Other H-21s are providing air transportation to mountain peaks in the construction of early warning radar stations and the supporting network of communication stations in the north.

Employment increased from 3,700 in 1954 to approximately 5,000 at the year's end.

Sales for 1955 were expected to exceed 1954's $48.5-million, and earnings to be comparable ($2.5-million before taxes). The annual payroll was over $20-million.

A new contract for additional H-21 Work Horse helicopters was awarded the company in November by the U. S. Army. This contract was for the largest production quantity ever received by the organization, raising the backlog of orders to approximately $140-million.

Piper Aircraft Corp.

During 1955, Piper Aircraft Corp. produced three basic commercial models: the two-place tandem Super Cub, the four-place single engine Tri-Pacer, and the twin engine all metal Apache, resulting in the best year in the company's history. For the fiscal year ending Sept. 30, 1955, there were produced 526 of the tandem, 882 of the Tri-Pacers, and 271 Apaches.

Employment increased from approximately 1,250 at the start of the year to approximately 1,500 at the close. Production and the output of airplanes were completely shut off for one month in August due to a four week strike of the employees, which cost the company approximately 60 Super Cubs, 100 Tri-Pacers, and 30 Apaches.

Lack of production floor space also hindered output and in the summer of 1955 production was begun on a new assembly building to be used primarily for the construction of Apaches. This building will cover approximately 60,000 sq. ft. and is sxpected to be completed in January, 1956.

Sales for the fiscal year were expected to approximate $16.7-million; income before tax approximately $3-million; and net income approximately $1.4-million.

Radioplane Co.

Principal production item for Radioplane Co. of Van Nuys, a subsidiary of Northrop Aircraft, Inc., was the OQ-19 airplane target, used by the armed services as the standard radio-controlled target for anti-aircraft gunnery and missile training.

The greater portion of 1955 Radioplane production was devoted to the OQ-19B target drone system, an out-of-sight target which may be equipped with radar corner reflectors to render the vehicle valuable for plotting board target missions.

Proved reliability of the OQ-19 has led to new applications of the drones for purposes other than purely as targets. One of the most recent of these has been the RP-71, a joint development of the U. S. Army and Radioplane in which the agile drones have been assigned the task of photographic reconnaissance.

No details concerning the company's increasing activity in the guided missile field have been released for reasons of military security.

Indicative of Radioplane's operations in the guided missile field was the announcement of plans for developing facilities at El Paso, Texas, close to military bases involved in guided missile and pilotless aircraft activities. Radioplane will build and operate a 25,000-square-foot pilot plant at El Paso. In addition, the company has announced plans to acquire a large industrial site near El Paso to provide for additional expansion.

A clue to Radioplane's activity in the supersonic field was contained in the announcement that a rocket-powered sled designed and built by the company had achieved a new land speed record in reaching a velocity of 1,100 mph on the 10,000-foot track at Edwards Air Force Base.

Besides its work in the pilotless aircraft field, Radioplane Co. is engaged in research on parachute deceleration and recovery systems. The company's Aero-Mechanical Projects Department is presently conducting parachute tests at various service installations in addition to designing, developing and fabricating missile recovery systems.

Republic Aviation Corp.

While mass production of F-84F Thunderstreak fighter-bombers and RF-84F Thunderflash photo reconnaissance fighters was Republic Aviation Corporation's major program in 1955, the company was also laying the foundations for a new family of super and hypersonic aircraft of the future.

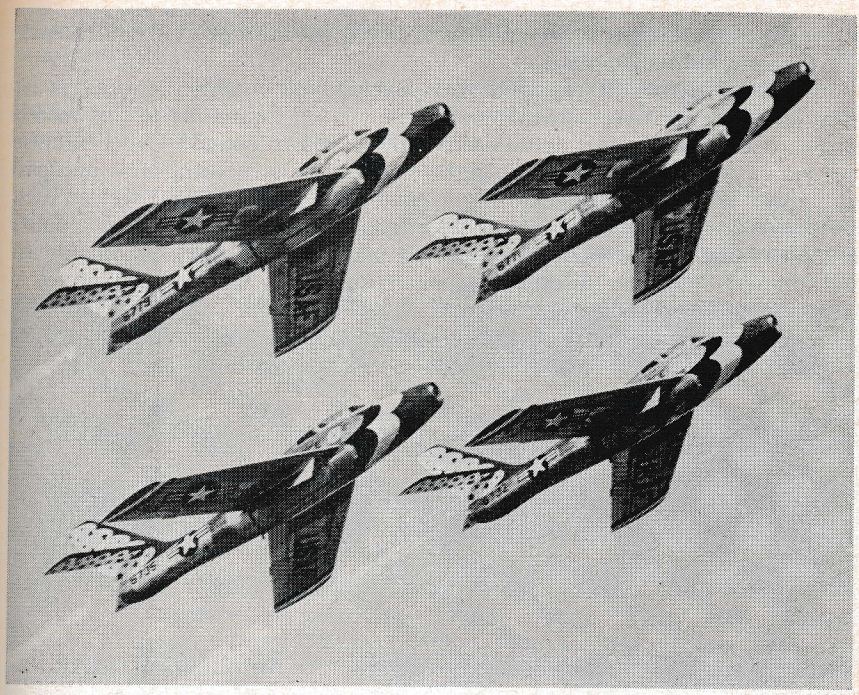
In mid-1955 Republic passed the 1,000 mark in Thunderstreak production and a few months later, in September 1955, announced it had launched a $12-million research and development facilities expansion aimed at accelerating design and production of future aircraft.

In their first full year of mass active duty both the Thunderstreak and Thunderflash were setting records. In March, 1955, a Thunderstreak flew 2,445 miles across country from Los Angeles to New York in 3 hr. 44 min. for an average speed of 652 mph and a new official transcontinental speed record. That same day two other Thunderstreak pilots bettered the previous transcontinental speed mark.

On Aug. 17, 1955, the 27th Strategic Fighter Wing set a new world's non-stop jet fighter distance record, flying Thunderstreaks 5,118 miles from London, England, to Texas, breaking the 4,840-miles trans-Pacific record set only three months before by Far East Air Forces' Thunderjets. Both Republic planes utilized mid-air refueling, which the company has pioneered, to set the records.

In "Operation Flashgun" in March, 1955, the 18th Tactical Reconnaissance Wing put its Thunderflashes through their first combat shakedown. During "Flashgun" the 18th flew double its quota of missions in only 23 of the 31 allotted days with a minimum of maintenance problems.

Republic completed, during the year, modification of an undisclosed number of Thunderflashes for use in the FICON F-84F-B-36 combination.



Republic's swept-wing F-84F Thunderstreaks

The Air Force announced formation of the first FICON Thunderflash unit, the 91st Strategic Reconnaissance Squadron at Larson AFB, Wash.

In service with six USAF commands, Thunderstreaks and Thunderflashes in 1955 joined the F-84 Thunderjet in the air forces of NATO (North Atlantic Treaty Organization) nations. The first NATO countries to receive the new airplanes were France, Belgium and The Netherlands.

The year was also one of increased activity on the F-103 interceptor and the F-105 fighter-bomber which is designed to follow the Thunderstreak on Republic's assembly lines. In 1955 the Air Force revealed the RF-105, a photo-reconnaissance version of the new fighter-bomber.

Republic's XF-84H experimental turboprop fighter made its maiden flight at the U. S. Air Force Test Center at Edwards AFB, Calif., in the summer of 1955. Built to split down the middle and take several forward sections with different types of supersonic propellers, the XF-84H incorporates many radical features. The plane is believed to be the first propeller-driven plane designed for afterburner jet augmentation of propeller thrust.

During 1955 Republic was also awarded a contract for development of a new, as yet undesignated, advanced fighter-bomber. The contract covers Phase I, complete design up to and including production of a mock-up, and

if the Republic design is accepted, will result in mass production contracts for the new fighter-bomber.

