TRANSMITS TV PHOTOS—

Surveyor Soft-Lands On Surface of Moon

The United States trod with aluminum 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 Flamsteed 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 at 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 upon landing, Surveyor flight controllers at the Jet Propulsion Laboratory commanded the spacecraft's television camera on, and a series of 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 structure (including a small TV test pattern attached to one landing leg) and of the surrounding moonscape.

Surveyor's passage through 238,000 miles to the moon began at 8:41 CST May 30 when the Atlas/Centaur launch vehicle lifted off Pad 36A at Kennedy Space Center to faultlessly inject the spacecraft into a lunar trajectory. The spacecraft landing legs and solar panels deployed as programmed — the only hitch was failure of one of two so-called omni antennas to deploy, and it apparently deployed to the full extended position upon lunar impact. A midcourse correction using the Surveyor's vernier engines was made at 10:45 pm CST May 30 to shift the landing point some 250 miles to more near the desired aiming point.

JPL project scientists expect Surveyor's batteries to keep charged through the lunar day. But as the moon's terminator, or "sunset" moves across 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.

The successful Surveyor A mission proved the concept of automatically decelerating 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.

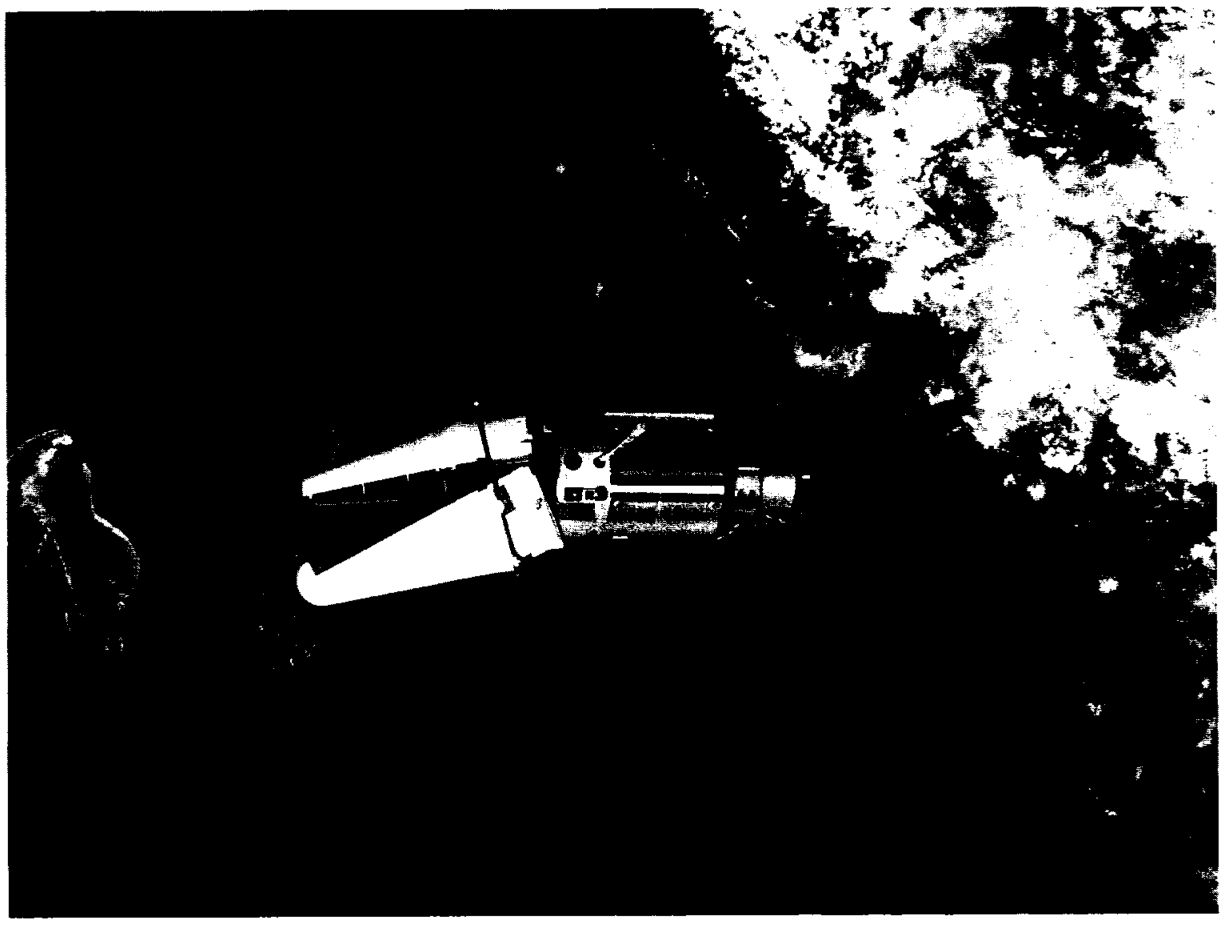
Surveyor's critical terminal descent of soft landing was accomplished with a 10,000-pound thrust solid propellant retrorocket and three liquid-fuel vernier engines throttleable from 30 to 104 pounds of thrust. Engine ignition was actuated by a flight programmer and analog computer coupled with radars reading altitude and rate of descent relative to the lunar surface.

The solid-propellant retrorocket ignited at the proper altitude and radar data processed by the computer throttled the vernier engines to effect the soft landing. The retrorocket was automatically jettisoned after burnout, reducing Surveyor's weight by 1,377 pounds. Final landing weight after use of the vernier engine liquid propellants 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 Space Science and Applications, with project management assigned to JPL operated by the California Institute of Technology, Pasadena, Calif. Tracking and communications for the mission was through the NASA/JPL Deep Space Network

(Continued on page 2)



ALLIGATOR HUNT—Gemini IX's quarry, the Augmented Target Docking Adapter, was thrice met in orbit by Stafford and Cernan using first the coelliptic transfer technique, then the equi-period orbit technique, and finally the rendezvous-from-above technique which simulates a lunar module abort. Physical docking with the ATDA was thwarted by failure of the docking adapter protective shroud to fully separate. Stafford dubbed the ATDA with its tenacious shroud an "angry alligator." Island at left is Isla los Roquez in the Caribbean Sea, northwest of Caracas, Venezuela, obscured by clouds at upper right.

Space News ROUNDUP! NASA

VOL. 5, NO. 17 MANNED SPACECRAFT CENTER, HOUSTON, TEXAS JUNE 10, 1966

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.

Gemini IX's successes included pilot Gene Cernan's two hours and ten minutes of extravehicular 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 close-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. I 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.

"This doesn't mean there can't be problems in future flights, but Gemini IX went through the whole sequence from liftoff to landing in a completely nominal 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."

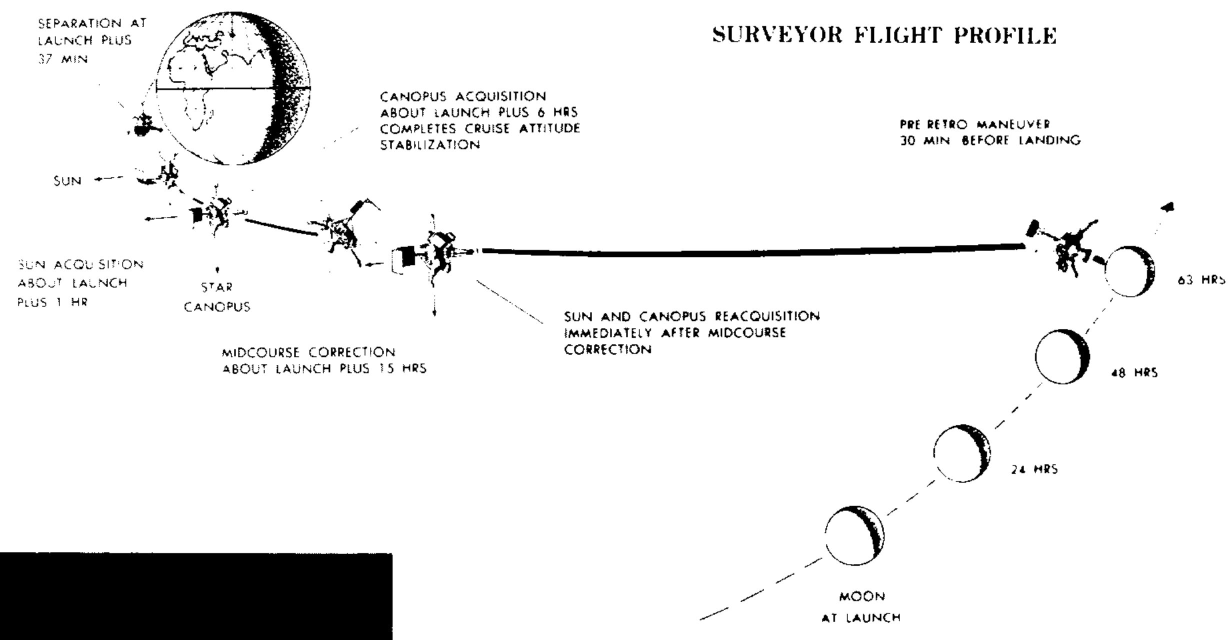
(Continued on page 6)

