reds charged down the Korean peninsula in 1950 is equivalent to more than three times the dead weight of the aircraft carrier Midway, one of the world's largest carriers.

The average MATS passenger, 418,000 of whom have been patients, flew over 2,000 miles, nearly four times the average flown on the scheduled airlines and an over-all equivalent of 1.9 million flights from Los Angeles to Cleveland, O.

Increase In Jet Engine Durability Saves Millions In Defense Dollars

Design simplicity and rugged durability of late-model jet engines are paying off in greatly increased service life — and, in the case of one jet powerplant type, will save taxpayers more than $100 million.

Although it has been less than 11 years since the first American jet flew over the sands of Muroc, Calif., the officially-authorized time between overhauls on some modern jet powerplants already has reached 1,000 hours—or about 600,000 miles of flying. This compares with 800 to 1,400 hours between overhaul for piston-type engines, which have been in operation and development for years.

In the early days of jet production—when theory was first being put to test—jet engines were built which had a seldom-reached life expectancy of 200 hours. Generally after about 150 hours of flying these engines had to be pulled down for complete overhaul.

Development Slow at First

From 1945 through 1948 development in the jet engine field was slow, but the added impetus of increased military activity in jet flying, which began to develop in 1949, provided the necessary flight time and experience the industry needed for the evolution of advanced engines.

Two major reasons for the rapid extension in the life of jet engines are the simplicity of the designs and the forward strides by the aircraft industry's scientists and research engineers in developing materials which can stand up under the blistering temperatures of jet thrust.

Unlike conventional piston-type engines, jets are not adversely affected to any great degree from parts wear. Most of the difficulties are experienced in the "hot section" of the engine and through the development of a field repair and replacement program it has been possible to greatly extend the life of the power plants between actual overhauls.

Three Million Hours

Test stand runs made on one jet engine model—to check engine performance deterioration—showed that after 1,000 hours of operation the engines still exceeded the minimum operating limits established for new production engines.

Jet engines produced by one American manufacturer have already logged more than three million hours in the air — the equivalent of over 340 years of continuous flying. And many of these hours were gained in actual combat when the load on the engine was at its greatest point.

Even under these severe circumstances many squadrons maintained better than 90 per cent in-service availability. During one period of 1953, 85 per cent of all engine failures of these combat jets was due to "foreign object" damage — damage caused by pilot error and others which were not attributable to the engine.

One manufacturer predicts that jet engines will soon operate indefinitely with an amazingly low rate, possibly 15 per cent, of failures.

In 1947, when engines with a maximum of 4,500 pounds of thrust were being built, a typical manufacturer reported that one engine model required approximately 5,250 individual tools for production. Three years later, the same manufacturer needed 17,000 tools for a new model and today — as production requirements pyramid — one of the latest model jet engines requires 20,000 tools.

Complex Machines

The airplane itself is just as complex. Design and development of one modern bomber required three million engineering hours — nearly 20 times as much needed to build its World War II equivalent. Whereas the bomber of the last war carried 530 pounds of electronic equipment, today's big craft carry 2,500 pounds.

As these modern aircraft become heavier and more intricate they become much more expensive — but they also become more deadly and accurate, which is essential to America's defense.

Precision Bombing

The complexity of modern jet aircraft increases rapidly as higher altitudes are attained and as new speeds are reached.

One example of this is the altitude control device used on some U.S. combat aircraft. It is so delicate and sensitive that it can maintain the aircraft at a constant altitude up to 65,000 feet with not more than two feet of variation.

This intricate equipment gives the bombardier a "platform" for high altitude bombing that is vital in determining the bomb's trajectory and makes it possible to release the bomb load from many thousands of feet.

Utility Airplanes Have Longer Life Than Automobiles

Precision manufacturing of modern civil aircraft gives them a life several times as long as the average family automobile — which rapidly gets into the jalopy class after the 50,000-mile mark.

Late records on civil planes—both transports and light utility craft—show that 71 per cent are more than five years old and that, insofar as safety is concerned, virtually every plane in regular operation is in new aircraft condition. In fact, many business airplanes are flown 600 hours per year, an equivalent of 75,000 miles. In contrast, only 43 per cent of U. S. automobiles are more than five years old—with substantial numbers in this age-bracket traveling the highways in unsafe operating condition.

Two Major Reasons

The long life-span of today's civil planes is attributed by the AIA Utility Airplane Council to two major factors: quality manufacturing and design techniques, and the excellent maintenance required under Civil Aeronautics Administration regulations. These regulations stipulate that aircraft which are flown constantly must be maintained in what amounts to "new" condition at all times. A plane that has flown 3,000 hours must be in just as airworthy shape as one that has flown 30 hours, although it may have covered nearly 400,000 miles in this time.

So soundly constructed are today's aircraft and so exacting are the continuing inspections that a modern airplane provides literally thousands of flying hours and hundreds of thousands of miles of travel.

Only the continuing improvements in each new model, as the industry strives for further perfection and greater utility and economy in their operation, ultimately make older models obsolescent.

Even then old aircraft are often found which are kept in airworthy condition by cannibalizing parts from similar airplanes after the manufacturer no longer finds it practical to supply spare parts and maintenance supplies.

Air Quotes

"At the risk of being repetitious, I wish to say again that unquestionably the Soviet Union is capable of attacking now. Whether or not an attack will be forthcoming today, tomorrow, or five years from now is a question which only the men in the Kremlin can answer. The fact remains, however, that the Soviet air force is capable of launching devastating atomic attacks on our major cities and industries now." — *Gen. Nathan Twining, Chief of Staff, United States Air Force.*

Jet Destruction

More than 180,000 rounds of 50-calibre bullets were fired by the average American jet pilot during a 100-mission tour in Korea and 350 high-powered rockets were rained down on the enemy.

Adding to the effectiveness of these modern combat jet aircraft, these pilots averaged dropping 220 tons of bombs and over 2,500 gallons of napalm.