

# Stargazing Is Not Easy

Gemini astronauts have all been unable to see stars during the daylight hours of their space flights because the sky's brightness makes them invisible

► PART of the Gemini astronauts' business is stargazing, but everything from the atmosphere to the spacecraft itself seems to work against them.

There is still enough air even at orbital altitudes to create background illumination that can make most stars invisible. Even such first magnitude stars as Antares disappear if the sky is any more than a hundred-millionth as bright as the sun. This means that background light must be 100 times dimmer than the normal daylight sky at sea level.

All the Mercury and Gemini astronauts have insisted at their debriefings that "stars cannot be seen in the daytime," two scientists from the University of Minnesota reported.

If the brightness of the sky itself at orbital heights is to blame, E. P. Ney and W. F. Huch said, it could be "a real scientific dilemma." However, sev-

eral other factors have a hand in the problem, some of which can be controlled.

Materials dumped from the spacecraft cluster around in the vicinity and glow brightly enough at sunrise and sunset to have been referred to as "space fireflies." To produce enough background brightness by light scattering to make first magnitude stars invisible, however, would require two pounds of waste to be dumped from the spacecraft every minute.

Luckily, the dump rate during Gemini flights has been only about one pound per hour.

Besides true illumination of the sky, there are two main sources of background light, the scientists reported in *Science*, 153:297, 1966—a cloud around the spacecraft, or corona, and illumination on the spacecraft window.

The corona is something of a prob-

lem, but it still allows second magnitude stars (only 0.4 as bright as first magnitude) to be seen. The window is more of a culprit. Even if the window scatters only one percent of the light falling on it, full earthlight or sunlight could make it at least a tenth as bright as the daylight sky at sea level, thus "washing out" almost all stars.

Getting used to the dark improves an astronaut's stargazing ability, however, the scientists reported.

SPACE

## Gemini 10 Goes Walking and Docking

► THE CREW of the tenth Gemini flight (the eighth with men aboard) docked with its target, changed orbits, docked again, went spacewalking, and did just about everything else short of going to the moon.

With astronauts John Young at the controls and Michael Collins at the computers, GT-10 blasted off at 6:20 p.m. on July 18, the first night launching of the series. Because of the tricky planned double rendezvous, the spacecraft had to be launched within a precise 40-second time slot. It was.

At the top of the agenda was a docking maneuver with an Agena target vehicle that had been launched an hour and 40 minutes previously. The Agena's motors were to take Gemini 10 to a record-high orbit, where it would undock, go off in search of Agena 8 (left over from GT-8's mission five months ago), and dock with it.

Everything went according to schedule, but during his maneuvering, pilot Young used about nine times as much fuel in his attitude rockets as he should have. For a while space officials doubted whether Collins would be able to make his spacewalk, since considerable fuel would be required to keep the spacecraft near him.

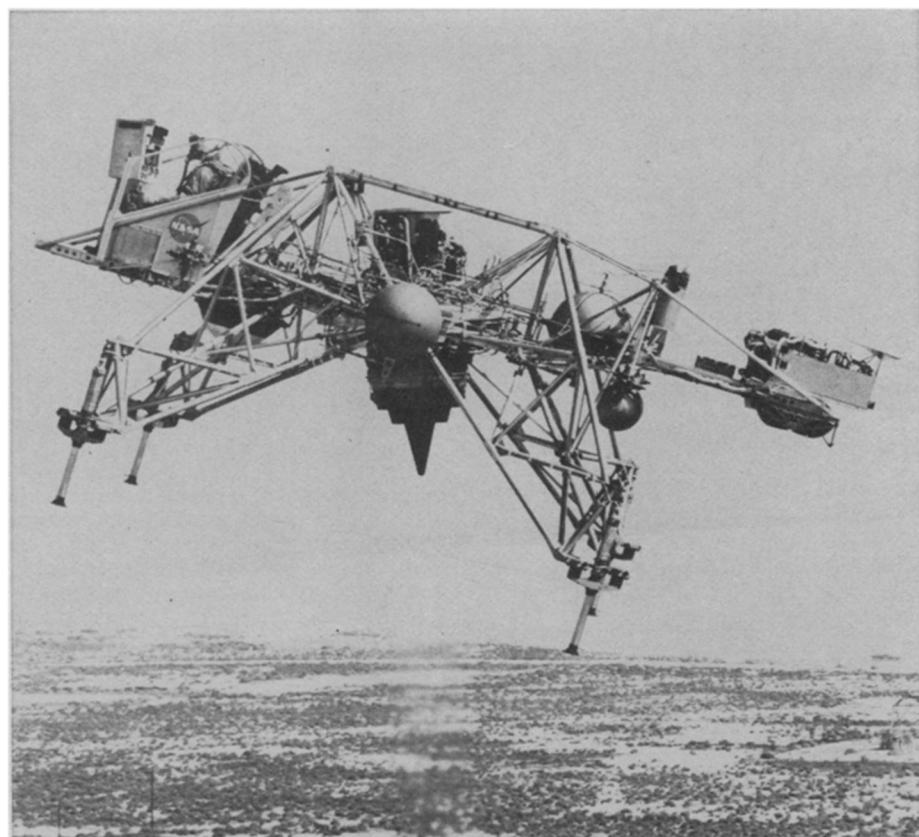
However, by eliminating several undocking-redocking maneuvers, the spacewalk was kept in the lineup.

Prior to the spacewalk, Collins had already completed a "space-stand," opening the hatch and standing on his seat to take pictures. The event was cut short when both astronauts smelled fumes of lithium hydroxide, a substance used in Gemini's oxygen system.

The spacewalk was also terminated prematurely when Young was found to be using too much of his precious fuel holding the spacecraft steady. The walk lasted 38 out of a planned 55 minutes.

Earlier, on the second day of the flight, the astronauts had been warned not to look down as they crossed Murooa Atoll in the South Pacific, for fear of being blinded by the second French nuclear test in the area. The test took place on schedule, at 10:05 a.m., but the astronauts did not pass over until shortly after noon. Result: no harm.

Splashdown took place at a little after 5:00 p.m. on July 21.



NASA

NO WINGS—A Lunar Landing Research Vehicle (LLRV), flown by National Aeronautics and Space Administration test pilot Donald Mallick, hovers over Rogers Dry Lake, Calif., prior to making a descent and landing. The wingless machine, built for NASA by Bell Aerosystems, simulates problems of landing a manned spacecraft on the moon in low-gravity conditions.