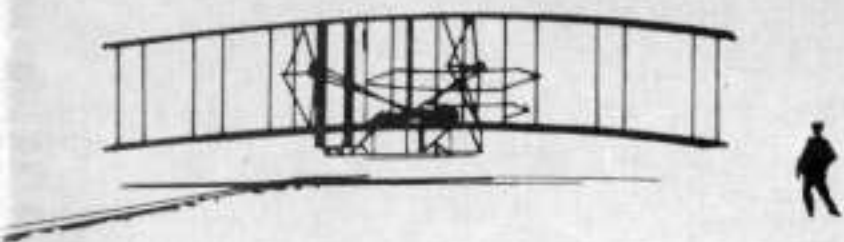


THE
AGE
OF FLIGHT



Refueling in the air is an important phase of military aviation. Below, a Boeing KC-135 tanker-transport refuels a McDonnell F-101 Voodoo. Both aircraft are powered by Pratt & Whitney Aircraft J-57 turbojet engines.



THIS book is for the aviation-minded youth of the country. In it we have tried to show missiles and airplanes, past and present, of the United States which have made their mark in the sky.

UNITED AIRCRAFT



CORPORATION

EAST HARTFORD, CONNECTICUT

DIVISIONS

PRATT & WHITNEY AIRCRAFT
HAMILTON STANDARD
SIKORSKY AIRCRAFT
NORDEN

THE AGE OF FLIGHT



Orville and Wilbur Wright

ALMOST from the beginning of time man longed to fly. He patiently studied the birds and tried to copy their wings and effortless soaring. Some men made crude gliders and, by running downhill, sailed over the ground for short distances. Others rigged up balloons which they filled with hot air. Then, climbing into a basket arrangement hung from the balloon by ropes, the daring aeronauts would be carried upwards.

But what man really wanted was to fly and at the same time control his flight.

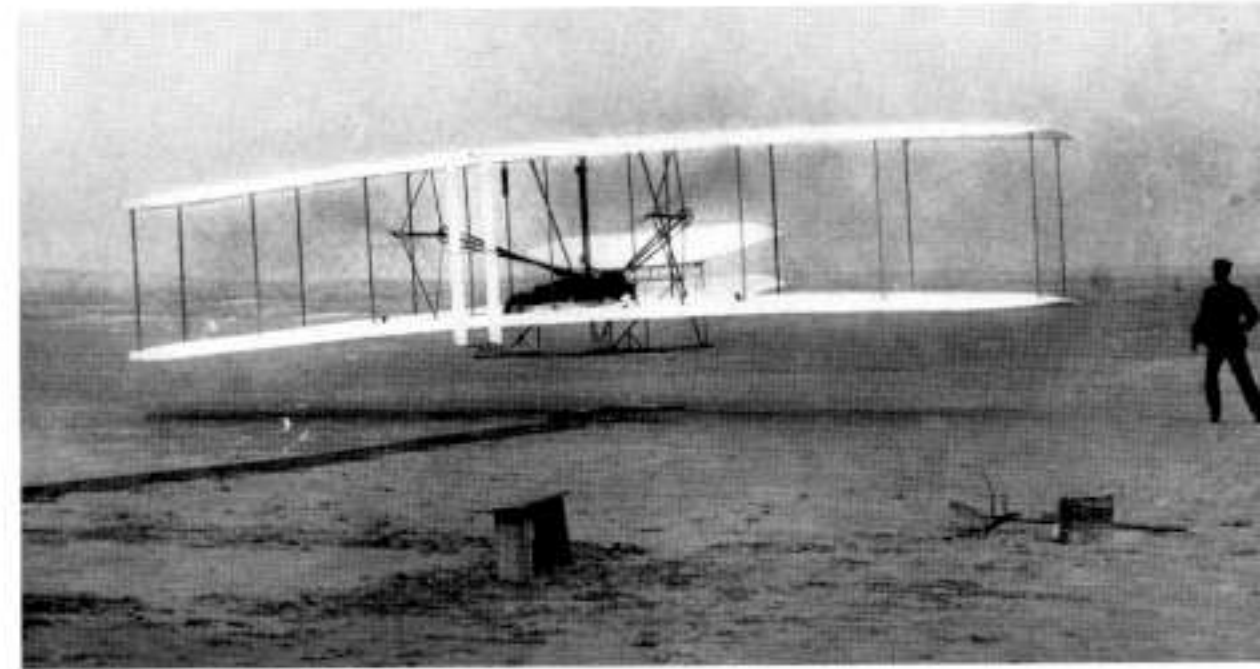
These hopes were fulfilled on December 17, 1903, when two brothers, Wilbur and Orville Wright, Dayton, Ohio, bicycle builders, made their four historic flights over the windswept sand dunes at Kitty Hawk, North Carolina. True, the plane was flimsy, the homemade engine turned out only 12 horsepower, and the distances they flew were not very great. Nevertheless, the Wrights proved that man could both fly and control flight.

The years that followed were epic. Man quickly applied his hard-won knowledge of the air. Where flights once lasted minutes, they now lasted hours. Planes flew higher and faster. The airplane took on a military significance. It also began to carry a few passengers. Towards the end of the first World War, airplanes duelled in the sky. Others were used for photographic purposes, and still others were used to drop small bombs. In the peaceful years that followed, aviation turned to fairs and flying circuses. Airplanes began to

carry the mail and passengers in increasing numbers, and cities started building airports. Pilots raced the sun across the country. The airplane demonstrated that it could fly around the world.

Lindbergh flew the Atlantic nonstop in a single-engined plane. Airplanes aided explorers of the North and South Poles. During the early 1930s sturdy trimotored transports were linking cities, and twin-engined flying boats spanned oceans to bring foreign lands closer.

Science worked hand in hand with aviation. Better engines, new metals, better ways of building planes were found. Pilots were given instruments to help them fly blind;



landing gears became retractable; the propeller's pitch was controlled, and devices to help conquer weather hazards were put aboard planes. Pilots talked to the ground by radio. Science streamlined the airplane and helped make it safe and dependable. The airplane now played a vital role in everyday living. Passengers and freight were going by air. Aircraft were used to dust crops and spot forest fires. They flew ill and injured people to distant hospitals, transported food, and came to the rescue during floods and other emergencies. The airplane could be used for almost any purpose.

