

The unscheduled return of Cosmos 954

The job of Cosmos 954 — keeping an orbiting radar eye on U.S. ship positions for Soviet military planners — was serious enough, but it was the satellite's unscheduled return to earth that captured the headlines and raised concerns of a wholly different kind. Launched last Sept. 18, the multi-ton probe apparently encountered early difficulties that led ultimately to its reentering the earth's atmosphere on the morning of Jan. 24 for a fiery descent over western Canada. Aboard Cosmos 954 as it fell was its power supply: a nuclear reactor fueled, according to Soviet sources, by about 100 pounds of uranium 235.

Fragments of the satellite apparently struck the earth in several places in Canada's remote Northwest Territories. Members of a wilderness expedition found some "struts" and other pieces of metal in a small crater near the Thelon River, about 110 kilometers southwest of Baker Lake; investigators described the material as "moderately radioactive," but not part of the reactor itself. (The expedition members were examined and reported to have been exposed only to the equivalent of "two chest X-rays.") A U.S. Department of Energy official, however, was reported on Jan. 31 as saying that helicopter-borne searchers had located two other areas where the radiation was higher, possibly representing pieces of the reactor.

Cosmos 954's reactor, according to one U.S. analysis, was estimated to occupy a little less than a cubic meter (although finding even a piece of it might enable a much more accurate calculation). Its 100 pounds of uranium 235 could imply a power output in the range of tens to hundreds of kilowatts. Any recovered scraps of the device would be informative, and U.S. officials early this week were hoping for what could be an intelligence bonanza, revealing details of the state of Soviet reactor design, metallurgy and other technologies including the radar system.

But the growing interest/concern — at least 120 people from the United States had joined Canadian investigators within days of the incident — has another side.

President Carter told a Jan. 30 news conference that he "would favor at this moment an agreement with the Soviets to prohibit earth-orbiting satellites with atomic radiation material in them." The last U.S. nuclear fission reactor acknowledged to have been used for spacecraft power was launched in 1965, carrying 25 pounds of U 235 and designed to burn up and disperse in a high orbit. Since that time, however, a number of earth-orbiting U.S. satellites (as well as deep-space probes) have carried radioisotope thermal generators (RTG's) which work by the passive thermoelectric conversion of heat from their fuel, typically plutonium. The president's FY 1979 budget request for the Department of Energy, issued only a day

before the Cosmos incident, also contains several million dollars to begin development of a 10- to 100-kilowatt nuclear reactor for spacecraft use. (A department official says that, unlike the case of Cosmos 954, which apparently failed to ascend as planned to a higher, longer-lived orbit, any reactor aboard a U.S. spacecraft would not be turned on until it was safely in high orbit. The initial fuel load of U 235 is considered a relatively minor hazard compared with the by-products, such as strontium and cesium, that accumulate during its operation.) Funding has also been requested for improved-efficiency RTG's, using a "dynamic" heat-conversion system rather than direct thermoelectrics.

Another concern is Skylab, the 100-ton U.S. space workshop that has been orbiting the earth since it was launched in 1973. It may reenter the atmosphere in late 1980, by some NASA estimates, but, says one official, the uncertainties are such that it could be as early as October of 1979. Cosmos 954 renews questions of whether pieces of Skylab will reach the ground, and a booster now being developed for NASA to send it higher may be hard-pressed to meet the uncertain deadline. □

An antidote for kepone poisoning

Only two and a half years after severe neurological symptoms were first linked to the pesticide kepone, a treatment has emerged. The resin cholestyramine, a drug used to lower blood cholesterol levels, has been found to hasten the excretion of kepone, dramatically decreasing blood and fat levels and reversing the toxic symptoms. Because cholestyramine is already on the market, it is immediately available to other kepone victims.

Philip Guzelian of Virginia Medical College announces that more than 20 affected persons, half of whom had been so severely impaired that they could not work, now have no more than very mild symptoms. In the Feb. 2 *NEW ENGLAND JOURNAL OF MEDICINE*, he describes a study of twenty-two workers exposed to kepone. As treatment, each person ingested a powdered material four times a day. None of the patients or investigators knew which patients received the cholestyramine and which took an inert placebo. The amount of kepone in the blood of the placebo group fell slowly at the same rate as in the months before the experiment. However, among treated patients the kepone elimination rate increased significantly. Half the kepone was removed every 80, instead of 160, days.

Guzelian believes that kepone binds to cholestyramine and is eliminated from the body, instead of being reabsorbed in the

intestinal tract. A preliminary experiment showed a sixfold increase in kepone in the feces of seven patients given cholestyramine for three days (SN: 11/20/76, p. 324). Researchers are continuing to search for the exact mechanism underlying the drug effect. Recent experiments on rats and humans indicate that the direct intestinal transport of kepone is altered.

Because only about 5 percent of the contaminating kepone circulates in the blood, Guzelian also checked levels in small samples of fat taken with a needle from abdomens of the patients. Fat is generally a major reservoir of pesticides in the body. Guzelian found that decreases in kepone levels in the fat parallel decreases in the blood levels.

Impaired testicular function, another effect of kepone, also appears to be reversed by cholestyramine treatment. Most of the men with high blood levels of kepone produced few or no sperm. In 12 of 13 patients examined, the sperm counts rose as the blood kepone levels fell.

Most important, once kepone is eliminated from the body the tremor, stutter, chaotic eye movements and other neurological symptoms become less severe. The major toxic effects of the pesticide thus seem reversible. After the five-month experiment ended last February, all the participants, the controls as well as the treated patients, were given cholestyramine. Treatment was eventually stopped in half the patients; their blood kepone levels became too low to measure.

"Our study establishes that cholestyramine is a practical treatment for patients exposed to large quantities of kepone," Guzelian says. "It also is important to note that cholestyramine can possibly have the same effect of detoxifying the body of other environmental toxins." Last week Guzelian began tests on a single patient poisoned by chlordane, another pesticide. He expects other researchers to try cholestyramine to treat victims of PBB poisoning in Michigan (SN: 8/13/77, p. 100). □

A measles, mumps link to diabetes?

During the past 100 years, a viral cause for diabetes has tantalizingly surfaced from time to time, as diabetes has followed outbreaks of mumps, infectious hepatitis and infectious mononucleosis, and as Coxsackie viruses and encephalomyocarditis viruses have produced diabetes in mice. Now the case for a viral cause for diabetes — specifically measles and mumps infections — is tightening, according to reports in the Jan. 14 *LANCET* and the Jan. 12 *NATURE*.

Margaret A. Menser and her colleagues at the Children's Medical Research Foundation in New South Wales, Australia, have been following, since 1967, 45 persons born with German measles infections. So