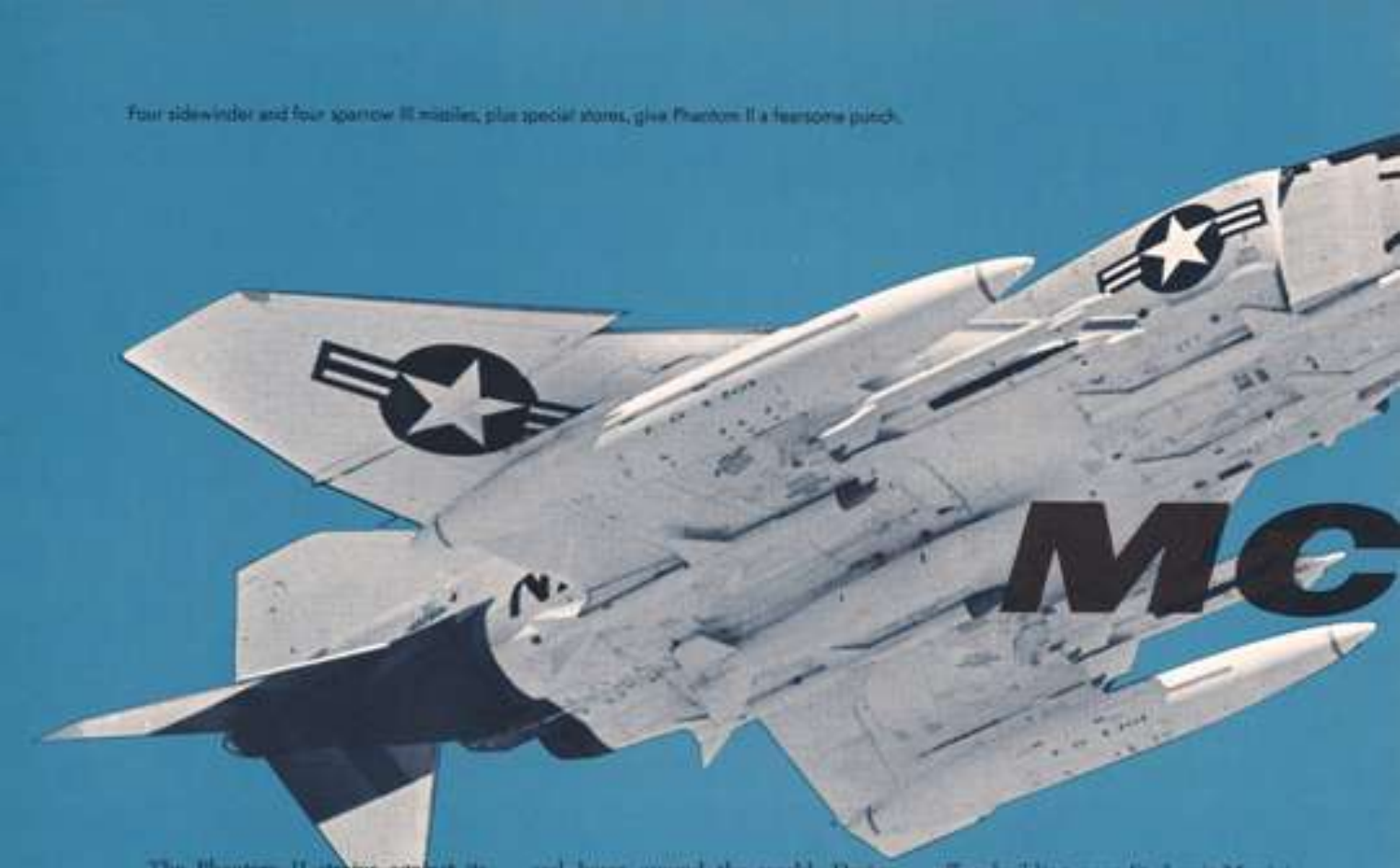
Four sidewinder and four sparrow III missiles, plus special stores, give Phantom II a fearsome punch.



The Phantom II strains against its brakes at the end of the runway. Twin engines belch heat waves across the overrun; spirals of jet exhaust mix with dust to darken the sky.