Of the $12-million research and development facilities expansion for 1955-56, the most spectacular item is a new wind tunnel for testing models of proposed new aircraft at four times the speed of sound. Other items in the expansion program include high temperature structural and functional apparatus which can duplicate flight conditions above 50,000 feet and test airframes to the breaking point, additional analog and digital computers and multi-channel oscillographs and new machinery to work titanium, magnesium and a number of other heat-resisting alloys which are expected to help overcome the "thermal barrier."

Also in anticipation of future trends Republic began in 1955 a training program in the nuclear aspects of aviation design. Under this program two Republic engineers have already been enrolled in full-time courses at the School of Reactor Technology at Oak Ridge, Tenn., and the School of Nuclear Science and Engineering of the Argonne National Laboratory of the University of Chicago.

While plans for future research activities were getting underway, Republic scientists were investigating many of the problems of advanced high speed aircraft designs. Among the projects underway in 1955 were cockpit air conditioning in supersonic aircraft, lightweight honeycomb structure fuel cells and high temperature hydraulic systems and materials.

Properties of various high temperature structural materials such as titanium, special strainless steels and magnesium were investigated at temperatures up to 1,000 degrees. Preliminary research has also been done on high temperature honeycomb structures for use to 1,200 degrees. Other high temperatures materials projects underway in 1955 included paint and ceramic coatings for corrosion protection at 1,000 degrees and laminated plastics for possible utilization as structural insulation.

Antenna design and testing continued through 1955 with new equipment and facilities keeping pace with this important field. The scope of electronic instrumentation for measuring and recording data from all types of test work was expanded with new and improved equipment and advanced techniques.

In the fall of 1955 Republic began to move into the adjacent Fairchild buildings which were purchased last year. The new area consists of 425,000 square feet of floor area.

Other facilities expanded and enlarged in 1955 brought Republic's plant and airfield area to 586 acres and floor space to 2,813,000 square feet, nearly double that of five years ago.

Net income for the first nine months of the year was $12,312,873. Sales for the period amounted to $422,607,390.

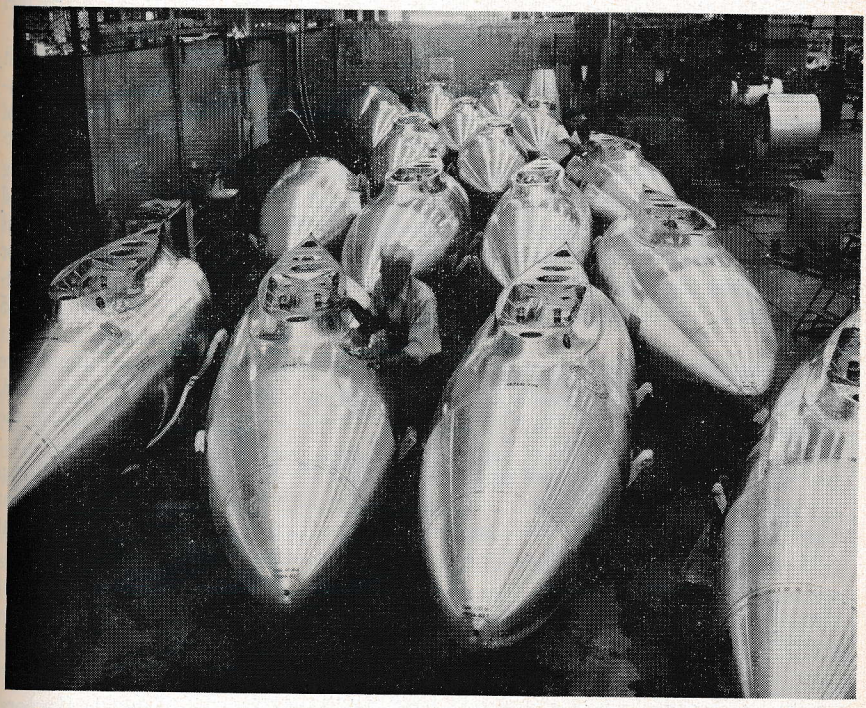
Ryan Aeronautical Co.

Ryan Aeronautical Company launched the most ambitious airframe tooling and production program of its history during 1955, while accelerating output of jet engine components, and continuing its large volume of piston

engine exhaust systems, external fuel tanks, rocket engines, and pilotless target drones.

At the same time, the company completed and delivered to the testing grounds at Edwards Air Force Base the world's first all jet-powered vertical takeoff plane, and obtained a multi-million dollar contract from the Navy for a new system of automatic navigation.

The biggest jigs ever built at Ryan went into service as climax to a high-speed tooling program which saw more than 300 fixtures installed for the Boeing KC-135 jet tanker-transport project. One of the first subcon-



Ryan under-wing fuel tanks for Boeing KC-97

tracts let on this long-range program was to Ryan, for mid and aft-fuselage sections, and the large torque box structure inside the fuselage, serving as an integral unit in the flight controls system. Ryan is building almost half the entire length of the KC-135 fuselage.

To accommodate the giant structures, mammoth jigs were built. Biggest is the 57-foot long fixture which will mate the upper and lower lobes of the mid-fuselage section, which is 40 feet long. This jig is 17 feet high and 14 feet wide, and the first lobe assemblies were lowerered into it near the year's end.

At the same time KC-135 tooling was being stepped up, tools for another project began pouring into the plant from North American Aviation, Inc. Approximately 2,400 tools and templates, drophammer dies and stretch form dies were delivered to the company for immediate start of quantity production of aft fuselage sections of the F-86 Sabrejet fighter.

A steadily growing volume of jet engine and afterburner components was turned out during 1955 for the General Electric J-47, the Pratt & Whitney Aircraft J-57 and the Curtiss-Wright J-65. Exhaust systems for piston engines also held a prominent place in Ryan's production picture.

During the autumn of 1955, Ryan completed the 1,000th external fuel tank for the Boeing KC-97 aerial tanker.

Meanwhile, aft fuselage sections and other assemblies in Ryan's oldest quantity production project, for the KC-97, were built in gradually diminishing numbers, as Ryan entered its seventh year of work on orders of approximately $60-million.

Ryan added 100,000 square feet of floor space during the year, giving the company 850,000 square feet under roof. At the same time, its leasehold of San Diego Harbor Department lands on which the plant is located was increased from 40 to almost 44 acres. Additional facilities were built for warehousing, for expansion of the machine shop and the electronics department, and for establishment of huge process tank area in the KC-135 project.

More than half a million dollars worth of new tools and equipment were acquired during the year, and almost 1,000 additional employees were hired, bringing the payroll at year's end over the 4,700 mark, highest since the peak of World War II.

Sales during 1955 were approximately $40-million, only a slight drop under 1954's $45-million despite the great amount of time and effort spent this past year in tooling for future large production. Backlog remained at $35-million, and net worth of the company was about $10-million.

Sikorsky Aircraft Div.
United Aircraft Corp.

During 1955, Sikorsky Aircraft division of United Aircraft Corporation expanded manufacturing facilities, began quantity production of the S-58, completed initial production of the twin-engine S-56, continued production of the S-55, and carried on extensive development of the turbine-powered S-59.

Sikorsky Aircraft dedicated its new multi-million dollar plant on Oct. 26, increasing overall manufacturing facilities to well over a million and a half feet.

Principal product of the new plant is the Sikorsky S-56, a 26-plus passenger transport being manufactured for the U. S. Marine Corps as the HR2S and the U. S. Army as the H-37. In addition, all S-55 (H-19, Army and Air Force; HRS, Marines; HO4S, Navy and Coast Guard)

production was transferred from the Bridgeport plant to the new facility in nearby Stratford.

