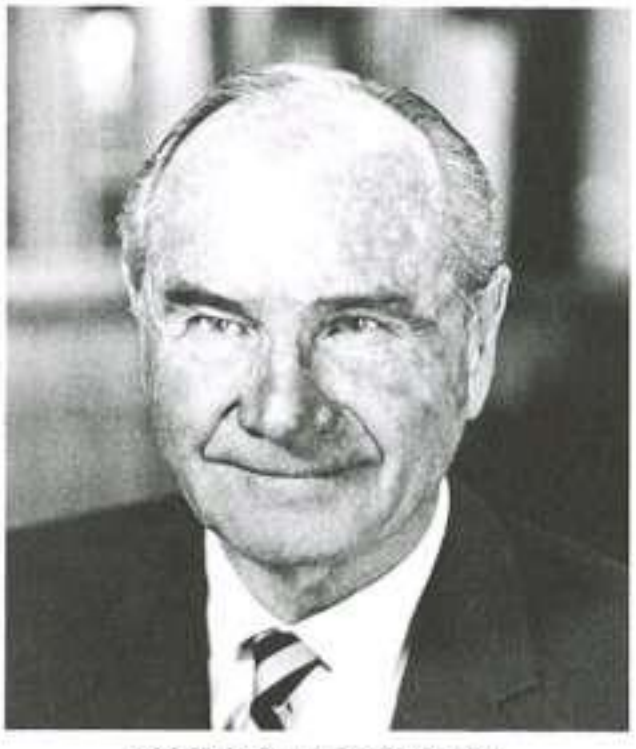
1920
1970

50 YEARS of Service to the Community the Nation and the World

MCDONNELL DOUGLAS



JAMES S. MCDONNELL
Chairman and Chief Executive Officer

DONALD W. DOUGLAS
Honorary Chairman of the Board

Corporations, like people, are entitled to a little nostalgia as they reach the half-century mark. This volume of pictorial reminiscence also serves other purposes: Not only is this an appropriate occasion on which to review the record, but history is instructive, and proven performance both inspires and underwrites confidence in the future. Looking back can be fun, too!

This 50-year-old, pausing in July 1970 to look back, is a leader of the modern aerospace industry. Its beginnings trace to two events in the period between the two World Wars which, while separate in time and circumstance, were alike in their modesty and motivating spirit. Donald Wills Douglas, on July 22, 1920, and James Smith McDonnell,

on July 6, 1939, each set in motion the human potentialities which have created the McDonnell Douglas Corporation of today.

The year 1920 hardly seemed propitious for the start of a new company. During World War I the airplane had demonstrated some military uses and a potential for still further application as an instrument of defense. But military production was over and, in the aftermath of the great conflict, the future of America's infant aircraft industry seemed cloudy indeed. Nevertheless, in that environment of 50 years ago, Donald Douglas determined to pursue a long-held dream. He believed that the future of the airplane rested upon its wide use as a vehicle to serve man by transporting people and cargo through the broad, unconfined highways of the sky, and he wanted to test that theory in his own way. This led him to give up his job as one of the nation's leading aeronautical engineers and go to California, with meager capital, to start a new venture.

DC-3

The history of that venture has been told and

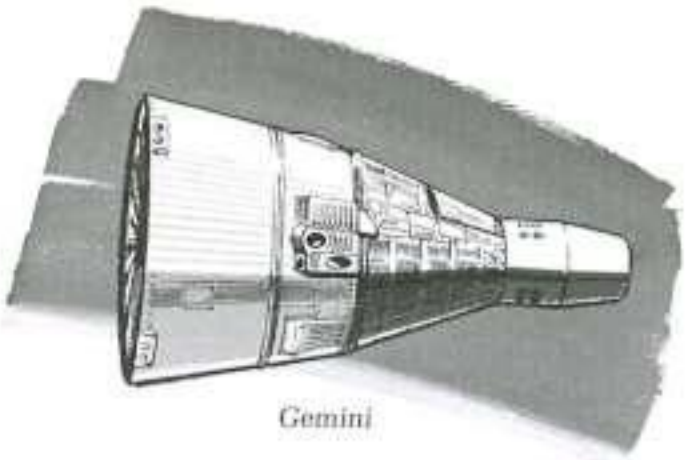
retold. It brought forth, in time, the famous aircraft series designated DC—Douglas Commercial. And it helped provide the military aircraft which saved the Free World during World War II.

It was on the eve of that second World War, in July 1939, that James McDonnell founded the McDonnell Aircraft Corporation in St. Louis and provided new and wider scope for his creativity. Several weeks later World War II erupted in Europe, the United States looked anew to its defenses, and the need of the times was unmistakably aircraft production.

Phantom FH-1

After a beginning year of struggle, during which few sales and no earnings were achieved, the new company grew rapidly by manufacturing airplane parts, developing the XP-67 bomber destroyer and producing the AT-21 bomber trainer, contributing substantially to the war effort.

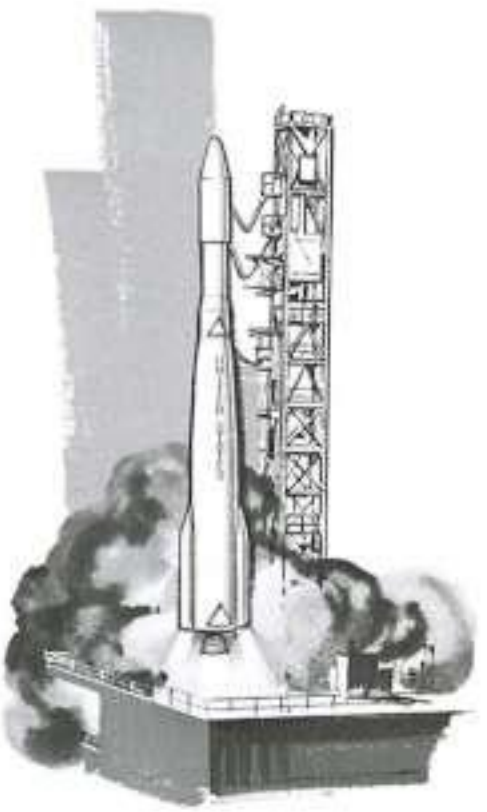
Of greatest significance for the future, however, was McDonnell Aircraft's wartime research on the application of jet propulsion to aircraft, a new concept at that time. The company's impressive progress in this field led to its selection to develop



Gemini

a jet-propelled, carrier-based fighter in January 1943. The historic result was the FH-1 Phantom, the world's first operational carrier-based jet, the first U.S. Navy aircraft to attain a speed of 500 miles per hour, and the progenitor of a long and distinguished line of McDonnell fighter aircraft.

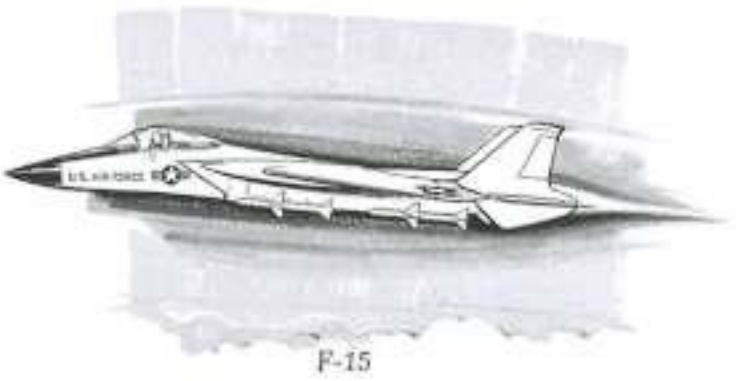
Both McDonnell and Douglas were in the forefront in meeting the challenge of the Space Age. Mercury and Gemini spacecraft carried the first American astronauts on a spectacularly successful series of space flights, while the Thor and Delta boosters launched scores of satellites, and the S-IVB space vehicle played a significant role in the Saturn/Apollo program that was climaxed by man's first landing on the moon.



Delta

The merger of McDonnell and Douglas on April 28, 1967 blended these two great heritages into a team of unsurpassed capabilities spanning the full spectrum of aerospace activity.

Today, McDonnell Douglas commercial transports, combat aircraft and space vehicles are adding new chapters and new lustre to a long history of accomplishment. Tomorrow, the F-15 air superiority fighter, the DC-10 wide-bodied luxury transport, and the Skylab orbiting workshop will carry forward the tradition of excellence set by the first Phantom, the early DCs and the company's pioneering space vehicles.



F-15

DC-10

This volume does not presume to be a complete history. But the products shown on the pages following do tell something of the creative contributions made by the people of McDonnell Douglas to national security, air commerce and the exploration of space—and through these achievements to the betterment of their communities, the nation and the world.

It all began 50 years ago...

BEGINNINGS

In the early days, a budding aircraft company found office and production space wherever it could—within its limited means. In California this meant, in the beginning, office space behind a barber shop and a rented loft in Los Angeles and, later, an abandoned movie studio on **Wilshire Boulevard** in Santa Monica. In Missouri the **original offices** were on the second floor of a small building adjacent to the St. Louis Municipal Airport, with industrial space being obtained later for **early manufacturing** operations.

The first product was the **Cloudster,** a strut-braced wood, wire and doped-cloth biplane powered by a 400 hp Liberty engine, surplus from World War I. Ordered by a wealthy sportsman named David R. Davis in 1920, it led to the incorporation of the Davis-Douglas Company, from which later stemmed the Douglas Aircraft Company in 1928. The Cloudster was the first airplane in history to lift a useful load exceeding its own weight.

Donald W. Douglas and **James S. McDonnell** were working founders. The vision of the future was theirs, but so was a big share of the day-to-day (and night time) hard work that made it all come true.

Material shortages revived interest in wooden aircraft during World War II. One of the corporation's early facilities, in Memphis, Tennessee, produced such a plane, the **AT-21 bomber trainer.**

Original offices—St. Louis (1920)

Wilshire Blvd. Plant—Santa Monica (1922)

James S. McDonnell (1940)

Donald W. Douglas (arrow) (1920)

Early manufacturing—St. Louis (1940)

The Cloudster (1921)

AT-21 assembly in Memphis (1943)

MILITARY AIRCRAFT

Navy Contract No. 53305 of April 1, 1921, required only 18 pages to set forth the specifications which resulted in the purchase of three **DT** (D-for-Douglas, T-for-torpedo) folding-wing aircraft—the company's first military contract.

