

Chrysler's Ballistic Missile And Space Activities

First 20 Years



Redstone

Jupiter

Mercury
Redstone

Saturn 1B



CHRYSLER
CORPORATION

The First 20 Years

Chrysler Corporation, long recognized as one of the world's leading automotive manufacturers, has also made significant contributions to the missile and space fields over the past 20 years. Chrysler was the first major industrial firm involved in the development and production of large surface-to-surface ballistic missiles, re-entry vehicles and space boosters used in a number of historic space programs.

Starting with just 26 engineers in October 1952, Chrysler's missile and space activity grew into a multi-divisional operation which simultaneously produced and fielded the Redstone and Jupiter missile systems. Modified versions of these missiles served as launch vehicles in many major space "firsts." Redstone boosters launched Alan Shepard and Gus Grissom in the first two U.S. manned Mercury flights, Explorer 1 — the first U.S. earth satellite, and WRESAT 1 — the first Australian earth satellite. Jupiters were used in the launchings of Pioneer IV — the first sun probe, and Able and Baker — the first U.S. primates to travel in space.

Despite the developmental nature and urgency of the various Redstone and Jupiter missile and space programs, Chrysler achieved extremely high reliability and met all programmed costs, while meeting or bettering all delivery schedules.

Later, Chrysler Space Division engineered and built the Saturn 1 and Saturn 1B launch vehicles which qualified manned and unmanned Apollo spacecraft in earth orbit for the manned lunar expeditions. Today, the Saturn 1B remains a vital part of the nation's space effort as the launch vehicle which will send men to live and work in the orbiting Skylab workshop, starting in the spring of 1973.

The overall launch record of these programs—from the early Redstone firings to the Saturn/Apollo orbital flights — speaks for itself. Chrysler-built launch vehicles have performed successfully in every one of the twenty-seven flight tests or missions programmed. No Chrysler launch vehicle from the early Redstone to the most recent Saturn series has ever failed. Of sixty-six Redstone and Jupiter ballistic missile firings undertaken, sixty-two were successful. This is a 100% reliability record for launch vehicles and a 94% record for ballistic missiles.

Chrysler Corporation Ballistic Missile And Space Milestones

July 1956	First industry-built Redstone launched successfully.
Aug. 1957	First scale model Jupiter nose cone — launched 3,000 miles by Jupiter-C/Redstone launch vehicle.*
Dec. 1957	First Redstone with Chrysler-developed tactical top — successfully flight-tested.
Jan. 1958	First U.S. earth satellite, Explorer I — successfully orbited by Jupiter-C/Redstone launch vehicle.*
March 1958	Explorer III — successfully orbited Jupiter-C/Redstone launch vehicle.
July 1958	Explorer IV — successfully orbited by Jupiter-C/Redstone launch vehicle.
Jan. 1959	First Chrysler-built tactical Jupiter missile — successfully launched.
March 1959	First sun probe, Pioneer IV — successfully orbited by Juno II/Jupiter launch vehicle.*
May 1959	Space flight of primates Able and Baker — launched by Jupiter missile.*
March 1960	First "TV station" transmitting photos of descending nose cone — launched by Redstone missile.
Dec. 1960	First Mercury spacecraft sub-orbital flight test — successfully launched by Mercury/Redstone launch vehicle.
May 1961	Free World's first astronaut, Alan Shepard — successfully launched by Mercury/Redstone launch vehicle.
July 1961	Free World's second astronaut, Virgil Grissom — successfully launched by Mercury/Redstone launch vehicle.

* Government-built, Chrysler-supported.

Oct. 1961	First Saturn 1 flight test.*
May 1965	First industry-built Saturn 1 flight test.
Feb. 1966	First Apollo sub-orbital flight — successfully launched by Saturn 1B.
July 1966	First flight of liquid hydrogen S-IVB stage — successfully launched by Saturn 1B.
Nov. 1967	First Australian earth satellite — WRESAT 1 — successfully launched by Redstone launch vehicle.
Jan. 1968	First lunar module flight test — successfully launched by Saturn 1B.
Oct. 1968	First Apollo manned flight — Astronauts Schirra, Cunningham and Eisele — successfully launched by a Saturn 1B.

* Government-built, Chrysler-supported.