Brakes released, the aircraft surges forward. A few seconds and considerably less than 5,000 feet later, the nose rotates in a smooth upward arc and the fighter is airborne—on its way—in its element.

With 34,000 pounds of thrust screeching defiantly, the big bird "stands on its tail" searching for a climbing speed comfortably close to the speed of sound. In less than 70 seconds, the fighter is lost to the eye of the ground observer. In another 50 seconds and at an altitude of over 50,000 feet it levels-off for a routine mission.

Hardly routine to the men who know their aircraft best, the Phantom II is the product of McDonnell Aircraft Corporation, the crowning achievement in a long line of fighters stretching across 24 years of aviation history. Happily for McDonnell, the craft is so good at its job that the Navy, Air Force and Marines have combined orders for various models totaling more than a billion dollars.

By 1967, more than a thousand Phantoms will be in service on ships and bases around the world. Designated F-4B, the Phantom now serves the fleet as the Navy's primary all-weather anti-air warfare aircraft. F-4Bs recently intercepted prowling Soviet MIGS over the Caribbean and escorted Soviet bombers in unannounced flights over U. S. aircraft carriers.

The Air Force, impressed with the aircraft's performance and versatility, has ordered Phantoms (designated F-4Cs) for Tactical Air Command squadrons which will utilize the ship's Mach 2.5 speed and phenomenal load-carrying capacity in tactical attack roles. Additionally, the Air Force, Navy and Marines have ordered modified versions designated RF-4C and RF-4B multiple sensor reconnaissance aircraft.

With the Marines, the Phantom is serving as the primary amphibious-support weapon, charged with air superiority, intercept and close support missions.

Behind McDonnell's achievement in building an aircraft which has inspired a billion dollars in orders is a story-book tale in the best American tradition.

The story began in 1939 when a dynamic 40-year-old Scotsman from Arkansas—James Smith McDonnell, Jr., rented the second floor of a small office building near St. Louis Municipal airport and, with a typewriter, two employees and no contracts announced he was in the aircraft business.

The odds against him were considerable. Established companies such as Boeing, Douglas, Lockheed, Consolidated and Glenn L. Martin, had "grown up" with aviation from its infancy and appeared to have the available business pretty much in hand.

Undaunted, the visionary Scotsman got "into business" with a small contract for airframe components followed by an award for aeronautical engineering work. After assembling a group of some 15 top designers and engineers, he submitted a proposal for an experimental aircraft called the XP-67 Bomber Destroyer—and won the competition with a twin-engine airplane designed for a top speed of over 400 mph.

Only two XP-67s were produced but they began to establish the company's capability in the airframe business and set a pattern for advanced design concepts to follow.

Strangely, McDonnell did not achieve prominence during World War II although it produced some 7,000,000 pounds of airframe components (mostly for twin-engine bomber trainers) and saw employment climb

DONNELL

Twenty years between PHANTOMS...

to more than 5,000.

It was North American with its P-51, Republic with its P-47, Chance Vought with its Corsair, Grumann with the Hellcat and Lockheed with the P-38 – these were the firms whose products garnered fame during the long war years.

In those years, McDonnell engineers began early studies and experiments with airframes designed around a new concept of propulsion – the jet engine.

Jets and McDonnell came into their own together. The forward-thinking of the company was rewarded in January, 1943, with a contract to develop a jet-propelled carrier-based fighter. The design was successful and two years later the company received a production contract for the FH-1 Phantom, a single-place twin-jet fighter which became the first Navy airplane to attain a speed of 500 mph.

Another concept embodied in the Phantom I was to become a McDonnell trademark with only one exception – use of twin jet engines. This concept not only improved performance and safety, it provided a multi-mission versatility leading ultimately to the success of the Phantom II as a tri-service fighter some 20 years later.

The Phantom I, first American jet aircraft to land and takeoff on a carrier (the USS Franklin D. Roosevelt, July 21, 1946), not only introduced a new era in Naval aviation, it marked a turning point for McDonnell by putting the company on a firm financial foundation in a difficult post-war period.

Following the Phantom I, McDonnell turned out a series of aircraft named after creatures of the spirit world: Banshee, Goblin, Demon, Voodoo and, finally, the Phantom II. The series represented 22 years of history, growth from almost nothing to facilities valued at over $75,000,000, employment of more than 28,000, and a payroll totaling $3.8 million per week.