The **XP-67** bomber destroyer contract was received in September 1941 for a twin piston-engine fighter with a design top speed of 405 mph and a combat range of 2385 statute miles. One experimental airplane was flight-tested for the Army Air Forces.

In 1942, a production contract was received for all-wood **AT-21** bomber crew trainers. They were manufactured from Fairchild designs at the McDonnell-operated plant in Memphis, Tennessee.

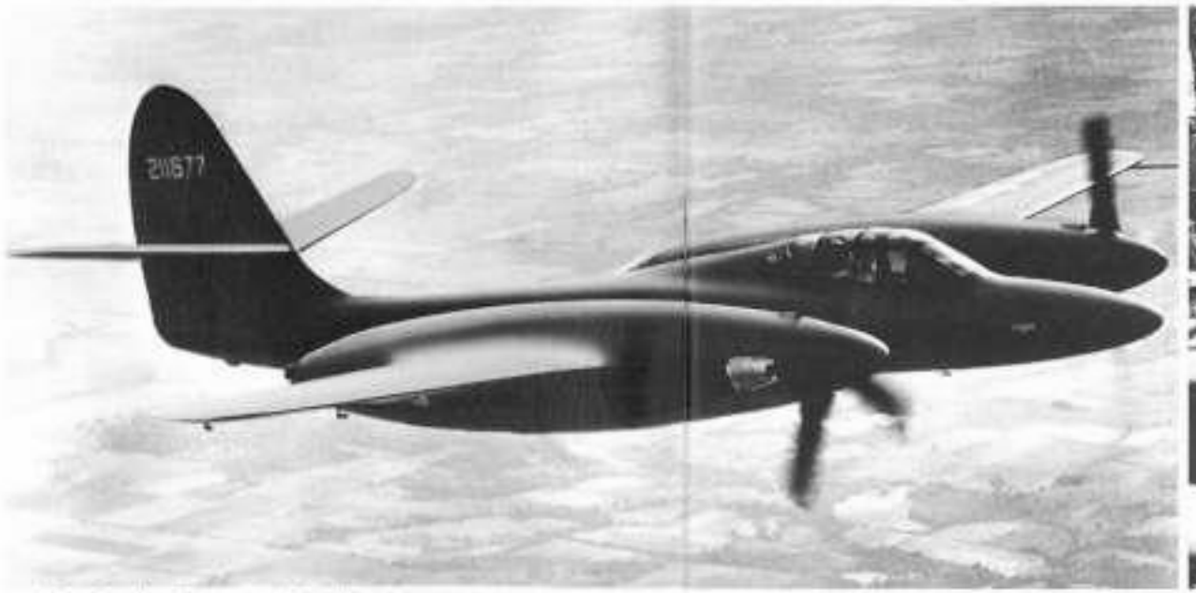
The **Douglas World Cruiser** was a two-place biplane with a 50-foot wing span, powered by a 420 horsepower Liberty engine. Based on the Cloudster and DT designs, five planes were built for the Aviation Service of the U.S. Army. In 1924, two were flown 28,945 miles around the world in six months and six days.

The **0-2** observation plane, also produced for the U.S. Army Aviation Service, was the first of a series which remained in production for more than 10 years. It was a two-place biplane powered by a Liberty engine. A contract in February 1925 for 46 was the largest order received by the company to that time.

DT Torpedo Bomber (Douglas 1921)

O-2 Observation Plane (Douglas 1925)

AT-21 Bomber Trainer (McDonnell 1944)



XP-67 Bomber Destroyer (McDonnell 1944)

Douglas World Cruiser (Douglas 1924)

Dolphin Flying Boat *(Douglas 1931)*

B-18 Medium Bomber *(Douglas 1937)*

A-20 Havoc *(Douglas 1940)*

Douglas commenced production of flying boats in 1929. The **Dolphin,** purchased by the Army, Navy and the Coast Guard in quantity, was perhaps the best known.

The **B-18,** a 1937 twin-engine medium bomber having a crew of six, was a combat version of the DC-3/C-47. The B-18 absorbed punishment well and was especially useful during the early days of World War II.

In early January 1943, an order was received for a single-place, jet-propelled, carrier-based fighter, the **XFD-1 Phantom.** Production versions designated **FH-1** became the Navy's first 500 mph airplane and the first combat jet aircraft to operate from the flight deck of a U.S. aircraft carrier.

The **SBD Dauntless** was a two-place, low-wing Navy scout bomber, powered by a single Wright R1820, 1200-horsepower engine. The Dauntless became a mainstay of the Navy's air fleet in the Pacific, with the lowest loss ratio of any U.S. carrier aircraft. A total of 5396 SBDs was delivered between first delivery in 1940 and the end of production in July 1944.

The **A-20 Havoc,** which was to become the A-26 and the B-26, was a high-wing, twin-engine, three-place medium bomber. It shared with the SBD a deserved reputation for getting its crews home, even when both crew and aircraft suffered crippling blows. In all, 6278 Havocs were built.

XFD-1 Phantom–First U.S. Carrier Jet *(McDonnell 1946)*

SBD Dauntless *(Douglas 1940)*

FH-1 Phantom *(McDonnell 1946)*

AD Skyraider *(Douglas 1946)*

F2H-2 Banshee *(McDonnell 1949)*

F2H-2 Banshee production *(McDonnell 1951)*

F2H-1 Banshee *(McDonnell 1948)*

F3H Demon *(McDonnell 1953)*

First of the **Skyraider** series, the single-place AD-1 (now designated the A-1) was delivered in 1946. The AD-1 was powered by a single Wright 3350 piston engine. Before production ceased in 1956, 3155 Skyraiders were delivered in 21 variations. Basically a low-wing, attack bomber, the **AD** was used for anti-submarine surveillance missions, as a cargo carrier and an ambulance plane. As a personnel carrier, the AD-5 version airlifted 10 passengers plus crew.

The **F2H-1 Banshee,** a single-place Navy tactical fighter, was introduced in 1947. The Banshee was similar in design and appearance to the FH-1 Phantom, although larger and with more powerful twin Westinghouse J34 engines which gave about twice the power of the J30 engines in the FH-1. The Banshee's engines were installed in expanded wing roots next to the fuselage to reduce aerodynamic drag. Designed to conform to the Navy's exacting requirements for carrier operations, and to meet its needs for high speeds and increased rates of climb, the F2H Banshee became the Navy's standard aircraft for all-weather fighter missions of extended range. The **F2H-2** set a jet altitude record of 52,000 feet in 1949 and was an outstanding operational fighter during the Korean War, being immortalized by James Michener in his novel, "The Bridges of Toko-Ri." A total of 895 Banshees of all types was delivered.

The **F3H Demon** was a transonic, swept-wing, single-jet, all-weather fighter, the first aircraft designed for missile armament rather than guns. It first flew in 1951 and saw service during the Lebanon and Quemoy crises of 1958.

C-47 Transport (Douglas 1941)

C-124 (Douglas 1950)

C-133 (Douglas 1956)

The **C-47**, perhaps the best known military transport of all time, was neither the largest, the fastest, nor the most beautiful but it must have been the best loved and hardest worked. More than 10,000 of the C-47s—a beefed-up, military version of the DC-3—served the U.S. Army Air Forces, the U.S. Navy and our allies.

Starting in 1942 came more than 900 C-54s, the four-engine transport which made global military airlift possible. The C-54 was a military counterpart of the DC-4. It flew a million miles a month over the rugged North Atlantic—more than 20 round trips a day. A **C-54**, irreverently called the **"Sacred Cow"** by the White House press corps, became the first presidential aircraft, ordered for Franklin D. Roosevelt. The DC-6B went into military service as the Navy's **R6D-1** and the Air Force's **C-118A/B**. President Harry Truman's **"Independence"** was a DC-6.

The post-war **C-124** had twice the capacity of the C-54. The **C-133**, a four-engine turbo-prop, was still larger and faster.

The "Sacred Cow" was a C-54 (Douglas 1942)

R6D-1/C-118A/B (Douglas 1953)

The "Independence" (Douglas 1947)

The Air Force's **F-101 Voodoo,** a long-range, twin-jet fighter designed to escort bombers, attack distant targets and provide close support for ground troops, evolved from the **XF-88** and was a further development of the two-engine design pioneered in the FH-1. Attack fighter, interceptor and reconnaissance versions of the Mach 1.7 F-101 served with the Strategic, Air Defense and Tactical Air Commands. Voodoo deliveries totaled 807. In Operation Firewall in 1958, an **F-101A** fighter-bomber set a world speed record of 1207 mph. In Operation Sun Run, in 1957, an **RF-101** raced from Los Angeles to New York and back to Los Angeles in a record time of 6 hours, 46 minutes.

The **F4D Skyray,** a delta wing twin-jet, set new speed and time-to-climb records. The single-place F4D was, in its time, capable of higher performance than any aircraft in the Navy's inventory.

The **RB-66** reconnaissance aircraft and the B-66 medium bomber were the most advanced of their types in the United States Air Force when introduced in 1954 and 1955. (They derived from the Navy A3D attack bomber.) In speed, range and capacity, the B-66 twin-jet with a three man crew met all tactical requirements for delivering the most potent weapons. The RB-66 was modified for use in night photo reconnaissance, electronics reconnaissance and weather reconnaissance.

F-101A, F-101B and RF-101 Voodoos (McDonnell 1954)

F4D Skyray (Douglas 1954)

RB-66 (Douglas 1954)

RF-101 (McDonnell)

F-101A Voodoo (McDonnell)

XF-88 (McDonnell 1948)

A-4, first of the Douglas Skyhawk series *(1954)*

A-4B *(1956)*

A-4F *(1966)*

New Zealand's A-4K and TA-4K *(1969)*

TA-4F trainer *(1966)*

For more than 15 years, the **Skyhawk** series of light-weight, high-speed, combat aircraft has had an excellent record. Starting with the **A-4** prototype, which was first flown on June 22, 1954, Skyhawks have continuously provided the U.S. Navy and Marines and friendly nations with a maneuverable yet powerful attack bomber which has great altitude and range capabilities, plus an unusual flexibility in armament capacity.

