Combined Civil-Military Production

INDUSTRY TO BUILD 16,700 PLANES IN '53

Variety of Skills Needed to Build Jet Powerplants

It takes 8,854 parts and 87 different kinds of specialists to create one of the big jet engines that power America's latest military aircraft.

These 87 types of specialists—all highly-skilled in their professions and trades—perform several thousand different engineering and precision manufacturing jobs.

Hundreds of workers in each specialization may be needed. For example, more than 600 design and application engineers are now working in a single engine plant.

Additional Specialists

And behind the direct engine production workers are hordes of other specialists employed by subcontractors and suppliers who produce many of the jet powerplants' 8,000-plus parts. One company reports that its subcontractors and suppliers number more than 4,000 independent firms.

The concentration of highly-skilled talent required for designing, developing, building and testing these engines is one factor in the increase in unit cost of today's powerplants.

Yet the inventive and production skill of modern engine-builders has resulted in more power per dollar of cost than in a typical piston-engine. Based on one engine with afterburner, for example, the cost per horsepower is only $2.56, compared with approximately $17 per horsepower.

(See JET ENGINE, page 4)

Military Output

At Approximately Scheduled Peak

With production approximately at the peak rate contemplated under present military schedules, the U.S. aircraft industry today is building some 48 new military aircraft every working day—with well over half of the planes jet-powered.

These new aircraft—which are being added to the nation's air arsenal at the rate of some 250 per week—are the products of 50 airframe manufacturers, 20 engine builders, 10 propeller makers, and several hundred companies building instruments, electronics equipment and other aircraft components. Behind this primary industry are approximately 60,000 subcontractors and suppliers, located in every state in the nation.

Value of Production

The industry is presently producing more than $900 million worth of aircraft, engines, parts and propellers (including civil products) per month. This figure does not include other aircraft components and accessories.

At this rate, it is estimated that during this year aircraft manufacturers will build:

- Approximately 12,000 military aircraft (over half of them jets).
- Approximately 4,700 civil transports and utility aircraft.

Twenty-three types of combat jets (15 of which are fighters) are now in production for U.S. military services. In addition, several turboprop transports are being built for the armed forces, and at least one commercial jet transport prototype is under construction.

Geographic Distribution

Geographically, the basic aircraft industry is widely dispersed. Key airframe production centers are in Southern California; Dallas-Fort Worth, Texas; Kansas; Long Island and Buffalo, New York; St. Louis, Missouri; Seattle, Washington; Hampton and Baltimore, Maryland; Marietta, Georgia; and Tulsa, Oklahoma. Major centers of engine production are in Connecticut, Indiana, New Jersey, Missouri, Ohio and Michigan. Electronics and other components production is widely dispersed.

(See AIR OUTPUT, page 3)

Production Economies Shave Costs In Building U.S. Military Airplanes

- An aircraft engine manufacturer's new method for testing jet engines will result in savings to the American taxpayer of approximately two million dollars a year.
- An airframe manufacturer's development of a new-type support for aircraft wiring will cut the cost of building late-model transport-type aircraft by an estimated $269,500 during the total production run.
- These are typical examples of savings accruing to the American taxpayer from the all-inclusive cost-reduction campaign underway in the U.S. aircraft industry.

Broad Program

Adm. DeWitt C. Ramsey, president of the Aircraft Industries Association, in commenting on the cost-reduction efforts undertaken by manufacturers, has pointed out: "It is not only essential to our national economy to keep our air power costs at a minimum, but in the industry's view, it is also good business practice based on the American free enterprise and free competitive system."

He outlined the six general areas of production in which intensive efforts are in progress in an attempt to produce more air power per dollar:

- Management. Management is reducing costs by (1) strict budgetary controls, (2) exchange of production, technical and manufacturing information within the industry, (3) strict control over labor, tooling and manufacturing, (4) emphasis on cost consciousness on the part of every employee—from production line to executives.
- Engineering. Engineering costs are being cut by (See AIR POWER, page 4)

Electronics Get Rough Workout During Flight

On a typical mission flown by 30 heavy bombers, the planes' vacuum tubes operate a total of 1,500,000 hours.

That's equal to running a home radio for 30 straight years.

But, says the tube manufacturer, "bomber conditions also mean that this same home radio should be in a 200-degree oven and dropped on the floor every 10 minutes."