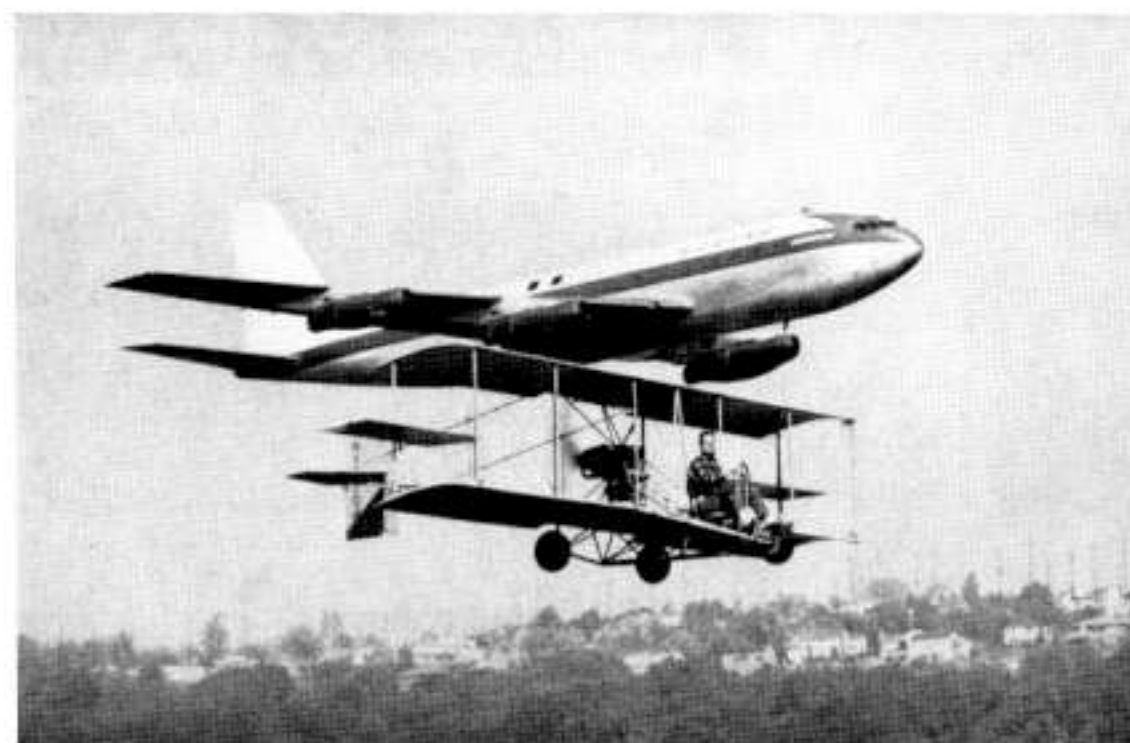
In World War II, America made more planes than ever before. Factories turned out sleek pursuit planes and heavy bombers. Cargo-type planes carried troops and parachuted them into battle. The airplane now could easily circle the globe. Soldiers and supplies could be flown from the United States to Europe, Asia, or Africa in a matter of hours.

Immediately following the war, a new era of aviation was ushered in. Science turned from piston engines to a new and faster means of power — the jet. In 1940 piston-engined planes flew 350 miles an hour. Thirteen years later jet engines powered them to the speed of sound, which is about 763 miles an hour at sea level. Now they travel faster than twice the speed of sound and at extremely high altitudes. Big four-engined jet tanker-transport fly more than 10,000 miles without refueling.

Commercial transports, carrying record numbers of passengers, are faster, more spacious, and more luxurious than ever before. At speeds of 600 miles an hour they fly coast-to-coast in less than five hours and span the Atlantic in six hours.

Meanwhile, the helicopter has become the world's most versatile vehicle, performing tasks of matchless scope for military and commercial users on every continent. Larger, faster, and more efficient helicopters are being devised to expand even further the duties of the already hard-working vehicles.

The missile with its powerful rocket or jet engines has now heralded still another new era in flight — the beginning of man's exploration of space. The missile has already been



Contrast between yesterday and today in aviation is seen in this photograph of a Boeing 707 commercial jet transport as it streaks past an ancient Curtiss pusher plane of 1912 vintage. Top speed of the pusher was 60 miles an hour. Today's 707 cruises at 600 miles an hour.

assigned to carry out some phases of our national defense. Some missiles, traveling over 25,000 miles an hour, have hurled man-made satellites into orbit around the earth. Others have successfully reached targets more than 9,000 miles away from their launching sites. Another new dimension has been added to aviation's fast-expanding technology of flight.

In many ways the flight industry is one of America's youngest activities. Few others, however, match its unbounded scope and the progress already recorded in history books. Each day flight vehicles play an increasingly important role in our lives. This importance will increase still more as new flight techniques now under research and study are perfected and put to use.