Other Skyhawk combat versions include the **A-4B, A-4E, A-4F** and **A-4M,** the most recent to be flown. Trainer versions include the **TA-4F** and **TA-4J.** The Skyhawk is also in use by Argentina, Australia, Israel and New Zealand, which flies the **A-4K** and **TA-4K.** By July 1970, more than 2400 Skyhawks had been delivered. Skyhawks are made available to the air forces of friendly nations by government-to-government agreement.

A-4M *(1970)*

A-4E *(1962)*

TA-4J trainer *(1969)*

The two-place, twin-jet, all-weather **F-4 Phantom II series**, with top speeds more than twice that of sound, is one of the most versatile fighters ever built.

The **F-4A** Phantom first flew on May 27, 1958, and immediately entered evaluation tests by the U.S. Navy. It was followed into Navy service by the **F-4B** and **F-4J.** The U.S. Air Force uses **F-4C, F-4D, F-4E** and **RF-4C** versions. F-4B, F-4J and **RF-4B** versions have been delivered to the Marine Corps. Phantoms made available to other nations by our government include the United Kingdom's Royal Navy **F-4K** and Royal Air Force **F-4M,** the Imperial Iranian Air Force F-4D, the Israeli Air Force F-4E, the Republic of Korea Air Force F-4D, the Japan Air Self Defense Force F-4E, and the West German Air Force RF-4E.

Both U.S. military demonstration teams, the Navy Blue Angels and the Air Force Thunderbirds, fly the Phantom.

The F-4 Phantom established 16 speed, altitude and time-to-climb records. It has been flown faster than 1600 miles an hour and to altitudes above 100,000 feet. More than 3700 Phantoms have been delivered and they are still coming down the production line.

F-4E model in the Phantom series (1967)

F-4D (1965)

F-4C (1963)

RF-4C (1964)

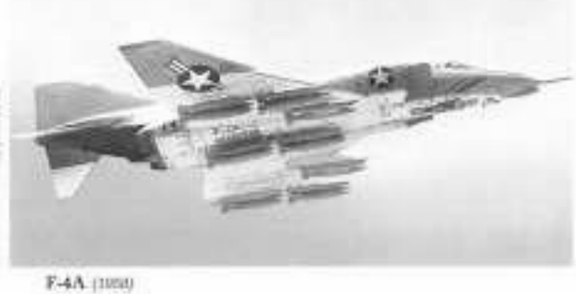
F-4B (1960)

F-4M (1967)

RF-4B (1965)

F-4K (1966)

F-4J (1966)



F-4A (1958)

The historic McDonnell Douglas tradition of excellence in fighter aircraft will be carried forward by the **F-15.** An air superiority fighter, it is a single-place, fixed-wing aircraft weighing about 40,000 pounds when combat loaded. The F-15 will have a mix of air-to-air weaponry, including both medium and short-range missiles and an internal rapid-firing cannon. It also will have the capability of seeking and destroying enemy aircraft in bad weather.

First flight is scheduled for 1972 with an initial operational capability in the mid-1970s.

The Hawker Siddeley **Harrier V/STOL** attack fighter may be built in this country by McDonnell Douglas under an agreement between the two companies announced in December 1969.

The Harrier, which can takeoff and land vertically, is a single-seat, close support, tactical weapon system that can operate from unprepared and rough areas.

Harrier V/STOL

McDonnell Douglas F-15

RARE BIRDS...

Rare birds include the prototypes, the purely experimental and the special, one-shot jobs.

The **XHJD-1 Whirlaway,** built in 1946 for the Navy, was the world's first twin-engine helicopter. It weighed six tons.

The **XP3D-2** was a high-wing, all-metal flying boat powered by two Wright 1000 hp engines mounted atop the wing.

The **XF-88B** was a turbo-prop experimental version of the XF-88 Voodoo, built to conduct propeller research for supersonic planes.

The **YIB-7** was a gull-wing, four-place, twin-engine high-speed (182 mph) bomber for the Army Air Corps.

The **Gamma 2B** was hand-crafted solely for the Antarctic expedition of Lincoln Ellsworth.

The **B-19,** a four-engine experimental bomber, contributed much to the science of strategic bombing.

The **XF-85 Goblin,** the smallest jet-propelled fighter ever built, was a "parasite" designed to be dropped from a bomber, perform its mission and return to the mother ship.

XHJD-1 Whirlaway (McDonnell 1946)

YIB-7 (Douglas 1932)

Gamma 2B (Douglas 1932)

XP3D-2 (Douglas 1938)

B-19 (Douglas 1941)

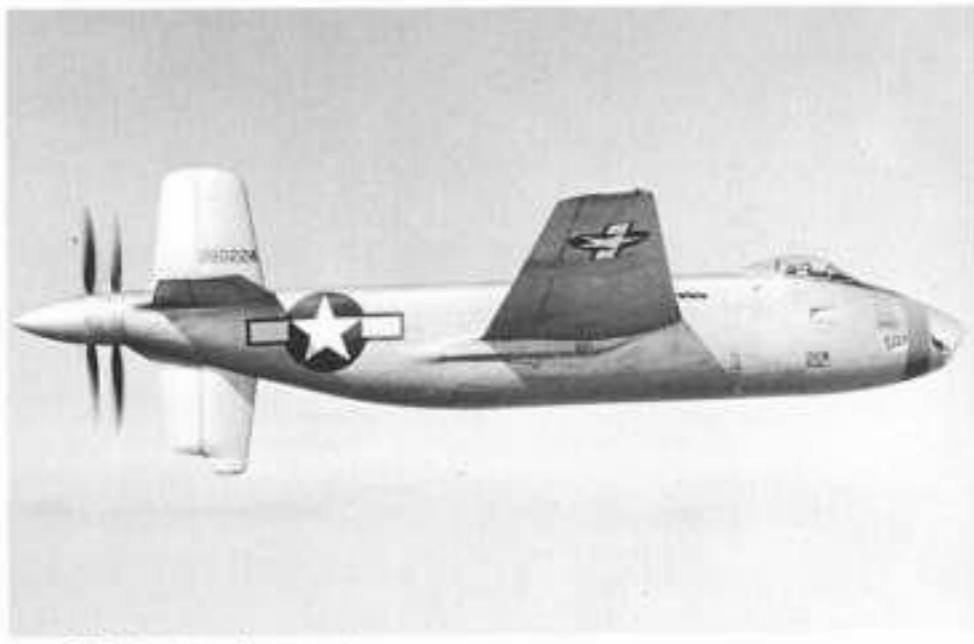
XF-88B (McDonnell 1953)

XF-85 Goblin (McDonnell 1948)

Goblin and mothership

...MORE RARE BIRDS

Model 120 *(McDonnell 1957)*



XB-42 *(Douglas 1945)*

D-558-2 Skyrocket *(Douglas 1948)*

XH-20 Little Henry *(McDonnell 1947)*

D-558-1 Skystreak *(Douglas 1947)*

Cloudster II *(Douglas 1947)*

XV-1 Convertiplane *(McDonnell 1954)*

XB-43 *(Douglas 1946)*

Model 119/220 *(McDonnell 1959)*

The **D-558-1 Skystreak** and the **D-558-2 Skyrocket** were 1947-48 experimental aircraft, which first nudged, then penetrated the sonic barrier. The jet-powered Skystreak reached 651 mph; the jet-and-rocket-powered Skyrocket was flown at 1327 mph (Mach 2.01).

The **XH-20 Little Henry** was the world's first ramjet helicopter. A flying test stand, it had no tail rotor and weighed only 280 pounds.

The **Model 120** was a "flying crane" of unusual lifting capability.

The four-engine **Model 119/220** was the first business, non-airline-type jet aircraft to receive an FAA Class I provisional type certificate as airworthy in the transport category.

The **XV-1 Convertiplane** compound helicopter for the U.S. Army made the first successful conversion from vertical rotor lift to horizontal winged flight.

The **XB-42** and the **XB-43** were top security wartime programs which produced only four flying aircraft. Two engines driving tail propellers were housed in the XB-42 fuselage. The XB-43 was a jet-propelled version of the XB-42.

The **Cloudster II** was a small, one-of-a-kind transport using a tail-mounted propeller. It first flew in March 1947.

COMMERCIAL AIRCRAFT

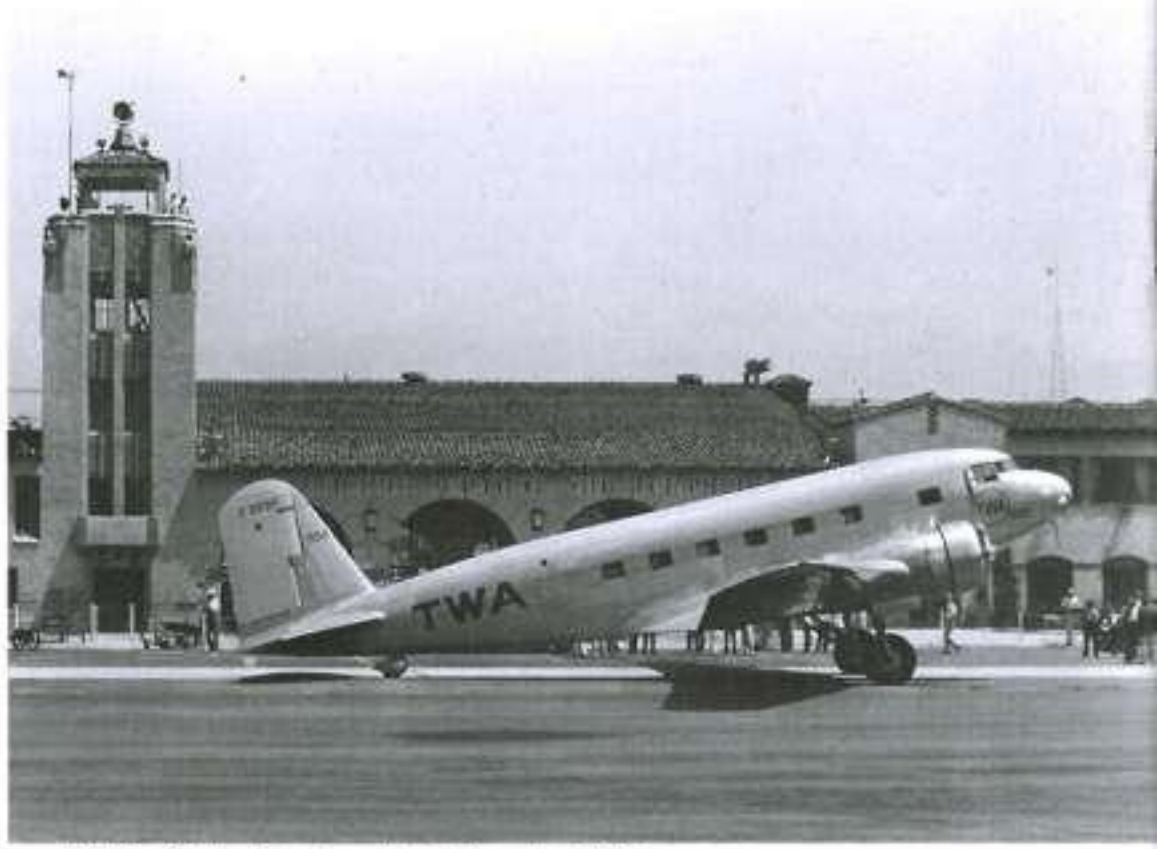
The one and only **DC-1,** first of the "Douglas Commercial" family, was a low-wing, all-metal monoplane which first flew on July 1, 1933. Two Wright Cyclone 710 hp engines carried 14 passengers at 180 mph.

