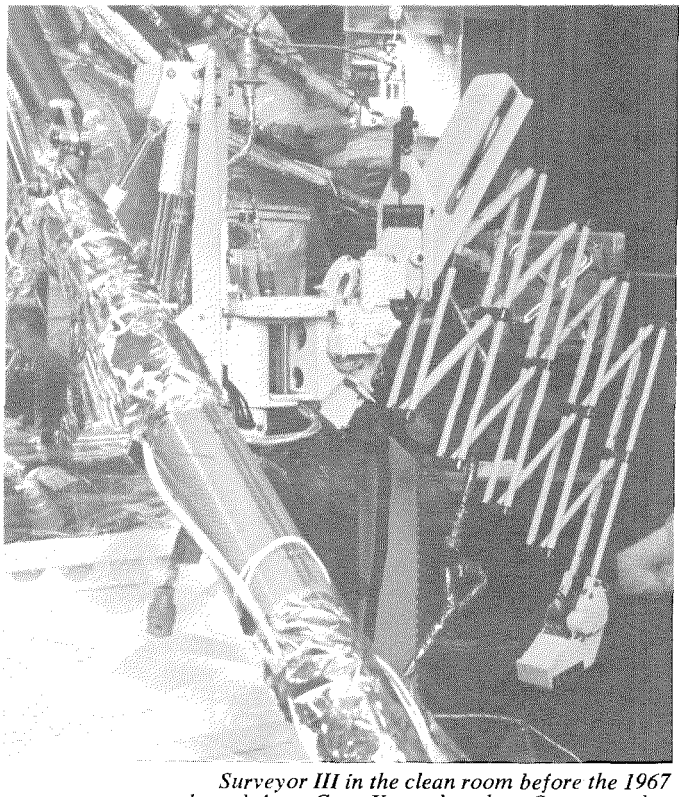
On Meeting an Old Friend, Slightly The Worse for Wear, After a Lapse of Two and a Half Years

