

# MANNED SPACECRAFT CENTER

## HOUSTON, TEXAS

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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## GEMINI 3 FLIGHT

Astronauts Virgil I. "Gus" Grissom and John W. Young were selected as command pilot and pilot, respectively, for the Gemini 3 (GT-3) flight on April 13, 1964.

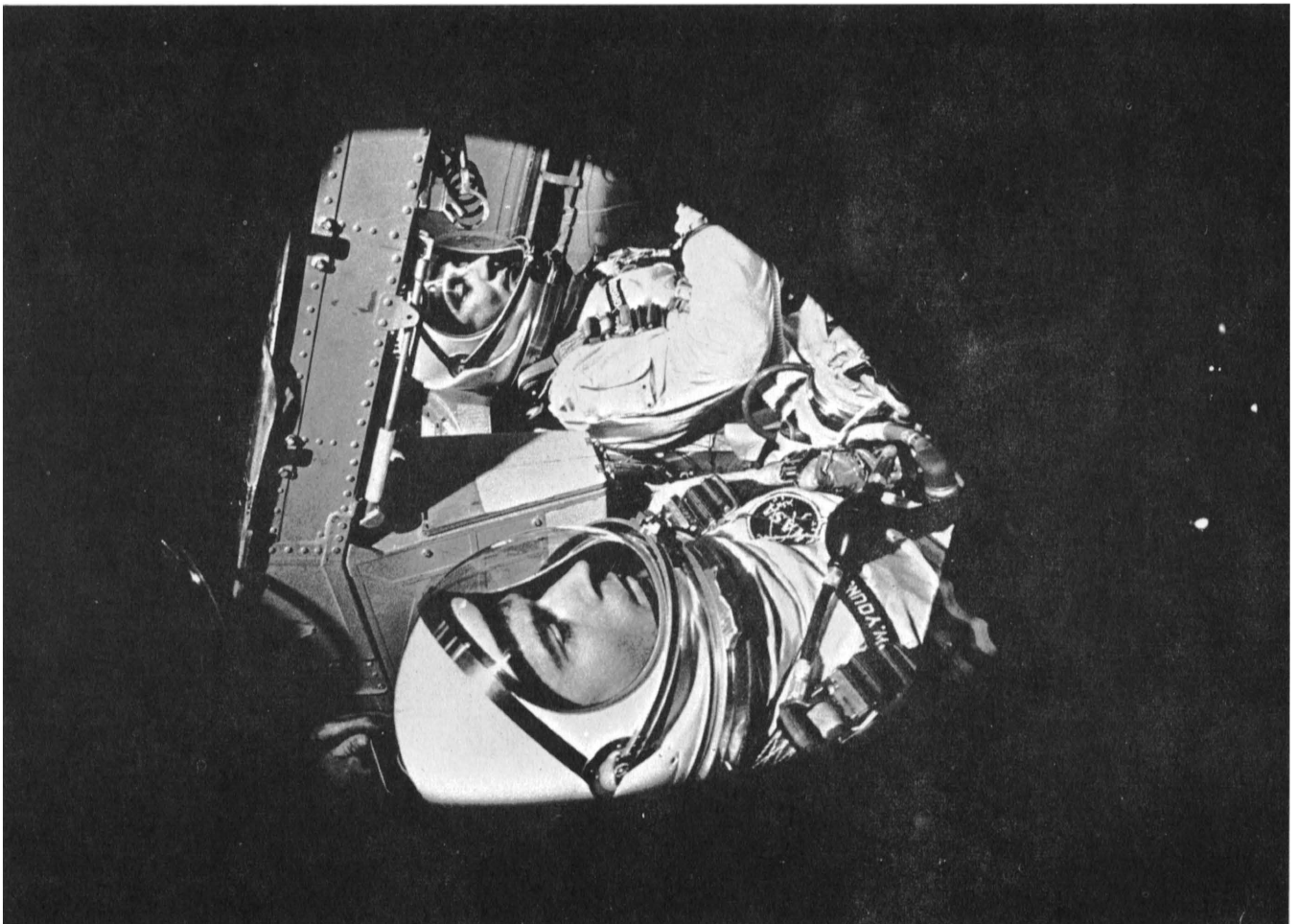
Nearly one year later, on March 22, 1965, they were at the eve of making the first manned flight in the Gemini Program. During the interim they had concentrated on many activities — all with a view toward preparing themselves for the planned three-orbit mission.

They undertook an intensive training schedule, as determined necessary to meet the specific mission requirements. This schedule included refresher training in many of the fields covered by the overall astronaut

training program in addition to "practically living" with their assigned spacecraft from the time it was still in the assembly stage in the McDonnell Aircraft Corporation plant in St. Louis, Missouri, until launch day. They were present and participated in all major tests which ultimately found the spacecraft checked out and ready for the flight.

They spent hundreds of hours in simulators which prepared them for all the anticipated phases of flight except for the prolonged weightless environment. This included hours of practice to sharpen their reactions to emergency situations which might arise.

Finally, on the eve of the Gemini 3 flight, there was a calm well-prepared flight crew. They had thoroughly



THIS VIEW OF THE GEMINI 3 crew, with Astronaut John W. Young in the foreground and Command Pilot Virgil I. "Gus" Grissom was taken through the window of the open hatch on Young's side just before the hatches were closed. They then participated in the remaining activities of the countdown in preparation for their flight.

learned the flight plan and each knew what both crew members were to do during every minute of the entire mission.

Grissom and Young had undergone a thorough physical examination two days prior to the flight and had passed with flying colors. The only thing that remained was the final countdown, acceptable weather, a good control network and time.

After eating dinner at the Manned Spaceflight Operations Building on Merritt Island, they worked out in the gymnasium in the crew quarters there, watched television, and retired at 9 p.m.