October 1952 — The Beginning

In October 1952, the U.S. Army selected Chrysler to assist the Redstone Arsenal in the development of the new highly-secret XSSM-14 missile project, later renamed the Redstone. A surface-to-surface medium-range missile weapons system, the Redstone had been designed by Dr. Wernher von Braun and a 120-man team of German rocket scientists — the same group who had created the V-2 rocket during World War II.

Chrysler's top management assigned the responsibility for the new missile project to its Engineering Division. Initially, a separate Engineering Missile Branch was established, and 26 of the Engineering Division's outstanding research engineers were handpicked for the Redstone program. These men were the first of many Chrysler engineers sent to the Redstone Arsenal in Huntsville, Alabama, for intensified work with Dr. von Braun and his associates.

First Redstone Launch

In August 1953, the Army successfully flight-tested the first research and development Redstone at Cape Canaveral, Florida. This test firing was the first successful launching of a large ballistic missile built in the United States.

The successful results of the early Army Redstone launchings paved the way for the go-ahead of a limited production program. In August 1954, Chrysler was awarded a contract to produce five Redstones in the Michigan Missile Plant, north of Detroit. Under the terms of the contract, components built for the early Army-built R & D Redstones would be phased into the production program. The first Chrysler-built Redstone was completed and shipped to Huntsville for static tests in November 1955.

During that year, Chrysler's Army Redstone assignments were expanded to include the design, development and testing of a tactical top to carry a warhead which became the first ballistic missile maneuverable-type re-entry vehicle.

The Jupiter Assignment

Chrysler's rapidly-growing missile operation was selected for a new assignment in February 1956. The Defense Department announced that the company would serve as prime contractor for a joint Army-Navy intermediate range ballistic missile, later called Jupiter. Chrysler would assist in the development, and would produce a mobile land-based Army Jupiter system that could be handled by troops in the field. At the same time, it was to initiate development of a modified version for the Navy that could be launched from ships at sea.

Along with the new assignment, Redstone production requirements were also expanded during 1956 to include 13 additional missiles. The first Chrysler-built Redstone was successfully launched from Cape Canaveral in July.

Late in 1956, the Navy decided to change from the shipboard version of the Jupiter to a solid propellant concept called Polaris. While the Navy Jupiter program was being terminated, development of the Army version continued without interruption.

Redstone-Jupiter Programs Combined

With two Army missile programs now under a single roof, Chrysler began transformation of the Michigan Missile Plant to a complete missile engineering and production facility. The work was completed in just nine months, in time to meet crash production programming for the Redstone and Jupiter.

Both the Redstone and Jupiter programs recorded several missile "firsts" during 1957. In May, the Army successfully launched the first Army-built Jupiter on a 1,400-mile flight. This was the first intermediate range ballistic missile in this country to be successfully flight-tested. Three months later, a modified Redstone/Jupiter-C rocket propelled a scale model Jupiter IRBM nose cone more than 3,000 miles over the South Atlantic Ocean. This nose cone successfully re-entered the earth's atmosphere and was recovered intact. President Eisenhower displayed the nose cone during a nation-wide telecast on November 7.

In December 1957, a Redstone equipped with the first tactical top warhead was fired from Cape Canaveral. At the same time, the Army gave Chrysler the go-ahead to place the Redstone and Jupiter weapons systems, including ground support equipment, in full scale production.

The Launching Of Explorer 1

The Redstone's proven record of reliability was an important factor in its selection as the launch vehicle for the free world's first satellite— Explorer 1. In November 1957, less than a month after Russia orbited Sputnik I, Defense Secretary Neil McElroy announced that he had given the Army Ballistic Missile Agency the go-ahead to place the 31 pound Explorer satellite into orbit — using the same modified Redstone/Jupiter-C configuration that had previously flight-tested the development Jupiter nose cone. The highly-successful launching and orbit of Explorer 1 came just 84 days later on January 31, 1958. Chrysler's contribution in the historic flight included a number of parts and components for the Jupiter-C rocket and the services of both engineers and technicians.

Meanwhile, the company was already working on seven additional Jupiter-C boosters for the Explorer program. Two of these Chrysler-built boosters were used to successfully launch Explorer III and Explorer IV into orbit later in the year.

