DOWNLOAD PDF RANGER TO THE MOON.

Chapter 1 : Ranger 7 photographs moon - HISTORY

The Ranger series was the first U.S. attempt to obtain close-up images of the Lunar surface. The Ranger spacecraft were designed to fly straight down towards the Moon and send images back until the moment of impact. Shown above is the Ranger spacecraft and an image of the Moon taken by the Ranger 7.

Ranger Moon Missions Ranger Missions to the Moon The Ranger program was a series of unmanned space missions by the United States in the s whose objective was to obtain the first close-up images of the surface of the Moon. The Ranger spacecraft were designed to collide with the lunar surface, returning imagery until they were destroyed upon impact. Ranger was originally designed, beginning in , in three distinct phases, called "blocks". Each block had different mission objectives and progressively more advanced system design. The JPL mission designers planned multiple launches in each block, to maximize the engineering experience and scientific value of the mission and to assure at least one successful flight. August 23, Ranger 1 was the first US spacecraft designed to test the feasibility of going into a parking orbit around Earth before heading out to the Moon. A parking orbit would give engineers time to calculate a much more accurate trajectory for the spacecraft to follow to the Moon. Ranger 1 made it into low Earth orbit. Its engines, which were supposed to re-ignite after 13 minutes and burn for 90 seconds, only burned for a few seconds and then shut off. November 18, Ranger 2, like Ranger 1, was designed as a test vehicle. April 23, Lunar impact: April 26, After a successful launch, a failure of some sort onboard Ranger 4 made communication with the spacecraft impossible. Engineers were able to track the spacecraft until it crashed on the far side of the Moon, but were unable to collect any data. October 18, A solar cell onboard Ranger 5 failed shortly after launch. Without power, engineers on the ground were unable to control the spacecraft and Ranger 5 missed the Moon by kilometers miles. January 30, Moon impact: Ranger 6 was designed to take a series of images as it approached the Moon, right up to the point where it crashed into its surface. Ranger 6 crash-landed in the Sea of Tranquility. July 28, Moon impact: July 31, Ranger 7 sent back the first high-quality images of the lunar surface before it crash-landed in the Sea of Clouds. Over 4, images were sent back. February 17, Moon impact: Ranger 8 took over 7, high quality images of the lunar surface before it crash-landed in the Sea of Tranquility. March 21, Ranger 9 took over 5, images of the lunar surface before it crash-landed in the crater Alphonsus. Network television broadcasted images from the spacecraft as they were received - live from the Moon!

Chapter 2 : Ranger Moon Missions

The Ranger program was a series of unmanned space missions by the United States in the s whose objective was to obtain the first close-up images of the surface of the Moon.