The crew was awakened by Assistant Director of Manned Spacecraft Center for Flight Crew Operations Donald K. Slayton at 4:40 a.m. on March 23, 1965. At 5 a.m. they left their sleeping quarters and underwent a brief final physical examination which lasted about 10 minutes and were found physically fit for the mission.

Grissom and Young then joined 12 invited guests at breakfast in the crew quarters in an air of general optimism concerning the flight and there was much discussion of past spaceflights during the meal. For breakfast they had tomato juice, half a cantaloupe, scrambled eggs, a two-pound porterhouse steak, toast and jelly. In addition, Grissom drank a glass of milk.

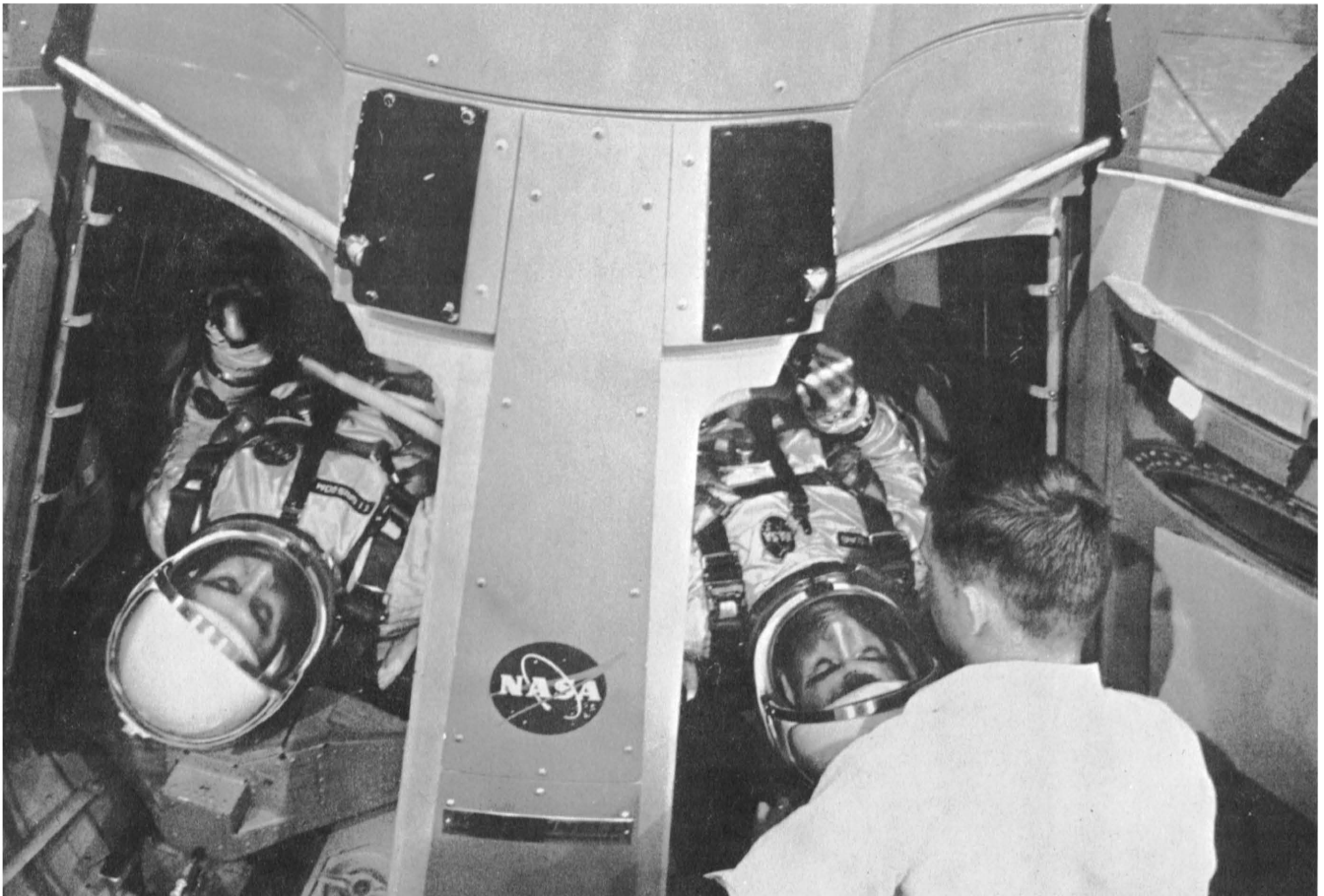
Following breakfast and after receiving the good wishes of their friends, they left the building, dressed casually, at 5:53 a.m., waved to a few people gathered there, looked at the sky, and entered a car for the six-mile trip to the trailer at Pad 16 where they were to be suited up for their flight. They arrived there at 6:05 a.m.

Meanwhile, the countdown had been picked up at 2 a.m. as scheduled. About one hour later, the back-up crew, Astronauts Walter M. Schirra, Jr., and Thomas P. Stafford, entered the spacecraft and spent several hours checking flight controls, communications, and other spacecraft systems. They made a report on the status to the flight crew during the suiting-up process which started soon after the arrival at the trailer.

After the biomedical sensors — which record pulse, respiration, electro-cardiogram and blood pressure during the flight — were placed on the crew, they were assisted into their suits, went through checks on the biomedical and communications systems, then oxygen was sent through their suits to purge them of nitrogen.

Just prior to their departure for the launch pad at 7:05 a.m., they received a last minute weather briefing from Slayton.

