MOON OBJECTIVE (USA, 1959 / 1973)

edited by Franco Mauri

Collection plan

The collection presents the evolution of the developed efforts by the USA during the engaged race in the 60s with the URSS for the conquest of the Moon.
At the beginning a brief mention of the precursors of the Mercury Program. With the establishment of the NASA, on July 29, 1958, american space policy finally consolidated and, for the first time, its non-military character was explicity stated. From a decree of February 1959 depends on the historic decision, taken in November of that year, to transfer definitively to NASA Von Braun, then employed by the Army, who became its technical director, and its group of collaborators. Although the NASA emphasizes the peaceful use and scientific purpose of these rockets, we can not hide that their use in space projects also has the obvious secondary objective of developing and testing new, ever more powerful missiles, and developing the relative infrastructures as well as, on the other hand, are doing the Soviets. This is how the future american launchers of the Mercury and Gemini spacecraft were born.
In the second section, dedicated to the Mercury Program, the research carried out by NASA is highlighted to safely face the launch of a man beyond the atmosphere, the attempts to develop the necessary technologies and the study to learn more about the space in which the man will have to venture.
In the third section, dedicated to the Gemini Program, we follow the development and testing of a suitable launcher and the setup of technologies for rendez-vous that will be fundamental for the next phase. The effects of a long-lasting flight on the human body are also studied.
Fourth section: Between 1962 and 1968, when the Gemini and Apollo Programs are in progress, the NASA, before sending a man to the Moon and making him return safe and sound to the ground, take additional precautions by launching a series of automatic probes (Ranger, Lunar Orbiter, Surveyor) in lunar orbit and on the surface of our natural satellite, for the purpose of studying and evaluating the lunar environment.
In the fifth section, dedicated to the Apollo Program, we illustrated the various phases of the development of the powerful Saturn rocket and the tests performed on the various components of the Apollo spacecraft and the Lunar Module, until the first moon landing with Apollo 11, which represents the achievement of the goal of the race undertaken between USA and URSS, and the victory of the USA.
The sixth and last section concerns the return to the Moon. The Americans, after the success of the Apollo 11, confirm their presence on our natural satellite completing five more successful lunar missions. The failure of the Apollo 13 is also part of this section.

Bibliography:

NASA mission archives on line (NSSDCA)

American astrophilately (David S. Ball)

Propaganda e pragmatismo (Umberto Cavallaro)

THE RACE BETWEEN USA AND URSS FOR THE CONQUEST OF SPACE BEGINS IN ROME.

September 1956. For the first time in history a stamp reproduces an artificial satellite : it is the Italian stamp designed by Corrado Mancioli to remember the 7th IAC (International Astronautical Congress) which that year takes place in Rome, from 17 to 22 September. The congress is organized by the IAF, International Astronautical Organization, a non-governmental organization, founded in Paris in 1950, when the 1st IAF was held. In 1956 this traveling congress was hosted by the Italian Rockets Association, directed by prof. Gen. Crocco. The theme of the IAC-7 is the artificial satellite " first step towards the sidereal space ", as the newspapers emphatically announce. About 400 delegates from 20 national astronautical association, which are part of the IAF, partecipate in the congress. Representatives of the Soviet Astronautical Association are also invited as observers. During the congress, half a dozen American scientists take turns to illustrate, with rich details, the plans of their country. It emerges that also England, France, Holland and URSS are studying their own satellite. A competition begins to come out, that until then had been played in the greatest reserve.

PRECURSOR OF MERCURY PROGRAM : THE REDSTONE ROCKET

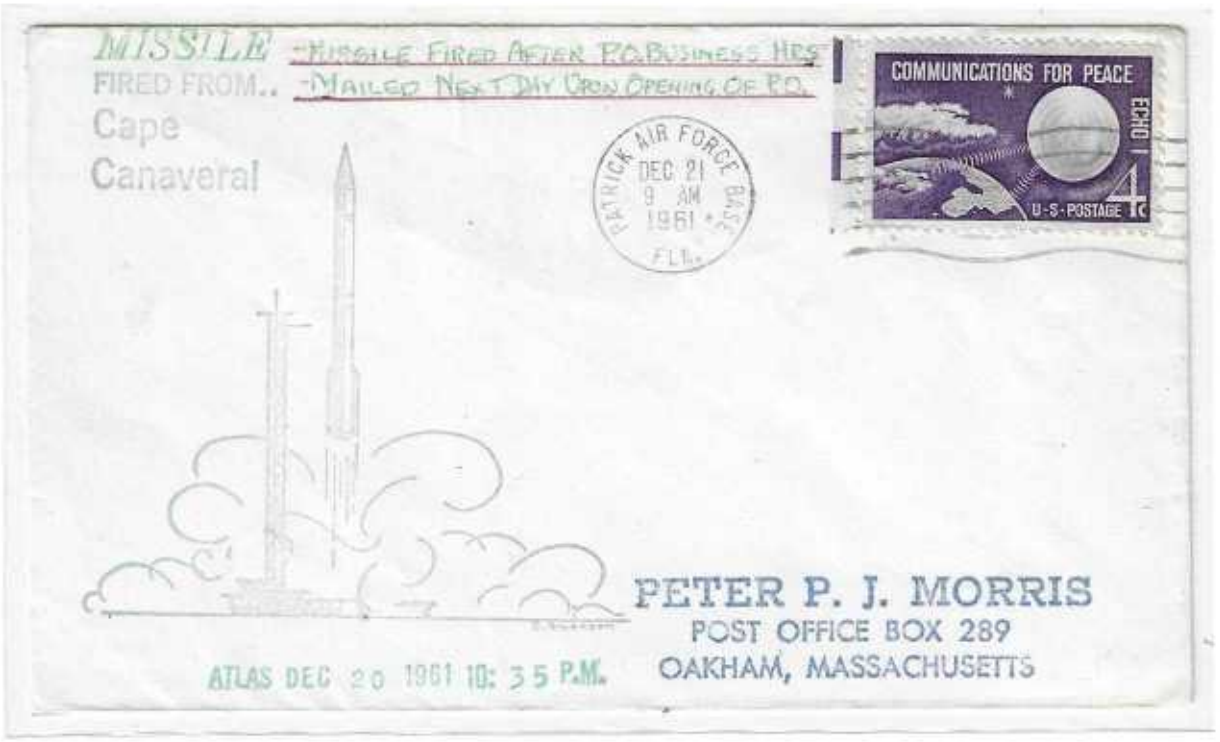
JANUARY 23, 1961. Patrick AFB machine cancel on the second day following the launch. The Redstone ballistic missile was a high-accuracy, liquid-propelled, surface-to-surface missile developed by Army Ballistic Missile Agency,Redstone arsenal, in Huntsville, Alabama, under the direction of dr. Von Braun. The Redstone engine was a modified and improved version of the Air Force's Navaho cruise missile engine of the late forties. The A-series, as this would be know, utilized a cylindrical combustion chamber as compared with the bulky, spherical V-2 chamber.

JULY 14, 1961. Patrick AFB machine cancel on the date and time of launch. Redstone rockets became the " reliable workhorse " for America's early space program. As an example of the versatility, Redstone was utilized in the booster for Explorer 1, the first American satellite, with no major changes to the engine or missile. Redstone missiles played an important role in the early years of the space race. Modified Redstone rocket technology flew as both Jupiter-C and Mercury-Redstone space launchers.

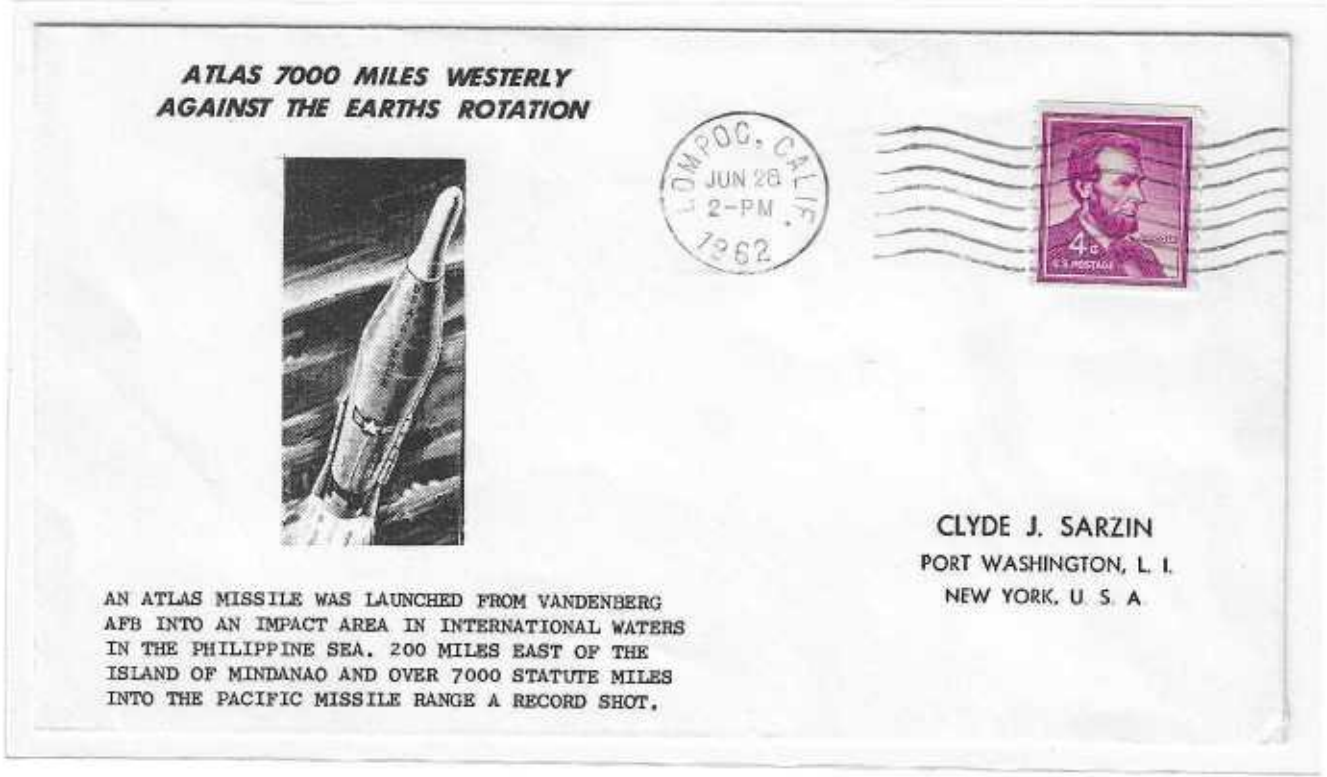
PRECURSOR OF MERCURY PROGRAM : THE ATLAS ROCKET

JANUARY 26, 1960. Lompoc machine cancel on the date and time of launch. Atlas was the name given to american first operational ICBM (Intercontinental Ballistic Missile). Although its career as a nuclear armed missile was short lived, the Atlas has evolved into one of the worlds premier satellite launchers. One unusual feature of the Atlas rocket is its unique staging system. The radical solution developed was two fold. First of all, of the three main rocket engines on the Atlas, only one remained with the Atlas all the way on orbit. The inner engine, sometimes referred to as the sustainer engine, remained permanently attached to the rocket, while the two outer engines, known as a booster engines, were used only during the first few minutes of flight.

NOVEMBER 24, 1961. Patrick AFB machine cancel on the second day following the launch. As the rocket rose into the air, fuel was consumed at a fast rate. After a short period of time, the rocket became light enough and the two booster rockets were dropped. By shedding the weight of the two booster engines, the Atlas was now light enough to fly all the way to orbit using only the sustainer engine.

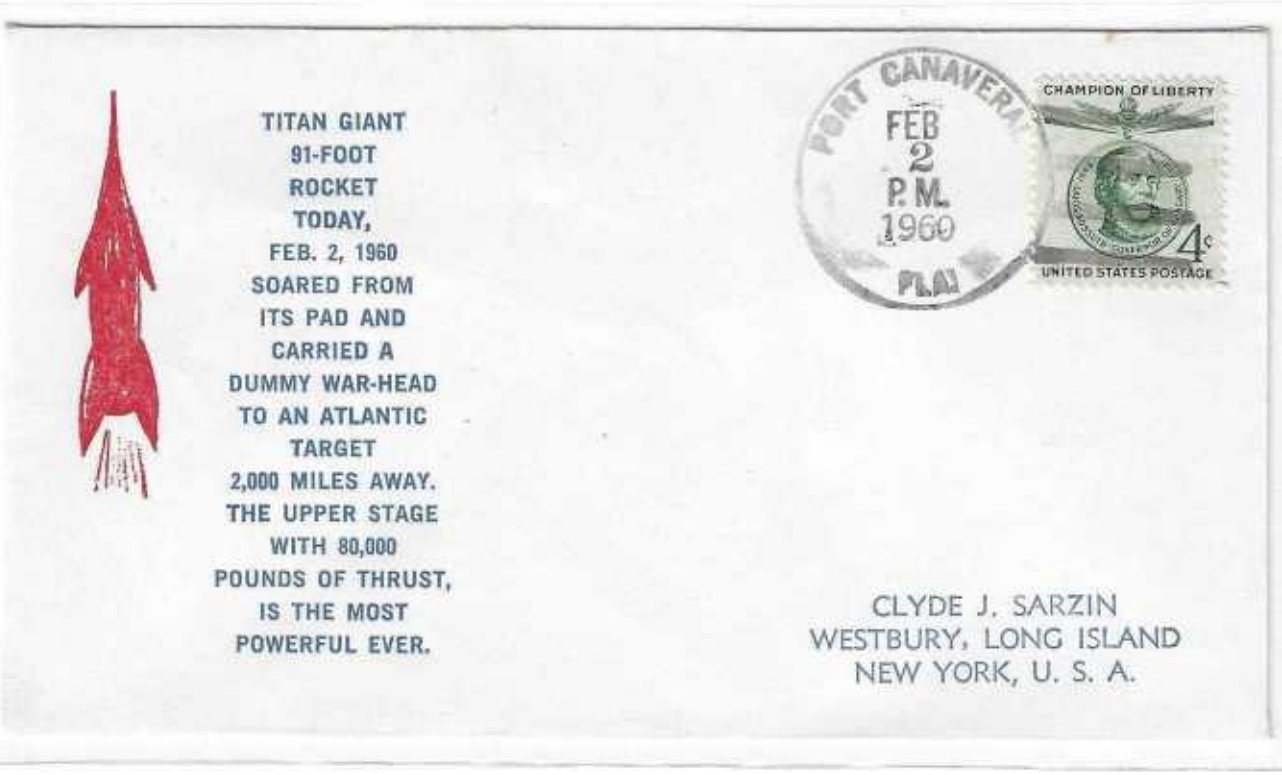


DECEMBER 21, 1961. Patrick AFB machine cancel on the day following the launch. Another design feature of the Atlas was the use of an extremely light weight structure. The structure, know as a " balloon structure ", was so light weight that the fuel tanks needed to be continuously pressurized to avoid collapsing under their own weight !



JUNE 26, 1962. Lompoc machine cancel on the date and time of launch. The light weight balloon structure, along with the ability to drop the booster engines in flight, allowed the Atlas to approach conventionally staged rockets in performance while still retaining the ability to start and test all main engines while still safely on the ground.

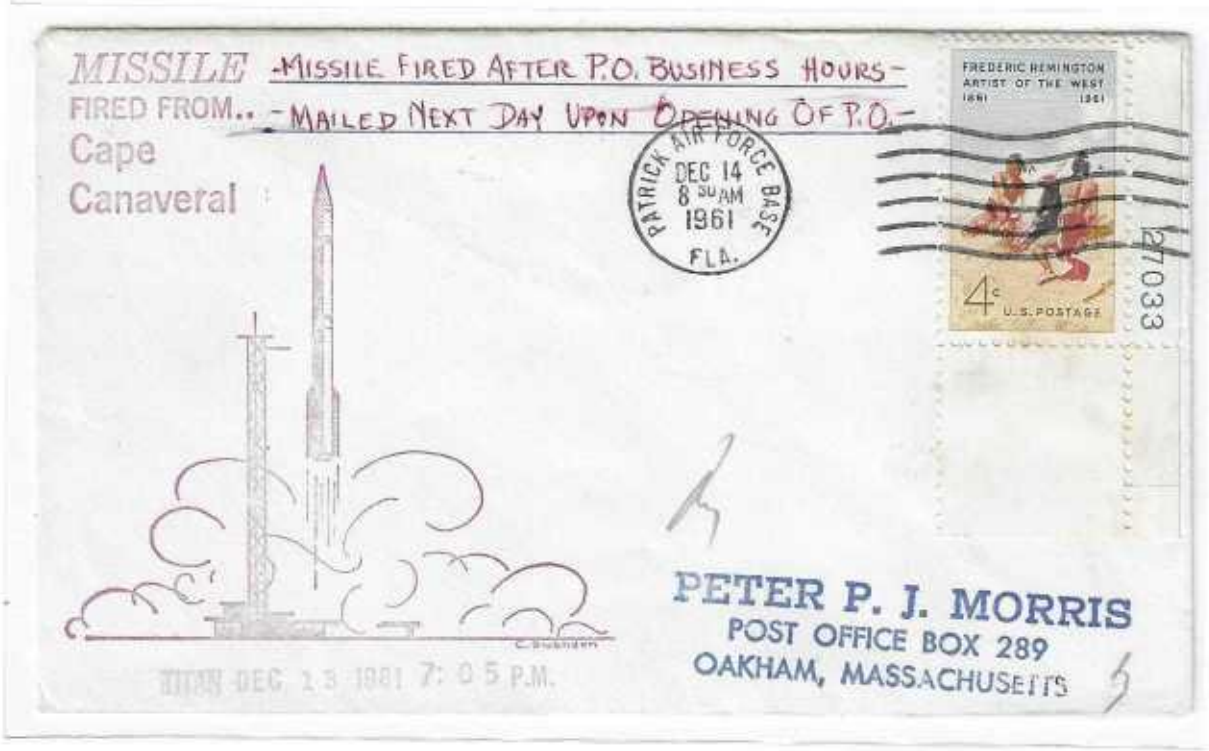
PRECURSOR OF MERCURY PROGRAM : THE TITAN ROCKET



February 2, 1960. Port Canaveral manual cancel on the date and time of launch. The Titan Program began development in 1955 as a back up option in case the Atlas Program failed. It would become the second Intercontinental Ballistic Missile (ICBM) deployed by the U.S. Air Force. Also a liquid fueled giant, the Titan was the first multi-stage ICBM put on operational alert.

August 30, 1960. Patrick AFB machine cancel on the date and time of launch. Based within super-hardened silos, deep beneath the ground, the Titan's concrete and steel reinforced facilities were able to withstand the massive pressure of a nuclear blast. This gave it a survivability from nuclear attack, that the Atlas lacked.

February 21, 1961. Patrick AFB machine cancel on the day following the launch. The first successfull of a Titan took place in January of 1960. A little over two years later, the first Titan I's became operational, based out of Lowry Air Force Base in Denver, Colorado, in April 1962. The two-stage Titan was the largest ICBM ever deployed. The Titan held a nine megaton nuclear warhead, making it the most powerful single nuclear weapon in American history.



December 14, 1961. Patrick AFB machine cancel on the day following the launch. The Titan II was the largest ICBM ever deployed by the U.S. Air Force. Standing 103 feet tall and weighing a colossal 330,000 pounds, it had a range of up to 9,300 miles away (3,000 miles greater than the Titan I). A major innovation of the Titan II was that it had storable liquid propellant. This allowed the Titan II to launch within about a minute, a considerable upgrade over the Titan I's 15 minute launch response time.

PRECURSOR OF MERCURY PROGRAM : THE SCOUT ROCKET

Scout, an acronym for Solid Controlled Orbital Utility Test System, was a four-stage, solid-fuel rocket capable of orbiting, sounding, and reentry flights with a large variety of payloads. It had three types of missions : placing small satellites in orbit, high-velocity reentry studies and testing of heat-resistant materials, and launching high-altitude and space probes. Early Scout missions helped researchers study the density of the atmosphere at various altitudes, the properties of the Van Allen radiations belts, and the possible dangers of the micrometeoroid environment on spacecraft. Called " the unsung hero of Space " because it set a standard for reliability, simplicity, and economy, the relatively small rocket was conceived and developed at Langley-Although not widely known, Scout developed into " one of the finest pieces of technology in the history of Space exploration, and became a " very reliable, consistent, performing war horse ". Scout provided access to Space for more than 30 years and was one of the few programs " born of the spaceflights revolution (that) survided the spaceflight revolution ". The original Scout was only 72 feet high and weighed only 37,000 pounds, while the total thrust of its four stages was just under 200,000 pounds

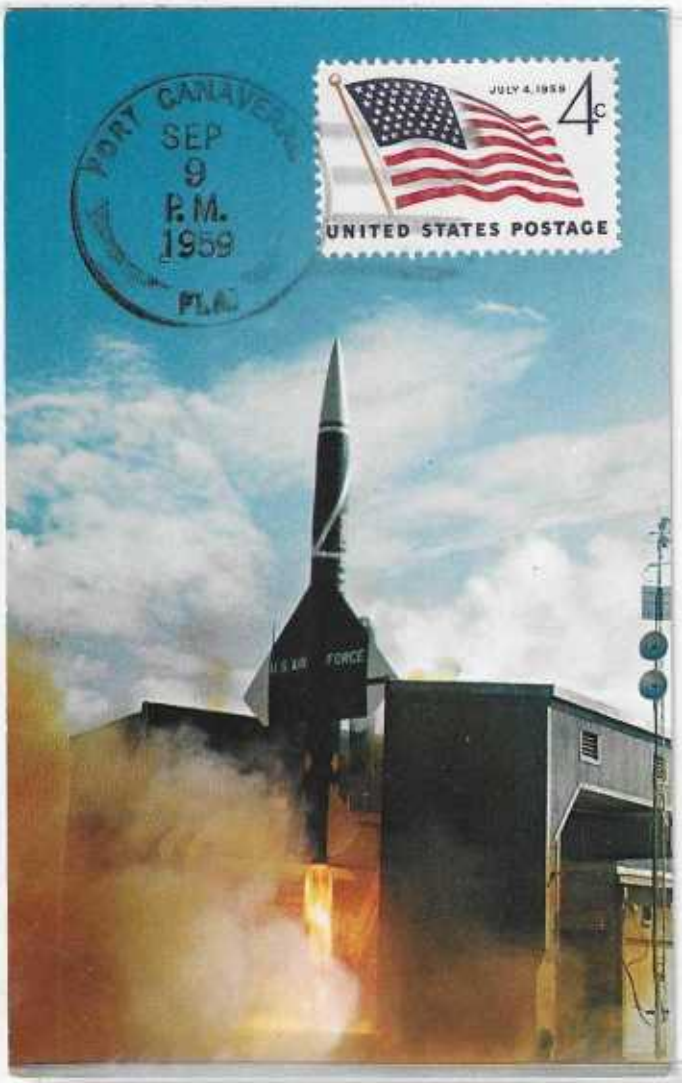
Mission S-55 satellite. JUNE 30, 1961. Wallops Island machine cancel on the date and time of launch. Scout 5's three solid propellant stages are in the launcher prior to mating the fourth stage. The fourth stage will carry the S-55 micrometeoroid satellite. Mission failed.

Mission ST-7. OCTOBER 19, 1961. Wallops Island machine cancel on the date and time of launch. Scout 7 is the seventh in a developmental series of solid-fuel rocket launches to provide the U.S. with a small reliable and flexible research vehicle for Space exploration tasks. Scout 7 will carry a P-21 Electron Density Profile Probe to an altitude of 4,500 miles. It will measure daytime electron concentration and impact in the Atlantic Ocean about 3,900 miles from the launch site.

Mission ST-8. MARCH 1, 1962. Wallops Island machine cancel on the date and time of launch. Scout-X1A was a five-stages derivative of the earlier Scout- X1, with an uprated first stage, and a NOTS-17 upper stage. It flew from Launch Area 3 of the Wallops flight facility. The flight carried an Atmospheric Reentry Experiment to an apogee of 214 km (133 mi).

Mission STS-9. MARCH 29, 1962. Wallops Island machine cancel on the date and time of launch. Scout- X2 was an expendable launch system and sounding rocket. It was a four-stage rocket carried plasma and aeronomy experiments to an apogee of 6,291 km (3,909 mi).

Mission V-114. AUGUST 31, 1962. Wallops Island machine cancel on the date and time of launch. Scout –X3A was a five-stage rocket. Stage 1 ALGOL-2A, stage 2 CASTOR-1A, stage 3 ANTARES- 2A, stage 4 ALTAIR-1A, stage 5 NOTS 17. Payload : reentry 2.



MERCURY PROGRAM

Mission Big Joe 1(BJ-1). SEPTEMBER 9, 1959. Port Canaveral manual cancel on the date of launch. Two years before the launch of the Sputnik, some engineers, behalf the NACA, National Advisory Committee for Aeronautics, of Aviation, and several aeronautical industries, are already planning spacecraft equipped with crew as a logical extension of the plane-rockets of the serie X. On November 26, 1958 the Program passes to newborn NASA, which baptized him " Mercury Program ". The purpose is to bring in the space a man before the Soviets. The " run to space " become a decisive attempt and forecast on the whole conflict of the Cold War between USA and URSS. Abandoned the troubled Project MISS (Man in Space Soonest) of the USAF which uses a winged vehicle, one decide the best way to go in the space is a spacecraft launched by a rocket. NASA learned a lot from Project Mercury. The Agency learned how to put astronauts in orbit around Earth. It learned how people could live and work in space. It learned how to operate a spacecraft in orbit, and recover the man and the spacecraft safely.

Mission Mercury-Redstone 1A (MR-1A). DECEMBER 19, 1960. Patrick AFB machine cancel on the date and time of launch. The mission objectives of this suborbital flight were to qualify the spacecraft for space flight and qualify the system for an upcoming primate suborbital flight. The spacecraft tested its instrumentation, posigrade rockets, retrorockets, and recovery system. The mission was completely successful. The Mercury capsule reached an altitude of 209 km, and a range of 378 km. The launch vehicle reached a slightly higher velocity than expected, 7,900 km/h.

PORT CANAVERAL
JAN
31
P.M.
1961
FLA.

PROJECT MERCURY
FIRST LIVING CREATURE
SPACE FLIGHT

OUR FIRST LITTLE MAN IN SPACE

A highly trained chimp named HAM rocketed into space in our elaborate project Mercury space ship capsule today January 31, 1961. Important prelude to manned space ship flight.

Mission Mercury-Redstone 2 (MR-2). JANUARY 31, 1961. Port Canaveral manual cancel on the date and time of launch. Mercury spacecraft (#5) contained six new systems that had not been on previous flight : environmental control system, attitude stabilization control system, live retrorockets, voice communications system, " closed loop " abort sensing system, and a pneumatic landing bag. The spacecraft carried Ham the Chimp, on a suborbital flight, landing in the Atlantic Ocean 16 min., 39 sec. after launch. The Mercury reached an altitude of 253 km, and a range of 679 km, with a velocity of 9,426 km/h.

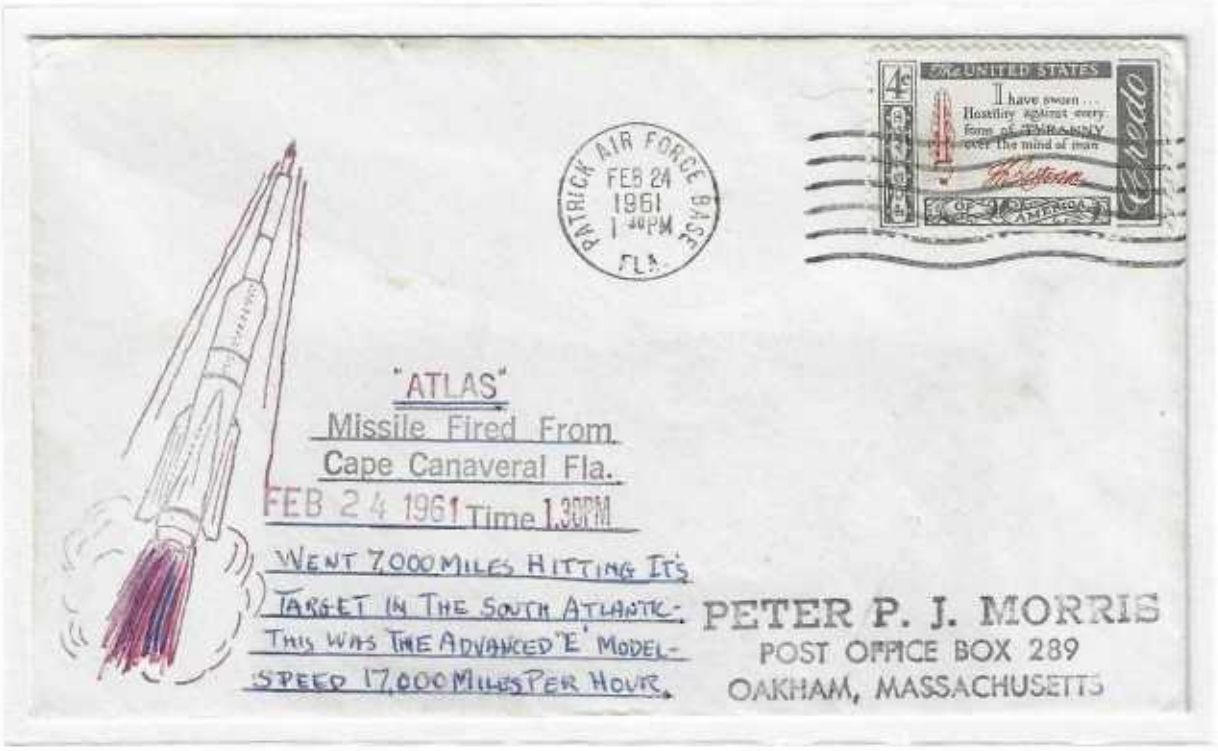
PORT CANAVERAL
FEB
21
A.M.
1961
FLA.

ASTRONAUTS VIEW
SPACE CAPSULE
SUCCESSFUL FIRING
FEB. 21, 1961
Unmanned Space
Capsule Launched
In Difficult Test . . .

The Seven Astronauts were on hand to view the re-entry of the 2400 Pound Space Cabin. Flown from Canaveral Florida to a spot 400 Miles Northeast of Antigua Island.

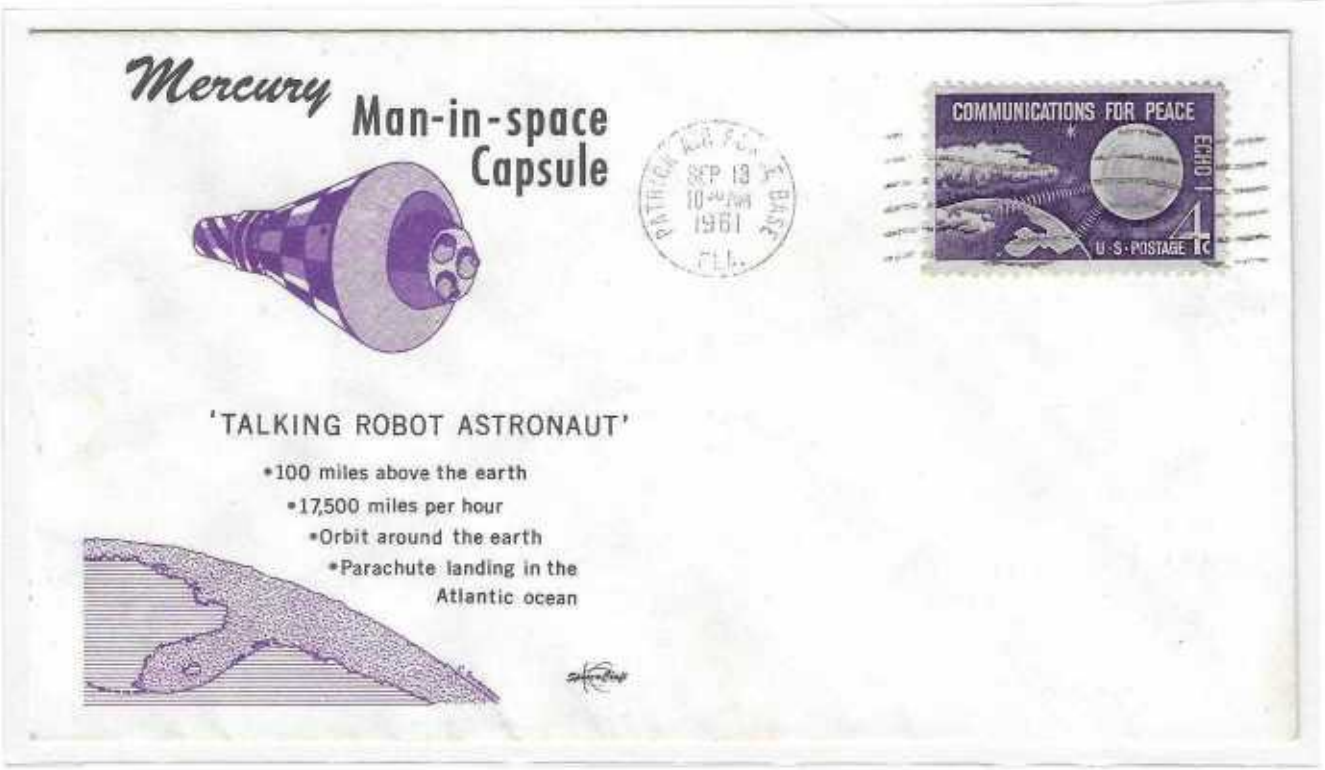
CLYDE J. SARZIN
PORT WASHINGTON, L. I.
NEW YORK, U. S. A.

Mission Mercury-Atlas 2 (MA-2). FEBRUARY 21, 1961. Port Canaveral manual cancel on the date and time of launch. Test objectives for this flight were concerned with the ability of the spacecraft to withstand reentry under the temperature-critical abort conditions, and with the capability of the Atlas to meet the proper injection conditions. MA-2 flew a successful suborbital mission that lasted 17 min., 56 sec., reaching an altitude of 183 km, and a speed of 21,287 km. The capsule was recovered 2,305 km downrange.



Mercury Project. FEBRUARY 24, 1961. Patrick Air Force Base machine cancel on the date and time of ATLAS launch, intercontinental ballistic rocket (ICBM), developed by U.S.A.F. and built by Convair, then adapted to human flight (man rated) in the course of development of Mercury Project.

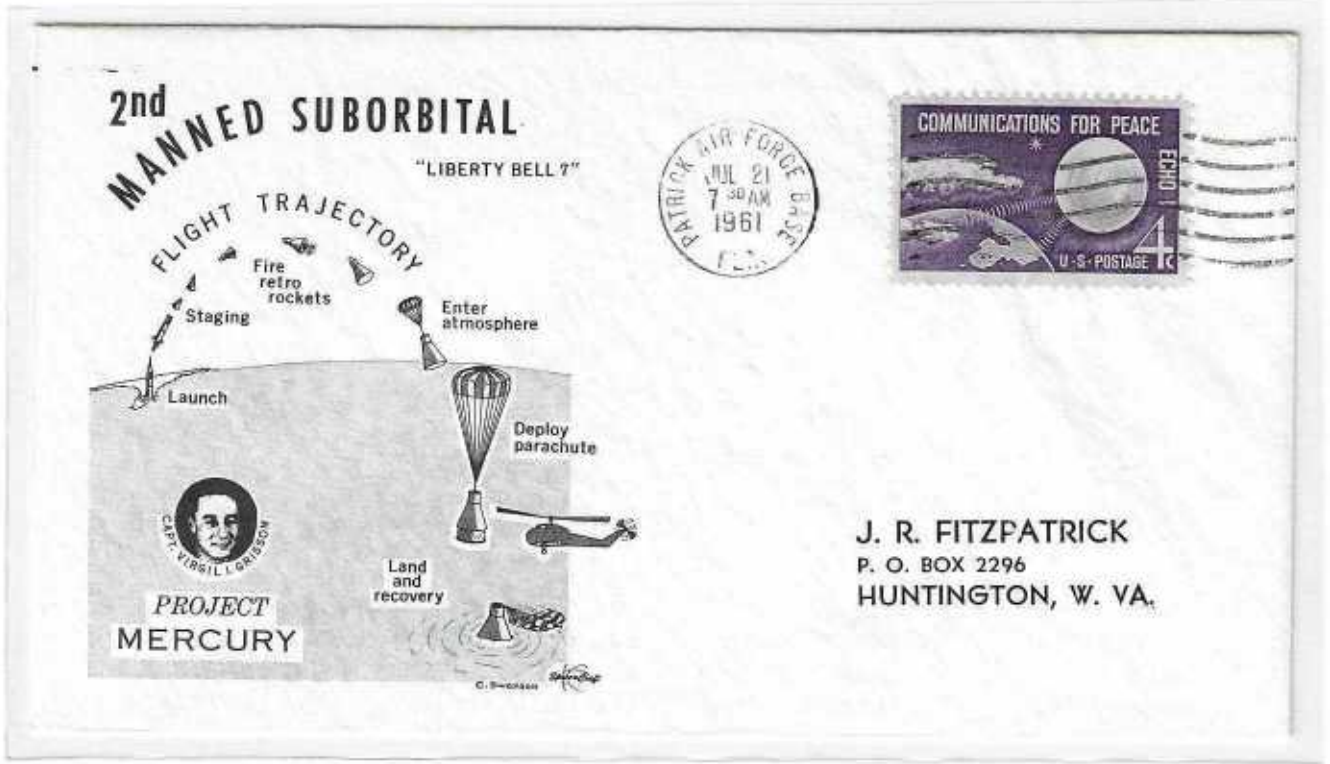
Mission Little Joe 5B (LJ-5B). APRIL 28, 1961. Commemorative cover postmarked with machine cancel in Wallops Island on the date and time of launch. The rocket reaches an altitude of 5 km and covers a distance of 14 km. Little Joe was the nickname given to a solid-fueled rocket of the USA and used in 8 launches, since 1959 to 1961, from the Wallops Island Base in Virginia.



Mission Mercury Atlas 4 (MA-4). SEPTEMBER 13, 1961. Patrick AFB machine cancel on the date and time of launch. The Mercury spacecraft designed by Max Faget and NASA's Space Task Group, is totally controllable from the ground, not knowing yet the reactions of the human body in weightless and in the presence of strong stresses.