by Ronald F. Scott

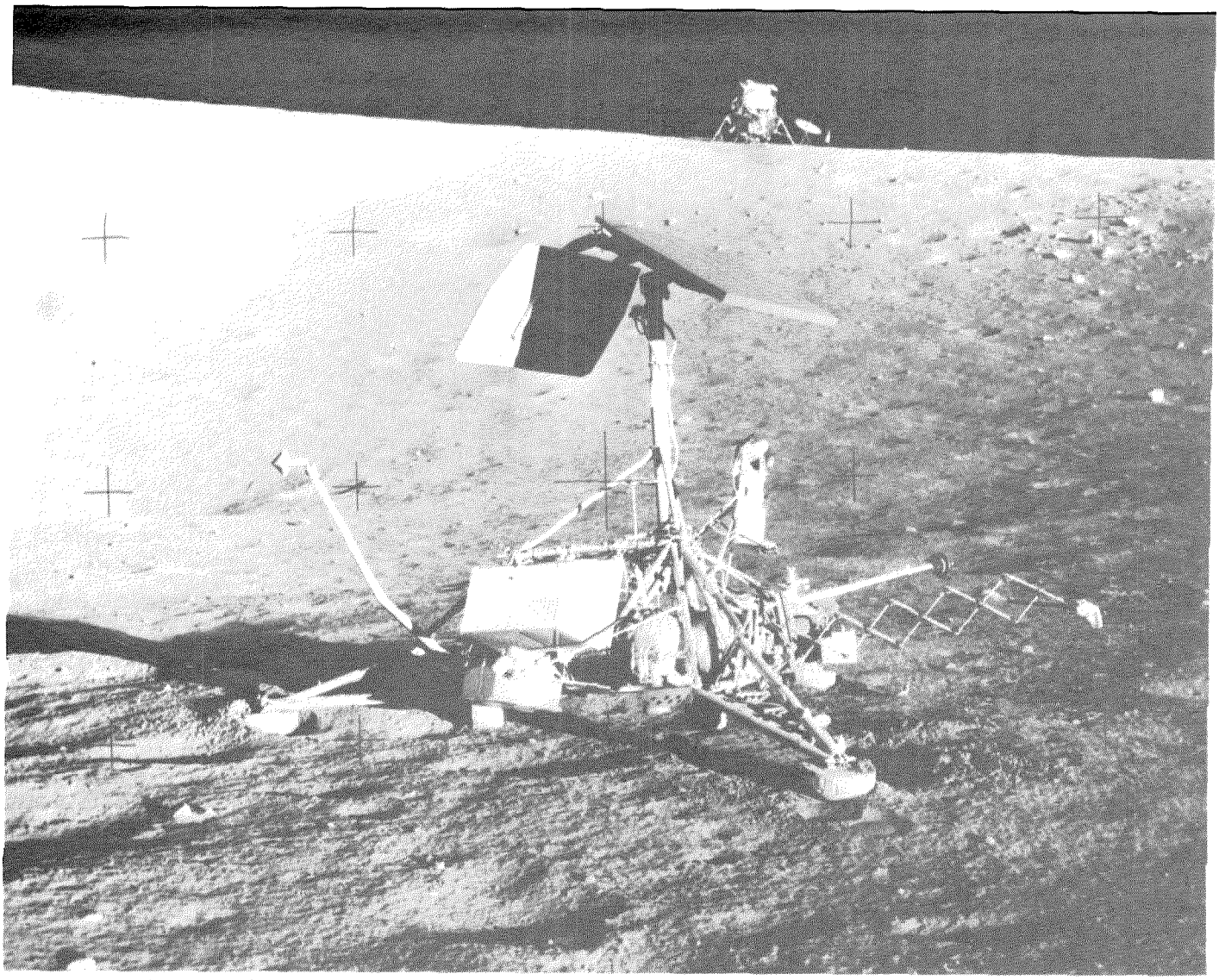


Surveyor III in the clean room before the 1967 launch from Cape Kennedy, where Scott got what he thought would be his last good look at the surface sampler.

During and following the first manned landing on the moon last July, I was in Houston to assist in the evaluation of the physical and mechanical properties of the lunar soil. On one of these occasions I was asked what I thought of the idea of aiming Apollo 12, the second manned mission, at the landing site of Surveyor III, a Jet Propulsion Laboratory unmanned vehicle that soft-landed on the moon in April 1967. I was enthusiastic about the goal, but dubious as to the chances of accomplishing it. Apollo 11 had landed several miles from its intended landing site in a location that was not identified until the descent movies were processed and examined after the astronauts' return.

There was a special reason for my enthusiasm, however. Seven years ago I had proposed using a device called the surface sampler on the Surveyor spacecraft series, to explore the mechanical properties of the moon's surface—whose nature was only speculation at that time. In the course of time, much delay, many committee meetings, and a good deal of hard work, a surface sampler was mounted on the third Surveyor spacecraft. As principal investigator for the sampler as an experiment, I spent some time with Floyd Roberson, my JPL colleague, at Cape Kennedy late in 1966 taking part in the final calibration of the surface sampler.

When that was over, the spacecraft was moved from the "clean room" to be loaded with propellant, and we said goodbye to the surface sampler, with the hope that we would next meet on television. On the sharp end of an Atlas-Centaur rocket, the surface sampler departed the earth on April 17, 1967, for a landing site in Oceanus Procellarum on the moon. Surveyor III became operational on the lunar surface on April 20, 1967. For the next two weeks Floyd Roberson and I happily and sleeplessly



Uncle Sam's used spacecraft lot.

played with the lunar surface soil on the inside surface of a 650-foot-diameter crater close to the aiming point. The surface sampler performed very well, and I finished that lunar day with a good understanding of the nature of the lunar surface, as well as some controversial results.