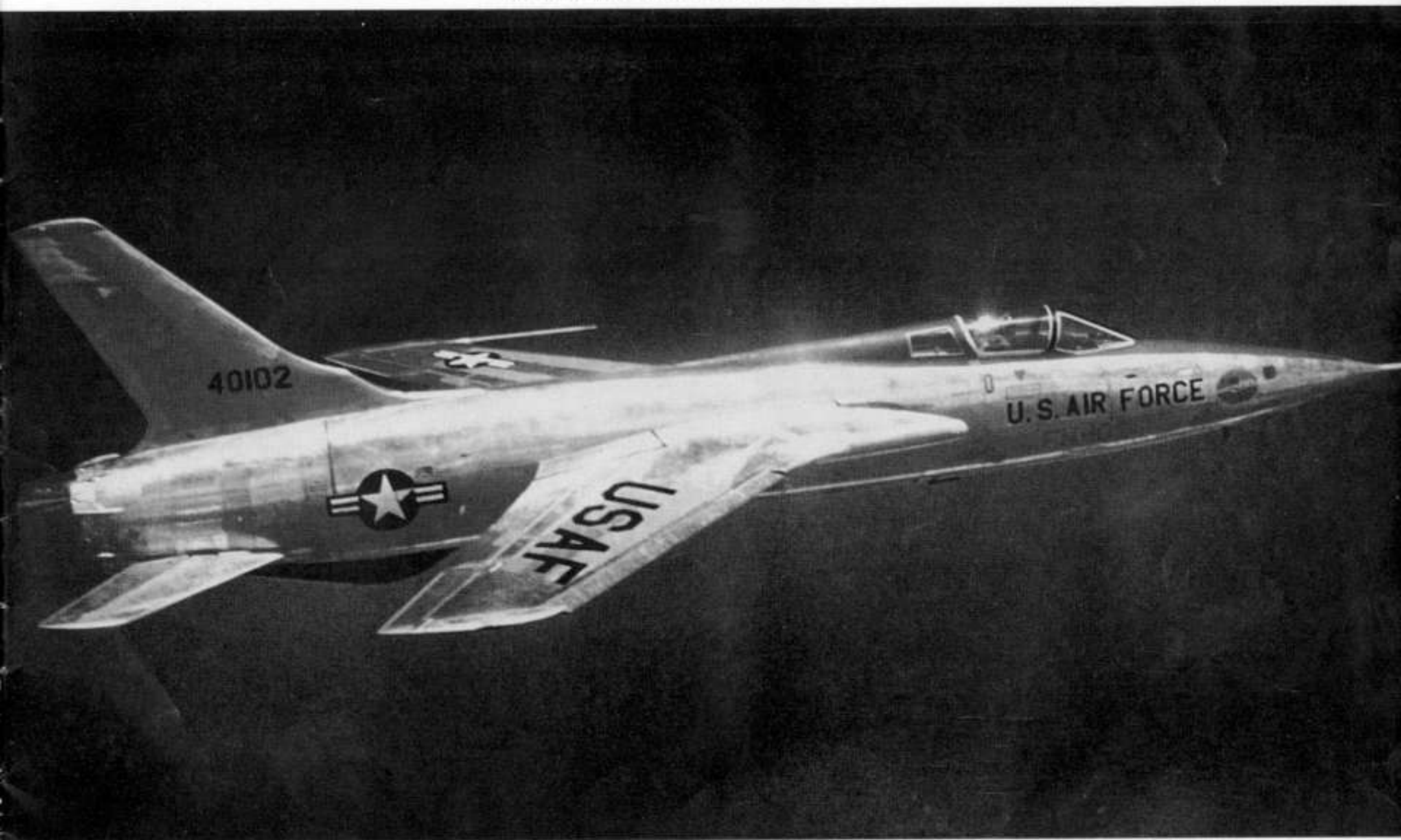


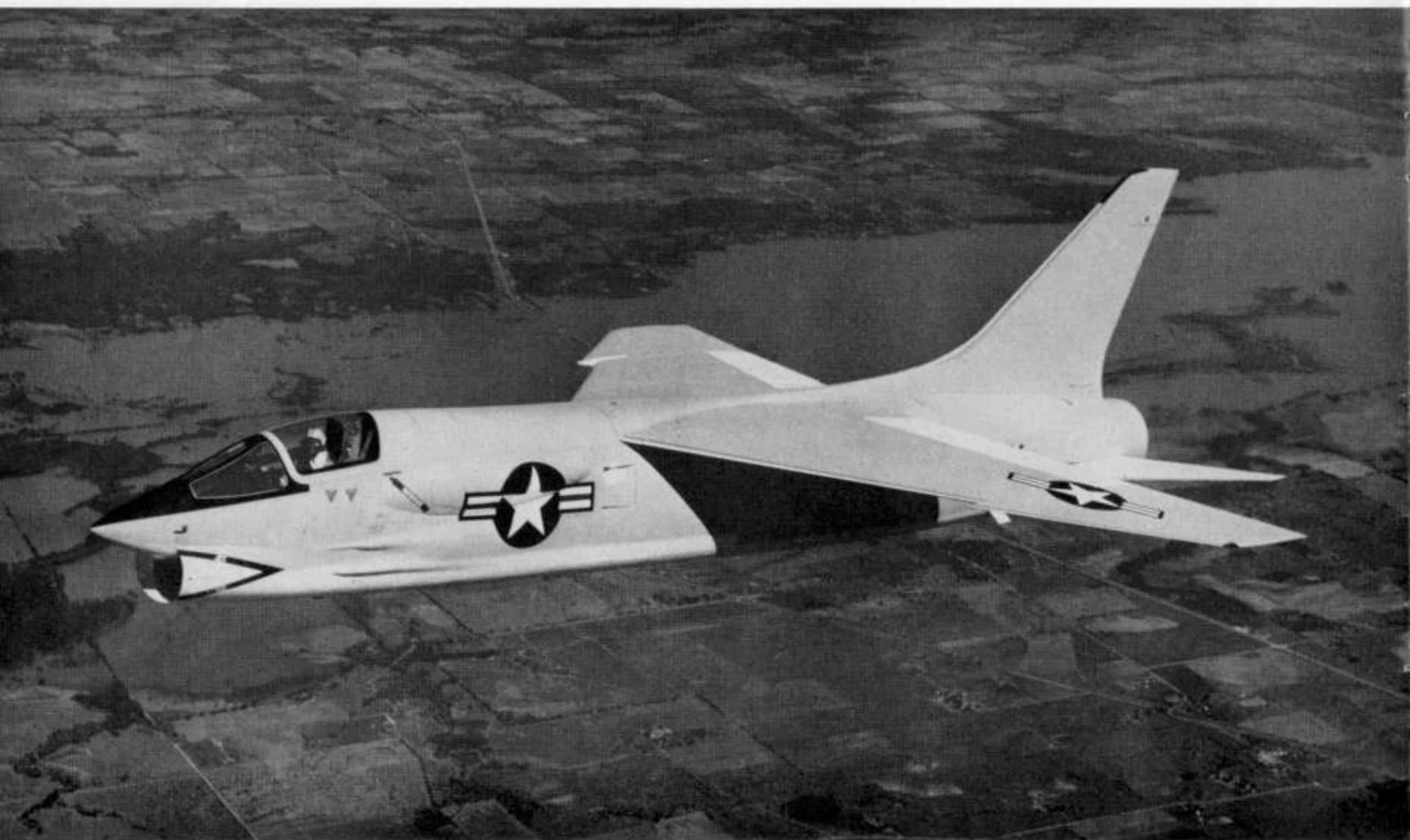
Boeing's B-52 intercontinental bomber, powered by J-57s, is capable of speeds in excess of 650 miles an hour. It carries two potent air-to-surface Hound Dog missiles, each powered by a P&WA J-52 jet.



The Air Force's F-106, built by Convair and powered by the high-thrust J-75, is an all-weather interceptor which holds the world's speed record of 1,525.95 m.p.h. It is equipped with Hamilton Standard fuel controls.

The J-75 jet engine powers this Air Force Republic F-105, one of today's most advanced aircraft, capable of speeds twice those of sound. It has a Hamilton Standard air-conditioning system.





Faster than the speed of sound is this Chance Vought F8U Crusader powered by a J-57 with afterburner. Squadrons of these advanced aircraft are now operating with the fleet.

Douglas A3D shipboard attack bomber with two J-57s supplies the Navy's air arm with a powerful punch. A3D has Hamilton Standard fuel control units.

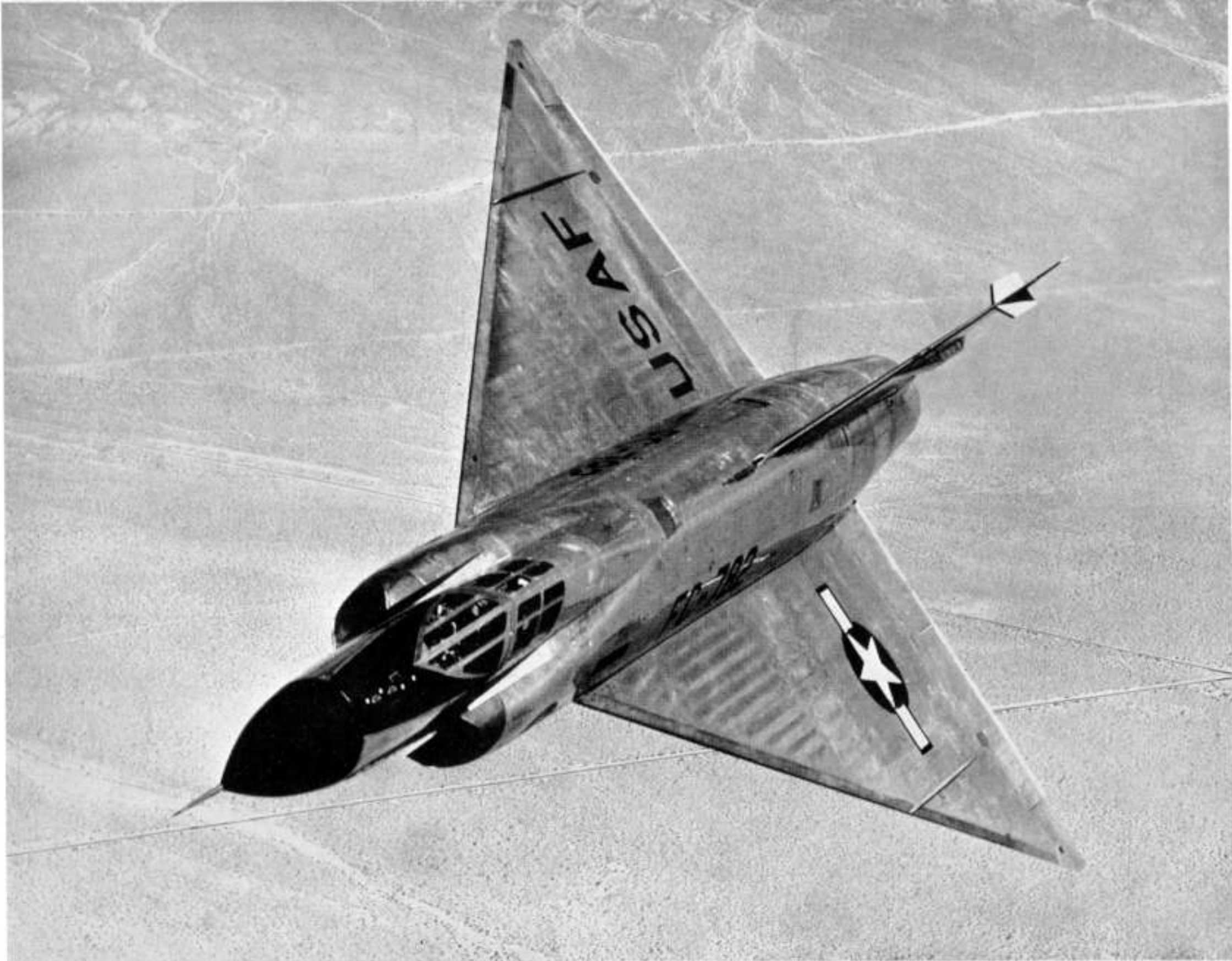




Supersonic North American F-100s were the first of the Air Force's Century Series to become operational. They are powered by Pratt & Whitney Aircraft J-57 turbojet engines.

