ASTRONAUTICS

Animals Pioneer in Space

Animals are making important contributions to the national effort directed at manned space flight. Mice and monkeys have blazed a trail in space, Lillian Levy reports.

➤ MORE THAN 15,000 ANIMALS a year are aiding space medical research in the United States for manned space flight.

The space research animals include rats, rabbits, cats, chimpanzees, mice and monkeys. Each of these species already has made important contributions toward knowledge necessary to assure man's survival in the hazardous and hostile environs of space.

Special mice and monkeys actually have ventured into space and lived to squeak and chatter about it while U. S. space scientists observed them. A chimpanzee is scheduled to join soon the furry pioneers who have penetrated the space frontier.

Most of the animals that qualify as candidates for space flight are "undergraduates" at two institutions of higher learning: the University of Texas and the University of Kentucky.

In the laboratories of these schools, hundreds of potential animal astronauts are bred; but only a few are chosen for the specialized "graduate" training at Holloman Air Force Base, New Mexico, and the School of Aviation Medicine, Brooks Air Force Base, San Antonio, Texas.

Chimpanzee Astronauts Train

Four chimpanzees, the first space candidates of their kind, now are at training quarters at Holloman's aeromedical bi-astronautics branch. Minnie, Tiger, Elvis and Ham, only youngsters not quite three, are part of the National Aeronautics and Space Administration's Project Mercury; and their program of training is much like that of the seven adult human astronauts for whom they will trailblaze in space.

The chimpanzees' training program, worked out by Lt. Col. Rufus R. Hessberg, chief of Holloman's aeromedical field laboratory, is based on the many resemblances of man and chimpanzee, "metabolically, physically and temperamentally."

The "little men" and their "little woman" companion, all Pan troglodytes, or chimpanzees, are rated "ideal subjects for space" by Col. Hessberg and his co-workers who began working with them early in 1958.

Lt. William Ward, an Air Force biologist, was assigned to the "chimp in space" effort to find out how the primates would react to such space conditions as restraint, isolation, weightlessness, physical and mental response, and—finally—actual flight.

"In our first experiments," Lt. Ward said, "all the chimps were excited and a bit upset by the idea of restraint as well as isolation."

Training reports show that they usually quieted down after the first ten or 15 minutes. However, there was one class failure, Paleface, who was just too excited and unruly.

For the "restraint" tests the simian space cadets are strapped to an especially designed chair of sheet-metal structure, low on the ground, upholstered with insolite, and with a hole in the seat.

The straps are fastened to a snugly fitting nylon vest around the chest and stomach of each animal; and Minnie and her fellow candidates idle in the chair for five to eight hours a day on a five-day week basis. Time off is allowed for any signs of undue stress, and the chimps enjoy periodic vacations from space school.

A reasonable facsimile of an isolation booth is provided by partitions that keep them separated from one another.

Their training also includes management of simple instruments that light a panel in front of each chimp. The animals have learned by means of a "reward" system to push the proper switch to turn the light off. Their "pay-off" is a tidbit of favored food, bananas.

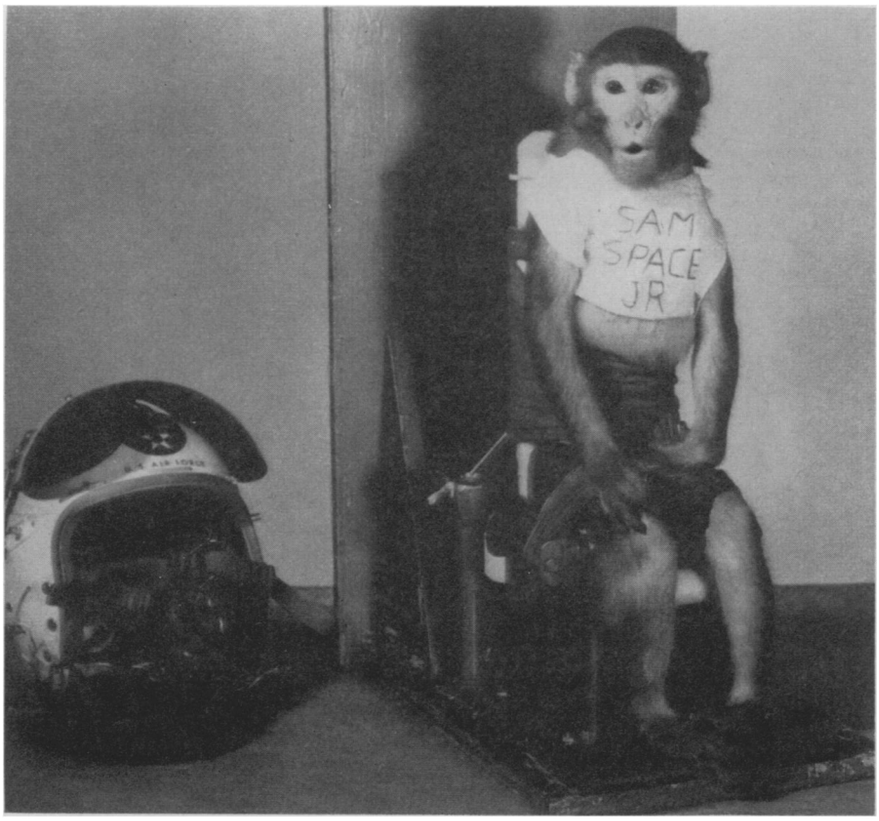
Training animals for space flight is a job only for men who like them. The Air Force laboratory men who work with them on an "intimate daily basis" have become attached to their simian companions. As Lt. Ward explained, "they behave much as children of the same age, even to the frequency of temper tantrums, and we get attached to them."