Before the DC-1 was delivered on September 13, 1933, an order was received for 20 of an improved version, the **DC-2,** which would cruise at 190 mph. Sales of the DC-2 eventually reached 138.

The immortal **DC-3** first flew on December 17, 1935. It was a simple, logical, evolutionary development of the DC-1 and DC-2. New 1000 hp Pratt & Whitney engines permitted the DC-3 to carry 21 passengers 1480 miles at 195 mph. The world's airlines bought 448 DC-3s, and many times that number of surplus C-47s.

The **DC-4** carried 44 passengers at more than 200 mph. Its straightforward, four-engine design was laid down in 1938. Roughly three times the size of the DC-3, the DC-4 was commandeered by the U.S. Army Air Forces in 1942, delaying its use in commercial service until 1946. More than 300 eventually were used by the airlines.

The **DC-5** was a two-engine transport which embodied many DC-3 systems, but it enjoyed limited success and only 12 were built.



DC-1—First of a long line *(Douglas 1933)*

DC-2 *(Douglas 1934)*

DC-3 *(Douglas 1935)*

DC-4 *(Douglas 1946)*

DC-5 *(Douglas 1939)*

The **DC-6** was to the DC-4 what the DC-3 was to the DC-2.

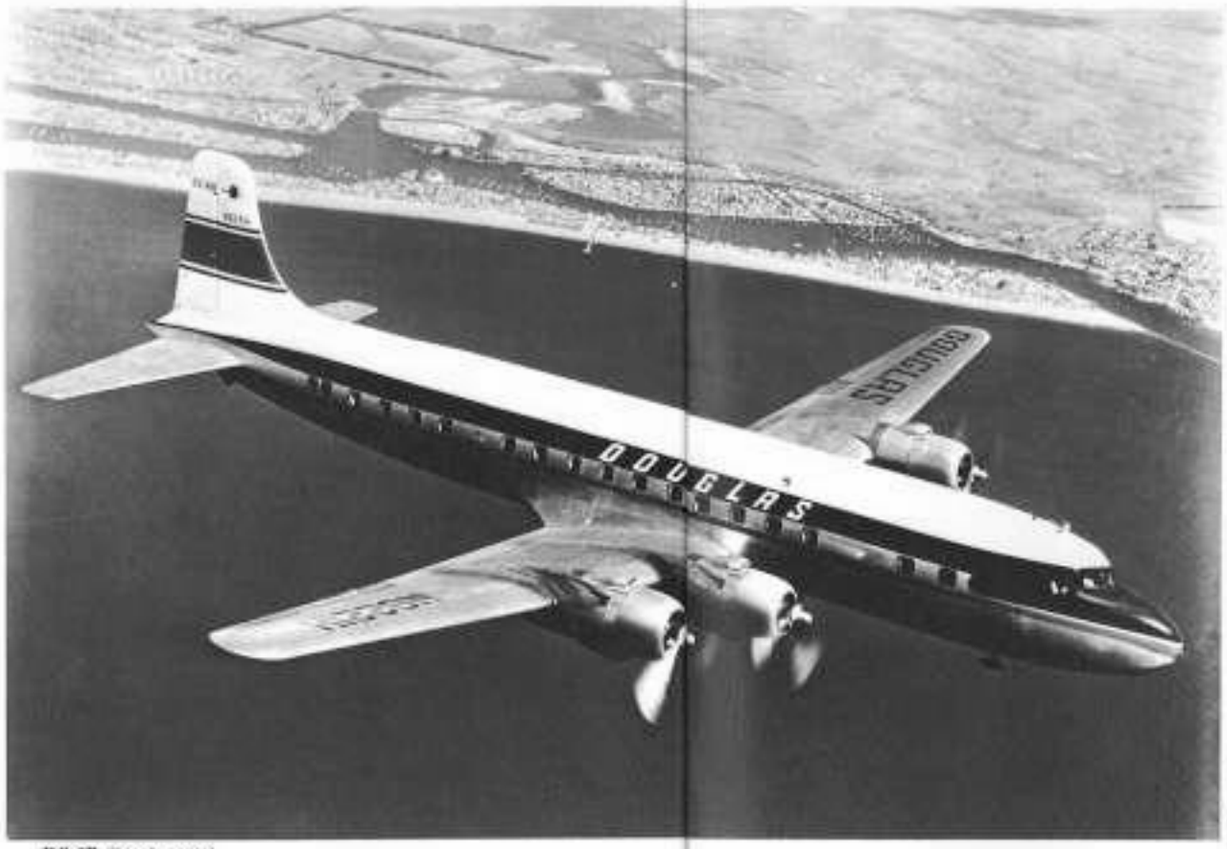
Four Pratt & Whitney R-2800 engines gave the DC-6 8400 hp and improved its speed to 350 mph from the DC-4's 240 mph. Payload was increased from 11,000 to 14,000 pounds and range extended from 1750 to 2600 miles. Cabin pressure was maintained at 5000 feet while flying at 20,000.

The improved **DC-6B** was a great money maker for most airlines. Greater power increased passenger capacity from 58 to 89 and top speed from 350 mph to 380 mph.

The **DC-7**, introduced in May 1953, was powered by four Wright turbo-compound W-3350s. It was the first commercial transport able to fly non-stop westbound across the United States against the prevailing winds. A total of 1041 of the DC-6/DC-7 series was delivered.

The **Super DC-3** was a major modification of the DC-3 with new wings and empennage, redesigned landing gear, lengthened fuselage and more powerful engines. As a replacement for the DC-3, it had considerable appeal to the military, and a few were converted to airline use.

The **Model 188** Short Takeoff and Landing (STOL) aircraft based on the French Breguet 941, has shown military and commercial use capabilities. Demonstration flights indicate that STOL aircraft can operate successfully either from downtown STOLports or STOLstrips at large airports, thus offering a measure of relief to airline congestion.



DC-6B (Douglas 1951)

DC-7 (Douglas 1953)

DC-6 (Douglas 1947)

Model 188 airline demonstration (McDonnell Douglas 1969)

Super DC-3 (Douglas 1950)

The **DC-8**, powered by four jet turbine engines and capable of speeds of more than 600 mph, first flew on May 30, 1958. As of July 1970, more than 500 DC-8s in all versions had been delivered to the world's airlines.

The DC-8 has been produced in eight basic models, with a variety of configurations and power plants. Production is now concentrated in the **Super Sixty** series.

The **DC-8-61** features a fuselage extension of nearly 37 feet over the original model. In an all-economy passenger configuration, the DC-8-61 can carry 260; the convertible-freighter configuration has a cargo volume of 12,535 cubic feet.

The **DC-8-62**, a very long range commercial jetliner, can carry 189 passengers, or 97,000 pounds of cargo as far as 5000 nautical miles.

All design improvements of the DC-8-61 and -62 are incorporated in the **DC-8-63**. The fuselage extension, aerodynamic improvements to nacelles, pylons and flaps, plus increased wing span and fuel capacity, combine to provide outstanding payload and range capability.

DC-8 Super 63 (1967)

DC-8 Super 62 (1967)

First of the DC-8s (1959)

DC-8 Super 61 (1967)

DC-9-40 (1968)

The DC-9 made its first flight on February 25, 1965 and entered airline service in December of the same year. It has been produced in four series and six principal configurations. Recent emphasis has been on the larger DC-9-30 and DC-9-40 versions.

The 90-passenger **DC-9-10** was expanded into the **DC-9-30,** which first flew on August 1, 1966. The DC-9-30 is 15 feet longer than the DC-9-10. It has a 4-foot increase in wingspan and can carry up to 115 passengers. It was accorded prompt and widespread airline acceptance.

The **DC-9-20** combines the compact fuselage of the Series 10 with the high-lift wing system of the larger Series 30. It has proven especially useful for short landing fields.

The **DC-9-40,** accommodating as many as 125 passengers, was introduced in 1968.

The **C-9A,** based on the DC-9 Series 30, was adapted for Air Force use to transport sick and injured military personnel.

DC-9-30 (1967)

DC-9-10 (1965)

DC-9-20 (1965)

C-9A (1968)

The **DC-10,** newest of the "DC" series, can accommodate 270 passengers in a typical first class and coach arrangement at comfort levels surpassing those on current jetliners or can seat up to 345 passengers in an all-economy configuration.

The new wide-bodied jetliner is being produced in three basic models: Series 10 for service on domestic routes of 300 to 3500 statute miles and the Series 20 and Series 30 extended range models for intercontinental operations, up to 6000 miles.

Overall length of the DC-10 is 182 feet, and the fuselage is nearly 20 feet in diameter. Wings, swept at an angle of 35 degrees, have a span of 155 feet 4 inches on the Series 10. Wing span on the Series 20 and 30 is six feet greater. Height to the tip of the tail is 58 feet 1 inch.

