

## Reviewing space priorities

The first decade of the American space venture saw the fulfillment of an engineering and technological goal: The mandate was to land a man on the moon within nine years. The philosophy was an operational one and the only options were those of ways to accomplish the goal.

The 1970's find the National Aeronautics and Space Administration in a period of transition (SN: 7/25, p. 53). The restraints are no longer technological, and NASA is looking at a new era of space flight objectives which are more experimental and exploratory than goal oriented. In broad outline, the scientific programs are being shaped now in a detailed review NASA has asked of the National Academy of Sciences. The review of the life sciences program is all but complete; it is being followed this week by a review of all the science priorities.

The life sciences at NASA have suffered from fragmentation due to organizational and administrative problems, from limited funds, from basic philosophical differences between applied and research biology, and from the complexities inherent in biological experimentation in space.

"We have asked for the life sciences review because we have not been satisfied with the direction or accomplishments of our bioscience programs," said Dr. Thomas O. Paine, NASA Administrator in one of his last interviews before his announced resignation (see below).

The program seemed sufficient to meet the needs of the 1960's. But before embarking on a new era of space exploration, requiring spacecraft designed for months or years of space travel, the agency faces the need to find out as much about the potential and reliability of man as it knows about its spacecraft systems.

"Our technology has outrun our science," says Dr. Paine. "We have only empirical knowledge; we need to establish firm fundamental scientific research in biology."

How NASA will establish this biomedical foundation may very well depend on the Academy's recommendations. One program, however, is already scheduled—Skylab. That orbiting laboratory will fly a largely biomedical program that has more appeal to flight surgeons than to biologists. Over 50 percent of the experiments that will be performed on or by

the astronauts in Skylab are biomedical. They range from a test to measure the in-flight rate of cardiovascular deconditioning, to daily measurements of weight losses and specimen mass. "This is the first one (program) which will allow us . . . to look in depth at man," says Maj. Gen. J. W. Humphreys Jr., director of manned space flight medicine.

In addition to biomedical studies of man in space, NASA is also looking at biological experiments.

Although there are four such experiments on Skylab—pocket mice, human tissue, vinegar flies and potatoes—and much ground-based research, the new bioscience program has not yet been formalized. The first era of bioscience ended with the death of the monkey Bonnie after its eight-day space voyage (SN: 12/13, p. 560) and the remaining biosatellites were canceled. And no one since, say several NASA officials, has come up with any good biological experiments—except collaring an elk to trace the migratory habits of wild-life or sending up another monkey.

The possibility that NASA will ever

### PAINE RESIGNS

#### Options left to a new man

After serving the space agency for nearly three of its most crucial years, Dr. Thomas O. Paine resigned this week as Administrator of the National Aeronautics and Space Administration. He will leave Sept. 15. His resignation marks the end of a tenure that stretched from the first Apollo flights through the lunar landing and the almost tragic flight of Apollo 13 to the Congressional approval of the budget endorsing the basic post-Apollo program.

Dr. Paine's resignation comes at a time when the nation's space agency is going through a transition from the glamorous, one-track goal of landing on the moon in the 1960's to a multipurpose, less spectacular and more earth-centered role of the 1970's (SN: 7/25, p. 53).

He leaves NASA with the specific programs and dates of the new decade still undecided; and his leaving now will allow the new Nixon appointee—not immediately named—the opportunity to chart the course.

First and foremost among the unfinished projects is the budget for fiscal 1972, now being prepared.

Dr. Paine's resignation coincides with

fly higher animals alone again without man to tend them is slim. The great difficulty of doing animal research in an automated system seems to prohibit that. And the successful adaptation to the space environment of over 25 astronauts for almost 6,000 hours in space supports the theory that no other animal responds to the capsule environment quite the way man does; animals therefore will probably be used in support of man for only very-long-term space flight. Such experiments are planned for the space station.

Most medical and biological specialists agree, however, that more animal research is needed to understand the causes of what is observed in man.

"Through animals we can investigate mechanisms (of biological response) that we cannot reasonably investigate in man today," says Gen. Humphreys.

As for the precise nature of biological and medical research, this too may depend on the recommendations of the Academy. "There is a large number of things that we could do," says Dr. John E. Naugle, associate administrator of Space Science and Applications in charge of bioscience as well as the physical sciences. "But with the scarcity of resources of both money and people, we will have to have a very strong endorsement from a concerned and knowledgeable community before we proceed with any one program." □

the approval by Congress this week of the lowest space budget in years—\$3.26 billion, not quite the \$3.3 billion request of the Nixon budget—and with a reduction in personnel of another 1,000 by Oct. 1.

Dr. Paine sees as his accomplishments not only the establishment of a base for the long haul, but the laying of the foundations for international cooperation in space as well. Several overtures were made by Dr. Paine personally to the European nations, Japan and Canada, in recent months, and the European Space Conference in Brussels is currently making decisions as to the extent of possible European involvement in the space station/shuttle program of the 1970's.

Projects Paine's resignation leaves unsettled, though decisions by September are possible, include the remaining Apollo flights after Apollo 14 (SN: 7/25, p. 53). It is quite possible that although Dr. Paine was a strong Apollo man, the new Administrator will want to identify himself with the Apollo landing era and will commit NASA to the more heavily scientific flights of Apollos 16 through 19. □