These tough, special-purpose tubes play a major role in modern aircraft performance.

Over 50 Million Persons To Use Airlines in '53

More than 50 million persons will fly on world airlines during 1953, predicts the International Air Transport Association.

That's 5 million more passengers than were carried last year.

The average airline passenger is flying farther, too, the world airline organization reports. In 1953, average length of trips is 547 miles; as compared with 536 miles last year. The longer flights are attributed by IATA to long-haul tourist operations.
Air Education—
A ‘Must’ in the Air Age

Today, despite the fact that the aeronautical science is at perhaps its most spectacular stage, aviation careers may have lost the interest of American youth.

Modern aircraft, flying at breathtaking speeds and at altitudes beyond human sight, fail to capture the imagination of youngsters as did the slow, comparatively cumbersome low-altitude craft of the pioneers.

And the undramatic efficiency with which airline commerce plys the air ocean with safety and dependability has rubbed the glamour from the pilot—and left, in its place, the badge of the professional man.

Aviation has grown from a sport—and a cow-pasture business for barnstormers—into one of America’s largest industries.

One result has been that, while the airplane plays an ever greater part in the life of the nation, we are increasingly confronted with shortages of trained aeronautical engineers, technicians, military pilots and scientists. These shortages are symptoms of youth’s lagging interest in aviation careers.

Even more important, perhaps, is the danger that a generation of Americans whose destinies lie in the air could reach maturity without a full understanding of the impact of aviation on the social, economic and scientific fabric of their world.

For this reason, the success of widespread aviation education programs, aimed at placing in perspective the startling aeronautical advances and revolutionary changes of the first 50 years of powered flight, has never been more important.

Such programs are already underway on several fronts, sponsored by such groups as the National Aviation Education Council, the Civil Aeronautics Administration, the Civil Air Patrol, the Air Force, the Navy, the airline industry, the aircraft industry and others.

Leading national educators have joined, through the National Aviation Education Council, with the support of the Aircraft Industries Association, to prepare materials for the use of schools throughout the country.

Such active programs are long due—at a time when man’s wings have changed the pace of the world, the concepts of commerce, and the tempo of communications.

Today, entire industries have been built upon air commerce. The world’s travelers have turned to the air—to the extent that more international travelers entering and leaving the United States do so by air than by sea. More first-class travelers use the nation’s airlines than use the nation’s railroads.

Moreover, the airplane as a weapon of war has become a keystone of peace, a deterrent to aggression, and the major defense against attack.

In this year, the Golden Anniversary of the first successful powered flight, we have seen advances undreamed of in past decades. Some of our aircraft travel faster than bullets; they carry equipment that works faster than man’s brains; they fly at heights that stagger the imagination; they carry tons of cargo at high speeds over vast distances.

It is a responsibility—because of the massive impact of aviation—for all Americans, especially those within the aviation industry and the educational field, to insure that the next generation is given the background and the foundation to use these great advances with intelligence and to continue them for man’s betterment.

In our absorption with the problems of the moment, we can never lose sight of the fact that the distant goals of today must be achieved by the men of tomorrow.
Aircraft Output To Reach 16,700 In Calendar '53

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scattered throughout the nation. Measurement in terms of employment, the central region of the United States has 40.1 per cent of the total, the West 29.8 per cent, and the East Coast 29.3 per cent. This is in contrast to the distribution of aircraft plants in the days prior to World War II, when its respective percentages were 4.5 per cent, 41.0 per cent, and 54.5 per cent.

In the Korean War period, the development of Fort Worth-Dallas area as a major production center, perhaps the most outstanding single change in the geographical redistribution of the aircraft manufacturing industry.

Aircraft Backlog

In mid-summer, the backlog on the books of the aircraft manufacturers amounted to $18.9 billion, the highest figure since World War II, and represented orders which will be filled in the next one, two and three years. Of the total backlog, $12.4 billion was war work, building complete aircraft and parts, of which $11.6 billion was earmarked for United States military plane production. Backlog of the engine manufacturers was $5.3 billion, of which $5.1 billion was for the military. Backlog of propeller and other parts manufacturers was $1.2 billion.

