

Sad end to Biosat 3

The flight of Biosatellite 3 had been hailed as a major advance in the study of how man might survive the rigors of long-term space flight. For 30 days a 14-pound pigtail monkey, highly trained, carefully selected, and monitored with the most sophisticated biomedical instrumentation ever carried into space on a living creature, was to orbit the earth, subject to the weightlessness, confinement and radiations of the space environment (SN: 6/14, p. 569).

But last week, disaster hit. The monkey, Bonny, became sluggish, was brought back to earth, and died.

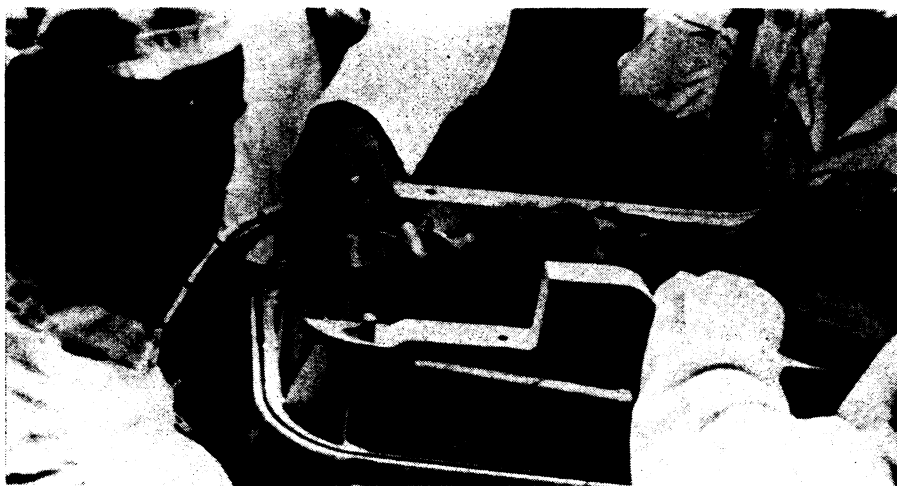
Men and animals have spent thousands of hours in space, but never before had they been instrumented for more than a few obvious conditions (see p. 61). Bonny, however, was equipped with electrodes, catheters and a variety of other devices that would provide scientists on the ground with everything from brain-wave patterns to continual analysis of the content of his urine.

But on the ninth day of the flight, because of concern over the monkey's physical condition, the voyage was ordered ended. Ten hours and twenty minutes after the capsule was fished out of the stormy Pacific Ocean, Bonny died.

The mission started normally enough. The 1,550-pound capsule was placed into a 220-mile circular orbit by a Delta rocket launched from Cape Kennedy on June 28. At first Bonny acted as expected, performing his tasks and consuming his ration of food pellets. There was a time even when it seemed he had found a way to outwit the food dispensing mechanism to get more of the two-gram pellets than he had been allotted.

Then his activity began falling off, and the scientists became worried. Bonny's "daytime" beginning Sunday morning, a 12-hour period, was normal for him. He did not successfully perform his behavioral tasks to receive food but did drink his ration of water. During his free feed period of two hours that afternoon, when pellets are released in addition to those earned for carrying out the tasks, the primate ate all 20 pellets available. His urine output was normal.

Starting that evening, Bonny ceased drinking water at his usual rate. But his physiological data were normal and he appeared to be in good condition. Even though his pulse and respiration were lower than they were before the mission began, the concern was not strong. Metabolic slowdowns are not



NASA/Wide World

Bonny: Death for the monkey at the end of a promising ride in the sky.

uncommon to his species, *Macaca nemestrina*, when placed in isolation or confined to a couch.

During the night, Bonny continued to refuse water and appeared to be in a deeper state of rest than at similar times during the flight. Early Monday morning, scientists attempted to alert him with repeated water-available signals, a signal to which he had usually responded.

They took his lack of response as an indication of dangerous sluggishness, which if allowed to continue might have led to serious physical deterioration.

The mission was ordered ended. The reentering capsule overshot its target, where a special Air Force plane was to try to snare the craft in midair as it descended by parachute. Recovery 25 miles north of Kauai was complicated by rain squalls, but divers eventually lashed the capsule to a helicopter

which took it to Hickam Air Force Base in Honolulu.