For no particular reason that I can recall, we tidily raised the surface sampler as high as it would go and moved it to the extreme right edge of our area of operations before the spacecraft was put to bed. When Surveyor III failed to respond after the lunar night, I considered that my time with that surface sampler was over, and retired to work over my results. Two more surface samplers were flown, on the following Surveyor, which crashed, and on Surveyor VII which landed successfully near the crater Tycho far to the south. We exercised the Surveyor VII surface sampler thoroughly in its first lunar day in January 1968, and sent a few commands on

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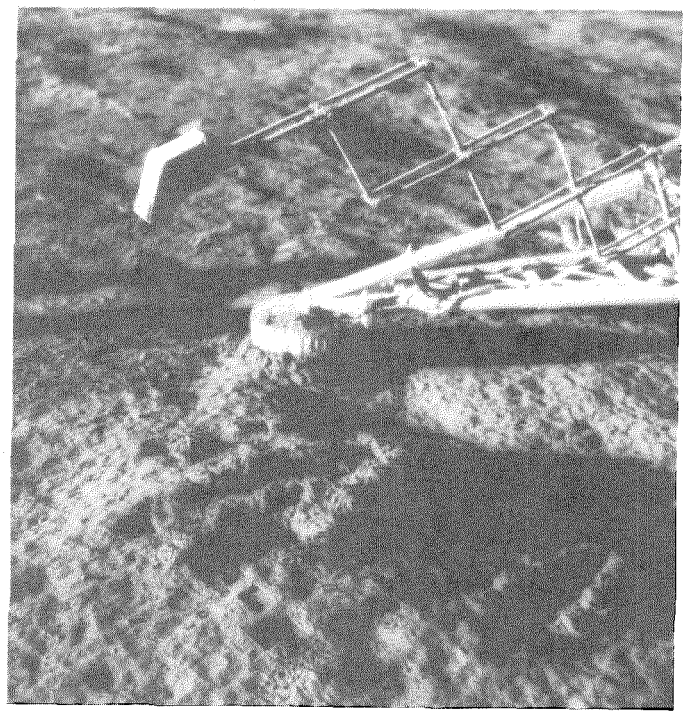


The surface sampler as it appeared to the Apollo 12 astronauts on the moon last November. The trenches it dug two and a half years before are still clearly visible.

the second lunar day in February to which it responded for the last time.

Meanwhile, the Apollo program was moving ahead. Among the innumerable pieces of information needed for the manned landing, the results from the surface sampler operations gave assurance that the landing itself, and the astronauts' activities on the lunar surface, could proceed safely—as far as the soil's strength was concerned. The landing of Apollo 11 demonstrated the satisfactory nature of a number of assumptions which had been made, and more ambitious plans were laid for Apollo 12 last November. If the Lunar Module landed sufficiently close to Surveyor III, Astronauts Conrad and Bean were to visit it, and remove selected portions of the Surveyor with a pair of cutters. Because the surface sampler had a high-strength steel tape attached to it, it was not thought possible that the astronauts could bring back a part of the sampler. However, they did plan to remove the Surveyor television camera, some tubing, and a piece of cable. The condition of these components has great scientific and engineering interest due to their stay of two and a half years on the lunar surface.

As part of the Apollo Soil Mechanics Team, I was sitting in a "Science Support Room" at Mission Control in Houston on November 19, 1969, when we heard Bean's excited words during the final stages of descent:

"Okay, look out there; I think I see my crater . . .

"There it is, there it is; son of a gun—right down the middle of the road—

"Look at that crater—right where we are supposed to be."

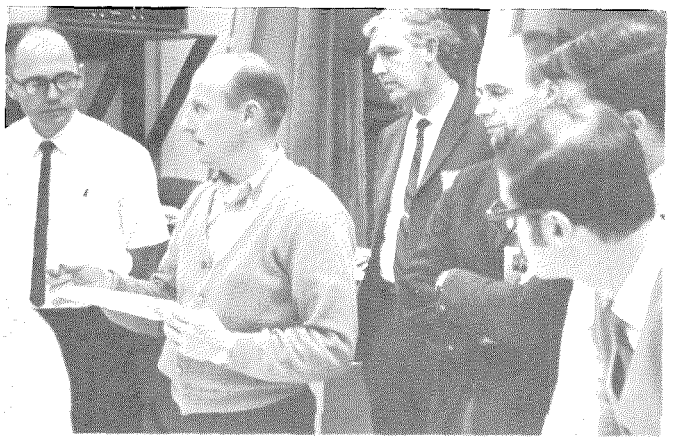
For the first time I realized that Conrad and Bean might really manage to visit Surveyor III. Later, Conrad emerged from the landed Lunar Module and reported he could see Surveyor to the southeast on the inside slope of what had become "its" crater. Following a first trip outside the Module to arrange a number of pieces of equipment on the surface, and after a rest inside, the two astronauts disembarked again on a journey of exploration which was to include Surveyor toward the end. After two hours of traversing the lunar surface, taking samples, and driving core tubes, the men made their way to Surveyor and began poking around it. They obtained various pieces of the vehicle as required, and then Conrad remarked casually that he had got the scoop and had put it in the scoop bag. This was entirely unexpected, and I did not know at the time how he had accomplished it. When the crew returned to earth, I asked Conrad what had happened. He said he had, as an experiment, put