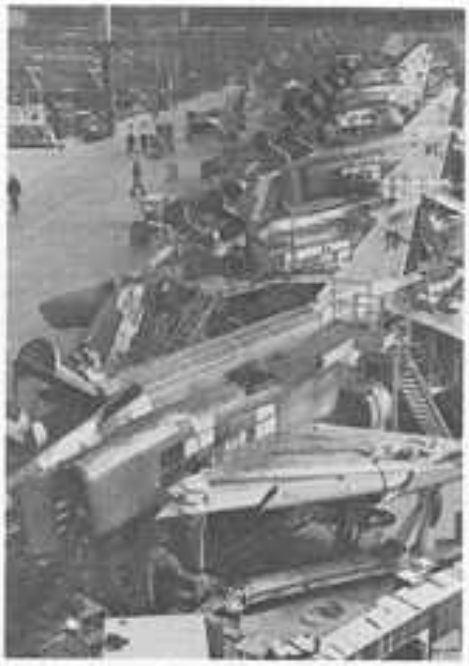
McDonnell is the largest employer in the state of Missouri, one of the largest airframe manufacturers in the United States and one of the country's largest suppliers of defense material. It does business with some 4,000 subcontractors and suppliers located in virtually every state in the union.

Behind the growth lies a philosophy espoused by J. S. McDonnell or "Mr. Mac" as he is called by top associates as well as men in the shop, the year he founded his company.

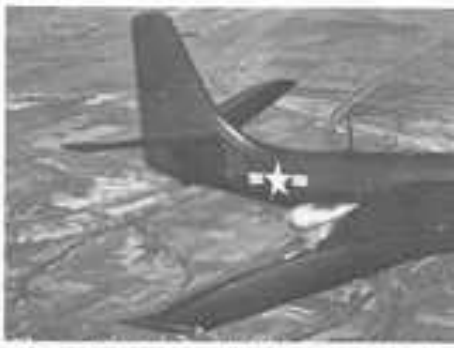
To the Chief of the Contract Sec-

Phantom II aboard USS Forrestal in Pacific.

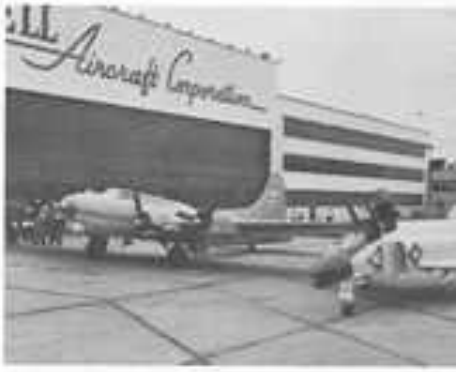
Twin engines capable of 34,000-lbs total thrust power Phantom II to Mach 2.5 speeds. Down-swept tail aids controllability through full speed range.