During 1958, the launch program for the tactical Redstone missile was moved from Cape Canaveral to White Sands Missile Range, New Mexico. The first tactical Redstone to be fired by Army troops was launched in May by Battery A, 40th Group, 217th Field Artillery. In June, Battery B of the same group fired another tactical Redstone under combat conditions, using a full complement of ground support equipment. This highly-successful flight test of the production line Redstone configuration proved its operational readiness, and enabled the Army to begin deployment of the weapon system to NATO forces in Western Europe.

First Jupiter Shipment

Chrysler, in 1958, also completed and shipped the first Jupiter missile from the Michigan Missile Plant to Cape Canaveral. This missile was built and checked-out in just nine months, bettering by three months the original Army schedule. By integrating production engineering into the development cycle, the Army-Chrysler team was able to reduce the lead time for the Jupiter to a record minimum of three years from concept to production line reality.

The Jupiter flight test program was inaugurated in January 1959, with the highly-successful launching and full range 1,500-mile flight of the first production line IRBM. Over the next ten months, three more tactical Jupiters were successfully flight-tested.

During 1959, the U.S. Air Force assumed control of the Jupiter system as a result of the Defense Department's earlier decision to give the Air Force complete responsibility for all missiles with ranges beyond 500 miles. Shortly after the new ruling went into effect, Chrysler field support personnel began training military squadrons to field the Jupiter system in Italy under NATO surveillance.

In 1959, Chrysler also received a contract award from the National Aeronautics and Space Administration for six modified Redstone boosters. These would be used to qualify unmanned and manned spacecraft as part of the Project Mercury Program.

Two More Redstone Firsts

Redstone participated in two more firsts during 1960. In March, a Chrysler-built Redstone hurled the first picture-taking TV station into space. Chrysler's aerodynamic TV station, housing a TV camera, transmitted images of the Redstone warhead hitting the target. In December, an unmanned Mercury spacecraft was successfully launched on the first sub-orbital flight test of a Chrysler-built Redstone booster.

Meanwhile, Chrysler turned over the first operational Jupiter base in Italy to NATO troops, and began preparation of similar sites in Turkey.

By the end of 1960, production of both the Redstone and Jupiter weapons systems was nearly completed. Despite the urgency connected with both programs, Chrysler had met all programmed costs on contracts that exceeded \$700 million, while meeting or bettering all delivery schedules. Chrysler also set significant reliability performance records for both missiles that were unsurpassed in the industry for that time period.

First Manned Mercury Flights

The biggest space news of 1961 centered around the first two space flights of American astronauts. On May 5, 1961, Alan Shepard became the nation's first astronaut as he made a successful 15-minute sub-orbital flight in his Mercury space craft. Virgil Grissom duplicated Shepard's feat on July 21. Modified Chrysler-built Redstone launch vehicles were used in both flights, maintaining Chrysler's perfect launch record in the Explorer and Mercury programs.

Other highlights of 1961 included the first launching of a production line Jupiter IRBM with its actual ground support equipment from Cape Canaveral in April. This milestone launching, conducted by Italian troops, was the first in which mobile firing equipment had been used at the Cape. The following month, the first Jupiter base in Turkey became operational.

At the Michigan Missile Plant, Chrysler began working under an Air Force contract to design and develop a series of experimental re-entry vehicles for advanced intercontinental ballistic missiles.



Saturn S-1B/Skylab launch vehicle

In October 1961, the first Saturn space vehicle, designed and developed at NASA's Marshall Space Flight Center, was successfully launched from Cape Canaveral. This 162-foot high rocket was the largest and most powerful ever launched in the United States. Chrysler as a member of the NASA-Saturn team, had provided more than two million man-hours of engineering testing and fabrication support in development of the Saturn booster project, and in the Saturn launch complex. At the time of the launch, more than 1,100 Chrysler Missile Division engineers were involved in the Saturn program in Detroit, Huntsville and Cape Canaveral.

Chrysler Wins Saturn Contract

The following month, Chrysler was selected as prime contractor for the production of the 80-foot Saturn I first stage. A more powerful version of the Saturn I ultimately would be used to qualify the manned Apollo spacecraft in earth orbit in preparation for Saturn V/Apollo manned lunar missions.