DC-10 first class section

McDonnell Douglas DC-10 (Illustration is a model)

SPACE AND MISSILES

Eleven months before America announced a plan to orbit a man around the Earth, the engineering team in St. Louis began work on the project. The **Mercury spacecraft** that emerged from the NASA competition drew the plaudits of the world as people of all nations shared this great adventure.

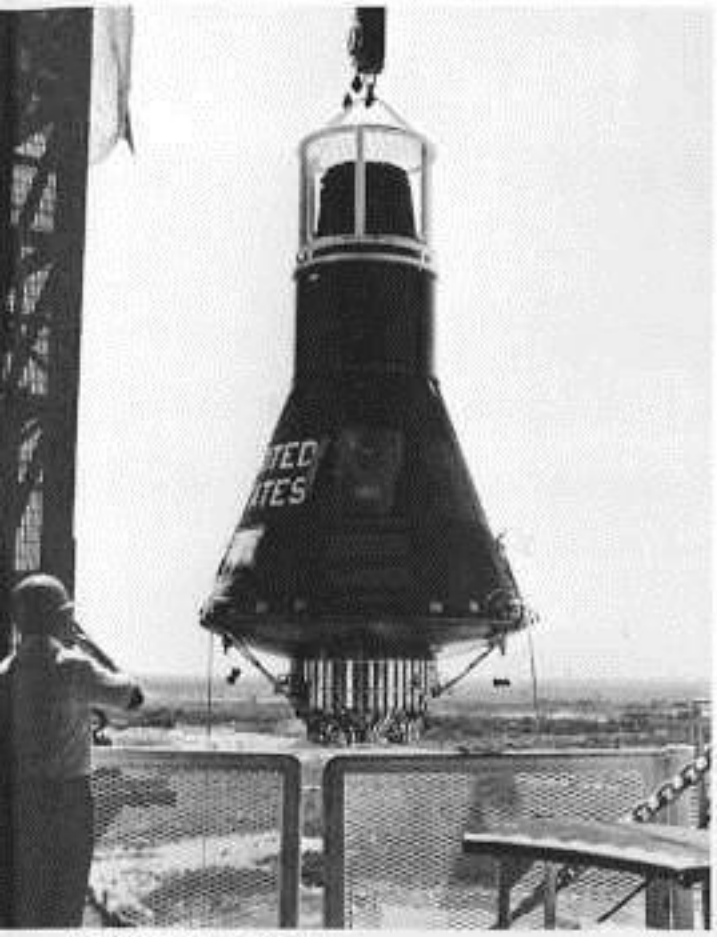
The **seven original astronauts** intensely followed every phase of Mercury spacecraft production in St. Louis. **Clean rooms** were established to meet stringent manufacturing quality standards.

Mercury's journeys into space started with a delivery ride **to the Cape** in a C-124 Globemaster and a **lift up the gantry.**

Suborbital flights on a **Redstone** rocket carried astronauts Shepard and Grissom on test flights 100 miles above the Earth. Then, on February 20, 1962, an Atlas pushed John Glenn and **Friendship 7** into orbit. America had become a spacefaring nation.

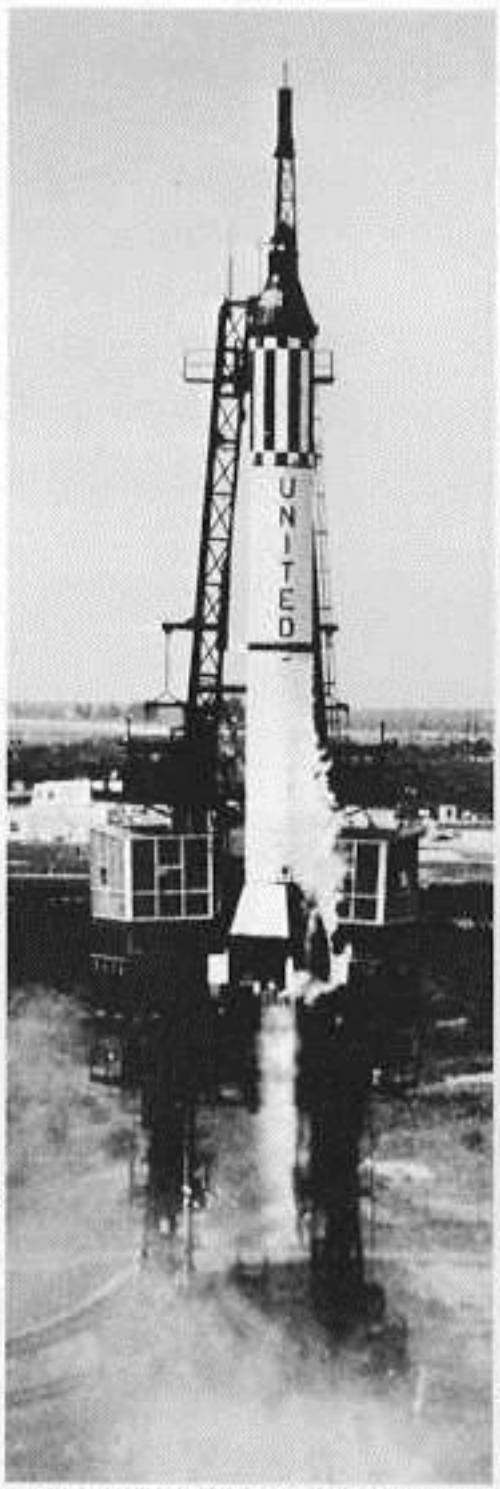
Original astronauts with J. S. McDonnell *(1961)*