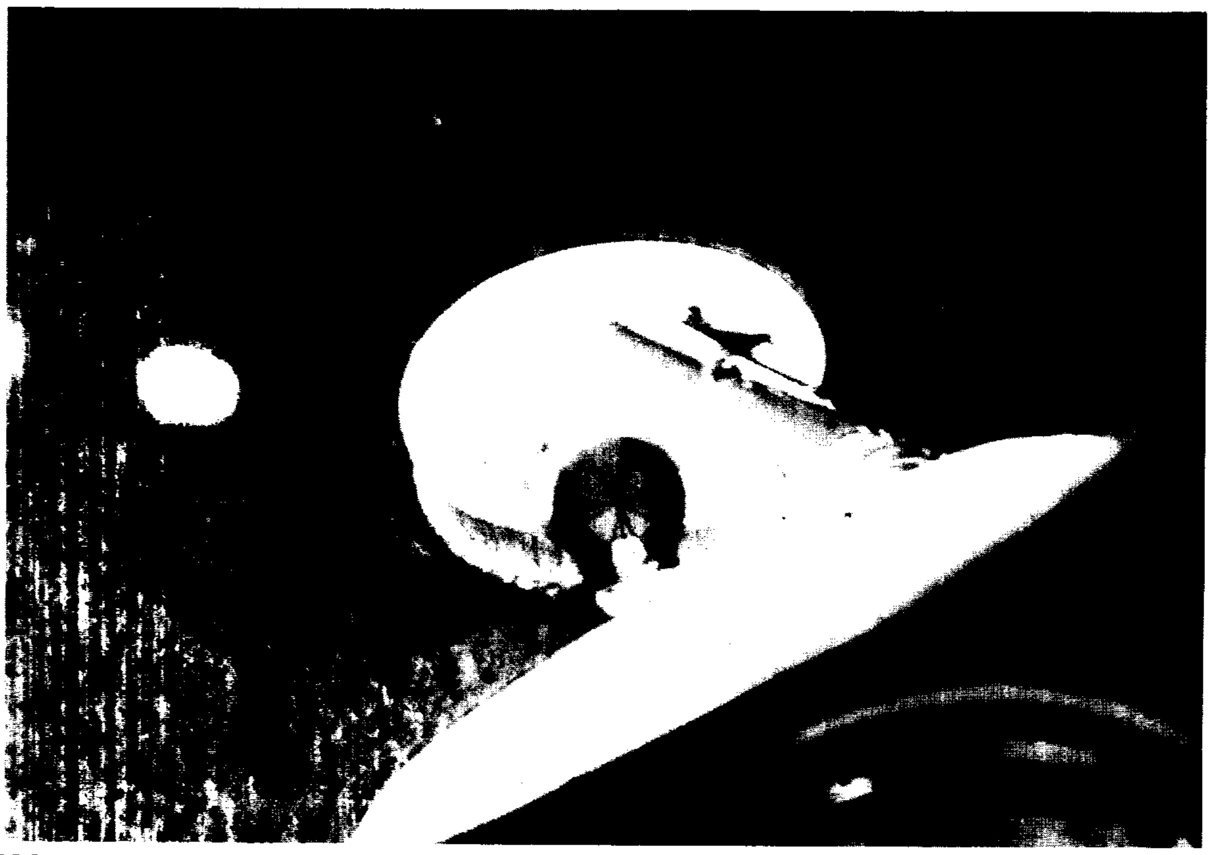
HUMAN SATELLITE—Gemini IX pilot Eugene Cernan peers through command pilot Tom Stafford's window during his two-hour and ten-minute extravehicular activity—longest EVA of any space pilot to date.

Soft-Landed Surveyor A Transmits High-Detail Photos

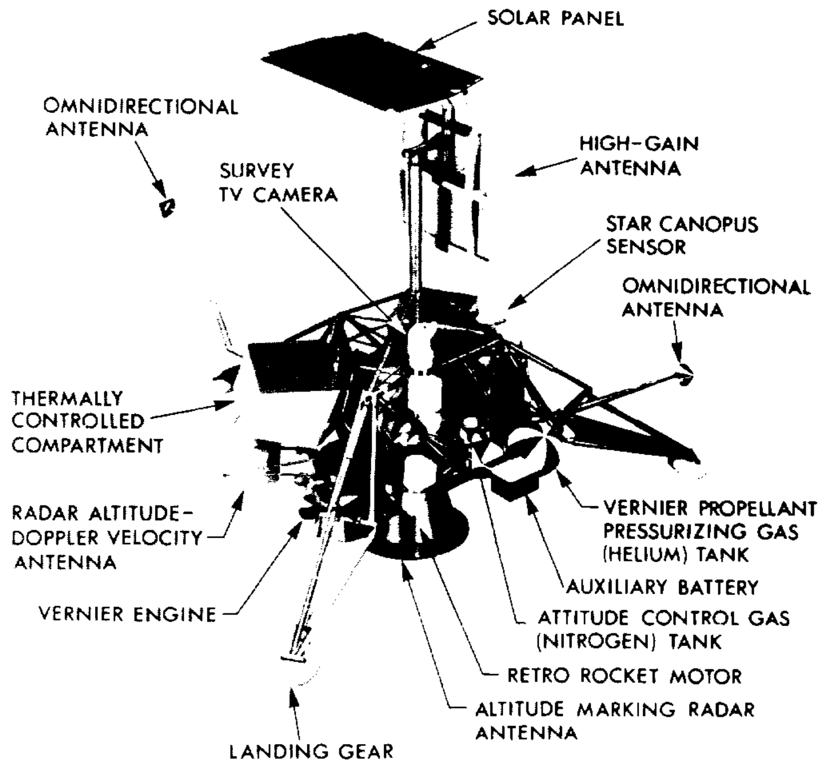
(Continued from page 1)

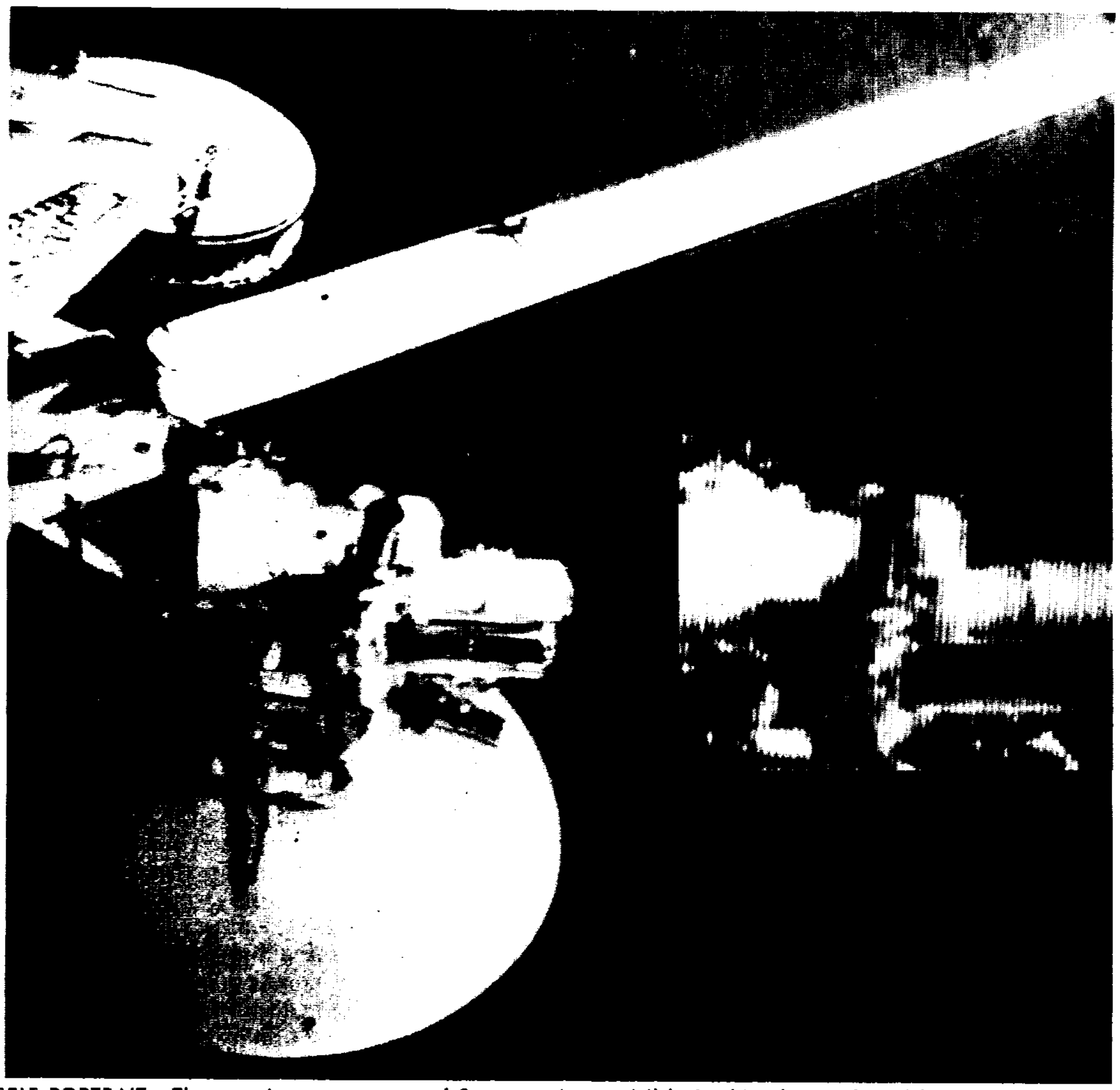
(DSN) with stations at Goldstone, Calif., Johannesburg, South Africa, and Tidbinbilla, Australia. DSN station data was relayed to the JPL Spaceflight Operations Facility in Pasadena, command center for the mission. Hughes Aircraft Company is prime contractor for the Surveyor spacecraft.