In quantity production at the Bridgeport plant for the Army and Navy was the S-58, a single-engine aircraft offering a considerable payload increase over the S-55. Known as the HSS-1 by the Navy and the H-34 by the Army, the S-58 is powered by a single Lycoming-built Wright R-1820 delivering 1,425 horsepower. In addition to deliveries to the Army, which employs the aircraft as a transport, and the Navy, which uses the aircraft primarily as an anti-submarine hunter-killer, units have been delivered to the Royal Canadian Air Force and have been ordered by New York Airways. CAA certification of the S-58 is underway and New York Airways is scheduled to start taking initial deliveries during the spring of 1956.

In a commercial configuration, the S-58 carries 12 passengers plus provision for a crew of two. The aircraft cruises at better than 100 knots and carries a payload of over 4,000 pounds distances of approximately 100 miles.

First production delivery of the S-56 was accomplished in September. Powered by twin Pratt & Whitney R-2800s, the S-56 features a single five-bladed main rotor coupled with a four-bladed torque-compensating tail rotor. The aircraft also features a folding tail boom, for stowage below the decks of aircraft carriers, and clamshell doors at the nose of the fuselage which open to allow the unfolding of a ramp for loading and unloading of troops, weapons and vehicles.

In the meantime, the S-55, the only certificated transport helicopter in the world, continued to see broadening use by both military and commercial operators. Powered by a single Pratt & Whitney R-1340, the single main rotor, seven-passenger helicopter is now in operation throughout the world.

Outstanding in 1955 was the performance of helicopters during the Aug. 19 floods which swept through Connecticut, New York, Massachusetts and Pennsylvania. Although exact figures are not available, estimates indicate over 1,000 persons owe their lives to helicopter rescue. Sikorskys operated by all U. S. military services saw service throughout the stricken states and remained on duty carrying food, medical supplies and allied material as long as two weeks after the disaster struck.

Sikorsky Aircraft continued to hold the international helicopter speed record by virtue of the 1954 performance of the Army's XH-39. The international altitude record set by the XH-39, also in 1954, fell during 1955 to the French SE-3120. The speed record remains, however, at the XH-39's 156,005 mph, set over a three-kilometer course on Aug. 26, 1954.

The XH-39 (S-59) is powered by a single Turbomeca Artouste II gas turbine of 400 horsepower. In addition to its speed, the four-bladed single rotor aircraft offers extreme maneuverability. Payload of the record aircraft is approximately 800 pounds.

At the close of 1955, Sikorsky Aircraft employed approximately 7,000 office and production personnel at both the Bridgeport and Stratford facilities.

Stroukoff Aircraft Corp.

Highlight of the year's activity for Stroukoff Aircraft Corporation, of West Trenton, N. J., was the completion and flight test of its new Pantobase transport, the Air Force YC-123E. This all-purpose medium transport, although basically a land-based plane, demonstrated it unique capabilities at its first flight demonstration on July 28, 1955, by taking off from the water, landing and maneuvering with ease in the Delaware River at Mustin Field, Philadelphia, immediately after a conventional take-off from a hard surfaced runway. It is designed to operate from water, snow, ice, sand strips, rough or unprepared fields, as well as hard surface runways, with the choice of landing gear completely under pilot control from the cockpit. The prototype is undergoing an extensive flight test program conducted jointly by the company and the Air Force. Successful tests have been completed by the Air Force under conditions similar to Arctic operations.

The company is currently in production, for the Air Force, of a service test quantity of medium transports which will incorporate its previously developed Boundary Layer Wing, with the Pantobase airframe and landing gear system and two Wright 3350 compound engines. The general configuration is the low, truck bed height, integral loading ramp, high wing fuselage type, pioneered by Stroukoff. During the past year, the company has independently intensified its research activity in Boundary Layer Control systems. The very encouraging results attained promise important break-through in wing design directed to reduction of drag in high speed aircraft and cutting sharply take-offs and landing distances of all types aircraft.

Plant employment increased 40 percent for the year, reaching a high point in December, and an increase of 50 percent from present levels is planned for the first half of '56. Additional tools and equipment were acquired during the year, including a large hydro-press now being installed which will be in operation by March, 1956, placing the company in position to take on additional contracts for major aircraft assemblies or complete aircraft.

Taylorcraft, Inc.

During 1955 two new Fiberglas light airplanes were in production by Tavlorcraft, Inc. One, the Ranch Wagon, which will seat four people, is a medium-priced plane powered by a 225 hp Continental engine. The other, the Topper, is also powered by a 225 hp Continental engine and is used for crop dusting, seeding and spraying. It weighs 1,450 lbs. empty and will lift a three-quarter ton load after a short take-off run.

In constructing the airplanes, molds are made of the fuselage, wings and other sections. Fiberglas cloth and resin are placed in the mold and permitted to cure. The sections are then put into place on the tubular steel structure of the fuselage and the aluminum and spruce structure of the wing. By this method, the fuselage is made of only two sections, joined together. The wings are made of eight molded units. Present plans and facilities of the company are being geared for a one-a-day production.

At year-end, company plant facilities covered 50,000 square feet.

In addition to manufacturing Taylorcraft airplanes, the company produces parts and assemblies for other aircraft and helicopter manufacturers.

Temco Aircraft Corp.

By November, Temco had subcontracts for production of major components for 12 different aircraft types, including the production of parts and assemblies for the Boeing B-47 and B-52; Lockheed's P2V-7, C-130 and "Electra" turbo-prop transport; McDonnell's F-101, RF-101 and F3H; Republic's F-84F; North American's F-100; Convair's B-58, and Chance Vought's F7U-3. Eight of these subcontracts and three orders for additional work on contracts previously acquired were awarded the company during 1955. Temco's responsibility on these projects ranged from fabrication to basic component design.

As a result of engineering development work, Temco in 1955 acquired contracts from two U. S. Military services. In May the Navy ordered a number of Temco-designed "Alpha" airborne electronic systems which had been developed at company expense and flight-tested under a Navy contract.

In August the company announced it had a U. S. Army Signal Corps contract to modify six L-17s into photo-drone aircraft and to fabricate three ground control stations. The contract also gave the company responsibility for training Army pilots to use the drones, for providing instruction booklets and spare parts, and for providing engineering field service at Army research centers.

Temco Engineering also continued development work on classified aircraft, missiles and weapon systems of the company's own design. And engineers expanded the company's overhaul and modification potentialities to include the fields of electronic installation and modification. A step was taken in this direction when Temco signed open-end contracts with Air Force Air Materiel Areas in Oklahoma City and San Bernardino, Calif. These contracts make it possible for the company to perform special modification jobs as required in addition to the contract reconditioning being performed for the Air Force and Navy at the Greenville and Dallas plants.

The "Riley Twin," a twin-engine executive conversion of the single-engine Navion, was licensed by the CAA as a new aircraft type during the year, and Temco began deliveries of an improved version of the Twin, introduced late in 1954.

A new paint hangar and stripping building added 40,000 square feet to facilities available to Temco's Dallas plant during the year. The Garland facility was expanded by 76,000 square feet, and a 60 x 60 extension was added to the Greenville plant's largest production hangar. These additions raised the total square footage used by the three plants to more than 1,900,000.

Employees totaled about 7,000 throughout the year.

Temco registered net earnings after federal taxes of $2,350,707 for the

first nine months of 1955. This figure was 2.6 percent higher than earnings for the first nine months of 1954.

Sales for the first three quarters of this year were $57,428,170, up 33.4 percent over sales for the same period last year.

United Aircraft Corp.

Because United Aircraft Corporation's three divisions operate autonomously, discussion of the company's 1955 operating activities are found under the names of the divisions: Pratt & Whitney Aircraft (engines), Hamilton Standard (propellers and aircraft equipment), and Sikorsky Aircraft (helicopters), all of which maintained high level production during the year.

Completion of the new 800,000 square-foot Sikorsky Aircraft division plant in Stratford, Conn., marked a milestone in a $175-million postwar expansion program conducted by United with its own funds.