Mercury Spacecraft *(McDonnell 1961)*



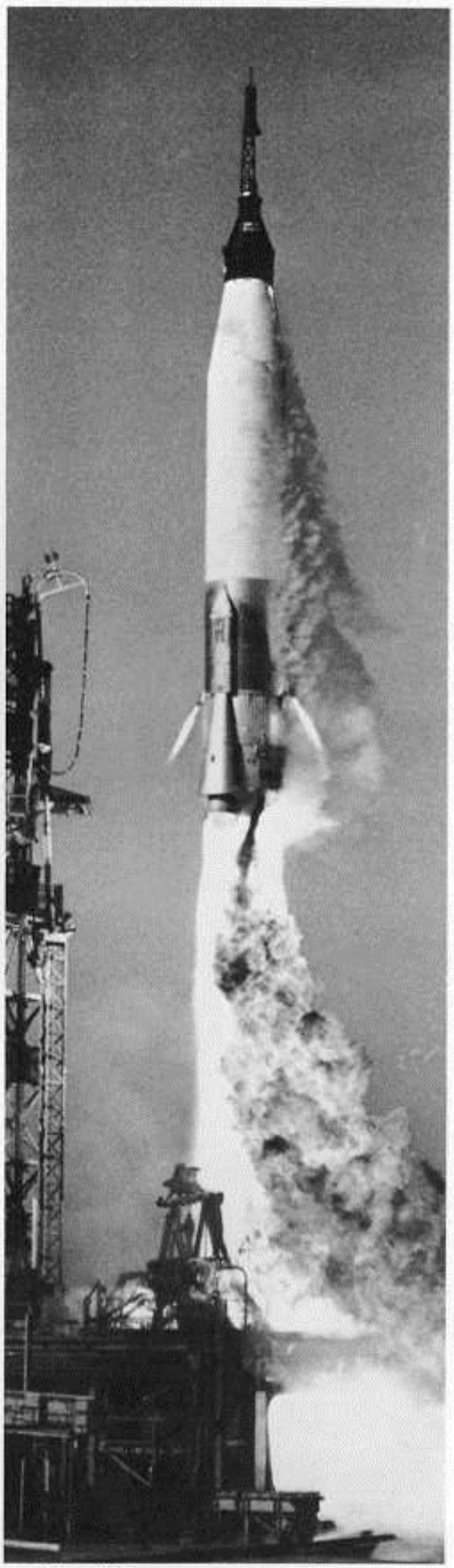
A lift up the gantry

Off to the Cape



Redstone launch *(1961)*

Mercury clean room



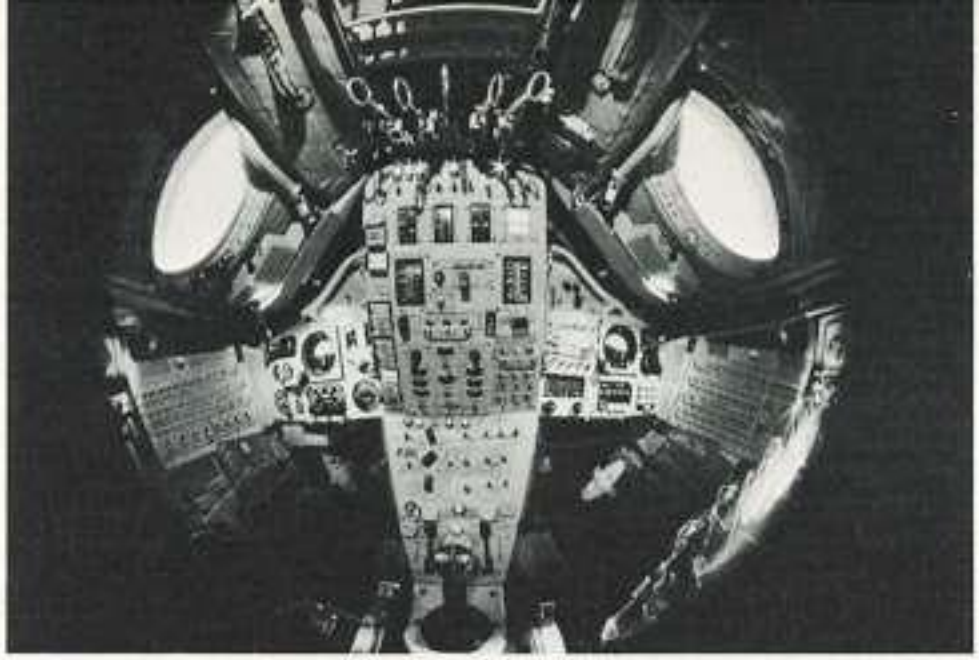
Friendship *7 (1962)*

First rendezvous in space *(1965)*

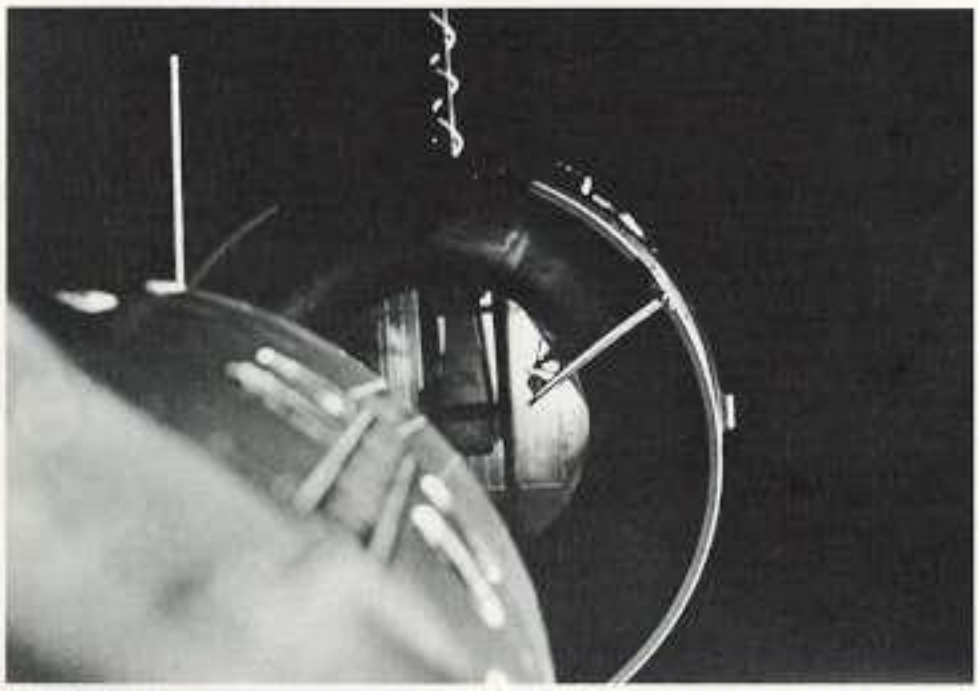
Walk in space *(1965)*

A pin-point landing *(1965)*

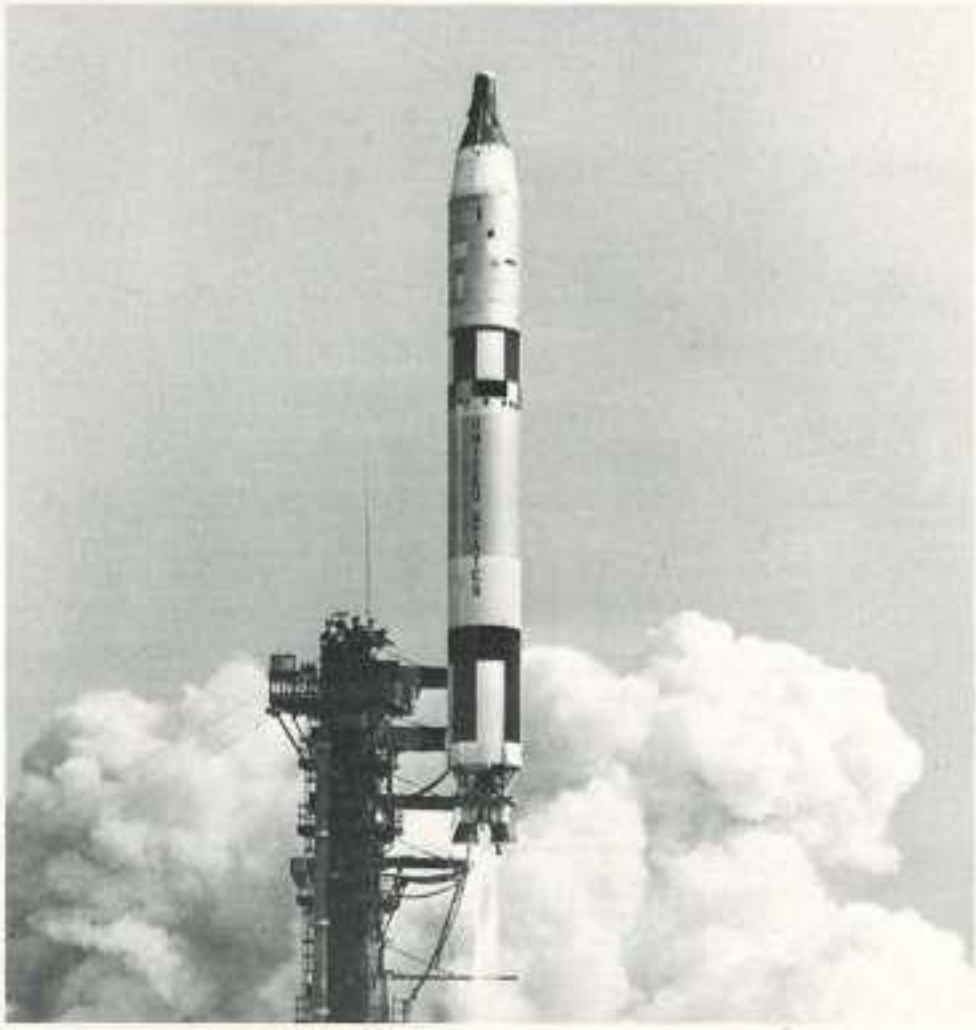
After Mercury had proven that man could live and work in space, Gemini spacecraft were designed by McDonnell under NASA leadership to master the orbital environment and test techniques that would allow man to go to the moon. Concepts developed during the Gemini program, such as the **first rendezvous in space** during the flights of Gemini 7 and 6 on December 15, 1965, will be the foundation for manned spaceflight in Earth orbit and beyond for decades to come. The world thrilled with Ed White, as he **walked in space** for 5000 miles across the sky and told the world all the while of his experience. Gemini crews flew in the compact cabin for 14 days, and used hundreds of **controls and instruments** to navigate and maneuver from one orbit to another for the first time. They recorded the **first docking in space**, and repeatedly demonstrated **on-time launches** and guided reentries to **pin-point landings** within sight of the recovery carriers.



Controls and instruments



First docking *(1966)*



An on-time launch *(1966)*

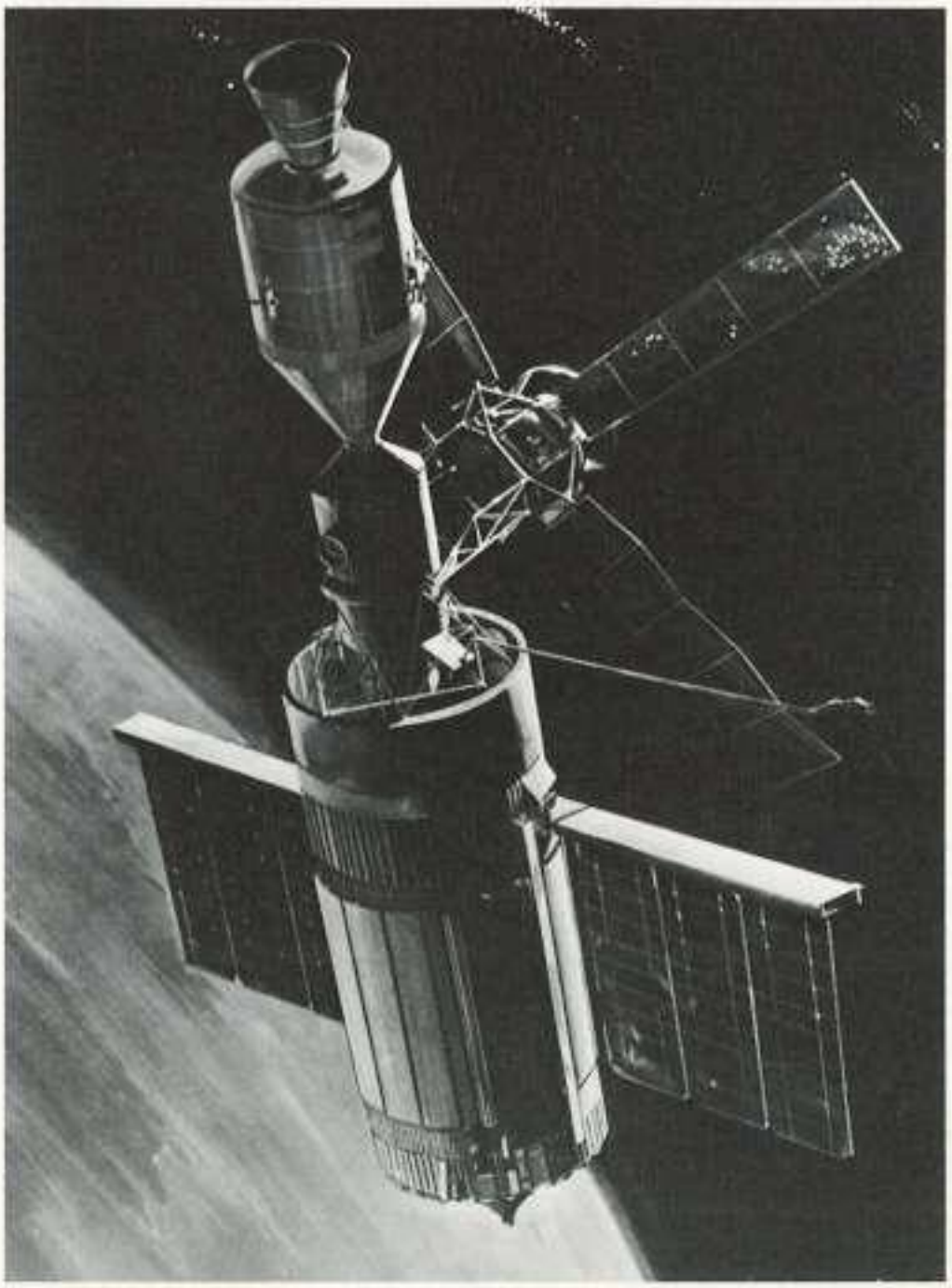
S-IVB and Apollo 9 Lunar Module *(1969)*

Even while Gemini spacecraft were flight-testing the techniques for journeys to the moon, the hydrogen-fueled **S-IVB stage** built by McDonnell Douglas for the Saturn V launch vehicle was being designed and tested. S-IVB pushes the Apollo spacecraft into Earth orbit and then re-ignites to accelerate the spacecraft toward the moon. The power of the S-IVB comes from super-cold liquid oxygen kept only a bulkhead away from even colder liquid hydrogen and brought together in a rocket engine producing 200,000 pounds of thrust.

