aerospace

Pioneer 11 aims antenna to earth

Pioneer 11, traveling 74,000 miles per hour, passed its most recent major maneuver with flying colors. On commands from ground control, the spacecraft pointed its high-power, narrow-beam antenna toward earth. This shift from the wide-beam antenna allows a fourfold increase in the rate of data returned to earth—up to 2,048 data bits per second. The high-power antenna will now be used for the rest of the flight to Jupiter.

Pioneer 11 is now two months out on its 20-month journey to the planet. (Pioneer 10 will get to Jupiter in December.) The latest maneuver required engineers at NASA's Ames Research Center to fire 26 short pulses from the spacecraft thrusters to turn the spin axis and therefore the nine-foot dish antenna directly to earth. The spacecraft had been pointed away from earth to reduce the angle of solar radiation and heating.

Air Force watches the sun

The Air Force is developing a surveillance net to keep an eye on the sun. The first of six optical telescopes will be set up in Palehua, Hawaii, in 1974. Others will be placed later in Puerto Rico; Athens, Greece; Carnarvon, Australia; Boulder, Colo., and a site yet to be chosen in the Far East.

The network will be called SOON for Solar Observing Optical Network. The idea is to establish a tracking and warning system to predict solar events disruptive to satellites, radar and radio communications. With SOON, the Air Force hopes to be able to pinpoint more accurately the location and magnitude of solar disturbances that affect the earth's ionosphere and atmosphere as well as radiation levels near earth. Each telescope will have systems for tracking the sun and flares, and analyzing spectral lines.

Lasers for space communications . . .

The Air Force Avionics Laboratory at Wright-Patterson AFB in Ohio is developing a sun-powered laser designed to provide longer life to space communications systems. The device collects and focuses rays from the sun through a series of lenses and mirrors. These rays stimulate material in the laser to produce light beams that are capable of transmitting data, television, voice and other communication.

The power output and data-transmission rate will equal that of current solid-state lasers. With a working model of the system—a neodymium laser—engineers at the laboratory have obtained five watts of power. They are exploring the possibility of using auxiliary lamps or light-emitting diodes to power the laser during periods when the satellite is not in the sun.

. . . and for tracking aircraft

A laser-radar system that can, in relatively clear weather, track low-flying aircraft at distances beyond 20 miles is being developed for NASA by RCA. The system will be used at NASA's experimental runway facility at the Wallops Station in Virginia to evaluate the precision of automatic landing systems.

The laser system will operate at optical frequencies instead of in the microwave range used by conventional tracking radars. The narrow laser beam is thus not subject to problems encountered by the low-altitude microwave tracking—distortion and interference from mountains, trees, tall buildings and other obstacles. The system can also be used as a calibration aid for the automatic radar systems.

biomedical sciences

Magnet to destroy tumors

A team of medical scientists and physicists in California have successfully used a specially developed superconducting magnet to kill tumors in human patients.

The scientists knew that iron filings placed in blood vessels make blood clot. So they hypothesized that iron injected into blood vessels supplying tumors would cut off the blood supply to the tumors. The tumors would thus be destroyed. But how could they get the iron to stay in the right blood vessels? A magnet applied to the blood vessels from outside the body might do the trick, they decided.

Electromagnets were not strong enough. Physicists and engineers at the Stanford Linear Accelerator Center (SLAC) set out to make a superconducting magnet that would be suitable. It had to be small enough to be portable and powerful enough to do the job. The task turned out to be so difficult, expensive and time-consuming that the SLAC group several times came close to giving up. But they finally got what they were after—a small (six-inch by eight-inch) cylindrical magnet 20,000 times the earth's field strength. "To my knowledge," physicist Steven L. St. Lorant says, "this is the first time that magnet technology developed for high-energy physics research has found a direct application in a totally different discipline."

Neurosurgeon Robert W. Rand has used the device on patients at the University of California at Los Angeles Hospital. The magnet and iron injections have cut off blood supplies to a tumor of the tongue of one patient, to a brain tumor in another patient and to a tumor of the adrenal gland in still another patient. All the tumors were destroyed.

The thump from the womb

When a fetus moves in the womb, it is usually alive and well. Mothers often note these thumps and kickings. But how often are fetal movements really sensed by a mother? E. Sadovsky and his colleagues at Hadassah University Hospital in Jerusalem followed 20 pregnant women's subjective assessment of fetal movements and also recorded the movements. They found that the mother's sensations coincided with fetal movements 87 percent of the time.

"These results," the Israeli obstetricians report in LANCET, "indicate that a daily count by the patient of fetal movements could be used to monitor fetal wellbeing in cases of high-risk pregnancy."

Hydrogen sulfide and suicide

The highest suicide rates in the country for the 50-year period to 1961 were in cities on the West Coast. At a regional meeting of the American Chemical Society last week, Leroy Schieler of South Seattle Community College suggested that this suicide trend might be blamed on high levels of hydrogen sulfide in the atmosphere.

During 1972 and part of 1973, Schieler surveyed several thousand Seattle residents and measured hydrogen sulfide in the air over Seattle. He found a decided correlation between mental depression and ambient high levels of hydrogen sulfide. Other investigators have also linked chronic exposure to hydrogen sulfide with mental depression.

Among the conditions that trigger high levels of hydrogen sulfide, Schieler says, are acid soil (especially prevalent in the western United States) and high concentrations of sulfur pollutants caused by smelting operations, pulp mills or stationary power sources.

High suicide rates in Sweden, Denmark and Finland, Schieler says, may also correlate with hydrogen sulfide.