

# Gemini XI

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Launch: 09/12/66, 9:42 a.m EST

Landing: 09/15/66, 8:59 p.m. EST

Duration: 2 days, 23 hrs, 17 min, 8 sec

Orbits: 44

The primary objectives of Gemini XI were:

- 1) To achieve a first orbit rendezvous and docking with the Agena target vehicle.
- 2) Accomplish two Extravehicular Activity (EVA) tests.
- 3) Perform docking practice, docked configuration maneuvers, tethered operations and parking of the Agena target vehicle.
- 4) Demonstrate an automatic reentry.
- 5) Eight scientific experiments
  - Synergistic effect of zero-g and radiation on white blood cells.
  - Synoptic terrain photography.
  - Synoptic weather photography.
  - Nuclear emulsions.
  - Airglow horizon photography.
  - UV astronomical photography.
  - Gemini ion wake measurement.
  - Dim sky photography.
- 6) Four technological experiments were also on board.

Gemini 11 was the ninth crewed Earth-orbiting spacecraft of the Gemini series, carrying astronauts Charles "Pete" Conrad and Richard Gordon on a 3-day orbital mission.



The countdown-to-launch began on schedule on September 9, 1966, but it did not finish that way. After the booster was fueled, the launch crew detected a pinhole leak in the first stage oxidizer tank, which had to be fixed. Launch was reset for September 10.

Trouble for the second scheduled send-off cropped up in a different area and much later in the countdown. Conrad and Gordon had completed the required rituals and headed toward pad 19 and their spacecraft when they heard that the Atlas (which would launch the Gemini Agena Target Vehicle), only 1,800 meters away, was having a problem with its autopilot. When the delay had stretched to an hour, the launch was postponed for two more days.

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On 12 September 1966, Conrad and Gordon arrived at the pad and stepped into their seats exactly on time. The hatches were closed but they soon had to reopen Conrad's. He suspected that some oxygen was leaking from his side of the cabin. He was right. When the hatch had been fixed, the countdown went on.

At 8:05 a.m., the Atlas carrying the Agena roared into action launching the target for the crew of Gemini XI. If ever two pilots waited anxiously for the starter's gun to crack, Conrad and Gordon did. For the first objective to be met (a first orbit rendezvous with the Agena) they had to launch the Gemini spacecraft within 2 seconds of the launch of the Agena. It was the shortest launch window in the Gemini program.



Launch occurred on September 12, 1966 at 9:42:26.5 a.m. EST. just half a second into the two-second period.

The Titan booster shoved Gemini XI toward a first-orbit rendezvous with near-perfect accuracy. At booster separation, when debris could be seen out the window. Gordon had warned himself not to look, but temptation got the better of him for a brief instant.

After five spacecraft maneuvers were made to adjust their orbit, the Agena, whose blinking lights they had been watching in the darkness, flashed into the sunlight over the Pacific and almost blinded them. The crew scrambled for sunglasses, then Conrad jockeyed the spacecraft to within 15 meters of the target's docking cone. Over the coast of

California, only 85 minutes after launch, rendezvous in the first orbit was achieved consuming less fuel than expected.

The Gemini XI crew now had an opportunity to do something else that NASA had wanted for a long time - docking and undocking practice. Each man pulled out and drove back once in daylight and once in darkness. It was easy - much easier, Conrad said, than in the translation and docking trainer on the ground. For the first time, also, a copilot was given the chance to dock with a target vehicle.



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After six hours of hard but frustration-free work, Conrad and Gordon powered down the spacecraft systems, ate a meal, and soon got a "good night" salutation from the ground. For eight hours, they dozed and rested, awaking, as Gordon said, "bright-eyed and bushy-tailed."

The only complaints the pilots had were about their dirty windows. Dirty windows had plagued all Gemini flights. Conrad had asked if Gordon could wipe his window when he went outside. He was told he could rub half the command pilot's window with a dry cloth and bring the rag back for testing.

Conrad and Gordon napped and rested a while longer, then started their next major task - preparation for Extravehicular Activity (EVA). Four hours before they were to open the hatch, the crew began to get their suits ready for the vacuum environment. They had practiced this so many times on the ground, Conrad said, that they soon realized they did not need all that time. Within 50 minutes, the gear was ready and running.

Briefly, the two men considered asking the Flight Director to let Gordon go out a revolution early. But they decided to keep on schedule.



At last it was almost time to open the hatch. Gordon began putting a sun visor on his faceplate which turned out to be a much bigger chore than anticipated. Conrad finally got the left side fastened, but he could not reach across Gordon to fasten the other side. Gordon wrestled with the right snap for five minutes and finally got it fastened, cracking the visor in the process. He was thoroughly winded before he got out of his seat. But he opened the hatch and stood up at 24:02 hours ground elapsed time exactly on schedule.

As expected, everything in the spacecraft that was not tied down began to float upward and outward - including Gordon. Conrad grabbed for a strap on the leg of Gordon's suit and held him in the seat.

Gordon then deployed a handrail, installed a camera and handed an experiment into Conrad.

The first challenge was to attach the Agena to the Gemini capsule by a 30-meter tether. Gordon pushed himself forward to the target and grabbed some fixed handrails to pull himself astride the spacecraft nose.