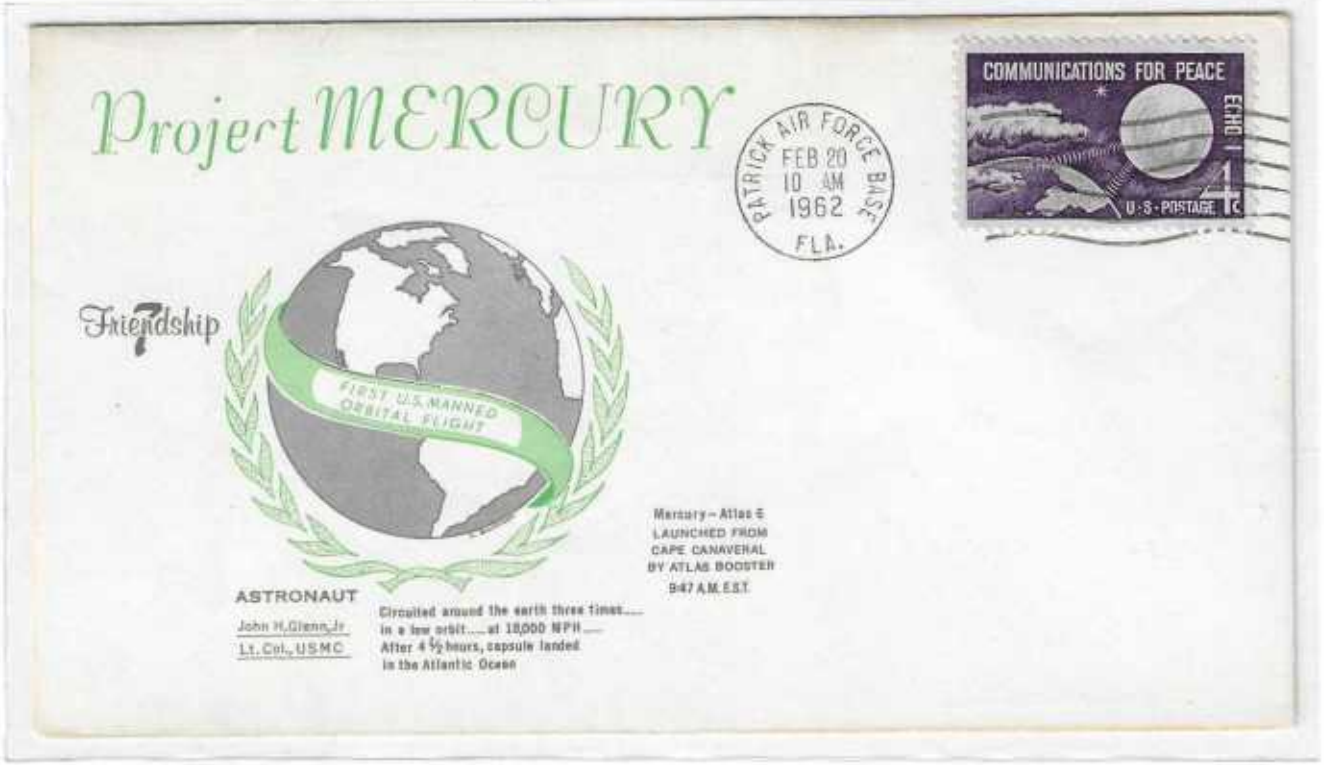
DECEMBER 14, 1962. Edwards Air Force Base machine cancel on the date and time of flight. At the end of the 1950s years, before moving on to the executive stage of the Mercury Program, the Americans are putting in act a whole series of missile experiments (Redstone and derivates, Vanguard), launching in the space small artificial satellites and cavyes. The plane-rockets supersonics X-15 reach altitudes and speed never touched until then, becoming a test bench on the human body, submitted directly to strong accelerations and stresses. Only after testing with robots, monkeys and mannequins have given reassuring results, is announced the first flight suborbital USA with human crew.

Mission Freedom 7 MR-3. MAY 5, 1961. Patrick AFB machine cancel on the date and time of launch. Only 23 days after Yuri Gagarin became the first person in space, NASA astronaut Alan Shepard, launched aboard his Freedom 7 capsule powered by a Redstone booster, to become the first American in space. His historic flight lasted 15 min. 28 sec. A few of the basic flight problems included the development of an automatic escape system, vehicle control during insertion, behavior of space systems, evalutation of pilots capabilities in space, in flight monitoring, retrofire and reentry maneuvers and landing and recovery.

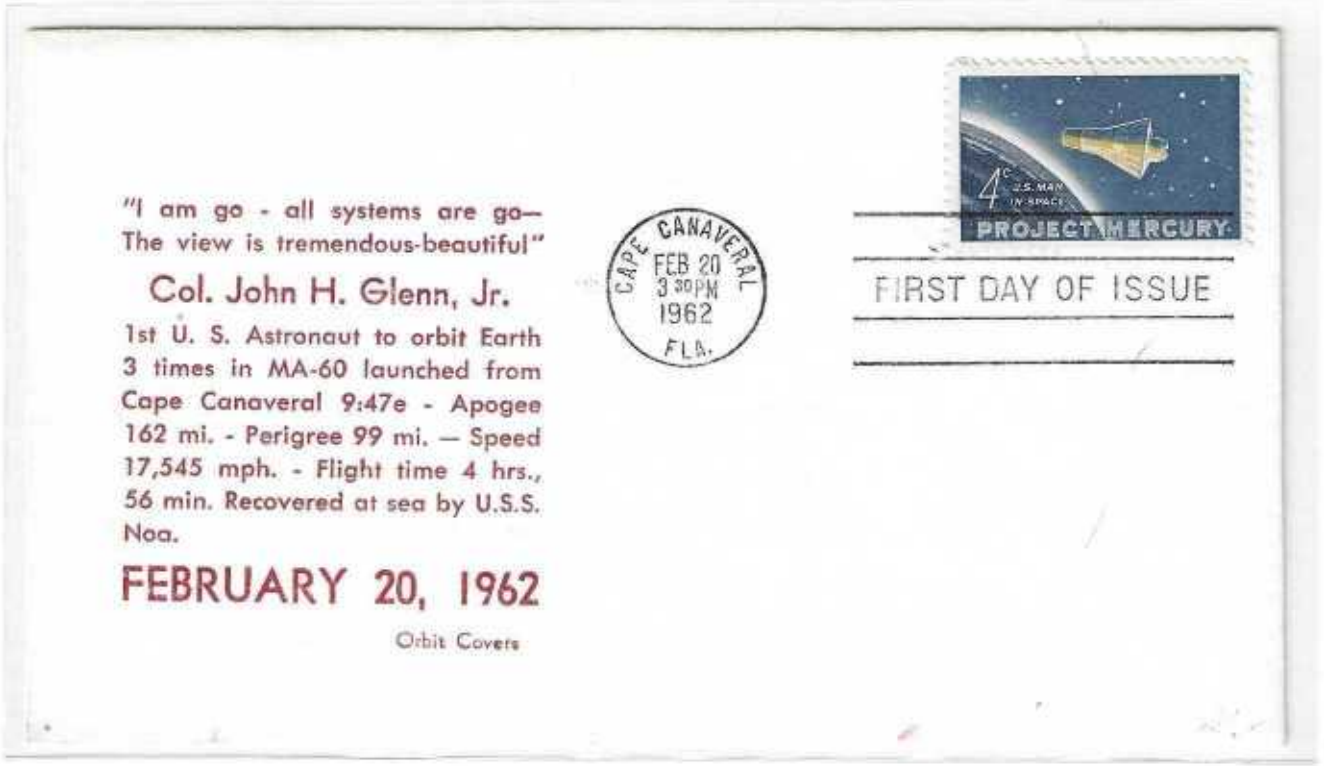


Mission Liberty Bell MR-4. JULY 21, 1961. Patrick AFB machine cancel on the date and time of launch. Mercury-Redstone 4 was the next step in the progressive research, development and training, to corroborate the man-in-space concept. The addition of the large viewing window, which allowed to have a greater viewing area, was a result of change requested by Mercury astronauts. The spacecraft was lost during the recovery period as a result of premature actuation of the explosively actuated side egress hatch.

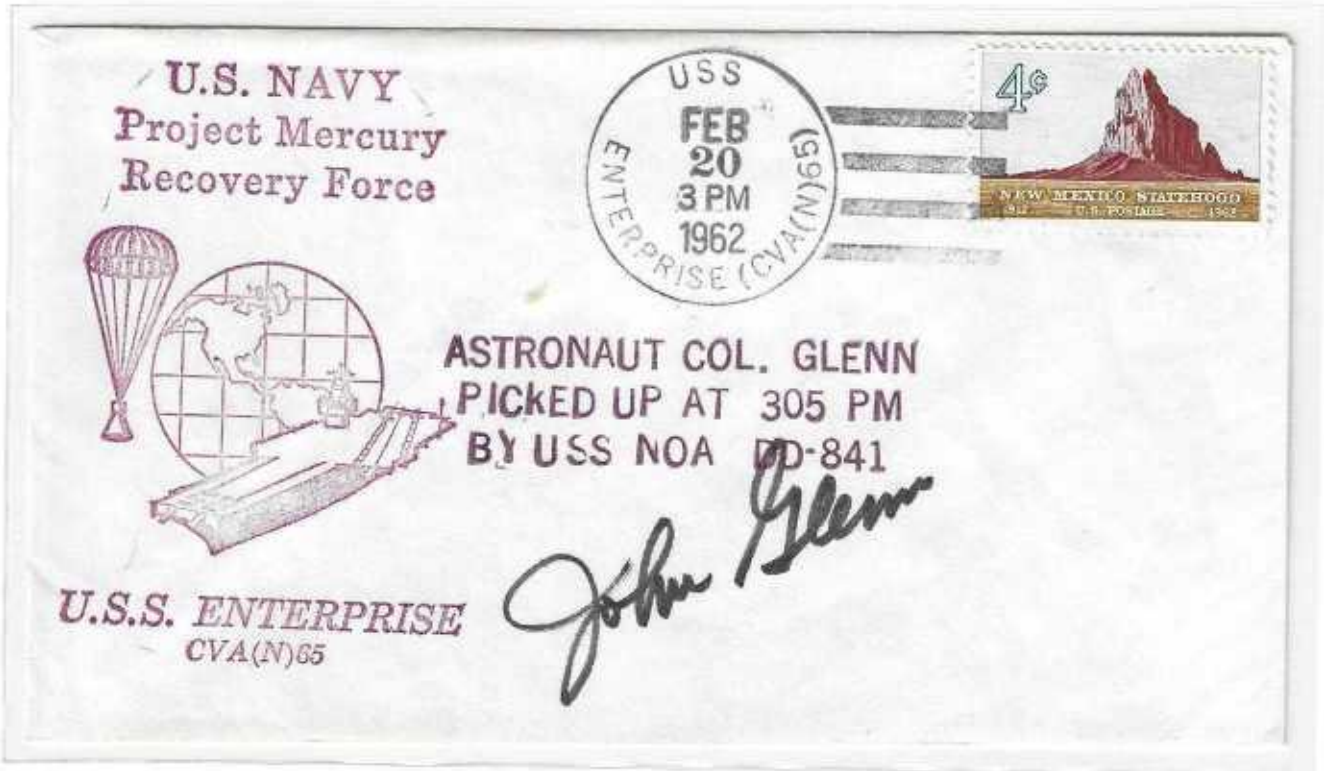
Mission Mercury Atlas 5 (MA-5). NOVEMBER 29, 1961. Port Canaveral manual cancel on the date and time of launch. This mission was the second and final orbital qualification flight of the Mercury systems prior to manned orbital flight. On-board was a 17 kg, five-year-old chimpanzee named Enos which performed various psychomotor activities during the flight and was found to be in excellent physical conditions following splashdown. He had been under observation, day and night, for two months prior to his death with a case of shigella dysentary, a type resistant to antibiotics.



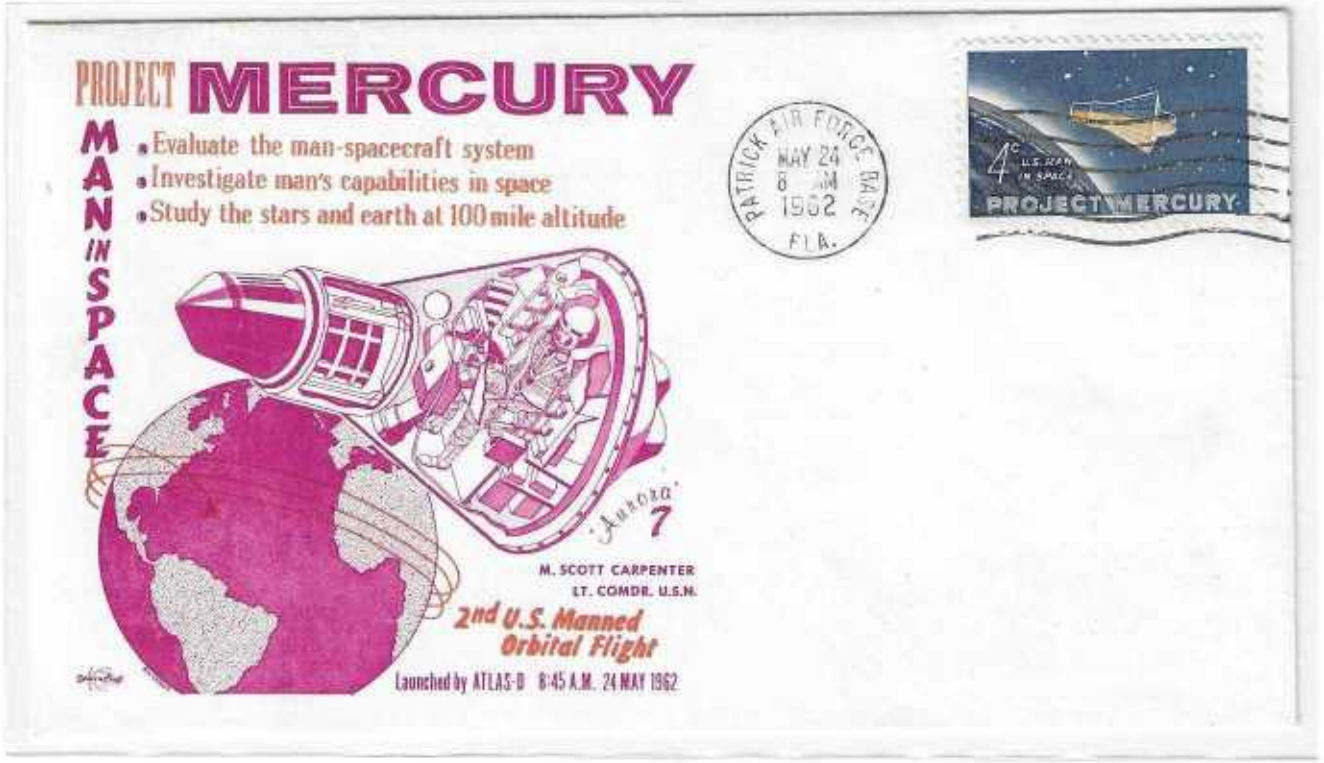
Mission Friendship 7 MA-6. FEBRUARY 20, 1962. Patrick AFB machine cancel on the date and time of launch. On this date the astronaut John H. Glenn, Jr became the first American to orbit Earth. An Atlas launch vehicle propelled a Mercury spacecraft into Earth orbit and enabled Glenn to circle Earth three times. orbital mission, NASA was finally able to pull back even with the Soviets.



Mission Friendship 7 MA-6. FEBRUARY 20, 1962. Commemorative " first day cover " postmarked with machine cancel in Cape Canaveral on the date and time of launch. During the flight only two major problems were encountered : a yaw attitude control jet apparently clogged at the end of the first orbit, forcing the astronaut to abandon the automatic control system for the manual-electrical fly-by-wire system; and a faulty switch in the heat shield circuit indicated that the clamp holding the shield had been prematurely released-a signal later found to be false. During reentry, however, the retropack was not jettisoned but retained as a safety measure to hold the heat shield in place in the event it had loosened.



Mission Friendship 7 MA-6. FEBRUARY 20, 1962. Commemorative cover postmarked with manual cancel on the secondary recovery ship USS Enterprise on the date and time of the splashdown.



Mission Aurora 7 MA-7. MAY 24, 1962. Patrick AFB machine cancel on the date and time of launch. The performance of the launch vehicle was exceptionally good with the countdown, launch and insertion conforming very closely to planned conditions. The launch vehicle used to accelerate Carpenter and the Aurora 7 spacecraft was an Atlas D. The differences between the Atlas 107-D launch vehicle and the Atlas 109-D used for MA-6 involved retention of the insulation bulkhead and reduction of the staging time from 131.3 to 130.1 seconds after liftoff.

Mission Aurora 7 MA-7. MAY 24, 1962. Port Canaveral machine cancel on the date and time of launch. The single mission critical malfunction which occurred involved a failure in the spacecraft pitch horizon scanner, a component of the automatic control system. This anomaly was adequately compensated for by the pilot in subsequent in-flight operations so that the success of the mission was not compromised.

MAN IN SPACE

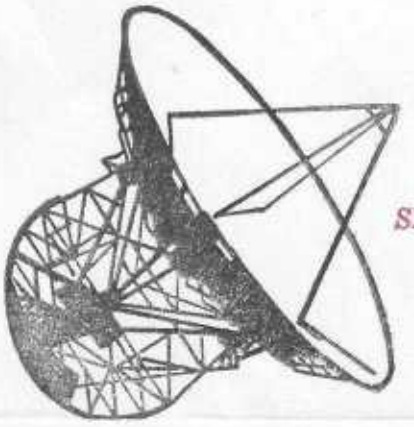
Walter Shirra Orbits the Earth
Six Times in Ship Space
Signa 7 Oct. 3, 1962

Lift off CAPE CANAVARAL 8:15 AM EST

CLYDE J. SARZIN
PORT WASHINGTON, L. I.
NEW YORK, U. S. A.

Mission Sigma 7 MA-8. OCTOBER 3, 1962. Commemorative cover postmarked with manual cancel in Cape Canaveral on the date and time of launch. The pilot Walter M. Schirra, Jr called his mission a " text book flight ". The only difficulty having been attaining the correct temperature adjustment on his pressure suit. Schirra proved that an astronaut could carefully manage the limited amounts of electricity and fuel necessary for longer, more complex flights. The objectives of MA-8 were to evaluate the performance of the man-spacecraft system, the effects of an extended orbital space flight on the astronaut, the performance of spacecraft systems.

Land-Air, Inc.
Project Mercury
Station M-16
P. O. Box 6005
Lamar Park Station
Corpus Christi, Texas
Attn: J. H. DeLong



SIGMA 7

Mission Sigma 7 MA-8. OCTOBER 3, 1962. Commemorative cover postmarked with machine pictorial cancel in Corpus Christi on the date and time of launch.

Mission Sigma 7 MA-8. OCTOBER 3, 1962. Commemorative cover postmarked with machine cancel on the principal recovery ship USS Kearsarge on the date and time of splashdown.

Mission Faith 7 MA-9. MAY 15, 1963. Commemorative cover postmarked with machine cancel in Cape Canaveral on the date and time of launch. With a Moon landing estimated to take a week or more of space flight, NASA needed to prove that a human could function in space over a long duration. As it turned out, Gordon Cooper did stay in orbit for a fully day, plus ten more hours. That made him the most experienced astronaut in the world, the first man to sleep in space, and the first man to eat a meal in space.

Mission Faith 7 MA-9. MAY 16, 1963. Commemorative cover postmarked with machine cancel in Cape Canaveral on the date and time of splashdown.

Mission Faith 7 MA-9. MAY 16, 1963. Commemorative cover postmarked with machine cancel on the principal recovery ship USS Kearsarge on the date and time of splashdown.

GEMINI PROGRAM

(CACHET SHOWS A 2 MANNED PROJECT GEMINI AND PROPOSED U.S. SPACE STATION IN CUT-A-WAY VIEW)
TITAN 2 530,000 POUNDS OF THRUST IN ITS FIRST TWO STAGES SUCCESSFULLY FIRED TODAY. THIS IS TO BE THE SPACE BOOSTER FOR PROJECT GEMINI THE TWO-MANNED SPACE CAPSULE AND ALSO FOR THE SPACE GLIDER DYNA-SOAR.

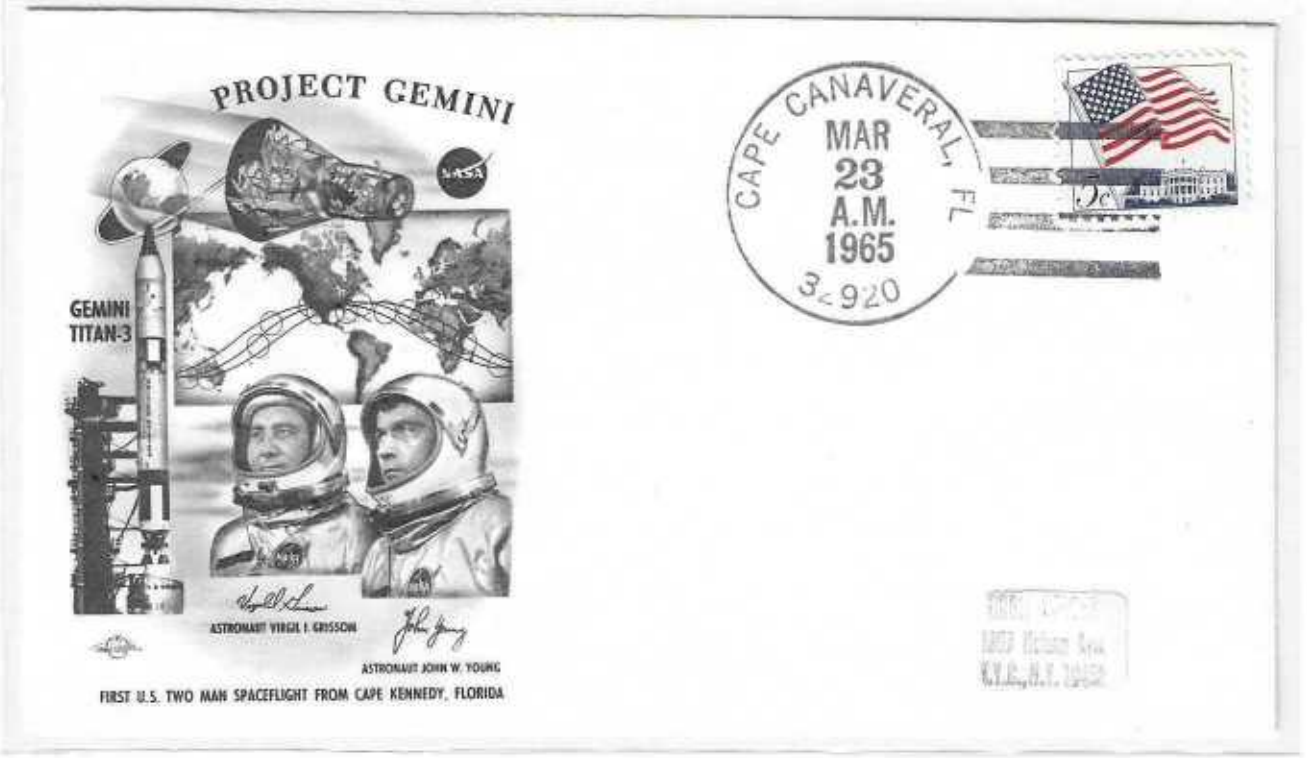
CLYDE J. SARZIN
Port Washington, L. I., N. Y.
U. S. A.

Project Gemini. SEPTEMBER 12, 1962. Commemorative cover postmarked with manual cancel in Cape Canaveral on the date and time of static test, two stages successfully fired, of Titan II. At the time there was not other American launcher able to put into orbit the 3.600 kg Gemini spacecraft. The Titan II was the largest ICBM ever deployed by the U.S. Air Force. Standing 103 feet tall and weighing a colossal 330,000 pounds, it had a range of up to 9,300 miles away (3,000 miles greater than the Titan I). A major innovation of the Titan II was that it had storable liquid propellant. This allowed the Titan II to launch within above a minute, a considerable upgrade over the Titan I's 15 minute launch response time.

Mission Gemini GT- 1. APRIL 8, 1964. Commemorative cover postmarked with manual cancel in Cape Canaveral on the date and time of launch. Successful orbital test of the Titan 2 launch vehicle, spacecraft structural integrity and launch vehicle – spacecraft compatibility. Unmanned, no plan to recover. Mission terminated after three orbits and spacecraft disintegrated 3,5 days after launch. All primary and secondary objectives achieved.

Mission Gemini GT-2. JANUARY 19, 1965. Cape Canaveral manual cancel on the date and time of launch. This was the second uncreved Gemini test mission, consisting of a sub-orbital ballistic flight and reentry with the primary objectives being to demonstrate the adeguacy of the spacecraft reentry module's heat protection during a maximum heating rate return, the structural integrity of the spacecraft, and the performance of its systems.

Mission Gemini GT-2. JANUARY 19, 1965. Primary recovery ship USS Lake Champlain manual cancel on the date and time of splashdown. The Gemini spacecraft was a cone-shaped capsule consisting of two components, a reentry module and an adaptor module. At 6 min., 54 sec. after launch, retrorockets were fired and the spacecraft cart wheeled into a reentry attitude.



Mission Gemini GT-3. MARCH 23, 1965. Cape Canaveral manual cancel on the date and time of launch. The flight of the " Molly Brown " was intended to test the new maneuverable Gemini spacecraft. In space, the crew members fired thrusters to change the shape of their orbit, shift their orbital plane slightly, and drop to a lower altitude.

Mission Gemini GT-3. MARCH 23, 1965. Corpus Christi tracking station machine cancel on the date and time of flight. The revolutionary technology paved the way for rendezvous missions later in the Gemini Program and proved it was possible for a Lunar Module to lift off the Moon and dock with the lunar orbiting Command Module for the trip home to Earth.

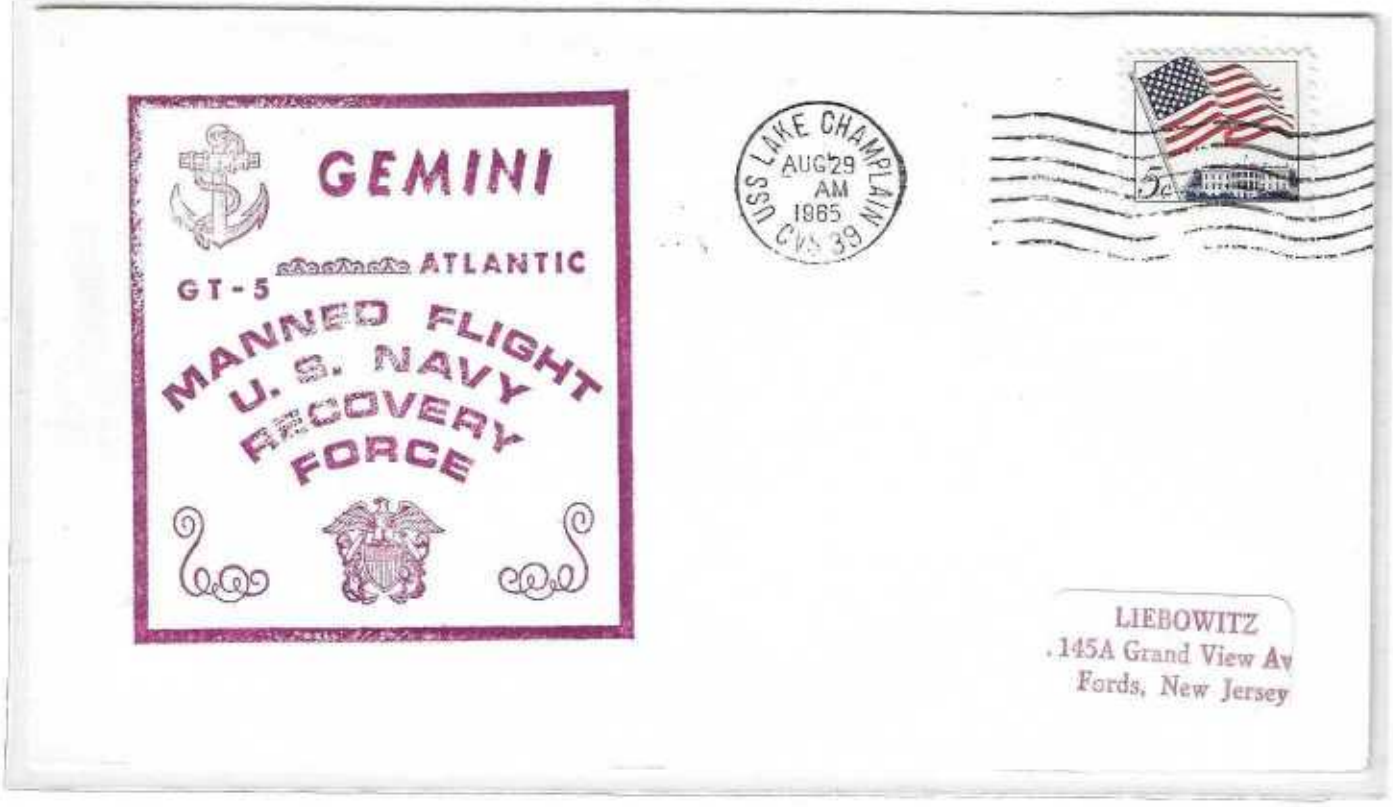
Mission Gemini GT-3. MARCH 23, 1965. Secondary recovery ship USS Barsfield manual cancel on the date and time of splashdown.

Mission Gemini GT-4. JUNE 3, 1965. Cape Canaveral machine cancel on the date and time of launch. It was the tenth manned American spaceflight (including two X-15 flights at altitudes exceeding 100 km (54 nmi) It circle the Earth 66 times in four days. The objective of the mission was to test the performance of the astronauts and capsule and to evaluate work procedures, schedules, and flight planning for an extended length of time in space. The mission included the first American spacewalk.

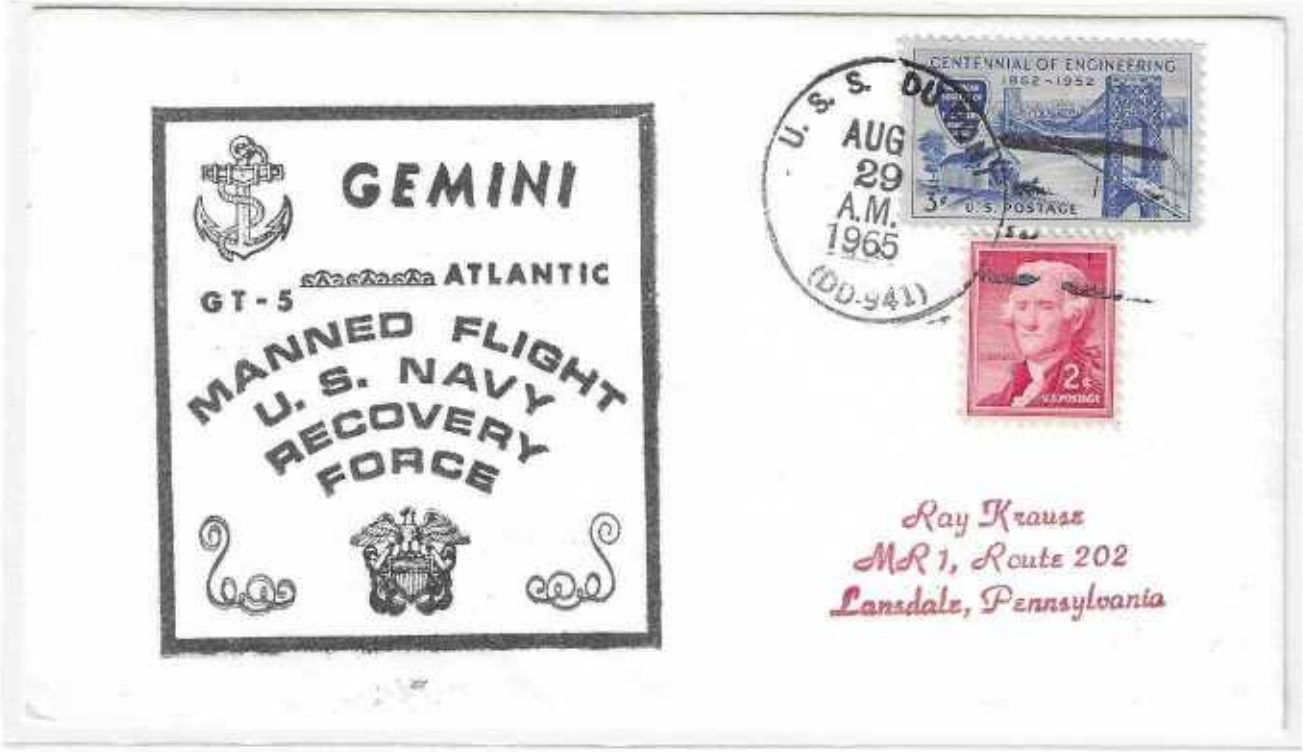
Mission Gemini GT-4. JUNE 3, 1965. Cape Canaveral machine cancel on the date and time of launch. The Highlight of the mission was the first spacewalk by an American, during which Edward H. White floated free outside the spacecraft, tethered to it, for approximately 20 min. The flight also included the first attempt to make a space rendezvous as James Mc Divitt attempted to maneuver his craft close to the Titan 2 upper stage, but this was not successful. The flight was the first American flight to perform many scientific experiments, including use of a sextant to investigate the use of celestial navigation for lunar flight in the Apollo Program.

Mission Gemini GT-4. JUNE 7, 1965. Primary recovery ship USS Wasp machine cancel on the date and time of splashdown.

Mission Gemini 5 (01516). AUGUST 21, 1965. Cape Canaveral machine cancel on the date and time of launch. The primary objective of the Gemini 5 mission was to demonstrate man's ability to function in the space environment for eight days, the length of time it would take to fly to the Moon, land and return, and to qualify the spacecraft systems under these conditions " he said ". In addition to effort to determine microgravity's effects after more than a week in orbit, the crew planned to attempt to catch up with an instrument package called the Rendezvous Evaluation Pod (REP). Four rendezvous radar test were conducted during the mission, starting on revolution 14 on the second day. The phantom rendezvous came on the third day. It went perfectly, even though it was the first precision maneuver on a space flight. They tried four maneuvers : apogee adjust, plane change, and coelliptical maneuver.

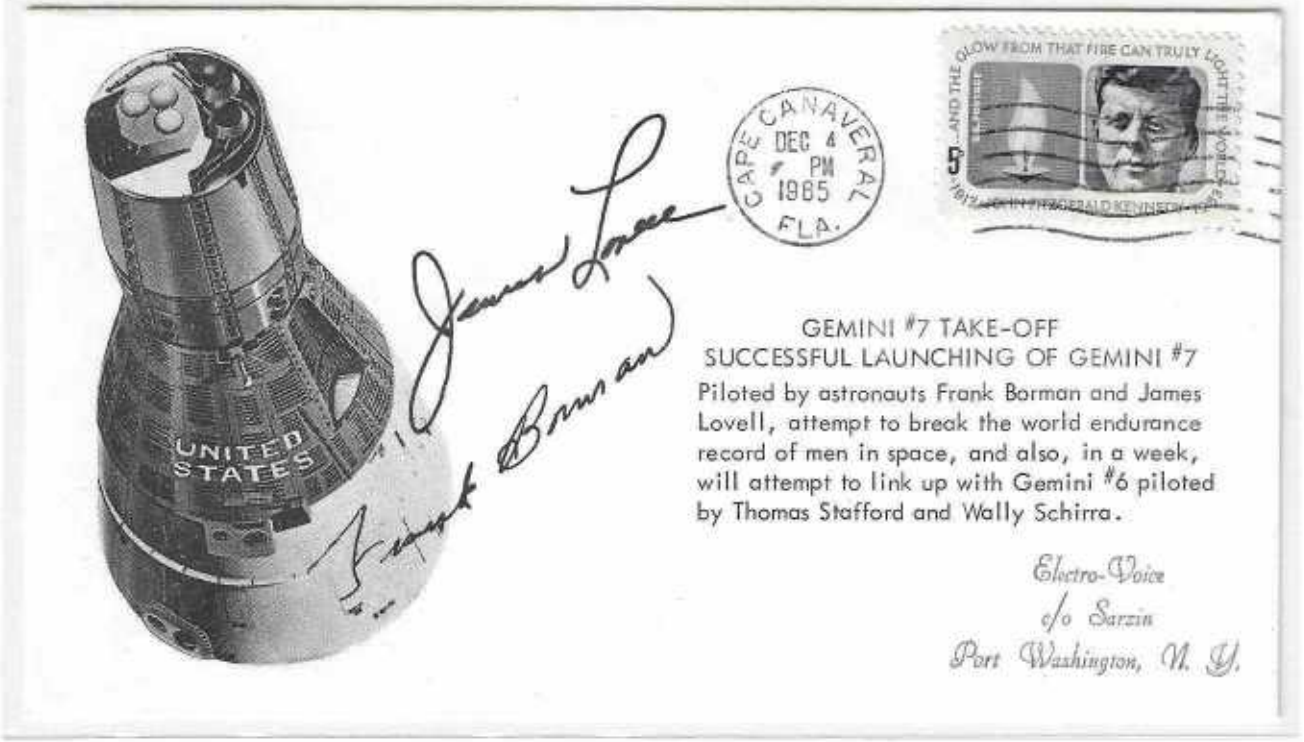


Mission Gemini 5 (01516). AUGUST 29, 1965. Primary recovery ship USS Lake Champlain machine cancel on the date and time of splashdown.



Mission Gemini 5 (01516). AUGUST 29, 1965. Secondary recovery ship USS Du Pont manual cancel on the date and time of splashdown.

Mission Gemini 6A (01839). OCTOBER 25, 1965. Commemorative cover postmarked with machine cancel in Patrick AFB on the date and time of mission abort. This mission was originally designated Gemini 6 and scheduled for launch on October 25, but was cancelled when the Agena Target Vehicle failed to go into orbit an hour earlier.

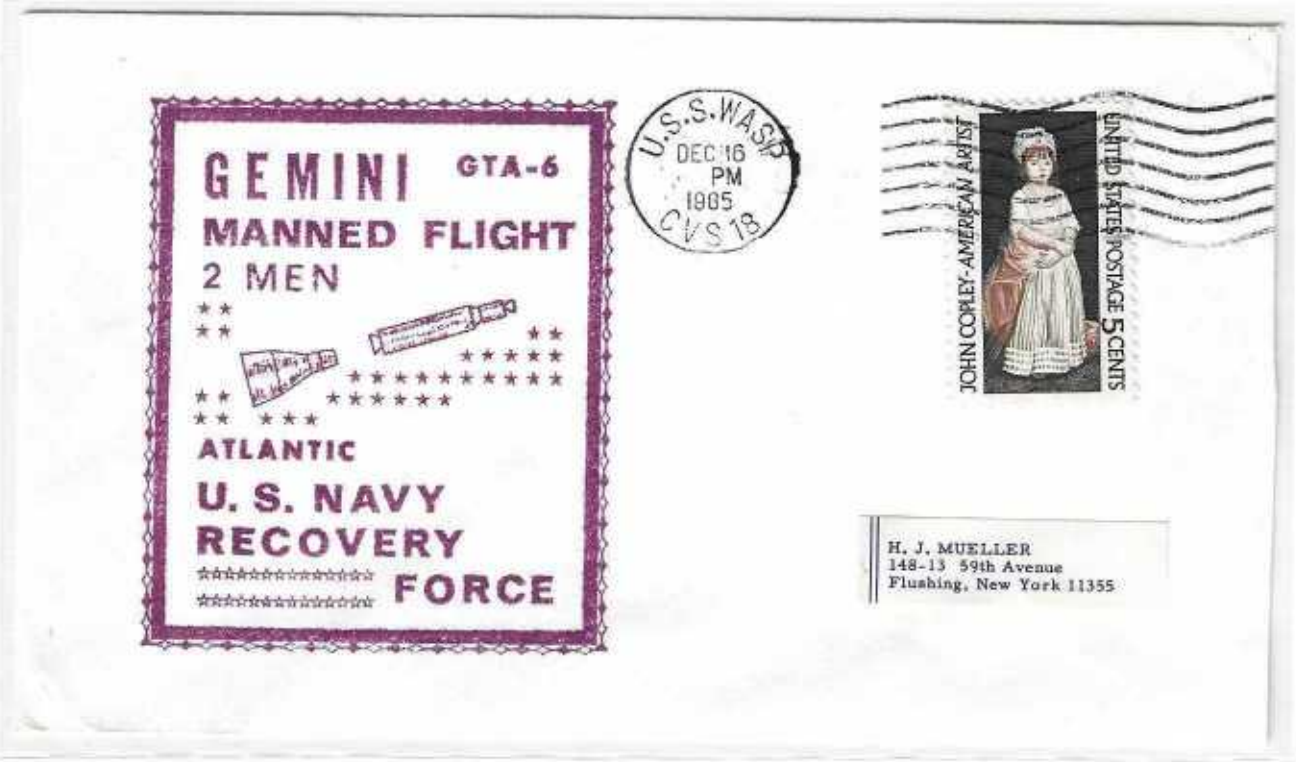


Mission Gemini 7 (01812). DECEMBER 4, 1965. Cape Canaveral machine cancel on the date and time of launch. Gemini 7 was the fourth crewed Earth-orbiting spacecraft of the Gemini series, having been launched before Gemini 6A. Its mission priorities were to demonstrate a 2-week flight, to perform stationkeeping with the Titan launch vehicle stage, to evaluate the " shirt sleeve " environment and the light weight pressure suit, to act as a rendezvous target for Gemini 6A, and to demonstrate controlled reentry close to the target landing point. The crew members had three scientific, four technological, four spacecraft, and eight medical experiments to perform. On 9 December, the orbit was circularized to 299,7 x 303,7 km to prepare for the rendezvous exercise with Gemini 6A.