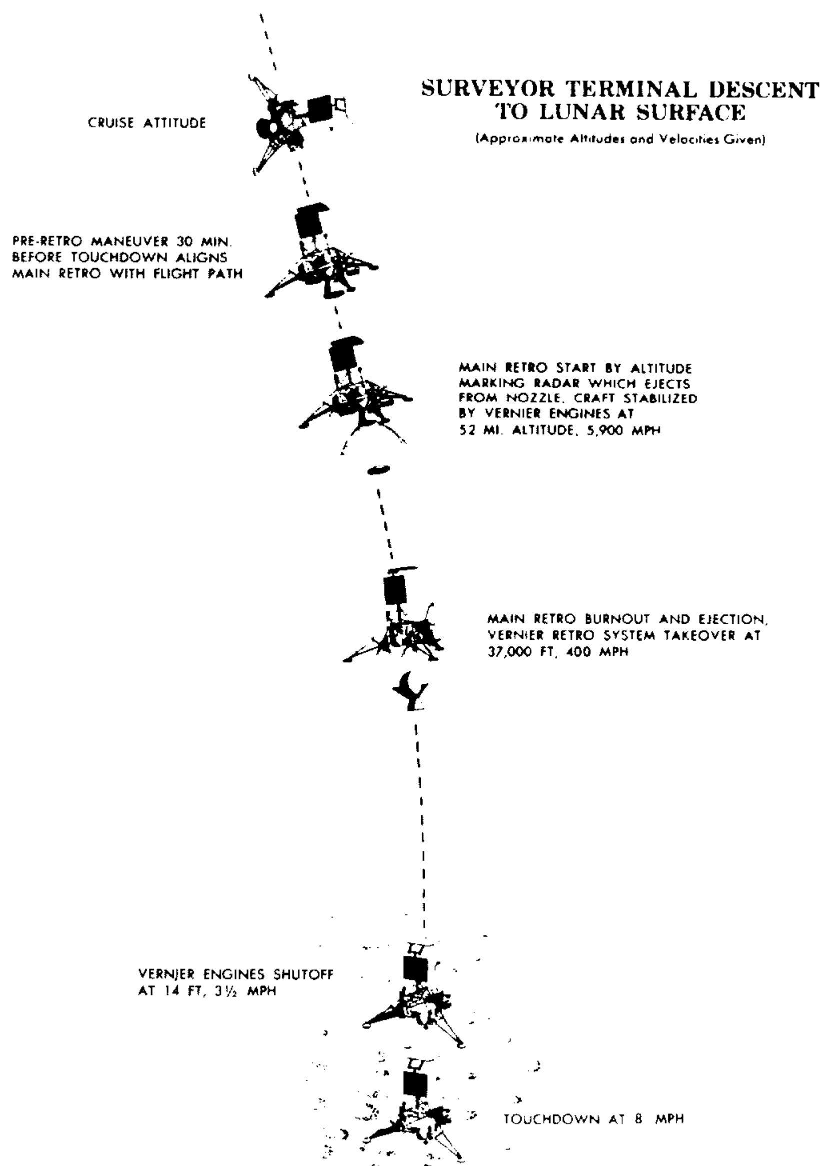


FOOTPRINT ON THE MOON—Surveyor A's television camera looks down at one of the spacecraft landing pads and the slight dent it made in landing on the lunar surface. The circular disc just above the landing pad is a television photometric chart with a grey-scale and converging lines for measuring resolution 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 inside the two large vacuum chambers here when humid outside air was used to repressurize the big chamber in drills of emergency rescues. Supercooled nitrogen wall panels which are used to simulate space temperatures inside the chamber caused the moisture in the air to change into ice crystals resulting in snow formation and a dense fog which hampered practice rescue operations by severely limiting visibility. In addition, it also took several days to clean the chamber after the moisture condensed over all of the interior surfaces of the chamber.

The MSC engineers began looking around for a way to provide dry air to repressurize the chamber and found it in the era of the Navy dirigible.

The large tanks which supplied helium for the lighter-than-air craft at the Lakehurst Naval Air Station were discovered on the surplus list. Six of these steel tanks were obtained by MSC to play a role in the space program.

After a thorough scrubbing out and rehabilitation, the slender 45-foot-long tanks were placed on line outside the vacuum chamber building to provide 400 cubic feet of compressed air each for the facility. The dry air is made from a mixture of pure, supercooled nitrogen and oxygen which is vaporized and heated to room temperature before being placed in the storage tanks.

By using the 50-ton tanks instead of buying new equipment, an economical means was found for preventing bad weather in space operations.

Surveyor's All-Seeing Eye

MOONSCAPE—A small crater and a boulder near the landing point of the Surveyor A soft-landing lunar spacecraft are clearly visible in this photo relayed by earth by the spacecraft's television camera in the 600-line scan mode. Surveyor A landed on the moon near the crater Flamsteed at 12:17 CST June 1, and within 35 minutes began transmitting photos back to Surveyor Operations at Jet Propulsion Laboratory, Pasadena, Calif. (Additional Surveyor photos on page 2.)

Accident Board Reports Findings in See-Bassett Crash

An Accident Investigation Board was appointed by the Director of the NASA Manned Spacecraft Center, Houston, Texas, on the 28th of February 1966, in order to report on an aircraft accident which occurred that day in St. Louis, Missouri. Astronauts Elliot See and Charles Bassett were killed during this accident when the plane in which they were flying struck the roof of a building at the municipal airport. The Board has completed its investigation and report. Following is a summary of its findings.

On the 28th of February 1966, Mr. Elliot M. See, Jr., and Major Charles A. Bassett, II, took off from Ellington AFB, Texas, at 0741 CST in a T-38A aircraft with Lambert-St. Louis Municipal Airport as their destination. See was the pilot in the front seat and Bassett was the co-pilot in the rear seat. Lt. Colonel Thomas P. Stafford, pilot, and Lt. Commander Eugene A. Cernan, co-pilot, accompanied them in formation in a second T-38A. 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 briefed and a flight plan was filed with the FAA through the facilities available at Ellington AFB. The takeoff, climb to 41,000 feet, and the enroute portion of the flight were normal in all respects. Instrument flight clearances and procedures were used, as is the case on all cross-country flights. An enroute check of the St. Louis weather was made by the flight during radio contact at 0818 CST with the Little Rock Air Force Base Meteorological Office. The weather indicated an overcast ceiling of 600 feet above the ground, a visibility of 2 miles, rain, fog, and a ragged ceiling with a forecast for little change.

Radar and voice contact were established at 0835 CST with Kansas City Center. At 0837 the weather observation at Lambert (0825) was forwarded to the flight. It indicated a partial obscuration, measured ceiling of broken clouds at 800 feet, an overcast ceiling at 1500 feet, visibility 1½ miles with light rain, light snow and fog. At 0839 CST, a radar letdown was initiated under the control of Kansas City. The flight was passed to St. Louis Approach Control at 0848 CST for radar vectors to an ILS (Instrument Landing System) approach to the southeast runway at Lambert Field. The 0825 weather report was repeated to the flight. (FAA landing minimums for this type aircraft and this particular approach are 400 feet ceiling, 1 mile visibility for a straight-in approach and 500 feet ceiling, 1½ miles visibility for a visual circling approach.) The radar controller continued to give heading and altitude information to which the flight responded properly.

The flight leader did not report passage of the outer marker to St. Louis Approach Control; however, radio contact was made with the Tower at 0853½ CST as the aircraft continued inbound during their descent. When the flight cleared the clouds at 0855 CST, it was over the runway centerline but too high for a straight-in landing.

See elected to make a visual circling approach to the southeast runway, under the clouds, since the weather had been reported as adequate for this type of approach. Stafford took proper spacing for a single-plane landing behind See. When See had completed three-fourths of a circle, Stafford lost sight of him, requested another radar approach to the ILS and landed at 0912 CST, 14 minutes after the accident.

See completed a full circle, in sight of the field and at an altitude of 500 to 600 feet, and announced that he had the southwest runway in sight and was making a landing. Shortly afterwards, 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, six hours after the accident. The Board included four qualified pilots, a safety officer, a maintenance supervisor and a physician. The personnel and laboratories of Wright-Patterson Air Force Base; U. S. Naval Bureau of Weapons (St. Louis); Northrop Corporation; General Electric Company; Manned Spacecraft Center, Houston; Marshall Space Flight Center, Huntsville; McDonnell Aircraft Corporation; and Scott Air Force Base assisted in the investigation. The Federal Aviation Agency and the Environmental Science Services Administration cooperated in providing flight control and weather data respectively.

The investigation into the causes of the crash was divided into three distinct phases. The first phase was directed toward determining the configuration and operation of all aircraft systems immediately prior to contact with the roof of Building 101. The second was directed toward accurately determining the history of the flight, including pertinent weather data. The third consisted of searching the aircraft and pilot histories for significant data applicable to this investigation.

The configuration and operation of the aircraft systems were determined by a crash-site examination of the wreckage, detailed analysis of the systems when the aircraft was removed to the disassembly area, and critical analysis of selected aircraft components at either the manufacturer's, Air Force, or NASA laboratories.