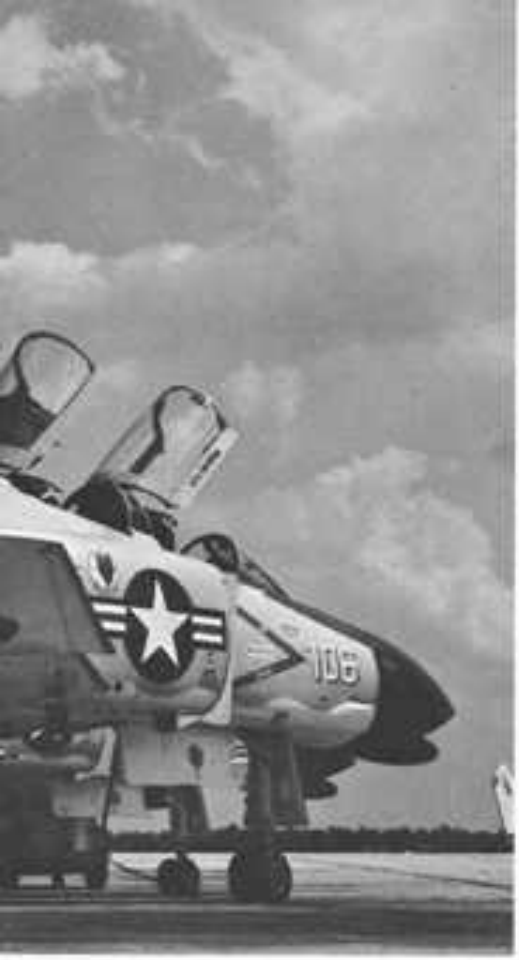


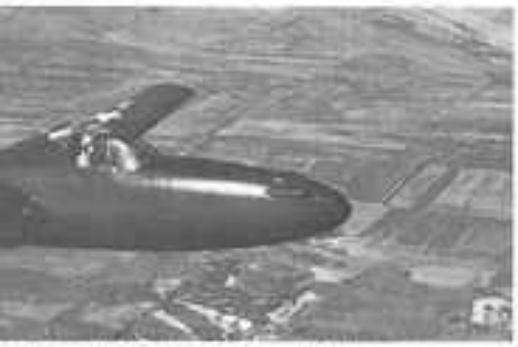
Left: R. L. Truax, Collins, checks Collins CNI installation in Phantom II. Above: McDonnell plant is stepping up production of world's fastest jet fighter to meet tri-service orders for over a thousand planes.



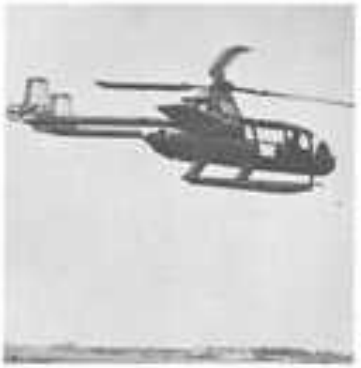
Above: Phantom I was first American jet to lan
Phantom II is shown in relation to WW II B-17 bo







and takeoff on a carrier. Below left: Impressive size of
er. Right: "Convertiplane" achieved 200 mph top speed.



tion, Materiel Division, Wright Field, Dayton, Ohio, he wrote: "Our objective is to be of the maximum service possible to the United States Government in the design and manufacture of airplanes. With this end in view we are building an organization which will be exceptionally strong in creative airplane research and design and in economical factory production. We are going to operate as a constructive influence in this industry."

Reflecting this philosophy, work was started on a more powerful Navy fighter before the first Phantom I had rolled off the assembly lines. Named the F-2H Banshee, the twin jet aircraft was ordered into production in May, 1947, and within a year was being developed in day fighter, night fighter and photo-reconnaissance versions. By the time production ceased in 1953, nearly 900 Banshees had been delivered. The rugged airplane saw much service in Korea and was extolled in James Michener's famous story, "The Bridges of Toko-Ri."

Long before the last Banshee left the flight ramp at St. Louis, McDonnell engineers had another fighter on the drawing boards – the F-3H Demon.

A carrier-based aircraft capable of supersonic performance, the Demon differed from its predecessors in one respect: it was powered by a single jet engine, one of the few McDonnell fighters to be so equipped.

More than 500 Demons were delivered to the Navy up to 1959, completing a 10-year program. In active squadron service since 1955, the Demon is still operational with U. S. Navy units around the world.

At about the same time McDonnell engineers were applying the finishing touches to the design of the Banshee, another group started advanced studies for a long range, supersonic penetration fighter for the Air Force. From this early design came the F-101 Voodoo.

Produced in three versions – fighter, intercepter and photo-reconnaissance, the Voodoo became operational in 1956 and proceeded to set six new world speed records, including a dash to 1,207 mph, and a number of transcontinental and transoceanic marks in the period from 1957 to 1959.

Fully deployed with the Air Force all over the world, Voodoos received plaudits from a grateful President and a nation for repeated low-level reconnaissance forays over missile sites in Cuba during the 1962 Cuban crisis.

Evolving from such a successful ancestry, it was probably axiomatic that the Phantom II would be a good airplane.

Just how good is now a matter of record. Employing a number of new design concepts in an appropriate mix with the old, the Phantom II has just about rewritten the handbook of jet fighter performance.

Probably the supreme example of Mr. Mac's avowed principle of "sticking to one thing until it's done right," the Phantom II has accomplished the following:

1. Established the world's class record for horizontal flight at sustained altitude, maintaining 66,443.8 feet over a measured 15/25 kilometer course.