Although his temperature was subnormal, Bonny appeared to be in fairly good condition after being removed from the capsule. He was given intravenous fluids and put in intensive care, where he died at 5:56 a.m. (EDT) Tuesday.

Space agency doctors were unable to guess what could have happened to their pet monkey. "Why he passed away so suddenly is a complete mystery to me," said Dr. W. Ross Adey, Biosat chief investigator. An extension of Bonny's normal 24-hour cycle to 26 hours during the flight was one unusual condition noted. An interior cabin temperature of 70 degrees F.—at the lower acceptable limit—was considered a possible factor in the lowered metabolic rate. Complete analyses will take many weeks.

X-RADIATION

Standards for TV sets

Ever since a child first sat down in front of a TV set, the cry from parents has been, "Don't sit so close." That cry has now been picked up by the U.S. Public Health Service, specifically its Consumer Protection and Environmental Health Service.

However, the agency is not as concerned about eye damage as it is about possible danger from X-rays, especially damage to the genes. The Public Health Service of Suffolk County, N.Y., released a report in April showing that 20 percent of the color sets examined on a random basis were emitting X-radiation in excess of the recommended 0.5 milliroentgen per hour level. Since then, the agency's Environmental Control Administration has urged viewers to stay 6 to 10 feet away from color sets.

A similar survey by the U.S. Public

Health Service in Washington, D.C., in January 1968, found only 5 percent of sets dangerous; the difference is in part attributable to the higher picture-tube voltages sometimes required by outlying suburban sets. But the studies catalyzed the formation of an industry-Government committee to work out a proposed performance standard for X-ray emissions for color TV sets.

Television is only one task of the committee, which was formed last month in accordance with the 1968 Radiation Control Act. Problems looming before it include the development of standards for microwave ovens and medical and dental X-ray equipment as well.

Two weeks ago the committee received a draft of a proposed manufacturer's standard from the ECA's Bureau of Radiological Health, recommending

adoption of a 0.5 milliroentgen an hour standard until 1971, when a stricter standard of 0.1 milliroentgen an hour, measured at a distance of five centimeters, would go into effect. The 0.1 standard would apply "under any conditions of operation." That proposal was found unacceptable and is now back with the bureau for revision. Another meeting is scheduled for mid-August, when the committee will consider the bureau's revised proposal.

One of the grounds for the committee's rejection was that the phrase "under any conditions of operation" was too broad. A set could leave the manufacturer in excellent condition, the committee reasoned, but in the hands of a careless TV repairman, it could wind up emitting X-rays.

In fact, excessive X-ray leakage is often caused by adjustments made by repairmen rather than a manufacturing fault, according to the committee. Excessive X-rays are the product of high voltage (more than 25,000 volts). When repairmen fix sets in outlying areas, they sometimes increase the voltage to improve reception and the result can be excessive X-ray emission. This explains why black and white sets, which operate on 18,000 volts, have no known X-ray problem.

A second objection was to the 0.1 milliroentgen an hour standard. As expressed by several committee members the 0.1 level would have to be reviewed in terms of being "reasonable and technically feasible."

What is reasonable is determined by the potential threat of the X-rays. The type of X-rays produced by color sets is probably too weak to cause immediate damage. The main worry, as stated by Consumers Union, Mount Vernon, N.Y., is that of the cumulative effect; color TV becomes one more source of radiation in a world filling up with radiation emitters. Says the union, "Until a limit of exposure to radiation

from all man-made sources is imposed to safeguard the total population, there remains the chance that at some unknown future time too many people will have become exposed too often to excessive radiation."

The third basis for the committee's rejection is instrumentation. The committee felt that adequate instruments are not on hand to detect radiation levels of 0.1.

The TV manufacturing industry, which has been especially leery about X-ray emissions ever since General Electric encountered such a problem (SN: 7/1/67, p. 11), now claims it can make a radiation-proof color set by 1971. Jack Wayman, staff vice president of the Electronic Industries Association, sees the technical problem as boiling down to three areas in the set:

- Shunt regulator tube, which keeps voltage constant so the picture doesn't jump. This is what caused the trouble in the G.E. sets.
- High voltage rectifier tube, which converts the 25,000-volt AC voltage to DC.
- Picture tube, the least likely source of radiation.

