

the size of a dime. Replacing it will correct the problem, but to improve the error-detection and correction capability of the entire system, design changes are now under development. Until they are in place, communications traffic is being re-routed to and from NORAD's main computer. In addition, an independent review team of computer experts is analyzing the June incidents to verify NORAD's diagnosis as accurate and complete.

The affected computer system was only recently installed to replace aging and obsolescent equipment. Though declared operational, the system was still undergoing tests at the time of the malfunction.

Another false alert occurred last November 9. Unlike the current pair, it involved human error when a test tape of a missile attack was inadvertently inserted. □

A blow to acid rain

In a move seen by many as the first concrete governmental step toward dealing with the problem of acid rain, the Environmental Protection Agency last week ordered two controversial Ohio power plants to cut their sulfur dioxide output by 100,000 tons per year. The Eastlake and Avon Lake coal-burning facilities, owned by Cleveland Electric Illuminating Co., have become a symbol in the battle between environmentalists and coal interests over the issue of acid rain.

Sulfur dioxide, as well as other compounds produced by the burning of fossil fuels such as coal, can combine with water vapor and form weakly acidic rains that have been shown to damage lakes and possibly crops (SN: 2/2/80, p. 76; 2/16/80, p. 106). The sulfur and nitrogen oxides produced by the heavy concentration of power plants in the Ohio Valley and blown to the east by prevailing winds have, according to recent studies, caused a steady increase in the acidity of rain falling in the eastern United States (SN: 3/29/80, p. 199). The Eastlake and Avon Lake plants became a test case for controlling sulfur dioxide emissions when President Jimmy Carter announced last June that the pollution limit at the plants would be relaxed because the Ohio coal industry — which produces high-sulfur coal — would suffer if the plants were required to burn out-of-state, low-sulfur coal.

Saying that the new restrictions would result in only "minor labor dislocations" at Avon Lake and "minimal disruptions" at Eastlake, the EPA set the limits at 5.64 pounds of sulfur dioxide per million British Thermal Units (Btus) of heat emitted at Eastlake and 4.10 pounds per million Btus at Avon Lake. Previous limits allowed 6.58 pounds per million Btus, and 6.09 pounds per million Btus, respectively. The new restrictions were arrived at by using a different computer model of the regional sources and movements of pollutants. □

Magsat down; magnetic field declining

Preliminary results from the just-downed Magsat — for Magnetic Field Satellite — confirm a previously detected decrease in the intensity of the earth's magnetic field, NASA scientists said last week. But it is not clear, they cautioned, if the measured decline is a normal fluctuation of the field, or indicates that the field is approaching a periodic reversal.

Magsat was launched into a polar orbit Oct. 30, 1979 (SN: 11/10/79, p. 327) and re-entered earth's atmosphere over the Norwegian Sea at 3:20 p.m. (EDT) June 11, gleaning nearly 2 months' more data than initially expected. Like its predecessors, the three POGO's (for Polar Orbiting Geophysical Observatory, SN: 5/24/75, p. 341), Magsat measured the earth's main magnetic field as well as the fine-scale magnetic anomalies present in the crust. Unlike POGO, Magsat's magnetometers were able to discern the direction as well as the magnitude of the main field and to get a higher resolution view of the crustal anomalies.

Measurements of the main field, when plugged into a computer model, show that the overall intensity of the field is declining at a rate of 26 nanoteslas per year, according to Gilbert Mead, a member of the project team at Goddard Space Flight Center. (A nanotesla is a measurement of magnetic flux density, or magnetic induc-

tion, and is abbreviated nT.) This decrease — a rate of decline of less than 1 percent per decade — is consistent with a trend noted more than 20 years ago, says Mead, although larger than the 10 to 20 nT per year decline between 1940 and 1960.

If the rate of decline were to continue steadily — and Mead stressed that the researchers cannot determine if it will — the field strength would reach zero in 1,200 years. In that event, according to current theory, the magnetic field would be likely to rebuild with a polarity opposite to that of the present, so that compass needles that now point north would point south. From measurements of the magnetic field preserved in ancient lava flows, the earth's field is known to reverse approximately every 500,000 to 1 million years; the last major reversal occurred about 700,000 years ago. Little is known about the effects of field reversals, although some research has linked them to mass extinctions of species due to an influx of ultraviolet or cosmic radiation (SN: 3/27/76, p. 205). Moreover, little is known about what may cause the field — which is created by churning in the earth's molten core — to decline in strength. "All we've been able to do is observe the phenomena," says Mead. "We can't predict if these changes are likely to cause reversals or are the normal fluctuations due to changes in the core." □

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