The Navy's new Grumman A2F Intruder is powered by two J-52s. It has Hamilton's fuel and temperature controls and Norden's electronic gear.





The supersonic F-102 is the Air Force's first delta-wing, all-weather interceptor. It is powered by a Pratt & Whitney J-57 turbojet engine.



Experimental aircraft such as these are being flown and evaluated at Edwards Air Force Base, California. From these may come some of the manned space craft of the future.

Troop and Cargo TRANSPORTS



Douglas C-124



Douglas C-133



Lockheed C-130



P&WA-powered Gee Bee won 1932 Air Races.

Some EARLY Airplanes



Boeing P-12 was speedy little plane.



Lockheed transport had pilot in rear.



PB2Y-2 was Navy's largest patrol bomber.



Navy used this fast Boeing F4B3.



Boeing P-26A fighters in combat formation.



Boeing B-9 was first all-metal bomber.



Sikorsky flying boats spanned both oceans.



Boeing XB-15

BOMBERS

PAST AND PRESENT



Boeing B-17



Convair B-24



Lockheed PV-1



North American B-25



Boeing B-29



Convair B-36



Boeing B-52



Convair B-58

FIGHTERS Past and Present



Five jet fighters of the Air Force's Century series, capable of supersonic speeds, are grouped together in this photograph. Four of them are powered by Pratt & Whitney Aircraft engines. Lockheed F-104 Starfighter is in the foreground and behind it, clockwise, are North American F-100 Super Sabre, Convair F-102 Dart, McDonnell F-101 Voodoo, and Republic F-105 Thunderchief.



Shipboard Curtiss torpedo bomber was one of the early planes with retractable landing gear.



North American P-51 Mustang was one of the nation's top fighter aircraft in World War II.



Gull-winged Chance Vought Corsair fought in two wars, wrought havoc on enemies.



Speedy Republic P-47N had P&WA engine, did bomber escort, ground-attack work.



Lockheed P-38 Lightning was twin-engined fighter, carried machine guns and cannon.



Jet-engine-powered North American F-86F Sabre was most active fighter in the Korean conflict.

COMMERCIAL AVIATION



Giant Douglas DC-8 commercial jet airliner dwarfs earlier Douglas transports. Left to right behind DC-8 are the DC-3, DC-4, C-118 (DC-6 type), and the DC-7.



Ford Trimotor



Boeing 247



Martin 4-0-4



Convair 340



Boeing Stratocruiser



Lockheed 749



Douglas DC-8



Lockheed Electra



Convair 880



Lockheed JetStar



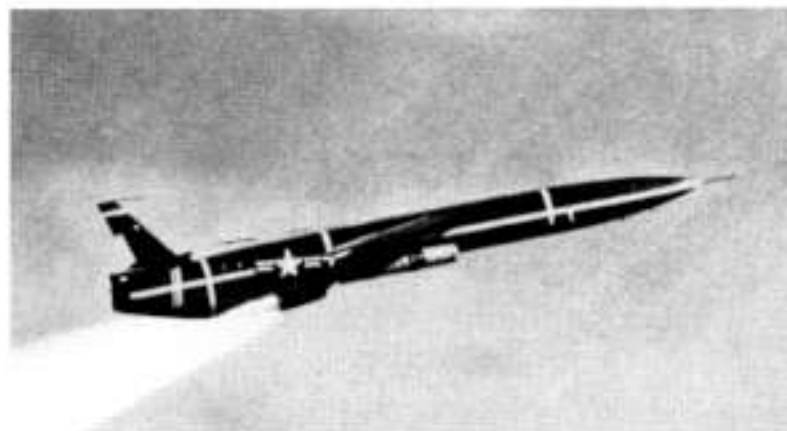
Boeing 707

Flight's NEW DIMENSION

Rockets and missiles have become important in man's conquest of space. Some are already operational weapons. They can be launched from land, sea, or air, and their speeds range up to 25,000 miles an hour. Powerful jet and rocket engines have propelled some missiles more than 9,000 miles from their launching sites. On January 31, 1958, a rocket hurled the first United States satellite into orbit around the world, about four months after Russia put its first Sputnik aloft. Successful launchings of other satellites into orbit have followed in both countries.

A rocket or missile will reach its target only by means of an accurate guidance system. Active in this work and in the electronic and guidance systems of supersonic aircraft and marine vessels is United Aircraft's Norden division, a pioneer in aviation electronics. Its famous bombsights of World War II proved to be the backbone of strategic bombing. The division is still active in the design and development of bombsights, but it also designs and builds many other vital electronics devices used by both manned aircraft and missiles.

Missiles have assumed a major importance in the rapidly expanding technology of flight. For many years, however, powerful manned aircraft will continue to occupy a vital position in the nation's defense.