Engineering and production of the S-1 stage would be carried out in the NASA Michoud Operations Plant, located approximately 15 miles northeast of New Orleans, Louisiana. This was the same plant in which Chrysler produced engines for the M-48 medium tank during the Korean War. In addition to building the S-1 in the Michoud Plant, the Space Division was responsible for testing each booster in Huntsville, Alabama. Chrysler was also required to establish a launch team at Cape Kennedy.

A definitive contract for \$216 million was awarded to the Space Division the following August, calling for the production, checkout and static test of 21 Saturn S-1 stages. This contract was later modified to specify that Chrysler would furnish eight S-1 stages and 12 of a more powerful stage called S-1B.

Deactivation of the Jupiter weapon system in Italy and Turkey by Chrysler and Air Force personnel started in the fall of 1962. The Jupiter system had served as an integral part of the NATO Shield Force, and was on a T-15 minute alert at the time of deactivation.

The REX Program

With its large ballistic missile production programs completed, Chrysler placed increasing emphasis on research and engineering projects. One of the major efforts was directed toward the design and development of advanced re-entry vehicles that could escape radar detection or other types of missile identification.

Chrysler delivered the first in a series of experimental nose cone models to Cape Canaveral early in 1963. This nose cone, called REX I, was hurled 5,000 miles down the Atlantic Missile Range by an Atlas Intercontinental Ballistic Missile in March as the first flight test in the Air Force ABRES (Advanced Ballistic Missile Re-entry Systems) program. The following month, Chrysler's REX II nose cone was also sent on a 5,000 mile trajectory over the South Atlantic by an Atlas ICBM in the second ABRES test. Later, REX III was launched from Vandenberg AFB to Kwajalein in the Marshall Islands. All flights were described by Air Force officials as highly successful.

Saturn Program Accelerated

In October 1963, Chrysler's Saturn contract was again modified to meet the re-phasing of NASA's manned flight missions among the Saturn space vehicles. Under the new contract revision, the Saturn 1B launch vehicle development was accelerated, while six of the eight Saturn I stages were eliminated from the program.

Redstone, still deployed with NATO forces in Western Europe, was successfully fired six times at White Sands Missile Range during 1963 as part of the Army's continuing troop-training program.

Chrysler Completes First Saturn S-I

Two months later, the Space Division completed and rolled out the first Chrysler-built Saturn I first stage on schedule. Chrysler President L. A. Townsend presented the booster to Dr. Wernher von Braun, director of the Marshall Space Flight Center, in a special ceremony at the Michoud Plant. In April

1964, this booster — labeled S-I-8 — left the Michoud plant on a 1,086 mile trip by barge up the Mississippi and connecting rivers to Huntsville for static-firing tests. The booster was returned to Michoud for post static test re-work and additional checkout — the last preparations required before shipment to the Cape.

In addition to the Saturn production program at Michoud, Chrysler was required by NASA to redesign major elements of the 53-ton Saturn I launch vehicle to achieve a lighter Saturn IB stage. By redesigning the tail fins and other components, Space Division engineers were able to reduce the weight of the S-IB by 16,325 pounds.

In July, Army troops began deactivating the Redstone tactical system which had been part of the NATO surveillance force in Western Europe since mid-1958. The missiles were brought back to the United States and placed in storage for possible future use in other programs.

Deliveries of the industry-built Saturn I boosters to Cape Kennedy started in February 1965, with the shipment of S-I-8 from Michoud. The 1,000 mile water route for S-I-8 — and for all future S-I and S-IB boosters leaving New Orleans for the Cape — extended from the mouth of the Mississippi through the Gulf of Mexico, around the Florida Keys, and up the eastern coast of Florida to Port Canaveral.

First Chrysler-Built Saturn S-I Successfully Launched

A milestone date in the brief history of the Space Division occurred on May 25, 1965. In a rare 2:35 a.m. firing at Cape Kennedy, the first Chrysler-built Saturn I booster successfully launched a payload which placed a Pegasus Meteoroid Detection Satellite in earth orbit to gather and transmit scientific data for the Apollo program. The spectacular night launching, which went off on schedule to the second, could be seen by onlookers 130 miles away in Jacksonville, Florida.

In July, the second Chrysler-built Saturn I launch vehicle duplicated the performance of the first S-I, as it lifted a payload carrying another Pegasus into orbit. This shot completed the Saturn I flight program, with a record of ten successful flights in as many attempts.