S-IVB performed Apollo's first trans-lunar insertion when it ignited to push Apollo 8 toward a Christmas Eve 1968 rendezvous with the moon. It repeated its flawless performance in the continuing series of Apollo lunar flights, most notably the Apollo 11 mission which was highlighted by man's first landing on the moon on July 20, 1969.

Utilizing the great volume of the S-IVB tanks, the company is preparing the **Orbital Workshop** for NASA's Skylab program, combining the S-IVB structure equipped as a laboratory with an **Airlock** containing controls, a power distribution system, tanks for consumables and a tunnel for entering and leaving the workshop and for extravehicular activities. McDonnell Douglas' work on this early experimental "space station" and on launch systems, airframes and spacecraft systems is providing the base for advanced work on future space shuttles and permanent space stations.

Airlock



Orbital Workshop

ROC II *(Douglas 1943)*

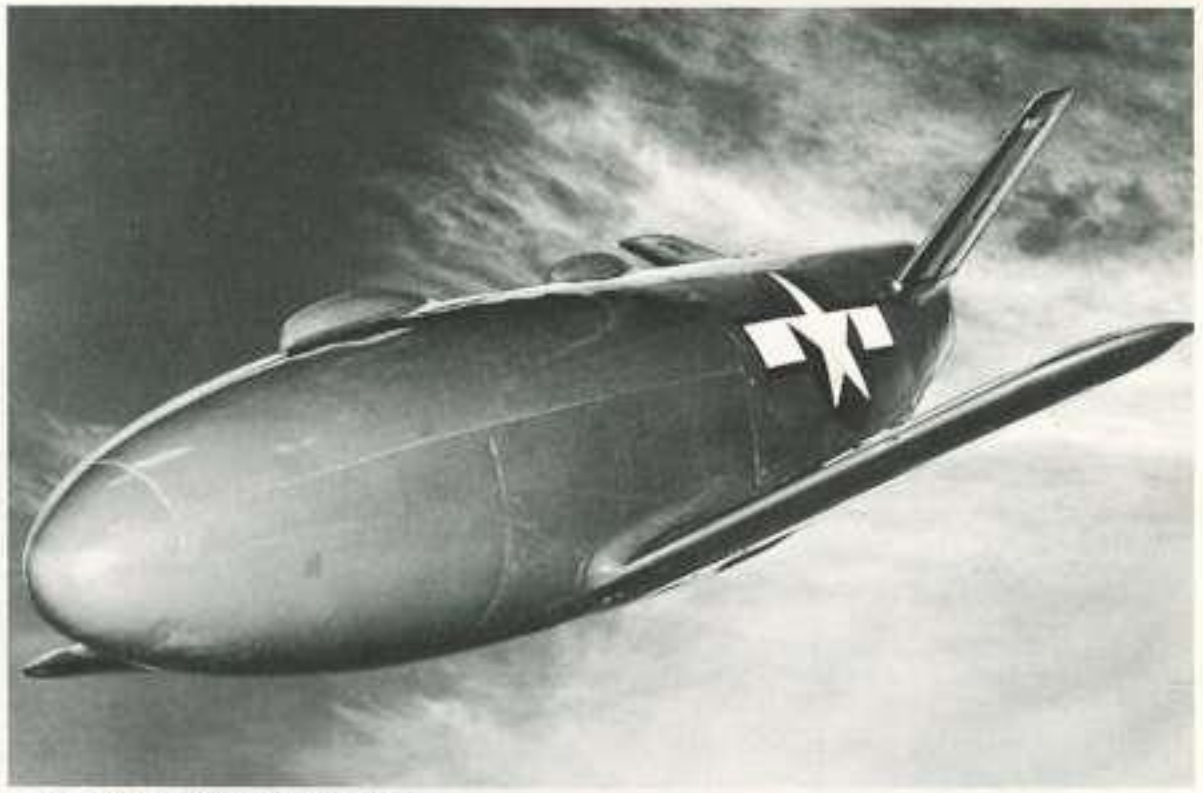
Honest John *(Douglas 1950)*

Even before Pearl Harbor, at a time when Cape Kennedy was a wasteland alongside Florida's Banana River and rocketry was assumed to be a Fourth of July adventure, an early missile, **ROC II**, was being developed and tested to fly down a radar beam.

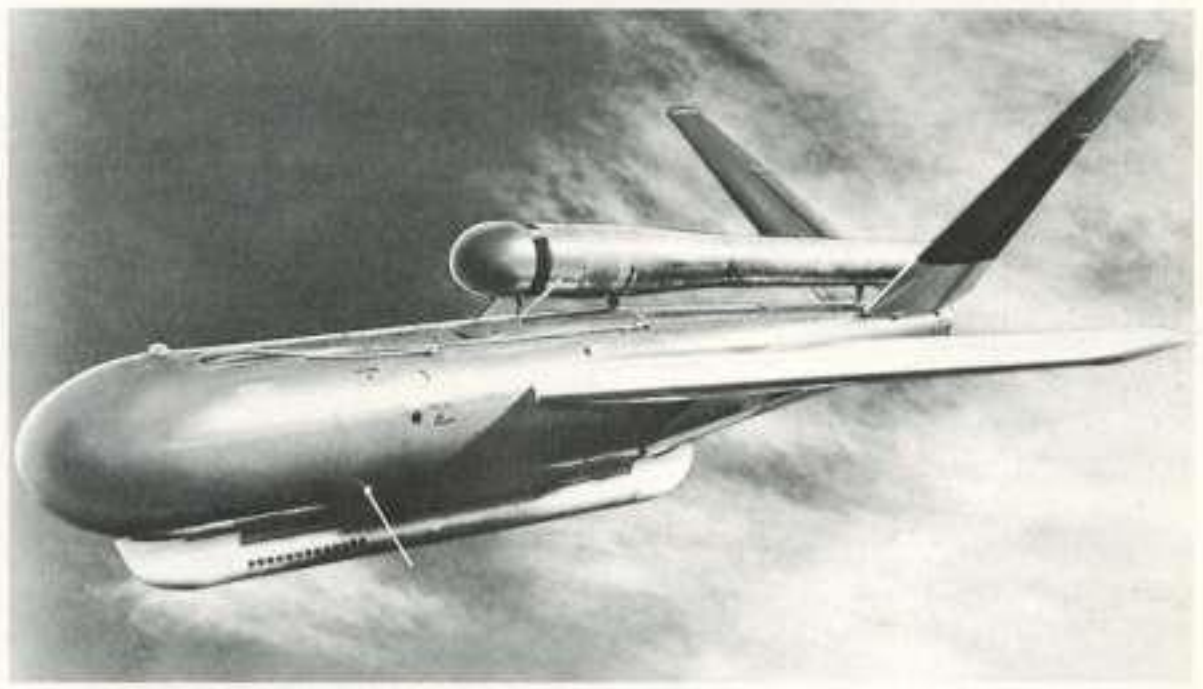
In beginning the process of becoming one of the nation's largest producers of missiles and launch vehicles, strange shapes emerged. Traditional wing configurations, dictated by sustained atmospheric flight requirements, marked the **Gargoyle** glide bomb and **Katydid** target drone development programs.
A conventional missile configuration emerged for the **WAC Corporal** as rocket engine requirements began to dictate design. A high-altitude research rocket, the Corporal flew as the second stage of the "Bumper WAC" to a record 250 mile altitude and a speed of 5000 miles an hour. That launch was the first from what has now become Cape Kennedy.

While the **Kingfisher** development missile flew from the air to the sea, its warhead detonating under the surface, the Army's **Honest John** was a surface-to-surface missile with a range comparable to medium artillery. Airframes and ramjet engines were built by the company for the Navy's **Talos** surface-to-air missiles, which are still in service.