Mission Gemini 6A (01839). DECEMBER 15, 1965. KSC machine cancel on the date and time of launch. After the failure of the target vehicle Agena, the priorities of the mission become the execution of orbital maneuvers and rendezvous with Gemini 7. On 12 December 1965, the launch was aborted one second after engine ignition because an electrical umbilical separated prematurely.

Mission Gemini 6A (01839). DECEMBER 15, 1965. Cape Canaveral machine cancel on the date and time of rendezvous. The astronauts on the 26 hour mission were Walter Schirra and Thomas Stafford. The mission priorities were to demonstrate on-time launch procedures, closed-loop rendezvous capabilities, and stationkeeping techniques with Gemini 7. Other objectives were to evaluate the spacecraft reentry guidance capabilities, and conduct spacecraft systems tests and four experiments.

Mission Gemini 6A (01839). DECEMBER 15, 1965. Cape Canaveral manual cancel on the date and time of rendezvous. Gemini 6A caught up to Gemini 7 and rendezvous was technically achieved and stationkeeping begun with the two Gemini spacecraft in zero relative motion at a distance of 110 meters. Stationkeeping maneuvers involving the spacecraft circling each other and approaching and backing off continued for 5 hours, 19 minutes over three and half orbits. This marked the first time two spacecraft were maneuvered with respect to each other by their crews.



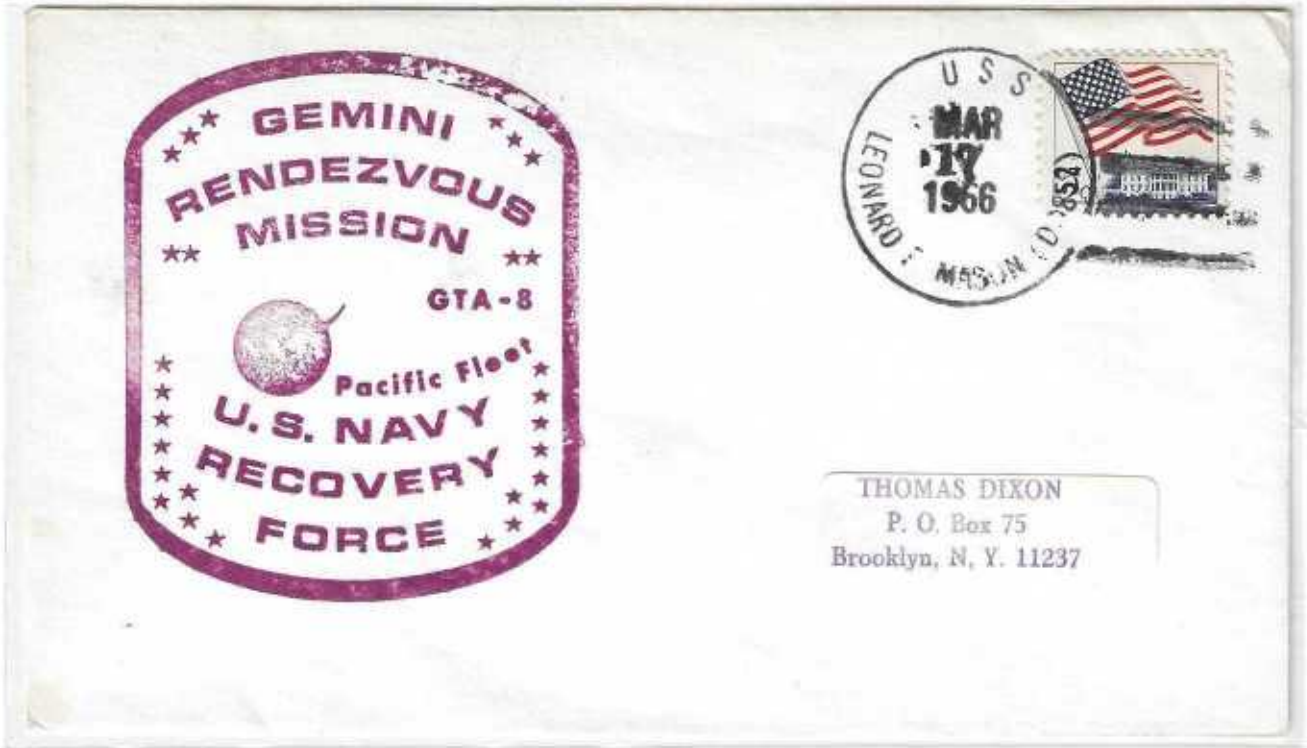
Mission Gemini 6A (01839). DECEMBER 16, 1965. Primary recovery ship USS Wasp machine cancel on the date and time of splashdown. The splashdown occurred only 13 km from the target. This was the first successful controlled reentry to a predeterminet point in the U.S. manned spaceflight program. The recovery and rendezvous section of the spacecraft splashed down in the same area and was retrieved, this was the first time the service section was recovered.

Mission Gemini 6A (01839). DECEMBER 17, 1965. Secondary recovery ship USS Rupertus.

Mission Gemini 7 (01812). DECEMBER 18, 1965. Primary recovery ship USS Wasp machine cancel on the date and time of splashdown.

Mission Gemini 8 (02105). MARCH 16, 1966. Cape Canaveral machine cancel on the date and time of Atlas Agena Target Vehicle (GATV 8) launch. The primary mission objectives were to perform rendezvous and four docking test with the GATV and to execute an EVA experiment.

Mission Gemini 8 (02105). MARCH 16, 1966. Cape Canaveral machine cancel on the date and time of launch. Over the next 6 hours after launch, the spacecraft performed nine maneuvers to rendezvous with GATV, which had been launched earlier. The rendezvous phase ended with the spacecraft 45 meters apart with zero relative motion. Stationkeeping and other maneuvers were performed for about half an hour, and then Gemini 8 moved in and docked with the GATV on the 5th revolution, the first docking ever to take place in space.



Mission Gemini 8 (02105). MARCH 17, 1966. Effective recovery ship USS Mason manual cancel on the date of splashdown. About 27 minutes after docking, the combined vehicle began to go into a violent yaw and tumble. Armstrong disengaged the Gemini capsule from the GATV causing it to roll, pitch, and yaw even more rapidly than when it was connected to the GATV.

Mission Gemini 8 (02105). MARCH 17, 1966. Designated primary recovery ship USS Boxer machine cancel on the date and time of splashdown. In a final attempt to counteract the violent tumbling all 16 Reentry Control System (RCS) thrusters were utilized to damp out the roll. Due to premature use of RCS, an immediate landing was required by Gemini safety rules, so the planned EVA and other activities were cancelled. The GATV remained in orbit and maneuvers were performed by ground command, including successfully placing it into circular orbit.

Mission Gemini 9A (02191). JUNE 1, 1966. Patrick AFB machine cancel on the date and time of ATDA launch. The mission was originally scheduled for launch (as Gemini 9) on 17 May but was postponed when the GATV failed to achieve orbit due to a booster failure earlier that day. The replacement Augmented Target Docking Adapter (ATDA) was launched successfully into Earth orbit on 1 June, but telemetry indicated that the shroud had failed to jettison properly.

THE FLIGHT OF GEMINI 9

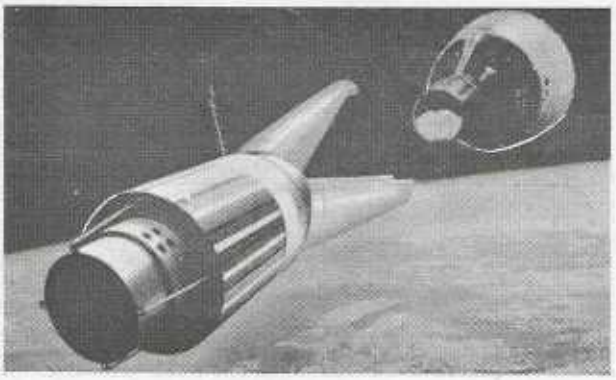
Gemini 9 manned by Thomas P. Stafford and Eugene Cernan takes off from Florida June 3, 1966 mission ... space docking and the longest space walk to date. (Cachet depicts astronaut Cernan in front of Gemini 9s nose during his fantastic space walk)

Electro-Voice
c/o Sarzin
Port Washington, N. Y.

Mission Gemini 9A (02191). JUNE 3, 1966. Cape Canaveral machine cancel on the date and time of launch. Gemini 9 was to launch on 1 June, but ground equipment failure resulted in a postponement until 3 June. It was confirmed that the launch shroud on the ATDA had failed to deploy and was blocking the docking port. The flight plan was then revised to include two equiperiod passive rendezvous maneuvers in place of the docking.

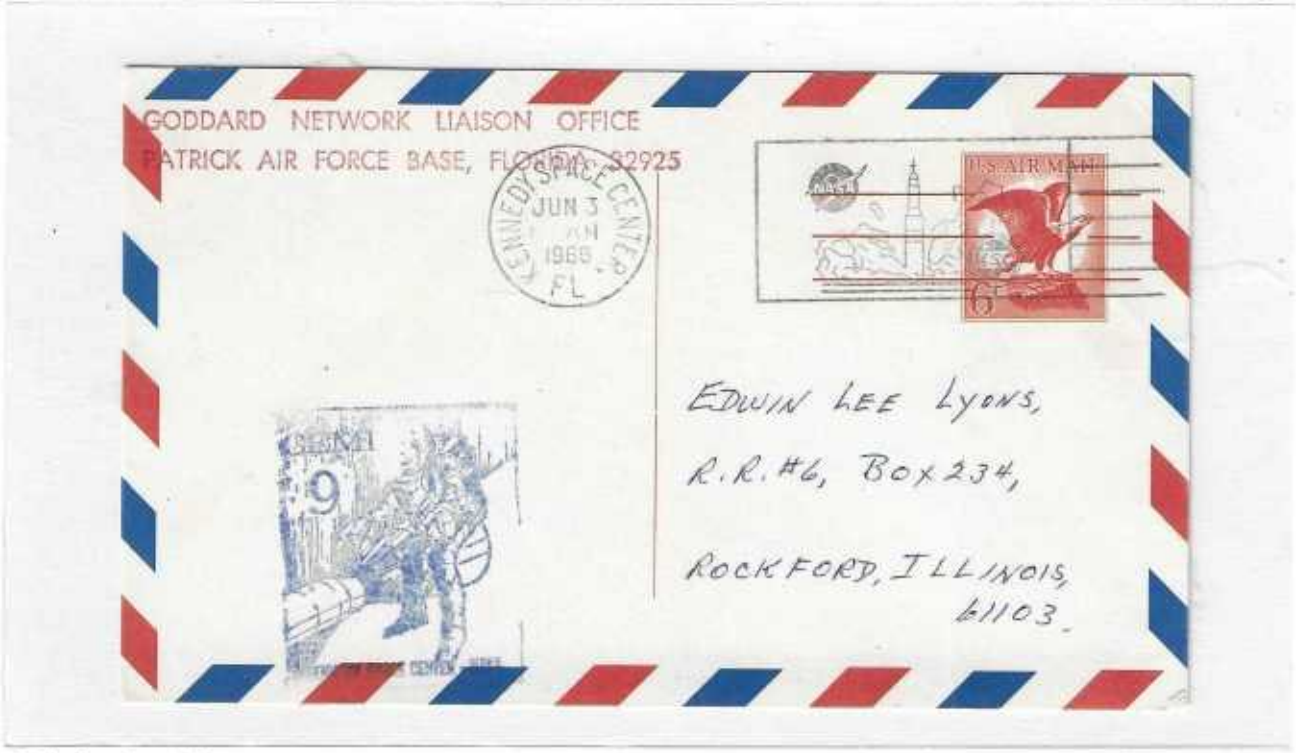
SPACE MEETING GT9

Gemini #9 meets in space on June 3rd with the (ATDA) augmented target docking adapter which had been launched from Cape Canaveral on June 1st. The outer jaws of the shroud had not disengaged but Gemini came to within 3 feet of the target vehicle.

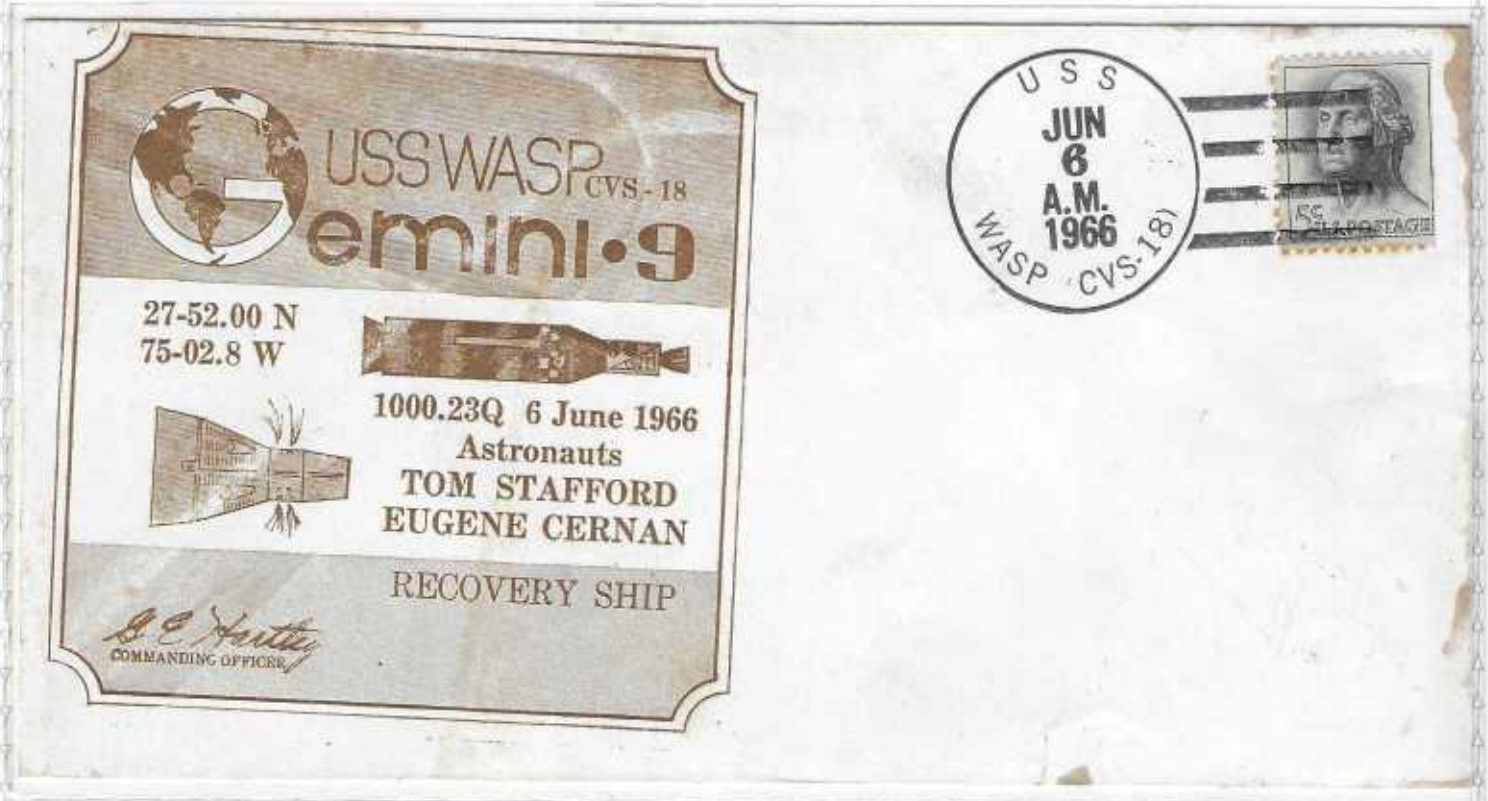


Electro-Voice
c/o Sarzin
Port Washington, N. Y.

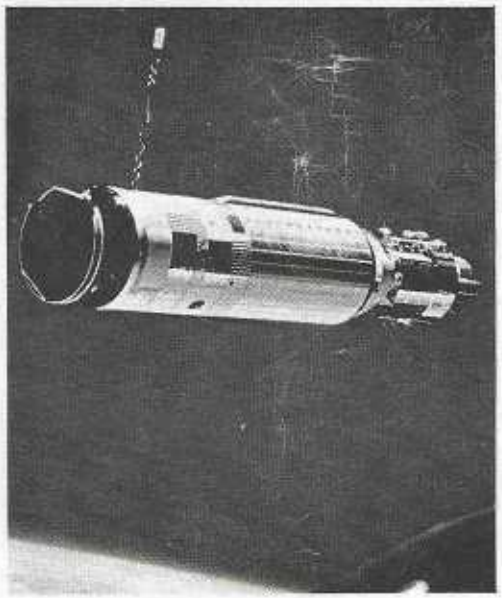
Mission Gemini 9A (02191). JUNE 3, 1966. Cape Canaveral machine cancel on the date and time of 1st rendezvous. Gemini 9A was inserted into a 158,8 x 266,9 km orbit. After three orbital maneuvers, rendezvous within 8 meters of the ATDA was achieved on the third revolution.



Mission Gemini 9A (02191). JUNE 3, 1966. KSC machine cancel on the date and time of 1st rendezvous. The second, a rendezvous from above simulating rendezvous of an Apollo Command Module with a Lunar Module after abort from the Moon, was completed on 4 June, before the final departure from the ATDA. On 5 June, Cernan was out of the spacecraft and finally moved to the back of the capsule where the Astronaut Maneuvering Unit (AMU) was mounted. The task of donning the AMU took " four to five times more work than anticipated ", overwhelming Cernan's environmental control system and causing his faceplate to fog up, limiting his visibility.



Mission Gemini 9A (02191). JUNE 6, 1966. Primary recovery ship USS Wasp manual cancel on the date and time of splashdown.

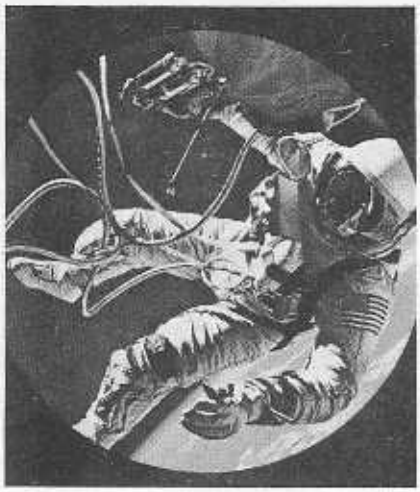


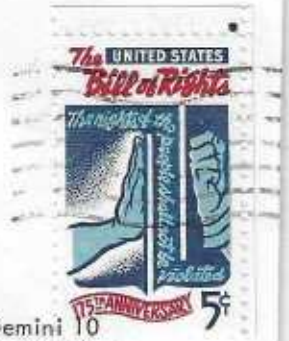
TAKEOFF OF AGENA 10

Takeoff on the button of Agena 10 which will link up in space with John Young and Michael Collins' Gemini 10 and provide the additional thrust needed to rocket the astronauts into a 440 mile orbit, the highest man has ever gone before.

CLYDE J. SARZIN
PORT WASHINGTON, L. I.
NEW YORK, U.S.A.

Mission Gemini 10 (02349). JULY 18, 1966. Patrick AFB machine cancel on the date and time of GATV 10 launch. Its primary purpose was to conduct rendezvous and docking tests with the GATV. The mission plan included a rendezvous with the Gemini 8 Agena Target, two Eva excursion, and the performance of 15 scientific, technological, and medical experiments.





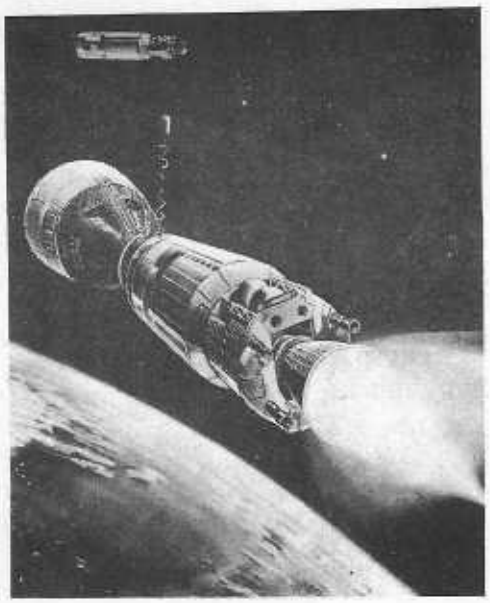
Perfect takeoff of the United States Gemini 10 with astronauts John Young and Michael Collins. Purpose a double rendezvous in space. Link up with Agena 10 and space meeting with Agena 8.

Michael Collins

John Young

Electro-Voice
c/o Sarzin
Port Washington, N. Y.

Mission Gemini 10 (02349). JULY 18, 1966. Cape Canaveral machine cancel on the date and time of launch. At orbit insertion, Gemini 10 was about 1600 km behind the GATV-10 which had been launched into a near circular orbit about 100 minutes earlier. Rendezvous and docking were achieved on the 4th revolution. To conserve fuel, Gemini 10 remained docked to GATV-10 for the next 39 hours and used the GATV propulsion system for maneuvers.



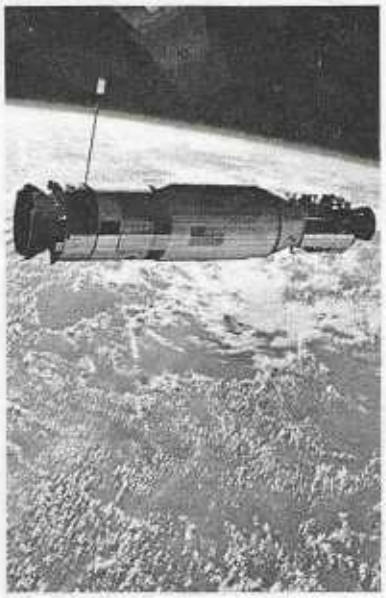
Gemini 10 with astronauts John Young and Michael Collins meets in space and links up with Agena 10 and rockets off into a 440 mile high orbit.

Electro-Voice
c/o Sarzin
Port Washington, N. Y.

Mission Gemini 10 (02349). JULY 18, 1966. Cape Canaveral machine cancel on the date and time of docking. While the spacecraft were docked, on 19 July, a second burn of GATV-10 brought the spacecraft into same orbit as the GATV-8. On 20 July, Gemini 10 separated from GATV-10. A series of maneuvers using its own thrusters brought Gemini 10 within about 15 meters of GATV-8.

RUTH E. BROWN
14917 BLEDSOE STREET
SYLMAR, CALIFORNIA 91342

Mission Gemini 10 (02349). JULY 21, 1966. Primary recovery ship USS Guadalcanal manual cancel on the date and time of splashdown. Partway into the standup EVA, Young and Collins began to experience severe eye irritation and Young ordered termination of the EVA. During the second EVA, Collins left the spacecraft attached to an umbilical cord and travelled to the GATV-8. He also retrieved the micrometeorite experiment, mounted on the Gemini 10 spacecraft, which was lost when Collins reentered the capsule. During the EVA he lost his camera.



SUCCESSFUL LAUNCHING OF AGENA #11

Purpose to link-up in space on its first orbit with Conrad and Gordon's Gemini #11.

Electro-Voice
c/o Sarzin
Port Washington, N. Y.

Mission Gemini 11 (02415). SEPTEMBER 12, 1966. Cape Canaveral machine cancel on the date and time of GATV 11 launch. The 3-days mission was designed to achieve a first orbit rendezvous and docking with the Agena Target Vehicle, to accomplish two EVA, to perform docking practice, docked configuration maneuvers, tethered operations, parking of the GATV, and demonstrate an automatic reentry. There were also eight scientific and four technological experiments on board.

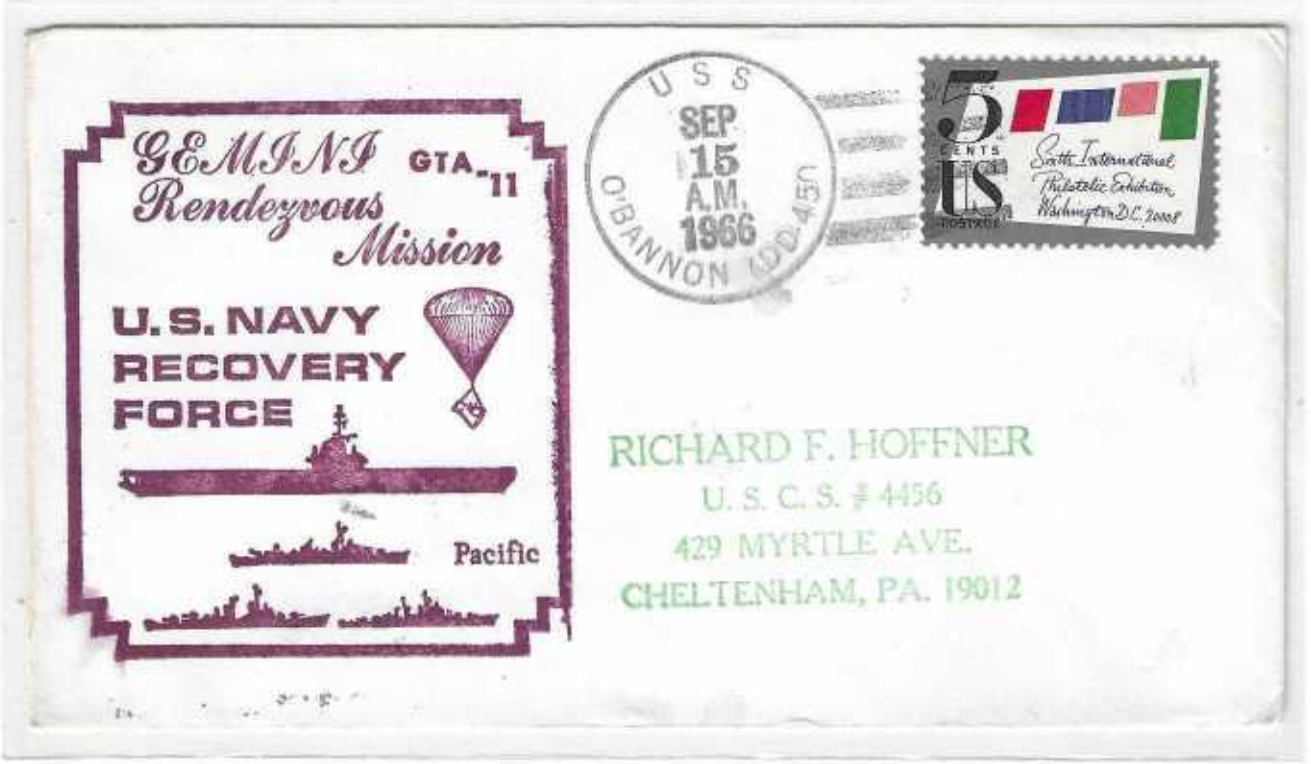
GEMINI #11 FLIGHT

By Charles Conrad and Richard Gordon. Purpose to link up with Agena #11 on first orbit.

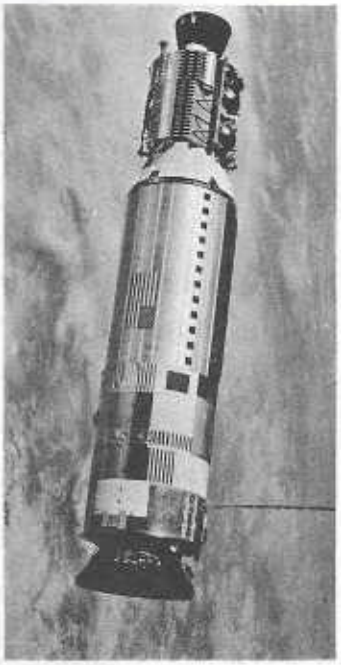
Electro-Voice
c/o Sarzin
Port Washington, N. Y.

Mission Gemini 11 (02415). SEPTEMBER 12, 1966. Cape Canaveral machine cancel on the date and time of launch. The GATV 11 had been launched an hour and a half before Gemini. Five spacecraft maneuvers were made to rendezvous with the GATV. Docking was completed on the first orbit, consuming less fuel than expected. Each astronaut then conducted two docking exercises with the GATV. The sleep period was spent in docked configuration.

Mission Gemini 11 (02415). SEPTEMBER 15, 1966. Primary recovery ship USS Guam manual cancel on the date and time of splashdown. On 14 September the spacecrafts were undocked and Gemini 11 moved to the end of the 30 meter tether attaching the two spacecrafts. The circular motion at the end of the tether imparted a slight artificial " gravitational acceleration " within Gemini 11, the first time such artificial gravity was demonstrated in space. This was the first closed-loop, automatic reentry (guided by computer commands directly to the thrusters) in the U.S. Space Program.



Mission Gemini 11 (02415). SEPTEMBER 15, 1966. Secondary recovery ship USS O' Bannon manual cancel on the date and time of splashdown.



AGENA 12

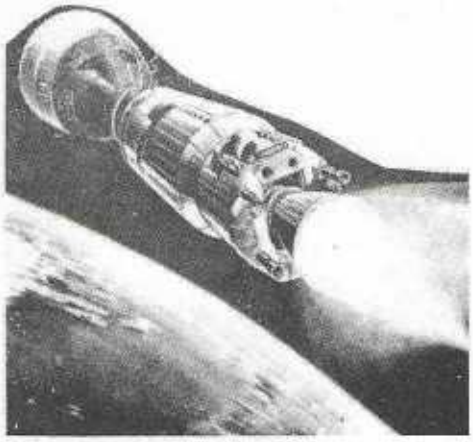
Takeoff of Agena 12 destined to meet in space with Gemini #12 perfect success.

Electro-Voice
c/o Sarzin
Port Washington, N. Y.

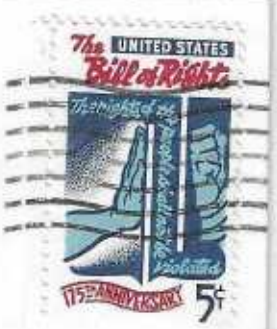
Mission Gemini 12 (02566). NOVEMBER 11, 1966. Cape Canaveral machine cancel on the date and time of GATV 12 launch. Gemini 12 was the tenth and final flight of the Gemini series, which bridged the Mercury and Apollo Programs. This mission was scheduled to perform rendezvous and docking with the GATV, to conduct three EVA operations, to conduct a tethered stationkeeping exercise, to perform docked maneuvers using the Agena Propulsion System to change orbit, and demonstrate an automatic reentry. There were also 14 scientific, medical, and technological experiments on board.

Mission Gemini 12 (02566). NOVEMBER 11, 1966. Cape Canaveral manual cancel on the date and time of launch. Two phasing maneuvers using the GATV secondary propulsion system were accomplished to allow the spacecraft to rendezvous with the November 12 total eclipse over South America with the crew taking pictures throught the spacecraft windows. During the second EVA, on 13 November, Aldrin attached a 30 meter long tether stowed in the GATV adapter to the Gemini adapter bar.

SPACE MEETING AND COUPLING UP
OF GEMINI #12 AND AGENA #12



CAPE CANAVERAL FL
NOV 11
PM
1966
32920



Rendezvous was carried out as scheduled on the third orbit about three and three quarter hours after lift-off. Radar was used to locate the target vehicle.

Electro-Voice
c/o Sarzin
Port Washington, N. Y.

Mission Gemini 12 (02566). NOVEMBER 11, 1966. Cape Canaveral machine cancel on the date and time of docking. Gemini 12 undocked from the GATV, moved to the end of the tether, and began the tether experiment by moving in a circular orbit about the GATV. The tether tended to remain slack, but the crew believed the two craft slowly attained gravity-gradient stabilization.

B707

U.S.S. WASP
NOV15
PM
1966
CVS 18

Mission Gemini 12 (02566). NOVEMBER 15, 1966. Primary recovery ship USS Wasp machine cancel on the date and time of splashdown.

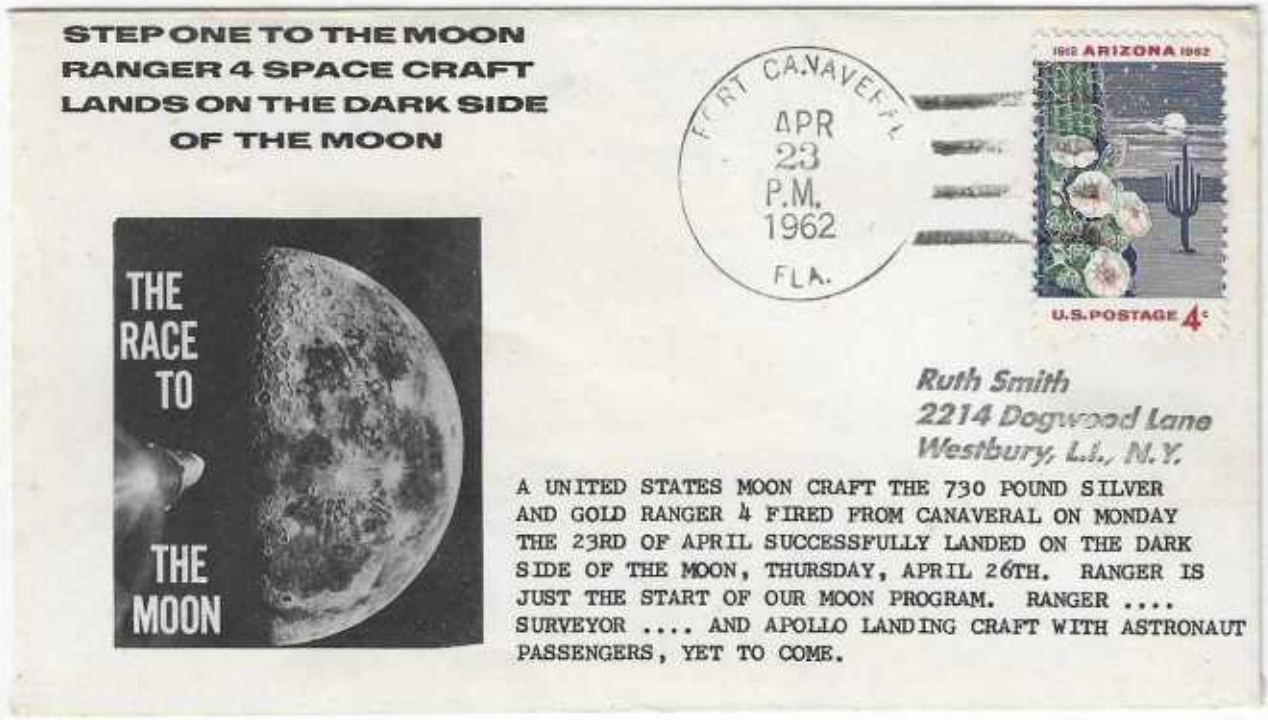
U.S. LUNAR SPACE PROBES : THE PIONEER 1 AND 8

Mission Pioneer 1. OCTOBER 11, 1958. Port Canaveral manual cancel on the date and time of launch. Pioneer 1, the second and most successful of three Project Able space probes, and the first spacecraft launched by the newly formed NASA, was intended to study the ionizing radiation, cosmic rays, magnetic fields, and micrometeorites in the vicinity of the Earth and in a lunar orbit. The spacecraft did not reach the Moon as planned, due to an incorrectly set valve in the upper stage.

Mission Pioneer 8. DECEMBER 13, 1967. Cape Canaveral machine cancel on the date and time of launch. The Pioneer 8 spacecraft, launched into a heliocentric orbit, first crossed the geomagnetic tail at a downstream distance of 500-800 R (E) as it left the Earth-Moon system, and during a two-week period centered on January 23, 1968, the magnetometer, plasma probe, and plasma wave instrument all detected specific tail-related phenomena. The spacecraft was last tracked successfully on August 22, 1996.

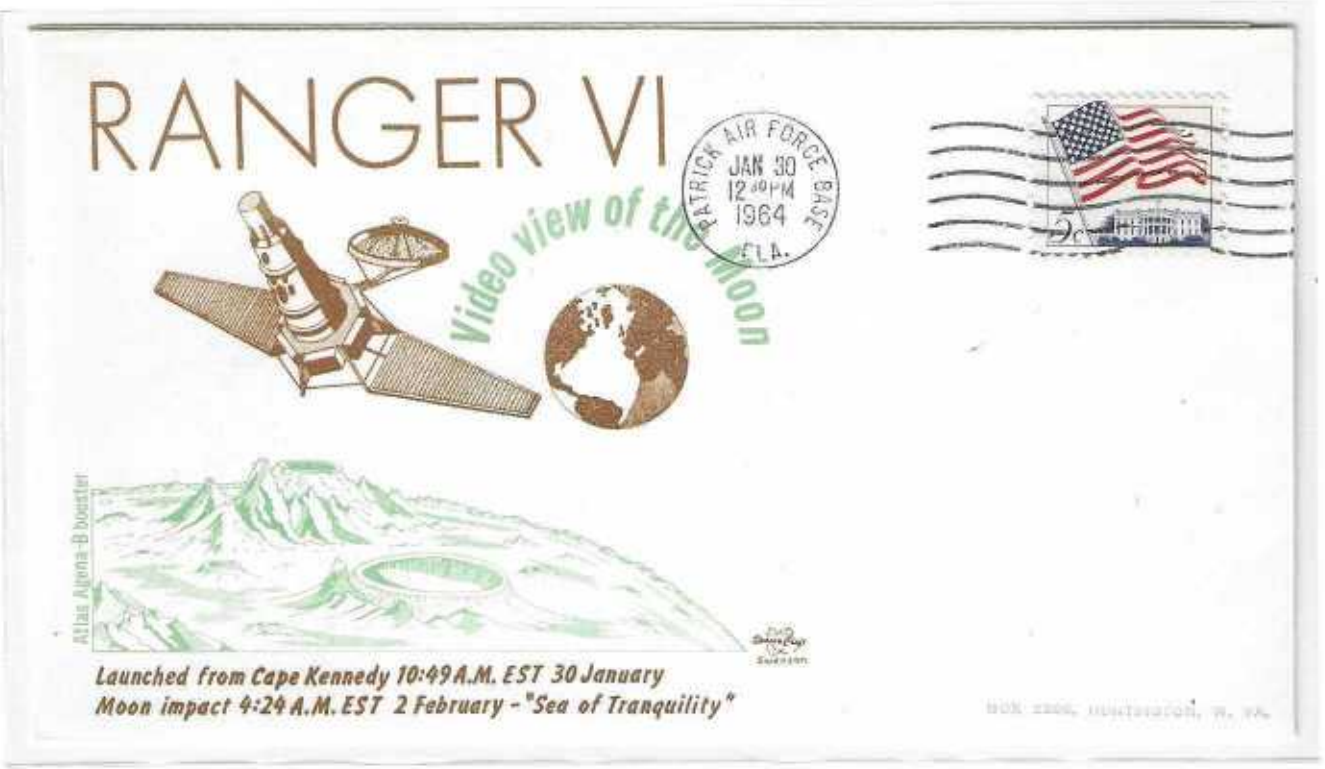
U.S. LUNAR SPACE PROBES : THE RANGER

Mission Ranger 3. JANUARY 26, 1962. Patrick AFB machine cancel on the date and time of launch. Ranger 3 was designed to continue testing of the Ranger Program for development of lunar and interplanetary spacecraft, to boosted towards the Moon by an Atlas/Agena the spacecraft, to transmit pictures of the lunar surface to Earth stations during a period of 10 minutes of flight, prior to impacting on the Moon. The basic vehicle was 3.1 m high and consisted of a lunar capsule, 65 cm in diameter, a mono-propellant mid-course motor, a 5080-pound thrust retrorocket, and a base 1.5 m in diameter. Attached to the base a large high-gain dish antenna and two wing-like solar panels. A malfunction in the booster guidance system resulted in excessive spacecraft speed . Ranger 3 missed the Moon by approximately 36,800 km on Jan. 28, and is now in a heliocentric orbit.