At the same time, Chrysler refurbished and shipped from the Michigan Missile Plant several Redstone missiles left over from the Army Redstone weapon system program. One of these reactivated missiles was successfully launched from the Pacific Missile Range in November 1965, as part of the Project Defender anti-missile research program.

The flight test program of the Saturn IB space vehicle successfully got under way in February 1966, at Cape Kennedy. The first Chrysler-built Saturn IB launch vehicle started an Apollo spacecraft on its maiden sub-orbital flight of 32 minutes. Another successful Saturn IB launching followed in July. This flight qualified the first "live" liquid hydrogen S-IVB second stage. A third Saturn IB flight test the following month resulted in a sub-orbital flight over three-fourths of the earth's surface. This test also qualified the Apollo command module's heat shield during re-entry.

Redstone/Sparta Program

During August 1966, Chrysler was awarded a contract to revamp ten more Redstones, and provide re-entry vehicles as part of the SPARTA Special Anti-Missile Research tests in Australia. SPARTA was a joint undertaking of the United States, Australia and Great Britain.

The first in the series of ten Redstone/SPARTA flight tests was successfully conducted at Woomera, Australia in December 1966. A modified Redstone, equipped with solid propellant upper stages, hurled its re-entry vehicle into an intercontinental ballistic missile trajectory, enabling the payload to be tracked by range radar during its descent. Eight other SPARTA re-entry test flights followed during 1967.

The final flight in the SPARTA program, conducted in November 1967, was perhaps the most significant to the Australians. In this mission, a Redstone was used to successfully launch WRESAT 1, Australia's first earth satellite, into earth orbit. This was the 58th and final launching in the 15-year Redstone flight test series.

Saturn/Apollo Program Resumes

In January 1968, the flight program to qualify the Apollo spacecraft resumed after a year-long delay. A Saturn 1B sent an unmanned Apollo spacecraft into earth orbit where a lunar module was successfully flight-tested for the first time. The success of this flight paved the way for the first manned mission ten months later. On October 11, 1968, Astronauts Walter Schirra, Walter Cunningham and Donn Eisele became the first and only Saturn 1B/Apollo crew when their spacecraft started an 11 day, 163 orbit test. This flight qualified the Apollo for the historic lunar missions which were to follow.

This manned earth orbit test also completed the Saturn 1B/Apollo program. Between 1966 and 1968, the NASA-Chrysler team had launched five Saturn 1Bs, all completely successful.

The nine remaining S-1B launch vehicles were housed in storage tents in the Michoud Plant awaiting new space missions. Measuring 35 feet high, 35 feet wide and 100 feet long, each tent contained its own air conditioning system which kept the enclosure completely dust free, humidity at 40 percent and temperatures between 65 and 80 degrees.

Skylab Begins

In October 1971, the first in a series of Saturn launch vehicles, called S-1B206, was removed from its storage area at Michoud as Chrysler Space Division engineers began to make preparations for NASA's Skylab program. Sometime in May 1973, the 58-foot long Skylab will be launched into earth orbit by the Saturn V launch vehicle. On the following day, a Saturn 1B will send three astronauts to join the giant workshop where they will spend 28 days living and working in a weightless environment. Two other Saturn 1Bs will taxi crews to occupy Skylab for 56 day periods later in 1973.

For Skylab missions, the Saturn 1B space vehicles will be launched for the first time from the Saturn V launch complex 39 at the Kennedy Space Center. Each Saturn 1B will be erected on a 127 foot high pedestal in the Vertical Assembly Building. This pedestal permits the Saturn 1B to use the launch facilities of the larger Saturn V rocket.

Soyuz Program

Skylab is not the last space program involving the Saturn 1B launch vehicle. NASA also plans to use the Chrysler-built stage to launch a manned Apollo into earth orbit to join the Russian Soyuz spacecraft as part of the first U.S.-Russian space mission. The launch is scheduled for 1975.

Chrysler Launch Record

Launch Vehicles	Attempts	Successes
Redstone (booster for Jupiter-C, Mercury-Redstone, Sparta, WRESAT)	20	20
Saturn 1	2	2
Saturn 1B	5	5
Total	27	27

Ballistic Missiles

Redstone	58	54
Jupiter	8	8
Total	66	62