The Research Department of United Aircraft Corporation made substantial contributions in support of the research and development programs of each of the three operating divisions. Intallation of two new wind tunnels was completed. One is a transonic tunnel operating in the range of speed up to one and one-half times that of sound. The second tunnel is supersonic and covers the range from one and one-half to five times the speed of sound. The department has also enlarged its electronic computer section.

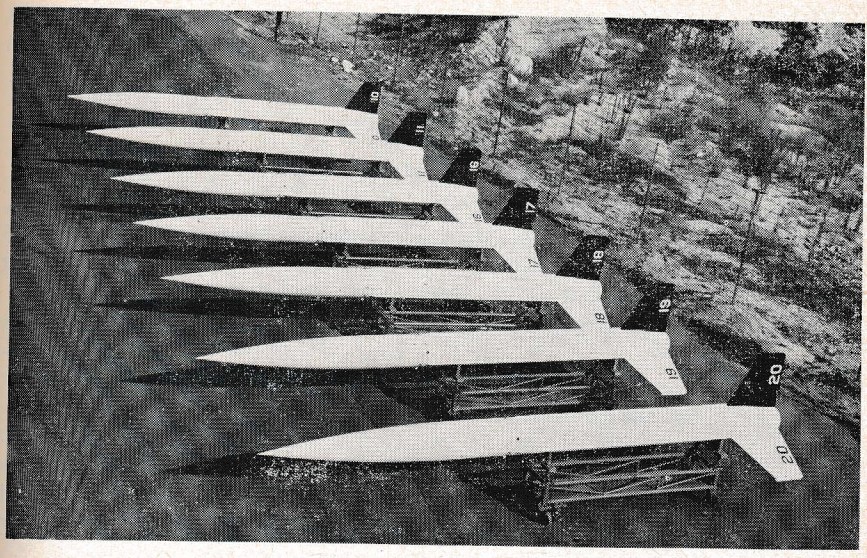
In 1954, the last complete year for which figures are available, United Aircraft reported a net income of $25,996,232 on sales totalling $654.239,-961. Total current assets at Dec. 31, 1954, amounted to $184,425,756,961. Total current assets at Dec. 31, 1954, amounted to $184,425,756 compared to total liabilities of $109,078,064 at that date. Contracts, orders and government letters of intent at Sept. 30, 1955, amounted to $1.275-billion.

ENGINE MANUFACTURERS

Aerojet-General Corp.

Continued expansion at Aerojet-General culminated in 1955 in the activation of a new Liquid Rocket Plant at the company's 15,000-acre Sacramento facility. Extensive facilities for testing rocket engines of extremely high thrust were completed.

Sodid-propellant rocket manufacturing continued at a high rate at Aerojet's adjacent Solid Rocket Plant. Jet-assisted takeoff units (JATOs) for aircraft and booster rockets for missiles streamed from the production lines, as well as rocket engines for deceleration sleds. Six of Aerojet's 5KS-4500 solid rockets, each delivering 4500 pounds thrust for 5 seconds, powered the sled used by Lt. Col. John P. Stapp in tests at Holloman Air Force Base. Using these engines, Lt. Col. Stapp was able to subject himself to deceleration rates as high as 35 g's. Twelve 5KS units are also used for assisted takeoff of the Navy's A3D Sky Warrior, a carrier-borne bomber.



Aerojet-General Aerobee sound rockets are used for upper-atmosphere research

An important event for the company was the CAA certification of Aerojet's 15KS-1000 JATO for use as standby power on business and executive aircraft. The 15KS produces 1000 pounds thrust for 15 seconds, the equivalent of about 400 horsepower. This rocket engine was originally developed for the Navy Bureau of Aeronautics.

At Aerojet's Azusa plant, production of metal parts for the Navy's 2.75-in. ordnance rocket continued at a high rate, as did production of the Aerobee research sounding rocket. Altitudes of 126 miles were achieved with the newest Aerobee models, and a height of 180 miles was anticipated in the future. The Aerobee, research rocket for the services for many years, was scheduled for extensive use in the International Geophysical Year. The Aerobee was also used in obtaining unusual photographs of the earth and in experiments involving the liberation of sodium vapor in the atmosphere to obtain spectral data.

The development and production of antiaircraft ordnance, underwater propulsion devices and electronic equipment continued, with exploratory work on many new propellant formulations for aircraft and missile applications, primary batteries, pilot ejection rockets, signal markers and turbojet starters. Various types of auxiliary power units and gas generators were in advanced development.

Aerojet, during the year, placed in preliminary production a simple, extremely effective thrust-reversing device for jet aircraft. Called the AeroBRAKE, the device permits up to 50 percent reverse thrust to be

obtained, permitting any jet aircraft to land on very short runways. It was developed under license from Société National d'Étude et de Construction de Moteurs d'Aviation (SNECMA).

Allison Div.
General Motors Corp.

Commercial acceptance of the Allison 501 turbo-prop engine and Aeroproducts propeller package for the new Lockheed Electra highlighted 1955 for Allison Division of General Motors and marked the entrance for the first time of General Motors into the commercial aircraft power field.

Similarly, in the military transport field, an aircraft production program got underway with Allison turbo-prop engines and the Military Air Transport Service completed more than one month ahead of schedule a flight evaluation program on Allison turbo-prop engines and Aeroproducts propellers, piling up 3,000 hours on two Convair YC-131Cs within the year.

Following announcement in January of commercial availablity of the Allison 501 engine and Aeroproducts propeller, American Airlines signed the first order for the GM power package in its 35 Electras ordered for delivery beginning in 1958.

The 501 was certificated for commercial operation by the Civil Aeronautics Administration in May, the first certificate ever awarded by the CAA for commercial operation of a turbo-prop engine. Approval by the CAA was based on successful completion of the official U. S. Air Force qualification test by the military version of the 501, designated the T56 and now in production for the Lockheed C-130 Hercules. In meeting the requirements of the stringent 150-hour test, the T56 demonstrated 3750 equivalent shaft horsepower—2.3 horsepower for each pound of engine weight. The engine also demonstrated superior fuel economy.

Concurrent with the progress of the 501 engine was development of a four-bladed propeller by Aeroproducts Operations of the Allison Division. Receiving CAA certification in September, the propeller was ordered in substantial quantities by American in November.

Prior to deliveries of the Electra in the latter part of 1958, the T56 will have accumulated more than 300,000 hours in military transport use. The bulk of this experience will be obtained from the four-engine Lockheed C-130. The USAF's first production turbo-prop transport, the Hercules was powered into the air for the first time in April by production model T56s. The initial flight, months ahead of schedule, was distinguished by the quick takeoff and landing characteristics afforded by the four 3750 HP T56 turboprops enclosed in slim-tapered nacelles. Considerable flight time with the T56 is currently being compiled as production aircraft are coming off the line regularly.