2. Set a 500-kilometer closed-course record of 1216 mph and a 100-kilometer world closed-course record of 1390 mph. Flying a circular path less than 20 miles in diameter, the airplane sustained a continuous centrifugal load of more than 3 G's throughout the Mach 2 turn.

3. Flown four times through a low altitude 3 kilometer course (at times less than 50 feet above the ground) at an average speed of 902.77 mph, capturing the world record for that distance.

4. Crossed the North American continent at the rate of 900 mph setting a transcontinental speed record for the 2421.42 statute miles from Los Angeles to New York.

5. Established the world's absolute speed record for jets of 1606.3 mph during a flight in which peak speeds in excess of 1650 mph (Mach 2.5 plus) were obtained.

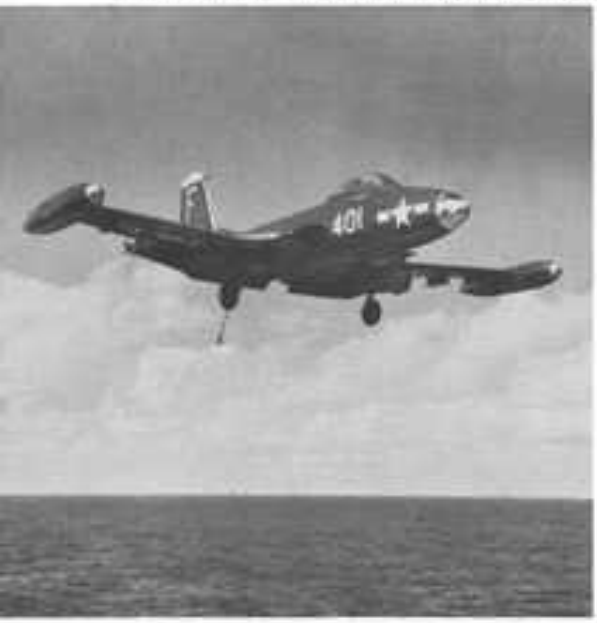
6. Established eight official world time-to-climb records for altitudes ranging from 3,000 meters to 30,000 meters. In setting the latter mark, the aircraft zoomed to an altitude of over 100,000 feet.

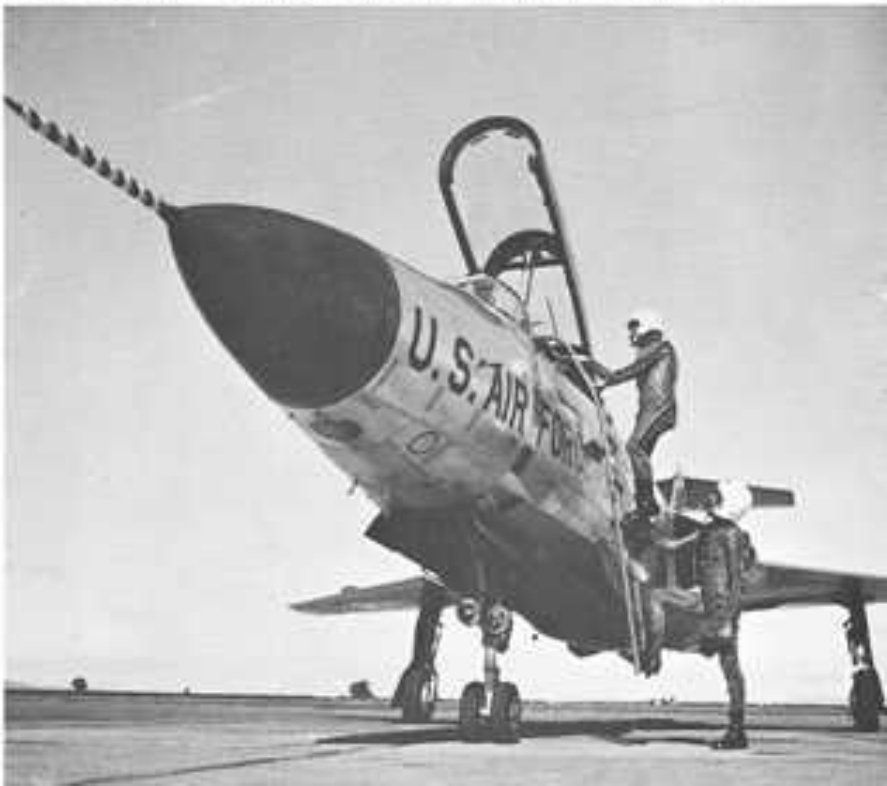
In addition to its capability for achieving high speeds and altitudes, the Phantom II is a stellar performer in the weight lifting field. The aircraft can haul as much as eight tons of external stores in packages ranging from 18 750-pound bombs to 15 air-to-ground rocket packages.