Grissom and Young were transported to nearby Pad 19 in an air-conditioned van and arrived at the ramp there at 7:09 a.m. The short walk to the elevator was



**THE PRIME GEMINI 3 flight crew — Grissom at the left and Young at the right — prepare to run GT-3 mission simulations in the simulator at Mission Control Center, Cape Kennedy, Fla. The team spent many hours in simulations for the various phases of the mission in preparation for the flight.**

accomplished within a matter of a few seconds and their 100-foot ride to the white room level was completed in less than a minute. At 7:12 a.m. they had entered their spacecraft, a final check of their equipment made, and the hatches were closed at 7:34 a.m.

From that time the countdown ran smoothly until about 8:20 a.m. when Mission Control Center received indication from the blockhouse that there might be a leak in the oxidizer line of the first stage of the launch vehicle. Mission Director Christopher C. Kraft, Jr., decided to hold the count at T minus 35 minutes in order to take a look at the situation and evaluate the problem.

Pad technicians located the source of the trouble — a sensor on an oxidizer line, quickly remedied it with a turn of a wrench, and the count was resumed.

The countdown progressed without further difficulty to zero, the first stage engines ignited, and four seconds later, at 9:24 a.m. the launch vehicle lifted off the pad and the first two "human Gemini twins" were started on their long awaited journey.

## THE FLIGHT

The flight progressed very close to the planned mission with only a few minor problems. Orbital insertion occurred at liftoff plus five minutes and 34 seconds. At that time the spacecraft was travelling at a speed of 16,600 miles-per-hour. The high point of the first orbit was 139 statute miles with a low point of 100 statute miles.

Among the engineering achievements accomplished during the flight were:

- An orbital maneuver over Texas during the first orbit. This event started at one hour and 33 minutes after liftoff and lasted for a minute and 14 seconds. Grissom fired rockets of the orbital attitude maneuver system and slowed the spacecraft speed down at a rate of about 50 feet-per-second during that period. This resulted in a change of orbit, and during the second orbit the Gemini 3 spacecraft attained a high point of 105 statute miles and a low point of 98 statute miles.

- During the second orbit, over the Indian Ocean. Grissom fired the forward and aft thrusters in a series of maneuvers to accomplish a translational movement. This action lasted 15 seconds, using a 10-foot-per-second burn, and changed the orbital path one-fiftieth of a degree. The completion of this planned maneuver proved the capability of minute changes in orbital path in Gemini as desired. This can prove valuable during later flights in rendezvous and docking maneuvers.

- During the third orbit, at four hours and 21 minutes after liftoff, Grissom fired the orbital attitude maneuver system rockets again in a pre-retrofire maneuver. This action slowed down the spacecraft at a rate of 96 feet-per-second and the burn lasted one minute and 49 seconds. The maneuver resulted in a change of the low point of the orbit to 52 statute miles, and would have insured reentry in the event the retro-rockets failed to function.

- The flight was the first in which a spacecraft was manually controlled through the reentry phase. Grissom performed two banking maneuvers during this period with the spacecraft in the proper attitude to gain the maximum lift as planned. The spacecraft touched down in the Atlantic, on the orbital path, about 58 miles short of the predicted landing point.

The impact occurred at 2:17 p.m., with the elapsed time of the flight four hours and 53 minutes.

The impact point was only nine and one-half miles from the U. S. Coast Guard cutter "Diligence" which was stationed 50 miles up-range from the prime recovery ship, the aircraft carrier "Intrepid." A helicopter took off from the deck of the "Diligence" at 2:31 p.m. and was over the spacecraft within three minutes. The assignment of the cutter was to render aid if needed, but by the time the helicopter arrived at the spacecraft location, pararescue men had already been dropped by an Air Rescue Service C-54. The first Navy helicopter with the swimmers arrived on the scene about five minutes later and fastened the flotation collar onto the spacecraft.

When Grissom opened his hatch after the flotation gear was in place and learned that the "Intrepid" would not arrive on the scene for about an hour and a half, he requested a helicopter pickup for himself and Young. During their 28 minute wait for the arrival of the swimmers, the cabin had heated up and both pilots



**COMMAND PILOT** Gus Grissom reclines on a couch in the Pad 16 Ready Room during a pre-flight check of his space suit equipment, before going to Pad 19 for a flight simulation in the spacecraft.





THE FLIGHT CREW, with Grissom in the foreground, is shown just after insertion in the spacecraft on the morning of the flight.

had removed their space suits. Five foot swells did not add to their comfort and Grissom became seasick. Referring to the incident later, Young quipped, "It's a wonderful spacecraft but it's not much of a boat. It's got pitch, heave, and roll."

Following the helicopter pickup the Gemini twins arrived on the deck of the carrier about 3:30 p.m. Following a brief reception by the ranking officers aboard, they started another busy part of an already busy day. The next several hours were spent in medical examinations, telephone chats with President Johnson and Vice President Humphrey, a meal, and self debriefing.

The spacecraft was picked up by the "Intrepid" at 5:03 p.m.

The following day the pilots had additional medical checks, followed by a long debriefing session, and spoke to the ship's crew which was assembled on the hangar deck, thanking them for picking them up.

Two days after their spaceflight they were flown in a much slower craft to Cape Kennedy. There they underwent another thorough physical examination, spent hours with engineers in technical debriefing, and rounded off the day's activities by riding in a motorcade from the Cape to Cocoa Beach, and participating in a news conference at the Gemini News Center.