On the basis of this backlog, a fairly high volume of business appears assured for the industry throughout 1954 and into 1955. What will develop thereafter will depend to a large degree on the international situation, domestic economic considerations, and the results of the current deliberations of the Joint Chiefs of Staff and the National Security Council on the entire basis of national defense.

Sales of complete aircraft, airplane engines and propellers were $4.2 billion for the first half of 1953, compared with $3.9 billion for the comparable period in 1952, and $3.0 billion for the first half of 1949. This increase should result in higher aggregate earnings for the aircraft industry, although it is questionable whether the percentage of profit to sales will show any marked improvement over previous years.

Financial Position

Statistical difficulties preclude an analysis of the aircraft industry's financial position on an inclusive basis, but Aircraft Industries Association figures for the 12 leading airplane manufacturers reflect the overall financial status of the industry. In 1952, latest period for which information is available, the 12 largest airplane manufacturers (who produced over 90 per cent of all planes built) reported a sales jump of 68.5 per cent over 1951, but their net earnings of $586 million represented only 2.2 per cent margin on sales—substantially below the national manufacturing average. The earnings rate of 2.2 per cent on sales compares with a 5.4 per cent margin for 1,783 manufacturing concerns surveyed by the National City Bank of New York.

It Costs Less to License Airplane Than Auto

The Civil Aeronautics Administration reports that it's cheaper to license an airplane than to license an automobile—and the whole operation doesn't cost the taxpayer a cent.

Last year, fees collected totaled more than $166,000. CAA reports that it issued 54,704 certificates for used aircraft in fiscal 1952. That's substantially more than one-third of the 15,000 civilian aircraft in the United States.

Sixteen Thousand U.S. Women Know How to Fly Planes

Harriet Quinby didn't know what she started—back in 1911 when she became the first American woman to hold a pilot's license.

Stemming from her first flight, made back in the days when women didn't even have the vote, are pilot instructors, crop-duster, air-taxi pilots, glider pilots—and even seven helicopter pilots.

License Holders

Today, more than 16,000 U.S. women hold pilot's licenses, five times as many as during World War II, and that number is increasing at an annual rate of about 1,500 per year.

But instead of flying for fun, as did the redoubtable Miss Quinby, most of the modern women pilots are learning to fly for the reason their mothers learned to drive an auto—to get places quicker and return faster.

The majority of the certified women pilots today hold private licenses—but six have the CAA Air Transport Rating certificate, qualifying them to handle today's huge transport aircraft, five of them are registered as glider pilots, and seven hold the newest of all ratings—that of helicopter pilot.

CAA Certification

In addition to those who are flying the airways for business or pleasure, there are 3,649 more women holding down jobs which also require CAA certification and are necessary to the nation's civil and military airpower. There are nearly 1,900 female tower operators employed in the Federally-controlled Airways Traffic Control Towers. Another 1,175 are helping to teach others to fly, holding Ground Instructors certificates, while 415 are classified as Parachute Riggers. Another 70 are licensed Dispatchers and 66 of them hold Aircraft and Powerplant Certificates, permitting them to perform all the overhauls required in an aircraft's Airworthiness certificate.

Aeronautical Engineers Build Tiny Parts For Key Roles at Supersonic Air Speeds

Minature electric circuits (like above) to photo-etching. Space requirements are crowded through process similar to circuit wiring on complete. Special parts or parts must be made from these circuits can be made out of master drawing, like parts which turn out washe can hardly be seen. Nearly 3,000, of a small resistor.

Other Projects

Among other recent examples of projects in the aircraft industry are:

- Air turbine drives, starters, and as 1/2 pound per horsepower.

- Electric motors for incorporating in actuators and other products weighing as little as 1/200th of 1 pound.

- Miniature intercommunication systems small enough to be held in the palm of the hand.

- Transistors—tiny substitutes for vacuum tubes—that are approximated the size of a pea.

- Transistors are in the most amazing advances in electronics in precisely. Usually when transistors they input power, transistors do not compensate for heating filaments. Consequently, they use much less, and generate very little heat. A cooling system is required to transmits to their heat. Use of these reliefs promises considerable new electronic equipment missiles.

Blueprints by the Acre

Revolutions advances in new aircraft design require—on a typical major aircraft manufacturer to produce more than two million square feet of blueprints each month.