Aftermath of Ranger 6 and preparation for Ranger 7[edit] Ranger 7 cameras system. The mission had not been a complete failure, but Coughlin was not alone in his opinion that Jet Propulsion Laboratory in Pasadena , a nonprofit laboratory and extension of the California Institute of Technology Caltech , was a "soft" academic environment without the drive or ambition needed to make the missions succeed. It was also being said that sending probes up for the sole purpose of returning images was pointless and accomplished nothing that Apollo could not also achieve. This was determined quickly; the inadvertent activation of the camera telemetry system during ascent had been caused by an electrical short that crippled the power supply for the cameras. But why it had happened was as yet a mystery, especially as telemetry data sent back from the probe could only provide a limited amount of information. On February 14, , JPL released a report noting that an internal command switch could have activated prematurely or that arcing had occurred in the umbilical connector on the payload fairing. If the cameras had to be completely redesigned from scratch, the next Ranger mission could be delayed almost a full year. The full report as submitted to U. Congress came under criticism from several people at NASA , noting that, although the cameras lacked redundancy, any one of dozens of failure modes in the booster or spacecraft could also result in failure to return any TV images. In regards to the lack of adequate prelaunch testing, they brought up the incident back in with Ranger 1 deploying its solar panels during a ground test and that ground tests with full 60 W power had been discontinued on the Block II probes for fear of accidentally igniting the midcourse correction engine on the pad and destroying the entire launch vehicle in the process. RCA also promised to look into workmanship standards at their main plant in Hightstown, New Jersey , when examination of a sealed Ranger module discovered a plastic bag with screws and washers inside. Although there was suspicion that this had been done by a disgruntled employee, it was far more probable that someone had done it by accident. Since no obvious reason for the malfunction could be found in the cameras themselves, investigation next shifted to the electrical umbilical on the payload fairing. One of the pins on the connector was "hot" and could easily be bridged, transferring a voltage to the adjacent pins and activating the TV camera system during launch. As for the cause of it, one possibility was electrostatic discharge , the other was a shock wave of some sort. The idea of an electrostatic discharge was also unlikely given the thinning air and high altitude of the Atlas when staging occurred. Bratenahl persisted and studied more film of Atlas launches with the frames enlarged, which revealed light flashes in the post-staging plume. Since the umbilical door on the payload shroud was only held in place with a thin latching mechanism, hot gases from igniting propellant could have contacted the electrical connector and caused a short. Among the changes made for Ranger 7 included new procedures to apply full power testing to the spacecraft off of the launch pad, where there was no risk of the midcourse correction engine activating on top of a fully fueled Atlas-Agena. Rangers 6 , 7, 8 , and 9 were called Block 3 versions of the Ranger spacecraft. The spacecraft consisted of a hexagonal aluminum frame base 1. A cylindrical quasi-omnidirectional antenna was seated on top of the conical tower. The overall height of the spacecraft was 3. Orientation and attitude control about three axes was enabled by twelve nitrogen gas jets coupled to a system of three gyros, four primary Sun sensors, two secondary Sun sensors, and an Earth sensor. Power was supplied by 9, silicon solar cells contained in the two solar panels, giving a total array area of 2. Two watt-hour AgZnO batteries rated at Two watt-hour AgZnO batteries stored power for spacecraft operations. The telecommunications equipment converted the composite video signal from the camera transmitters into an RF signal for subsequent transmission through the spacecraft high-gain antenna. Sufficient video bandwidth was provided to allow for rapid framing sequences of both narrow- and wide-angle television pictures. The noise pattern at right results from spacecraft impact while transmitting. On July 6, Ranger 7 completed its ground testing and was stacked atop the booster. On July 9, a NASA committee met and deemed the booster and spacecraft fully ready for launch, which was targeted for the 27th. The next day, all went smoothly and

Ranger 7 lifted off from LC at The weather was clear and cloudless on this launch and Atlas staging was observed by tracking cameras. The expected propellant cloud enveloped the booster, but no anomalous events occurred this time. Thirty minutes after liftoff, the Agena restarted to boost Ranger 7 on a trajectory towards the Moon. The flight trajectory for Ranger 7 was quite accurate, however a short midcourse correction would still be needed to ensure impact in the Sea of Storms instead of the far side of the Moon, which was carried out early on the morning of July The warmup period for the TV cameras would be performed earlier and made shorter than on Ranger 6. As Ranger 7 sped towards the surface of the Moon , TV camera performance remained normal. Images of the cratered lunar surface continued to filter back to JPL headquarters in Pasadena, California and finally, at 6: In the JPL control room, there was "rapturous celebration". The photographs returned from the probe found that the Moon was most likely "very craggy and rocky with debris everywhere". After speaking to the media, NASA officials were peppered with the obvious question â€” did the Moon have a surface solid enough that humans could safely land on it? Geologist Eugene Kupier replied that, judging by the images, it seemed likely that at least some of the Moon was smooth enough to land a spacecraft on. 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 Transmission of 4, photographs of excellent quality occurred over the final 17 minutes of flight. The final image taken before impact has a resolution of 0. The spacecraft encountered the lunar surface in direct motion along a hyperbolic trajectory, with an incoming asymptotic direction at an angle of The orbit plane was inclined Impact occurred at On the success of Ranger 7, someone in the control room was noticed eating peanuts â€” surely the reason the mission was successful. Since control rooms ceremonially open a container of peanuts for luck and tradition.

Chapter 3 : Ranger Missions to Moon - Windows to the Universe

Ranger 7 was the first U.S. mission to successfully impact the moon. This was one of more than 4, images sent back during the flyby.

