Lander 1: On its own for a while

On Aug. 29, the Viking 1 lander received its final scheduled message from earth. Even at computer speeds, the last command took about an hour and a half to send from the control center at the Jet Propulsion Laboratory, because it contained all the instructions necessary (barring revisions and malfunctions) to guide the versatile craft in its studies all the way through to solar conjunction in early November.

Viking's planners decided long ago that it would be impossibly difficult to run the two landers simultaneously at their maximum capabilities (SN: 7/17/76, p. 38). Hence, lander 1 will be working at a reduced level, providing about 10 percent of its normal data output, while attention focuses on its newly arrived twin. The other reason that it is being left on its own, however, is so that its former communications satellite, alias orbiter 1, can be freed to "walk" around the planet and study other parts of the Martian surface.

In the biology package, the labeled-release experiment will keep on reading radioactivity counts per minute from the sample it collected on Aug. 26, with the possibility of as many as 66 days of analysis. The gas-exchange experiment has been reading its original sample ever since it was delivered and will continue to do so until conjunction. The remaining biology device, the pyrolytic-release experiment, finished its intended labors before the reduced-workload period began; it may, however, prompt the craft's controllers to make their only interruption into the automatic instruction sequence, if it is judged that one more PR cycle is necessary to resolve uncertainties caused by too-high temperatures in the instrument's previous run.

The weather station, meanwhile, continues to make its daily reports; the organic chemistry instrument will periodically sample the atmosphere. The inorganic chemistry instrument will spend a total of about 20 days analyzing the composition of the sample it got on Aug. 29, then dump it out through its trapdoor, clean itself ("by rattling its trap," says one experimenter) and then commence to analyze whatever remains about every 5 or 6 days to see if any dust grains have been blown in by the wind. The last command even included instructions for the cameras, which will take a variety of photographs, all with no further scheduled guidance from the earth.

With lander 1 on its own, producing amounts of data small enough that they can all be sent during each day's brief direct link with earth, orbiter 1 is free to roam. On Sept. 11, its engine was scheduled to be fired to "desynchronize" its orbit from over the landing site, sending the orbiter off on a two-week journey around Mars, with the low point in its orbit passing over a different part of the surface each day, finally locking up over lander 1 again on Sept. 24. Six days later, orbiter 1 will take over as the earth-relay link for the second lander, and orbiter 2 will shift the plane of its path from a 55° angle with the equator to 75°, setting off on its own journey to look at the Martian polar regions. It will get home on Oct. 18, but three days later, orbiter 1 will be gone again, this time on a trek designed for radio-occultation studies of the planet's atmosphere and gravity that could last right up until conjunction itself.

Whether most of the lander's instruments will be shut down through conjunction (when the sun's position between earth and Mars will block communications for about six weeks) is not yet certain. Engineers get nervous when normally supervised machines are turned loose on their own, but present plans call for letting at least the gas-exchange and labeled-release experiments continue to incubate their samples, passively, to be read out in late December when the sun gets out of the way.

Beyond conjunction, Viking begins its so-called "extended mission," possibly involving all four spacecraft. The main mission's primary goals will be out of the way, and there should be more freedom to experiment. Plans are still being formulated (one idea is to lower the orbiters' periapses by nearly 50 percent for a closer look at the planet), but there are few of the project's scientists who have not already anticipated that less-fettered time by drawing up their Christmas lists. □

Ozone controversy's uncertain uncertainty

Another skirmish in the continuing battle over whether or not chlorofluorocarbons used in household aerosol products are destroying the ozone layer and increasing the skin cancer risk was waged at the 172nd national meeting of the American Chemical Society in San Francisco. The new scientific exchange came only a few days before the National Academy of Sciences planned to release two comprehensive reports on a controversy on which data supporting both sides have been appearing almost weekly.

In a press conference at the ACS meeting, Mario Molina of the University of California at Irvine said nothing has changed enough to convince him that the environmental hazard he and F. Sherwood Rowland had warned about two-and-a-half years ago was anything less than they had predicted. At that time, they calculated that the present rate of chlorofluorocarbon aerosol manufacture, if continued, would deplete the ozone layer by at least 13 percent, leading to about 80,000 more cases of skin cancer a year in the United States alone by the year 2000.

"The risk is substantial," Molina said. "We have searched for reactions and mechanisms of many types that may remove chlorofluorocarbons before they reach the stratosphere and have found none. . . . We think that the continued release of chlorofluorocarbon gases is indeed a threat to stratospheric ozone . . . I'm not advocating a ban tomorrow for spray cans, but we do have enough information to make an assessment within the next few months."

On the other hand, J. P. Jesson of the E.I. DuPont Co., which makes most of the chlorofluorocarbons used in refrigerants and aerosol products, said any such decision to terminate chlorofluorocarbon aerosol production could safely be postponed for two years. His recent calculations suggest, he says, that if chlorofluorocarbon production should continue at its peak 1974 level for the next two years it would deplete the ozone level in the stratosphere by only 0.05 percent. Jesson's calculations take into account the recent unproven studies which indicate that when the chlorofluorocarbons encounter cosmic rays and other factors in the stratosphere, chlorine atoms produced by degradation of the chlorofluorocarbons rapidly react with nitrogen oxides in the atmosphere to produce chlorine nitrite ($ClONO$) and nitryl chloride ($ClNO_2$).

When and if such reactions do occur, the reaction products form a kind of chemical sink, which delays or inhibits potentially destructive reactions of chlorine atoms with the ozone layer. The argument is similar to the one that followed an announcement last May from the scientists at the National Center for Atmospheric Research in Boulder, Colo., that another compound—called chlorine nitrate ($ClONO_2$)—was acting as the same kind of sink. Its presence was suggested by hydrogen chloride concentrations in the stratosphere that were lower than those proposed in the original Rowland-Molina model. Throwing a bit of cold water on the chlorine nitrate theory at the ACS meeting was Philip L. Hanst of the Environmental Protection Agency's Research Laboratory in Research Triangle Park, N.C. After reacting chlorine atoms, nitrogen dioxide and various organic compounds under simulated atmospheric conditions, he found that chlorine nitrate did not form unless air pressure and ozone levels were far greater than they would be in the stratosphere. Hanst also noted that stratospheric measurements carried out at the University of Denver last year detected man-made chlorofluorocarbons but no chlorine nitrate. Neither did his laboratory simulations nor the Denver measurements indicate that nitryl chloride could be or was being formed at the rate proposed by Jesson.

In response to reporters' questions,