TRANSMITS TV PHOTOS—

Surveyor Soft-Lands On Surface of Moon

The United States trod with aluminous feet upon the hostile surface of the moon as the first of the Surveyor soft-landing spacecraft series landed in the Sea of Storms north of the crater Flamstead at 12:17 am CST June 2. Telemetered strain gauge readouts on the landing legs of the Surveyor confirmed that the spacecraft had made a soft landing—velocity at 100 feet above the surface was reported to be 13 feet per second by Surveyor Operations.

Exact landing point was fixed at 2.49 degrees south latitude by 43.32 west longitude near the western end of the equatorial band of probable Apollo manned landing sites.

Immediately on landing, Surveyor flight controllers at the Jet Propulsion Laboratory commanded the spacecraft's television camera to capture photos in both the low-gain 200-line scan mode and the high-gain 600-line mode were transmitted back to earth. The excellent definition of the photos shows fine detail of the Surveyor's landing weight after use of the retrorocket and three liquid-fuel vernier engines to effect the soft landing.

The solid-propellant retrorocket ignited at the proper altitude and rate of descent to the lunar surface. The retrorocket was automatically jettisoned after burning, reducing Surveyor's weight by 1,377 pounds. Final landing weight after use of the retrorocket and three vernier propellant engines was about 620 pounds.

Ground commands sent to the Surveyor during the flight and after landing will total more than 250, and about 300 persons were involved in Surveyor flight control duties at peak times during the mission.

The Surveyor program is directed by the NASA Office of Science and Applications, with project management assigned to JPL by the California Institute of Technology, Pasadena, Calif. Tracking and communications for the mission was through the NASA/JPL Deep Space Network.

The successful Surveyor A mission proved the concept of automatically accelerating a spacecraft from 6,000 miles per hour to a touchdown speed of about three and one-half miles per hour and to have the spacecraft function in the intense heat of the lunar day.

Surveyor's critical terminal descent of soft landing was accomplished with a 10,000-pound thrust solid-propellant retrorocket and three liquid-fuel vernier engines throttleable from 30 to 104 pounds of thrust.

Engine ignition was activated by a flight programmer and analog computer coupled with radars and other flight control equipment.

The Surveyor series will have mission accurately controlled reentry of Gemini 1V flight a year ago we had difficulty in near the landing point and temperatures drop to about minus 250° F. The batteries are not expected to be capable of providing power for a second lunar day. Later spacecraft in the Surveyor series will have mission objectives of gathering information on the properties of the lunar surface in support of the Apollo manned lunar landing program.

Surveyor A’s prime objectives were to demonstrate the capability of the Atlas/Centaur launch vehicle to inject the Surveyor into a lunar-intercept trajectory, to demonstrate Surveyor’s capability to perform midcourse and terminal maneuvers for a lunar soft landing, and to demonstrate the capability of the Surveyor communications system and of the Deep Space Network to maintain communications with the spacecraft during its flight and after soft landing.

Gemini IX Logs 3 Rendezvous, Long EVA, Precise Landing

The elation of Gemini IX’s perfect reentry and landing closest to the prime recovery vessel of any manned mission to date was tempered somewhat by the disappointment of not having done all the things that were set out as mission objectives.

The elation of Gemini IX’s success included pilot Gene Cernan’s two-hour and ten minutes of extra-vehicular activity, rendezvous with the Augmented Target Docking Adapter (ATDA) by three different rendezvous techniques, the gaining of knowledge of man’s capabilities and limitations to do useful work in space, and of the value of closed-up manned observation of another satellite in orbit, and the most accurately controlled reentry of any US manned space flight.

On the debit side, docking was ruled out because of the failure of the ATDA exit protective shroud to fully separate: use of the Astronaut Maneuvering Unit (AMU) was cancelled when Cernan’s visor fogged over after he had attached his suit circuit to the Environmental Life Support System.

Try To Do More

The balance of success and failure in the Gemini IX mission was described by MSC Director Dr. Robert R. Gilruth at the post-recovery press conference when he said, “It’s my observation that even though we get more proficient, the flights don’t get any easier. The reason they don’t get any easier is because each time we try to do more, we don’t think anyone mentioned the fuel cell very much. Last year at this time we were flying Gemini IV and we hadn’t even tried to fly a fuel cell, just a year ago.”

So as we get increased capability. Dr. Gilruth continued, we try to do more in the flights. The things that we spend most of our time talking about are things we hadn’t even tried before. For example this Gemini IX flight made three rendezvous and station kept, and you may remember in the Gemini IV flight a year ago we had difficulty in trying to station keep. We’ve learned these lessons well in a short time. I think it is significant that the spacecraft had no anomalies in this flight. There were no problems with this major piece of equipment.