Mission Ranger 4. APRIL 23, 1962. Port Canaveral manual cancel on the date and time of launch. An onboard computer failure caused failure of the deployment of the solar panels and navigation systems. The spacecraft impacted on the far side of the Moon, without returning any scientific data, on April 26, 1962, after 64 hours of flight.

Mission Ranger 5. OCTOBER 18, 1962. Cape Canaveral manual cancel on the date and time of launch. Due to an unknow malfunction after injection into lunar trajectory from Earth parking orbit, the spacecraft failed to receive power. The batteries ran down after 8 hours, 44 minutes, rendering the spacecraft inoperable. Ranger 5 missed the Moon by 725 km. Gamma-ray data were collected for 4 hours prior to the loss of power. It is now in a heliocentric orbit.



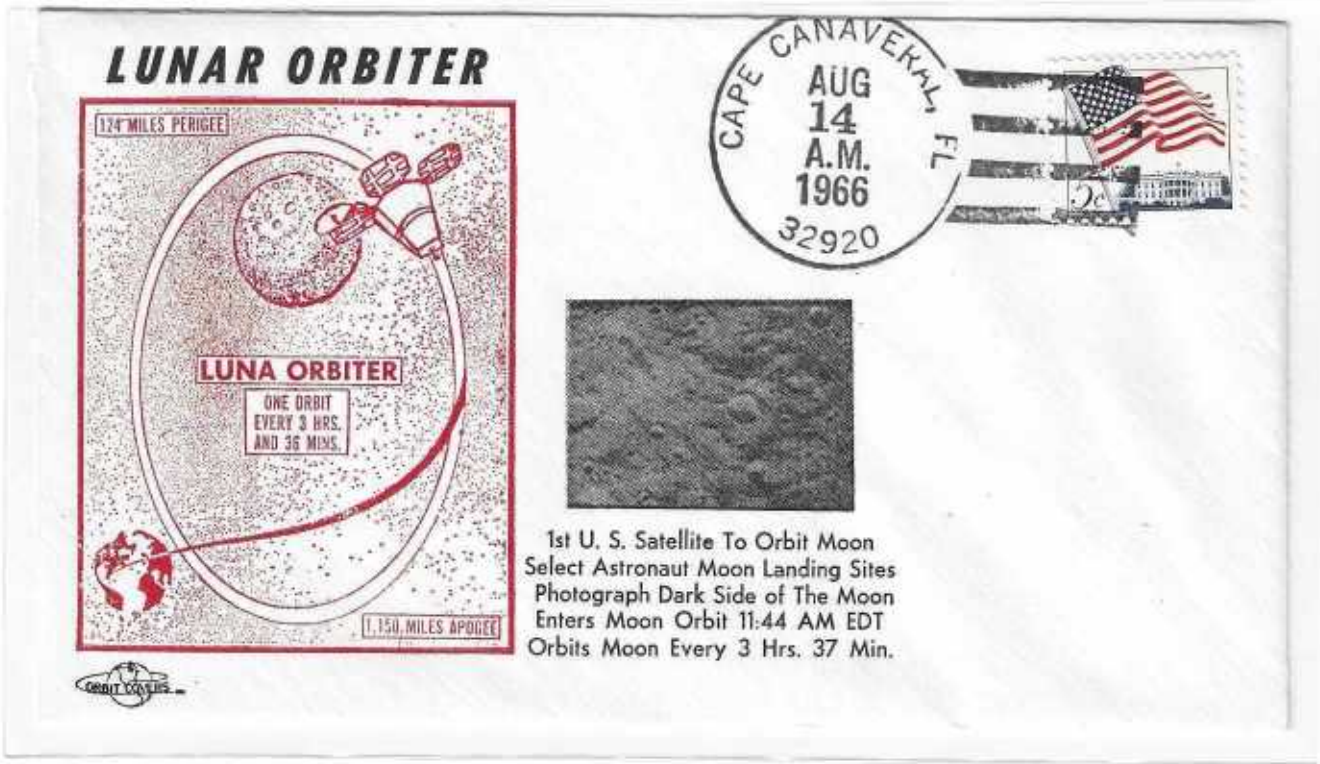
Mission Ranger 6. JANUARY 30, 1964. Patrick AFB machine cancel on the date and time of launch. The spacecraft carried six television vidicon cameras, two full-scan cameras, and four partial scan cameras. On February 2, 1964, Ranger 6 impacted the Moon on the eastern edge of Mare Tranquillitatis. A review board determined the most likely cause of failure was due to an arc-over in the TV power system when it inadvertently turned on for 67 seconds approximately 2 minutes after launch during the period of booster-engine separation.

Mission Ranger 7. JULY 28, 1964. Cape Canaveral machine cancel on the date and time of launch. Ranger 7 reached the Moon on 31 July. The F-channel began its one minute warm up 18 minutes before impact. The first image was taken at an altitude of 2,110 km. Transmission of 4,308 photographs of excellent quality occurred over the final 17 minutes of flight. The final image taken before impact has a resolution of 0.5 m. Ranger 7 impacted in an area between Mare Nubium and Oceanus Procellarum.

Mission Ranger 8. FEBRUARY 17, 1965. Cape Canaveral manual cancel on the date and time of launch. On 18 February, at a distance of 160,000 km from Earth, the planned mid-course maneuver took place. The telemetry dropout had no serious effects on the mission. Transmission of 7,137 photographs of good quality occurred over the final 23 minutes of flight. The final image taken before impact has a resolution of 1.5 m. After 64.9 hours of flight, impact occurred in Mare Tranquillitatis.

Mission Ranger 9. MARCH 21, 1965. Cape Canaveral manual cancel on the date and time of launch. Ranger 9 reached the Moon on 24 March, 1965. The first image was taken at an altitude of 2,363 km. Transmission of 5,814 good contrast photographs was made during the final 19 minutes of flight. The final image taken before impact has a resolution of 0.3 meters. The spacecraft performance was excellent. Real time television coverage with live network broadcasts of many of the F-channel images were provided for this flight. Impact occurred in the crater Alphonsus at a velocity of 2.67 km/s.

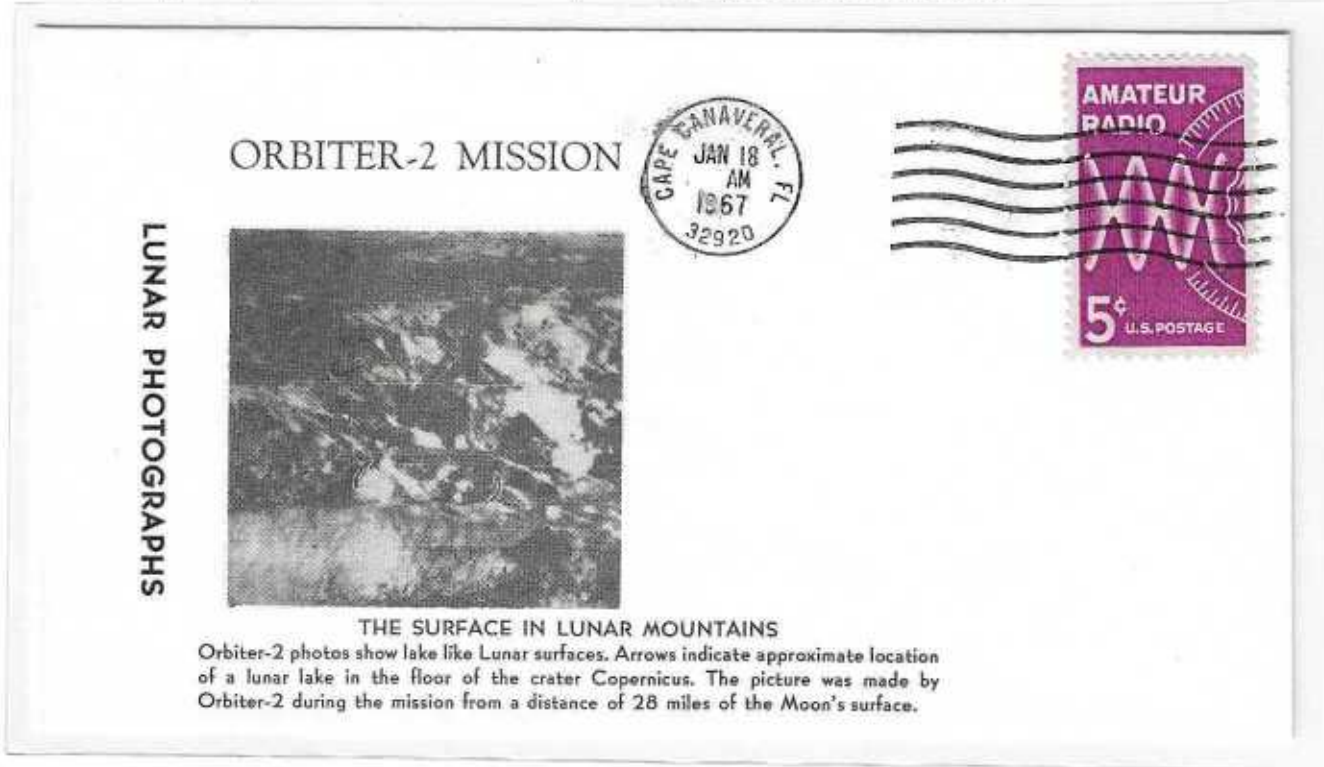
U.S. LUNAR SPACE PROBES : THE LUNAR ORBITER



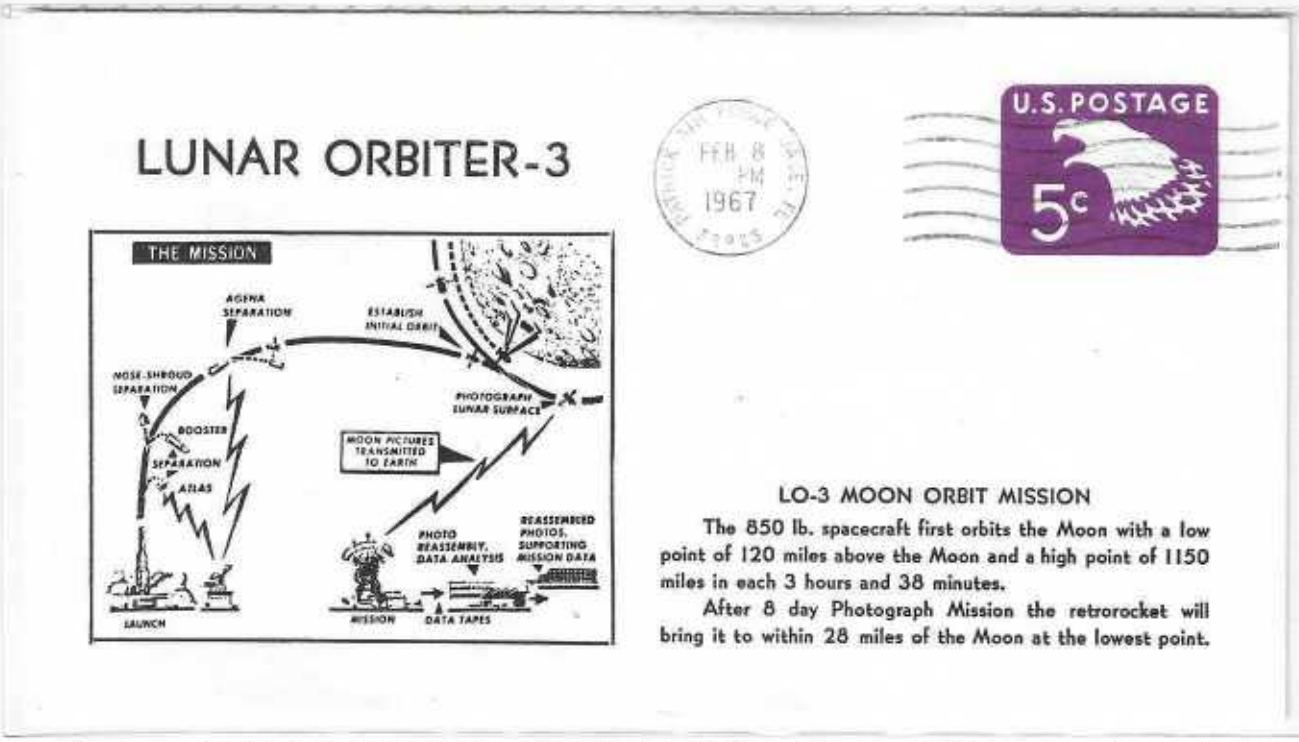
Mission Lunar Orbiter 1. AUGUST 14, 1966. Cape Canaveral manual cancel. Launched on August 10, 1966, Lunar Orbiter 1 was injected into an elliptical near-equatorial lunar orbit 92,1 hours after launch. The spacecraft was designed primarily to photograph smooth areas of the lunar surface for selection and verification of safe landing sites for the Surveyor and Apollo missions. NASA planned launches of a series of 3-axis-stabilized spacecraft with four solar panels and a main engine for lunar orbit insertion. The primary instrument on board was a 68- kg Eastman-Kodak Imaging System. During its mission, the probe took 207 frames, covering an area of 5.18 million square km. Crash onto the lunar surface on 29 October 1967.

Mission Lunar Orbiter 2. NOVEMBER 7, 1966. Cape Canaveral manual cancel. Launched on November 6, 1966, Lunar Orbiter 2 entered into a terrestrial parking orbit.

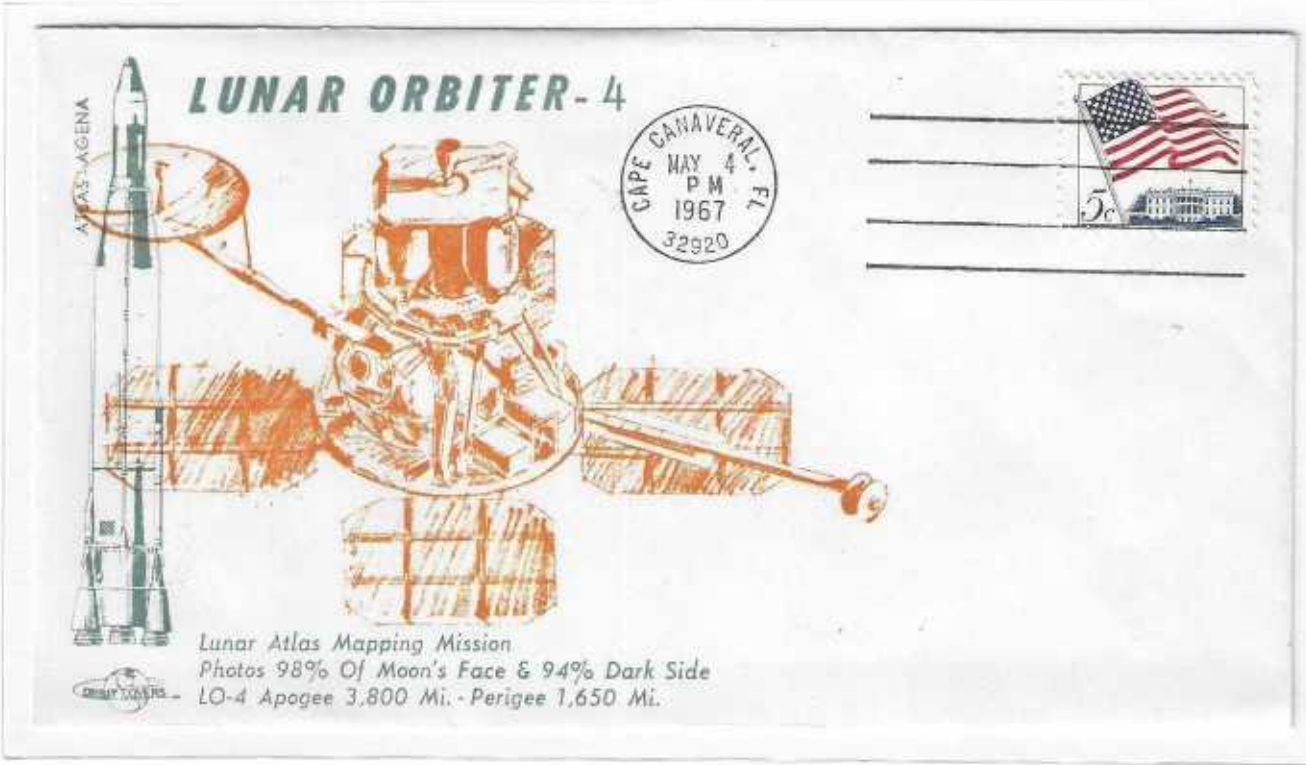
Mission Lunar Orbiter 2. NOVEMBER 10, 1966. Cape Canaveral machine cancel. The spacecraft was placed in a cislunar trajectory and injected into an elliptical near-equatorial lunar orbit for data acquisition after 92,5 hours flight time. The spacecraft was also equipped to collect selenodetic, radiation intensity, and micrometeoroid impact data. On 8 December 1966, the orbit inclination was altered to provide new data on lunar gravity. The perilune was lowered to 49,7 km five days later, after 33 orbits.



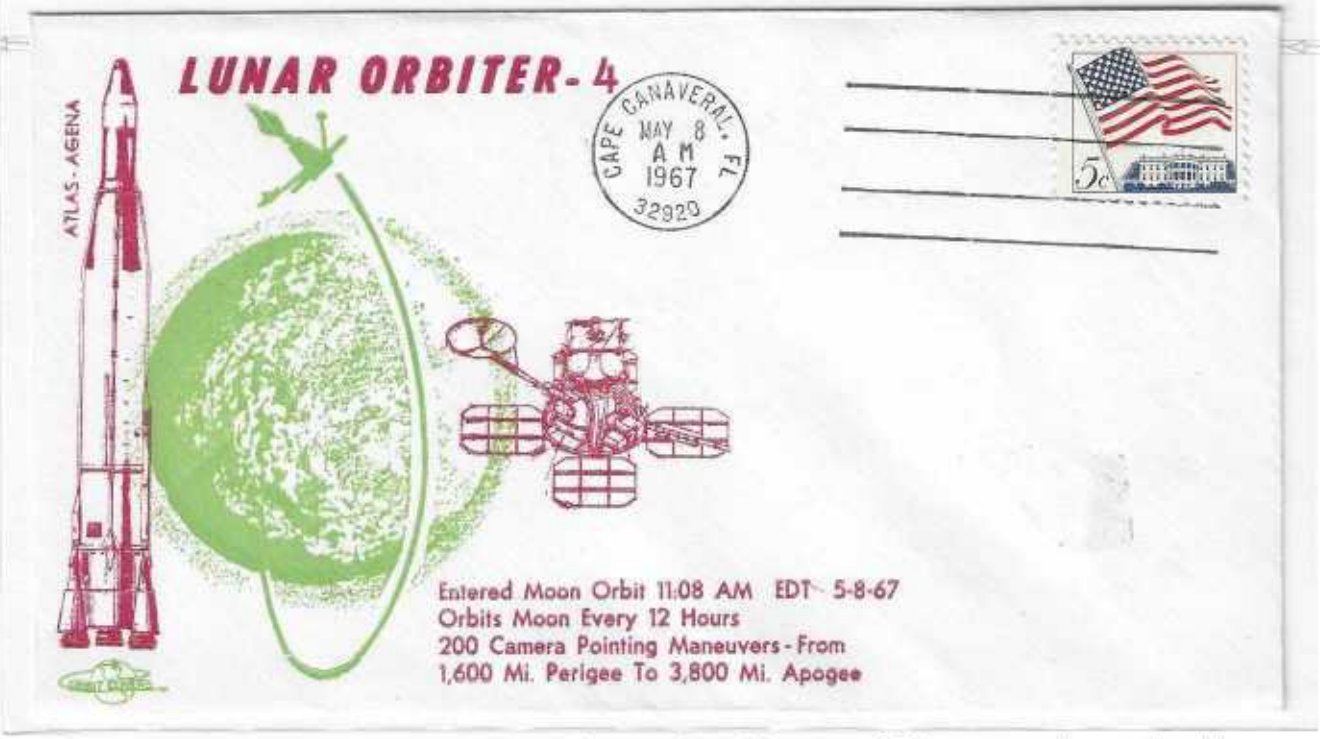
Mission Lunar Orbiter 2. JANUARY 18, 1967. Cape Canaveral machine cancel on the date and time of lunar orbits. The spacecraft acquired photographic data from November 18 to 25, 1966, and readout occurred through December 7, 1966. A total of 609 high resolution and 208 medium resolution frames were returned, most of excellent quality with resolutions down to 1 meter. The spacecraft was used for tracking purpose until it impacted the lunar surface on October 11, 1967.



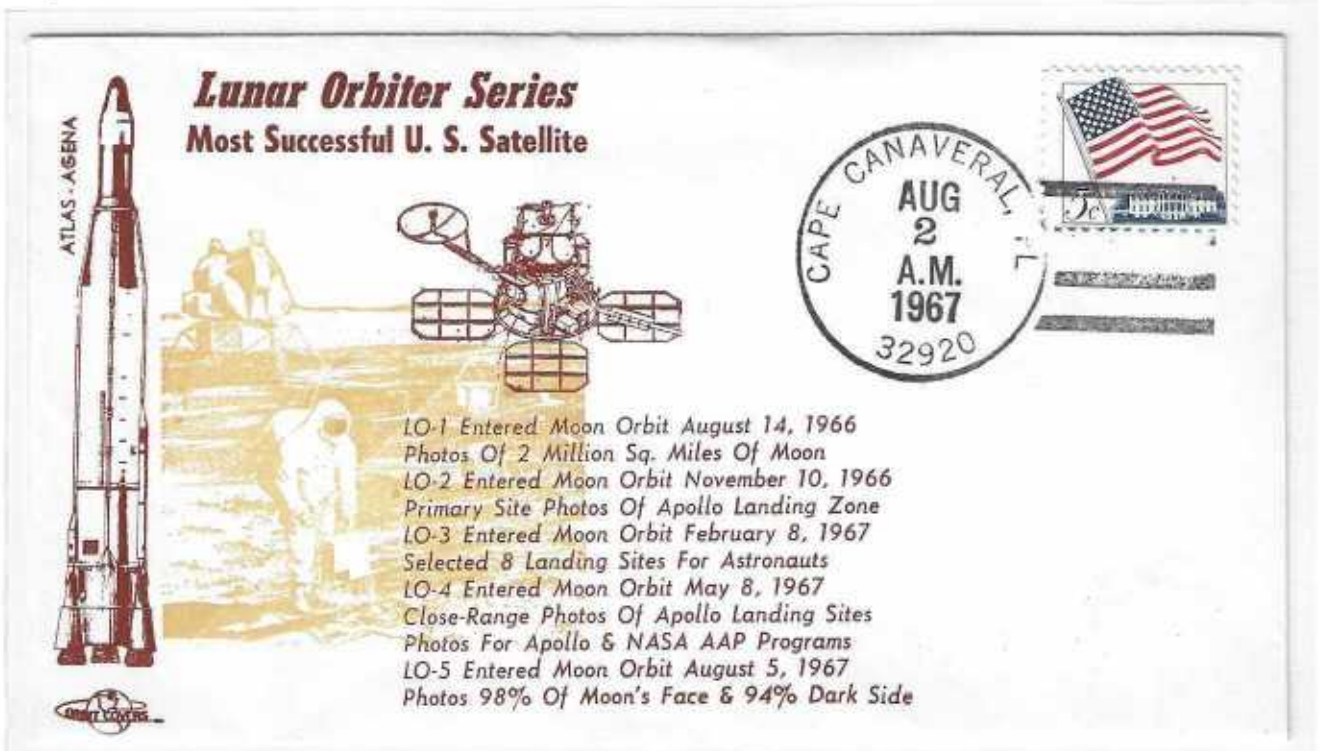
Mission Lunar Orbiter 3. FEBRUARY 8, 1967. Patrick AFB machine cancel. The spacecraft was placed in a cislunar trajectory and injected into an elliptical near-equatorial lunar orbit on 8 February. The orbit was 210,2 km x 1801,9 km, with an inclination of 20.9 degrees and a period of 3 hours, 25 minutes. After four days (25 orbits) of tracking the orbit was changed to 55 km x 1847 km. The spacecraft acquired photographic data from February 15 to 23, 1967, and readout occurred through March 2, 1967. A total of 149 medium resolution and 477 high resolution frames were returned. Included was a frame of Surveyor 1 landing site, permetting identification of the location of the spacecraft on the surface. The spacecraft was used for tracking purposes until it impacted the lunar surface on October 9, 1967.



Mission Lunar Orbiter 4. MAY 4, 1967. Cape Canaveral machine cancel on the date and time of launch. The spacecraft was designed to take advantage of the fact that the three previous lunar orbiters had completed the required needs for Apollo mapping and site selection, increasing the scientific knowledge of their nature, origin, and processes. The elliptical near-polar high lunar orbit was 2706 km x 6111 km with an inclination of 85.5 degrees and a period of 12 hours.

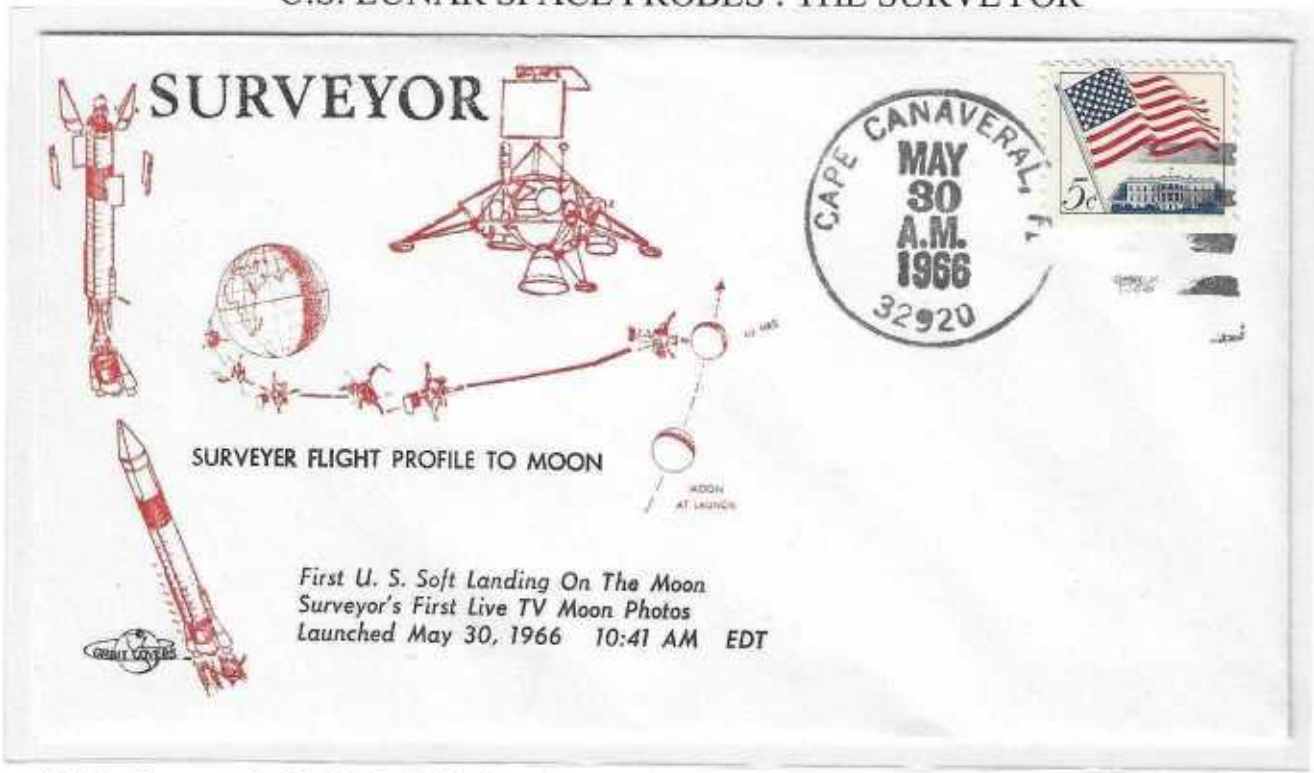


Mission Lunar Orbiter 4. MAY 8, 1967. Cape Canaveral machine cancel. The spacecraft was placed in a cislunar trajectory and injected into an elliptical near-polar high lunar orbit for data acquisition. After initial photography on May 11, 1967, problems with the camera's thermal door and with the readout drive mechanism starting and stopping resulted in a decision to terminate the photographic portion of the mission on 26 May. A total of 419 high resolution and 127 medium resolution frames were acquired covering 99% of the Moon's near side at resolution from 58 meters to 134 meters. Due to the natural decay of the orbit, it impacted the lunar surface no later than October 31, 1967.

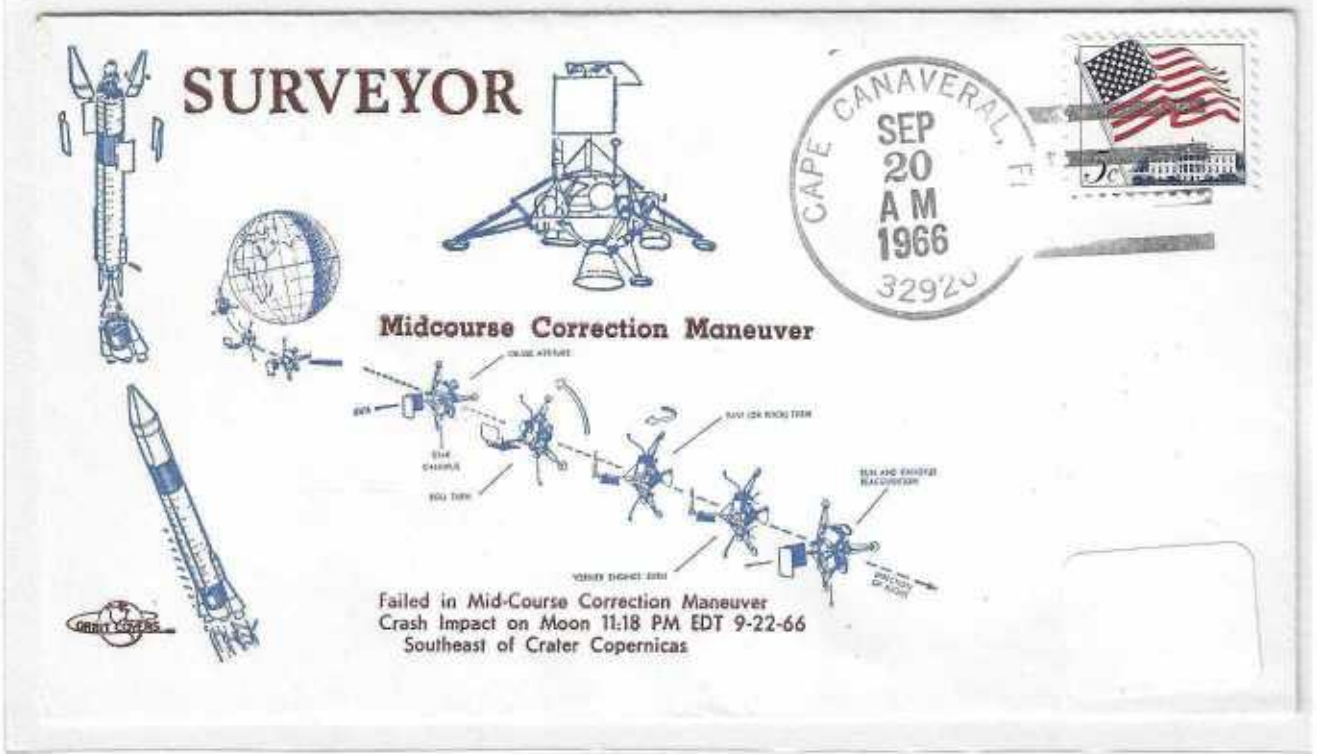


Mission Lunar Orbiter 5. AUGUST 2, 1967. Cape Canaveral manual cancel. Launched on August 1, 1967, the spacecraft entered into a terrestrial parking orbit. The last of the Lunar Orbiter series was designed to take additional Apollo and Surveyor landing site photographic and to take broad survey images of unphotographed parts of the Moon's far side. The spacecraft acquired photographic data from August 6to 18, 1967, and readout occurred until August 27, 1967. A total of 633 high resolution and 211 medium resolution frames at resolution down to 2 meters were acquired, bringing the cumulative photographic coverage by the five lunar orbiters to 99% of the Moon's surface. The spacecraft was tracked until it impacted the lunar surface on command on January 31, 1968.

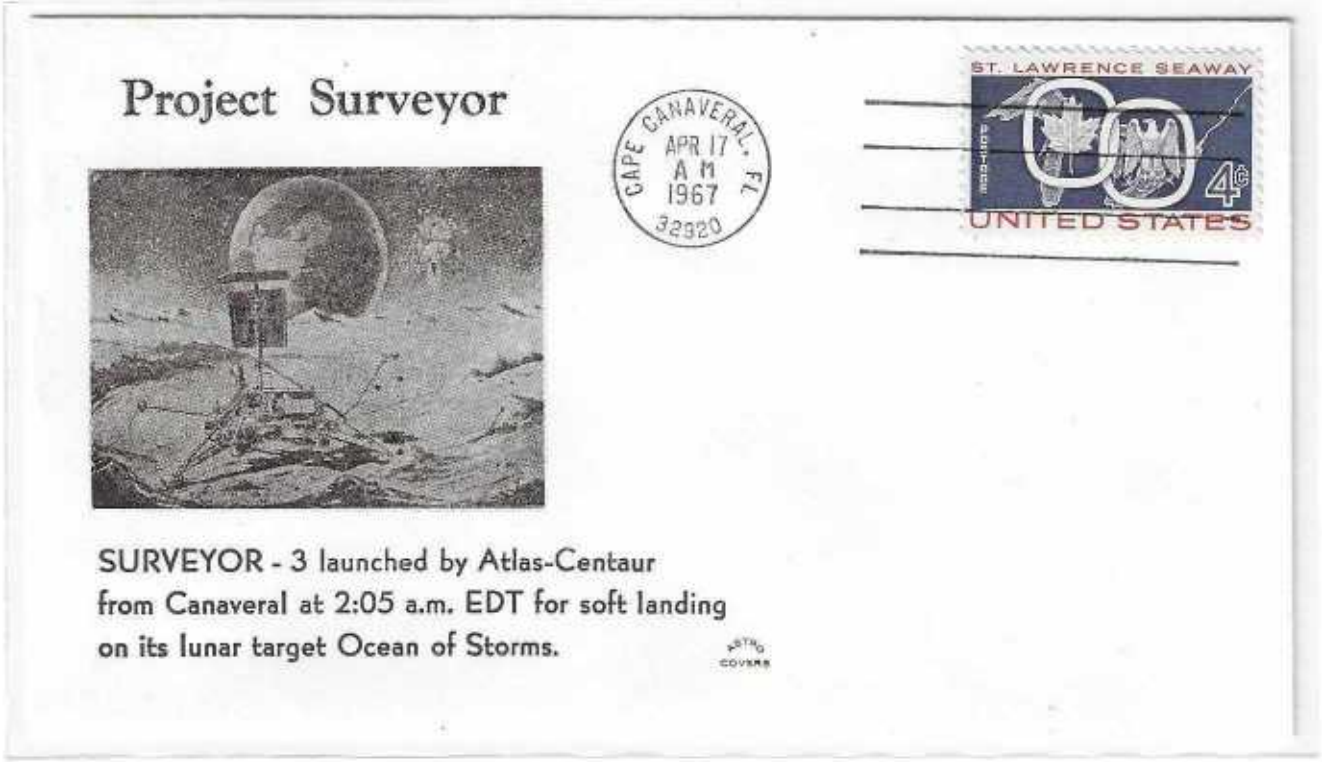
U.S. LUNAR SPACE PROBES : THE SURVEYOR



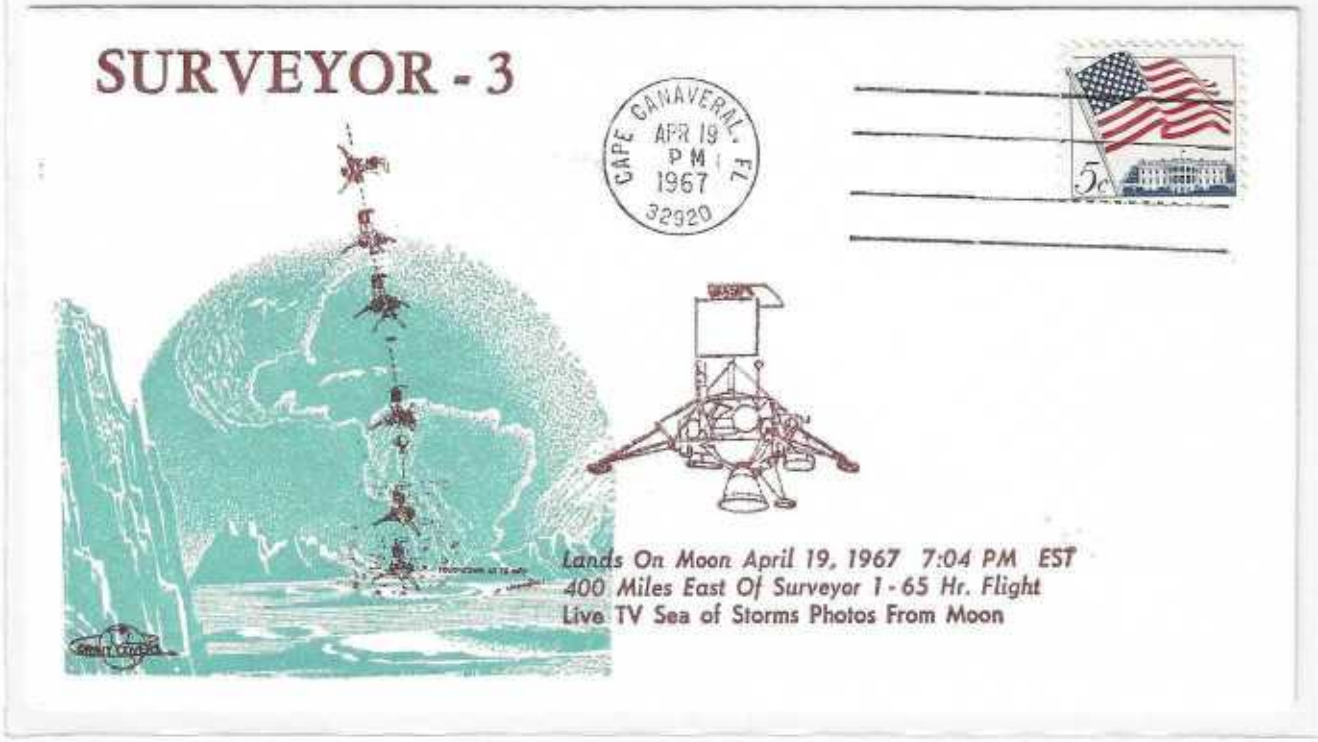
Mission Surveyor 1. MAY 30, 1966. Cape Canaveral manual cancel on the date and time of launch. First spacecraft launched in the Surveyor Program, a series of seven robotic lunar softlanding flights. Surveyor 1 was launched on an Atlas/Centaur and, about 63 hours after launch, reached the Moon in southwest Oceanus Procellarum. The mission was considered a complete success and demonstrate the technology necessary to achieve landing and operation on the lunar surface. Photography session were performed and the television system transmitted pictures of the spacecraft footpad and surrounding lunar terrain and surface materials.