## POSTFLIGHT NEWS CONFERENCE

A postflight news conference was conducted at the Cape Kennedy press site about an hour and a half after the astronauts landed on the carrier deck on flight day, with NASA and Department of Defense personnel as principals. Those participating were Dr. Robert C. Seamans, Associate Administrator, NASA; Dr. George E. Mueller, Associate Administrator for Manned Space Flight, NASA; Dr. Robert R. Gilruth, Director of Manned Spacecraft Center; Christopher C. Kraft, Jr., Assistant Director of MSC for Flight Operations and the Gemini 3 Mission and Flight Director; Dr. Charles Berry, Chief of MSC Center Medical Programs; Charles W. Mathews, Gemini Program Manager, MSC; Maj. Gen. Vincent G. Huston, Assistant DOD Manager for Manned Space Flight Support Operations; and Maj. Gen. Ben I. Funk, Commander, Air Force Space Systems Division.

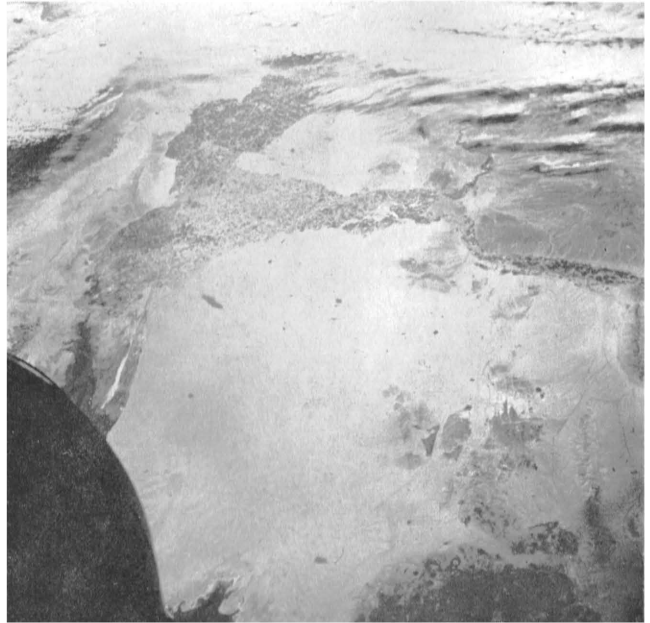
Following introductory remarks in which all the officials expressed pleasure with the success of the flight and the performance of the launch vehicle, the spacecraft, flight crew, and the supporting team members, Kraft, Mathews, and Berry went into greater detail concerning various aspects of the mission before the session was thrown open for questions.



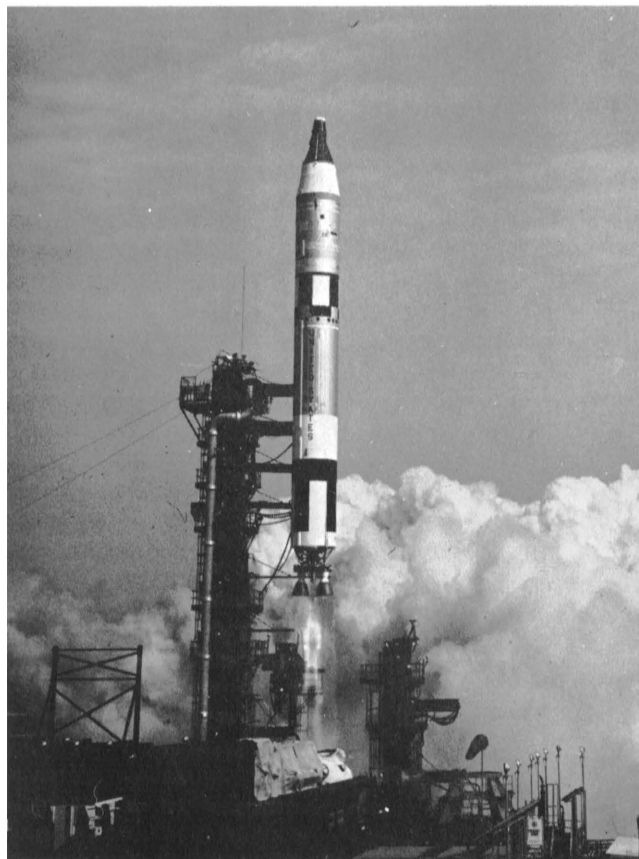
In discussing the mission, Kraft said in part:

"The entire flight was completely satisfactory from the standpoint of the control of the astronauts . . . As you know, these two pilots did not do a lot of talking, which is characteristic of test pilots. They seemed to have no trouble in controlling the systems, however, we did have some minor problems which I'll talk about later. I'd like to first talk about the performance of the spacecraft systems. The environmental control system, I think, outdid itself in that for the first flight it could not have performed any better. It was just about perfect. The cabin and suit temperatures were what we had experienced in the vacuum chamber runs and, certainly, in orbit the system performed extremely well.

"The propulsion system worked very well. We appeared to get just what we expected in acceleration and times of burn were pretty close to what the nominal values were. The attitude control system in orbit did appear to have some minor problem, in that we were continually drifting to yaw left direction. We did everything we could — the astronauts did, that is, to check the electronics of the system. We're satisfied from what we've seen so far that that was probably not the cause for the drift — it's possible we had a slight oxidizer leak which could have resulted in the yaw left. However, Gus continuously reported that he had no trouble in controlling the slight yaw drift with the pulse mode control."



A VIEW OF the western part of the North American continent was captured by Young from the Gemini 3 spacecraft with a modified 70mm Hasselblad camera during the second orbit.



ON THE WAY — the Gemini 3 is shown here as it lifted off the launch pad and the first few feet of an 81,000-mile journey had been accomplished.

(During the postflight analysis, it was determined that the slight yaw left drift was caused by water from the water boiler being spilled into space and creating a slight thrust. When Grissom switched from the water boiler to the space radiator the problem was solved. The other problems referred to by Kraft concerned an electrical failure and landing short of the impact point. In the first case, there was a short circuit in a converter, the only electrical failure in the more than 20 miles of wiring and the thousands of electrical components in the spacecraft, and this trouble was eliminated by switching to a backup system. The reentry error was the result of wind-tunnel tests not being capable of providing a truly definitive answer as to the "lifting" capability of the spacecraft. This error and the cause has added greatly to the understanding of the Gemini spacecraft's maneuverability during the atmospheric reentry phase of the flight.)