“Don’t this mean there can’t be problems in future flights, but Gemini IX went through the whole sequence from liftoff to landing in a completely normal fashion. I’m proud of the performance of the Manned Spacecraft Center people, the people at the Cape and the people around the world and, of course, the crew themselves I think did a magnificent job on this flight.”

(Continued on page 2)

HUMAN SATELLITE—Gemini IX pilot Eugene Cernan peers through command pilot Tom Stafford’s window during his two-hour and ten-minute extravehicular activity—longest EVA of any space pilot to date.
Soft-Landed Surveyor A Transmits High-Detail Photos

(Continued from page 1)

(DSN) with stations at Goldstone, Calif., Johannesburg, South Africa, and Tidbinbilla, Australia. DSN station data was relayed to the JPL Spaceflight Operations Facility in Pasadena, command center for the mission. Hughes Aircraft Company is prime contractor for the Surveyor spacecraft.

FOOTPRINT ON THE MOON—Surveyor A’s television camera looks down on one of the spacecraft landing pads and the slight dent it made in landing on the lunar surface. The circular disc just above the landing pad is a television photometric chart with a grey-scale and converging lines for measuring resolution of transmitted photos.

SELF PORTRAIT—Three major components of Surveyor A are visible in this photo relayed from the soft-landed lunar spacecraft. At lower left is the spacecraft’s vernier fuel system and spherical helium pressurization tank. Extending diagonally to the right is omnidirectional antenna B. At upper left is one of the three landing pads. Inset at right shows the vernier fuel system as taken in the 200-line scan mode.
Surplus Dirigible Tanks Find Space Application

An internal weather problem has been solved by creative use of government surplus equipment at the NASA Manned Spacecraft Center, Houston, Texas.

Snowstorms and fog have been created several times in the two large vacuum chambers here when humid outside air was used to repressurize the big chamber in drills of emergency rescues. Supercooled, nitrogen-cooled panels which are used to simulate space temperatures inside the chamber caused water to crystallize in the air and change into ice crystals resulting in snow formation and a dense fog which hampered practice rescue operations by severely vaporized and heated to room temperature. This fog may be used for preventing bad weather in space operations.

On the 28th of February 1966, Mr. Elliot M. See, Jr., and Major Charles A. Bassett, Jr., took off from Ellington Field in the 0741 CST in a T-38A aircraft with Lambert-St. Louis Municipal Airport as their destination. See was the pilot and Bassett was the co-pilot in the rear seat. Lt. Colonel Thomas B. Stafford and Lt. Commander Eugene A. Carr, co-pilot, accompanied them in the cockpit.

The mission of the four astronauts involved space flight training at the McDonnell Aircraft Corporation in St. Louis in support of their upcoming GT-9 flight.

The flight was brief and a flight plan was filed with the FAA through the facilities available at Ellington Field 4 minutes before takeoff. climb to 41,000 feet, and the enroute portion of the flight was normal in all respects. In the approach and landing procedures were used, as is the case on all cross-country flights.

At 0818 CST, the history of flight was documented by interview of the flight crew, the history of flight was documented by interviewing Weather Bureau personnel. It was determined that at the time of impact, the aircraft was flying at an altitude of 500 to 600 feet, and announced that he had the southern approach and was making a landing. Shortly afterward, at 0858 CST, the aircraft crashed on the roof of a building belonging to the McDonnell Aircraft Corporation. Both pilots were killed instantly by the impact. Sixteen McDonnell Aircraft employees and one contract worker received minor injuries.

Captain Alan B. Shepard, President of the Board, convened the first meeting in St. Louis at 1500 CST on Tuesday, June 10. The Board included four qualified pilots, a safety officer, a maintenance supervisor and a physician. In addition, four qualified pilots, a safety officer, a maintenance supervisor and a physician.

The history of flight was documented by interviewing Weather Bureau personnel. The weather that was actually encountered in flight was determined by interviewing Weather Bureau personnel and available data applicable to ground conditions.

The search for applicable data on the aircraft and pilots was centered on reviewing the written records of each. This information was supplemented by questioning pilots who had flown 901 recently regarding any unusual operations or characteristic of the aircraft systems.

In addition, flights were made in T-38 aircraft and helicopters using ground observers and cameras as well as airborne cameras. These data, with analytical techniques, established the flight path over the ground to within a wing span and the altitude to within a few feet. The detailed analysis of aircraft components included the airframe, hydraulic pumps, landing gear, landing flaps, flight controls, stabilizer, rudder, ailerons, fuel and electrical systems, both engines, instruments, ejection seats and communication and navigational equipment. It was determined that at the time of impact, the landing gear and flaps were fully down and all components and systems were functioning normally with two exceptions. The condition of the airspeed system and marker beacon receiver as a result of damage precluded exact determination of their operation.