Besides dressing them in their "space suits," observing their behavior under test conditions, even "soothing them out of temper tantrums," the men working with the chimps frequently fly with their charges in four-hour test runs.

All the chimps are rated champs in the air. They are good fliers with good responses, Lt. Ward said. He predicted they will do equally well in space flight when they will have to go it alone.

A similar but more advanced graduate program in animal space flight and research is being conducted with monkeys, mice, cats, rats and rabbits at the School of Aviation Medicine.

The monkeys used are Texas-born rhesus primates from the University of



SPACE MONKEY—Sam Space, Jr., a Texas-born rhesus monkey, is doing "graduate" work in space research. He is trained to pull a lever in response to a flashing light while within a sealed life capsule. The recorded pulls provide a record of the primate's mental and physical alertness during his stay in the sealed capsule.

Texas. The mice are special Air Force C-57 blacks, raised at the space animal institute at the School of Aviation Medicine. Both white rabbits and gray chinchillas also are bred there, while cats and rats are supplied by specialists in research animal breeding. This varied space menagerie is under the tender loving care of Col. Harry Gorman, veterinary surgeon.

Col. Gorman told SCIENCE SERVICE that the cats, rats and rabbits are making equally important if less spectacular contributions than have the space-flying mice and monkeys to our national space effort.

The rats have been used in experiments designed to show the effects of motion, vibration and other forms of stress on the digestive system. The rabbits are relaying information about the effect of radiation exposure from internal dosimeters attached to their spleen and an area above the kidney. Radiation is one of the major hazards of space travel.

Aeromedical experiments with cats may have saved countless lives from fatal concussion, a hazard of jet aviation as well as space flight, Col. Gorman said.

The biopack on Sally, one of the three black moustronauts that traveled 5,000 miles through space last Oct. 13 in the Air Force Atlas nose cone, was painlessly attached to the skin of the tiny space pioneer who was first anesthetized in a Gorman-designed and built anesthetic chamber for mice. As important as may be the information received from the high-flying mice, Col. Gorman believes monkeys and other primates can contribute more to men in space.

Presently six rhesus monkeys are being prepared for an orbit in a Discoverer satellite scheduled for launch in the very near future.

"All are equal in training and physical qualifications," Col. Gorman said. "And prior to launch, just as in the case of the Mercury astronauts, we will select the one we believe to be best qualified."

The space monkey chosen to go will be confined prior to launch anywhere from 12 to 30 hours, just as the Mercury astronaut will be. If for any reason the missile is not ready to go, the selected candidate, whether monkey or man, will have to yield his place to one of his stand-by companions.

Man's place in space is yet to be be achieved. So far animals have far surpassed man's exploration of the outer atmosphere. The success they have achieved in withstanding short-range flights in space have prompted researchers to long-range studies and preparation for more extended space flights for animal astronauts.

Assess Animal Performance

Dr. C. P. Crocetti, a member of the U. S. Air Force's Air Research and Development Command's behavioral sciences advisory panel, has assembled a group of psychologists who are developing a general research program for assessing animal performance in an orbiting vehicle. The program is aimed at answering these questions:

"Can behavior of the simplest types, even well practiced, be maintained by animals in a space environment?

"Are the major visual and auditory processes affected?

"Are the protective processes of the organism that must be used in dangerous situations still functional under conditions of prolonged space flight?

"What effects do repeated flights have on the animal?"

The advanced training activities required to produce the answers to these and other questions will be concentrated at the new comparative psychology branch at Holloman under the leadership of Dr. Frederick Rohles, an Air Force major.

Prolonged training of chimpanzees as well as other animals will be under his leadership. The work is planned to develop special space-oriented feeding devices and parachute-box cages; new techniques for testing monitoring and response capabilities, and experimental vehicle designs and equipment.

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AEROMEDICINE

Test Against Irradiation

➤ NONE OF THE MATERIALS tested as protective or therapeutic agents against radiation damage can be endorsed without qualification, two scientists from the Argonne National Laboratory, Lemont, Ill., reported in San Antonio, Tex.

The most successful approach to the problem of recovery in irradiated animals has been the use of bone marrow injections, Dr. John F. Thompson and Dr. Harvey M. Patt have found.

However, a serious deterrent to using transplants is secondary radiation sickness arising several weeks after the animals have recovered from the acute phase of radiation damage. This has been demonstrated primarily in studies with small rodents, as well as dogs, chimpanzees and monkeys. Bone-marrow treatment has been most effective in monkeys.

In the limited use of bone-marrow injections in man, in a few cases of attempted treatment of leukemia and for five victims of radiation from a reactor accident in Yugoslavia, there was no "clear-cut evidence of a 'take' of the transplanted marrow" in any case, the Argonne scientists found.

The reactor victims showed a dramatic response to the injections of bone marrow, and their recovery from the effects of mixed neutrons and gamma radiation was apparently accelerated. Possibly the most practical solution for post-irradiation treatment of man would be the use of "autologous" marrow.

For example, if a man were to venture into space knowing he would be exposed to radiation, some of his bone marrow could be removed and stored until after exposure and then reinjected into him. The procedure works well in dogs, the scientists said, and might be of value for man.

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