Mission Surveyor 2. SEPTEMBER 20, 1966. Cape Canaveral manual cancel on the date and time of launch. The target area proposed was within Sinus Medii. Surveyor 2 was also equipped to return data on radar reflectivity of the lunar surface, bearing strength of the lunar surface, and spacecraft temperatures for use in the analysis of lunar surface temperatures. During the midcourse maneuver, one vernier engine failed to ignite, causing the spacecraft to tumble. It impacted the Moon on 23 September 1966.



Mission Surveyor 3. APRIL 17, 1967. Cape Canaveral machine cancel on the date and time of launch. Unlike the previous missions, Surveyor 3 began its mission from parking orbit around Earth with a burn from the Centaur upper stage, now capable of multiple firings. Basic inertial control ensured that Surveyor 3 landed on the lunar surface with minimal vertical velocity on 20 April 1967 in the southeastern region of Oceanus Procellarum. A fairly strong sideways motion made the lander hop twice before coming to a standstill.



Mission Surveyor 3. APRIL 19, 1967. Cape Canaveral machine cancel on the date and time of insertion into the lunar orbit. Less than an hour after landing, the spacecraft began transmitting the first of 6,326 TV pictures of the surrounding areas. For the first time, the lander carried a soil-sampling instrument (The Soil Mechanics Surface Sampler) that could reach up to 1,5 meters from it and dig up to 0,5 meters deep.

CAPE CANAVERAL, FL APR 20 A M 1967 32920

SURVEYOR-3

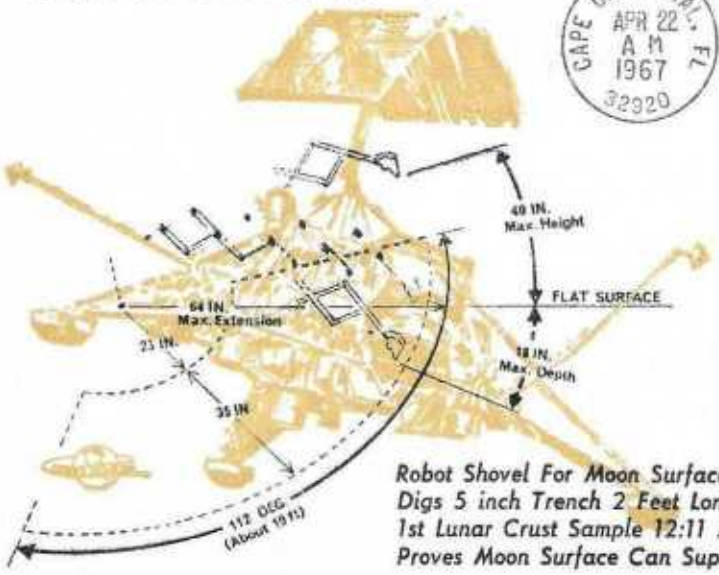
FIRST DAY COVER

Landed on Moon at 7:04 p.m. EST April 19, 1967
in one deep crater, area Ocean of Storms.
This photo was made from Apollo-12 Astronauts.

Mission Surveyor 3. APRIL 20, 1967. Cape Canaveral machine cancel on the date and time of lunar landing. The most exciting experiment was the deployment of the Remote Scooper Arm which, via commands from Earth, dug four trenches and performed four bearing tests and thirteen impact tests based on these experiments, scientists concluded that lunar soil had a consistency similar to wet sand, with a bearing strength of 0,7 kg per square centimeter-solid enough for an Apollo Lunar Module. Last contact was made on 4 May 1967, two days after the lunar night began.

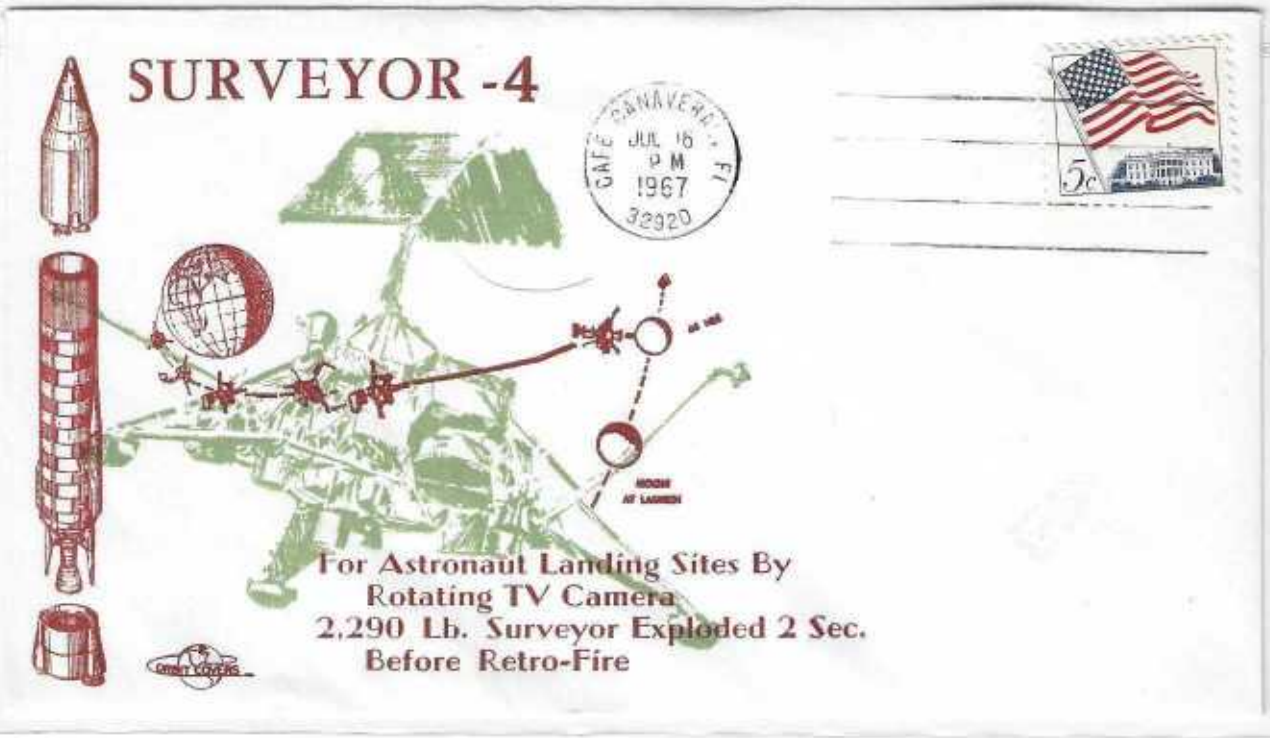
SURVEYOR - 3

CAPE CANAVERAL, FL APR 22 A M 1967 32920



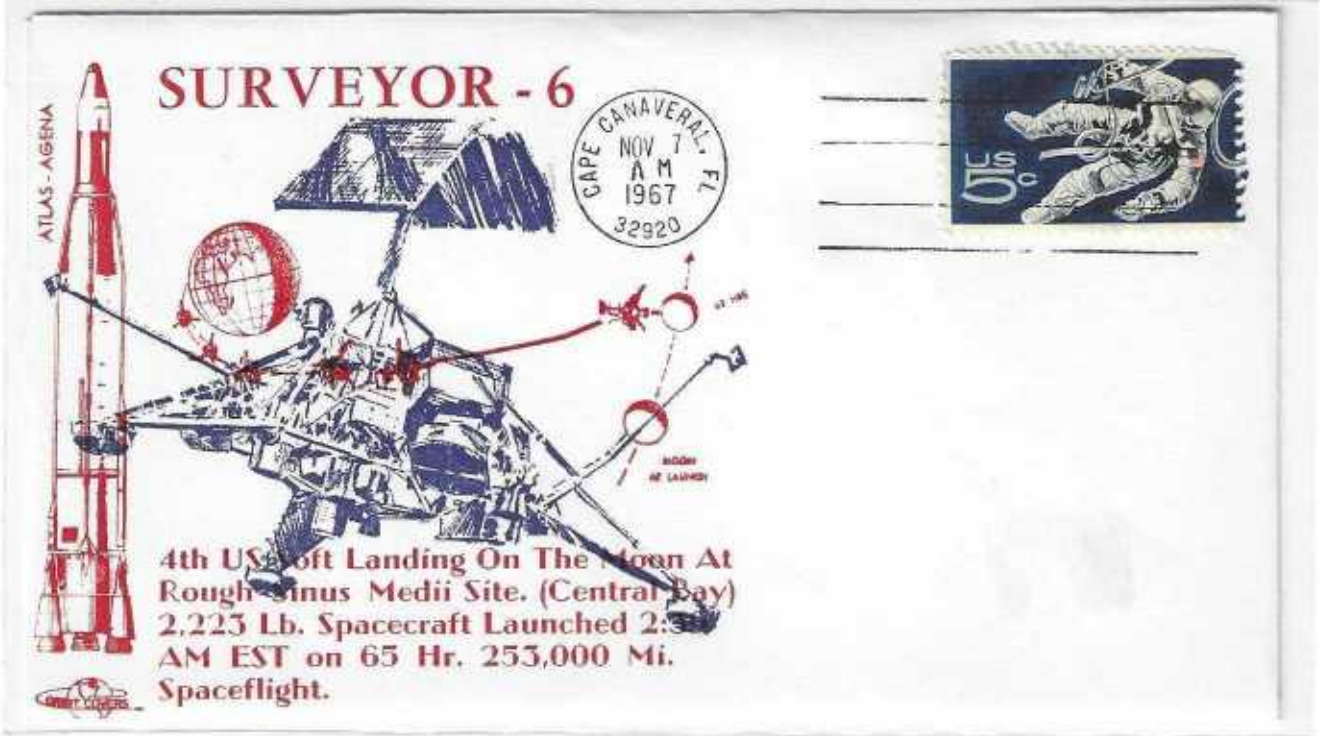
Robot Shovel For Moon Surface Samples
Digs 5 inch Trench 2 Feet Long
1st Lunar Crust Sample 12:11 AM April 22, 1967
Proves Moon Surface Can Support Astronauts

Mission Surveyor 3. APRIL 22, 1967. Cape Canaveral machine cancel on the date and time of experiments. More than two years later, Apollo 12 astronauts Charles Conrad jr and Alan L. Bean landed the Intrepid LM near the inactive Surveyor 3 lander on 18 November 1969. The astronauts recovered parts from Surveyor 3, including the soil scoop and camera system, to allow scientists to evaluate the effects of nearly two and one-half years of exposure on the Moon's surface.



Mission Surveyor 4. JULY 16, 1967. Cape Canaveral machine cancel on the date and time of the descent phase. Equipment on board included a television camera and auxiliary mirrors, a soil mechanics surface sampler, strain gauges on the spacecraft landing legs, and numerous engineering sensors. After a flawless flight to the Moon, radio signals from the spacecraft ceased during the terminal descente phase on 17 July 1967, approximately 2,5 minutes before touchdown. Contact with the spacecraft was never reestablished, and the mission was unsuccessful.

Mission Surveyor 5. SEPTEMBER 8, 1967. Cape Canaveral manual cancel on the date and time of launch. The specific objectives for this mission were to perform a soft landing on the Moon in Mare Tranquillitatis and obtain postlanding television pictures of the lunar surface, to conduct a vernier engine erosion experiment, determine the relative abundances of the chemical elements in the lunar soil by operation of the Alpha-Scattering Instrument, obtain touchdown dynamics data, and obtain thermal and radar reflectivity data The spacecraft transmitted excellent data for all experiments from shortly after touchdown until October 18, 1967, with an interval of no transmission from September 24 to October 15, 1967, during the first lunar night Transmissions were received until November 1, 1967, when shutdown for the second lunar night occurred. The final transmission occurring on December 17, 1967. 19,000 pictures were transmitted during the first, second and fourth lunar days.

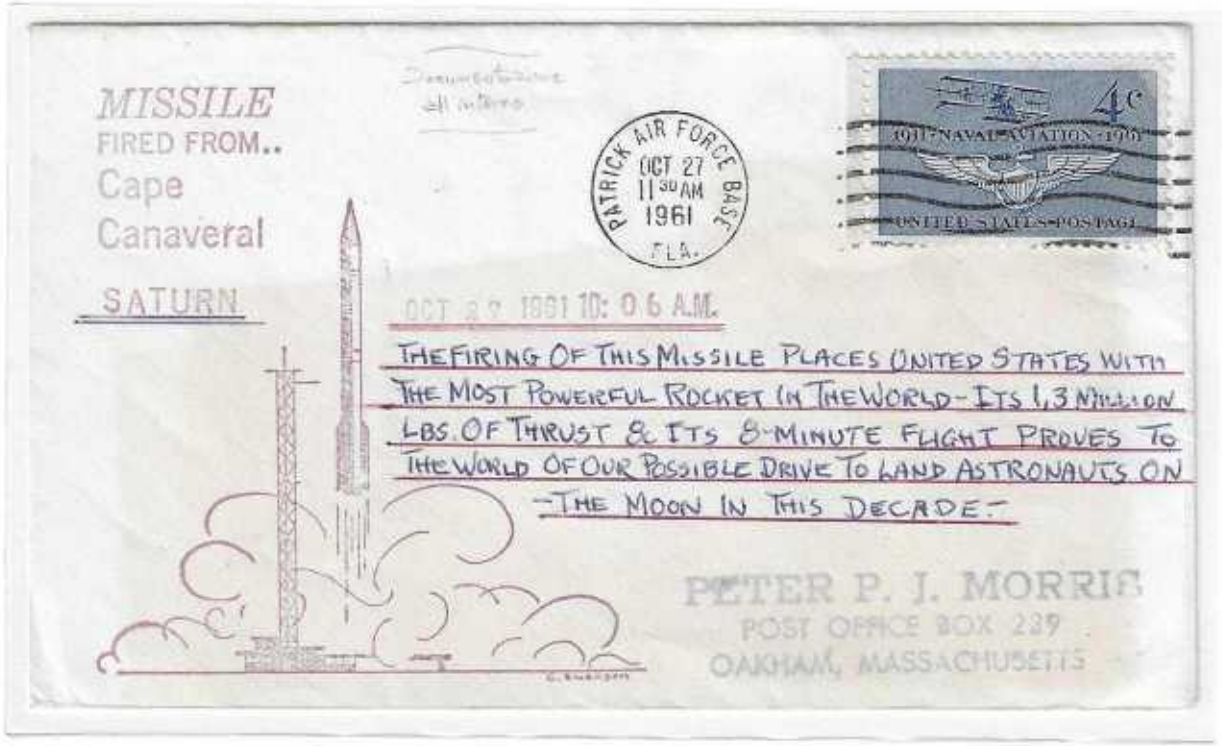


Mission Surveyor 6. November 7, 1967. Cape Canaveral machine cancel on the date and time of launch. Virtually identical to Surveyor 5, the spacecraft touched down on the lunar surface on 10 November in Sinus Medii, near the center of the Moon's visible hemisphere. On 17 November, the vernier engines were fired for 2,5 sec., causing Surveyor to lift off the lunar surface 3 to 4 meters and land about 2,4 meters west of its original position. This lunar "hop" represented the first powered takeoff from the lunar surface and furnished new informations on the effects of firing rocket engines on the Moon. A total of 30,027 images were transmitted to Earth.

Mission Surveyor 7. January 7, 1968. Cape Canaveral manual cancel on the date and time of launch. It was the only Surveyor craft to land in the lunar highland region, near Tycho Crater. This spacecraft was similar in design to the previous Surveyors, but it carried more scientific equipment including a television camera. Of the auxiliary mirrors, three were used to observe areas below the spacecraft, one to provide stereoscopic views of the surface sampler area, and seven to show lunar material deposited on the spacecraft. Operations of the spacecraft began shortly after the soft landing and were terminated on January 26, 80 hours after sunset. Operations on the second lunar day occurred from February 12 to 21.

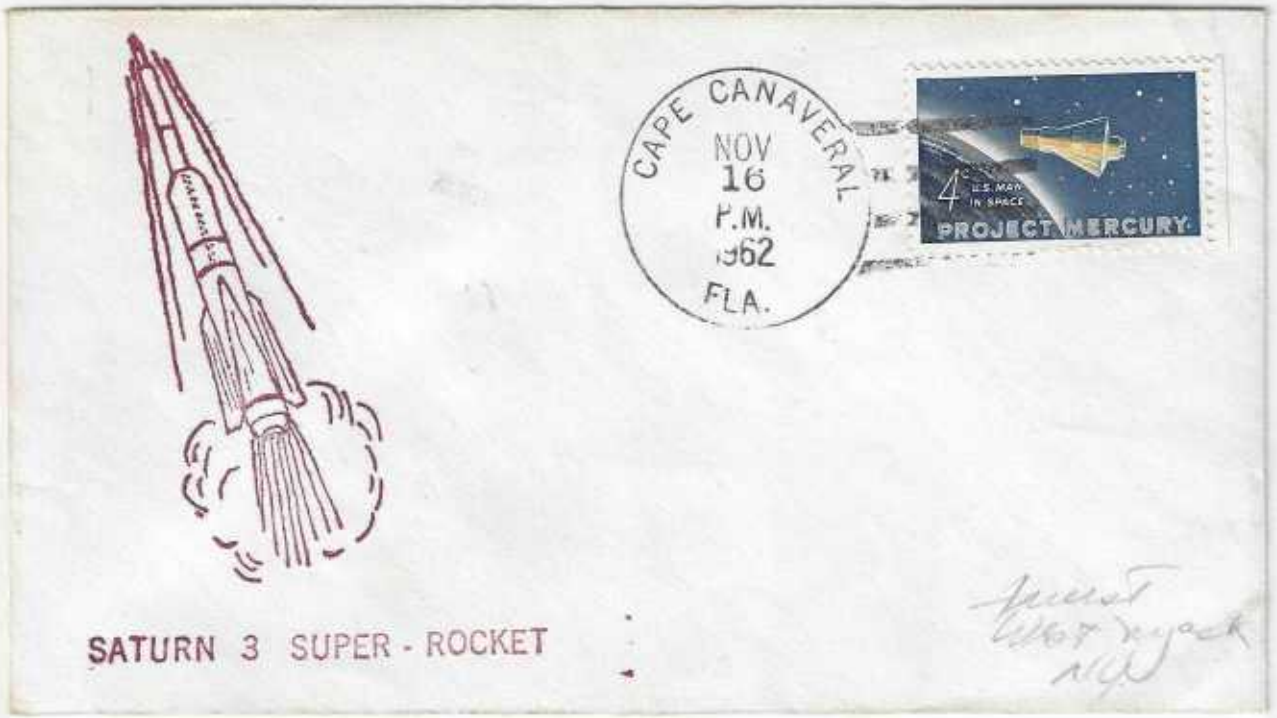
APOLLO PROGRAM

Mission Apollo SA-1. OCTOBER 27, 1961. Commemorative cover postmarked with manual cancel in Port Canaveral on the date and time of launch. SA-1 was the first flight of the Saturn I space launch vehicle, the first in the Saturn family. This first flight was designed to test the structure of the launch vehicle during a suborbital flight using the nose cone from a Jupiter rocket.

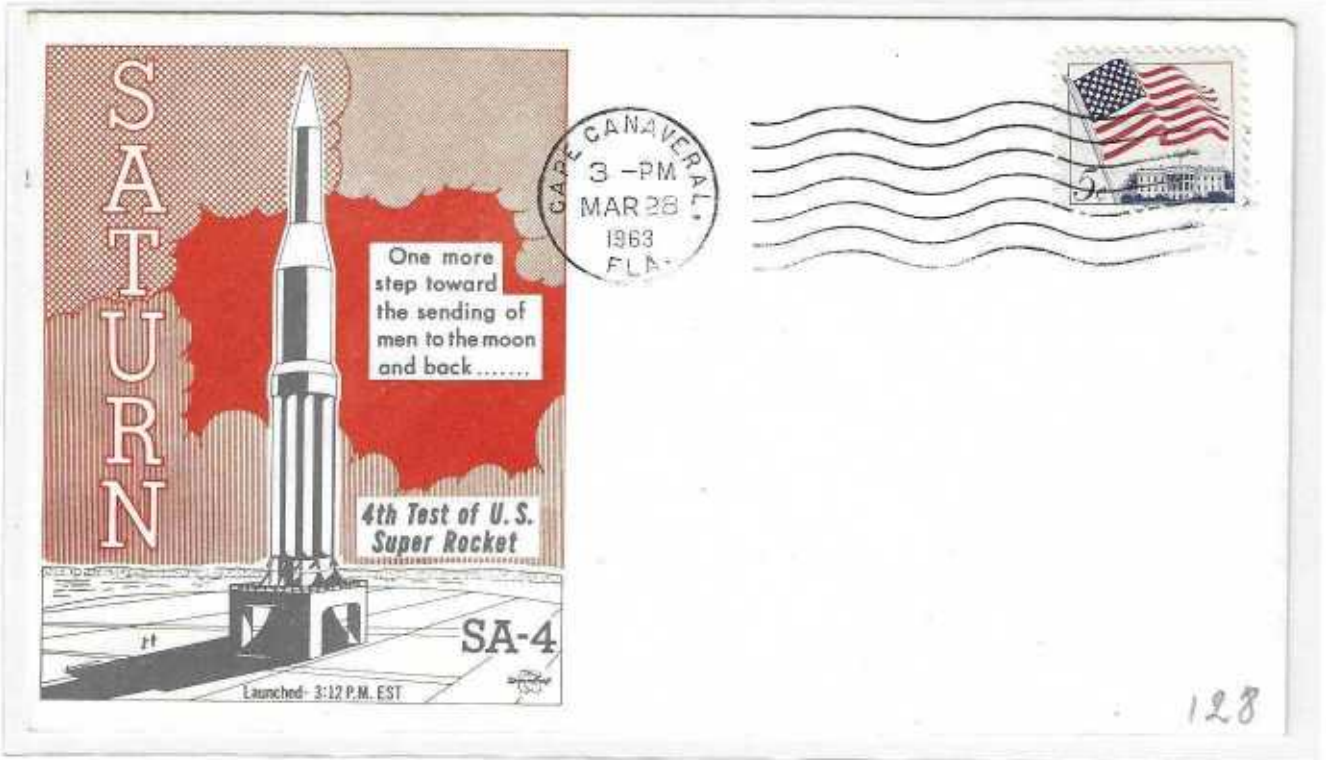


Mission Apollo SA-1. OCTOBER 27, 1961. Patrick AFB machine cancel on the date and time of launch. The Saturn I booster was a huge increase in size and power over anything previously launched. NASA planned to test each rocket stage in separate launches, so for SA-1 the only live stage was the S-I first stage, which launches in a simulated flight the upper stages filled with water at an altitude of 136,5 km and a range of 345,7 km. Fully fueled and ready to go, the Saturn weighed 925,000 lbs (420 ton). The first stage was loaded with 600,000 lbs (272,5 ton) of propellant (kerosene fuel and liquid oxygen).

Mission Apollo SA-2. APRIL 25, 1962. Patrick AFB machine cancel on the date and time of launch. The H-1 engines shut down at an altitude of 35 miles (56 km) after firing for 1 min., 55 sec. and reaching a maximum velocity of 3,750 miles/hour (6.040 km/h). The first payload was called Project Highwater. The inert S-IV and S-V stages for these launches carried 109,000 liters (30,000 gallons) of ballast water for release in the upper atmosphere. This was used to study the effects on radio transmission and changes in local weather conditions. At an altitude of 150 km, explosive devices ruptured the S-IV and S-V tanks and in just 5 seconds, ground observers saw the formation of a hugh ice cloud estimated to be several kilometer in diameter.

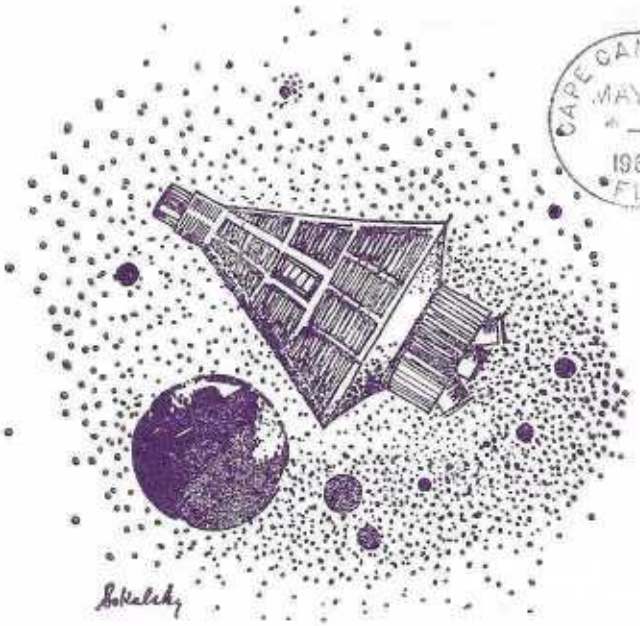


Mission Apollo SA-3. NOVEMBER 16, 1962. Cape Canaveral manual cancel on the date and time of launch. This was the first flight with a fully fueled first stage. The flight verification tests were all met. The Saturn 1st stage carried upper stages filled with 23,000 gallons (87.000 liters) of water on a sub-orbital flight to a peak altitude of 167 km, 4 minutes, 53 seconds after launch. At this point, it was detonated by radio command, releasing the water into the ionosphere. This cloud experiment, Project Highwater II, was hoped to provide data on atmospheric physics but poor telemetry made the results questionable.



Mission Apollo SA-4. MARCH 28, 1963. Cape Canaveral machine cancel on the date and time of launch. This was the final of a series of four tests of the Saturn 1st stage and completed the Block 1 Saturn tests. The rocket was launched on a sub-orbital flight to an altitude of 129 km and a peak velocity of 5,906 km/h. After 100 seconds of flight, a pre-set timer cut off engine N° 5 as planned to test " engine-out " capability of the booster. The rocket then continued to operate properly, the propellant system rerouting the fuel to the other seven engines and the flight continued.

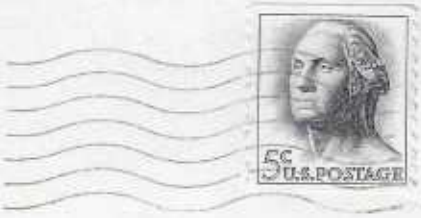
Mission Apollo SA-5. JANUARY 29, 1964. Cape Canaveral machine cancel on the date and time of launch. It was the first flight of the Block II Saturn. This Saturn I was used for a launch vehicle development test. More than 11,000 measurements were taken. It was also the first live flight of the LOX / LH2 (liquid oxygen / liquid hydrogen) fueled second stage (S-IV). For the first time in Apollo Program, this flight would be an orbital mission. The whole Stage Separation System worked perfectly with the retrorockets firing on the first stage to decelerate it.



A 19-Story Saturn I Booster
Sucessfully Orbits an 8½ Ton
APOLLO SPACECRAFT
Launched Cape Kennedy 5/28/64

Mission Apollo SA-6. MAY 28, 1964. Cape Canaveral machine cancel on the date and time of launch. The Saturn 1 launch vehicle was a two-stage booster with the Apollo payload attached to the S-IV second stage. The Apollo Payload was a boilerplate Command and Service Module (BP-13). The primary objective was further qualification of the Saturn 1 launch vehicle and continued development of the technology necessary to build the more powerful Saturn 1B and Saturn V. The Apollo boilerplate had a mass of 7,700 kg, the entire Apollo-instrument unit-second stage payload had a mass of 16,900 kg in orbit and was 24,4 m. long.

SATURN 1 APOLLO



World's mightiest space rocket, 19 stories tall and weighing 570 tons, blazed skyward today under a force of 1.5 million pounds of thrust, throwing an Apollo space craft into orbit, 115 to 135 miles high. Approximates the parking orbit, which our lunar astronauts will settle into before restarting the booster engines to propel the Apollo to the moon.

CLYDE J. SARZIN
PORT WASHINGTON, L. I.
NEW YORK, U.S.A.

Mission Apollo SA-7. SEPTEMBER 18, 1964. Cape Canaveral machine cancel on the date and time of launch. The Saturn 1 vehicle demonstrated launch vehicle / spacecraft compatibility and tested the Launch Escape System. It carried a boilerplate model CM and SM (BP-15) and an instrument unit to Earth orbit (177 x 206 km) similar to the interim orbit planned for future Apollo astronaut mission. A 305 cm high escape tower was mounted on top to support a 470 cm launch escape motor. The spacecraft was instrumented for 133 measurements such as heat rates, temperatures, aerodynamics and static loads. The spacecraft orbit decayed on September 22, after 59 orbits.

PEGASUS SPACE VEHICLE

Launched out of Cape Kennedy to detect meteoroid dust in space. To protect launching of manned space-crafts (as depicted in this illustrative cachet).

EDWIN D. WILLIAMS
5522 W INDIAN SCHL
PHOENIX, ARIZ.
85031

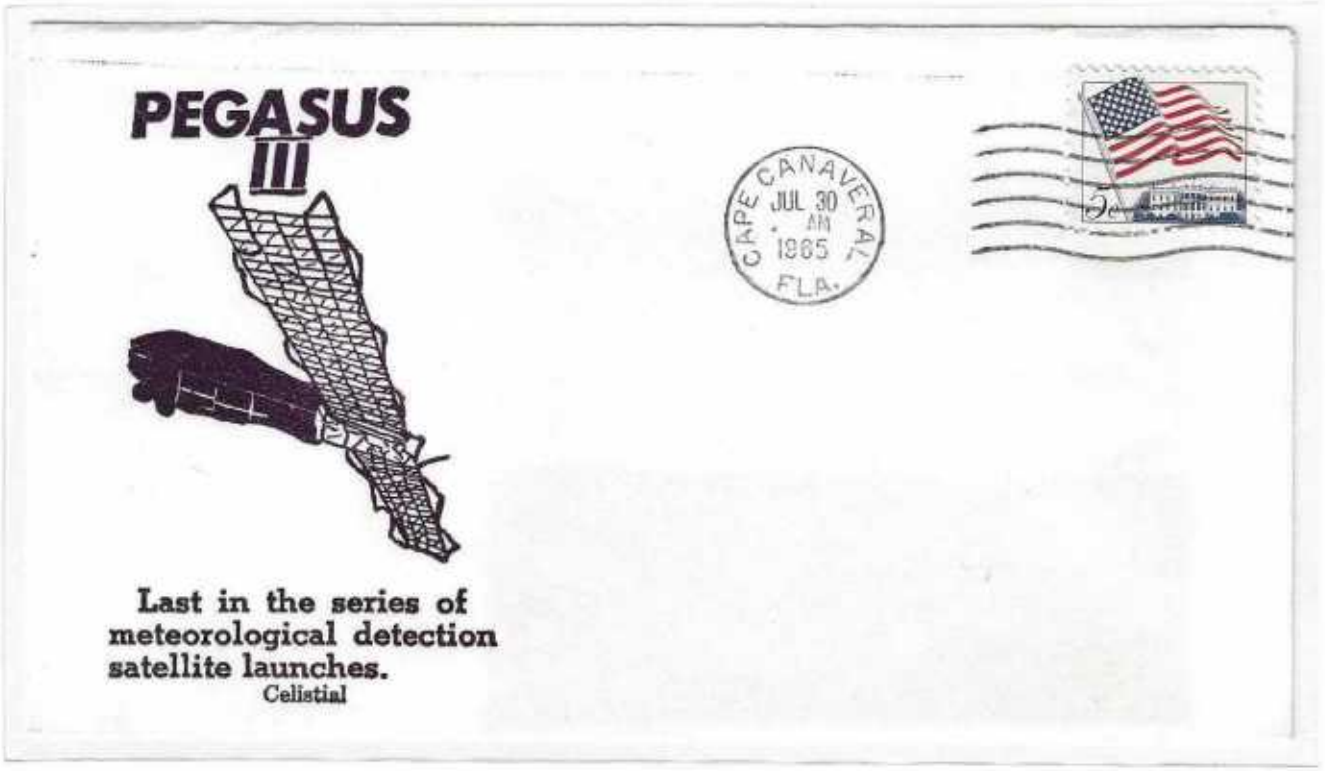
Mission Apollo SA-9 (Pegasus 1). FEBRUARY 16, 1965. Cape Canaveral machine cancel on the date and time of launch. The Pegasus 1 was the first active payload launched by the Saturn system. The mission of this spacecraft was to measure meteoroid abundances over the mass range 1.E-7 to 1.E-4g in the region near the Earth. The central section was attached to the second stage. The spacecraft was equipped with winglike appendages that extended to form a plane 29.3 m long by 4.3 m wide. After first stage separation and second stage ignition, the Launch Escape System was jettisoned. After the second stage attained orbit, the 4,500 kg BP-16 was jettisoned into a separate orbit.

PEGASUS 2

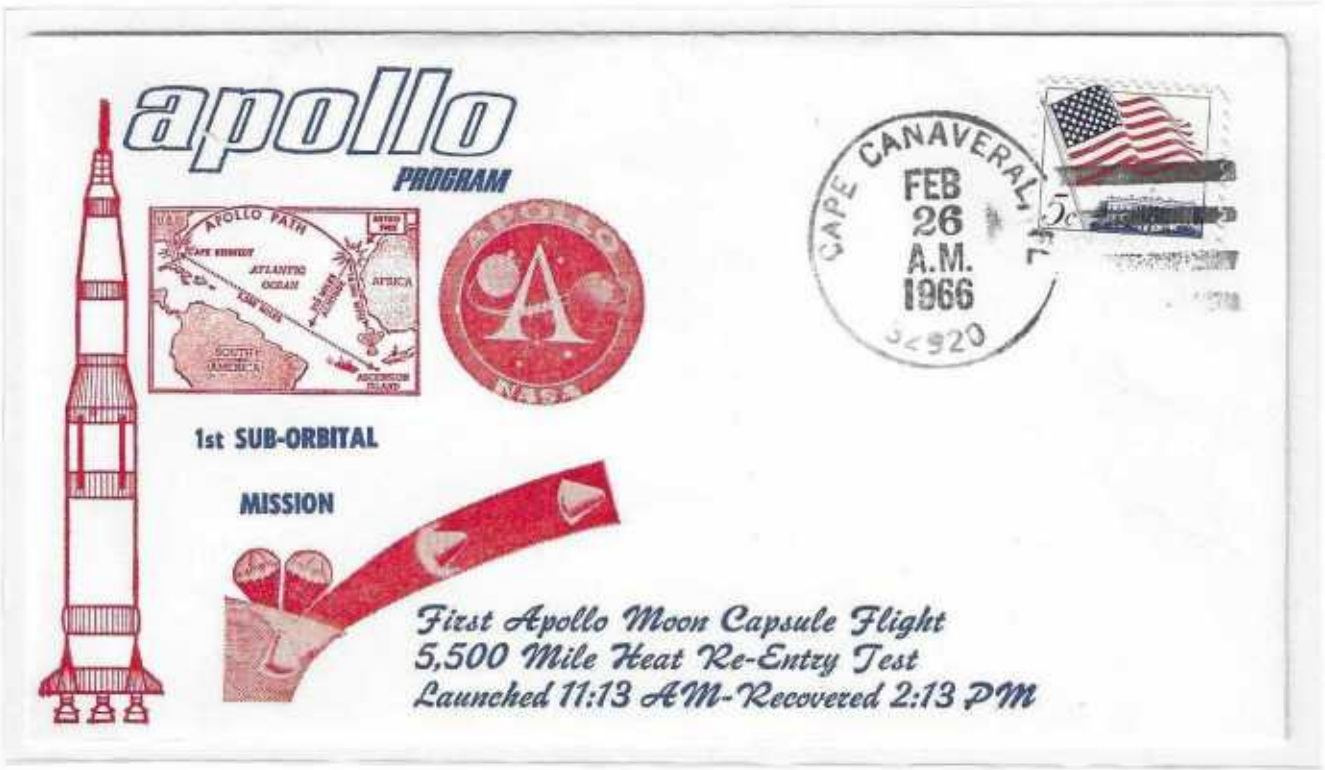
Space Vehicle to detect harmful radiation that may affect our moon-team (cachet shows United States astronaut entering our moon ve-hicle ship).

CLYDE J. SARZIN
PORT WASHINGTON, L. I.
NEW YORK, U.S.A.

Mission Apollo SA-8 (Pegasus 2). MAY 25, 1965. Cape Canaveral manual cancel on the date and time of launch. The Saturn 1 (SA-8) had a boilerplate Apollo Command and Service Module (BP-26) and a Launch Escape System tower mounted on top. The boilerplate CSM acted as a shroud to hold the Pegasus satellite. In its stored position with panels folded inside the Apollo SM, the spacecraft was 5.3 m high, 2.1 m wide, and 28 cm deep. The wings carried sensitive penetration surfaces for the experiments. After the second stage attained orbit, the BP-26 was jettisoned into a separate orbit.



Mission Apollo SA-10 (Pegasus 3). JULY 30, 1965. Cape Canaveral machine cancel on the date and time of launch. The mission of this spacecraft was to measure meteoroid abundances over the mass range 10E-7 to 10E-4g in the region near the Earth. Total weight in orbit was 10,500 kg. After the second stage attained orbit, the 4,600 kg BP-9 was jettisoned into a separate orbit, the Pegasus remained with the second stage in Earth orbit as planned and deployed its winglike panels. For this Pegasus mission, the orbit was adjusted to a nearly circular one.



Mission Apollo AS-201. FEBRUARY 26, 1966. Cape Canaveral manual cancel (plugged 9) on the date and time of launch. The Apollo-Saturn 201 was the first flight of the two-stages Saturn 1B. The objectives of the flight were to verify the structural integrity, launch loads, stage separation, and operation of subsystems, and evaluate heatshield (not achieved) and mission support facilities.

Mission Apollo AS-201. FEBRUARY 26, 1966. Secondary recovery ship USS R. L. Wilson manual cancel on the date and time of splashdown. The CSM-009 reached a maximum altitude of 499 km over the Atlantic Ocean before beginning its descent. The Service Module was jettisoned and the Command Module re-entered at 8,300 m/sec., generating a re-entry heat of roughly 2,200°C. Three main parachutes deployed at an altitude of 3,700 m.

SATURN 203

PATRICK AIR FORCE BASE FL JUL 5 AM 1966 32925

Uprated Saturn launching hurls 29 ton S-IVB into earth orbit and conducts engineering experiments with liquid hydrogen fuel which is the propulsion force that will propel the Apollo spacemen into a Lunar orbit.

CLYDE J. SARZIN
PORT WASHINGTON, L. I.
NEW YORK, U.S.A.