The history of flight was documented by interviewing personnel who came in contact with the crews of 901 and 907 prior to takeoff, statements by Lt. Colonel Stafford and Lt. Commander Cernan covering the flight and approach to St. Louis, recorded transmission between St. Louis Approach Control and Tower and both aircraft, and interviewing witnesses that observed 901 as it circled the field. The airport weather as it was observed and reported was determined by interviewing Weather Bureau personnel. The weather that was actually encountered in flight over the airport, as well as over runway approach zones, was derived from interviews with airline pilots operating from the field prior to and during the period of the accident. Flight tests were conducted to verify several engine parameters and the hypothesis concerning final airplane flight path.

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 operation or characteristic of the aircraft systems.

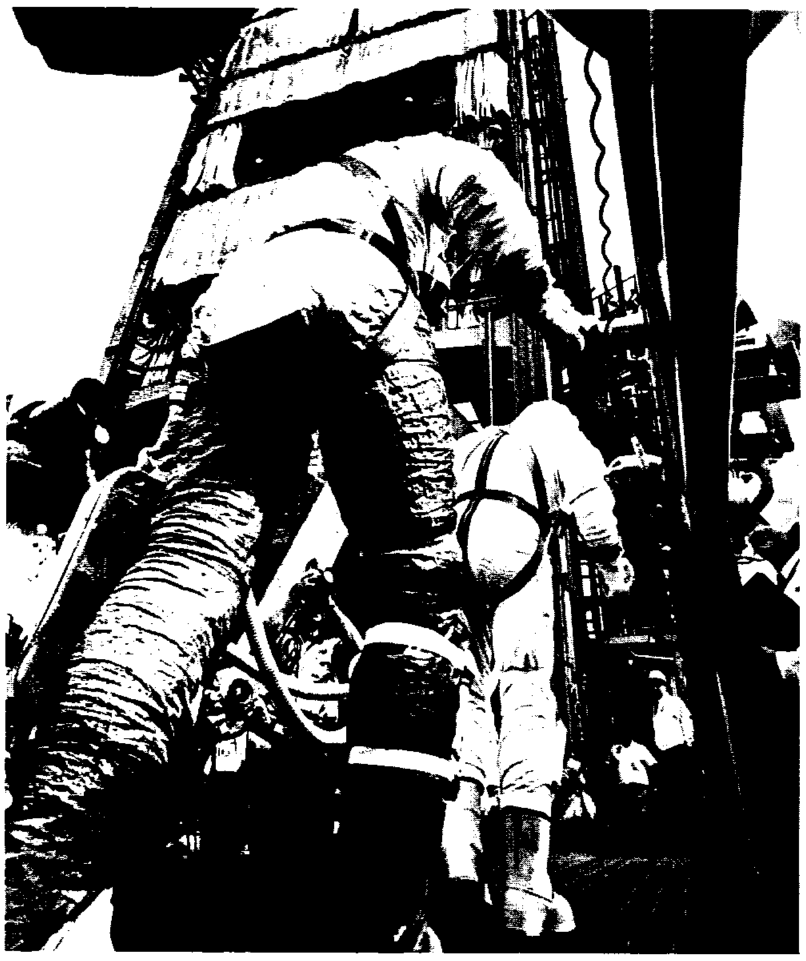
In addition, flights were made in T-38 aircraft and helicopters using ground observers and cameras as well as airborne cameras. These data, with analytical techniques, established the flight path over the ground to within a wing span and the altitude to within a few feet.

The detailed analysis of aircraft components included the airframe, hydraulic pumps, landing gear, landing flaps, speed brakes, flight controls, stabilator, rudder, ailerons, fuel and electrical systems, both engines, instruments, ejection seats and the 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 them capable and qualified to perform normal duties prior to impact.

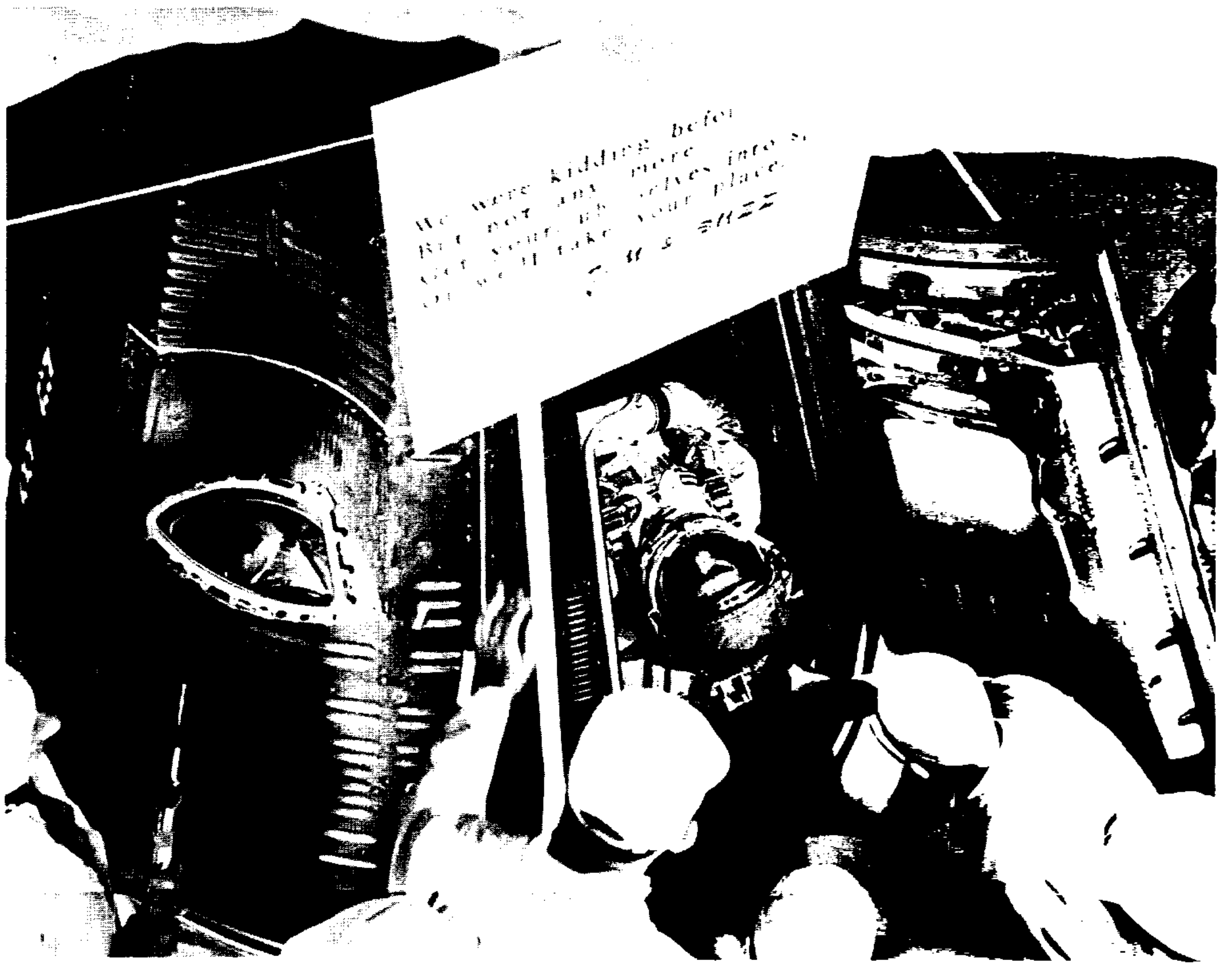
It was concluded by the Investigation Board that the primary cause of the accident was the inability of the pilot to maintain visual reference for a landing during local weather conditions that were irregular and deteriorating rapidly. The weather throughout approach was characterized by low ceiling, obscured sky, limited visibility, light rain, light 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 to 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