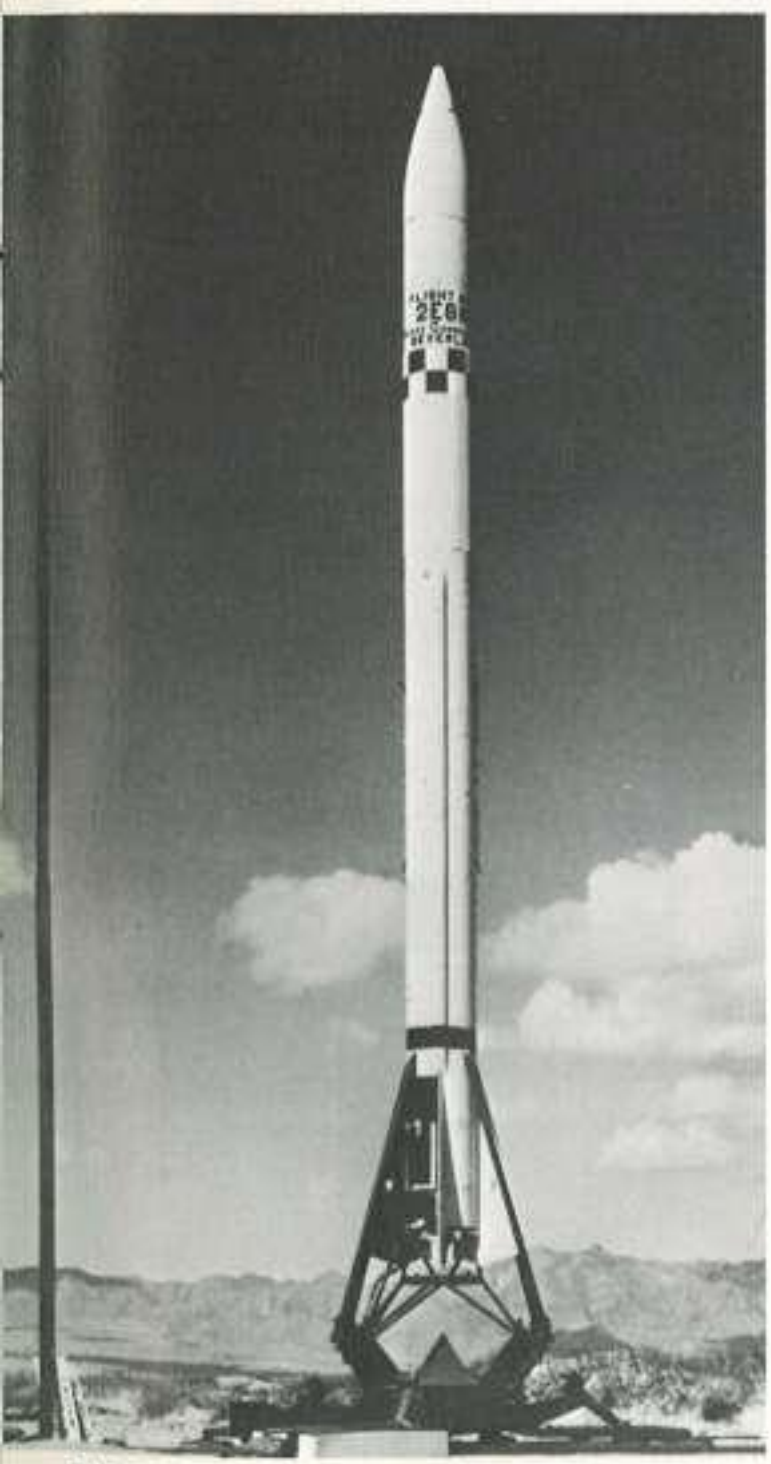
Talos *(McDonnell 1952)*



Gargoyle *(McDonnell 1944)*



Katydid *(McDonnell 1945)*



WAC Corporal *(Douglas 1948)*

Kingfisher *(McDonnell 1949)*

Thor IRBM *(Douglas 1957)*

Delta *(1960)*

Delta "Super Six" *(1969)*

Nike Hercules *(Douglas 1955)*

GAM-72 Quail *(McDonnell 1958)*

Nike Zeus *(Douglas 1959)*

Thor, an intermediate-range ballistic missile, provided nuclear deterrence before ICBMs were ready to assume the role. Thor missiles were later reconfigured as launch vehicles for the Air Force and NASA, providing first the hardware, then the technology for current Air Force and NASA launch systems, Long Tank Thor and **Delta.** The latest **Delta "Super Six"** is equipped with six strap-on solid missiles for greater payload capability.

An airbreathing missile with a shape as unusual as its mission is the **GAM-72 Quail.** Carried on strike missions aboard Strategic Air Command B-52 bombers, Quail is launched in flight, confusing enemy radar and drawing fire away from the target-bound bombers.

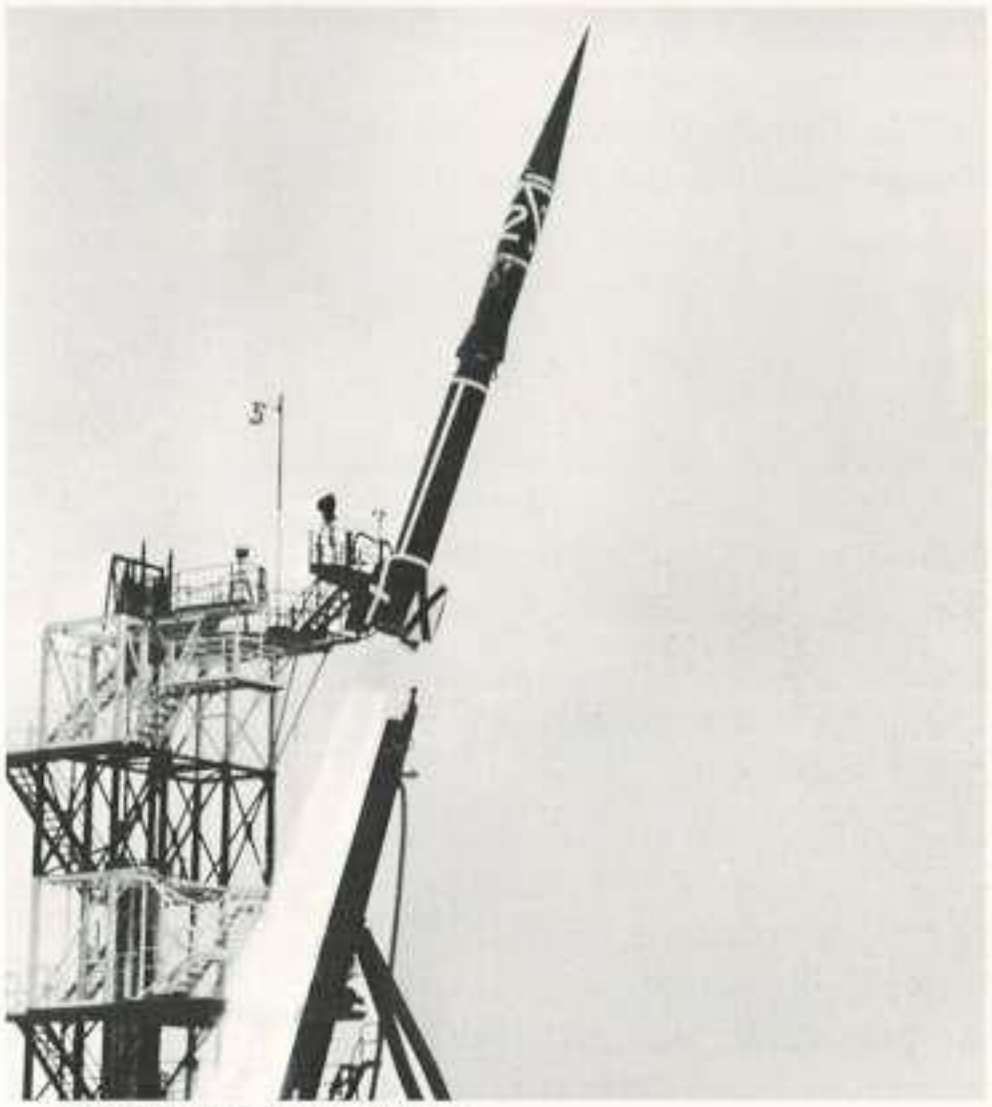
Nike Hercules completed an evolutionary line of antiaircraft missiles, and led to company participation in antiballistic missile research with the **Nike Zeus.** Based on Zeus technology, the Spartan is the advanced, long-range interceptor missile in the Safeguard ABM system.

ASSET, a reentry research vehicle, tested advanced metals and materials in gliding flights up to Mach 18.

Alpha Draco demonstrated lifting body flight previously unattainable at Mach 5 within the atmosphere.

Development is continuing on the Army's XM-47 **Dragon,** a guided antitank missile light enough to be carried and fired by one infantryman.

ASSET *(McDonnell 1963)*



Alpha Draco *(McDonnell 1959)*

XM-47 Dragon *(McDonnell Douglas 1968)*

DIVERSITY

At McDonnell Douglas, creative research and wide-ranging business interests often go beyond traditional aerospace product lines to effect unique solutions in related technologies.

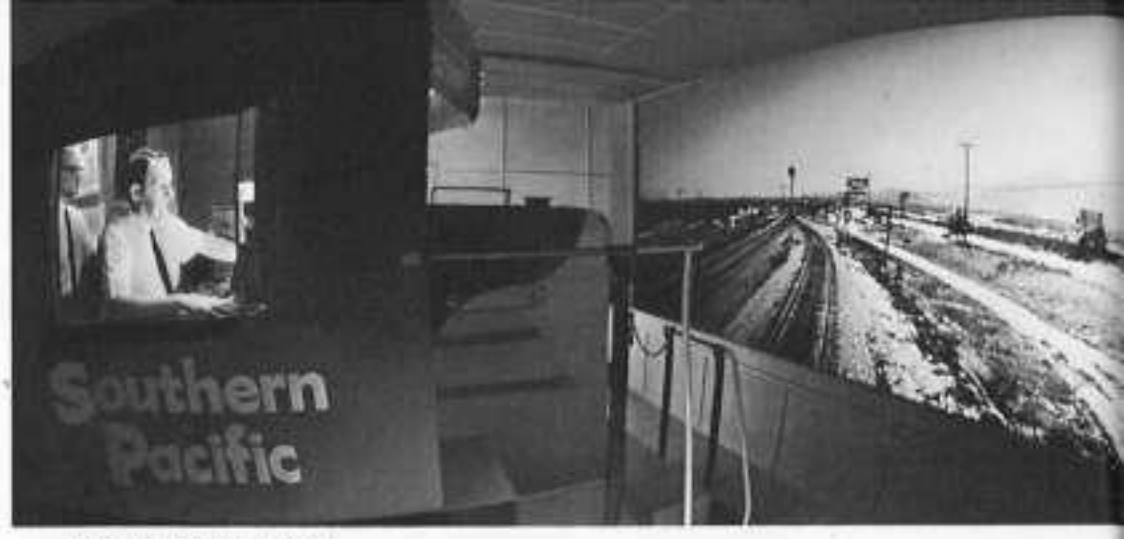
Dynamic simulation and training capability is the tie that led the Conductron subsidiary into production of **railroad** and **aircraft simulators.** Hycon **cameras,** products of another subsidiary, are aboard Apollos to photo-map the moon.

Tiny **Isotope batteries** grew from nuclear research.

Airborne collision avoidance systems protect aircraft during testing and are being designed to help solve air traffic control problems.

From Tridea, **automatic drafting** machines speed designs into production.

McDonnell Automation Company, created to supply in-house support to the corporation in computer technology, has expanded into a leading commercial **data processing and computing** organization with nation-wide facilities.



Railroad simulator

Photo-mapping camera

Isotope battery

Airborne Collision Avoidance System

Data processing and computing

Aircraft simulator

Automatic drafting

The progress of McDonnell Douglas spans and epitomizes a half century that brought greater technological advance than in all previous history. But we have only come to the end of the beginning. Each fresh tomorrow offers undiminished opportunities—in air commerce, in the exploration of space and in providing the sinews of strength that are the only sure foundation for peace. The historic accomplishments of McDonnell Douglas, 1920-1970, are a stimulating prologue for tomorrow's new achievements in service to the community, the nation and the world.

—July 1970

MCDONNELL DOUGLAS
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