Northrop Snark



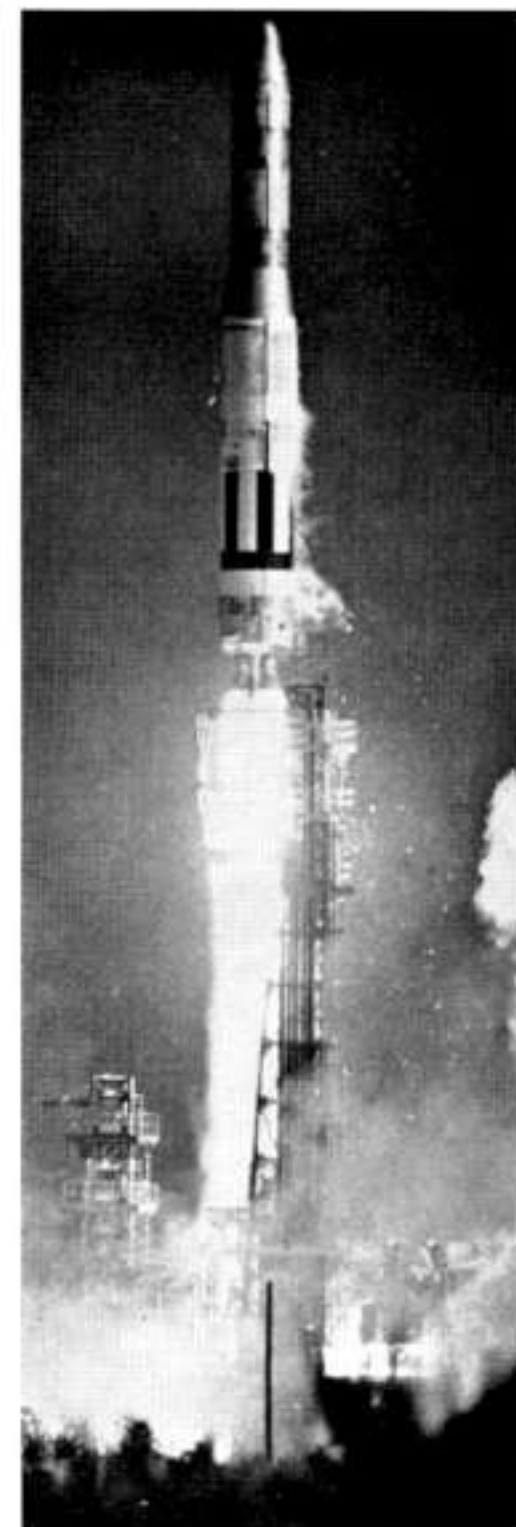
North American Hound Dog



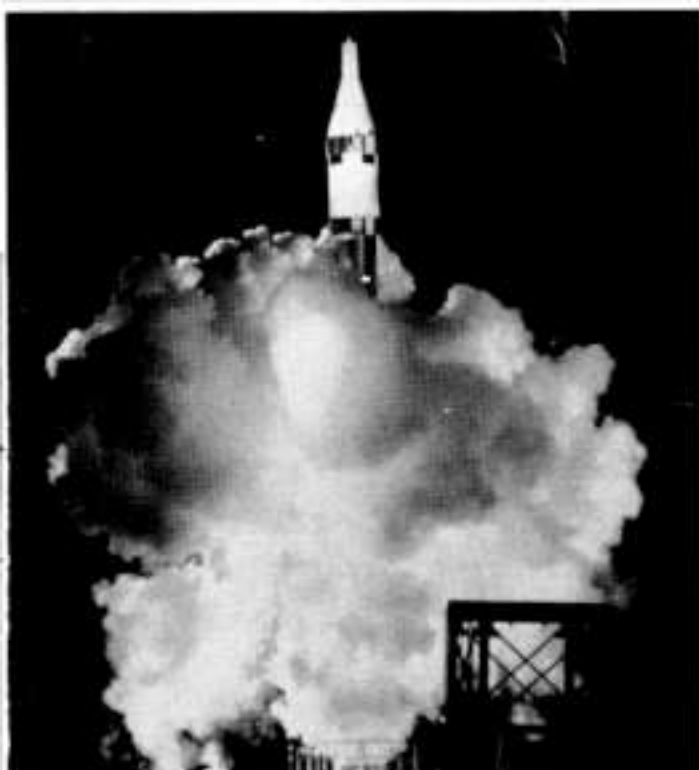
Chance Vought Regulus



Bell Rascal



Martin Titan



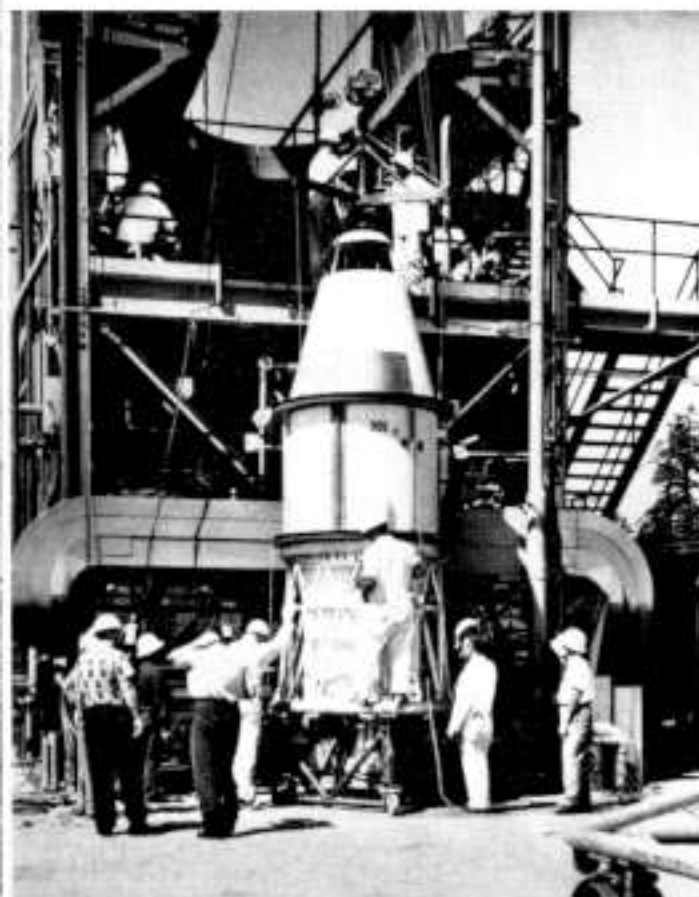
Polaris



Douglas Thor



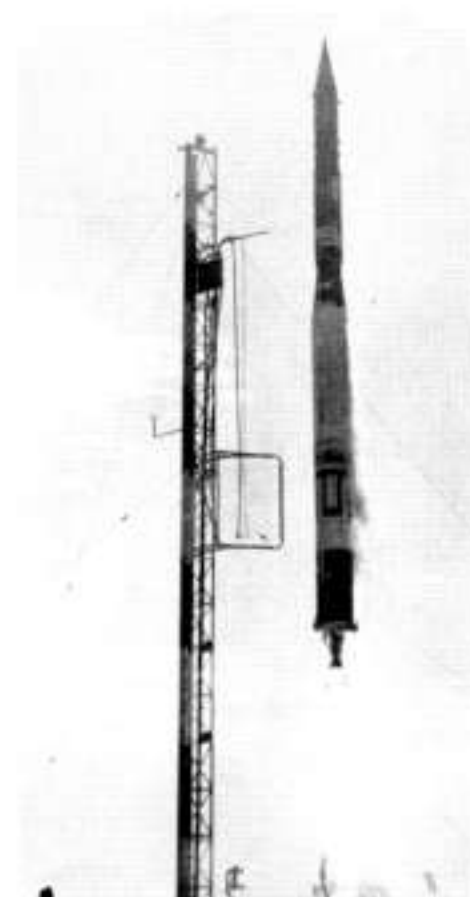
Jupiter



Lockheed Agena Satellite



Martin Pershing



Martin Vanguard



Convair Atlas

THE POWERPLANTS



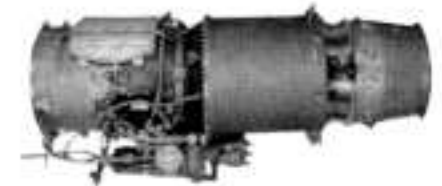
Original Wasp Piston



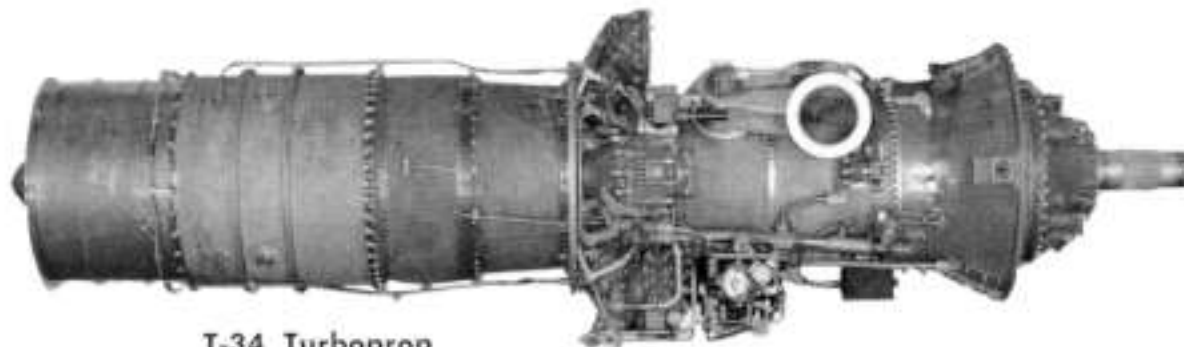
R-2800 Piston



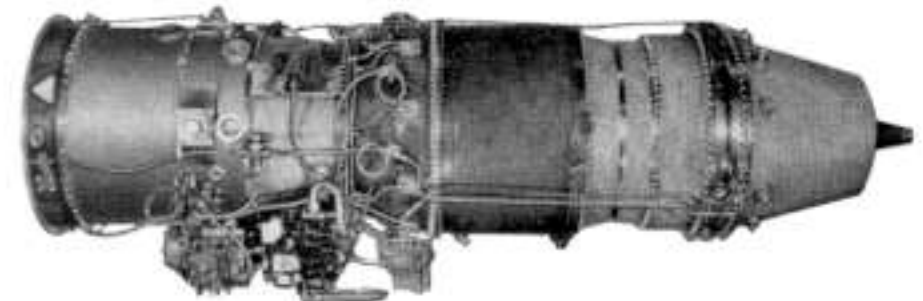
PT-6 Turboprop/Turboshaft



JT-12 Turbojet



T-34 Turboprop



J-52 Turbojet

The heart of the airplane and missile is the powerplant. Aircraft will travel faster, higher, and greater distances only with still more powerful engines.

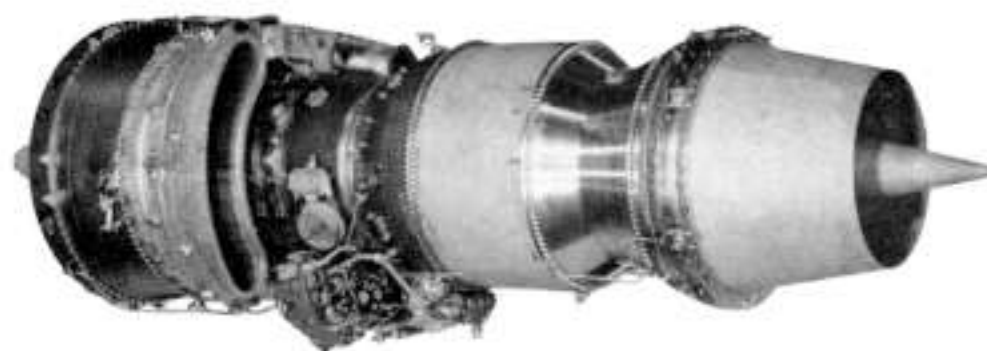
From its beginning, United Aircraft's Pratt & Whitney Aircraft division has steadily been a leading designer and builder of aircraft engines, and its present activities extend into missile propulsion. Its original Wasp, designed in 1925, was the first of the famous line of radial, air-cooled engines which followed. Today, piston, propeller-turbine, and pure jet engines in a variety of sizes and power