Members of the STG do believe in manned space flight, and, from all the indications, the options this group has prepared for the President consist partly of various time tables—and projected space budgets—by which NASA's Integrated Program, or something closely akin to it, can be achieved. According to Paine, the NASA administrator, if new manned flight capabilities are not to be developed fast enough to allow a manned Mars expedition in the early 1980's, the only alternative likely to be considered will be that of proceeding with the same development stretched out over a longer time.

Before considering some of the opinions expressed by scientists and members of Congress about how NASA should proceed, let us examine briefly what NASA's proposed Integrated Program consists of. This program would involve the early development of three important new items of space equipment: (i) a reusable, chemical-fuel space shuttle which, serving as the upper stage of the presently existing Saturn V rocket, would transport people, equipment, and supplies in support of earth orbital missions and then return to earth for a conventional landing; (ii) a space tug (having somewhat the appearance of Apollo's lunar excursion module) which would be the maneuvering unit for earth and lunar orbital missions and for lunar landings; and (iii) a new mission module which would be deployed singly or in combinations of two or more for use as space stations in earth and lunar orbit or as a lunar surface base. A principal assignment of the space stations would be to test man's ability to endure prolonged space flight, though the psychological conditions astronauts would experience when committed irretrievably to a 2-year Mars mission could not be simulated.

According to NASA, basically the same module, space shuttle, and tug would be used and reused in a variety of missions, thus bringing the cost of space operations down drastically. By the late 1970's, a reusable nuclear shuttle, for which the propulsion system is already under development in the Nerva rocket project, would come into use, first in an expanding program of lunar exploration but later for any mission involving heavy payloads and great distances. This and the other new systems of the 1970's would support the ambitious ventures NASA is proposing for the 1980's, of which a manned landing on Mars is only one.

Another is the large space base that would be established in earth orbit for the support of up to 100 persons. This base, an evolutionary offspring of the earlier orbital workshops and space stations, would be made up of a number of modules joined together, each representing separate units of activity. The various activities at the space base would include such things as astronomical observation, research in physics and biology, the surveying of earth resources, and materials research and processing under conditions of zero gravity. The availability of the nuclear shuttle would allow still another big step, the establishing of a large manned station in geosynchronous orbit some 22,000 miles above the earth.

### Leap across the Threshold

But, in the NASA vision, the culminating event of the 1980's would be the landing on Mars, marking man's leap across the threshold into an era of planetary travel and exploration. NASA insists that this leap need not be taken in the dark. Construction of the Mars excursion module, the major piece of equipment peculiar to the mission, would not have to start until some 6 years before the flight. Meanwhile, the results of two automated Mars missions, the Mariner Orbiter of 1971 and the Viking mission of 1973 (in which experiment packages would be dropped to the Martian surface) would be providing information bearing on the question of whether Mars is a safe and worthwhile place to go. "I see no reason to make the commitment [to go to Mars] until after Mariner Orbiter and Viking," Paine said in an interview with *Science*.

The Integrated Program concept, whatever its other merits, is politically shrewd, for some congressional leaders already have made it clear that, however President Nixon may feel, they are not willing for NASA to plunge precipitously into a manned Mars landing program. Even the chairman of the House space committee, Representative George P. Miller of California, recently has said that it is not yet time to set sail for Mars. But Miller then went on to recommend rapid progress toward a set of goals closely resembling those of the Integrated Program.

Newell, NASA's associate administrator, says that among the scientists with whom the agency deals there is a "remarkable unanimity" of opinion in support of its plans—except with respect to the fast pace of development

## NEWS IN BRIEF

• **NIH GRANTS CUT BY 20 PERCENT**: The National Institutes of Health (NIH) has reduced by approximately 20 percent the overall funding level for its continuing research grants due for renewal on 1 September, in response to the Administration's urging that federal agencies cut back their spending levels. NIH officials seemed reluctant to say whether cuts would be made across-the-board or on a selective basis, but it appears that the percentages of the individual cuts may vary. Scientists regard the 20 percent cut as particularly serious since research costs have risen rapidly over the last few years. The reduction, which represents a tentative planning figure, affects both individual competing and noncompeting NIH continuing grants. Last year, NIH held back about 15 percent of its overall support for research, and later restored about 7 or 8 percent of the negotiated reduction. NIH officials say that a restoration of part of the reduced funding may be repeated again this year. NIH's freeze on new grants, effective since July 1969, will persist until the Administration determines HEW's fiscal 1970 spending level.

• **SUBMARINE MISSION COMPLETED**: Six scientists and engineers led by Swiss oceanographer Jacques Piccard have completed the first submerged drift through the Gulf Stream, off the east coast of the United States. After logging 1600 miles in 30 days, the crew of the research submarine *Ben Franklin* reported several surprises, including a scarcity of sea life below the surface. Few schools of large fish were discovered, and, contrary to Piccard's expectation, no deep scattering layers (the shifting layers of plankton and other marine organisms that reflect sonar pulses in most ocean areas) were found. The crew also discovered that the undersea current could propel the *Franklin* at speeds of 3 to 4 knots—twice as fast as had been predicted. Contributing to the research effort, NASA provided a crew member to evaluate the ship's life-support system and cabin design for possible application in the manned-space-station program. NASA and the Navy Oceanographic Office contributed $160,000 to the project, and the Grumman Aircraft Engineering Corporation spent $5.3 million.