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What had been relatively easy in zero-g airplane flight training had become a monumental task. In practice sessions in zero-g aircraft flights, Gordon had been able to accomplish the tasks with his feet and legs wedged between the docking adapter and the spacecraft to hold himself in place, leaving his hands free. But this did not seem to work so well in the actual conditions of space. All he could do was hold on with one hand and try to operate the tether clamp with the other. He struggled for six minutes, finally securing the line. To Conrad it was obvious that Gordon was running out of steam. With his face streaming with sweat and his eyes stinging, Gordon groped blindly about.

As the pilot inched his way back to the hatch area, Conrad helped him as much as he could. They then discussed whether Gordon should go to the adapter and get the maneuvering gun stored there. His right eye was still burning, and Conrad could see just how exhausted his pilot was. The power tool evaluation became a casualty on Gemini XI as it had been on VII. The command pilot soon told the ground that he had "brought Dick back in . . . He got so hot and sweaty, he couldn't see." Gordon's EVA was ended and the hatch closed. It had been open 33 minutes, instead of the planned 107.



Because Conrad and Gordon were surrounded by so much loose gear, they opened the hatch an hour later and jettisoned all the umbilical extravehicular equipment.

As the Gemini flights progressed, each successive pilot continued to be amazed that the simplest tasks were so much harder than expected. "Gene Cernan warned me about this, and I took it to heart," Gordon later said. "I knew it was going to be harder, but I had no idea of the magnitude." Apparently the supporting engineers had no idea, either, since they still had not provided satisfactory restraints to help the crews.

The extreme exhaustion of past EVA pilots had sometimes adversely affected the rest of the mission, but Gordon's did not.

The next day, Conrad and Gordon skipped breakfast to get the cabin ready before the hard shove in their midsections sent them upstairs. They wanted things buttoned up as

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though for reentry. So they suited themselves, closed their faceplates, and stowed everything they could.



In the 26th revolution around the earth, Conrad triggered the firing signal to the Agena's main engine and fired it for 26 seconds. Since they faced the Agena, the acceleration forced the crew forward onto the seat harnesses. They watched the great round ball of Earth recede becoming the first humans to ever view the Earth as a sphere (from an altitude of 1374.1 km or 853.87 miles. A record altitude for an astronaut mission that would stand until Apollo 8 went to the Moon.) After two orbits the Agena was fired again for 22.5 seconds to lower the Gemini-Agena back down

Over the United States in the 28th revolution, Conrad used the Agena to lower the apogee of the orbit. Firing for 23 seconds decreased speed and lowering the spacecraft. Another mission objective could be stamped "achieved."

Conrad and Gordon ate a quick meal and began preparations for the next EVA. In revolution 29, above Madagascar, Gordon opened the hatch and watched the sunset. Gordon stood on the spacecraft floor, held down by a short tether. This allowed him to forget about maintaining body position and left both hands free for his tasks. He mounted cameras in brackets without any difficulty. And conducted photographic experiments "Most enjoyable," he said of his two-hour standup period. So relaxed and well oriented was he that the monitoring physicians reported, "From a medical viewpoint, the standup EVA was relatively uneventful."

Passing over the United States the crew marveled at the view of their home area - Houston. They passed quietly across Florida and out over the Atlantic. With the photos taken the EVA ended and Gordon reentered the capsule. Both astronauts were fatigued, but this time their fatigue stemmed mainly from concentration on an experiment.

The crew rested and discussed the next major mission event - the tethered vehicle exercise.

Over the tracking station in Hawaii, the crew separated the two vehicles. When the tether between them was taut, Conrad rolled the Gemini spacecraft and blipped the thrusters to begin the slow cartwheel motion. A 38-degree-per-



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minute rotational rate was obtained and remained steady throughout the night side pass and it was then increased to a 55-degree-per-minute rate. This caused a slight artificial "gravitational acceleration" within the capsule, the first time such artificial gravity was demonstrated in space



The second rendezvous in Gemini XI, like the first, took only one orbit. Maneuvers were made and Gemini docked with Agena again. Twelve minutes later, the crew broke away from the Agena for the last time. Conrad later said, "We made the 3 foot per second retrograde burn and left the best friend we ever had." Gordon added, "We were sorry to see that Agena go. It was very kind to us."

Conrad suggested that the Flight Director might send up a tanker - the crew would be happy to refuel, remain in orbit, and do some

more work. But while this air-to-ground joking was going on, the crew was getting ready to land.

There was only one significant event left before Conrad and Gordon wrapped up their mission. A secondary objective called for the crew to make an automatic reentry. The commanders of other Gemini flights had flown their spacecraft down from 120,000 meters. This had enabled them to make corrections up to 550 kilometers downrange and 50 kilometers cross range. Conrad, however, would not fly the spacecraft with his hand controller in conjunction with computer directions; the spacecraft would follow these commands automatically.

On September 15, 1966, after 70:41 hours of flight and in the 44<sup>th</sup> revolution of Earth, the retrorockets fired. Conrad and Gordon watched the computer closely. It certainly seemed to be working right. Conrad then disengaged his hand controller and put the system on automatic. On several occasions, the spacecraft displayed an almost human characteristic, hesitating before accepting its orders. But the system recovered quickly and performed beautifully, using a minimum of the reentry system's control fuel.



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The accuracy of automatic reentry was thoroughly demonstrated when the spacecraft landed within 4.6 kilometers of the U.S.S. Guam, the prime recovery ship, a sea-going platform for helicopters. The crew and spacecraft floated down to its landing, after 71:17 hours elapsed time.

All primary objectives had been accomplished and the last docking with Agena had been added to the mission plan due to the favorable fuel supply.



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