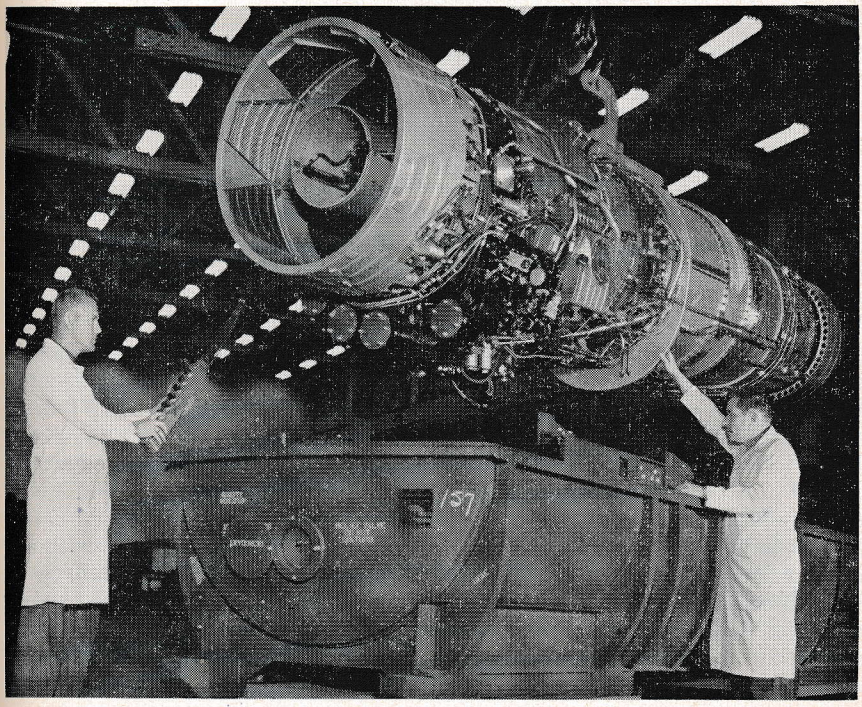
Additional experience was accumulated in 1955 by two twin-engine Convair YC-131C transports, equipped with prototype T56s and Aeroproducts propellers, in a USAF flight program designed to prove the adapta-

bility of turbo-prop transports to scheduled operation. Operating since January over regularly scheduled Military Air Transport Service routes from Kelly Air Force Base, Texas, the aircraft attained the program goal of 3,000 hours 30 days ahead of the original target date. Making as many as four and five flights a day, maximum utilization reached 46 hours, 20 minutes in one 24-hour period for the two aircraft. In accelerating the program, USAF raised the maximum allowable operating time before overhaul on the prototype engines from 50 to 200 hours.

Continuing to augment this experience were two YC-130s, equipped with prototype T56s; Lockheed's Constellation "1961," with a YT56 enclosed in one nacelle; and the B-17 Allison flight test bed, with a YT56 installed in the nose. In addition, the Allison Turbo-Liner was being modified to carry a T56 production-type engine in one nacelle.

Developed under sponsorship of the U. S. Air Force, the T-56, or 501, consists of a single turbine power section connected by an extension shaft and a supporting structure to a reduction gear assembly having a single propeller shaft. The 12.5:1 ratio reduction gear assembly reduces the power section shaft speed of 13,820 rpm to the rated propeller shaft speed of 1,060 rpm. The engine has a 14-stage axial-flow compressor, six com-

Allison J71-A-11 axial flow turbojet engine



bustor liners and a four-stage turbine. It weighs 1610 pounds and is 145 inches in length, 27 inches in width. The Aeroproducts propeller is of hollow steel construction and measures 13.5 feet in diameter.

The Allison dual power section T40 turbo-prop engine, although out of production, compiled impressive performances in the Navy's water-based transports—the Convair R3Y-1 and R3Y-2. In February, with its four 5850 HP T40s driving contra-rotating Aeroproducts propellers, a R3Y-1 completed a record cross-country flight in 6 hours and bettered scheduled commercial time by 1 hour, 20 minutes. Theree different R3Ys negotiated four coast to coast flights during the year.

Further progress was demonstrated by Allison in turbo-jet development during 1955. Already flying in the twin-engine Douglas RB-66 reconnaissance bomber, the 10,000-pound thrust axial-flow Allison J71 powered the USAF's B-66B bomber version on its first flight in January. A B-66 flew from Edwards AFB, Calif., to Eglin AFB, Fla., in 3 hours, 15 minutes.

The Navy's carrier-based single engine fighter, the McDonnell F3H-2N Demon, completed its maiden flight in August equipped with an Allison J71 and high altitude afterburner. Carrier trials have been successfully completed and production aircraft at the McDonnell flight facilities, St. Louis, and Patuxent Naval Air Station, Md., have logged more than 1500 hours of J71 flight time.

Another Navy aircraft, the Martin XP6M Seamaster, took to the air for the initial time in July powered by four J71s with takeoff afterburners. Logging approximately 200 hours' engine flight time on its first 20 flights, the swept-wing 600 mph seaplane has attracted the close attention of both the USAF and the Army.

Although production of the axial-flow J35 engine was discontinued in 1955, quantities of the engine were overhauled in the Allison manufacturing plant during the year. Veteran of the Korean conflict and several record-breaking Atlantic crossings, the J35 was put into production in 1946 for the Republic F-84 Thunderjet. Current use of the J35 is in the twin-engine Northrop F-89 Scorpion fighter-interceptor, in service with the USAF in defense of the country's far northern bases.

Another workhorse and still in production is the Allison J33 centrifugal-flow turbo-jet. In production since 1945, the J33 is currently being produced in large quantities for the USAF's jet trainer—the Lockheed T-33A. Another J33 is flying in the Navy's new and improved trainer, the Lockheed T2V-1. In addition, two other J33 models incorporating reductions in cost and critical materials, power the USAF's Martin TM-61 Matador and the Navy's Chance Vought Regulus guided missiles.

An indication of future engine requirements was brought forth with the announcement in March that General Motors was investing $75-million of its own funds on facilities and forward development work at Allison to meet anticipated needs of the supersonic aircraft of tomorrow. The program includes a major expansion to present engineering facilities and the start on development of four new gas turbine engines.

Under the expansion program the total area devoted to engine research, currently amounting to 500,000 square feet, will be increased to approximately 1-million square feet. It is estimated that the number of personnel required for aircraft engine development will be increased by approximately 40 percent. Engineering and technical personnel will represent the largest part of the employment increase. Preliminary work on the model shop and the engineering building is now underway with completion of the entire program targeted for 1959.

At year's end, employment totalled in excess of 17,200 with more than 5-million square feet of floor space being utilized by the Allison Division.

Continental Aviation & Engineering Corp.

Continental Aviation & Engineering Corp., subsidiary of Continental Motors, accomplished a major expansion of its production facilities in 1955. It took over the Air Force facility on Lasky Road, Toledo, formerly occupied by the A. O. Smith Corp., and after extensive re-tooling, started production of gas turbine engines for various military applications.

Since the first production model left the Toledo assembly line in September, employment has risen gradually until it stood in the vicinity of 200 Dec. 1. Further increase is foreseen for early spring of 1956.

Among the turbine models now in production in Toledo are the TC104 air generator, heart of the MA-1 starting unit for large jet aircraft; the J69-T19 turbine which powers the Ryan Q2 Firebee target drone; J69-T9, used in the T37 twin jet trainer manufactured by Cessna Aircraft Co., and the new Beech Model 73.

Curtiss-Wright Corporation

Flag-raising ceremonies were held at Curtiss-Wright's new Research and Development Center at Quehanna, Pa., the entire facility having been constructed in just 121 days. An initial appropriation of $20-million was made at Quehanna. The 85-square-mile site, located in north central Pennsylvania in the Clearfield-Philipsburg area, is designed to stimulate the development and production of high power engine types and develop new products for the company's operating divisions. The Quehanna Center will feature outdoor engine test cells for turbojet engines of 100,000 pounds thrust and more. The advantage of the site's isolation permits running test engines without noise suppression problems. Research will be conducted in such diverse fields as nucleonics, ultrasonics, electronics, chemicals and plastics.

During the year the corporation embarked on the largest engineering program in its history. At the Wright Aeronautical Division in Wood-Ridge, a $7.7-million expansion of the supersonic, high-altitude laboratory was opened, making it the largest such privately operated laboratory in the United States. The new laboratory will bring together in a single unit equipment and test facilities costing more than $18-million. The supersonic laboratory is being used for the development and production testing of ramjets. Performance figures on the company's ramjet power plants are

classified, but ramjets are generally known to operate best at speeds from Mach 2 to Mach 5.

First flight of the Bell X-2 under power was reported late in the year. A throttleable rocket engine, developed by Curtiss-Wright's Propeller Division, powers this Air Force experimental aircraft designed to probe the thermal barrier. Distinguished as the first throttle engine in the rocket field, the thrust rating of this Curtiss-Wright engine is classified as secret. It was designed for piloted aircraft flying from sea level to very high altitude. The engine is unique in that a lever controls the thrust, and the engine will idle with no thrust. It is known as the XLR25-CW-1.