Mathews, too, commented on the excellent performance of the spacecraft systems and said, "We're ready to proceed on with the program — we see no major bulwarks in the way to going into our operational phase of the program . . . There are things we are going to have to look into before the next flight. We have to look at the data before we can say what this means to us, but certainly we didn't have any major perturbations on this flight. At no time was any serious difficulty involved."

Berry commented on the flight crew performance and told in detail of the medical checks which were maintained on both pilots during the mission. He said at no time were any unexpected readings recorded as pertained to their body temperature, blood pressure, respiration rate, or heart rate.



**THE GEMINI 3 SPACECRAFT, with flotation gear attached, is shown in the water while two helicopters from the USS INTREPID move into the area to effect pickup of the flight crew. The rafts attached were occupied by Air Rescue Service personnel, first to arrive at the scene. Below, the scene on the deck of the Intrepid as the Gemini 3 crew first arrived on "solid U.S. territory" after nearly five hours in space, a period of "riding the waves" and a helicopter ride.**



## ASTRONAUT NEWS CONFERENCE

Grissom and Young gave their impressions of the flight to news media representatives at the Gemini News Center two days after the flight.

Both pilots discussed highlights of the mission and pointed up what they felt were particularly important activities toward insuring success of future Gemini missions. These included the achievements mentioned previously.

Another high point was the use of the space radiator on the spacecraft. Young called the use of the radiator another significant first in spaceflight. He pointed out that the radiator had enabled them to keep both themselves and the equipment cool by using coolant pumps and conducting the heat away and venting it into space. He also said it provided the capability of keeping certain items warm which need to be kept warm.

Young conducted an evaluation of the food, water supply, and the waste disposal system designed for Gemini and expressed satisfaction with these items. On the flight he reconstituted the dehydrated food by adding water to the package and kneading it. He had applesauce, grapefruit juice, bitesize chicken cubes and brownies. He found the packaging was adequate as well as the system of adding a germicide tablet to the remainder of the contents prior to stowing it. He added

that the water system worked well and felt the flight proved man can live aboard the Gemini spacecraft for extended periods of time.

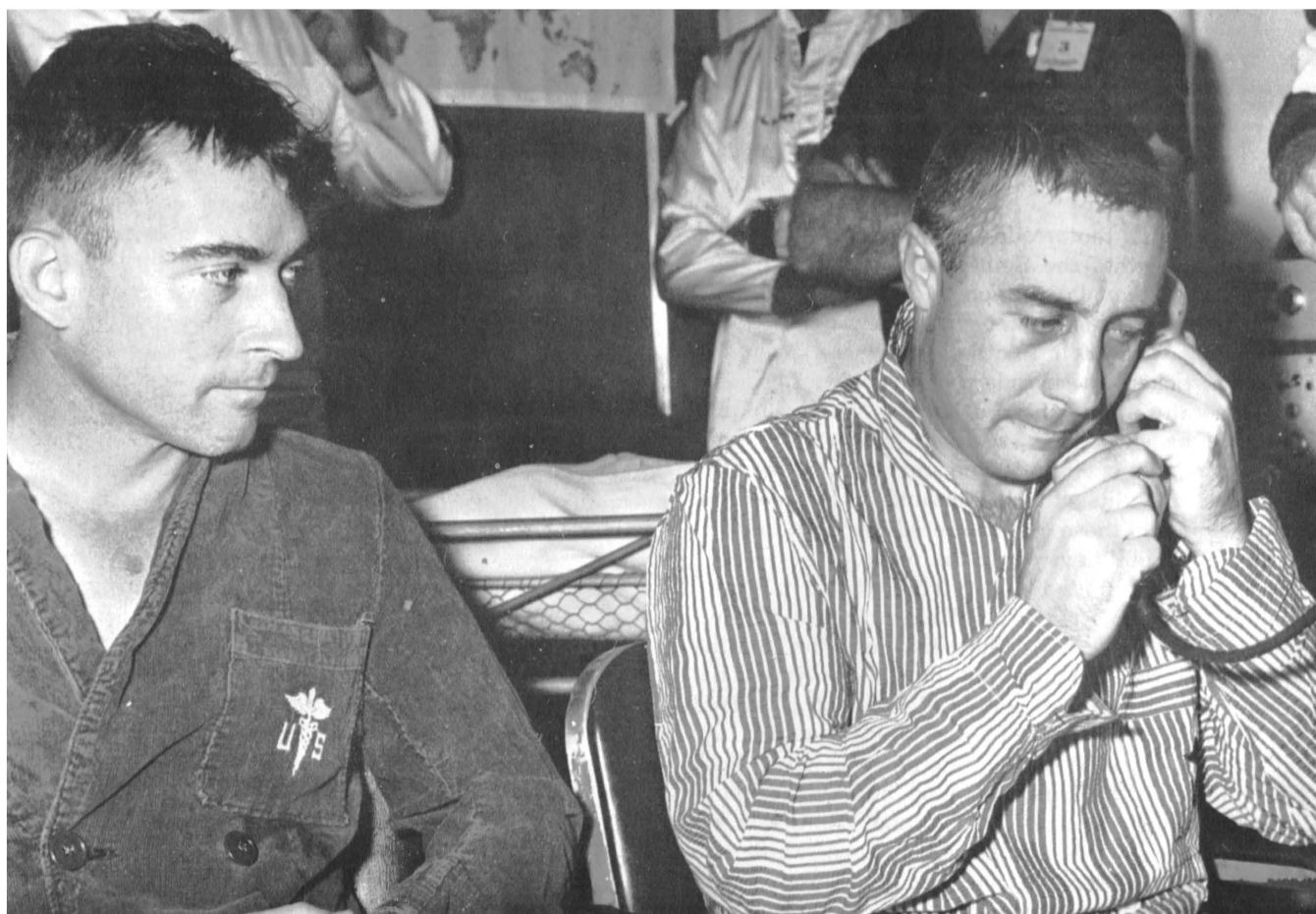
Both men claimed to get a real boot out of the retro-rocket firing and found it to be a most satisfying experience.