That's enough blueprints to paper 2,000 five-room homes.
It Takes 87 Kinds of Specialists, 8,854 Parts to Build a Jet Engine

Eighty-seven persons (above) represent 87 different skills needed to design, develop, build and test jet engine. Also shown: engine's 8,854 parts.

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h.p. on a reciprocating engine.

Among specialists required for jet engine production are:

Instrument engineers, chemists, test maintenance men, calculators, control system engineers, critical materials analysts, weight control analysts, field service engineers, augmentation engineers, stress analysts, flight test engineers, aerodynamics engineers, thermodynamics engineers, fuel systems engineers, lube systems engineers, afterburner controls engineers, engineering managers, test cell design engineers, accessory engineers, lab technicians, detail draftsmen, design consultants.

Engineering assistants, spectrophotographers, combustion development engineers, draftsmen, preliminary design engineers, blueprinters, electro-mechanical engineers, turbine design engineers, metallurgists, metallographers, compressor design engineers, mathematicians, component test supervisors, development managers, vibration specialists, instrument calibration specialists, welding engineers, hydraulic component design engineers, X-ray technicians, administrative executives, quality control specialists.

USAF plant representatives, modification assemblers, time study specialists, general foremen, shop engineers, expediters, assembly foremen, laborers, security guards, sub-assemblers, toolkeepers, sound control engineers, inspectors, cost reduction specialists, can line packers, methods planners, technical writers, jitney drivers, timekeepers, maintenance specialists, machinists, test methods engineers, test cell operators, stock keepers, fluorescent part inspectors, toolmakers.

Pre-test inspectors, major parts assemblers, carloaders, packaging specialists, magnetic particle inspectors, engine handlers, manufacturing managers, subcontracting managers, crane operators, tube benders, training instructors, safety engineers.

Air Power Costs Reduced by U.S. Industry Drive

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are being reduced by: (1) design for minimum weight, ease of production, product simplicity, and economical operation, (2) standardization and interchangeability of parts, (3) strict cost control, (4) careful scheduling of work load, (5) rapid dissemination of technical data to company personnel, and emphasis on employee training programs.

Cutting Tooling Costs

- Tooling. Tooling costs are being reduced by: (1) centralizing tooling management, (2) designing tools for multiple use and maximum number of operations, (3) adoption of production line methods where possible, (4) use of most economical materials, (5) strict budgetary controls.

- Manufacturing. Manufacturing costs are being reduced by: (1) tighter scheduling, (2) placing greater cost responsibility on foremen, (3) breakdown of major assemblies, (4) better use of factory space, (5) use of statistical quality control methods, (6) use of most efficient equipment and techniques.

Factories, Burden, Materials

- Factory burden. Factory burden (includes such items as rent, utilities, maintenance, property taxes, and administrative overhead) costs are being reduced by: (1) tight budgetary controls, (2) simplification of paperwork, (3) better preventative maintenance, (4) control of shipping, utility and postage costs.

- Materials. Materials costs are being reduced by: (1) coordinating company purchases for most economical quantities, (2) stimulating competition among suppliers, (3) helping suppliers to reduce costs, (4) preventing waste, (5) reclamation contracts and production planning managers, welders, financial managers, dynamic balancers, machine operators and sheet metal workers.

Air Quotes

"Let's look at another facet of the Army's operation which, if geared to airlift, might effect our appraisal of costs. Within the Army alone at any given time, there are upwards of 100,000 people in a travel status. If these people could be moved by air rather than by present means of transportation, and if this latter method of travel decreased the time required for their journey by only 20% — a truly conservative figure — that would mean that the Army would have to supply available for duty at any given time, 29,000 more soldiers — more than an entire infantry division — than we currently have. It is possible that the Army — and I stress, may be some increase in travel costs in moving large groups by air. However, the savings which would result from having an entire division available for duty rather than in a travel status would certainly more than offset any additional costs." — Earl D. Johnson, Under Secretary of the Army, August 21, 1953.

Sub-Zero Air Conditioner Used to Test Plane Parts

The air-conditioner used by a West Coast components manufacturer to test aircraft accessories in sub-zero temperatures is powerful enough to cool a 145-room hotel.

It would take 440 household refrigerators to equal the system's output.

Only when accessories are fully tested at the sub-zero temperatures encountered at high altitudes (as well as tested under conditions of heat, shock, dust, humidity, fungus, and others) are they ready for actual use in modern aircraft.