The solution for the shunt regulator, which can leak X-rays, and high voltage rectifier, is to phase them out by replacing them with diodes, a process

already under way. The picture tube can be protected with better shielding.

In addition, other safeguards are printed radiation signs on the back of sets, warning about tampering with the voltage, making the controls inaccessible to the average person and installing a governor in the set, to prevent stepping up the voltage beyond 25,000 volts.

Although the picture tube emits the least radiation, it has prompted one company to put out a device called Ray Alert, which measures the radiation from it. Commenting on the device, Charles C. Johnson Jr., administrator of the Consumer Protection and Environmental Health Service, says, "The Ray Alert is inadequate, partially by reason of smallness of size, for making a complete X-ray safety evaluation of a color receiver. The Ray Alert was designed for measuring X-radiation which may be emanating from the front of the picture tube, but it cannot measure X-rays which may be coming through the sides and rear from such components as high voltage shunt regulator and high voltage rectifier tubes."

There are devices that can measure all these emissions, but they cost as much as \$500 and are used by manufacturers and Federal and state health agencies.

CBW, MOL, CHEYENNE

Defense R&D programs lopped

As sudden and unforeseen as silent war itself, the Senate Armed Services Committee last week struck what may become a mortal blow to the U.S. offensive chemical and biological warfare program. At the same time it slashed deeply into once-sacrosanct defense requests for a broad range of research and development expenditures.

In the largest cutback of research and development spending for defense in recent history, the committee rejected Pentagon budget plans requesting \$16 million for research and development of chemical and biological offensive weapons, and proposed that a total of \$1 billion, or 12 percent, be trimmed from the \$8.3 billion military R&D budget proposal for next year. A large portion of the cut will be absorbed by the decision to scrap the Pentagon's plan for a manned orbital laboratory, a military version of the man-in-space program (SN: 6/21, p. 595). The committee budgetary recommendation also included abandoning the troubled Cheyenne helicopter's R&D program (SN: 5/24, p. 498).

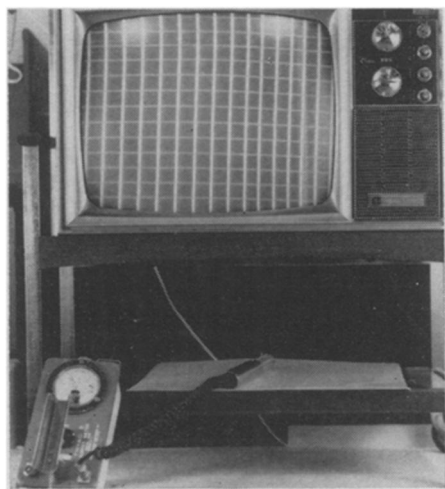
Coinciding with the committee rejection of the entire defense package for R&D in offensive CB weapons were two more events signaling increased

concern with the subject:

- In Key Biscayne, Fla., President Nixon pledged U.S. cooperation in international efforts which sought "reliable arms control" in CBW. Mr. Nixon had earlier ordered a review of CBW policies and a fresh look at the question of U.S. ratification of the 1925 Geneva Protocol, which Rep. Richard D. McCarthy (D-N.Y.) has asked to be re-submitted to the Senate.

- And in New York, the specter of warfare with poison gases and lethal disease organisms drew fire from the United Nations. In a report, "Chemical and Bacteriological (biological) Weapons and the Effects of Their Possible Use," a panel of 14 specialists, representing as many countries, denounced the principle of chemical and biological warfare as inhumane and technically inestimable in its effect. U.N. Secretary General U Thant called on all governments to halt experimentation with and stockpiling of CB agents as a step toward achieving "their effective elimination from the arsenal of weapons."

Conclusions reached by the U.N. special study panel are ominous. Besides expressing horror with the idea that "bacteriological (biological) weapons could deliberately be used to spread



Public Health Service

Testing the shunt regulator tube.