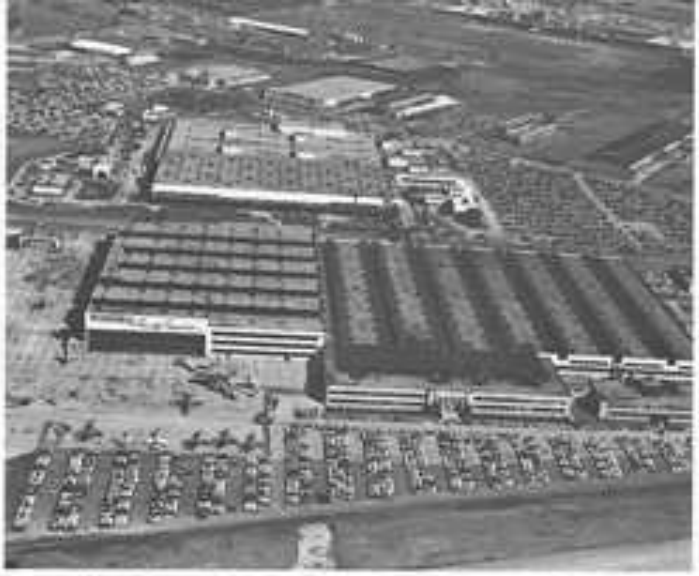
An excess of thrust-to-weight enables the Phantom II to takeoff fully loaded in 5,000 feet, or take a "wave off" on one engine without using afterburner.

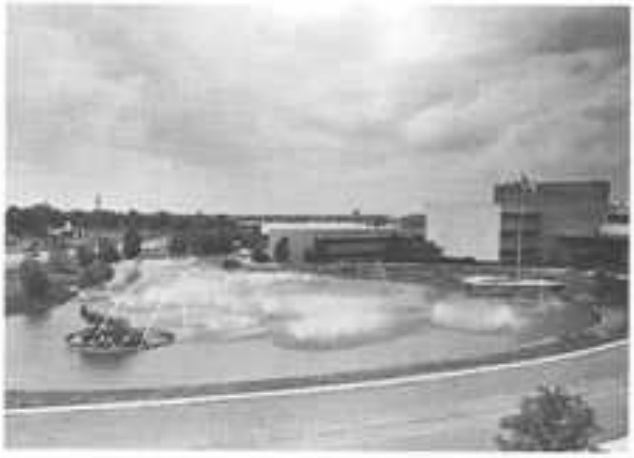
The fastest jet aircraft in the world, it can also be one of the slowest with

Above: Design of aeroballistic spacecraft is checked in McDonnell's hypervelocity (Mach 27) impulse tunnel. Below left: Rugged F-2H Banshee saw much service in Korea. Nearly 900 were produced. Below right: Supersonic F-101 Voodoo is in service with the USAF around the world.

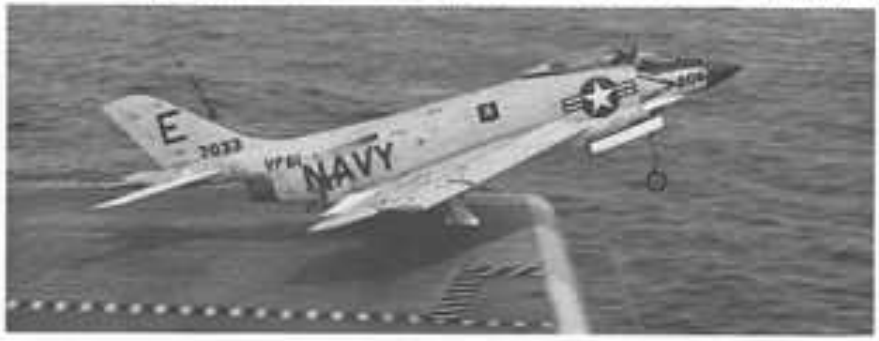








Above Left: Aerial view shows McDonnell's general offices, fabrication and assembly plants. Employment at the St. Louis facility will top 29,000 this year. Above right: McDonnell's engineering campus. Below left: Supersonic F-3H Demon, in active squadron service since 1955. Below right: A Mercury spacecraft receives final factory checkout in McDonnell's White Room. Total of 20 Mercury crafts were delivered in four-year period.