The Civil Aeronautics Administration granted Curtiss-Wright the first approved type certificate for a U. S. designed and built turboprop propeller. The government certificate, which authorizes commercial airline use of the new turboprop propeller, marked a major step in the Curtiss-Wright turboprop development program, which includes engines as well as propellers. Curtiss-Wright Turbolectric propeller models have been selected for eight current development and prototype installations and have been specified for use on every U. S. turboprop engine currently under development or production.

Equipped with Curtiss-Wright Turboelectric propellers, the Boeing XB-47D made its maiden flight during the year. The big Stratojet bomber is powered by two Curtiss-Wright T-49 turboprop engines and two turbojet engines. No power rating was announced for the big T-49 turboprop engines, but the Turbolectric propellers were developed to harness as much as 20,000 horsepower.

The Department of Defense announced early in the year that Curtiss-Wright is participating under United States Air Force contract in design studies for the application of atomic power to the propulsion of aircraft.

The Curtiss-Wright Turbo Compound engine passed the 10 billion seat-mile mark in commercial service with a perfect safety record during the year. This 3,400 hp. 18-cylinder, radial engine has power recovery turbines to utilize normally wasted exhaust gases. This combination makes it one of the most efficient engines ever built. The Turbo Compound powers fleets of Lockheed Super Constellations and Douglas DC-7s of 35 of the world's leading airlines. At the year's end, this rugged engine was logging 90 million sea-miles per day.

An order for more than 850 Turbo Compounds in the new EA series was placed with Curtiss-Wright by Douglas for use in their DC-7C, and Lockheed for use in their Super Constellations.

The afterburner version of the Curtiss-Wright J65 turbojet engine was revealed to the public for the first time at the Paris International Aviation Exhibition and later at the San Francisco Aircraft Exhibition. The latest version of the J65 is rated at 7,800 pounds thrust without afterburner, but thrust of the afterburner version is classified. A Douglas A4D Skyhawk, the Navy's bantam atomic attack plane powered by the J65, set the world's 500 kilometer closed circuit speed record with an average speed of 695.163

miles per hour. The corporation delivered its 5,000th J65 turbojet engine to the U. S. Military in April for installation in a series of seven high-performance fighters and bombers. It is presently flying in the supersonic Grumman F11F-1 and in the FJ-3 and FJ-4 fighters, in addition to the A4D. J65s also power the Republic F84-F and the twin-jet Martin B-57 bomber. Advanced models of J65 have also been specified for additional projects of classified status.

The Curtiss-Wright Electronics Division delivered the first B-52 Flight Simulator to the Air Force in 1955 ahead of actual aircraft delivery. Flight Simulators like the one built for the giant eight-jet Boeing B-52 are used to train and upgrade flight crews without committing actual aircraft. The Simulators are exact replicas of the flight cockpit of the aircraft they represent, backed by intricate electronic computers which simulate all flight characteristics, from outside lightning to carburetor icing, and all maneuvers of flight.

A B-36 Flight Simulator built by Curtiss-Wright was put to extensive use at Carswell Air Force Base, training flight crews.

The Air Force, during the year, specified that Flight Simulators be built for every new type aircraft as it is put into production.

In civilian aviation, Flight Simulators were more and more in use in training safer, more dependable flight crews for passenger and cargo aircraft. United Airlines, already the world's biggest operator of Simulators, ordered three more during the year, two for the Douglas DC-6B and one for a Convair 340. Air France ordered two Flight Simulators for its Lockheed Super Constellations 1049 and 1649.

Curtiss-Wright built the first turboprop Simulator, to duplicate the first U. S. turboprop transport in production, the Lockheed C-130.

As Curtiss-Wright's policy of diversification continued, many new products were added to the list. The Electronics Division, located in Carlstadt, received orders for a variety of electronic equipment in addition to Flight Simulators. Some of them include a scaler and ratemeter to detect nuclear radiation, a Radiameter and Radiatector for detection and measurement of radioactivity, Distortion Eliminating Voltage Regulator which cuts out noise and harmonics in electrical current and an economical, dependable Iconoscope for television receivers.

The Industrial and Scientific Products Division was active in the field of ultrasonics with a line of new products which include an ultrasonic chocolate conche, an ultrasonic hops extractor, a complete line of ultrasonic flaw detection equipment, an ultrasonic tire inspector, ultrasonic washing units, ultrasonic medical therapy units, an ultrasonic drill, an ultrasonic anesthetizer and an electrostatic molecular heater. The division also introduced an infra-red night viewer valuable in police and security work.

The world's largest horizontal extrusion press was put in operation at the company's Metals Processing Division in Buffalo during 1955. The division increased its output of jet turbine blades and other aircraft engine components.

Curtiss-Wright Europa, N. V., with offices in Amsterdam, the Netherlands, continued during 1955 to service and supply the corporation's products to NATO nations.

The sale of spare parts and servicing of Curtiss-Wright engines and other equipment for the military, the airlines, and private plane operators is a function of Caldwell-Wright Division.

Marquette Metal Products, a corporation subsidiary at Cleveland, Ohio, continued producing electric and hydraulic windshield wipers for all types of aircraft, including high-speed jet fighters.

Fairchild Engine Div.
Fairchild Engine & Airplane Corp.

Powerplant development and testing capability of the Fairchild Engine Division was expanded during the latter part of 1955 with the completion of an advanced turbine research laboratory. This modern research facility, plus the acquisition of a new 400,000 sq. ft. production, engineering and administrative main plant at Deer Park, Long Island, N. Y., were basic additions to the division's long range plan for the development and production of small, high-performance jet engines.

Both structures, situated on a 210-acre site at Deer Park, were completed during the year. Production and personnel operations started in October with first test operations in the new laboratory scheduled for February and March of 1956.

The most significant activity of the division in the small jet engine field was the completion of 150-hour endurance tests of the 1000-lb. thrust J44 midget jet engine as a prior requirement to military and commercial certification of the lightweight powerplant for installation in inhabited aircraft. The engine has been in production for guided missiles, target drones and pilotless aircraft use since 1950. All basic engine tests were completed by the end of the year.

J44's starred in the first successful jet thrust assist evaluation flights on a military transport last year. One engine, installed in pods on each wing tip of the C-123B, twin-engine assault transport, increased the plane's single main engine take-off and climb performance by a marked degree and provided important safety, as well as many operational advantages.

As a result of these and other equally successful evaluations, thrust augmentation is expected to be applied to commercial and military, multi-engined transports which are engaged in a variety of specialized operations.

A J44 also powered a U. S. Navy, Ryan-built KDA-1 target drone to 45,000 feet at approximately .9 Mach.

Design and test work continued at Fairchild on the development of an entirely new type, high-performance, lightweight turbine in the 2,000-lb. thrust category, for the U. S. Air Force.

Subcontract production of large turbojet engine components was expanded during the year to include orders from four major producers of large, high-powered turbojet engines. Parts production included turbine

wheels, forward frames, rear frames and nozzle diaphragms for the General Electric J47 engine. Orders for newer engines also included tooling allowances for components scheduled for long run production.

The Engine Division of Fairchild completed its experimental midget submarine and turned the craft over to the U. S. Navy for operational testing and evaluation in October. This underwater weapon, the first to be designed and constructed by an aircraft company, included many aircraft design features: airplane-like control system; a packaged powerplant; and provisions for dock or shipboard disassembly of components to permit rapid maintenance and replacement of parts.

The craft, officially designated the USS X-1 submersible, is approximately 50 feet long, 7 feet wide and weighs approximately 25 tons. Operated by a crew of four, its prime mission is the testing of United States harbor defenses.