December 15, Along with Rangers 8 and 9, its pictures helped the United States plan the excursions for the Apollo program, which saw astronauts land on the moon between and The spacecraft came at a very early time in space exploration, when engineers were still learning the fundamentals about how to keep a machine working in space. As such, Ranger 7 followed six failed missions in its own program over several years. It made the first pictures extra-special. Failure NASA was tasked with sending astronauts to the moon in , when the agency had accumulated just 15 minutes of human spaceflight experience. It spent the next decade building the rockets and spacecraft needed for the journey, and training the astronauts across three programs Mercury, Gemini and Apollo. This culminated with the first human landing on the moon on July 20, But before humans could go there, scientists needed to know what the surface looked like. Even telescopic views of the moon indicated lots of craters, and at least the first missions would be safest on flat ground. Some scientists also were unsure how much dust was on the surface; a few even thought an unwitting crew could sink into the dust upon landing which turned out not to be the case. The first Ranger spacecraft launched on August 23, While the launch went well, the Agena rocket stage failed to put the spacecraft in the right orbit around the Earth. Ranger 1 eventually ran out of gas, and its solar powers failed to track the sun, putting the probe on battery power until it died on Aug. Only a handful of satellites had gone into space at this time, however. The urgency was that the Soviet Union and the United States were both engaged in a race to send people to the moon for national pride purposes, as well as to demonstrate which political system communism or democracy was more capable of taking on large challenges. In fact, in the Soviet Union sent two successful missions to the moon, including Luna 3, the first to take pictures of the far side of the moon. NASA continued suffering several failures with the Ranger program and other moon-bound probes including several consecutive failures in the Pioneer program. Ranger 2 failed to leave Earth orbit. Ranger 3 got out of Earth orbit, but missed its target. By the time Ranger 7 launched in , NASA had sent 12 missions to the moon and had still not achieved its main objective of taking pictures. Recovery It should be emphasized that NASA tried engineering fix after engineering fix to resolve the problems, including a lengthy examination into the camera problems plaguing Ranger 6. While the initial suspicion was sabotage, interviews were performed and it was later determined that somebody placed it there out of fatigue and overwork. The launch proceeded as planned. Ranger 7 was designed to achieve a lunar impact trajectory and to transmit high-resolution photographs of the lunar surface during the final minutes of flight up to impact. NASA The first launch attempt on July 27, , did not go forward due to a ground equipment malfunction, but the next try on July 28 went perfectly. Ranger 7 was on its way to the moon. A midcourse correction was performed on July 29, and at that time the television system appeared to be working. Film footage from the camera which was transmitted to Goldstone, Calif. At an evening press conference, reporters asked if the pictures showed it was safe enough for Apollo astronauts to walk on the surface, according to the NASA book. Twelve astronauts made the journey to the surface. While the Apollo program ceased in , lunar missions have continued through the decades, with more recent missions finding evidence of ice in permanently shadowed craters, and investigating reports of dust levitation at the sunrise-sunset line on the moon.

Chapter 4 : Ranger Moon - by vipond33 @ calendrierdelascience.com ~ woodworking community

Ranger 9 was the last of the Ranger series of spacecraft launched in the s to explore the moon and was designed to image and impact the moon's crater Alphonsus. Includes imagery from the onboard cameras.

