

bined worksheet tabulation with a considerable amount of information about space flights, but no single document gives a complete record."

Dr. Sheldon's report reveals that the Russians have suffered 18 failures of various kinds in 19 attempted planetary probes, though one of them, Zond 3 in 1965, which apparently began as an intended Mars flyby, captured headlines by photographing the dark side of the moon. Nine of the spacecraft never got out of earth orbit; two more never got into it. Half a dozen died of communications breakdown. The only success was the Venus 4 probe, which soft-landed on that planet's surface (SN: 11/4).

The Soviet moon program has been luckier, with nine successes in 17 attempts. Through the end of 1965, there had been only three successful flights (one hard-lander similar to U.S. Ranger spacecraft, and two flybys) out of 11 tries. Last year, however, almost everything seemed to go right. Only one of six attempted missions failed.

That one was not identified by the Russians as a moon attempt. Instead, it was passed off as Cosmos 111, lumped as part of the catch-all Soviet satellite series. It lasted two days in a low orbit around the earth, then fell back through the atmosphere.

The brief stay in orbit, however, provided a clue to its real purpose. The flight came just "at the right time for lunar launches, consistent with other Soviet lunar launches for a soft landing or orbital mission," the report says. Such are the scraps upon which Western observers must base their deductions.

Dr. Sheldon also briefly discusses the possible future of the Soviet manned space program. "There is still a possibility," he says, "that the Russians could run enough tests unmanned that they would be willing to send men around the moon either before or concurrent with the resumed manned flights of Apollo in this country, in the summer of 1968."

Certainly the Russian pace in space has accelerated in recent months. "At the same time that space efforts in the United States appear to be slackening," Dr. Sheldon says, "the pace of Soviet space flight has picked up by about 60 percent this year."

Military space-watchers have more information available than their civilian counterparts, such as detailed radar tracking reports on the individual signatures of Soviet spacecraft. Why, then, is a civilian report necessary for Congress? "This report," says Dr. Sheldon, "is intended to navigate its way between the rocks of security information which must be protected on the one side, and the shoals of inaccurate speculation and misinformation on the other."

EFFICIENCY IN HEALTH

A National Campaign to Prevent Catastrophes

The staggering cost of medical care and the difficulties patients face in getting any care at all are hardly new. Hospital authorities, health insurance agencies and Federal officials frequently recount the fact that medical costs in the United States rose from \$12.9 billion to \$36.8 billion between 1950 and 1964—an increase of 186 percent. Expenses will climb another 140 percent by 1975.

Paradoxically, while the numbers both of physicians and hospital beds rise faster than the population, the availability and quality of care decline.

Patients spend long hours in waiting rooms only to receive quick, cursory care. Fewer and fewer persons have the attention of family physicians—98 percent of all medical school graduates choose specialties instead of general practice. Experts estimate that 40 to 70 percent of hospital care is less than optimal.

Standard answers have been to increase the numbers of physicians, dentists and nurses as well as hospital beds by pouring more money into school and hospital expansion. But last week a White House panel—the National Advisory Commission on Health Manpower—declared that this line of attack will not work unless the basic system of health care and the methods of paying for it are drastically revised.

J. Irwin Miller, chairman of the Commission, which President Johnson appointed in May 1966, says that from 1950 to the mid-1960s the nation's health system had problems to correct. "Now," he stresses, "we have catastrophes to prevent."

The 15-man Commission, Miller observes, began its work expecting to come out with recommendations for more manpower and more beds. But it changed its thinking as soon as the members got a good look at the glaring inadequacies.

The Commission finds that, in health care, the nation needs greater efficiency and higher quality. To achieve them it urges drastic revision in methods of paying for medicine—a system of economic incentives that will reward well-run, high-quality institutions and cost the laggards money.