Production of specialized, precision-built compressors for the Atomic Energy Commission was completed in August. Since this $40-million order was a one-time project, the company leased the 200,000 sq. ft. facility devoted to this work at Mineola to the Reeves Instrument Division of the Dynamics Corporation, and consolidated remaining spare parts production at the new Deer Park plant.

Al-Fin, a method for the joining of dissimilar metals in a lifetime bond, originally developed for aircraft engine use during World War II, expanded applications to many fields including automotive, trucks, missiles, consumer goods products and, the latest, for use on new design locomotives. Sizable contracts were received during the year from American Locomotive Company, for the production of ring band carriers for diesel locomotive pistons.

General Electric Co.

Research, development, and production of aviation products continued to be one of the General Electric Company's major efforts during 1955. Over 20 product departments engaged in the making of aviation systems and components during the year.

In the aircraft engine field production of the company's combat-tested J47 series jet engine continued, and the famed engine continued to set records for flying hours without overhaul. Six J47-23's in a Boeing B-47B Stratojet set one new mark in July by being the first complete group of powerplants on a multi-engined plane to pass 1,000 hours without major repair.

Also continuing in production was the company's J73 engine, which powers the latest of the North American Sabre Jet series, the F-86H. Sabre Jets powered by J73's have flown approximately 2.5-million miles without a single engine damaged by foreign objects.

The J47 also became the first U. S. jet engine to be licensed to a European manufacturer when an agreement was signed in June with the Fiat

Works of Turin, Italy, to build the J47-27 and the J47-33. The engines produced by Fiat will be used in the air forces of the NATO countries.

A new 14,500-acre outdoor testing center at Peebles, Ohio, was added to the Aircraft Gas Turbine Development Department's facilities during the year, enabling the department to test various types of engines on outdoor test stands and to carry out investigations on noise problems created by jet powered aircraft.

Other AGT facilities added during 1955 include a "hot" fuel and oil testing area capable of testing complete jet engine pumping systems under extreme temperature conditions, and a Computations Building to house two new IBM 704 electronic "Brains."

During 1955, the company's rocket engine development program was transferred to the Aircraft Gas Turbine Division, consolidating the company effort in aircraft and missile powerplants and making one group responsible for complete development of rocket, ramjet, and turbojet engines.

In line with the company transfer of rocket engine responsibility, the Aircraft Gas Turbine Development Department was assigned responsibility for producing the rocket engine for the first-stage of the Earth satellite vehicle, Project Vanguard, which will be launched into outer space sometime in 1957-58. Development work on this engine is being carried out both at Evendale and Schenectady, N. Y., facilities.

At the Small Aircraft Engine Department development of the XT58 gas turbine engine reached advanced stages during the year. This small turboshaft engine is being developed for the Navy Bureau of Aeronautics for use in helicopters. In addition, the department continued work on development of a small turbojet engine, the MX2273, for use by the Air Force in powering drones and pilotless aircraft.

The Aircraft Accessory Turbine Department revealed during the year that it was producing air turbine drives for the Boeing B-52 Strato-Fortress, the world's first aircraft to use pneumatic equipment for its complete accessory system. The department has supplied turbo-alternator drives for the X-52 and YB-52 and a number of initial production aircraft, and is currentliy supplying hydraulic turbopumps in support of the B-52 production program.

Also in production during the year were turbo-starters for the Martin B-57 Canberra bombers, afterburner fuel pumps for the North American F-86D, and turbo-superchargers for a number of military and commercial aircraft.

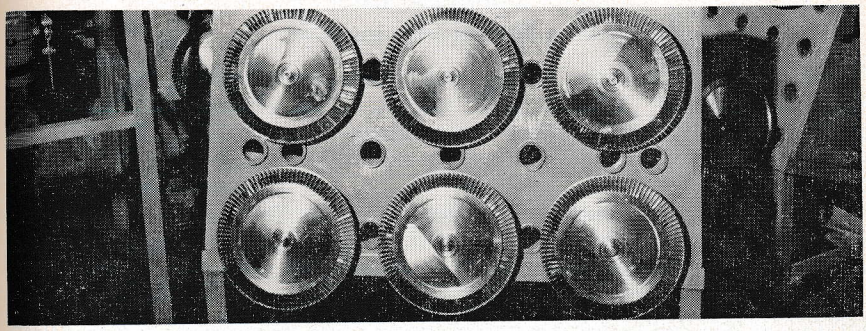
G-E's Electronics Division announced in 1955 that it was producing extremely high powered search radars for the Navy's radar picket blimps. A special advantage of the blimp radar is its ability to detect low flying planes at much greater distances than ground or ship radars, thus making it a major link in the country's radar defense network. Search radar for use on Air Force and Navy radar picket aircraft was also in production during 1955.

The opening of the division's completely mechanized printed wiring

board production line at its Auburn, N. Y., plant was also announced during the year. This production facility will be able to produce between five and six million individual wiring boards, largest production capacity of any manufacturer in the country.

The company's Specialty Control Department continued development of new and advanced regulating and protective equipment for aircraft electric systems. Included in the new equipment announced during 1955 were a new totally enclosed generator protective panel for the McDonnell F-101, a static regulator for alternators rated up to 90kva and temperatures to 120 degrees C, and a carbon pile regulator for operation between 90 and 120 degrees C.

Several new developments in aircraft instrumentation were announced by the Instrument Department during 1955. Outstanding among these were a small remote compass transmitter designed for mounting in new thin wing, high speed aircraft; a miniature 400 cycle servo motor featuring



General Electric's new "hybrid" turbo for Stratocruisers

an especially high torque to inertia ratio; and a high-range mass fuel flow transmitter for in-flight refueling operations which measures fuel flow rates up to 600,000 pounds per hour.

During the year three USAF operational bombers flew with fire control systems built by the company's Aircraft Products Department. These included the Strategic Air Command's Douglas B-66, the first Air Force tactical bomber to be equipped with a radar-directed, remotecontrolled armament system.

The Aircraft Products Department completed development of a dynamic accuracy tester which completely evaluates airborne armament systems during ground firing under simulated flight conditions and continued advanced development of electric and hydro-mechanical jet engine control

along with production of the company's integrated engine control for the North America F-86D fighter-interceptor.

Formation of the Special Defense Projects Department within the company's Defense Products Group was announced during the year. This new department was organized to conduct engineering and production of large, highly complex defense systems, primarily guided missiles, and to act as a focal point for the company organizations involved in development of defense systems.

The Schenectady Aeronautic & Ordnance operation continued its production of flight control systems, and announced the development and production of a new hydraulic constant speed alternator drive. Composed of ball piston hydraulic units, the new drive is being used on the Douglas A4D Skyhawk.

Announcement also was made of the development of a new lightweight computing gunsight for supersonic fighters. Considerably lighter than previous sights, the K-19 can be used with all weapons normally carried by a day fighter for both air-to-air and air-to-ground firing.

Lycoming Div.
Avco Manufacturing Corp.

Greater impetus in the development of its two gas turbine engines, along with an expansion of its reciprocating engine program, were keynotes of Avco's 1955 activity. Both of the turbines were being developed under classified contract for the Air Force at Avco's Lycoming Division in Stratford, Conn.

The smaller of the two engines, designated the T-53, successfully passed its initial 50-hour flight rating test in 1955. Described as a work horse engine, the T-53 will power the utility helicopter being developed by Bell Aircraft Corporation for the Army. The engine is designed for fixed-wing aircraft as well as helicopters. The helicopter version of the T-53 will have an 825 horsepower rating. Development work is continuing on the second, and larger, gas turbine engine. Marketing studies indicate that there are excellent prospects for using the engine in other applications besides rotary and fixed-wing aircraft.

In October, Avco announced the introduction of the first geared and supercharged aircraft engine to be manufactured in this country in its horsepower class. Designated the GSO-480, the engine is being produced by Lycoming's plant in Williamsport, Pa. It weighs 495 pounds, utilizes an integral gear-driven, centrifugal supercharger, develops 340 horsepower for take-offs and has a 320 horsepower normal rating. First aircraft manufacturer to use the new engine was Aero Design and Engineering Company which installed it in the 680 Super Aero Commander. Other firms have shown interest in the engine which is expected to open new horizons in smaller executive type planes.