ranges are coming off the assembly lines. Most powerful of them all is the J-58, the latest in the company's series of turbojets. It is in the 30,000-pound-thrust class and is designed for airplanes which will travel several times the speed of sound at very high altitudes.

A new addition to the jet engine family is the turbofan version of the J-57 turbojet. The engine, which is designated the JT-3D, develops up to 18,000 pounds of thrust, employing the forward fan principle.

Pratt & Whitney Aircraft's development of the XLR-115, the nation's first liquid-hydrogen rocket engine, opened the way for a new generation of space power. Clusters of these engines, producing more than 15,000 pounds of thrust each, will power stages of the Centaur and Saturn space vehicles.



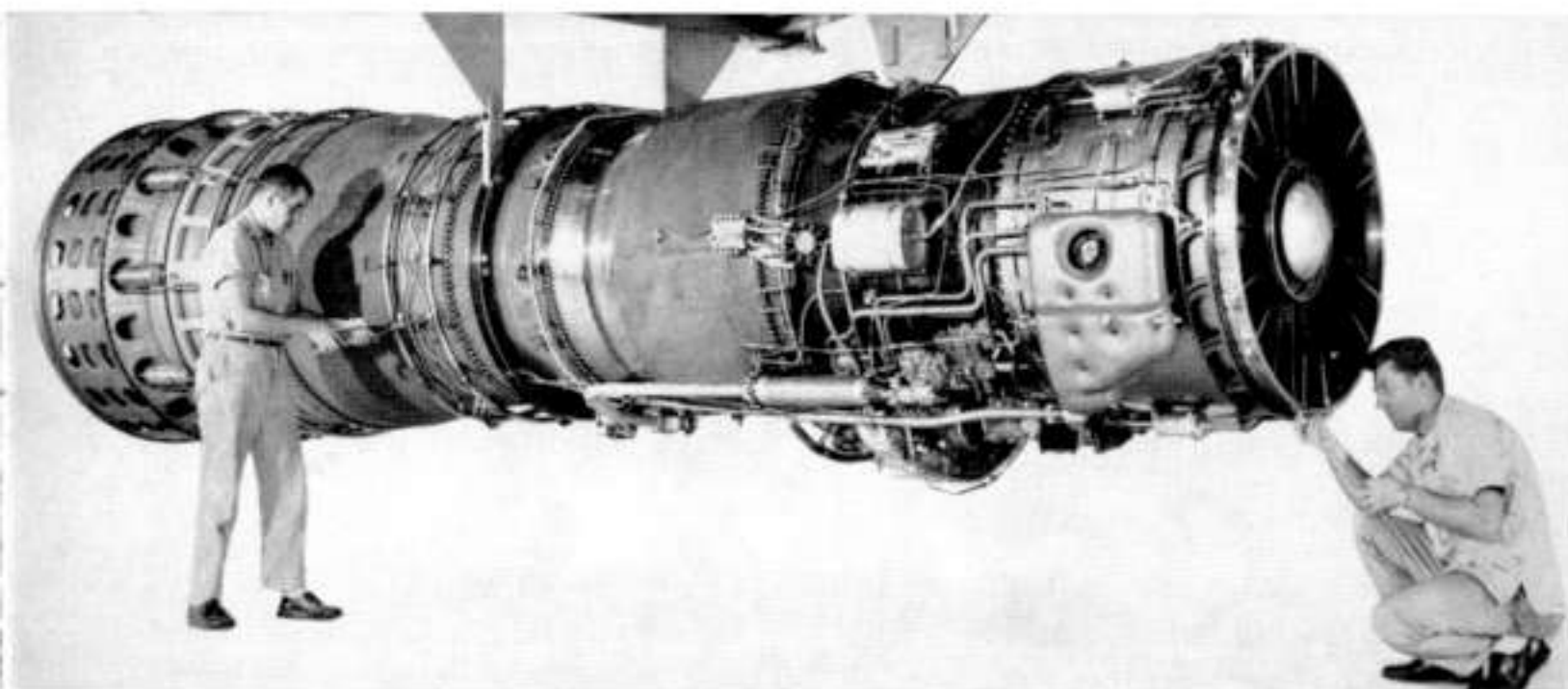
J-57 Turbojet
with Afterburner



JT3-D Turbofan



J-75 Turbojet with Afterburner



J-58 Turbojet with Afterburner



XLR-115 Liquid-Hydrogen Engine

The Range of Propeller Developments

The propeller has evolved from a simple, one-piece wooden airfoil to a complex but rugged mechanism that has been an important factor in the many records set by military and commercial aircraft for safety, speed, and distance performances.

