PHYSICS

Radiation From Earth

➤ ATOMIC RADIATION circling the earth that has caused some concern for space travelers comes from the earth's atmosphere.

Experiments reported to the American Physical Society in New York show that the inner Van Allen radiation belt is made up of the decay products of cosmic-ray-created neutrons leaking out of the earth's atmosphere.

The information resulted from two experiments by Dr. Wilmot N. Hess of the University of California's Lawrence Radiation Laboratory, Livermore, Calif., in which neutron counters were sent aloft by the U. S. Air Force on Atlas rockets. One was launched early last year under normal conditions and another last November during one of the largest solar storms in recent history.

The first Atlas flight demonstrated that the actual number of neutrons leaking out of the earth's atmosphere agreed closely with theoretical calculations made by Dr. Hess and his colleagues to account for the inner belt's known characteristics.

During the November flight, neutron leakage was found to be more than twice the level of the first experiment, thus demonstrating a relationship between cosmic radiation and neutron production in the upper atmosphere.

The sequence of events leading to the placement of nuclear particles in the inner Van Allen belt starts with the approach toward earth of protons from the sun and other sources of cosmic radiation. Some of the protons strike oxygen or nitrogen nuclei in the atmosphere and knock out neutrons.

Part of the neutrons produced escape from the top of the atmosphere and travel out into space where they eventually decay into protons and electrons. Some of the charged particles are then trapped by the earth's magnetic field to form the radiation belt.

In both experiments, said Dr. Hess, the neutron count level was quite low near the ground and rose to a maximum at about 60,000 feet. At about 50 miles the rate had decreased to that at sea level, and at 600 miles the rate was only half the sea-level rate. The inner Van Allen belt is roughly 700 to 2,000 miles from the earth surface.

The physicist indicated that there are not enough neutrons at any altitude to injure potential space travelers. But if a manned space flight happened to coincide with a large solar storm, the incoming protons could present a greater hazard than traversal of the radiation belts.

Dr. Hess, in conjunction with physicists Charles Curry and Robert Henderson of the Livermore Laboratory, conceived the experiments and designed and built the neutron counters with the support of the U. S. Atomic Energy Commission. Design and fabrication of the telemetry system and the instrument package was performed by personnel of the Air Force Special Weapons Center at Albuquerque, N. M.

For each flight a neutron counter and transmitter were mounted in a "pod" attached to the exterior of an Atlas rocket. The pod was released from the rocket in flight and data from the counter was radioed to the ground and recorded at several stations along the path of the rocket. The rockets were launched from Cape Canaveral, Fla., and traveled about 5,000 miles down range in the direction of Ascension Island, reaching a maximum altitude of about 800 miles.

Two more flights will be made this year to gather additional data and to study the energy distribution of the neutrons.

• Science News Letter, 79:103 February 18, 1961

Use Magnetic Fields

➤ PRACTICAL APPLICATIONS for superpowerful magnetic fields are being developed at the University of California's Lawrence Radiation Laboratory and in a number of industrial research centers.

DOUBLE PROP BLADES—A variable camber propeller uses tandem blades for varying flight conditions. The 15-foot diameter propeller, under development for the U.S. Navy at United Aircraft Corporation, Windsor Locks, Conn., will on vertical take-off and landing aircraft permit an increase of up to 50% in payload, or up to 40% in range. The propeller is now being tested.

H. P. Furth of the Lawrence Laboratory reported that metal parts can be formed by magnetic-field pressure at the American Physical Society meeting in New York. Sheet metal can be pressed into dies by harnessing the power of the high magnetic fields. The field used in this particular metal-pressing process is somewhat lower than the million gauss range, which has an explosive effect on massive steel and bronze coils.

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Superconductors Studied

➤ PRACTICAL APPLICATIONS for the tunneling of electrons in superconductors are being studied in the General Electric Research Laboratory, Schenectady, N. Y.

The researchers, Drs. Ivar Giaever and Karl Megerle, reported to the American Physical Society in New York that this new phenomenon may be particularly useful in developing new types of computers.

A superconductor is a metal, such as lead, which will conduct current seemingly indefinitely when cooled close to absolute zero, which is 459.7 degrees below zero Fahrenheit.

The tunneling phenomenon occurs when two metal sheets are separated by an insulating layer that is only five to ten atoms thick. When a voltage difference is applied between the two metals, current will flow through the insulating film.

The power requirement is extremely low and the samples are potentially easy and cheap to mass produce, the researchers said.

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SOCIOLOGY

No Place for Elderly In Industrial Plants

➤ EARLY RETIREMENT will increasingly be the lot of most manual workers, a study by the Nuffield Foundation at Cowley, Oxford, England, has shown.

For many years government officials and physicians have advised older persons to continue working.

However, in industrial plants at least, it seems there is no place for the aging worker. No longer able to keep up the pace on the assembly line, and with but little alternative light employment available, he must get out. Automation will not help him.

Indeed, the introduction of the new technique "may have the result of inclining companies more generally to favor an arbitrary retiring age," a report on the study states.

By 1980, nearly one man in five in most civilized countries will be over 65. Many must retire and then spend 12 years or more in retired life. Most such men will be in good health, but will simply have grown too old for the job.

F. Le Gros Clark, who produced the report, based it on studies in eight highly mechanized plants.

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