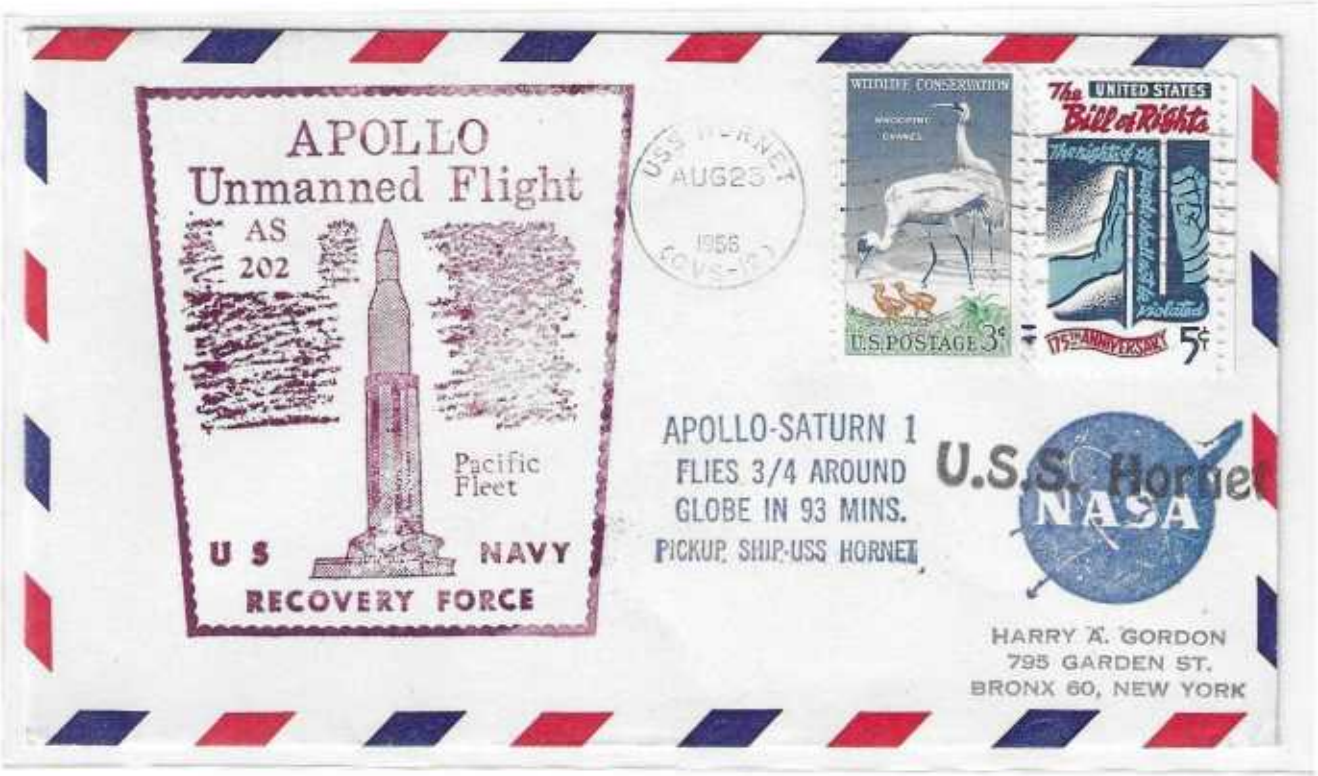
Mission Apollo AS-203. JULY 5, 1966. Patrick AFB machine cancel on the date and time of launch. The mission was an unmanned test of the S-IVB second stage and the IU (Instrument Unit) of the Saturn V to obtain flight information under orbital conditions. The two-stage launch vehicle boosted a payload consisting of the S-IVB, IU, and a nose cone into a 188 km circular orbit. The engine's capability to restart after coast was demonstrated. During the fourth orbit, internal pressure build up in the S-IVB stage while a pressure differential test was being performed.

Apollo 7

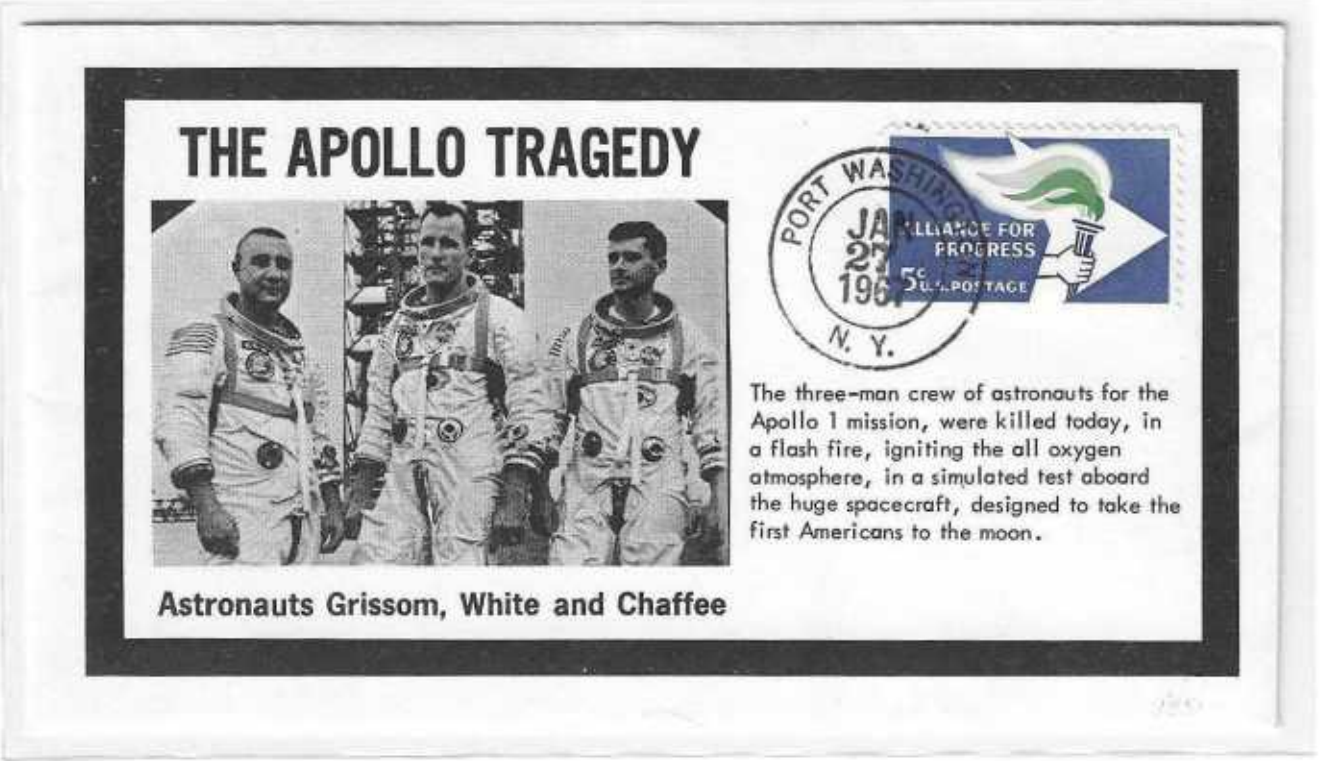
CAPE CANAVERAL, FL AUG 25 PM 1966 32920

Scott Carpenter

Mission Apollo AS-202. AUGUST 25, 1966. Cape Canaveral machine cancel on the date and time of launch. The Saturn 1B payload consisting of the Apollo CSM-011. After both stages completed their burns and separated, the SM propulsion engine burned for 3 min., 35 sec. to boost the spacecraft to a peak altitude of 1,128.6 km. The rapid restart capability of the SM's engines was tested, the last separating the SM from the CM. The firing also accelerated the CM re-entry to greater than 32,000 km/hr. Maximum temperature of thespacecraft exterior was calculated at about 1,500°C, temperature inside cabin was 21°C (70F).

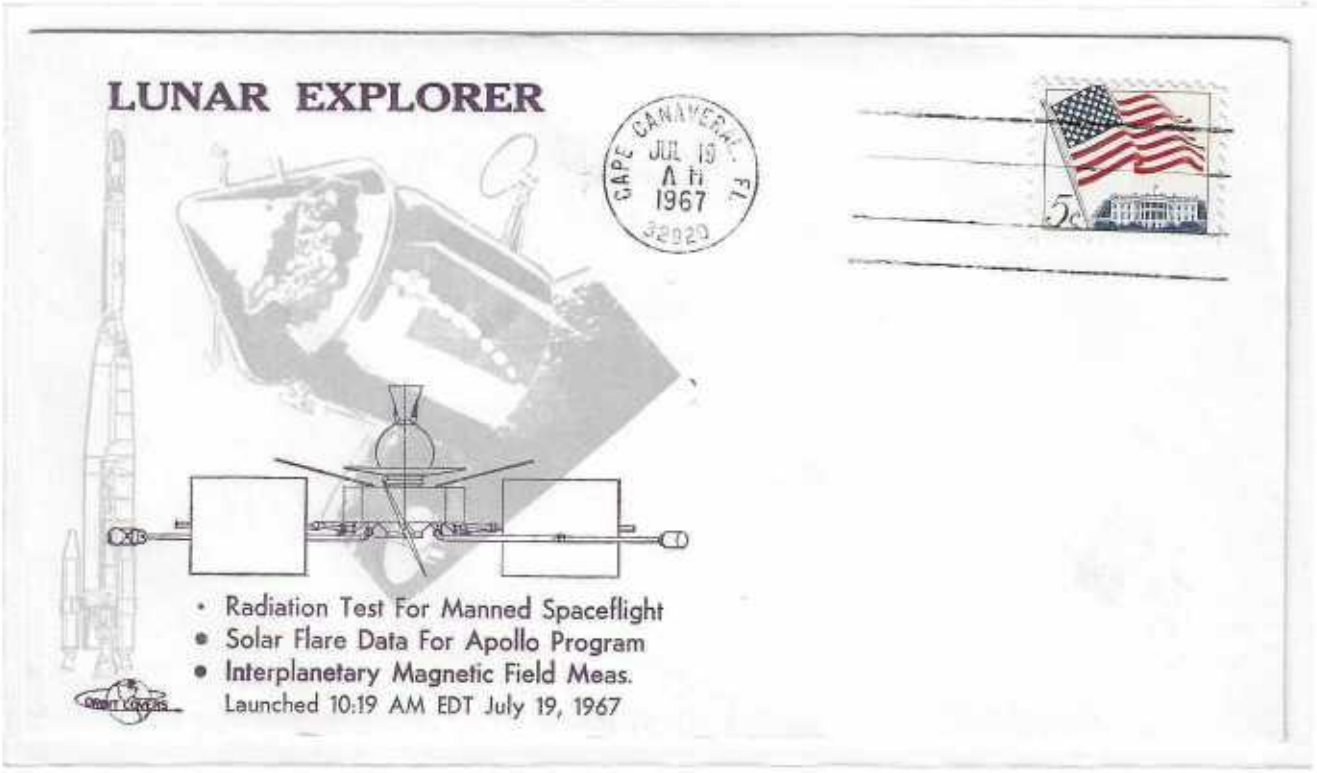


Mission Apollo AS-202. AUGUST 25, 1966. Primary recovery ship USS Hornet machine cancel on the date and time of splashdown.



Mission Apollo 1 (AS-204). JANUARY 27, 1967. Commemorative cover postmarked with manual cancel in Port Washington on the date of tragedy. Tragedy struck the Apollo Program when a flash fire occurred in CM-012 during a launch pad test of the Apollo/Saturn space vehicle being prepared for the first piloted flight The final report, completed in April 1967, made specific recommendations that led to major design and engineering modifications, and revisions to test planning, test discipline, manufacturing processes and procedures, and quality control. The overall safety of the CSM and the LM was increased substantially . The AS-204 mission was redesignated Apollo 1 in honor of the crew.

AMERICAN LUNAR SATELLITE : THE EXPLORER 35

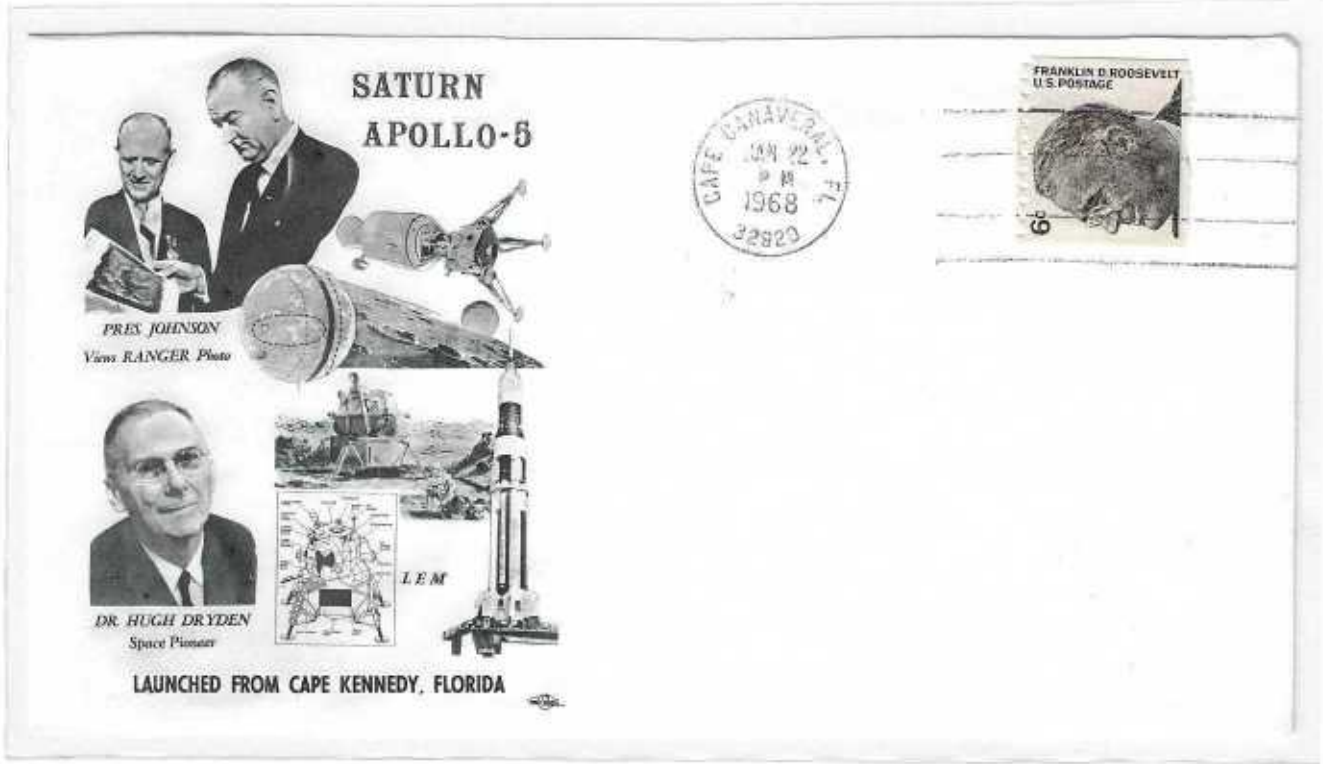


Mission Explorer 35. JULY 19, 1967. Cape Canaveral machine cancel on the date and time of launch. Explorer 35 was a spin-stabilized spacecraft instrumented for interplanetary studies, at lunar distances, of the interplanetary plasma, magnetic field, energetic particles, and solar X rays. It was launched with a Delta rocket into an elliptical lunar orbit. Mission objectives were achieved. After successful operation for 6 years, the spacecraft was turned off on June 24, 1973.

Mission Apollo 4 (AS-501). NOVEMBER 9, 1967. KSC machine pictorial cancel on the date and time of launch. The unmanned Saturn/Apollo 4 mission was the first all-up test of three stage Saturn V rocket. It carried a payload of an Apollo CSM into Earth orbit. After two orbit, the third stage (S-IVB) was reignited for a simulated translunar injection burn, putting the spacecraft (S-IVB and CSM) into an Earth-intersecting trajectory with an apogee of 17,346 km. The S-IVB stage then separated from the CSM. Later the Service Propulsion System (SPS) was re-ignited for 271 seconds to accelerate the CSM to beyond lunar trajectory return velocities.

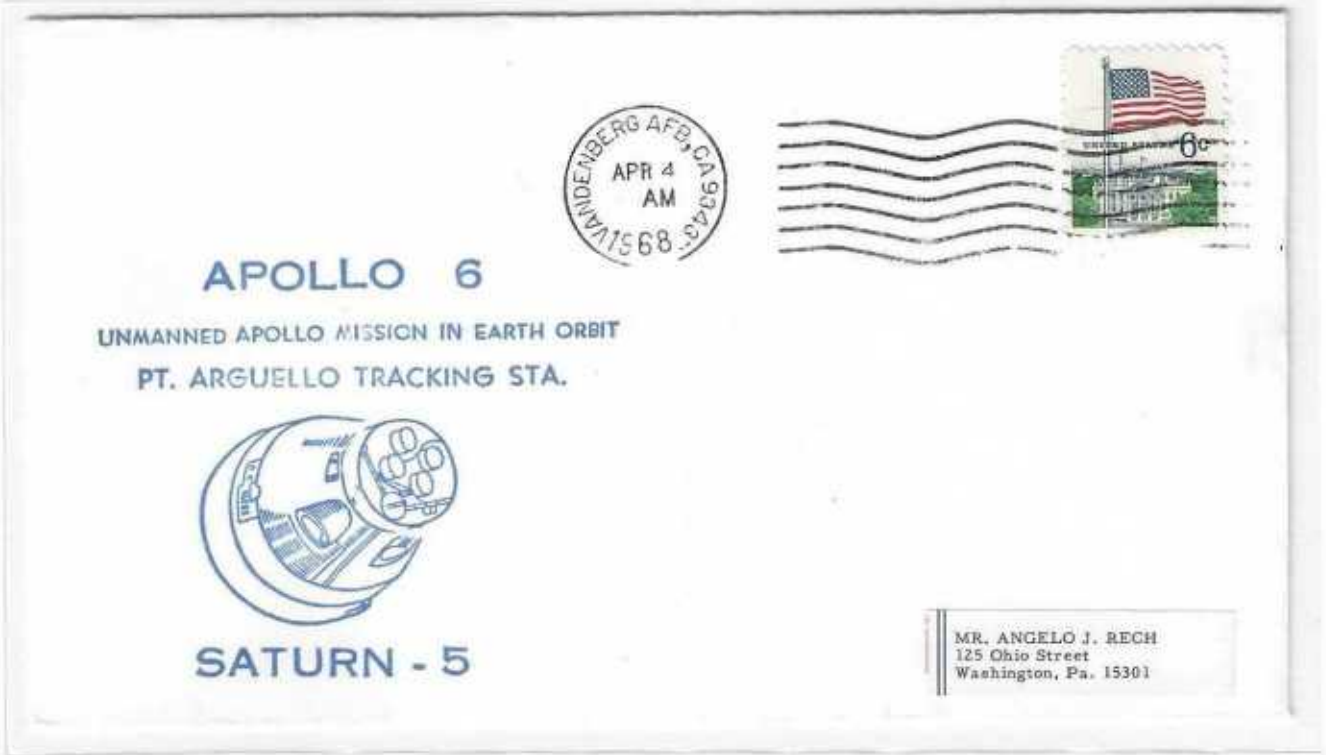
Mission Apollo 4 (AS-501). NOVEMBER 9, 1967. KSC machine pictorial cancel on the date and time of launch. Official cachet.

Mission Apollo 5 (AS-204). JANUARY 22, 1968. KSC machine cancel on the date and time of launch. Official cachet. The unmanned Saturn/Apollo 5 was the first test flight of the Lunar Module (LM).



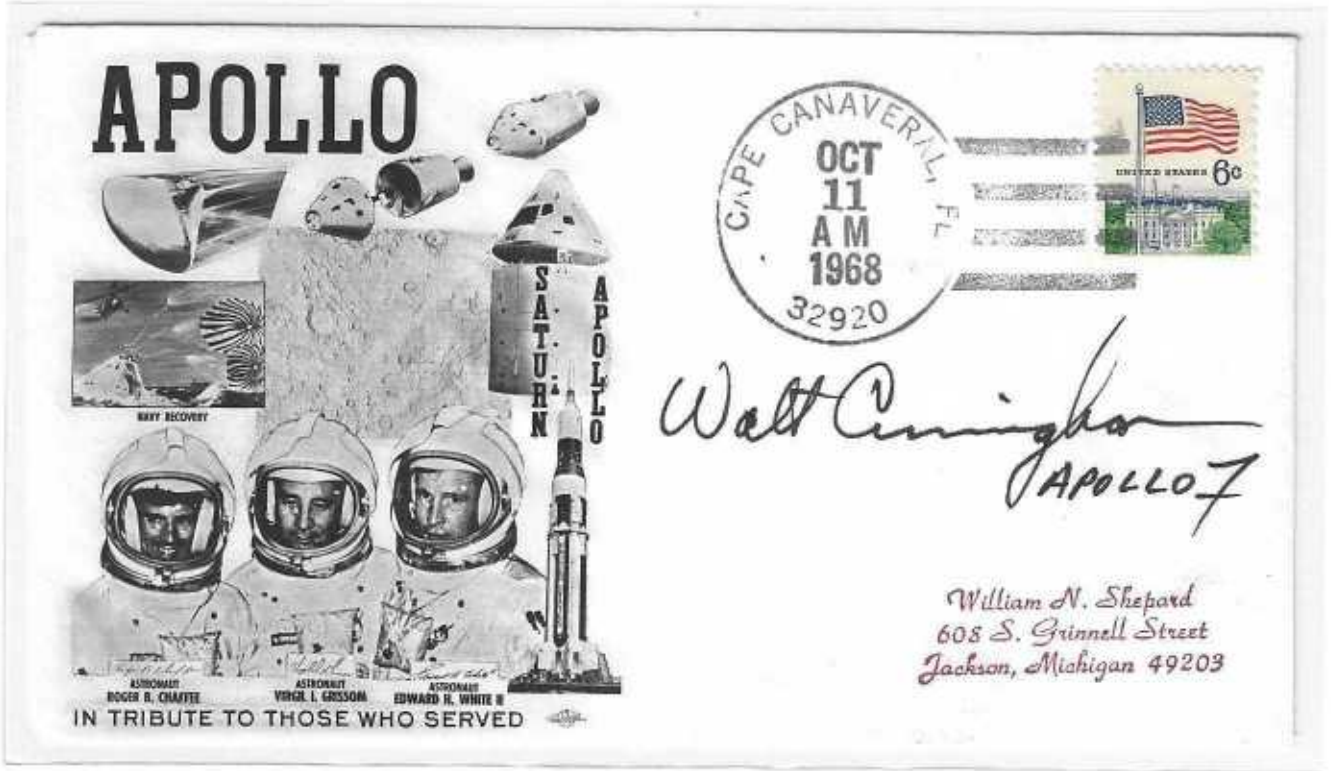
Mission Apollo 5 (AS-204). JANUARY 22, 1968. Cape Canaveral machine cancel on the date and time of launch. After launch, the S-IVB 2nd stage ignited to insert the spacecraft into an Earth orbit. The nose cone was jettisoned and the LM was separated from the LM adapter. A planned Descent Propulsion System , DPS, of 39 seconds, was cut short after only 4 seconds, due to overly conservative programming of the flight software. The Ascent Propulsion System (APS) was ignited simultaneously with the DPS being shut down. The APS burn lasted 60 seconds, followed by a 6 min., 23 sec. firing which depleted APS fuel.

Mission Apollo 6 (AS-502). APRIL 4, 1968. Cape Canaveral machine cancel on the date and time of launch. Official cachet. The unmanned Saturn/Apollo 6 mission was designed as the final qualification of the Saturn V launch vehicle and Apollo spacecraft for manned Apollo missions.



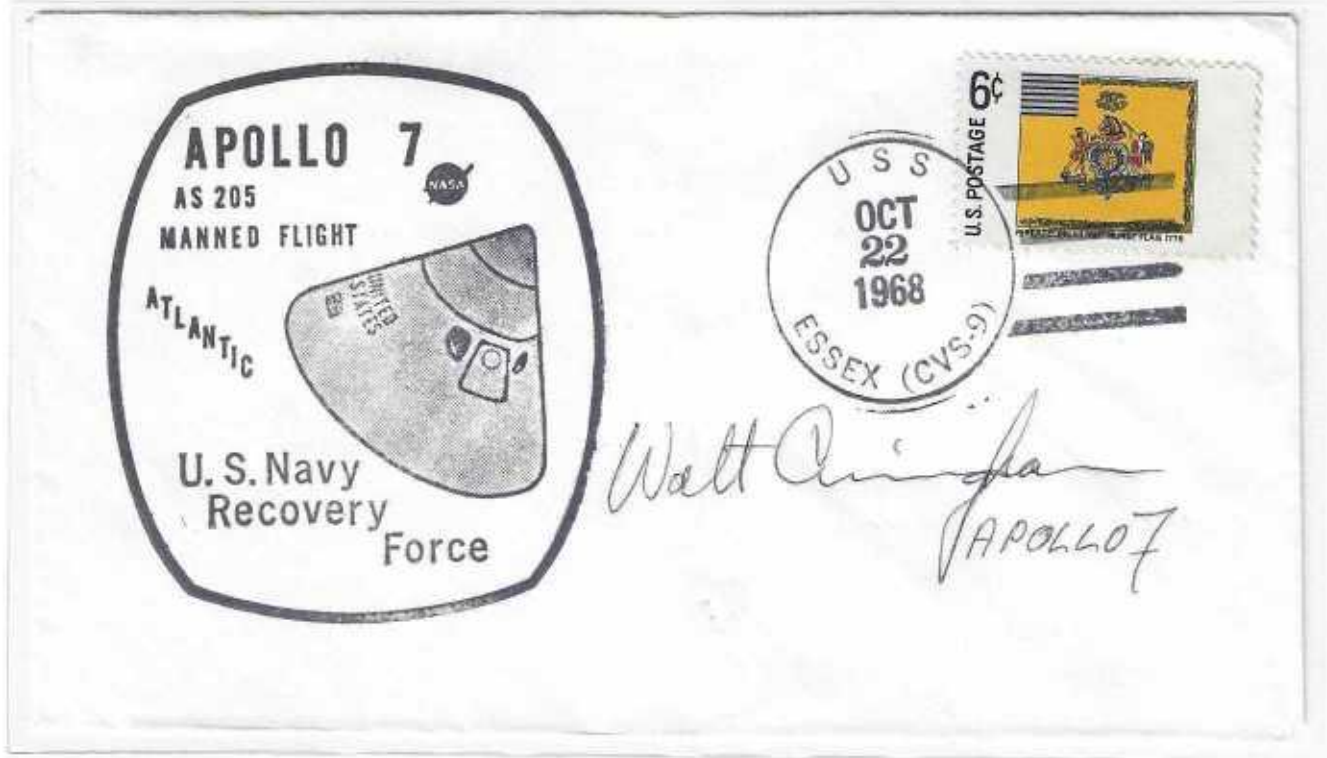
Mission Apollo 6 (AS-502). APRIL 4, 1968. Vandenberg AFB machine cancel on the date and time of launch. The spacecraft consisted of three stage Saturn V, the Apollo CSM, and a boilerplate LM, including CM recovery. After two orbits, the third stage failed to reignite as planned, so the SM propulsion system was used to boost the spacecraft an apogee of 22,225 km, from which the planned lunar reentry simulation took place at 36,025 km/h.

Mission Apollo 6 (AS-502) . APRIL 4, 1968. Primary recovery ship USS Okinawa manual cancel on the date and time of splashdown.



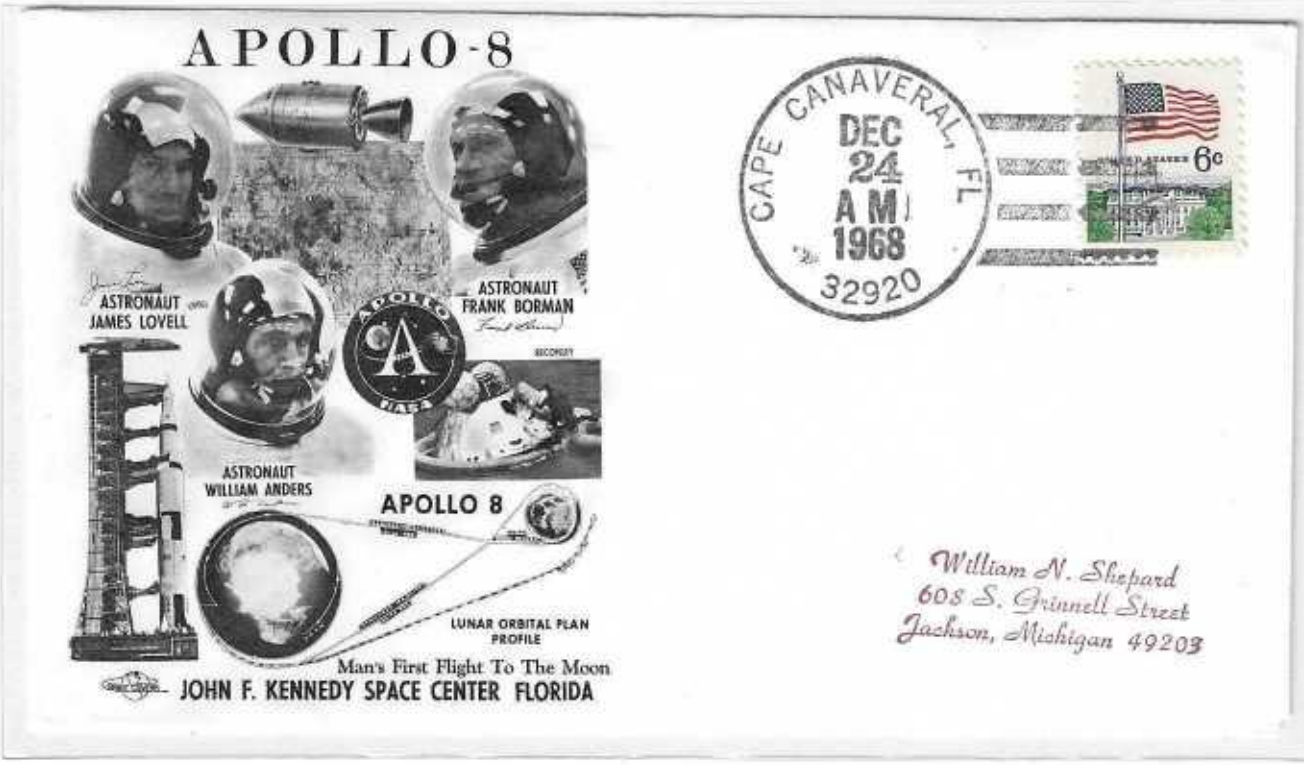
Mission Apollo 7 (AS-205). OCTOBER 11, 1968. Cape Canaveral manual cancel on the date and time of launch. Resume crew flights after the tragedy of Apollo 1. The primary objectives for the Apollo 7 engineering test flight were simple : demonstrate CSM and crew performance, demonstrate crew, space vehicle and mission support facilities performance, and demonstrate CSM rendezvous capability.

Mission Apollo 7 (AS-205). OCTOBER 11, 1968. Vandenberg AFB machine cancel on the date and time of launch. The S-IVB stayed with the CSM for about 1 ½ orbits, then separated. Schirra fired the CSM's small rockets to pull 50 feet ahead of the S-IVB, then turned the spacecraft around to simulate docking, as would be necessary to extract an LM for a Moon landing. The Apollo vehicle and the CSM performed superbly. Durability was shown for 10.8 days, longer than a journey to the Moon and back.



Mission Apollo 7 (AS-205). OCTOBER 22, 1968. Primary recovery ship USS Essex manual cancel on the date and time of splashdown. A cold is uncomfortable enough on the ground, but in weightlessness it presents a different problems : mucus accumulates, fills the nasal passages and does not drain from the head . They each took a decongestionant pill about an hour before reentry and made it through the acceleration zone without any problems with their ears.

Mission Apollo 8 (AS-503). DECEMBER 21, 1968. White Sands Missile Range manual cancel on the date and time of launch. Mission objectives were : demonstrate crew /space vehicle / mission support facilities during manned Saturn V / CSM mission, demonstrate translunar injection, CSM navigation,communications and midcourse corrections, consumable assessment and passive thermal control. The detailed test objective were to refine the systems and procedures relating to future lunar operation. Return high- resolution photographs of proposed Apollo landing sites and locations of scientific interest. All mission objectives were achieved.

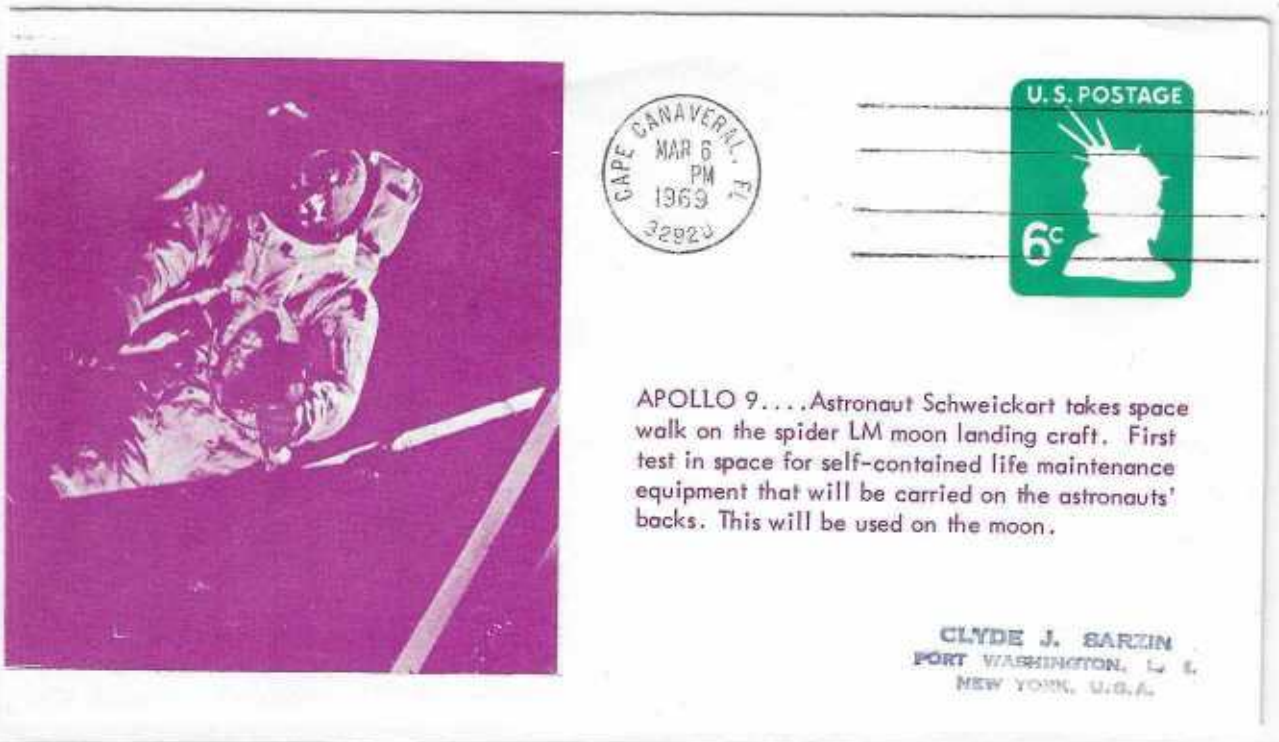


Mission Apollo 8 (AS-503). DECEMBER 24, 1968. White Sands Missile Range manual cancel on the date and time of insertion into lunar orbit. Following the third stage S-IVB / CSM separation, the propellant dumping sent the stage into diverging trajectory and solar orbit. Loss of signal occurred at 68 hours, 58 minutes, 45 seconds when Apollo 8 passed behind the Moon. At that moment, NASA's three astronauts became the first humans to see the Moon far side. The orbit circularized at 70 miles by the second lunar orbit insertion burn, performed at the start of the third revolution, again on the back side of the Moon, at 73 hours, 35 minutes, 5 seconds.

Mission Apollo 8 (AS-503). DECEMBER 27, 1968. Primary recovery ship USS Yorktown machine cancel on the date and time of splashdown. During the 20-hours period in lunar orbit, the crew conducted a full sleepless schedule of tasks including landmark and landing site tracking, vertical stereo photography, stereo navigation photography and sextant navigation. Six telecasts were conducted during the mission : two during translunar coast, two during lunar orbit and two during trans-Earth coast. These transmission were telecast worldwide and in real time to all five continents. During a telecast on Christmas eve, the crew read verses from the first chapter of Genesis and wished viewers.

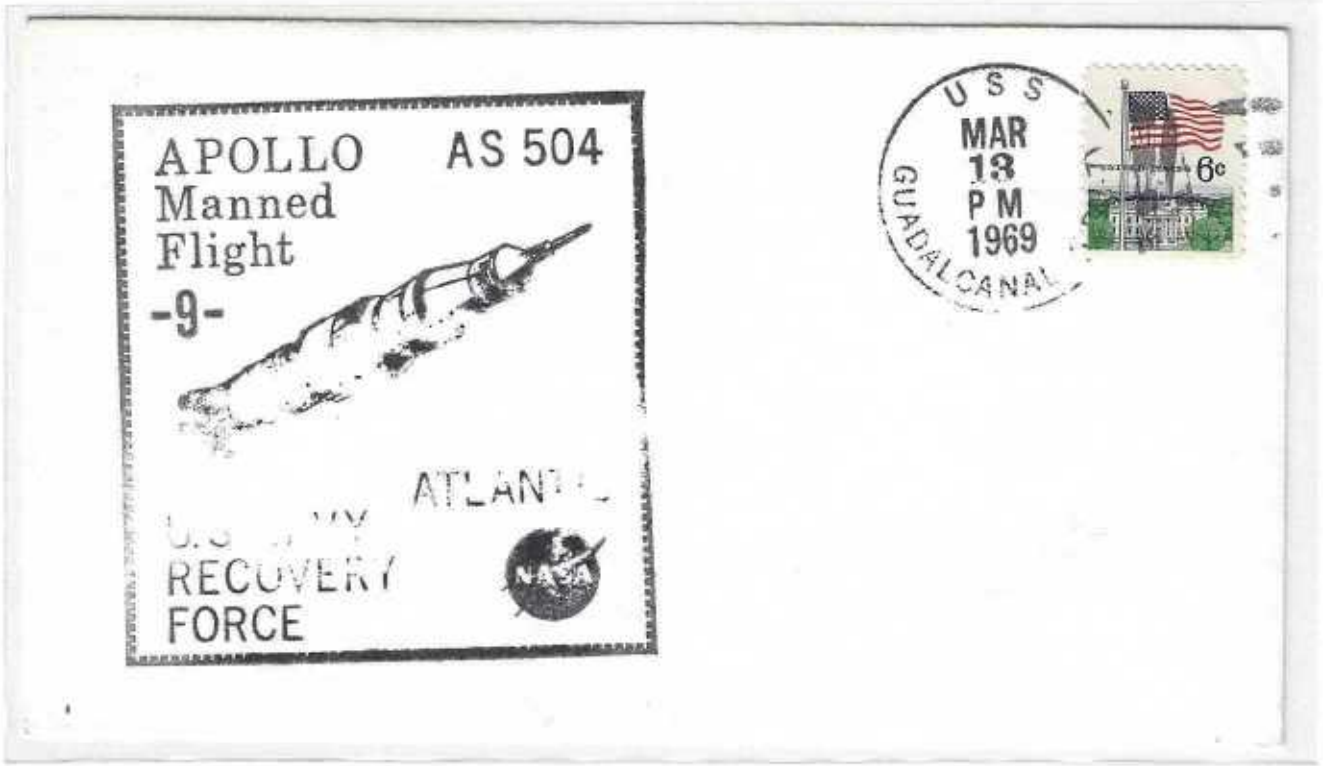
Mission Apollo 8 (AS-503). DECEMBER 27, 1968. Secondary recovery ship USS Chipola manual cancel on the date and time of splashdown.

Mission Apollo 9 (AS-504). MARCH 3, 1969. KSC machine cancel on the date and time of launch. Official cachet. The primary objective of Apollo 9 was a Earth-orbital engineering test of the first crewed Lunar Module, or LM, including operation of the LM as an independent self-sufficient spacecraft and performance of docking and rendezvous maneuvers. Apollo 9 was composed of a Command Module (CM), a Command Service Module (CSM), a Lunar Module (LM), and an Instrument Unit (IV), and was launched by a Saturn V rocket.



Mission Apollo 9 (AS-504). MARCH 6, 1969. Cape Canaveral machine cancel on the date and time of EVA. On March 6, were expected the first EVA of Apollo Program. Mc Divitt and Schweickart, through the tunnel, moved for the second time in the LM. Schweickart, through the garret, get out to the outside, and he return after 47 minutes.