The advent of the turbojet, ramjet, and rocket engines has reduced the demand for propellers, particularly for combat aircraft, which are now largely jet-powered. They continue as a requirement, however, for light planes and large air freighters and transports, powered by piston engines or gas-turbine engines designed specifically for the propeller's use. Hamilton Standard has pioneered the advances in aircraft propeller development for 40 years. Special knowledges and skills it has gathered now are being put to use in many phases of advanced flight, including high-speed environmental systems, gas-turbine and rocket fuel controls, jet engine starters and hydraulic pumps, and for the design of missiles and spacecraft.



Early planes used wooden, fixed-pitch props.



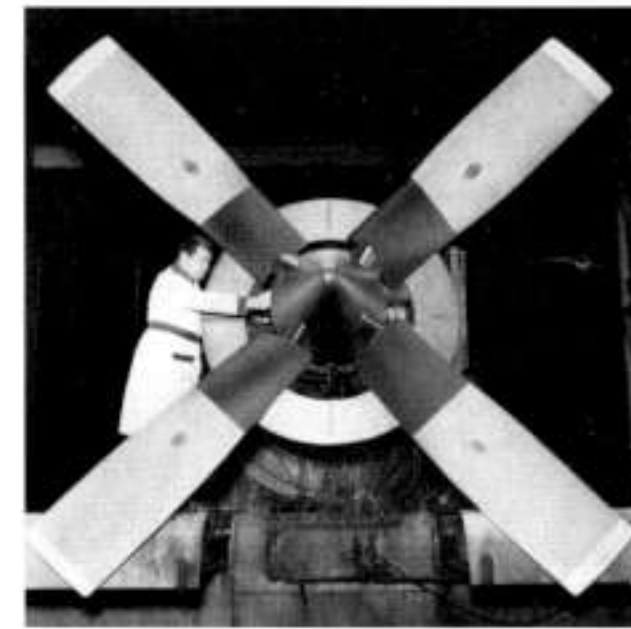
Two-bladed, adjustable propeller of the 1920s.



Most widely used propeller of World War II.



Modern transports use reversible-pitch props.



Turboprop uses wider, square-tipped blades.

Some GREAT FLIGHTS in History

Dec. 17, 1903 — Orville and Wilbur Wright make first powered flight at Kitty Hawk, N. C.

July 25, 1909 — Louis Bleriot flies across the English Channel to Great Britain.

May 31, 1919 — Navy NC-4 flying boat spans the Atlantic Ocean.

Sept. 4, 1922 — Lieut. James Doolittle races the sun, crossing the United States in 22½ hours.

Sept. 28, 1924 — Four Douglas Army planes make 26,000-mile, round-the-world flight in 175 days.

May 9, 1926 — Admiral Richard E. Byrd flies over the North Pole in Fokker trimotored monoplane.

May 21, 1927 — Charles A. Lindbergh flies single-engined plane nonstop New York-Paris in 33 hours.

May 31, 1928 — Sir Charles Kingsford-Smith flies Pacific from California to Brisbane, Australia.

Sept. 24, 1929 — Doolittle, using instruments, makes first "blind" flight in hooded cockpit.

Nov. 28, 1929 — Admiral Byrd flies over the South Pole in Ford trimotored monoplane.

July 1, 1931 — Wiley Post and Harold Gatty make 15,000-mile globe-girdling flight in "Winnie Mae."

May 20, 1932 — Amelia Earhart becomes first woman to fly Atlantic alone. She sets Los Angeles-New York nonstop record three months later.

July 14, 1938 — Howard Hughes circles globe in three and one-half days in twin-engined Lockheed.

Apr. 15, 1941 — Igor Sikorsky makes first officially recorded Western Hemisphere helicopter flight.

Apr. 18, 1942 — Sixteen B-25 bombers leave deck of carrier "Hornet" to bomb principal cities in Japan.

Oct. 1, 1942 — First American jet plane, Bell Aircomet, flies at Muroc Dry Lake, California.

Oct. 14, 1947 — USAF Maj. Charles "Chuck" Yeager in Bell X-1 becomes first pilot in the world to exceed speed of sound.

June 26, 1948 — Berlin Airlift begins. Over 1,200,000 tons of food and supplies carried to beleaguered city in months of round-the-clock operation.

Mar. 2, 1949 — Boeing B-50 bomber, "Lucky Lady II," with four air refuelings, makes non-stop, round-the-world flight in 94 hours.

June 11, 1951 — William "Bill" Bridgeman in rocket-powered Douglas Skyrocket sets altitude-speed record, travels 1,238 m.p.h. reaching 79,494 feet.

Aug. 1, 1952 — Two Sikorsky S-55 helicopters cross the Atlantic from Westover Field, Mass., to Scotland.

Dec. 12, 1953 — Maj. Charles Yeager, USAF pilot, establishes new world speed record of more than 1,650 m.p.h. in rocket-powered Bell X-1A.

Aug. 21, 1954 — New altitude record of 90,000 feet set in rocket-powered Bell X-1A by Maj. Arthur Murray, USAF.

Aug. 20, 1955 — North American F-100C sets the first supersonic world speed record of 822.135 m.p.h.

July 23, 1956 — Rocket-powered Bell X-2 sets new speed record of 1,900 m.p.h., flown by Lt. Col. Frank K. Everest, USAF.

Jan. 18, 1957 — Three B-52 jet bombers land in California, culminating the first nonstop jet flight around the world. The 24,325-mile flight was accomplished in 45 hrs. 20 mins.

July 16, 1957 — Chance Vought F8U-1 Crusader, piloted by Maj. John Glenn, Jr., USMC, sets new coast-to-coast record, flying from California to New York in 3 hrs. 23 mins.

Oct. 4, 1957 — Russia launches first earth satellite (Sputnik).

Oct. 22, 1957 — The Jupiter, Army's intermediate ballistic missile, flies its prescribed course and lands in pre-selected target area.

Nov. 13, 1957 — Boeing KC-135 jet transport-tanker, powered by four P&WA J-57s, piloted by Gen. Curtis LeMay, sets new distance nonstop

record, flying 6,350 miles from Westover AFB, Massachusetts, to Buenos Aires; the return trip sets new speed record, Buenos Aires - Washington, D. C., over 5,200 miles, in 11 hrs. 5 mins.

Nov. 27, 1957 — Air Force McDonnell Voodoo jets shatter three transcontinental speed records: Los Angeles to New York and back, 6 hrs. 42 mins. 6 secs.; east-west, 3 hrs. 34 mins. 8 secs.; west-east, 3 hrs. 5 mins. 39.2 secs.

Dec. 12, 1957 — McDonnell F-101A, piloted by Maj. Adrian Drew, USAF, captures world speed record for Air Force by flying 1,207.6 m.p.h.

Jan. 31, 1958 — First United States satellite (Explorer I) is hurled into orbit around the earth by Army's Jupiter-C rocket.

Mar. 17, 1958 — Navy's Vanguard missile fires second United States satellite (Explorer II) into orbit.

Mar. 26, 1958 — Explorer III, third United States satellite, is launched into orbit by Army's Jupiter-C rocket.

May 8, 1958 — An Air Force Lockheed F-104, flown by Maj. Howard C. Johnson, climbs to a record altitude of 91,249 feet.

May 16, 1958 — Air Force F-104 sets world speed record of 1,404.19 m.p.h.