the wire cutters to the sampler's steel tape, and, as expected, he could not cut it. Then he gave the cutters a twist, and to his surprise, the tape parted at a weld. All he needed to do to free the scoop was to snip through three aluminum supporting arms and some wires behind the first joint. He was able to do this because in April 1967 we had fortuitously left the sampler in its most elevated position. Astronauts in space suits cannot at present bend down.

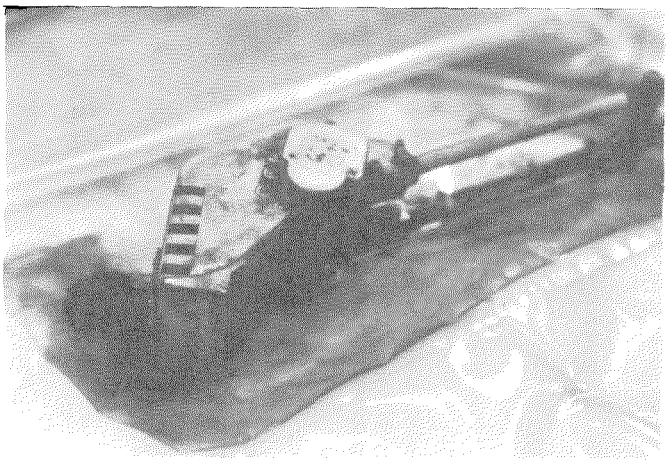
Along with the Surveyor television camera and other parts, the scoop spent the few weeks after the astronauts' return in quarantine at the NASA Lunar Receiving Laboratory in Houston. In due course, the quarantine was raised, and the returned surface sampler part—inside two murky teflon bags—was brought into an examination room. A small group of people was present, including astronauts Conrad and Bean, as well as myself, excited not for the first time, and probably not for the last, by the events of the space program. Some discussion ensued about the process of removal of the parts from Surveyor and the astronauts' observations at the time, and then we were ready to open the bags for a preliminary inspection of the scoop. Because the lunar soil adhered to the sampler during our operations of two and a half years ago, and had remained on it, the scoop was accompanied by a small amount of granular material in its inner bag. Since it had not been preserved in a vacuum, the soil had floated around in the bag under the zero gravity conditions of the return trip and had coated the entire mechanism and the inside of the bag with a fine particulate layer. If I had known I would see it again, I would have left the scoop completely packed with lunar soil.

The bags were opened carefully, almost reverently, not from any religious motivation, but to prevent any scattering of the fine dust. The smell of the lunar surface (Armstrong and Aldrin described it as a burnt smell, like spent pistol caps, and as usual with astronaut observations, I find it an accurate evaluation) pervaded the room, and we proceeded to photograph the scoop from all angles in case any changes occurred in the next few weeks. Except for the dust coating, it seemed to be in remarkably good condition.

Later, the bags were re-sealed, and the Surveyor parts were transported to Hughes Aircraft Company, the builder of Surveyor spacecraft under the supervision of JPL, for scientific and engineering examinations. Although these studies will take a number of months, I already have one of those inner feelings of satisfaction, which we recognize in life: a circle completed.



Reunited with the surface sampler at last, Scott (third from the left) listens as astronauts Conrad and Bean explain the lucky circumstances that enabled them to bring the device home.



The object of his affection and attention—the surface sampler, covered with lunar dust, but apparently little the worse for its ordeal.