Rangers 6, 7 , 8 , and 9 were called Block 3 versions of the Ranger spacecraft. The spacecraft consisted of a hexagonal aluminum frame base 1. A cylindrical quasiomnidirectional antenna was seated on top of the conical tower. The overall height of the spacecraft was 3. Orientation and attitude control about three axes was enabled by twelve nitrogen gas jets coupled to a system of three gyros , four primary Sun sensors, two secondary Sun sensors, and an Earth sensor. Power was supplied by 9, silicon solar cells contained in the two solar panels, giving a total array area of 2. Two watt-hour AgZnO batteries rated at Two watt-hour AgZnO batteries stored power for spacecraft operations. The telecommunications equipment converted the composite video signal from the camera transmitters into an RF signal for subsequent transmission through the spacecraft high-gain antenna. Sufficient video bandwidth was provided to allow for rapid framing sequences of both narrow- and wide-angle television pictures. Numerous theories were put forward about the cause of the failures, including poor management at JPL, overly-ambitious spacecraft designs that were unworkable and unreliable with contemporary technology, and some lesser reasons such as heat sterilization of the probes. Kelley, with the mission of establishing by November 30 the reasons for the continued program failures. They also concluded that heat sterilization was damaging to the delicate spacecraft systems and should be abandoned at once. If the Thor-Agena was also counted in, there had been a total of nine times that an Agena B stage had malfunctioned in flight. Moreover, it suggested that NASA needed to improve their prelaunch testing and preparation of launch vehicles. The Block III spacecraft would be stripped down to a minimum of instrumentation with the eight scientific instruments on Rangers removed so that more space could be devoted to redundant systems hardware. This caused some protests from the scientific community that the gamma ray and other measurements were far more valuable than simply returning photography of the Moon. Jet Propulsion Laboratory began more thorough testing of Ranger components and a second review board was put to work evaluating the reliability of the Atlas-Agena. The booster problems would prove a particularly vexing one to solve because the U. Although NASA had hoped to launch planetary probes on Centaur , which was entirely under their control, that program was delayed by serious technical issues and would not be flight-ready for a long time. Having to share the booster with the U. Air Force and its Department of Defense missions on the West Coast created repeated mixups, delays, and technical problems. Launch of Ranger 6. One of the important parts of the Ranger program was monitoring all Atlas and Thor-Agena launches to check for failures that could directly affect it. They recommended putting forward more detailed and stringent requirements for testing Atlas vehicles and making sure the guidance package could withstand in-flight vibration levels along with improved fabrication of wiring harnesses. Also, it was recommended that Convair establish one standardized booster configuration for all U. Air Force and NASA launches instead of custom modifications for each mission, replacing hardware with known design flaws with better substitutes, and improved testing of everything. Since the Air Force was in charge of Atlas-Agena, it followed that all these changes required their approval. Finally, NASA for the first time would be given complete oversight of all its space launches. Air Force involvement in procuring, preparing, and flying launch vehicles, as well as drafting postflight mission reports for NASA missions, was to end, a step that would greatly streamline and improve the efficiency of things. Problems continued, this time with getting the TV cameras for Ranger 6 in working order. During testing of Atlas guidance systems at General Electric , it was found that gold coating on diodes was flaking off and causing electrical shorts. Even worse, Ranger 6 had hundreds of the same diodes. This problem had easily eluded testing, moreover ground tests could not simulate a " zero gravity " environment in space where the gold flakes would float around and form a short between the legs of the diode. This meant that plans for Ranger probes up to 13 were cancelled. Only Rangers would be flown and they would carry little more than a TV camera. Television cameras of the spacecraft Ranger 6. Since the basic design of the Apollo lunar module had already been finalized by , landing on the Moon would only "confirm or deny that design".

Liftoff took place at The Atlas lifted smoothly into an overcast sky and disappeared from view. Shortly after Atlas BECO and staging, an ominous development occurred when telemetry indicated that the telemetry for the TV camera on Ranger 6 had turned itself on and then back off again 67 seconds later. Telemetry data showed everything else appear to function normally and tensions at JPL eased. The Agena placed the probe into parking orbit and then fired for translunar injection 25 minutes after launch. After separation of Ranger 6, the solar panels and high-gain antenna were extended and all appeared normal. The launch vehicle had placed the probe on an accurate enough flight path that only a short midcourse correction burn would be required. However, the activation of the TV camera telemetry during launch remained a cause for concern. JPL technicians wanted to turn the camera on to verify its operability, however they were running the risk of not being able to turn it off again if an electrical short had indeed occurred somewhere. They decided that it was not worth compromising the mission and the camera would not be touched until descent to the Moon began. Early in the morning of January 31, the command was sent to fire the midcourse correction engine, which performed flawlessly and set the probe on an impact course with the Sea of Tranquility. On February 2, JPL technicians prepared for the final phase of the mission. Ranger 6 began its descent and trajectory calculations determined that impact would occur close to the intended area. After an initial warm-up phase, the command to power them on was sent. However, no imagery or any sign of camera operation appeared. Two more commands were sent to turn on the camera, but still nothing happened even though all other systems continued to operate normally. The mission was over and for the 12th time in a row, a U. NASA attempted to put a positive spin on the mission by noting that, aside from the cameras, Ranger 6 and its Atlas-Agena booster had both functioned "extremely well". Ranger 6 was launched into an Earth parking orbit and injected on a lunar trajectory by a second Agena burn. The midcourse trajectory correction was accomplished early in the flight by ground control. On February 2, , The orientation of the spacecraft to the surface during descent was correct, but no video signal was received and no camera data obtained. 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. The spacecraft, the first Block III type vehicle with a suite of six TV cameras, was sterilized to avoid contaminating the lunar surface. The series would also serve as a test bed for future interplanetary spacecraft by deploying systems such as solar panels that could be used for more ambitious missions. The six cameras included two full-scan and four partial-scan cameras. Ranger 6 flew to the Moon successfully and impacted precisely on schedule at Unfortunately, the power supply for the TV camera package had short-circuited three days previously during Atlas booster separation and left the system inoperable. The cameras were to have transmitted high-resolution photos of the lunar approach from 1, kilometers to 6.