June 26, 1958 — A KC-135 flies from New York to London, England, in 5 hrs. 27 mins. 37 secs. On June 29, same aircraft flies from London to New York in 5 hrs. 51 mins. 24.8 secs. New records between the points were set by each flight.

Sept. 12, 1958 — Gen. Curtis LeMay flies a KC-135 jet tanker from Yokota Air Base in Japan to Washington, D.C. in 12 hrs. 37 mins. for a new unofficial record between the two points.

Dec. 11, 1959 — An Air Force Republic F-105 flown by Brig. Gen. Joseph H. Moore sets 100-kilometer, closed circuit speed record, flying at 1,216.48 m.p.h.

Dec. 14, 1959 — An Air Force Convair F-106 flown by Maj. Joseph W. Rogers makes record-breaking flight at 1,525.95 m.p.h. over straight-away course.

The VERSATILE HELICOPTER

The helicopter is the world's most versatile vehicle. It flies straight up, down, backward, forward, or sideways and, most important, it can hover — that is, stay motionless in the air. It has brought new dimensions to air travel and is equally at home in densely populated areas, in the wilderness, over land and over sea, as it serves in an ever-growing variety of commercial and military activities.

The helicopter made its first successful flight in this country September 14, 1939, when Igor I. Sikorsky first flew his VS-300. That original machine had very little payload and a top speed of only 50 miles an hour. However, it showed a range of performance unprecedented in the history of aviation. Rapid advances followed until, in 1956, the twin-engined Sikorsky S-56, which can carry payloads in excess of 9,000 pounds, set a world speed record of 162 miles an hour.

As performance increased, the helicopter began to serve in such commercial uses as agriculture, power line patrol, geophysical surveys, mapping, scheduled mail and passenger transport, and as an executive aircraft. Its rescue flights in floods and disaster became the helicopter's trademark. As a construction tool, the helicopter has airlifted transmission line towers and power line poles, installing them from the air in mountainous areas almost inaccessible by other means. It has even poured ready-mixed concrete from the air. These and other construction jobs have been completed in days rather than the months that would have been required by conventional means.

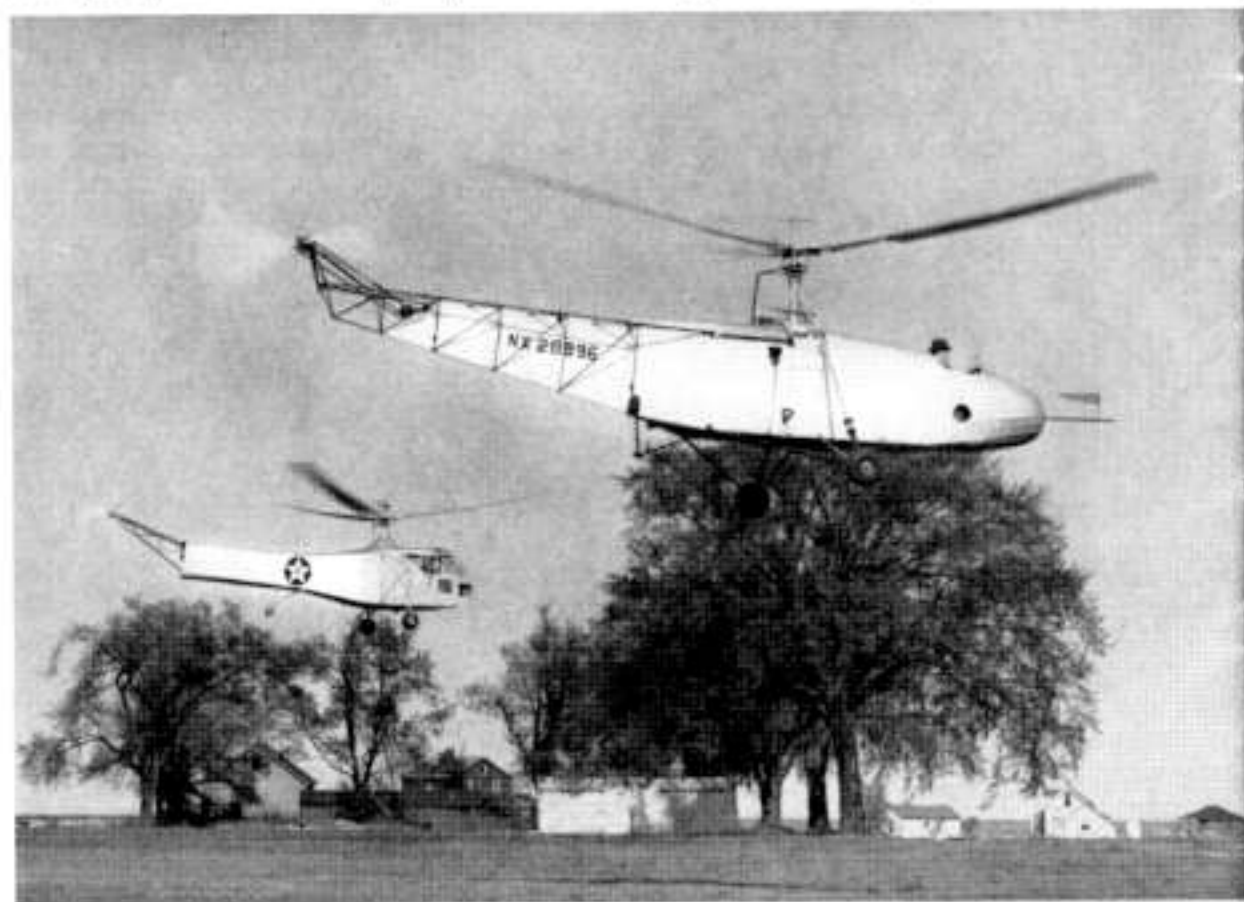
At the same time, the helicopter's military usefulness has grown. It received its first full-scale demonstration with the Marines in Korea. Fitted with external slings and cargo nets, the Sikorsky S-55 opened up a whole new concept of battle-field transportation, carrying food, water, medicine, fuel, and ammunition into places that no other vehicle could reach.

Today, helicopters are used by the military services for submarine hunting, and for carrying rockets, rocket-launchers, howitzers, trucks, jeeps, and bridge sections, as well as for

routine troop and cargo transportation. Even newer applications are being developed, including helicopter "sky cavalry" in which low-flying helicopters fire their own rockets and machine guns.

The introduction of gas-turbine power, all-weather instrumentation, amphibious fuselages, and specially designed flying cranes will greatly increase the helicopter's usefulness in the years to come. Since its inception, the helicopter has been the only flying machine to achieve a practical vertical-lift capability.

Sikorsky VS-300 (right), the first successful helicopter flown in the Western Hemisphere, and the Sikorsky R-4, the world's first production helicopter.





New turbine-powered Sikorsky S-62 is first amphibious helicopter ever built with flying boat-type hull suitable for operating from water, land, ice, snow, or swamp.



Helicopters such as this Sikorsky S-58 are in regular commercial service and are pioneering this newest advance in public transportation.



The sleek 25-passenger Sikorsky S-61 commercial turbocopter, capable of speeds in excess of 150 miles an hour, is an all-weather vehicle with a flying boat hull.



The HSS-2 is the Navy's first all-weather helicopter and its latest anti-submarine weapons system. The turbocopter is powered by twin gas-turbine engines.



Designed for extreme flexibility, this Sikorsky S-60 Skycrane has both cargo and passenger-carrying capabilities. Future Skycranes will be powered by gas-turbine engines and have lifting capacities ranging from eight to forty tons.