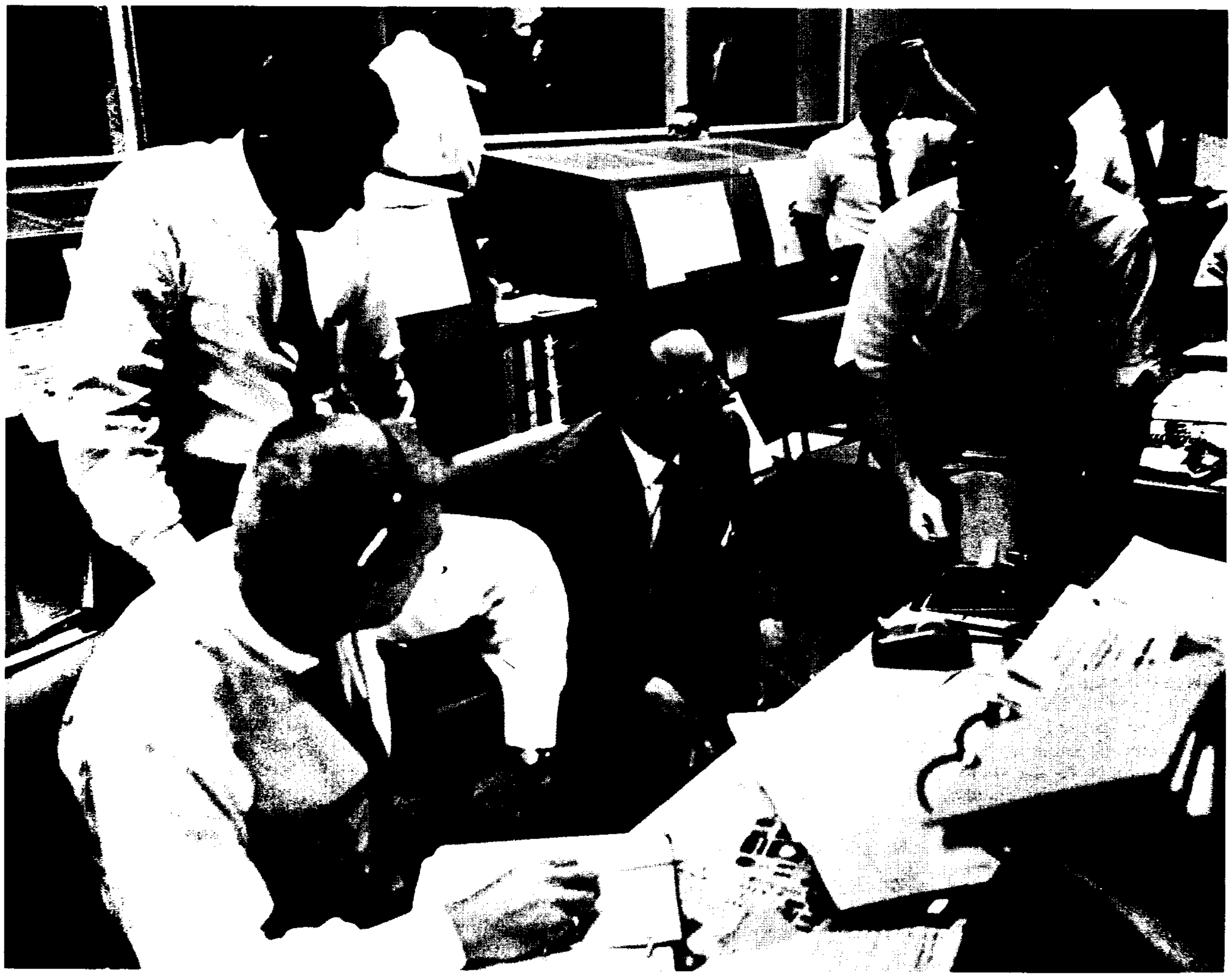


Three times up Pad 19's ramp . . .

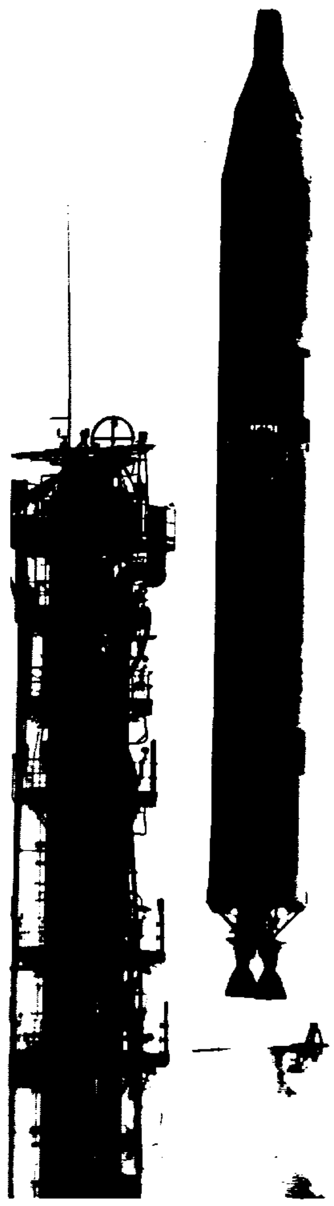
. . . and twice back down . . .



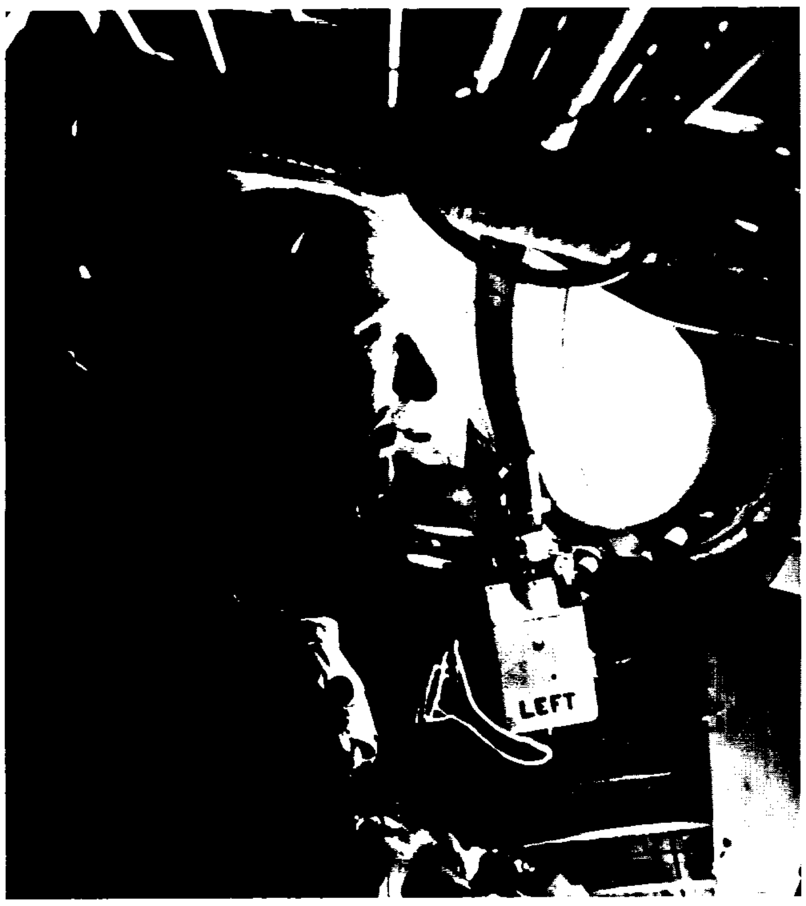
. . . until the hatches were closed for launch.



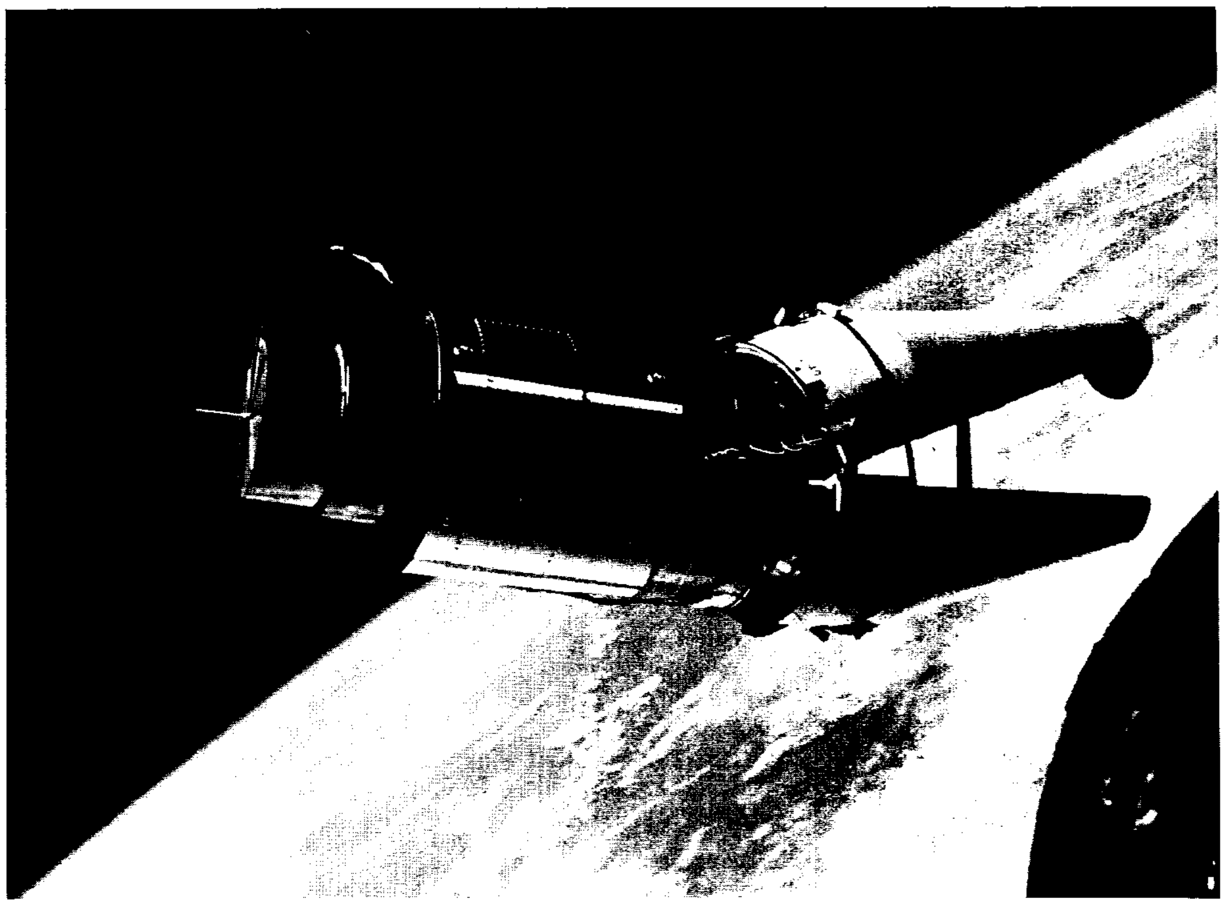
'Flight's' console was a busy place as the count approached . . .



. . . liftoff.



Stafford and Cernan sought out . . .