Chapter 5 : Ep. Giddy! The Girlfriend from the Moon | RangerWiki | FANDOM powered by Wikia

Ranger Missions to the Moon. The Ranger program was a series of unmanned space missions by the United States in the s whose objective was to obtain the first close-up images of the surface of the Moon.

The predecssors to Ranger 7 faced technical challenges along the way. As you may have heard, the National Air and Space Museum has set out to revitalize its building on the National Mall and, in the process, transform its exhibits. One of the new galleries will be called Destination Moon and will be devoted to the history and future of lunar exploration. One of the artifacts we are preparing for the new gallery is our Ranger Block 3 spacecraft. We recently took the spacecraft down from where it used to hang in the building and began the process of cleaning it, inside and out. As a space history curator at the Museum, I am responsible for the artifacts in our collection related to planetary science and exploration. Most of these artifacts have been here for much longer than I have. Every time we take one off display and I get to touch a piece of space history with gloves, of course , I learn more about it. The goal of the Ranger series was to acquire close-up images of the lunar surface â€" something that, when the program began, had never been done before. Our Ranger came to us in , just one year after the Museum opened to the public. It was transferred to the Museum at the suggestion of William Pickering, who ran JPL for 22 years and was one of the people responsible for the Ranger program. Pickering wanted the Museum to be able to display the first successful American robotic mission to the Moon. The spacecraft has remained on display since its arrival. When we moved Ranger into conservation, conservator David Blanchfield and I were given the rare opportunity to see it up close and examine what real parts JPL had included. The main body of the spacecraft, consisting of the hexagonal aluminum bus and camera tower, arrived as one piece. JPL had already prepared the spacecraft for hanging â€" all the Museum had to do was attach the solar panels and antenna and it was ready for display. Built between through , the Ranger spacecraft were designed to give scientists their first detailed closeup images of the lunar surface. The spacecraft were built to crash into its surface, collecting images as they approached. After six failed attempts, Rangers 7, 8, and 9 successfully completed their hour journeys to the Moon. Highlighted in this image are the solar panels on the Ranger spacecraft. David began his examination of the model in October Everything was pretty much as expected. About a month after this initial examination, David sent me an email telling me he had made an exciting discovery. While he was cleaning the dust from the camera bay, he discovered that there are six complete TV cameras inside. He also could see, looking deeper into the bay, that there was a lot of electronic equipment, too. When it was hanging from the ceiling, none of this had been visible. Inside he found what looked like a very complete set of camera electronics, all bearing the stamp of the RCA company that built the camera system. He sent me photos of his discoveries, taken with his phone camera. It seemed that our model was actually a very complete example of the Ranger spacecraft. This was an incredible find. The camera system from the Ranger Block 3 was a marvel of engineering, and its significance as the first American camera to take close-up images of the lunar surface makes it a milestone in the history of planetary exploration. Udvar-Hazy Center, Chantilly, Virginia. In them, you can see all six of the lenses from the narrow- and wide-angle cameras that the Ranger Block 3 carried. You can also see all of the intricately wired electronic components that made up the camera system. If you can remember what a television camera looked like in the early s, and how big they were, then you can imagine the engineering challenge RCA and JPL faced in having to fit six cameras inside of this tower. Looking at these images, I can only conclude that David is right: This is a fully-instrumented Ranger camera tower. It was likely used to test the camera design and function. Highlighted in this image are the cameras lens on the Ranger spacecraft. The Story of Ranger 7 and the six failures that preceded it Today we take planetary missions almost for granted. Our ability to visit and explore other worlds has improved by leaps and bounds since our first robotic steps off of our Earth, even while the endeavor remains costly and challenging. So, it is difficult to imagine just how nervous the engineers, scientists, and administrators of the Ranger mission were on July 28, , when they launched Ranger 7 on its way to the Moon. They were nervous because all of the previous six ranger missions had failed. And the spacecraft built for this purpose were designed not to land on