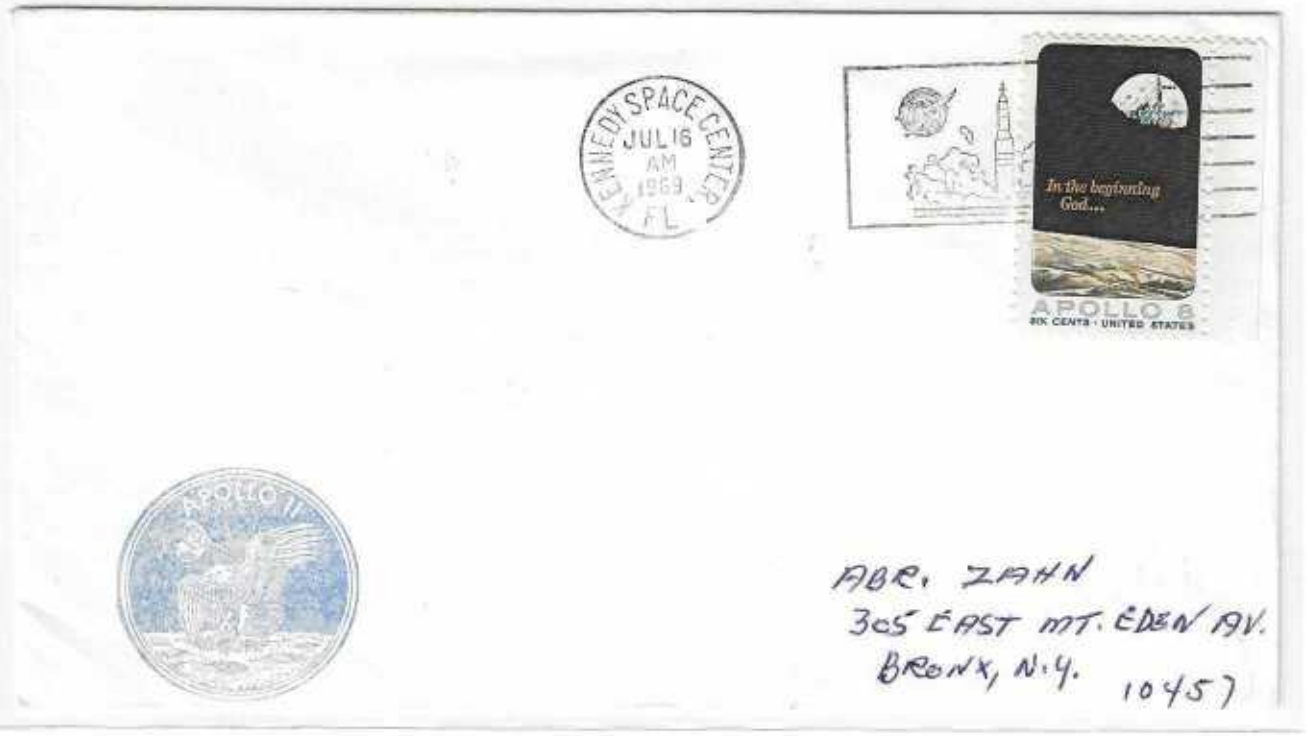
Mission Apollo 9 (AS-504). MARCH 7, 1969. Canberra machine cancel affixed during the mission. The CSM and LM rendezvous and docking was performed twice-once while the LM was still attached to the S-IVB, and again when the LM was active. Further goals included internal crew transfer from the docked CSM to the LM; special tests of the LM's support systems; crew procedures, and tests of flight equipment and the EVA Mobility Unit.



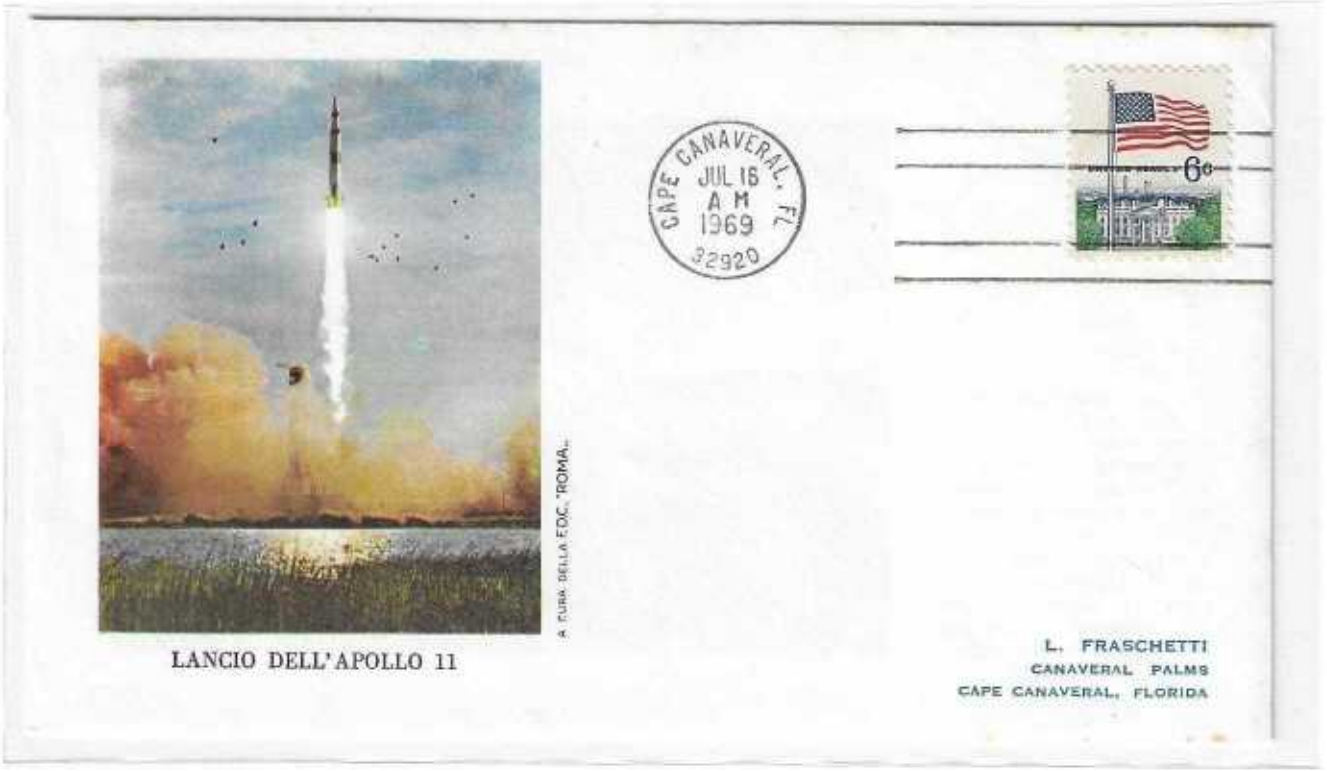
Mission Apollo 9 (AS-504). MARCH 13, 1969. Primary recovery ship USS Guadalcanal manual cancel on the date and time of splashdown. The LM descent and ascent engines fired on orbital change patterns to simulate a lunar-orbit rendezvous and backup abort procedures. The CSM Service Propulsion System, or SPS, fired five times, including a simulation of an active rendezvous to rescue an LM that had become inactivate.

Mission Apollo 10 (AS-505). MAY 18, 1969. KSC machine cancel on the date and time of launch. Official cachet. The Apollo 10 mission encompassed all aspects of an actual crewed lunar landing, except the landing. It was the first flight of a complete, crewed Apollo spacecraft to operate around the Moon. All mission objectives were achieved. Objectives included a scheduled eight-hour lunar orbit of the separated LM, and descent about 9 miles off the Moon's surface before ascending for rendezvous and docking with the CSM in about a 70-mile circular lunar orbit.

Mission Apollo 10 (AS-505). MAY 26, 1969. Primary recovery ship USS Princeton machine cancel on the date and time of splashdown. Stafford and Cernan entered the LM and prepared for the undocking maneuver that occurred on the 12th revolution, a little more than 98 hours into the flight. The LM flew over Landing Site 2, in the Sea of Tranquillity. During this run , the LM Landing Radar was tested for altitude functioning providing both " high gate " and " low gate " data.



Mission Apollo 11 (AS-506). JULY 16, 1969. KSC machine cancel on the date and time of launch. Official cachet. The primary objective was to complete a national goal set by President John F. Kennedy on May 25, 1961 : perform a crewed lunar landing and return to Earth by the end of the decade. Apollo 11 launched carrying commander Neil Armstrong, CM pilot Michael Collins, and LM pilot Edwin " Buzz " Aldrin. One-and-a-half revolutions, the S-IVB stage reignite placing Apollo 11 into a translunar orbit. The CSM Columbia separated from the stage, which included the spacecraft-LM adapter, or SLA, containing the LM Eagle. After transposition and jettisoning of the SLA panels, the CSM docked with LM.



Mission Apollo 11 (AS-506). JULY 16, 1969. Cape Canaveral machine cancel on the date and time of launch. The first color TV transmission to Earth from Apollo 11 occurred during the translunar coast of the CSM/LM. On July 18, Armstrong and Aldrin put on their spacesuits and climbed through the docking tunnel from Columbia to Eagle to check out the LM, and to make the second TV transmission.

L'APOLLO 11 ENTRA NELL'ORBITA LUNARE

A CURA DELLA F.D.C. "ROMA"

CAPE CANAVERAL, FL JUL 19 PM 1969 32920

L. FRASCHETTI
CANAVERAL PALMS
CAPE CANAVERAL, FLORIDA

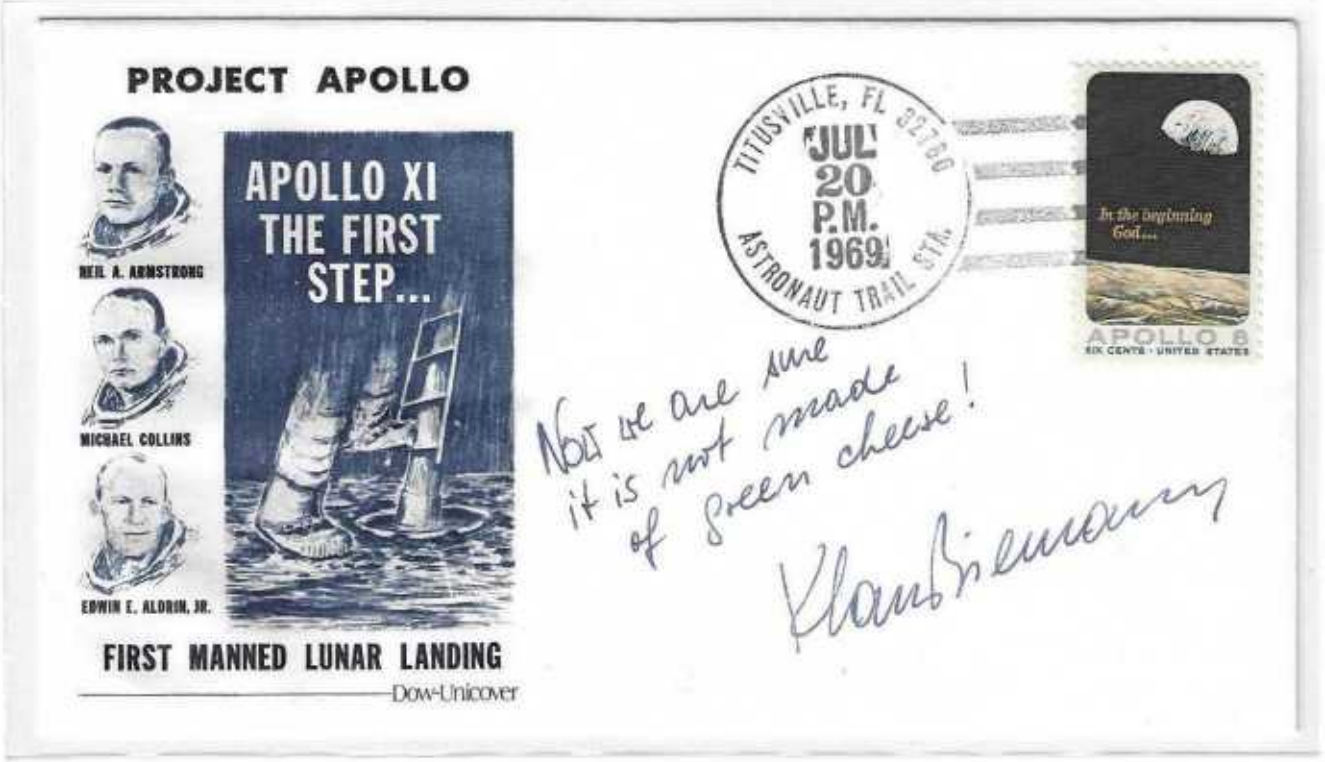
Mission Apollo 11 (AS-506). JULY 19, 1969. Cape Canaveral machine cancel on the date and time of the lunar orbit insertion. After Apollo 11 had flown behind the Moon out of contact with Earth, came the first lunar orbit insertion maneuver. Later, a second burn of SPS placed the docked vehicles into a lunar orbit of 62 by 70.5 miles, which was calculated to change the orbit of the CSM piloted by Collins. Another TV transmission was made, this time from the surface of the Moon.

LUNAR LANDING
AND WALK

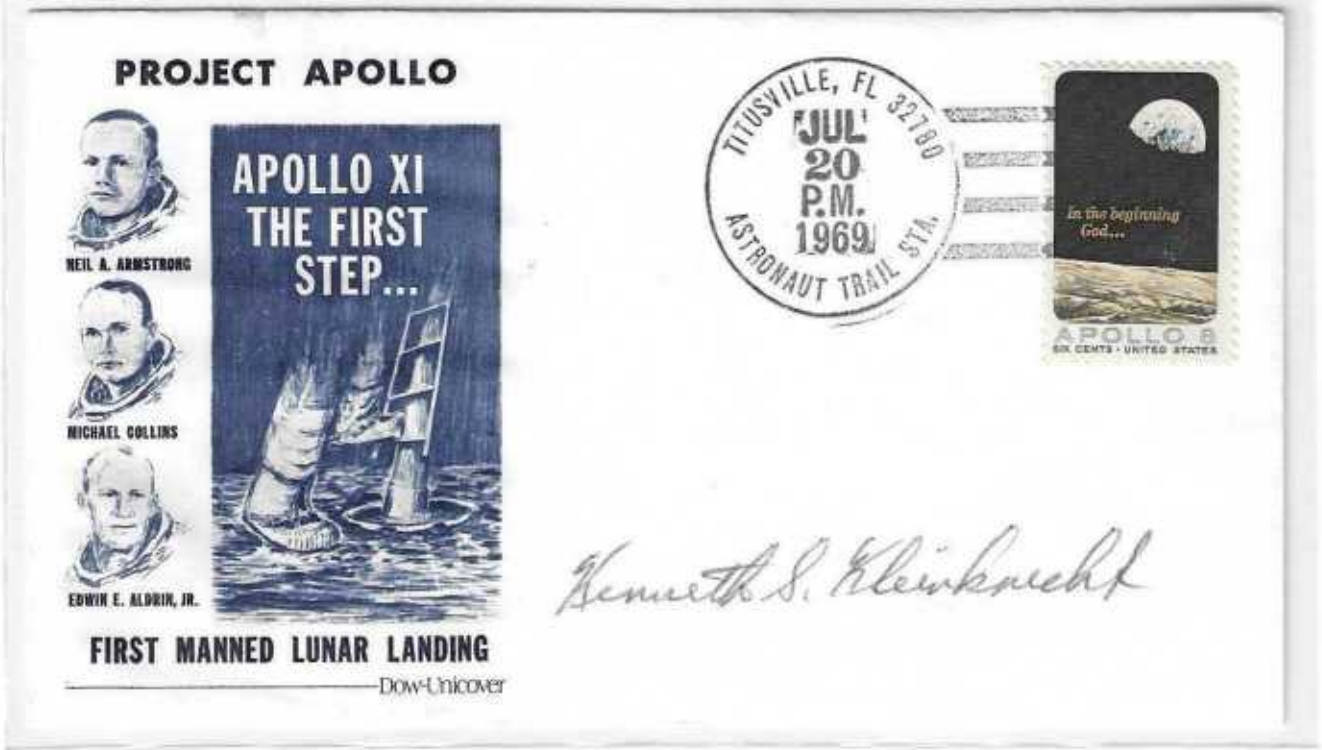
KENNEDY SPACE CENTER JUL 20 PM 1969 FL

"THAT'S ONE SMALL STEP
FOR MAN ..... ONE GIANT
LEAP FOR MANKIND."

Mission Apollo 11 (AS-506). JULY 20, 1969. KSC machine cancel on the date and time of moon landing. Official cachet. On July 20, the Eagle undocked and separated from Columbia for visual inspection. When the LM was behind the Moon, on its 13th orbit, the LM descent engine fired to provide retrograde thrust and commence descent orbit insertion, on a trajectory that was virtually identical to that flown by Apollo 10.



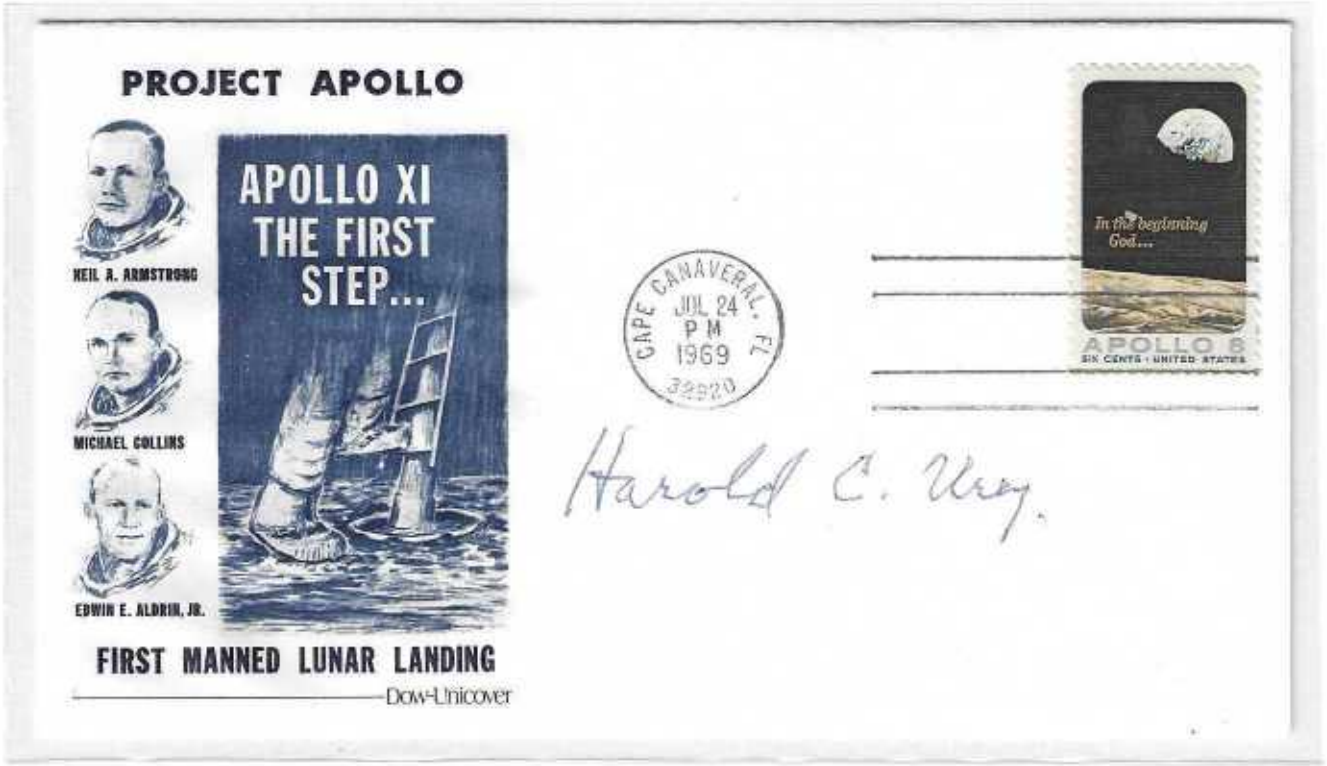
Mission Apollo 11 (AS-506). JULY 20, 1969. Titusville manual cancel on the date and time of moon landing. When the LM was about 300 miles uprange, powered descent initiation was performed. After 8 minutes, the LM was at " high gate " about 26,000 feet above the surface and about 5 miles from the landing site. Partially piloted manually by Armstrong, the Eagle landed in the Sea of Tranquillity, about 4 miles downrange from the predicted touch down point, and occurred almost one-and-a-half minutes earlier the scheduled.



Mission Apollo 11 (AS-506). JULY 20, 1969. Titusville manual cancel on the date and time of moon landing. Attached to the descent stage was a commemorative plaque signed by President Richard Nixon and three astronauts. It was almost 4 hours later that Armstrong emerged from the Eagle and deployed the TV camera for the transmission of the event to Earth.

Mission Apollo 11 (AS-506). JULY 20, 1969. Cape Canaveral machine cancel on the date and time of moon landing. Armstrong and Aldrin spent 21 hours, 36 minutes on the Moon's surface. During the EVA, in which they both ranged up to 300 feet from the Eagle, Aldrin deployed the Early Apollo Scientific Experiments Package, or EASEP, experiments, and Armstrong and Aldrin gathered and verbally reported on the surface samples. The entire EVA phase lasted more than two-and-a-half hours, the rest period included 7 hours of sleep.

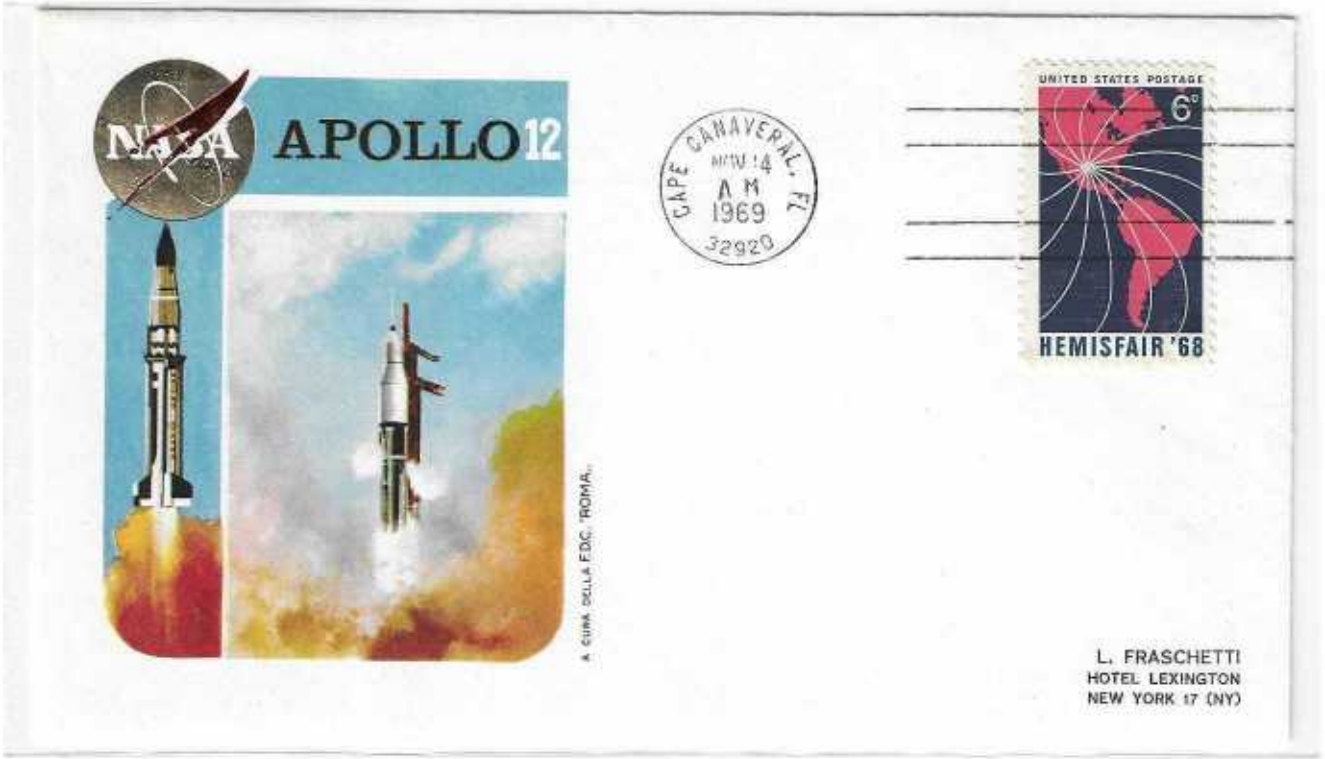
Mission Apollo 11 (AS-506). JULY 21, 1969. Cape Canaveral machine cancel on the date and time of lunar EVA. At about 109 hours, 42 minutes after launch, Armstrong stopped on the Moon. About 20 minutes later, Aldrin followed him. The ascent stage engine fired when Columbia was on its 25th revolution. Docking with Columbia occurred on the CSM's 27 th revolution . Armstrong and Aldrin returned to the CSM with Collins Four hours later, the LM jettisoned and remained in lunar orbit.



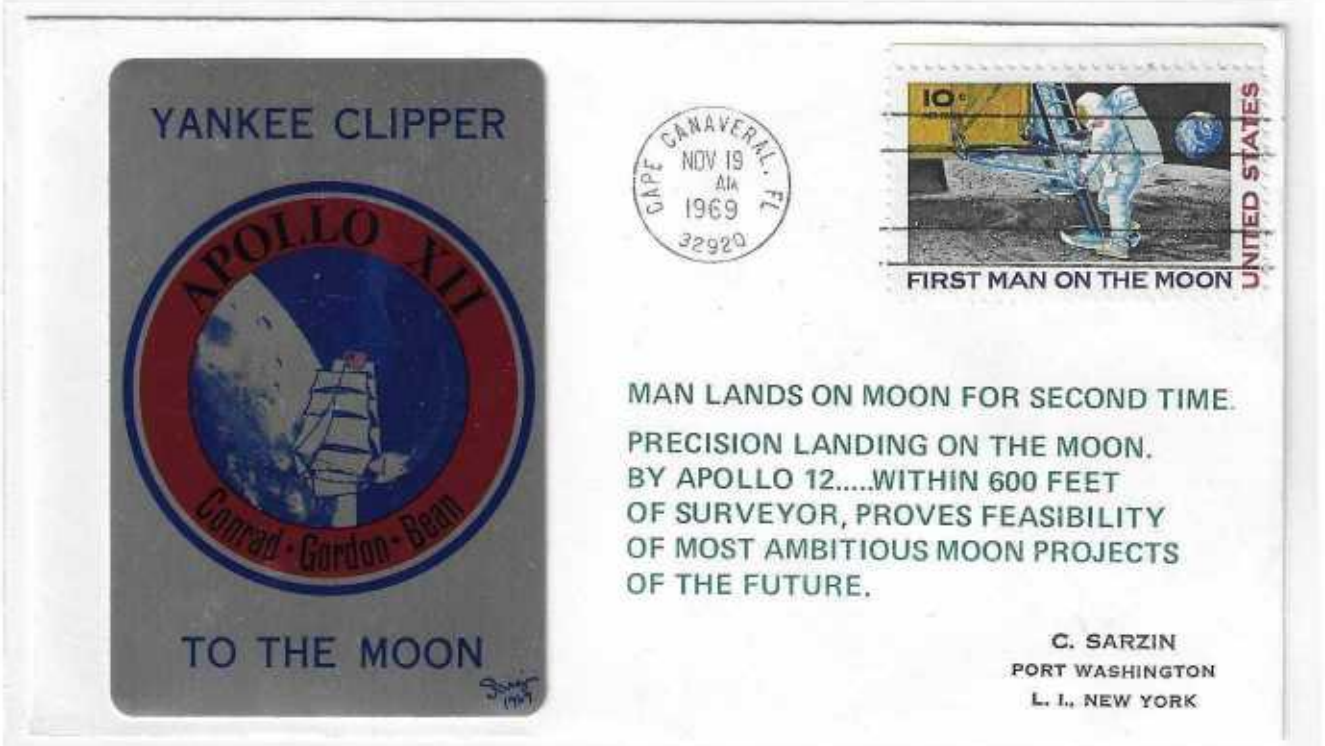
Mission Apollo 11 (AS-506). JULY 24, 1969. Cape Canaveral machine cancel on the date and time of re-entry. Trans-Earth injection of the CSM began July 21, when Columbia was behind the Moon in its 59th hour of lunar orbit. A second firing of the SPS accomplished the only midcourse correction required on the return flight. Two more television transmission were made during the trans-Earth coast. Reentry procedures were initiated July 24, 44 hours after leaving lunar orbit.

Mission Apollo 11 (AS-506). JULY 24, 1969. Primary recovery ship USS Hornet machine cancel on the date and time of splashdown. The SM separated from the CM, which was re-oriented to a heat-shield-forward position. Apollo 11 splashed down in the Pacific Ocean, 13 miles from the recovery ship. Because of bad weather in the target area, the landing point was changed by about 250 miles.

APOLLO PROGRAM (return on the Moon)

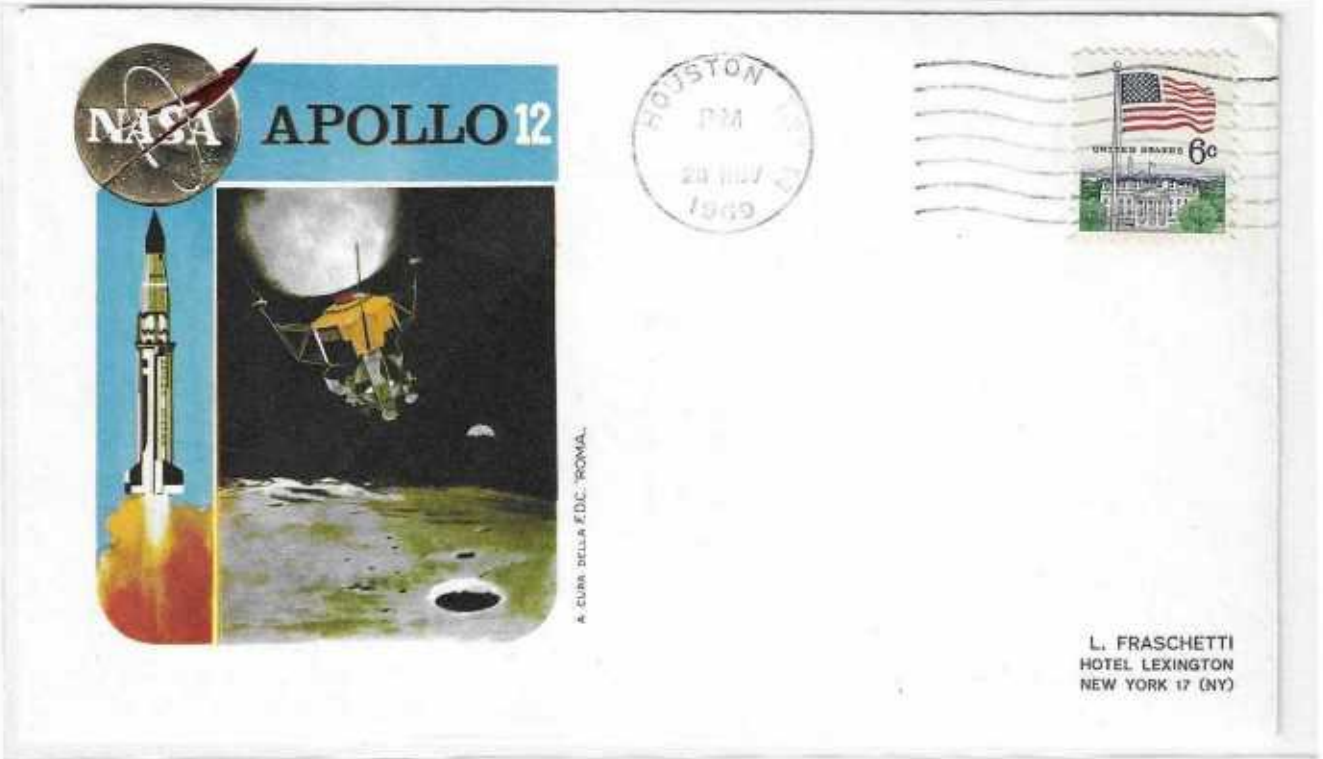


Apollo 12 (AS-507). NOVEMBER 14, 1969. Cape Canaveral machine cancel on the date and time of launch. The flight plan for Apollo 12 was similar to Apollo 11, except Apollo 12 was to fly a higher inclination to the lunar equator. The primary mission objectives included an extensive series of lunar exploration tasks by the LM, crew, and the deployment of the Apollo Lunar Surface Experiment Package, or ALSEP, which was to be left on the Moon's surface to gather seismic, scientific, and engineering data throughout a long period of time.



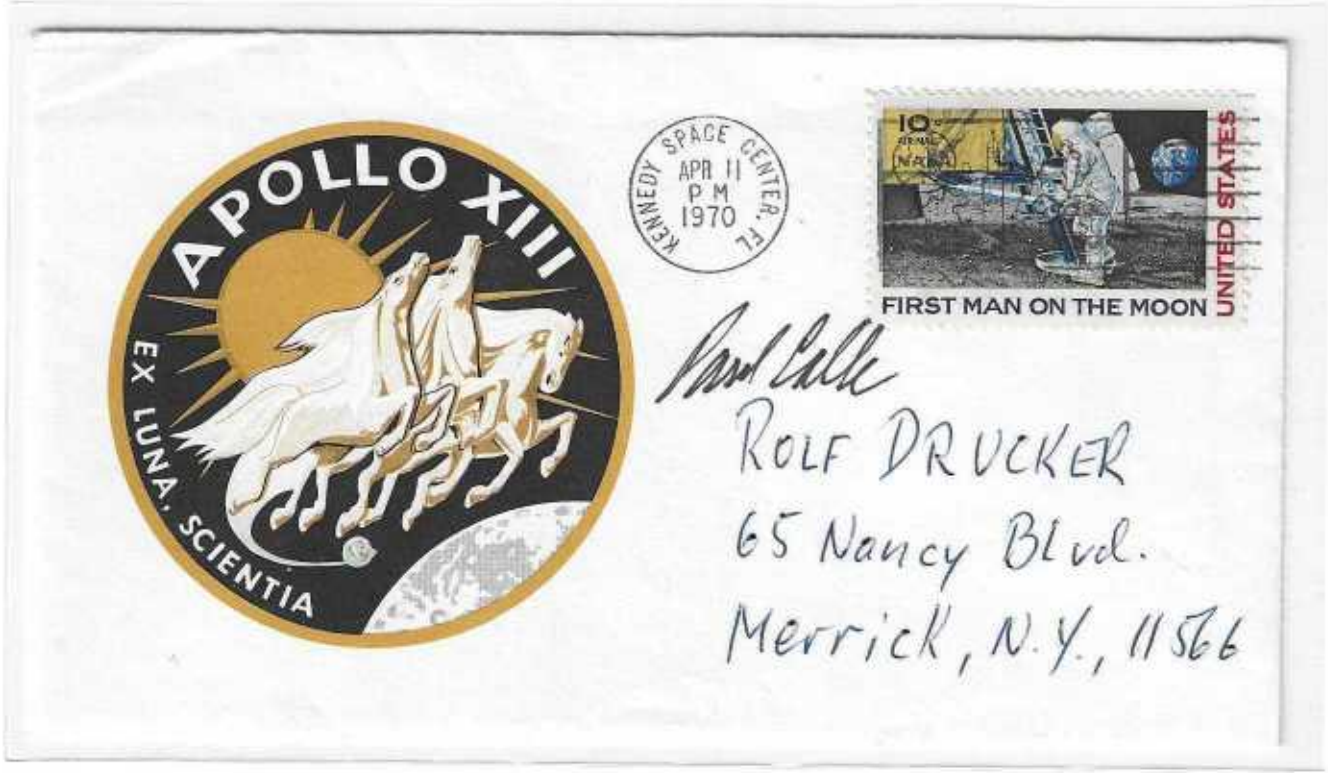
Mission Apollo 12 (AS-507). NOVEMBER 19, 1969. Cape Canaveral machine cancel on the date and time of moon landing. Sarzin cover metallic. Only one midcourse maneuver was needed. It changed Apollo 12's trajectory to prepare for later insertion into a non-free-return lunar orbit. The first non-free-return trajectory on a Apollo mission was designed to allow a daylight launch and a translunar injection above the Pacific.

Mission Apollo 12 (AS-507). NOVEMBER 19, 1969. Titusville manual cancel on the date and time of moon landing. A precision landing occurred in the Ocean of Storms, within 600 feet of Surveyor 3, landed on the Moon on April 20, 1967. Three hours after the landing and before the first lunar EVA began. Conrad spent 3 hours, 39 minutes outside the Intrepid, and Bean logged 2 hours, 58 minutes on the lurain. The astronauts collected lunar surface samples, deployed experiments, and took photographs.

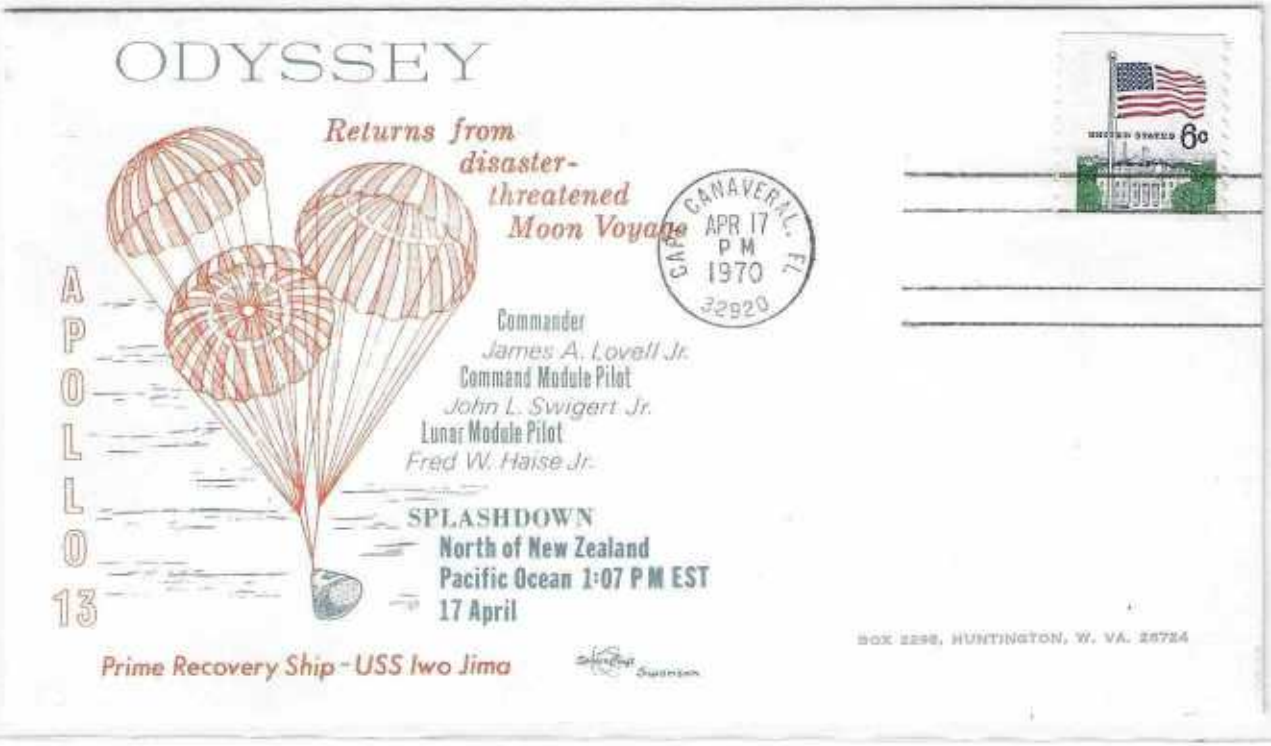


Mission Apollo 12 (AS-507). NOVEMBER 20, 1969. Houston machine cancel on the date and time of lunar liftoff. On November 20, the crew began the second lunar EVA, which included the collection of rock and dirt samples, material from depths 32 inches below the surface. The most important part of this EVA was a 5,200-foot traverse of the lurain, ranging up to 1,300 feet from Intrepid. After a total of 31,6 hours on the Moon, the LM ascent stage fired.