The analysis of Mr. See's and Major Bassett's flight and medical records showed they were capable and qualified to perform normal duties prior to impact.

It was concluded by the Investigation Board that the primary cause of the accident was the inability of the pilot to maintain visual reference for a landing during local weather conditions that were irregular and deteriorating rapidly. The weather throughout approach was characterized by low ceiling, obscured sky, limited visibility, light rain, snow and fog. As See was approaching the southwest runway, he remained below the clouds. In a left turn, attempting to maintain visual contact with the runway. Because of the weather conditions, See was forced to maneuver: at low altitude and inadvertently developed a rate of descent from which recovery was impossible. About three seconds before the crash, the bank angle was reduced and afterburner operation was selected. The right afterburner was in full thrust at impact, and the left was lighted and building up full thrust. The pilot had commanded a nose-up attitude in an apparent attempt to miss the building and climb to a higher altitude.
Ever-Present Camera Records Faces and Moods Of Gemini IX

Three times up Pad 19's ramp...

... and twice back down...

... until the hatches were closed for launch.

'Flight's' console was a busy place as the count approached...

... liftoff.
Stafford and Cernan sought out...

...the angry alligator three times.

Deke, backups Lovell and Aldrin, and CopCom Armstrong...

General Davis and Dr. Gilruth...

watched recovery in real time.

And Cernan looked across space to Gemini IX.
June 12, 1961 – Redstone launched a Vostok into the atmosphere which was recovered in the ocean and delivered to Cape Canaveral for the Mercury-Redstone 4 sub-orbital flight.

June 13-25, 1961 – The Freedom 7 (MR-3) spacecraft was viewed by approximately 750,000 visitors at the Rensselaer Polytechnic Institute, and thousands of Soviet space scientists as the Norman Regional Electronic and Nuclear Fair at Rome, Italy.

June 19, 1961 – A team of workers, designers, and scientists was chosen for the USSS Venus probe “lost” since February was ended at Jodrell Bank Observatory in England, and new scientists and engineers were called in, as the new project was reorganized for the USSS Venus probe

June 22, 1961 – Deputy NASA Administrator Dr. Robert J. R. Drake sent an explanatory letter to the Senate Committee on Aeronautical and Space Sciences on the broad scientific and technological gains to be achieved in landing a man on the moon and returning him to earth. Dr. Drake stated that it was a “highly significant role of accelerating the development of a great science and technology, motivating the scientists and engineers who are engaged in this effort in move forward with increased zeal. The nation is investing their efforts in a way that cannot be accomplished by a disconnected series of research investigations in several fields. It is important to realize, however, that the real values and purposes of the present system of manned lunar landing mission. The direct ascent method was found by the USSS to be the most promising method, in view of the results of its studies to determine the main problems, the pacing items, and the major decisions required to accomplish the manned lunar landing mission.

June 16, 1961 – An ad hoc task force of about 250 scientists and engineers was established by the University of Texas at Austin to study the role of U.S. scientists and engineers in the Apollo program.

June 22, 1961 – The President of the USSR Supreme Soviet awarded 7,026 honors to those associated with the flight of the Mercuray-Atlas animal spacecraft. These included training in acclimation to noise and vibration and to centrifugal forces.

June 11, 1961 – The people of the Big Bend, including workers, designers, and scientists, met in El Paso to planned a place of Socialist Labor; and 3,183 representatives were invited to submit written proposals. Among these are compensation for disability retirees, leave credited and that use of the Astronaut Reserve.
Singletons Hold Casual Dance Tonight!

The MSC Singleton Club tomorrow night will hold a dance at the Villa Monterrey, 550 Gulf Freeway. The dance will run from 8:30 pm to 1 am in the Third Club Section.

Casual sport clothes are the uniform of the night, and music will be supplied by a jukebox. Tickets will be sold at the door or can be had from Suzanne Thoben at 4906.

The College Graduate Club has extended an invitation to Singleton Club members to the Top of the Month Club Sunday night at 7. Singleton Club members will have the same privileges as Graduate Club members.

“Big doings” of some sort are scheduled by the Singleton Club on June 23, and members are urged to keep tabs on fate open. They will be advised by bulletin on the arrangements.