the capability for maintaining flight at speeds as low as 115 knots. This is accomplished in part by the bleeding of compressor air out over the wings, creating "boundary layer control" which creates a lift effect. With boundary layer control, the Phantom II can land fully loaded in about 3,000 feet. Leading and trailing edge flaps contribute to the aircraft's controllability through various speed ranges.

Exclusive to the Phantom is another feature contributing to its overall performance – variable ramp-like "throats" installed at the engine intakes which function automatically to vary the rate of air entering the engines. This design enables the big General Electric J-79s to utilize the optimum mixture of fuel and air at any given power setting.

Dual controls and complete instrumentation are provided for both cockpits of the Air Force Phantoms and training controls are available in kit form for Navy and Marine versions. Included in America's most advanced fighter aircraft is a Collins Communication/Navigation/Instrumentation system designated the AN/ASQ-19 which performs major functions of UHF and data communications, intercom and control.

Collins also provides a flight director system for the airplane combining nearly all required attitude and course information, formerly displayed by a variety of instruments or not shown at all, in two easily-read panel-mounted instruments.

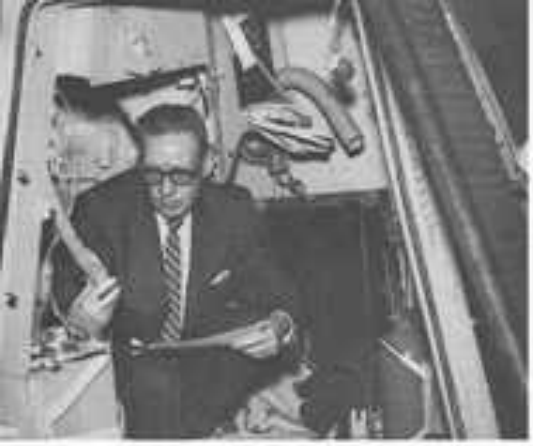
McDonnell's success in combining man and machine guided the design of the Mercury spacecraft with which the company bridged the gap between the earth's atmosphere and space.

Nearly a year before the National Aeronautics and Space Administration issued a call for a manned space vehicle, McDonnell engineers began investigating designs for such a craft. In January, 1959, NASA selected McDonnell as prime contractor for Mercury.

The Mercury program proved one of history's greatest challenges to a government/industry team. The problems involved were manifold. There were no prototypes. There were no design criteria for a vehicle capable of sustaining human life in space. No engineering information had been accumulated on the re-entry problems of a vehicle the size of Mercury. There were physical space and weight limitations based on the power of available boosters.

Safety of the astronaut was paramount, and from the beginning engineering concepts were based on safety considerations. All systems had to be automatic; yet, because a study of man's capabilities in space was basic to the mission, provisions had to be made for manual control. A fail-proof communication system was a must for radio communication would be the astronaut's only link with the world. And time limitations were involved because McDonnell's development and production phases had to coincide with NASA's research and test phases. Overall hung the urgency engendered by the race with the Soviet Union for leadership in space.

One by one the problems were mastered. The basic shape was a radical departure from the aerodynamic configurations normally visualized. A control system was developed. Life sup-



Above: G. E. Younger, senior design engineer on Gemini mockup, checks the final stage of mockup construction. Right: The completed Gemini two-man spacecraft configuration.

port systems were devised. Structure was designed to withstand maximum Gs at liftoff and the fiery heat of re-entry.

The communications system, subcontracted to Collins, was developed over a period of two years from previously proven designs reduced greatly in weight and volume.