It takes its cue from the successful experience of the Kaiser Foundation's Hospitals in California, which provide care to 1.5 million persons on a prepaid instead of cost-plus basis. Stressing that it sees no value in a master Federal plan to assume control of health services, the Commission believes economic incentives will induce the private

sector to do the job, a notion likely to draw strong political support, and fire.

Even before the Commission reported, Representative Wilbur Mills (D-Ark.), chairman of the tax-writing Ways and Means Committee, declared, "I do not want to see Government intrude more into this (health) process. I believe we can depend on hospitals to exercise the restraint and good judgment necessary to meet the problems."

Under the Kaiser plan in California and other prepaid plans, the administering agency agrees to provide comprehensive care for a fixed sum of money. If inefficiency, profligate utilization of hospital beds and high fees cost the hospital more than the fixed sum, it loses. Between 1960 and 1965, while nationwide private bills jumped 40 percent, Kaiser's costs rose only 19 percent, according to Dr. Peter Bing, executive director of the Commission. And, Dr. Bing says, Kaiser has been able to obtain adequate funds from private sources for expansion.

When payment is made on a cost-plus basis, as it is for Medicare, Blue Cross and other private groups, the hospital or doctor provides his services and the funding source pays the bill whatever it is. Under this system, Dr. Bing says, inefficiency and high costs are fostered rather than discouraged. Hospitals receiving Medicare payments recover their full costs plus an additional two percent capital for future investment or expansion. Therefore, it makes two dollars for every \$100 it charges and six dollars for every \$300. "It actually pays the hospitals to charge more," Dr. Bing points out.

Anticipating the accusation that the economic incentive of the prepaid plans could merely foster lower quality, the Commission recommends a system in which review boards of medical leaders would constantly survey and evaluate quality. High-quality hospitals would be paid more than low-quality ones.

"Ideally," Dr. Bing says, "there should be an objective measure of quality but until such standards can be worked out, the subjective system of peer review is better than nothing at all."

If the Commission's recommendations are accepted, they could mean an eventual change in the Medicare legislation, but that does not appear likely for some time. It is difficult to assess what impact the report will have. President Johnson says it is required reading for all Cabinet members and

has called on all Federal health officials to send him further recommendations.

In addition to recommending economic incentives to improve efficiency and quality, the Commission listed over 50 other specific proposals including suggestions that:

- The 7,000 foreign medical graduates who enter the U.S. every year be required to pass examinations equivalent to those given to American medical graduates.

- Attention be directed to expanding existing medical schools—with a view to maintaining quality while inducing

new and more flexible curricula—instead of creating new institutions.

- Nursing should be made a more attractive profession by greater utilization of professional skills. Higher salaries and more flexible hours for married women should draw some of the half million accredited but unemployed nurses back to work.

- The Government revise and expand its Health Professions Education Assistance Programs to make available student loans covering tuition and living expenses during professional education. ♦

FIRST LUNAR TAKEOFF

Precise Measurements Result from Surveyor's Leap

Luniks, Rangers, Surveyors, Lunar Orbiters. The United States and the Soviet Union have placed no fewer than 18 spacecraft of various kinds on the moon, six of them gently, the rest abruptly. Until recently, however, no man-made object had ever taken off from the lunar surface. In the still-dark hours of the morning on Nov. 17, eight days after Surveyor 6 landed, scientists at the Jet Propulsion Laboratory in Pasadena, Calif., ordered its three small vernier rockets to fire for two and a half seconds. Obediently, the engines blasted, the spacecraft rose 10 feet and came down again, some eight feet from where it had stood.

Surveyor had taken 12,754 photographs of the moon before its hop. From its slightly different viewpoint, JPL then directed it to take thousands more of the same terrain. Scientists will be able to combine the two sets in stereoscopic pairs from which distance and size of lunar features can be determined. The result, says Surveyor program manager Benjamin Milwitzky, will be the first "absolutely certain, unequivocal, unambiguous" such measurements ever made from the surface.

