ROCKETS AND MISSILES

Sun Affects Echo Orbit

➤ THE EFFECT OF a severe solar storm on the orbit of ECHO I, the 100-foot balloon satellite, may have provided an important clue to the influence of solar weather on earth, scientists of the National Aeronautics and Space Administration reported in Washington, D. C.

On Nov. 12, at approximately the time a great solar storm occurred, the atmospheric drag acting on the satellite spurted upward by a factor or two, and stayed at this high value for several days before returning to its previous level.

Response of a satellite to a specific solar flare has been detected only once before, in the case of Sputnik III.

The calculations revealing the effect of the November solar storm on the balloon satellite were made by Dr. Robert Jastrow, chief of the theoretical division of NASA's Space Flight Center, and Robert Bryant, also of the division.

The increase of the drag indicated an increase in the average density of the air through which the satellite moved, Dr. Jastrow explained, and resulted when particles and radiation from the solar flares struck the atmosphere and heated it.

"Scientists have discovered that the whole upper atmosphere rises and falls, or breathes, according to the level of storminess of solar weather," he said. "There is a slight upward expansion of the atmosphere at lower levels during stormy solar weather; but the density of the very thin air at the 900-mile altitude at which ECHO I travels is greatly increased."

"One of the most interesting problems of space science and perhaps the most important is the question of solar activity and the way in which particles and radiation travel through the solar system and affect life on earth," Dr. Jastrow said. "Storms on the sun produce great eruptions, known as flares, that spray X-rays, ultraviolet radiation and charged particles through the solar system. These have a number of serious effects on earth."

The increase in the number of charged particles in the atmosphere weakens and distorts the transmission of radio waves through the ionosphere and generally plays havoc with international radio communications, Dr. Jastrow said.

The solar storm of Nov. 12 was the most severe since the great flare of Feb. 23, 1956. It consisted of giant flares on the surface of the sun and several smaller eruptions, all within a short period.

The role played by solar flares in emptying and filling the Van Allen belts currently constitutes one of the major and most important research goals of the NASA space science program.

Both Sputnik III and ECHO I pass through the outer Van Allen belt, Dr. Jastrow said. Vanguard I does not go through the outer belt and solar flares have not detectably affected the orbit of Vanguard I. Explorer VI and VII measurements have shown that the outer Van Allen belt radiation intensity increases by as much as a thousand-fold after a solar flare.

"This may explain why the solar storms have influenced the drag on Sputnik III and ECHO I, but not on Vanguard I," Dr. Jastrow said.

The Pioneer V space probe, the recent Explorer satellites, and several NASA launchings, including a lunar orbit planned for the near future, are directed wholly or in part to the investigation of solar weather and earth relationships.

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ROCKET SKIRT FASHIONS—designed by ARO, Inc., are being tested in the wind tunnels at the U. S. Air Force Arnold Center.

TECHNOLOGY

Non-Metallic Structure For Largest Transmitter

See Front Cover

➤ LARGE NON-METALLIC structures are being built for the world's most powerful very low frequency, or VLF, radio transmitter. This installation will transmit radio messages to submerged submarines patrolling the North Atlantic and Arctic Oceans.

A non-metallic rotor structure for a variometer for the U. S. Navy's radio transmitter at Cutler, Me., is seen on the cover of this week's SCIENCE NEWS LETTER. E. T. Rogers and Paul A. Doorley, vice presidents of Permali, Inc., Mt. Pleasant, Pa., check a structure built there.

The structures are built from Permali, a laminated fabric made from thin wood veneers, impregnated under vacuum with a synthetic resin and densified by heat and pressure. The mechanical properties of the material can be adjusted to order, and the proper grade for each part chosen to give maximum strength in the direction needed. The structure is assembled with nuts, bolts and dowels made from the same material.

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ROCKETS AND MISSILES

Air Force Engineers Design Rocket Skirts

➤ THE LATEST FASHION for rockets are light, tight, well-fitting "skirts" now being tested for wear and utility at the Arnold Engineering Development Center of the Air Force Research and Development Command, Tullahoma, Tenn.

The skirts are extensions flaring from the rocket bottom or nozzle. Rockets with the proper skirts can be sure of traveling high in the best space circles.

The skirt fashion that has been the favorite with the Center's rocket experts is designed for action. Ideally this is the skirt that will extend just far enough from the rocket nozzle to provide the best thrust at the planned altitude level. For efficiency, it must be light in weight.

Materials favored are glass fiber and titanium, both light in weight and heat resistant.

At Arnold Center, scale models of the skirted rockets can be tested under conditions of thrust in excess of 35,000 pounds, at altitudes above 150,000 feet, and at heat levels ranging from 100 degrees to 6,500 degrees Fahrenheit.

Gen. James Ferguson, vice-commander Air Research and Development Command, who accompanied the press on a tour of the Center, said that tests have shown that the size of the skirt expands with the stage of the rocket.

"The third stage rockets need larger skirts to provide the greater thrust to get them higher in space," he said.

The Center has made more than 1,000 simulated rocket firings for test purposes to date, aimed at getting the best rocket design for the United States.

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