Other high points they discussed were the beauty of both the view and of the open main parachute.

The next few days found the Gemini pilots busily engaged in a round of celebrations in Washington, D. C., New York City, Chicago, and Houston. They did get a brief respite during the weekend, however.

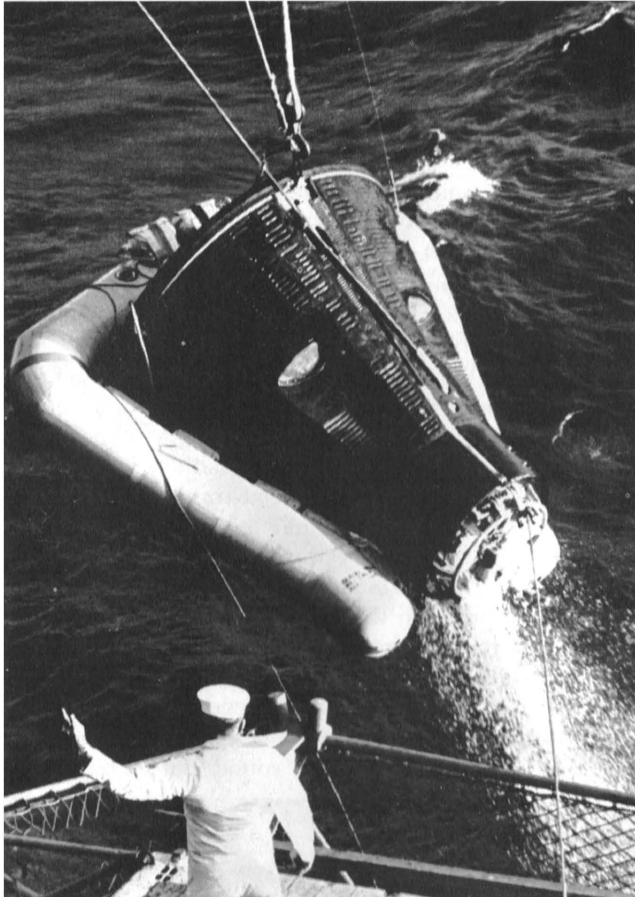
The day following their return to the Cape, the pilots and their families were flown to Washington to receive the personal congratulations of President Johnson. Because of rain, ceremonies, which had been scheduled for the Rose Garden, were moved inside into the East Room of the White House and the President awarded the Exceptional Service Award of NASA to Grissom, Young, and Dr. Seamans. In addition, Grissom was awarded a cluster to the NASA Distinguished Service Medal he received following his first flight in space. Grissom is the first man in the world to have flown in the space environment on two separate occasions.

Following the White House ceremonies, there were numerous other activities to round out a busy day.



GUS GRISSOM is shown talking to President Lyndon B. Johnson on the ship to shore telephone shortly after arrival on the INTREPID. John Young, at his right, had the same opportunity moments later.





**THE SPACECRAFT** is shown as it is hoisted aboard the aircraft carrier **INTREPID**, thus ending the recovery phase of the Gemini 3 mission.

These included a motorcade to the Capitol, a Capitol luncheon, a visit to the Smithsonian Institution, and later a Congressional reception.

The following Monday the flight crew flew to New York, along with their families, and were given the traditional ticker-tape parade up Broadway. Despite a low temperature and a hard driving rain Grissom and Young, along with Vice President Hubert H. Humphrey, rode in an open limousine and acknowledged the cheers and plaudits of the thousands who lined the parade route and those who showered them with ticker-tape from the buildings along the route.

The procession halted at City Hall where, in a brief ceremony, Mayor Robert F. Wagner presented keys to the city to the two astronauts, Dr. Seamans, and the wives of all three. Later that day they visited the United Nations and were guests of honor at an official New York City reception at the Waldorf-Astoria. At that affair, Mayor Wagner presented the New York City Gold Medal to Grissom, Young, and Dr. Seamans.

The following morning, Grissom and Young, accompanied by their wives and Grissom's sons, Mark and Scott, and Dr. Hugh Dryden, Deputy Administrator of the National Aeronautics and Space Administration, flew to Chicago for a round of ceremonies there.

It was estimated that more than a million persons

witnessed the motorcade from O'Hare Field to City Hall. There they were special guests of the City Council and Grissom, Young, and Dryden were made Honorary Citizens and presented medallions by Mayor Richard J. Daley.

This activity was followed by an official luncheon at the Sherman House for the astronauts. A feature of this event was the attendance of selected students from the Chicago schools and some of them were given the opportunity of asking questions of the Gemini 3 crew.

On Wednesday, the group returned to Houston and were greeted at the airport by NASA and civic officials in addition to an estimated 10,000 students. This was followed by a city reception.

The round of greetings came to at least a temporary halt Thursday at noon when the two pilots participated in a short ceremony at the Manned Spacecraft Center. During this ceremony a flag, made of parachute silk by members of the parachute support section of MSC's Technical Services Division, was raised. The flag had been carried in the Gemini 3 spacecraft and Dr. Gilruth said it would be flown at MSC during all future Gemini missions.

