space sciences

Instrument landing by nuclear guidance?

The Federal Aviation Administration is developing a family of microwave systems that will alleviate problems of landing airplanes at fog-shrouded airports. Microwave instrument landing systems have three advantages over current ILS systems: they have better accuracy because they have narrow beams; they are not as suspectible to reflections from taxiing aircraft on the ground or buildings near the airstrip; and they may allow multiple aircraft approaches to the airport from different angles.

Now TRW Systems of Redondo Beach, Calif., is working on a back-up system which could provide an independent check to the microwave ILS. It is a nuclear system using a radioisotope (cobalt 60) to beam signals. Developed by R. A. Kaminskas of TRW, it is little larger than a cigarette-lighter flint and gives off less than 10 watts of heat. The unit, tested at Edwards Air Force Base, tells a pilot when he is on the glidescope or the centerline, too high or too low, and too far left or right.

Soviets get Apollo 16 and 17 samples

Vladimir Shcherbina and Lev Tarasov of the Academy of Sciences of the U.S.S.R. presented papers at the recent Lunar Science Conference in Houston and returned to Moscow with samples from Apollo 16 and 17. The six grams of material represented a wide variety of soil and rock types found at Descartes and Taurus-Littrow sites. U.S. scientists have already reported on Luna 16 and 20 samples received from the Soviets.

Also this month NASA and the Soviets announced results of joint working group meetings on space biology and medicine, the earth's environment, and Mars and Venus. The two groups exchanged results of studies conducted in geology, geomorphology, soil, land use, hydrology, glaciology and microwave techniques. The biology working groups discussed fluid and electrolyte balance studies and plans for medical procedures in future manned space flights.

Airborne landing pad tested

The Northern Transportation Company Limited of Canada successfully tested this month the first airborne landing pad. A Canadian Coast Guard Jet Ranger helicopter landed on NTCL's Voyageur Air Cushion Vehicle. The deck of the vehicle is 44 by 34 feet.

The cushioned craft rides on a four-foot cushion of air retained by a flexible skirt. Landings were made at sea and near the docks. The test proved the vehicle's capability to serve as a mobile landing platform for vertical takeoff and landing aircraft.

The moon's radioactive material

Apollo 15 orbital gamma-ray results showed that the lunar materials rich in radioactive elements (KREEP) were concentrated in Oceanus Procellarum. Now J. I. Trombka, J. R. Arnold, R. C. Reedy, L. E. Peterson and A. E. Metzger have another model for KREEP-like materials. They note that there is a strong inverse correlation between elevation and natural radioactivity, not just in the western maria, but all over the moon. Where the elevation is high, the amount of radioactive material is low; where the elevation is low, the amount of radioactive material is high. This includes low regions in the highlands. This suggests to some that the radioactive-rich basalts were a lava flow early in the moon's history that filled in the lower regions of the moon.

astronomy

Missing planet misses

The hypothesis that the asteroids are debris resulting from the break-up of a planet is an old one. Last autumn J. L. Ovenden of the University of British Columbia gave it new life (SN: 11/18/72, p. 330) by suggesting that a planet with 90 times the earth's mass once orbited between Mars and Jupiter and blew up about 16 million years ago.

In the March 23 NATURE, W. McD. Napier and R. J. Dodd of the Royal Observatory at Edinburgh present arguments that tend to explode the explosion hypothesis. First they figure out the energy that would be needed for a chemical explosion and find out that it could not be supplied by any chemical detonations. Then they consider tidal forces. These would be negligible at the location of the supposed planet unless it strayed too close to Jupiter. But if it had gotten close to Jupiter it would have disrupted Jupiter's Galilean satellite system, and there is no evidence of that. A nuclear explosion might have done the job, but that would have required enormous amounts of uranium to be brought together simultaneously, a highly unlikely event.

Ovenden's secondary suggestion that the 90 earth masses might have been in the form of a ring is dismissed also. To get to the present asteroid density matter would have to be dispersed from the rings either out of the solar system or into the sun. Trying to imagine a mechanism for either case presents severe difficulties, according to Napier and Dodd, and they conclude that the source of the asteroids must be sought elsewhere.

Deuterium in Jupiter's atmosphere

The amount of deuterium found in the universe today can be evidence in favor of the big-bang theory of the origin of the universe. The theory predicts that at an early stage in development (before the formation of galaxies or stars) large amounts of deuterium should have been produced. Most of this deuterium would later be burned in the thermonuclear energy cycles of stars. Only a small amount should be left, and this can be used to check the theoretical prediction.

Recently deuterium was found in the interstellar gas and dust clouds in amounts barely compatible with theory. Last week at the meeting of the Division of Planetary Sciences of the American Astronomical Society in Tucson, the discovery of deuterium in the atmosphere of Jupiter was reported by a group from the Smithsonian Astrophysical Observatory and the University of Wisconsin. According to one of the team, Nathaniel Carleton of the Smithsonian, the abundance of deuterium corresponds to the prediction of the big-bang theory.

Of pulsars and X-ray sources

In recent years astronomers have found two new classes of celestial objects that give off pulsed signals, the radio pulsars and the pulsed X-ray sources. There seems to be little connection between the two: The X-ray sources generally do not give off radio signals, and only one or two of the radio pulsars show X-ray emission.

A cross correlation between the two classes is thus of interest, and a possible one is reported by a group from Parkes, Australia (J. G. Ables et al), in International Astronomical Union Circular 2508: The pulsar PSR 1641-45 lies within a few minutes of arc of the strong X-ray source 2U 1641-45. The Parkes group suggests a search for evidence of a connection: X-ray pulses with the same period as the radio pulses of the pulsar.