Bouncing waves off a heated ionosphere

Very high frequency (VHF) radio waves have a distinct advantage over longer wavelength transmissions in many applications because they can carry more information—the complex combination of signals required to transmit continuous television pictures would be virtually impossible using the standard AM radio band. Similarly, FM radio gives better sound reproduction because of its VHF character. But VHF waves also have one great disadvantage: They do not bounce off the ionosphere as "short wave" signals can, and transmission is thus limited to the more or less "line of sight" horizon—about 50 miles. If the ionosphere could be changed to reflect VHF waves, transmission for a thousand miles would be possible.

Now the Stanford Research Institute has anounced that some of its scientists have demonstrated a technique for creating such an ionosphere change, and that the modification is simple and environmentally safe. Using a ground-based "heating transmitter," SRI scientists disrupt the motion of electrons in the ionosphere overhead by a heating technique similar to that used in microwave ovens. Then, a VHF transmitter far away on one side can beam a signal toward the heated area, where it is reflected to a receiving station far away on the other side. The heated area itself is about 10 miles thick and 100 miles in diameter.

Conceivably, the new technique could revolutionize transmission of certain types of teletype, telephone and facsimile communication, especially in remote, underdeveloped areas that lack telecommunications networks. But the system is not likely to affect normal commercial broadcasting, since reflected signals require more sensitive receivers than those available in homes, and the signals suffer distortion. For these applications, communications satellites will probably remain attractive, but for others, the prospect of building a "heating transmitter" for perhaps a fifth the cost of launching a satellite, in order to improve communications, is getting increased attention. □

Sungrazer Helios off on solar journey

The German Helios solar probe, destined to go closer to the sun than any man-made object before it, was launched successfully on Dec. 10. Tracking of the early part of its flight path indicates that it should pass about 28,818,000 miles from the sun on March 15, 1975.

Its dozen experiments are designed to study the solar wind, magnetic fields, solar and galactic cosmic rays, electromagnetic waves, micrometeoroids and zodiacal light. All of the experiments appear to be working well except for a solar plasma detector, which has been yielding confused data due to problems in the deployment of the boom on which the instrument is mounted. (Another boom, carrying one of the probe's two flux-gate magnetometers, also opened to less than its full length, but this is not expected to appreciably affect the instrument's findings.)

Though all of the experiments will be providing data from a previously unexplored region of space, one, a cosmic ray sensor directed by H. Kunow of the University of Kiel, Germany, may be of particular interest in light of recent findings that affect the relative charged-particle contributions of solar and galactic sources versus planetary magnetospheres (see p. 390).

Designed to operate for 18 months, Helios should complete about three orbits of the sun. Many deep-space probes, however, such as the hardy Pioneers, have far outlived their predicted lifetimes, and the unprecedented nature of Helios' data should ensure NASA's willingness to support possible extra years of performance.

The launching of the spacecraft, aboard a U.S. Titan-Centaur rocket, also eased the minds of space officials concerned about qualifying the new booster combination for the 1975 Viking launches toward Mars, as well as the 1977 Mariner Jupiter-Saturn missions. In the first Titan-Centaur launch, last February, the complex Centaur upper stage malfunctioned, making Helios officials nervous and putting a heavy responsibility on this month's flight—which it met. □