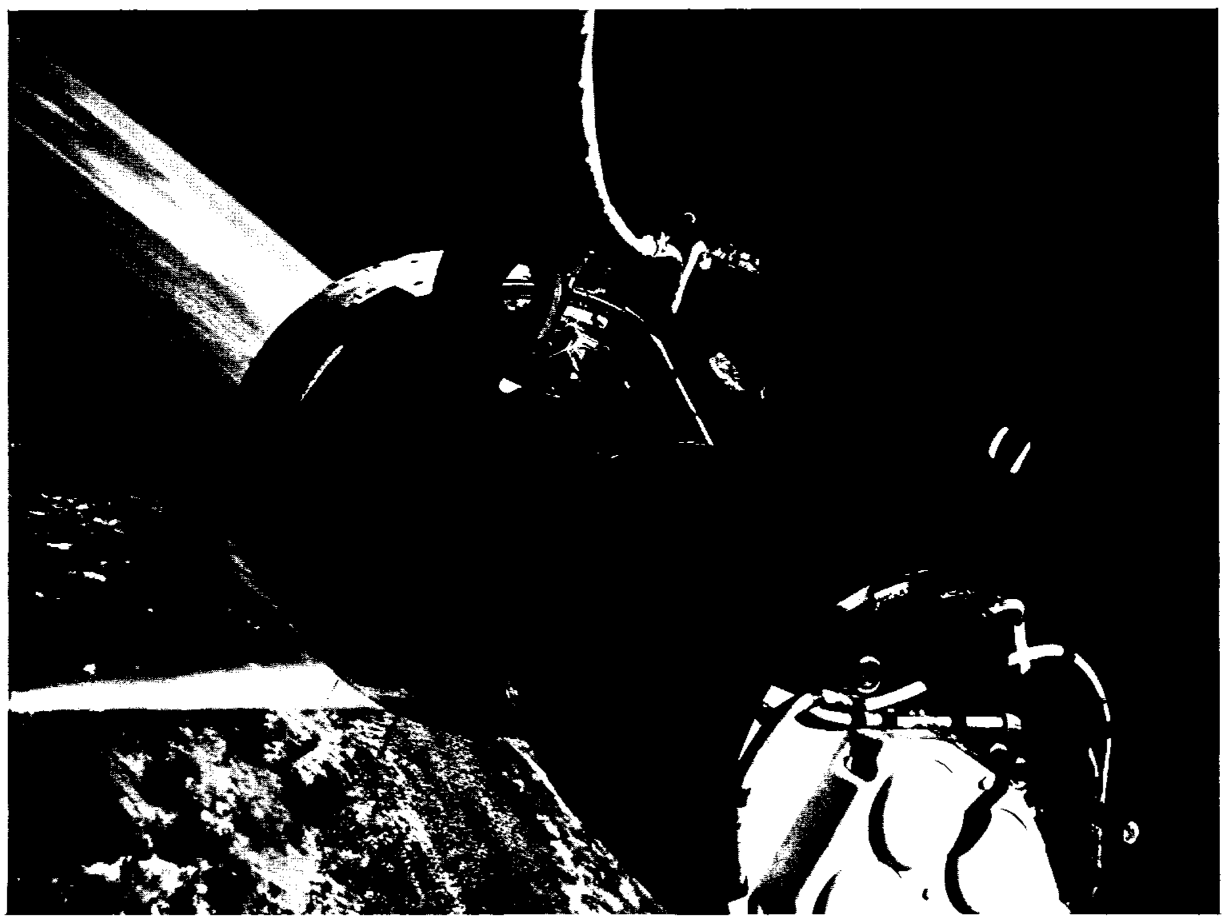


. . . the angry alligator three times.

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

General Davis and Dr. Gilruth . . .

watched recovery in real time.



And Cernan looked across space to Gemini IX.

OUT OF TEXAS' PAST

Many Interesting Vacations Found Within Short Drive of Clear Lake

Newly naturalized Texans about to take annual leave are reminded that Clear Lake is fortunately located for terranauts embarking on Earth-exploration missions. From your bayshore pad you can drive in a matter of hours to the semitropics of the lower Rio Grande, where the poinciana trees bloom in the ditches; to the rugged mountains of the Big Bend; to the forest-hidden baygalls of the Big Thicket; or to the arid, canyon-sliced tablelands of the Staked Plains.

In a diurnal journey of fairly easy going, Clear Lakers can: (1) Drive to Mexico. (2) Travel through many miles of rural and urban Texas where the culture is still half European (German, Bohemian, Moravian, Polish, Wendish, Alsatian). (3) Cross the Sabine into the enchanting Bayou Country of Louisiana, where seventh-generation Americans still speak French, eat boudin, dance all night at fais-do-dos and stand up and cheer when the band plays "La Marseillaise." Or (4) Make pilgrimages to more historic locales and shrines than it's possible to list here.

If you don't mind driving hard and fast you can actually have weekend round-trip adventures in some of the most romantic spots in the hemisphere: in the heartland of old Texas, in Western Louisiana's Franco-America or along the 1200-mile international river border.

Here is a random sampling of places interesting for historic or other reasons that you can visit on a *one-day drive:*

1. The Keyser Burnout, in the Big Thicket, where a colony of Confederate draft-dodgers hid out.
2. The Alabama-Coushatta Indian Reservation.
3. The site near Austin of the only known volcano in Texas (inactive, believe it or not!).
4. Fort Parker (restored), where Cynthia Ann Parker was kidnaped (she became the mother of the last Comanche chief).
5. The smallest brewery in Texas, where beer is made from cornflakes.
6. The tektite country near Bedias, where you can pick up moon pebbles.
7. Sabine Pass, where a Houston saloonkeeper and 41 other Rebels routed a Federal invasion force of more than 5000 men in 1863.
8. The tomb of the Texas heroes who drew white beans from among the black beans of death in the famous decimation lottery at Mier.

If you have a *full weekend,* here are half a dozen more ambitious target destinations:

1. St. Martinville and the lovely Evangeline country along Louisiana's Bayou Teche.
2. Paluxy Creek (sometimes called Paluxy River to impress tourists), where dinosaur tracks have been found in the stream's bed.
3. The Little Eva Plantation, in the *"Cote Joyous"* country along Cane River (which is not a river), just over the northern Louisiana line.
4. The marvelous Indian pictographs on the Concho River cliffs near Paint Rock.
5. The Hill Country just west of Austin (rugged hills, big Lakes, historic towns — including Johnson City).
6. The ancient and fantastic Mexican border town of Mier, where the celebrated decimation occurred in 1842.

Of course, if you have a week or two to get acquainted with Texas, you can really have yourself a memorable time. Best bet, this time of year, is westward-ho: The Davis Mountains. Fort Davis (and the observatory). Ysleta, oldest town in Texas (1682). Roy Bean's Langtry town in the Devil's River country. The Odessa meteor crater (third largest in the U.S.). The radioactive Comanche Springs. The wild country around Presidio. The Terlingua silver mines. And the Chisos Mountains of the Big Bend—there's a place that will open your sinuses!

—Sigman Byrd

Space News Of Five Years Ago

June 12, 1961 — Redstone launch vehicle No. 8 was delivered to Cape Canaveral for the Mercury-Redstone 4 suborbital flight mission.

June 13-25, 1961—The Freedom 7 (MR-3) spacecraft was viewed by approximately 750, 000 visitors at the Rassegna International Electronic and Nuclear Fair at Rome, Italy.

June 15, 1961—Search for USSR Venus probe "lost" since February was ended at Jodrell Bank radiotelescope, as visiting Soviet space scientists Alla Masevitch and Jouli Khodarev prepared to leave. The USSR Venus probe was last commanded on February 12.

June 16, 1961—An ad hoc task group reported to NASA 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. The direct ascent method was studied intensively with much less attention given to the rendezvous method.

June 18, 1961—Presidium of the USSR Supreme Soviet awarded 7,026 honors to those associated with the flight of the spaceship satellite *Vostok* I: Nikita S. Khrushchev received the Order of Lenin and a third Gold Hammer and Sickle Medal for "guiding the creation and development of the rocket industry, science and technology" which "opened up a new era in the conquest of space"; seven outstanding scientists and designers received a second Gold Hammer and Sickle Medal; 95 designers, officials and technicians received the title of Hero of Socialist Labor; and 6,924 workers, designers, scientists and technicians received various orders and medals (Order of Lenin, 478 persons; Order of the Red Banner of Labor, 1,218; Order of the Red Star, 256; Order of the Badge of Honor, 1,789; and medals to 3,183 other persons).

June 21, 1961—Between this date and July 15, 1961, as a part of the Mercury-Atlas animal program, chimpanzees received training in acclimation to noise and vibration and to centrifuge runs at the University of Southern California. Two of the animals flew parabolas in a C-131 aircraft for weightlessness training. The animals were also trained in advance psychomotor problems.

June 22, 1961 — Deputy NASA Administrator Dryden sent an explanatory letter to Chairman Robert S. Kerr of 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. Dryden pointed out that this difficult goal "has the highly important role of accelerating the development of space science and technology, motivating the scientists and engineers who are engaged in this effort to move forward with urgency, and integrating 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 are not in the mere accomplishment of man of setting foot on the moon but rather in the great cooperative national effort in the development of science and technology which is stimulated by this goal." Dr. Dryden pointed out that "the billions of dollars required in this effort are not spent on the moon; they are spent in the factories, workshops, and laboratories of our people for salaries, for new materials and supplies, which in turn represent income for others . . . The national enterprise involved in the goal of manned lunar landing and return within this decade is an activity of critical impact on the future of this nation as an industrial and military power, and as a leader of a free world."

Mercury-Redstone booster for MR-4 flight was erected on Pad 5 at Atlantic Missile Range.