Early in the year the company announced the formation of its new Advanced Development Division in Stratford. Since its inception, the di-

vision has engaged leading scientists in the fields of heat transfer, gas dynamics and related areas. At Everett, Mass., the division began experimentations at its research laboratories.

Other key Avco projects during the year involved the introduction of a new self-propelled auxiliary air supply and electrical ground power unit for aircraft. The unit has been named Pow-Air. Lycoming's Spencer Boiler department continued its development work on a new gas-fired boiler line and on oil burner package units.

Two contracts were received from the Atomic Energy Commission for items produced by the method of machining known as Hydrospin. In Stratford, Lycoming has one of the three Hydrospin machines in use in the country.

The division also received an extension of contract for additional state-of-the-art development for a 5,000 pounds per-square-inch compressor used with pneumatic control systems.

The Crosley division of Avco (Cincinnati, Ohio, and Nashville, Tenn.) was active throughout the year in the field of electronic control for aircraft and in the production of airframe component parts.

Marquardt Aircraft Co.

Marquardt Aircraft Company expanded both its facilities and areas of research in the field of supersonic ramjet propulsion during 1955. New fuels, new approaches to high temperature metallurgical problems and new applications for supersonic ramjet engines were in the sphere of Marquardt's research program.

The company's Research Division, established in 1954, moved to expanded quarters in anticipation of an increase in size and scope of activities. The variety of studies and evaluations underway included a number of advanced projects, all relating to very high speeds and altitudes.

In the field of metallurgy, Marquardt expanded its ceramics and cermet research and development program in search of materials that can withstand the high temperatures of sustained supersonic flight. A new metallurgical laboratory supported this effort.

Marquardt also joined with Reaction Motors, Inc., and Olin Mathieson Chemical Corporation in an applied research and development effort to advance the present limits of rocket and ramjet powerplants. Fuels and heat resistant construction materials were among the problems being researched by the OMAR program.

Ramjet engine development continued to represent the major portion of Marquardt's operations. Although military security prevents disclosure of how these supersonic ramjet engines are being used in the guided missiles field, it can be said that the powerplants have performed so well that they are now ready for volume production.

The record established by the supersonic ramjet as a missile powerplant resulted in orders from other sources for additional applications.

Engine research and development also went forward on supersonic ram-

jets of larger size and higher performance, ramjets of increased operating range and rotor-mounted (helicopter) ramjet powerplants.

Allied with Marquardt's ramjet program were the development of afterburners and nozzles for turbojet engines, accessory power packages (ram and bleed air driven) and ramjet and turbojet engine controls. Reverse thrust devices for turbojet engines and a system for vertical take-off propulsion also were among Marquardt's projects during the year.

The Marquardt Jet Laboratory was expanded to include the installation of a new high speed data recording system. In all, the Marquardt Jet Laboratory embraces a total of seven test cells. It can simulate speeds up to approximately Mach 3 and altitudes to 100,000 feet.

Marquardt employs 1,200 persons, half of whom are engaged in engineering and research. The company's plant facilities now occupy 160,000 square feet of floor space, situated on 30 acres of land.

Financially, Marquardt enjoyed its best year in 1955. Sales exceeded $10-million, up 10 percent from 1954, and net earnings recorded an equally favorable ratio. Early in the year, the company's stock was split, and 220,000 shares were outstanding at the end of the year.

Pratt & Whitney Aircraft Div. United Aircraft Corp.

Pratt & Whitney Aircraft's operations during 1955 were highlighted by the performance and acceptance of its 10,000-pound thrust class J-57 jet-turbine engine by the Air Force, the Navy, and commercial airline operators. Progress was also made in the development and testing of the more powerful J-75 jet-turbine and T-57 propeller-turbine engines, and research on an atomic-powered aircraft engine was accelerated.

As 1955 drew to a close more than 2,500 of the twin-spool, axial-flow J-57's had been delivered to airframe builders for installation in many of the nation's first-line fighters, interceptors, and bombers.

In the commercial field Pan American World Airways in October opened the vista for commercial jet air travel when it placed the first firm orders for 20 Boeing 707's and 25 Douglas DC-8's. These transport jet aircraft, both to be powered by P&WA jet engines, are designed for non-stop transoceanic flights at speeds of better than 550 miles an hour and will carry up to 108 first class and 130 tourist passengers. The first 707's will be delivered by December, 1958, and the DC-8's by December, 1959.

Two weeks after the Pan American announcement United Air Lines ordered 30 J-57-powered Douglas DC-8's and shortly thereafter National Airlines and American Airlines ordered 6 DC-8's and 30 707's respectively.

Among the J-57-powered military aircraft are: the North American F-100, the first supersonic plane to be placed in operational use; the Air Force's the McDonnell F-101, the Convair F-102, and the Republic F-105; and the Navy's Douglas F4D and Chance Vought XF8U-1. All of these fighters and/or interceptors are supersonic and are equipped with P&WA-designed afterburners which greatly augment the thrust of the engine. Non-

afterburner engines power the Air Force's Boeing B-52 eight-engined intercontinental bomber and JC-135 four-engined tanker, and the Navy's Douglas A3D twin-engine attack bomber.

The J-57, with afterburner, also powered a North American F-100 Super Sabre to a new official speed record on Aug. 20, 1955. On that date Air Force Colonel Horace A. Hanes piloted an F-100 over an 18-kilometer course at an average speed of 822.135 miles an hour. For his feat Colonel Hanes was awarded the Thompson Trophy.

The J-57 also helped set still another speed record when the Boeing 707 prototype commercial transport flew nonstop from Seattle, Wash., to Washington, D. C., in 3 hours and 58 minutes. The plane made the non-stop return trip in 4 hours and 8 minutes.

Full scale testing of the more advanced P&WA axial-flow jet turbine, the J-75, continued during the year. Flight testing of this engine was being carried out in a modified four-engined B-45 bomber in which the J-75 is mounted in the bomb bay.

The T-57, a propeller-turbine adaptation of the J-57 jet configuration, underwent extensive testing during the year and will start its flight test cycle early in 1956 mounted in the nose of a transport plane which will serve as a flying test bed.

Work on an atomic-powered engine, begun in 1951, proceeded on schedule in the company's leased facilities in South Windsor, Conn. In 1957, P&WA will begin operating a government-owned nuclear laboratory now being constructed by the Air Force and the Atomic Energy Commission, in Middletown, Conn.

The T-34 axial-flow propeller-turbine engine, delivering 6,000 equivalent shaft horsepower, powered both Air Force and Navy prototype transports in service evaluation test flights during the year. These aircraft were the Air Force's Douglas YC-124B, Lockheed YC-121F and Boeing YC-97J, and the Navy's Lockheed R7V-2.

Production on the 7,250-pound thrust J-48 centrifugal-flow jet turbine was resumed in 1955. Manufacture of this engine was suspended in 1954 but substantial additional orders from the Navy for Grumman F9F-8 Cougar, a carrier-based fighter, made it necessary to reopen the J-48 production lines. The J-48 also powers the Navy's F9F-5 Panther and F9F-6 Cougar, and an afterburner model powers the Air Force Lockheed F94C all-weather interceptor.

Production of the R-2800 Double Wasp piston engine continued at a steady pace, but that of the R-4360 Wasp Major phased out in August. More than 18,500 of the R-4360 engine have been produced.

A major addition to Pratt & Whitney Aircraft's North Haven branch plant was started in November and will be completed in 1956. The expansion program will add 500,000 square feet of manufacturing space and 100,000 square feet of office area to almost double the size of the original facility which was opened in 1952. The new company-owned space will be used entirely for jet-engine parts production.