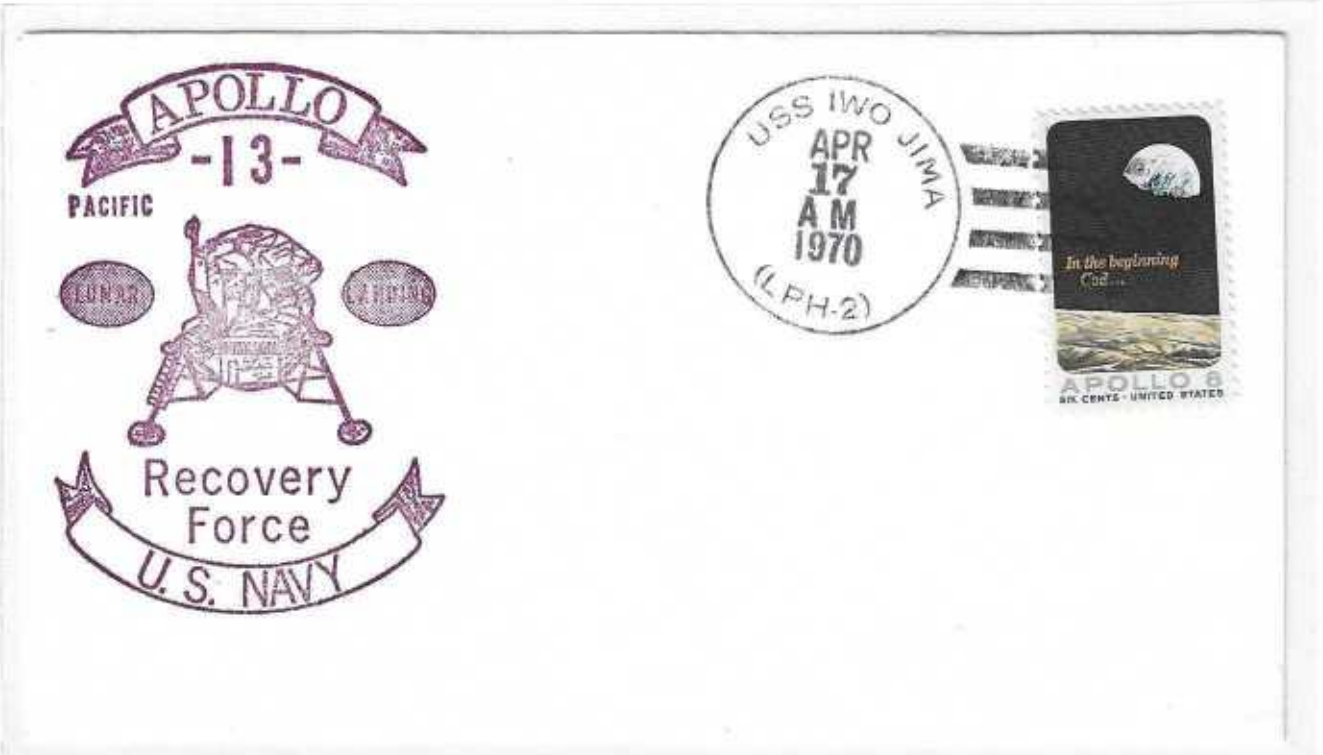
Mission Apollo 12 (AS-507). NOVEMBER 24, 1969. Primary recovery ship USS Hornet machine cancel on the date and time of splashdown.



Mission Apollo 13 (AS-508). APRIL 11, 1970. KSC machine cancel on the date and time of launch. Apollo 13 was supposed to land in the Fra' Mauro area. The Fra' Mauro site was reassigned to Apollo 14. The mission was aborted after rupture of SM oxygen tank. Still, it was classified as a " successful failure " because of the experience gained in rescuing the crew. At 55 hours, 55 minutes, oxygen tank N° 2 blew up, causing the N° 1 tank to also fail. The CM's normal supply of electricity, light, and water was lost, and they were above 200,000 miles from Earth. Ground controllers in Houston faced a formidable task. Completely new procedures had to be written and tested in the simulator before being passed up to crew. The navigation problem had to be solved; essentially how, when and in what attitude to burn the LM descent engine to provide a quick return home. The full LM descent tank alone would suffice. Oxygen wasn't a problem. At LM jettison just before reentry, 28.5 pounds of oxygen remained, more than half of what was available after the explosion.



Mission Apollo 13 (AS-508). APRIL 17, 1970. Cape Canaveral machine cancel on the date and time of reentry. Power also was a concern. Had the battery failed, there would have been insufficient power to return the ship to Earth. Water was the main consumable concern. It was estimated that the crew would run out of water about 5 hours before Earth reentry. Now the task was to get back on a free-return course. The ground computed a 35-sec. burn and fired it 5 hours after the explosion. As they approached the Moon, another burn was computed; this time a long 5-min. burn to speed up the return home. It took place 2 hours after rounding the far side of the Moon.

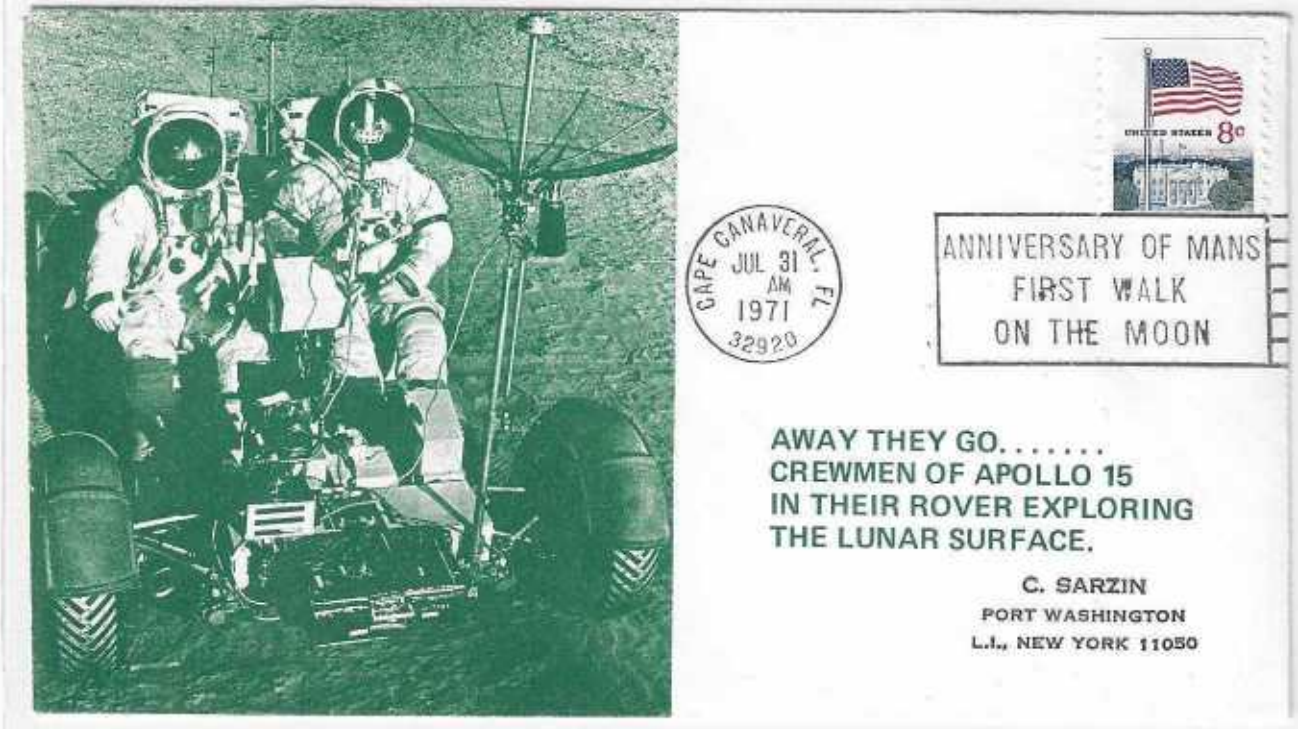


Mission Apollo 13 (AS-508). APRIL 17, 1970. Primary recovery ship USS Iwo Jima manual cancel on the date and time of splashdown. Alignment with Alignment Optical Telescope was difficult. An alternate procedure was developed to use the Sun as an alignment star. Four hours before landing, the crew shed the SM, three hours later, the crew left the LM Aquarius and then splashed down gently in the Pacific Ocean, near Samoa.

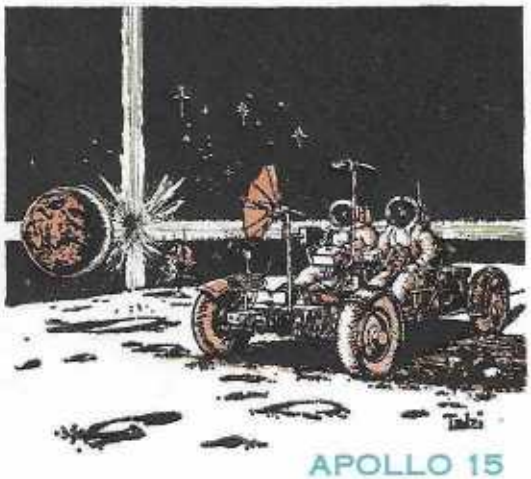
Mission Apollo 14 (AS-509). JANUARY 31, 1971. KSC machine cancel on the date and time of launch. Official cachet. The primary objectives of this mission were to explore the Fra' Mauro region, centered around the deployment of ALSEP experiment. The Fra' Mauro formation is material ejected by the impact that produced the Imbrium basin. The major crater Copernicus lies 360 km to the North, and bright ray material that emanates from Copernicus crater covers much of the landing site region. In addition to their geologic studies, the Apollo crew performed several experiments on the lunar surface.

Mission Apollo 14 (AS-509). FEBRUARY 5, 1971. KSC machine cancel on the date and time of moon landing. Official cachet. During their 33.5 hours on the Moon, the Apollo 14 crew performed two EVAs, totaling over 9 hours on the lunar surface, covering a total traverse distance of 3.5 km. Both the surface and orbital photography of the mission served not only to document, but also to identify scientific areas and experiments for study on the future missions.

Mission Apollo 15 (AS-510). JULY 26, 1971. Commemorative cover postmarked with machine cancel in Kourou on the date and time of launch. Apollo 15 was the first of the " Apollo J " missions, capable of a longer stay time on the Moon and greater surface mobility. The mission objectives were to explore the Hadley-Appennine region, set up and activate lunar surface scientific experiments, make engineering evaluations of new Apollo equipment, and conduct lunar orbital experiments and photographic tasks.



Mission Apollo 15 (AS-510). JULY 31, 1971. Cape Canaveral machine cancel on the date and time of first lunar EVA. Exploration and geological investigations at the landing site were enhanced by the addition of the Lunar Roving Vehicle, or LRV. Set up of the ALSEP experiment was the third in a trio of operating ALSEP.



APOLLO 15

Successo completo di un decennio di imprese spaziali

FDC "ROMA"

HOUSTON TEXAS AUG 2 X 1971

FIRST DAY OF ISSUE

Mission Apollo 15 (AS-510). AUGUST 2, 1971. Houston machine cancel on the date and time of third lunar EVA. David Scott and James Irwin flew their LM to a perfect landing, near a crater named Salyut. While previous crews had exited the LM shortly after landing, the crew of Apollo 15 elected to spend the rest of the day inside the LM, waiting until the next day to perform the first of three lunar EVAs.

KENNEDY SPACE CENTER, FL AUG 2 1971

FIRST DAY OF ISSUE

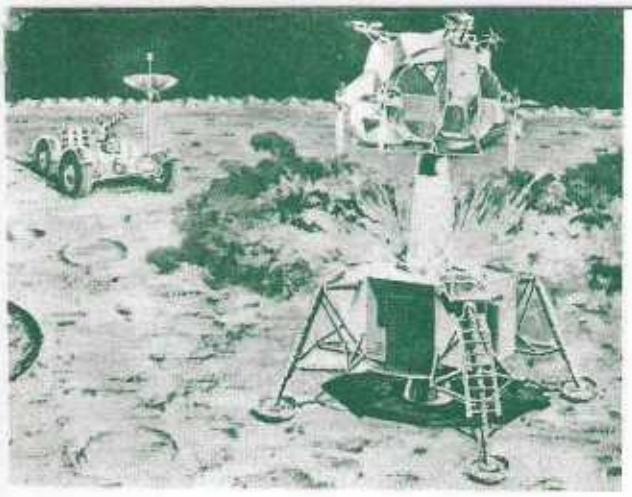
Commander
David R. Scott

Command Module Pilot
Alfred M. Worden

Lunar Module Pilot
James E. Irwin

HERMANN-OBERTH-SOCIETY
c/o P.O. Box 54
Cape Canaveral, Florida 32920

Mission Apollo 15 (AS-510). AUGUST 2, 1971. KSC machine cancel on the date and time of third lunar EVA. Scott performed a stand-up EVA during which the LM was depressurized and he photographed their surroundings from the top docking hatch. After unloading the LRV, the two drove to the first moonwalk's primary destination, Elbow crater. The target of the second lunar EVA, the next day, was the edge of Mount Hadley Delta. During this moonwalk astronauts recovered what came to be one of the more famous lunar samples collected on the Moon. On the next day, during EVA 3, the crew again ventured to the edge of Hadley Rille.



FALCON BLASTS OFF FROM THE SURFACE OF THE MOON ON AUG. 2, 1971, AS TELEVISED VIA THE CAMERA ON THE LUNAR ROVER.

CAPE CANAVERAL, FL AUG 2 PM 1971 32920

8c

ANNIVERSARY OF MANS FIRST WALK ON THE MOON

C. SARZIN
PORT WASHINGTON
L.I., NEW YORK 11050

Mission Apollo 15 (AS-510). AUGUST 2, 1971. Cape Canaveral machine cancel on the date and time of lunar liftoff. During three periods of lunar EVA, on July 31 and August 1 and 2, Scott and Irwin completed a record 18 hours, 37 minutes of exploration, traveled 17,5 miles in the first car that humans have ever driven on the Moon, collected more than 170 pounds of lunar samples, obtained a core sample from about 10 feet beneath the lunar surface, and provided extensive oral descriptions and photographic documentation of geologic features in the vicinity of the landing site during the three days (66 hours, 55 minutes) on the lunar surface.

APOLLO 15 SPLASHDOWN

SCOTT, IRWIN, AND WORDEN ON RECOVERY RAFT.

CAPE CANAVERAL, FL AUG 7 PM 32920

8c

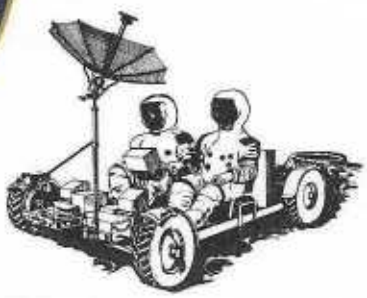
ANNIVERSARY OF MANS FIRST WALK ON THE MOON

AFTER 12 DAYS IN SPACE, SAFE SPLASHDOWN APOLLO 15 "ENDEAVOR" 300 MILES NORTH OF HONOLULU.

C. SARZIN
PORT WASHINGTON
L.I., NEW YORK 11050

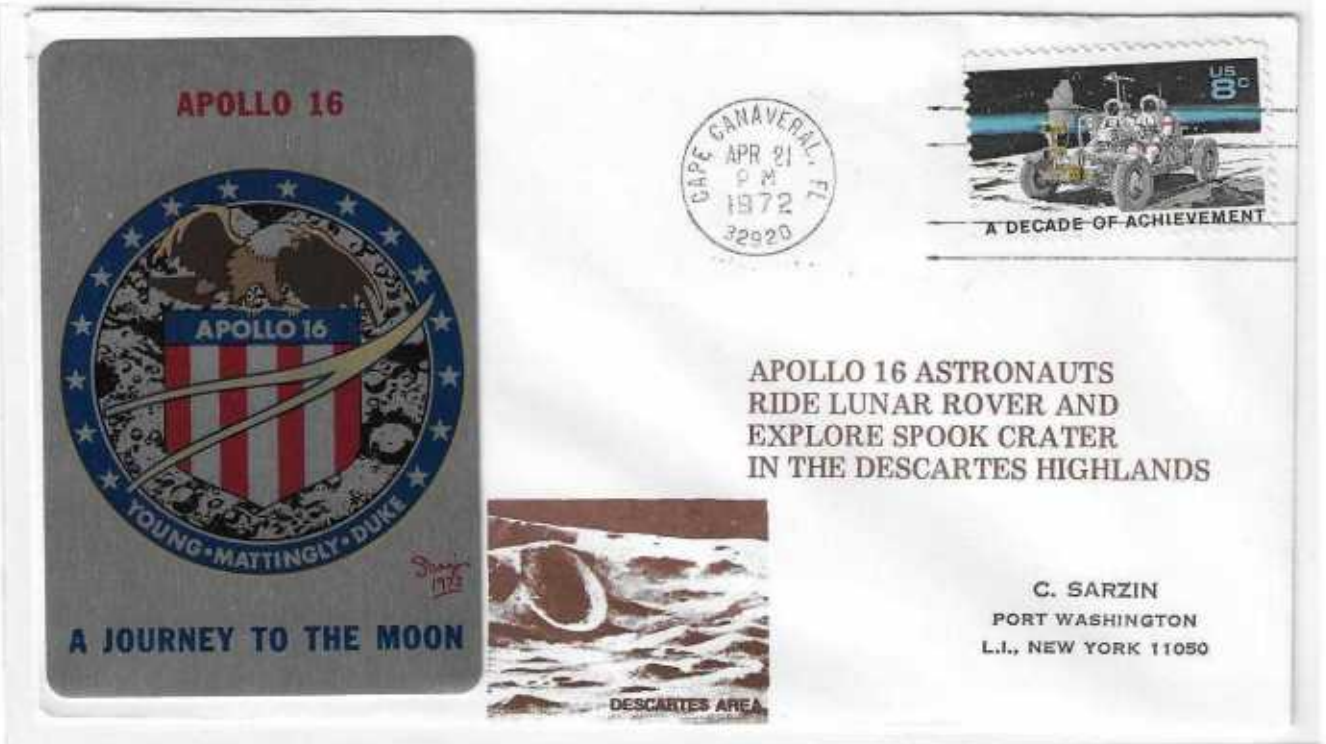
Mission Apollo 15. (AS-510). AUGUST 7, 1971. Cape Canaveral machine cancel on the date and time of splashdown.

Mission Apollo 15 (AS-510). AUGUST 7, 1971. Primary recovery ship USS Okinawa manual cancel on the date and time of splashdown. Another major mission objective involved the launching of a particles and fields, or P&F, subsatellite into lunar orbit by the CSM, shortly before beginning the return-to-Earth portion of the mission. The subsatellite was designed to investigate the Moon's mass and gravitational variations, particle composition of space near the Moon, and the interaction of the Moon's magnetic field with that of Earth.



Mission Apollo 16 (AS-511). APRIL 16, 1972. KSC machine pictorial cancel on the date and time of launch. Three primary objectives were to inspect, survey, and sample materials and surface features at a selected landing site in the Descartes region, emplace and activate surface experiments, conduct in-flight experiments and photographic tasks from lunar orbit.

Mission Apollo 16 (AS-511). APRIL 20, 1972. Houston manual cancel on the date and time of moon landing. A significant addition to surface objectives was the evaluation of the LRV through a " grand prix " exercise consisting of S-turns, hairpin turns, and hard stops. The ALSEP was the fourth such station to operate become operational.



Mission Apollo 16 (AS-511). APRIL 21, 1972. Cape Canaveral machine cancel on the date and time of lunar exploration. Sarzin cover metallic. The Descartes landing site is in a highlands region of the Moon's South East quadrant, characterized by hilly, grooved, furrowed terrain. It was selected as an outstanding location for sampling two volcanic constructional units of the highlands, the Cayley Formation and the Kant Plateau.

Partenza del Modulo Lunare dalla Luna

MR. L. FRASCHETTI
RODERWAY INN HOTEL
HOUSTON (TEXAS)

1500

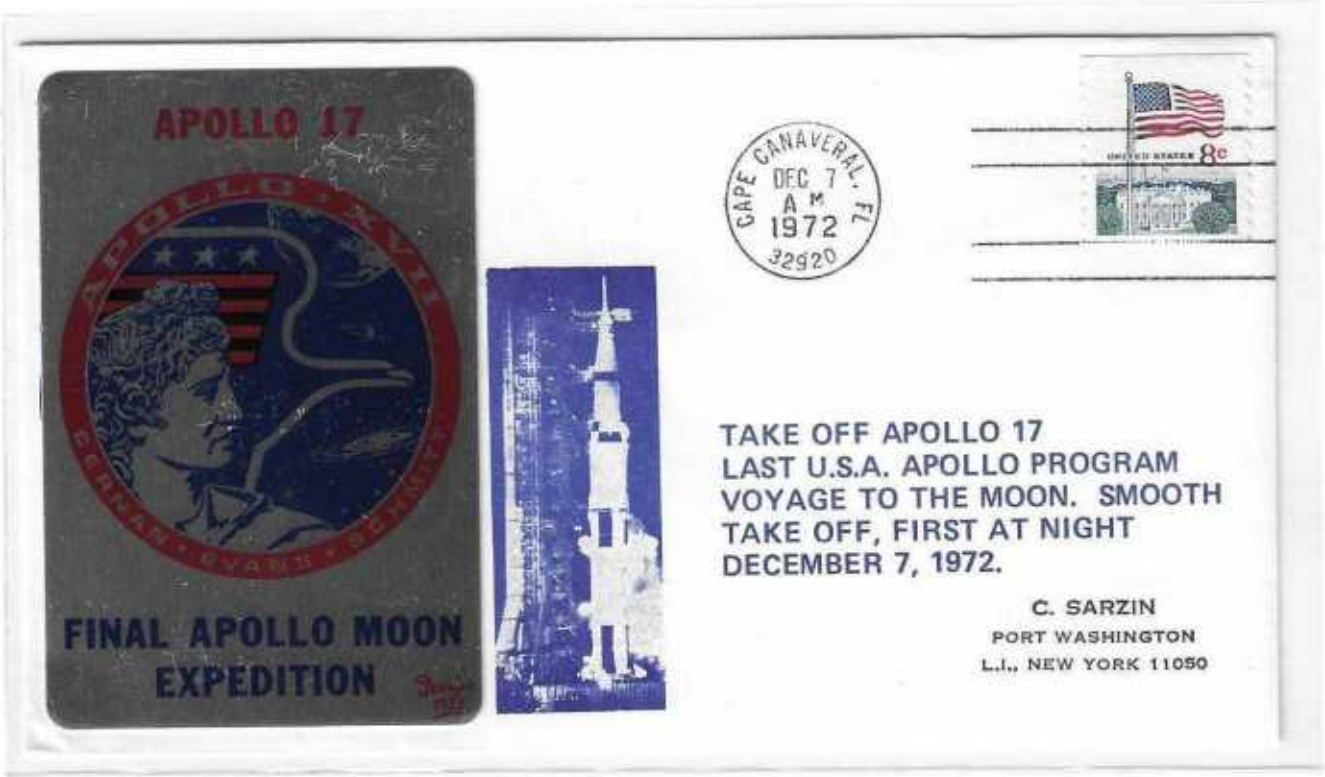
Mission Apollo 16 (AS-511). APRIL 23, 1972. Houston manual cancel on the date and time of lunar liftoff. During 71 hours, 2 minutes surface stay, astronauts explored region on three EVAs totaling 20 hours, 14 min First EVA duration was about 7 hours, 11 minutes with 2,5 miles driven in the rover. Second EVA began with drive south to Stone Mountain where surface and core samples were collected, penetrometer measurements and photography, portable magnetometer (LPM) measurements. Crew returned to LM and ended second EVA after 7 hours, 23 minutes and 6,9 miles on the rover. During third EVA astronauts drove north to North Ray Crater where " House Rock " inside the crater rim and, returning south, the crew stopped at " Shadow Rock ". EVA completed after 5 hours, 40 minutes. Rover distance was 7.1 miles.

APOLLO 16
PACIFIC TASKFORCE 130
Dr. Morris Schwartz
ROUTE 52
GLENHAM, NEW YORK 12527

MORRIS SCHWARTZ, M.D.
ROUTE NO. 52
GLENHAM, N. Y. 12527

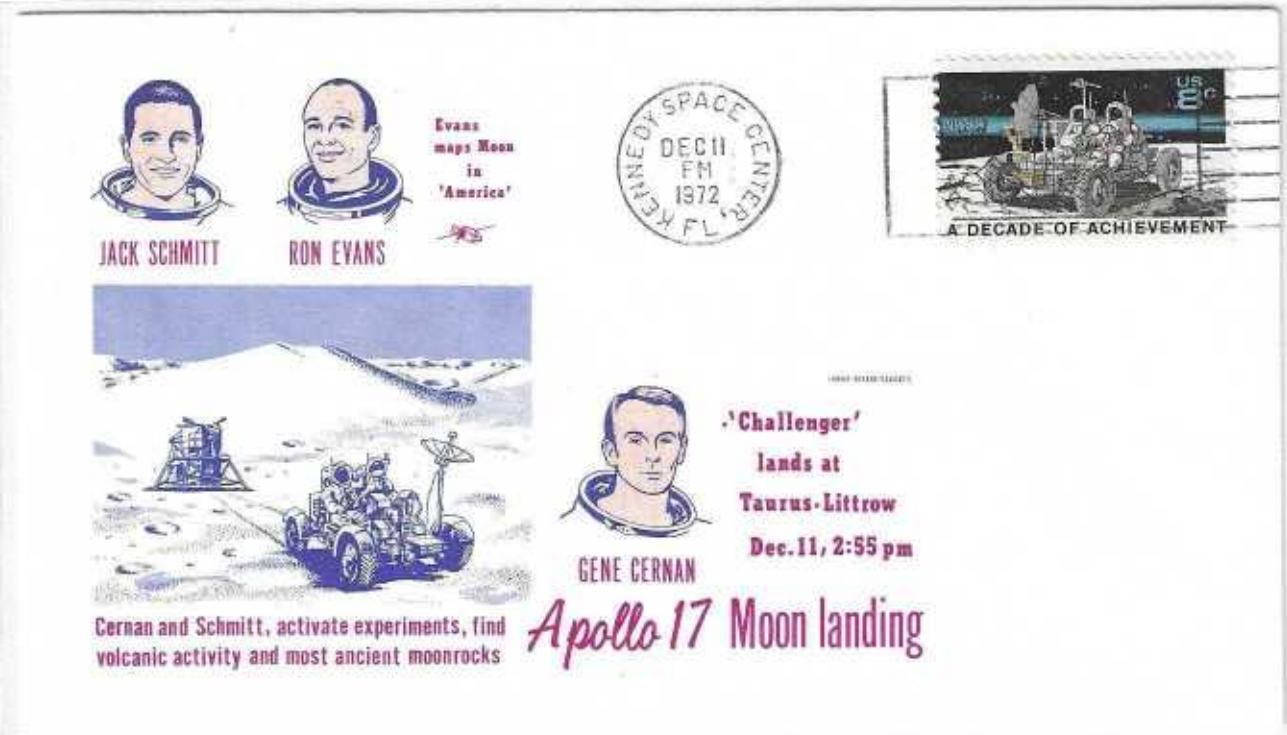
Mission Apollo 16 (AS-511). APRIL 27, 1972. Primary recovery ship USS Ticonderoga manual cancel on the date and time of splashdown.

Mission Apollo 17 (AS-512). DECEMBER 7, 1972. KSC machine cancel on the date and time of launch. Official cachet.

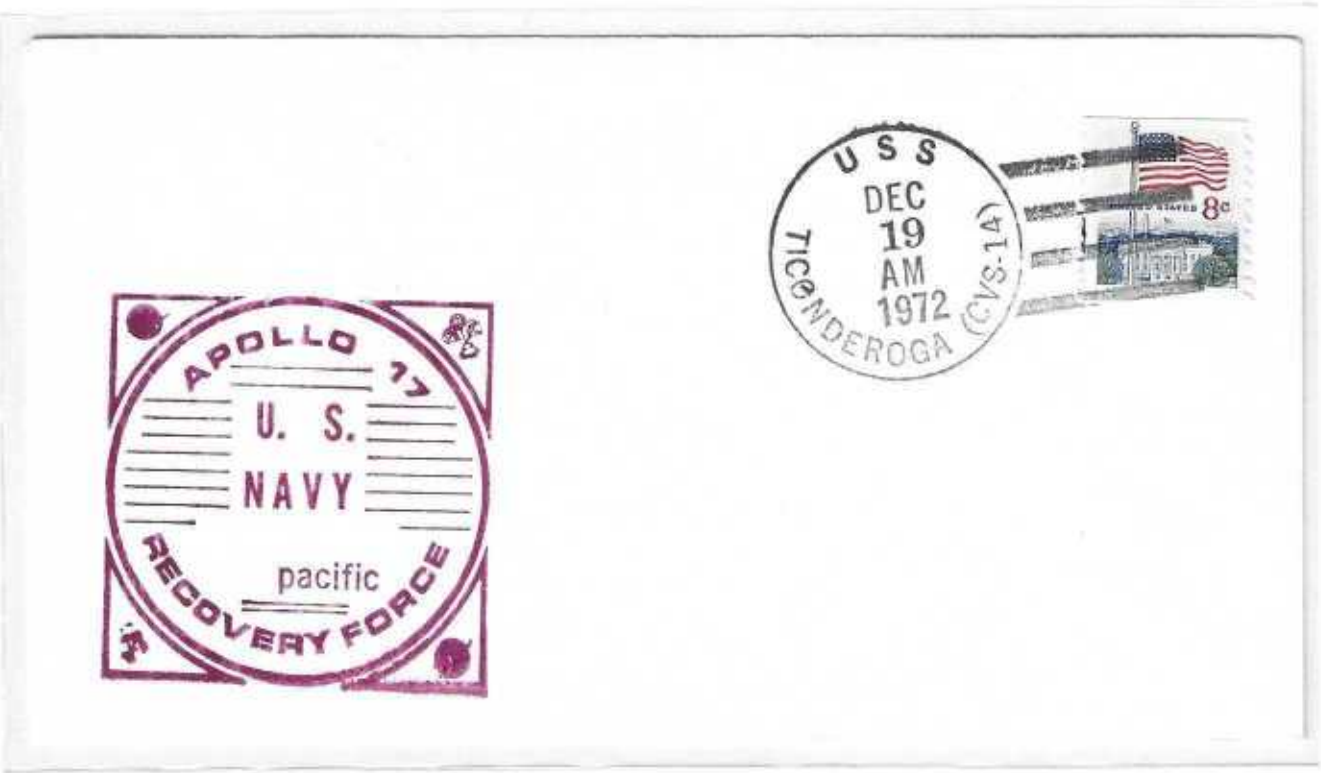


Mission Apollo 17 (AS-512). DECEMBER 7, 1972. Cape Canaveral machine cancel on the date and time of launch. Sarzin cover metallic. This mission was the final in a series of three J-tipe missions. Apollo 17 was indeed a fitting capstone to the Apollo missions. Its awesome and magnificent midnight launch, its flawless operation, its 72 hours lunar stay time, its deployment of scientific instrumentation, its return of the richest collection of lunar materials from any lunar site, its orbital science coverage, and its glorious splashdown in the Pacific Ocean surely marked Apollo 17 as the mission most impressively exemplifying the Apollo Program.

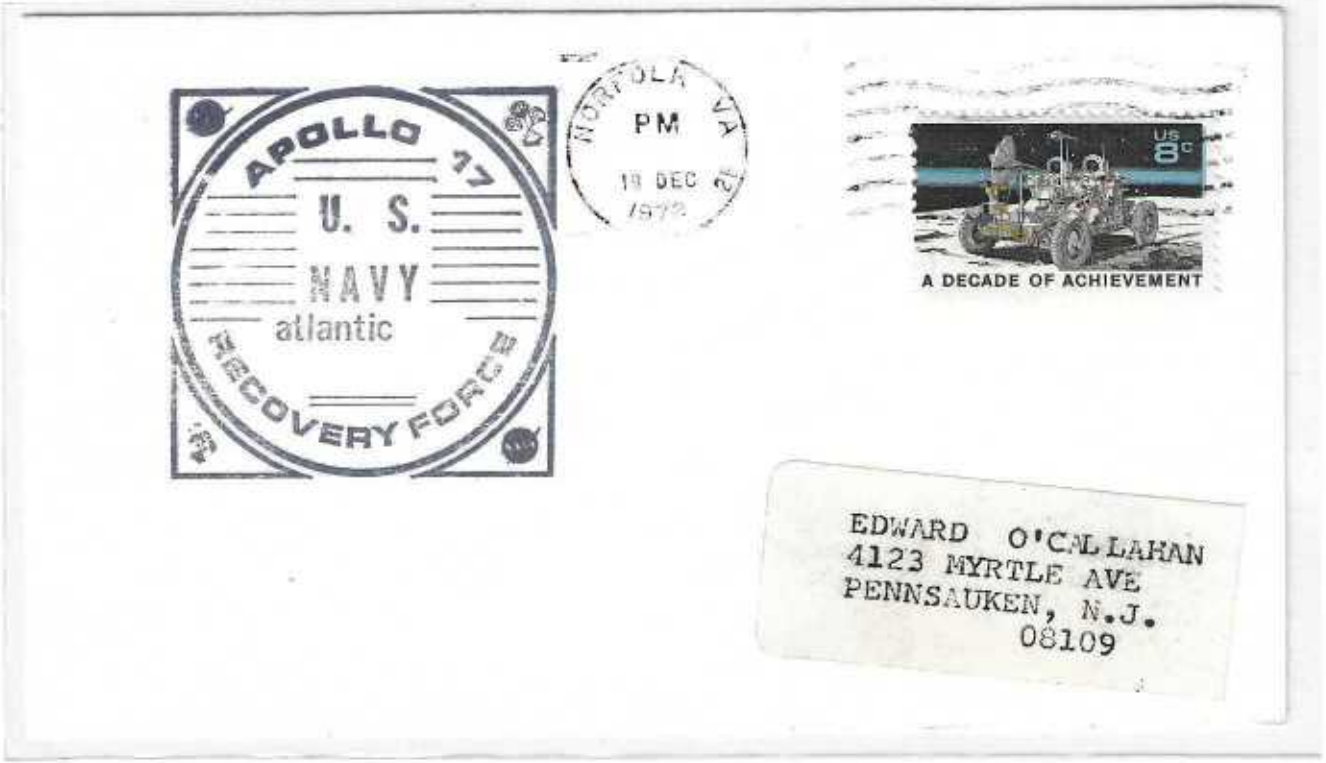
Mission Apollo 17 (AS-512). DECEMBER 7, 1972. Kourou ground station machine cancel on the date and time of launch. Only one of the four planned midcourse corrections was required during translunar coast. The Apollo 17 LM landed in a deep narrow valley called Taurus-Littrow, about 750 km north of the Apollo 11 site, on the eastern edge of Mare Serenitatis. During their 72 hours on the Moon, the Apollo 17 crew conducted three lunar EVAs, totaling 22 hours on the lunar surface. These EVAs included lunar rover traverses, totaling 36 km, collection of lunar samples at 22 locations, deployment or performance of 10 science experiments, and examination and photographic of the lunar surface.



Mission Apollo 17 (AS-512). DECEMBER 11, 1972. KSC machine cancel on the date and time of moonlanding. The Apollo 17 crew collected 741 individual rock and soil samples, including a deep drill core that included material from 3 meters below the lunar surface, with a total mass of 111 kg. In addition to their studies on the lunar surface, the Apollo 17 crew performed intensive studies of the Moon from lunar orbit. In addition to photography performed with handhled cameras in the CM, a series of experiments were carried in the Scientific Instrument Module on the SM.

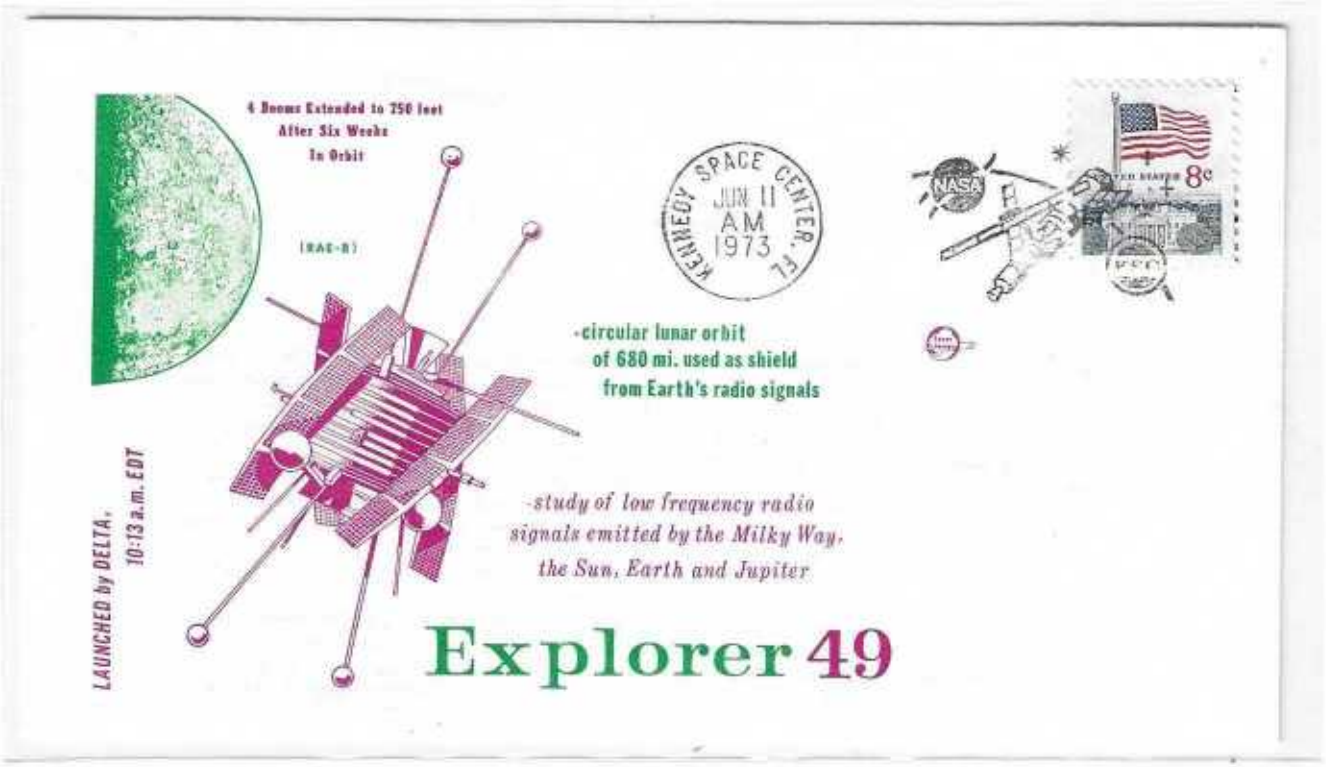


Mission Apollo 17 (AS-512). DECEMBER 19, 1972. Primary recovery ship USS Ticonderoga manual cancel on the date and time of splashdown.



Mission Apollo 17 (AS-512). DECEMBER 19, 1972. Commemorative cover postmarked with machine cancel in Norfolk on the date and time of splashdown.

AMERICAN LUNAR SATELLITE : THE EXPLORER 49



Mission RAE-B. JUNE 11, 1973. KSC machine pictorial cancel. Launched on June 10, 1973, the satellite was placed into lunar orbit to provide radio astronomical measurements of the planets, the Sun, and the galaxy over the frequency range of 25 KHz to 13.1 MHz. The spacecraft body had a mass of 328 kg at launch and 200 kg in lunar orbit, and was a truncated cylinder 92 cm in diameter and 79 cm high, with four fixed solar paddles. The lunar orbit and position of the Earth as a radio source, imposed periodicities on the observations of 29.5 days (the lunar synodic month) and 24.8 hours (the interval between consecutive sweeps of a given Earth geographic position past the Moon).