A child to educate? Monthly investments of $37.50 in Series E United States Savings Bonds will grow to $10,964 at the end of 17 years, assuming the current rate of yield is unchanged during the automatic 10-year extension period.

Gemini IX

(Continued from page 1)

Agena Lost

Gemini IX was originally scheduled for launch on May 17, but the Agena rendezvous vehicle failed to orbit when an engine of the Atlas launch vehicle gimbaled to a hard-over position and caused a downward flight path during the sustainer engine phase of the launch.

The mission was next scheduled for May 31 using the ATDA, but a slip of one day was announced to allow additional time to ready the Atlas launch vehicle for orbiting the ATDA.

Countdown of Gemini IX on the morning of June 1 was faultless until T-3 minutes when a back-up guidance update of launch azimuth, target orbital plane and other information failed to get from the GE/ Burroughs complex to the spacecraft. Three different attempts were made to transmit the update before the mission was scrubbed. The ATDA was launched into a precise 161 nm circular orbit 90 minutes prior to scheduled Gemini liftoff, but ground readouts hinted that the exit protective shroud over the docking adapter had not separated and thereby could hinder Gemini IX's docking attempts.

The rescheduled Gemini IX launch Friday, June 3 was made on time and without any countdown holds. Liftoff was at 8:39:33 CST to make the first available "window" for rendezvous with the ATDA near third spacecraft apogee—the so-called M-3 rendezvous.

Shroud Attached

The first rendezvous with the ATDA followed the nominal mission plan to the letter, as did the second and third re-rendezvous. That the shroud indeed had not separated was confirmed by the crew of Gemini IX upon approach to the ATDA in first rendezvous. Command pilot Tom Stafford described the gaping shroud as resembling an "angry alligator."

Ground commands cycling the docking adapter rigidizing mechanism were unsuccessful in shaking loose the shroud, and the ATDA became a passive rendezvous vehicle with which docking was impossible.

Extravehicular activity was postponed from the second day to the third day when the crew of Gemini IX reported that they were "bushed" following the three rendezvous during the first and second days.

Fogged Visor

Cernan opened the hatch and spent two hours and 10 minutes in EVA, but fogging of his visor after connecting to the ELSS forced the crew to recommend that use of the Astronaut Maneuvering Unit be cancelled. Also, Cernan encountered some difficulty in getting one of the AMU's controller arms to properly deploy during checkout of the AMU in the spacecraft adapter.

Gemini IX retrofired over Canton Island and reentered to land within three miles of the prime recovery vessel USS *Wasp* and 3000 yards from the predicted aiming point. The spacecraft was sighted on the parachute by persons aboard the *Wasp*, making Gemini IX's splashdown the first to be observed by the prime recovery ship since Gordon Cooper's MA-9 Mercury flight in May, 1963.

Possible Change In Leave System Under Study

Civil Service Commission has been discussing plans for possible changes in the Federal-service leave system with agency representatives and employee-organization leaders.

Agencies, Federal Executive Boards and employee groups were invited to submit written comments by the end of March. On the basis of this information and of many comments already volunteered the Commission will decide what changes, if any, to recommend.

Features of the present system and of several possible changes are under study by the Commission. Ideally, the new system should cost no more than the present one—preferably cost less—and it should be more responsive to the needs of employees and agencies.

Several concepts entirely new to the Government leave program are illustrated in the proposals. Among these are compensation for unused sick leave, temporary disability insurance, personal leave, a temporary annuity supplement for disability retirees, leave credited and charged in dollars, and "deductibles." The Commission is interested in evaluating reaction to these concepts rather than in tabulating votes for one plan versus another. Concepts could be combined in numerous ways, and details such as amount of leave earned, the level of compensation for unused leave, and the size of the deductible could be adjusted to accommodate the system, provided the underlying principles are sound.

The Commission is not committed to any one position and will recommend changing the present leave system only if convinced that the new approach would result in a better and more workable system.

The SPACE NEWS ROUNDUP, an official publication of the Manned Spacecraft Center, National Aeronautics and Space Administration, Houston, Texas, is published for MSC personnel by the Public Affairs Office.

Director . . . . Dr. Robert R. Gilruth
Public Affairs Officer . . . . Paul Haney
Editor . . . . Terry White
Staff Photographer . . . . A. "Pat" Patnesky

Singletons Hold Casual Dance Tomorrow Night

The MSC Singleton Club tomorrow night will hold a dance at the Villa Monterrey, 9150 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 4904.

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 25, and members are urged to hold that date 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 two-place aircraft is four weeks. The Club's June meeting will be Tuesday at 5 pm in the MSC News Center auditorium, Nassau Bay Building 6. On the agenda is discussion of the purchase of a Cessna 150 and/or a Cessna 172.

The Club is winding up its 1966 membership drive. Dues are $4 a year. Application forms are available from Lou Bernardi at 3831 or from Mel Feldman at HU 8-1270, Ext. 275.

Space News ROUNDUP

MANNED SPACECRAFT CENTER, HOUSTON, TEXAS

EMPLOYEE NEWS

1966 MSC/EAFB Fast-Pitch Softball League

American Division	National Division
1. TRW	11. Lockheed Electronics
2. IBM/RTCC	12. McDonnell Aircraft
3. Lonestars (ASTD)	13. NAA
4. Link	14. Brown & Root
5. Graham	15. Hustlers (Comp & Anal)
6. IESD/LEC	16. MSC/Pyros
7. MSC/AF MOLS	17. Weather
8. FCD	18. IESD
9. Philco/WDL	19. CG/Houston
10. 747th Rams	20. 2578th

All games are played on EAFB Diamond No. 1. Game times are at 6 and 8 pm. Teams are listed in schedule by numbers assigned above.

June 13	June 14	June 15	June 16	June 17
11 vs 19	20 vs 18	12 vs 17	13 vs 16	14 vs 15
1 vs 9	10 vs 8	2 vs 7	3 vs 6	4 vs 5

June 20	June 21	June 22	June 23	June 24
5 vs 1	6 vs 4	7 vs 3	8 vs 2	9 vs 10
15 vs 11	16 vs 14	17 vs 13	18 vs 12	19 vs 20

1966 MSC/EAFB Slow-Pitch Softball League

American Division	National Division
1. TSD All Stars	13. SMD Moonrakers
2. LRD	14. IBM
3. TRW OGOS	15. CSD
4. FSD Batmen	16. Univac
5. MPAD/FAB	17. FSD Dirty Sox
6. APSO Lunartics	18. RMD Plus
7. IESD Misfits	19. P&PD Hustlers
8. Security Mets	20. SSD
9. Pro & Con	21. TSD Virginians
10. MPAD Animals	22. MPAD/RAB
11. FCSD	23. Lockheed Operators
12. GE	24. CG/EAFB

All games are played on EAFB Diamond No. 3. Game times are 6, 7:30 and 9 pm. Teams are listed in schedule by numbers assigned above.

June 13	June 14	June 15	June 16
6 vs 11	5 vs 12	18 vs 23	17 vs 24
7 vs 10	8 vs 9	19 vs 22	20 vs 21
4 vs 2	1 vs 3	16 vs 14	13 vs 15

June 20	June 21	June 22	June 23
7 vs 9	6 vs 10	19 vs 21	18 vs 22
2 vs 3	12 vs 4	14 vs 15	24 vs 16
8 vs 1	11 vs 5	20 vs 13	23 vs 17

Dietert Shoots Way To Pistol Championship

Lloyd Dietert of Advanced Spacecraft Technology Division won 11 of 17 matches including the Grand Aggregate in the Texas State Pistol Match held May 21-22 in Houston. He became champion in the NRA Sharpshooter Classification.

Dieter, a member of the MSC Rod and Gun Club, is the second MSC employee to win the championship in this category. Gordon Rysavy of Propulsion and Power Division last year won the same event at Fort Worth.

OPEN SEASON ON WASTENIKS –

M$C Days Aim At Dehoarding Hoarders

Pack rats who let their desks and work areas accumulate unneeded supplies and equipment will be tapped on their shoulders during M$C Days and asked to part with their hoard.

M$C (Money $aving Campaign) Days is a dehoarding campaign that will start on June 27 and run through June 1. Area campaigners have been appointed for each division. They have complete information on the M$C Days program, the success of which depends upon wholehearted MSC employee support.

Labeled boxes for all types of materials – pencils, staplers, rubber bands and all the other types of flotsam and jetsam that accumulate in desks and work areas – will be provided for collection. An MSC Bulletin will be issued to all employees June 17 spelling out the items that should be turned in.

Don't be a ruddy Wastenik! Shell out with all those excess supplies when your Area Campaigner comes around.

Oil Fire Fighter Adair June 20 AIAA Speaker

Oilwell fire snuffer Paul "Red" Adair will be the principal speaker at the June 20 meeting of the Houston Section of the American Institute of Aeronautics and Astronautics. Adair, whose specialty is taming oil and gas wells that have ignited and gone out of control, will speak on "Wild Wells."

Since 1946 Adair's Houston-based firm has snuffed out 500 blazing wells in such places as Alaska, Colombia, Kuwait, Libya and Southeast Africa. His technique frequently calls for a close approach to the flaming well head with a large bundle of dynamite, which when ignited, momentarily removes the oxygen from the well head area.

John Glenn, during his MA-6 mission, spotted one of the fires Adair was later to extinguish in the Sahara Desert – the "Devil's Cigarette Lighter."