## FLIGHT CONTROL

Flight control for the Gemini 3 mission was exercised from the Mission Control Center at Cape Kennedy, Florida. Although not playing an active part in the control, a full team of flight controllers monitored the entire flight starting with the pick-up of the countdown at the new Mission Control Center at Houston.

Flight controllers at the Cape, assisting Kraft in control of the mission, included an assistant flight director, operations and procedures officers, network controllers, flight dynamics officers, guidance and navigation engineers, retrofire controllers, switchover monitors, electrical, environmental and communications system engineers, booster system engineer, spacecraft communicator, booster tank monitor, flight surgeons, and a recovery coordinator.

In addition, there were spacecraft communicators, systems engineers, and flight surgeons at remote sites around the world, responsible for advising the flight crew and controllers of the status of the various systems as the spacecraft was in range of those stations and for relaying commands, in some cases, to the astronauts. The remote sites were: Canary Island; Carnarvon, Australia; Kauai, Hawaii; Corpus Christi, Texas; Guaymas, Mexico; and two tracking ships — the Coastal Sentry which was positioned in the Indian Ocean and the Rose Knot, positioned east of Hawaii in the Pacific.

## RECOVERY FORCES

The recovery forces used for Gemini 3 consisted of about 10,000 personnel, 17 ships, and 126 aircraft. These forces were strategically placed to insure rapid recovery in case of a pad abort, failure to achieve orbital



**TWO DAYS** after their flight, the crew was flown from the carrier to Skid Strip at Cape Kennedy. They are shown, above, shortly after their arrival, obviously pleased to be on American soil again. Below, the astronauts are shown leaving the White House after ceremonies there. Left to right are Young, Senator Mike Mansfield, Vice President Hubert H. Humphrey, Grissom, and President Johnson.



velocity, mission termination at the end of the first or second orbits, mission termination at the end of the nominal three-orbit mission, or in contingency situations at any other place along the ground track.

The effectiveness of the recovery planning is borne out by the results of that phase of the operation for this mission.

## EXPERIMENTS

There were three experiments conducted on Gemini 3, two of which have been termed totally successful as a result of preliminary study of the data received:

The experiments were:

- Sea Urchin Egg Experiment — this experiment, sponsored by the NASA Office of Space Sciences and conducted by the NASA Ames Research Center, was designed to explore the possibility of a gravitational field effect on cells exposed to low gravity conditions. Since cellular effects are more easily detectable in simple cell systems, the sea urchin eggs were used to investigate zero-gravity effects during sensitive stages such as fertilization and cell division. A similar experiment was developed simultaneously on the ground in order that a comparison might be made. The results of



AN UMBRELLA COVERED CROWD greeted the returning Gemini crew in the traditional New York City ticker-tape parade up Broadway. At the upper right, Young, Dr. Robert C. Seamans, and Grissom are shown with Mayor Robert F. Wagner after being awarded the New York City Gold Medal of Honor.





**THE GEMINI 3 CREW** was also honored by a giant parade staged in Chicago one week after their flight. It was estimated that a crowd of more than one million persons were cheering spectators during this event.

this experiment are inconclusive due to an internal equipment failure in the experimental package carried in the spacecraft. This compromised the data being obtained.

- **Synergistic Effect of Zero Gravity and Radiation on White Blood Cells** — this experiment was conducted by the Atomic Energy Commission and was also sponsored by the NASA Office of Space Sciences. The objective of the test was to examine the biological effects of radiation and to determine whether weightlessness interacts with radiation to produce unpredicted effects. A known quantity and quality of radiation was applied to human blood samples both in the spacecraft and on the ground. This experiment has been classified as totally successful after a study of the samples with no synergistic effects apparent.

- **Reentry Communications** — this experiment was designed by NASA Langley Research Center and sponsored by the NASA Office of Advanced Research and Technology. All communications with the spacecraft were lost during the blackout period of the reentry phase in Project Mercury flights. The experiment on Gemini 3 consisted of injecting fluid into the plasma sheath which surrounds the spacecraft as a result of the high temperatures ionizing the air. Water was injected in brief, timed pulses, and telemetry signals

transmitted during the period. This experiment, too, was successful, based on signal strength data received at Key West and Homestead, Florida, and by high-flying aircraft. The overall results have not been completely analyzed since additional data were received in the three prime recovery areas and are currently being studied.

## THE PILOTS

Command pilot for Gemini 3 was Air Force Major Virgil I. "Gus" Grissom. Grissom was born in Mitchell, Indiana, April 3, 1926, and was selected as one of the seven Project Mercury astronauts in April 1959.

Grissom is five-feet seven-inches tall, weighs 150 pounds and has brown eyes and brown hair. He is married to the former Betty L. Moore, also of Mitchell, and they have two sons, Scott and Mark.

During the Mercury flights, Grissom was pilot of the "Liberty Bell 7" spacecraft — the second and final suborbital test flight. This flight attained an altitude of 118 statute miles and traveled about 303 miles down-range during its 15-minute flight. By contrast, his latest trip in space lasted about 20 times as long and he traveled approximately 81,000 miles.

After attending primary and secondary schools in Mitchell, he entered the Air Force as an Aviation

Cadet in 1944. He was discharged in November 1945. He was graduated from Purdue University in 1950 with a degree in mechanical engineering and returned to Aviation Cadet training after graduation. He received his wings in March 1951.

Grissom flew 100 combat missions in Korea in F-86 aircraft with the 334th Fighter-Interceptor Squadron. He left Korea in June 1952 and was assigned as a jet pilot instructor at Bryan, Texas. In August 1955 he entered the Air Force Institute of Technology at Wright-Patterson AFB, Ohio, to study aeronautical engineering; and subsequently attended the Test Pilot School at Edwards AFB, California. He returned to Wright-Patterson in May 1957, as a test pilot, assigned to the Fighter Branch.