the Moon â€" at least not softly â€" but to crash into its surface, collecting images as they approached. The JPL engineers knew there was a lot they needed to learn in order to pull off this complex mission: They would need to successfully launch the spacecraft on top of a rocket powerful enough to send it to the Moon. They would need to control the spacecraft and navigate the trajectory to the Moon. Highlighted in this image are the cameras electronics on the Ranger spacecraft. The Block 2 Rangers each carried a television camera for collecting images, a gamma-ray spectrometer for studying the minerals in the lunar rocks and soil, and a radar altimeter for studying lunar topography. These spacecraft also carried a capsule containing a seismometer and transmitter that would be able to operate for up to 30 days after being dropped on the lunar surface. So what happened to Rangers ? How had all of the spacecraft in Blocks 1 and 2 failed? During its final 17 minutes of flight, the spacecraft sent back 4, images of the lunar surface. During Block 1, much of the technology being tested was new. Ranger 1 and Ranger 2 were launched into low-Earth orbits that unfortunately did not last long enough for the spacecraft to stabilize themselves or point their large solar panels toward the Sun to generate power. Although none of the Block 2 Rangers succeeded in accomplishing their full missions, the three spacecraft together did demonstrate that the launch system and the spacecraft design were sound. Ranger 3 launched perfectly but, due to a malfunction in the guidance system, missed the Moon. Ranger 4 also launched perfectly, and even managed to crash into the lunar surface, but, due to a computer failure, the spacecraft did not extend its solar panels and stopped operating before reaching the Moon. Ranger 5 again missed the Moon, this time because of a power failure that left it inoperable. While these three missions showed progress in working out the bugs of a lunar mission, no significant scientific data was collected. In the meantime, the Soviet Union had successfully landed Luna 2 on the Moon in and had photographed the far side of the Moon with Luna 3 that same year. Highlighted in this image are the cameras on the Ranger spacecraft. A lot was riding on the success of the Block 3 Rangers. Because of the earlier failures, every instrument but the camera system impressive in its own right was removed from its design. Things seemed to go very well for Ranger 6. It was launched into Earth orbit by the Atlas rocket and then boosted into a lunar trajectory by a second Agena burn. Ground control successfully sent it course correction instructions, and the spacecraft responded appropriately. The spacecraft crash-landed as intended, with the proper orientation to send data back to Earth. And yet, when it came time to transmit data, there was radio silence. No camera data was returned. NASA convened a review panel that determined the problem to be a malfunction of the camera system most likely caused during launch. Likewise, RCA gathered a large team of engineers and specialists. Together they worked around the clock to examine every aspect of the camera system to make sure that Ranger 7 would not experience the same problem. Each team double-checked the work of the others. The spacecraft was inspected and tested multiple times before launch. Highlighted in this image is the camera tower of the Ranger spacecraft. Like Ranger 6, the spacecraft was first put into Earth orbit before being boosted on a lunar trajectory. The launch system and the spacecraft seemed to operate flawlessly. Rangers had taught them that problems could arise all the way up to the last second. Finally, on July 31, Ranger 7 reached the Moon. The last image taken before impact had a resolution of just half-a-meter. Ranger 7 took this image, the first picture of the Moon by a U. Ranger 8 returned more than 7, images of the Moon.

Chapter 6 : Uncovering the Secrets of the Ranger 7 | National Air and Space Museum

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Chapter 7 : Ranger 6 - Wikipedia

Ranger 3 was launched on January 26, , but missed the moon. Ranger 4 was launched on April 23, , and became the first US spacecraft to impact on the moon. Ranger 5 was launched on October 18,

Chapter 8 : Ranger 7 - Wikipedia

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Ranger 7 was the first American spacecraft to image the moon's surface from close-up. Along with Rangers 8 and 9, its pictures helped the United States plan the excursions for the Apollo program.

Chapter 9 : Moon Palace | RangerWiki | FANDOM powered by Wikia

Ranger Photographs of the Moon is the online version of the NASA documents on the NASA Lunar Ranger Program. It contains selected Ranger 7, Ranger 8, and Ranger 9 mission images and documentation from the photographic edition of the following Ranger publications.