Aero Club T-34 Due in 4 Weeks

Latest estimated delivery of the MSC Aero Club’s newly- acquired Beech T-34 twin-place aircraft is four weeks. The Club’s June meeting will be Tuesday at 5 pm in the MSC II. FCSD 23. Lockheed operators/Singleton Club members to the 9. Philco has extended an invitation to 8. FCD 18. 1ESD or can be had from Suzanne 4. Link 14. Brown & Root at 3831 or from Mel Feldman at 2 vs 3 12 vs 4 14 vs 15 24 vs 16 campaign that will start on June be issued to all employees June

Cessna 172.

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Cessna 172.
June 30 Date Picked For A/S 203 Mission

The second Apollo/Saturn 1B mission, A/S 203, is scheduled to be launched by NASA from Cape Kennedy no earlier than June 30.

Major purpose of the mission is to test operation of the Saturn launch vehicle S-IVB stage in a 115-statute-mile orbit above the earth. The S-IVB serves as the top stage of both the two-stage, 1.6-million-pound-thrust upgraded Saturn I (Saturn IB) vehicle and the three-stage, 7.5 million-pound-thrust Saturn V. It is powered by a single 200,000 pound-thrust J-2, liquid hydrogen/oxygen engine.

During Apollo/Saturn V landing missions, the S-IVB will be required to ignite for 172 seconds to insert the spacecraft into earth orbit, coast for a period of up to 4½ hours and reignite to inject the spacecraft into translunar trajectory.

Techniques devised for managing the high energy liquid hydrogen fuel during these operations will be tested for three or four revolutions. Techniques include non-propulsive propellant venting, continuous venting to provide forward acceleration to settle hydrogen at the bottom of the tank and engine shutdown before restart.

No conclusive flight data involving large masses of liquid hydrogen in a weightless condition has been acquired previously, nor can large-mass zero-gravity phenomena be acquired from testing on earth.

An Apollo spacecraft will not be flown in this mission. Instead, a cone-shaped shroud containing a system to test cryogenic storage in near weightlessness will be atop the vehicle. Test measurements will include gaseous flow rates, temperatures and pressures of liquid nitrogen.

The payload in orbit will consist of the Saturn S-IVB stage, instrument unit and shroud. Weight at insertion will be approximately 55,000 lbs., the largest ever to be boosted into orbit. It will not be recovered.

A specifically modified stage will be flown to simulate Saturn V operations. The engineering tests programmed will be a more severe test than the stage A/S 11. The S-IVB will be heavily instrumented to transmit data from the engineering tests. Special instrumentation includes two television cameras to provide views of the hydrogen tank interior to four ground stations--Cape Kennedy, Corpus Christi, Texas; Bermuda and Canaveral, Australia. The camera, mounted on a special manhole cover at the top bulkhead of the tank, will photograph the behavior of the liquid hydrogen against the interior which has been marked and colored to permit observation of the fuel. Other instruments will measure the level of hydrogen, temperatures and separation of gas and liquid.

The S-IVB stage orbital tests are the responsibility of the NASA Marshall Space Flight Center, Huntsville, Ala., which manages development of Saturn launch vehicles. Marshall engineers will monitor the stage's operation during the mission at the Manned Space Flight Tracking Network stations and at the Mission Control Center--Houston.

Jesse Jones To Study Under Stanford-Sloan Fellowship

Jesse C. Jones, chief of the Thermochemical Test Branch of Propulsion and Power Division, has been selected as a participant in the 1966-1967 Stanford-Sloan Fellowship Program. The program is conducted by Stanford University and sponsored by a grant from the Alfred P. Sloan Foundation. Jones will be at Stanford from September 1966 to June 1967.

Radar System Chosen For Lunar Rendezvous

A rendezvous radar system will be used to guide the Apollo lunar module back to the command-service module orbiting the moon, NASA announced last week.

Parallel development of an optical tracker for Apollo lunar rendezvous will continue at a reduced rate for possible experimental tests aboard an earth-orbiting lunar module.

Hughes Aircraft Co. began work last August as a subcontractor on a NASA guidance and navigation contract to perfect the Lunar Optical Rendezvous System (LORS). The LORS employs an optical sighting and reference system in the lunar module and a bright flashing beacon on the command module. It has been developed to a point that suitable hardware for use as a rendezvous sensor is available for testing in the lunar module.

The radar also is a two-unit system with the radar located in the lunar module and a transponder or signal receiver-transmitter in the command module. RCA's estimated cost for a completed system, including production models of 22 radars and 19 transponders, is $58.5 million and estimate for the Hughes system is $29.8 million. Both systems will require $14 million to complete.

Although the optical system weighs less, the radar system provides slightly increased operational capability. The optical system has performed exceptionally well but the present lunar module weight is such that the increase in operational capability is more desirable than the weight advantage.