One prominent lunar feature that has intrigued the investigators is a rocky wrinkle ridge some 650 yards from the spacecraft. Photographs taken from Lunar Orbiter 4 overhead had helped fix the distance of the ridge, but not until Surveyor's hop had there been a way to measure its height; the photos have all been taken and are presently undergoing analysis.

Surveyor unfortunately suffered a casualty as a result of its brief trip. The spacecraft had been analyzing the lunar surface with its alpha scattering device, an automatic chemical laboratory (SN: 9/23), which was lowered to the ground on a flexible cable shortly after the initial landing. There was no way to pull it back up again before re-

firing the rocket engines. As a result, the experiment bumped along on its cable until Surveyor was in the air, then hung free and finally was the first thing to hit the ground in the descent.

At first, when the device was found to be "talking funny," JPL engineers thought there might be hope for it. Then the spacecraft's camera revealed the experiment's gold-plated box, lying on its side bracketed by Surveyor's three feet.

Even if the hop had ended in the whole spacecraft's being reduced to junk, however, it would have proved something. All previous U.S. moon probes had been directed at finding and photographing potential landing sites for the manned Apollo spacecraft. That the National Aeronautics and Space Administration allowed Surveyor 6 to be risked as it was underlines what NASA had already indicated—that there are now enough moon pictures to satisfy Apollo—probably several times over.

On earth, where the spacecraft weighed 2,223 pounds, the hop could never have been made, since the tiny vernier engines can only produce a total of 312 pounds of thrust. Just before touchdown on the moon, however, Surveyor jettisoned its big retrorocket motor, which itself weighs 1,395 earth pounds. The remaining weight was reduced still further by the consumption of fuel and attitude control gas, and in moon's reduced gravity, only one-sixth that of earth, the verniers had to pick up less than 110 pounds for the hop.

Weight was not the only pre-hop problem, however. A whole set of conditions had to be met before the move could be possible. Most important was the alpha scattering experiment, with which NASA had promised to provide 18 hours of analysis of the lunar surface; it got 27. In addition, photos had to be carefully checked to make sure

the spacecraft had a clear field to jump in, and would not come down on some irregularity such as a boulder or crater. There had to be enough pressure in the helium-filled bladders that control the fuel shutoff valve, so that the rockets would stop firing at exactly the right instant; and finally, the temperature around all three rockets had to be low enough that the nylon solenoids controlling the bladders would not expand and stick open.

Shortly before the hop, all the conditions had been satisfied except one: the rockets, exposed to the glare of the lunar day, were too hot. At last, when the sun was directly overhead, shadows from Surveyor's solar panel and high-gain antenna fell on the rockets and solenoids, causing them to cool to a safe level. A signal was radioed from JPL, and Surveyor jumped.

The success of the hop prompted the Surveyor team to consider a second one, but at a meeting early last week the idea was dropped. One reason, says JPL, was that a scientifically useful jump would have to travel at least 1,000 feet across the lunar surface and go through the whole radar-guided soft-landing procedure again, in contrast to the first hop, which the engineers called a simple ballistic "kick in the pants." The other reason was that Apollo officials, though they had enough landing site photos, decided they wanted a longer look at the rocket blast impressions of the first hop, which could be photographed by the spacecraft from its new position.

WET AND METRIC

English Measurements Take a Setback

Another breach has been opened in the dam keeping the metric system out of the United States. Henceforth, water quality data issued by the U.S. Geological Survey will be in metric units.

The concentrations of dissolved materials, for example, will be reported in milligrams per liter instead of parts per million, and stream temperatures will be changed from degrees Fahrenheit to Celsius (Centigrade). The metric units are those used for international standards, and will also do away with the need for corrections to compensate for changes in water density.

The changeover, which followed a year-long study of the problem, will not be a complete one, however, according to the Survey's chief hydrologist, Ernest L. Hendricks. "It is applicable only to certain water chemical data," he says, "and not to the full spectrum of hydrologic data such as streamflow, ground water conditions and reservoir contents, which will continue to be reported in English units."