The Mercury communication system included functions for both HF and UHF voice communication during all phases of the mission. Command functions were provided to control various operations within the spacecraft during launch, flight and reentry. Two radar transponder beacons were included for precision tracking during flight. Also provided were two rescue beacons, operating on international distress frequencies, for determining the spacecraft's bearings during retrieval operations at sea.

As with McDonnell's Mercury team, Collins engineers possessed limited data on problems associated with radio propagation in space. Working under severe restrictions of space and weight, engineers developed a rugged, highly miniaturized communications system.

For sheer thrill of accomplishment by an industrial team, there probably never has been anything to compare with the flight into space of the Project Mercury spacecraft on May 5, 1961. That day, Astronaut Alan B. Shepard rode into history with his ballistic flight beyond the atmosphere and his exultation: "What a beautiful view" was carried around the world.

Shepard's feat was duplicated 11 weeks later by Astronaut Virgil I. Grissom. But it was John Glenn and his Friendship 7 spacecraft who proved beyond doubt man's ability to adapt to the space environment, meeting the initial goals of the Mercury program only three years and 39 days after the Mercury contract was awarded.

The space flights following Glenn's have added to man's knowledge of space. Astronaut Scott Carpenter investigated man's visual perception, and photographed the launch vehicle and the sun from his atmosphere-free vantage point. Walter M. Schirra, Jr., in Mercury Spacecraft Sigma 7, extended Mercury's range to six orbits in a near perfect flight, and what was possibly the last one-man flight was achieved last May 15 by Gordon Cooper who successfully completed 22 orbits.

As Project Mercury moved to its conclusion, McDonnell's space team began developing Gemini, a larger two-man spacecraft capable of flights of up to two weeks duration. Designed to be launched by a Titan II vehicle, Gemini will rendezvous with an Agena vehicle while in orbit, make a controlled ballistic return to earth and, in later flights, make an earth landing at a preselected field in the United States.

Gemini will vastly enlarge man's knowledge of space, accomplishing a host of missions where human judgment and control are essential.

On the conquest of space Mr. Mac has said: "To achieve the basic purpose for which we are here, the individual must have freedom to discover and create and to grow in spirit. Astronautics provides us with a tremendous opportunity to do just this.

"As a part of waging the peace, we need many psychological substitutes for war as outlets for the creative, restless, adventurous, competitive souls of mankind. The creative conquest of space provides such an outlet. It can serve as a competitive creative substitute for war if mankind will grasp this wonderful opportunity."

McDonnell does not see the company's concentration on weapons systems as incongruous with his desire to foster peace. "We will be criminally negligent if we do not wage the peace from a foundation of great strength," he has commented.

Strength is a characteristic readily apparent at McDonnell – in research and development, manufacturing and finance.

At its mushrooming St. Louis headquarters, the company has built an automation center which provides computer services to banks, retail stores and other industries. A glittering new engineering campus is the center for R & D activities; a space center recently occupied will house the corporation's efforts with Gemini and the space projects to follow.

Research is underway on an unmanned lifting body space glider called ASSET which is scheduled this fall to begin a series of a flights aimed at investigating winged re-entry areas.

McDonnell's earnings per share have increased every year since 1953, rising from $1.02 in that year to $4.02 in 1962. Sales jumped from $133,531,447 in 1953 to $442,408,483 in 1958; declined slightly in the years following to $390,718,187 last year. But there is every indication they will rise to record levels, based on the demand for the Phantom and the formalizing of contracts for Gemini. In early April, the Manned Spacecraft Center in Houston announced an award of $456,600,000 to the company for the production of 13 Gemini spacecraft and related equipment and services. Employment is expected to rise to a record 29,400 by the end of 1964.

Acknowledgment of McDonnell's stature in the aerospace industry was indicated by the unprecedented industrial visit in September, 1962, of President John F. Kennedy. Said the President: "I can imagine no action . . . which is more essential and exciting than to be involved in the most important and significant adventure that any man has been able to participate in in the history of the world . . ."

As partners in that great adventure, McDonnell and the city of St. Louis could well be proud. In the 36 years since Charles A. Lindbergh piloted the "Spirit of St. Louis" in a solo crossing of the Atlantic, man's quest for achievement had turned to the conquest of the new ocean – space.

And there are few industry officials who wouldn't admit that, for McDonnell, the adventure had just begun.