AIAA Section members are urged to make reservations early with Gail Renick at HU 8-0080 or with Cathy Robbins at 591-3030. The meeting at the Holiday Inn will be at 8 pm, preceded by cocktails at 6 and dinner at 7.

MSC Deputy Director George M. Low became Houston Section AIAA chairman on June 1.

Roundup Swap-Shop

(Deadline for classified ads is the Friday preceding *Roundup* publication date. Ads received after the deadline will be run in the next following issue. Send ads in writing to Roundup Editor, AP3. Ads will not be repeated unless requested. Use name and home telephone number.)

FOR SALE

Lotus 7 spares for many engines. Pair of 1½" SU carbs, Volvo w/ford-Lotus manifolds and linkage $35. (Healey, TR, etc) Coxworth A-111 billet cam $40. Stock Anglia 105-E gearbox $35 complete. Jon Farbman, WA 6-7192 or RI 7-3435.

Self-contained travel trailer, air conditioned, sleeps six, two years old. Low down payment; monthly terms if credit good. Lloyd Arnold, HO 5-1877.

32-foot ChrisCraft cruiser, sleeps 6, new upholstery, rebuilt engines and hull. Stall 36 Lakeside Boat Storage. NASA Road 1. Asking $4000. Henry Fancher, 877-1379.

Eight 400x150-foot lots in 300 block North Second, LaPorte. Wilma Wells, GA 1-1512.

NC-300 dual conversion receiver $175. Johnson Pacemaker SSB xmtr $160. Gotham 80-10 meter vertical antenna $5. All for $300. Donald Witt, SU 2-0648.

3-bdr 2-bath brick, central air, terrazzo floors, large den with built-in bookcases and desk, fireplace. On naturally-wooded lot (nearly and acre) in El Lago Estates. John Bertin, 877-3307.

1965 Triumph Spitfire convertible, like new. $1200. L. Fry, HU 4-5644 after 6 pm.

1964 special-order VW convertible with many xtras, xclnt condition. Make offer. Jim Donnell, 877-1746.

Modern 1-bdr apartment on Dickinson Bayou, air conditioned, 2-car garage, private yard with shade trees, boat ramp and pier. 534-6623.

Craftsman 9-inch table saw with table, motor and xtra blade. Hardly used, $75. John Boynton, MI 3-0926.

1957 Chevy BelAir 4-door, auto transm, good engine and body. Jim Mistrot, 534-5480.

1961 Olds 4-door hardtop, original white finish, blue vinyl interior. Looks and runs like new. $650. Frank Miceli, GA 1-0723.

3-bdr 2-bath brick colonial, air conditioned, landscaped, GE built-ins. $23,400 or equity and assume $110/mo payments. Frank Samonski, 877-4795.

CAR POOL

Two drivers want to join or form car pool from Fairmount Park to MSC, 8:30 to 5 shift. W. N. Henderson, 471-4653.

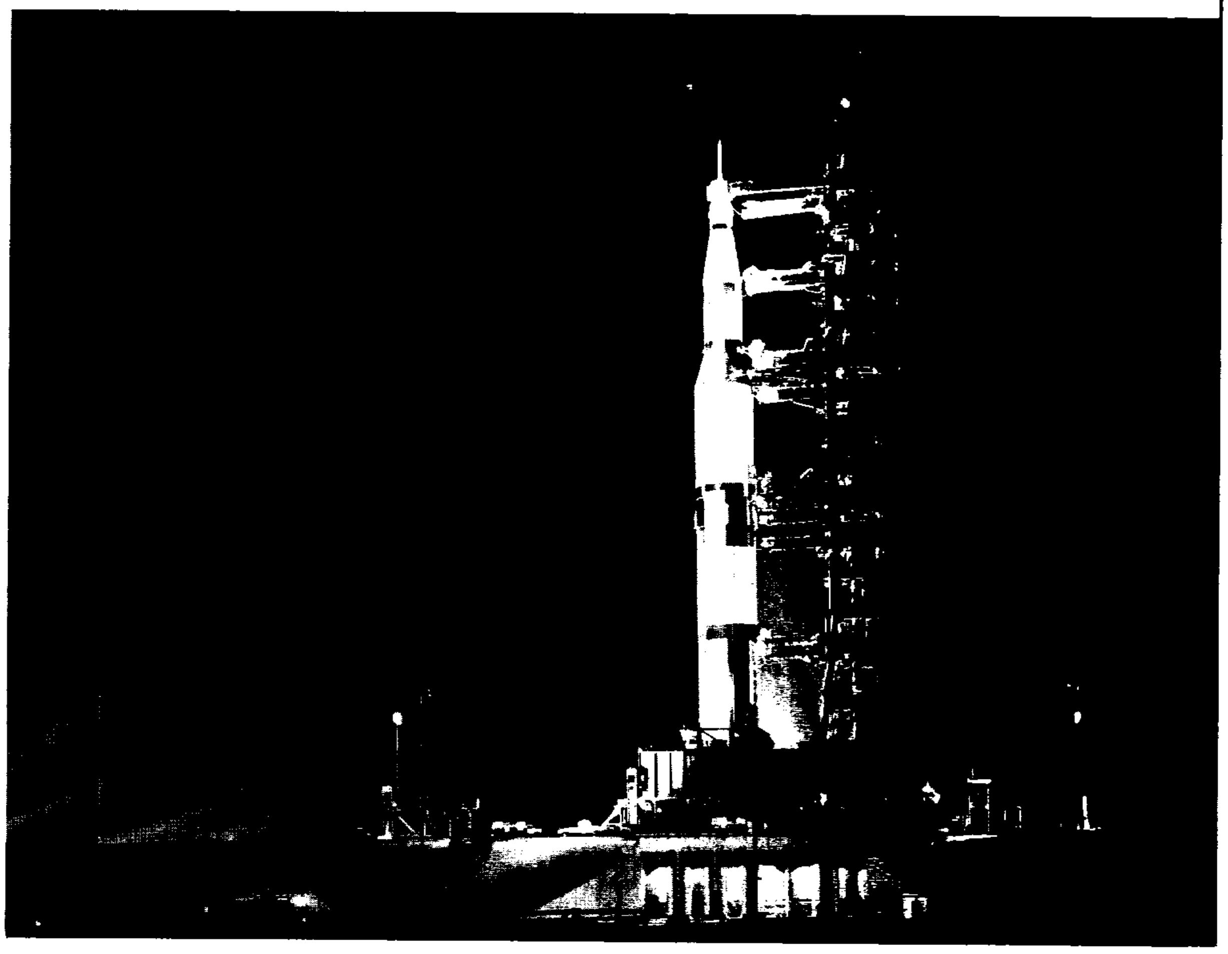
Clear Lake Area 10-Day Festival Begins Today

MSC employees have been invited to take part in the "Festival of the Ten Days to Rendezvous" sponsored by the Clear Lake Chamber of Commerce. The Festival begins today and runs through June 19.

Events planned for the Festival include an Aquacade at the Crest Hotel, a fishing and crabbing contest, a trap and skeet shoot, canoe race on Clear Lake, ballet, art show, dog show, teen dance, bridge tournament, barbecue, barge dance, carnival – you name it, the Festival's got it.

To get further information (or to volunteer to help in the activities) call HU 8-1455 or 932-3558.

Saturn V Learns to Crawl Before it Can Fly

FIRST THREE MILES ARE SLOWEST—Dr. Vernher von Braun, director of NASA Marshall Space Flight Center, left, and Dr. George E. Mueller, NASA Associate Administrator for Manned Space Flight, watch a facility checkout version of the Saturn V launch vehicle leave the Kennedy Space Center Vehicle Assembly building on a crawler-driven mobile launcher en route to Launch Complex 39. The vehicle was moved the 3.5 miles from the VAB to the pad on May 25. The photo at right shows the mobile launcher and the Saturn V floodlit as they stand on the pad that night.

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 uprated 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 lunar 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 chilldown 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 of the stage than a Saturn V flight.

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 Canarvon, Australia. The cameras, 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.

Indiana Tech Awards Doctorate to Kraft

MSC Director for Flight Operations Christopher C. Kraft, Jr. May 28 received an honorary Doctorate of Engineering degree from the Indiana Institute of Technology, Fort Wayne, Indiana.

Kraft was commencement speaker for the Institute's graduating class.

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.

Radio Corp. of America is developing the rendezvous radar, a system similar to that used in the Gemini program. This system has been under development since the early stages of the Apollo program.

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.

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.

The purpose of the program is to "give able young executives an opportunity to make an intensive study of new concepts and developments in business, to develop a top management perspective and to broaden the intellectual horizons." An intensive seminar series coupled with field trips and formal classroom work is credited toward a year of graduate study toward a Master of Business Administration degree at the completion of the program.

Jones was nominated for the program by MSC Director Dr. Robert R. Gilruth.

Joining MSC in May 1962 as head of the Thermochemical Test Section, Jones became branch chief when the section was expanded into a branch. Prior to joining MSC, Jones was a senior engineer with the Bechtel Corporation and an assistant group leader with Douglas Aircraft Corporation. He received his BSME and BSCE degrees from Texas Technological College and is a candidate for an MSME at the University of Houston. He served four years with the Navy and is married with one daughter and two sons.

AFGE Meets Monday

Lodge 2284 of the American Federation of Government Employees Monday will hold its monthly meeting at 5 pm at the Webster State Bank. The Lodge urges members, prospective members and other interested persons to attend the meeting.

Glenn Peterson, National Representative for the Tenth AFGE District, spoke at the Lodge's May meeting on employee rights and privileges, rights of appeal and other similar topics.