He has logged more than 4,000 hours flying time, including more than 3,000 hours in jet aircraft. He was awarded the Distinguished Flying Cross and the Air Medal with Cluster for his service in Korea.

Grissom's hobbies are hunting, fishing, skiing, and boating.

Gemini 3 pilot John W. Young was born in San Francisco, California, September 24, 1930. He was selected as one of the nine astronauts who joined NASA in September 1962.

Young is five-feet nine-inches tall, weighs 160

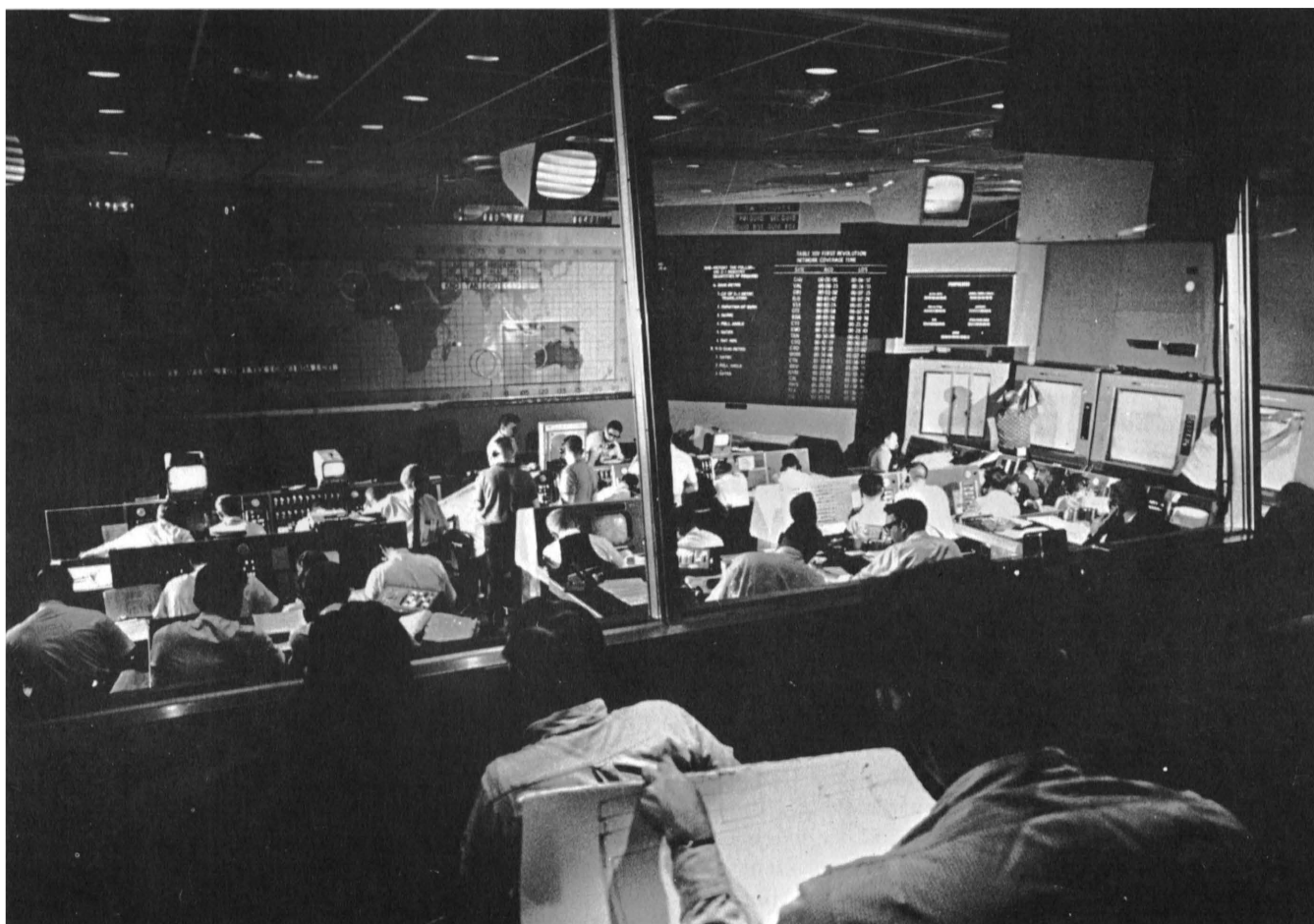
pounds, and has green eyes and brown hair. He is married to the former Barbara White of Savannah, Georgia, and they have two children, Sandra and John.

He attended Georgia Institute of Technology and was graduated in 1952 with a bachelor of science degree in aeronautical engineering. He joined the Navy after graduation and completed flight training. From 1959 until 1962 he was a test pilot and, later, program manager on the F4 weapons system projects, making test and evaluation flights and writing technical reports.

Young's last assignment prior to being named an astronaut was as maintenance officer for All-Weather Fighter Squadron 143 at the Naval Air Station, Miramar, California. Early in 1962 he set world time-to-climb records for the 3,000-meter and 25,000-meter events in the Navy F4B fighter. He has logged more than 3,000 hours flying time, including more than 2,500 hours in jet aircraft.

After completing the basic astronaut training program, and prior to being assigned to the GT-3 crew, he was assigned the special area of monitoring the development of the environmental control systems, pressure suits, survival and associated pilot personal equipment including ejection seats and couches.

Young's hobbies include swimming, water skiing, and physical fitness exercises.



**CONTROL OF THE FLIGHT** was exercised from Mission Control Center at Cape Kennedy, Fla. An overall view of the activity and displays in the Control Room is shown above.