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Apollo and Post-Apollo

With the magnificently successful Apollo 11 mission, the U.S. space program reached a crossroads, and the question arose: Where do we go from here? This has formed the agenda of a number of high-level committees. The administration's answers have been outlined by a Space Task Group (STG) headed by Vice President Agnew and presented in a report entitled "The Post-Apollo Space Program: Directions for the Future" (*Science*, 5 and 26 September).

Perhaps by design, the report gives a blurred vision of the future. One is left with the impression that the principal objective of the Space Task Group was to justify a long-term continuation of a manned space program. In this attempt they were not very convincing.

When the Apollo program was initiated, observers at home and abroad believed that the United States had fallen behind the U.S.S.R. in science and technology. The decision to place a man on the moon during this decade was a dramatic challenge. Succeeding steps toward the goal gave boosts to national pride and a sense of dignity to man everywhere. As a means of bringing stature to the nation, the space program has been more effective than much more costly military efforts.

The space agency has repeatedly made claims concerning "spin-off" from the Apollo program. Usually cited are advances in management techniques, development of very precise guidance systems, stimulus to the development of integrated solid-state circuits, and advances in cryogenics. While deprecating the importance of Apollo in stretching technology, one knowledgeable observer commented that this was to have been expected since the manned program necessarily emphasized reliability over innovation.

Because scientific discovery has had a very low priority in the Apollo program, it is not surprising that scientific accomplishments have been relatively meager. The lunar samples are proving very interesting, but they are scarcely worth the \$500 million a pound that some news stories have assigned them.

By reason of the success of the U.S. space program in both manned and unmanned efforts, the opportunities available are different from those of 1961. During this past decade the participation of man was essential. Now, however, earth-orbital travel is routine, and further trips to the moon cannot recapture the glamor of the first.

The manned space program outlined in the STG report does not appear to be a good mechanism for attaining international prestige or for further stretching the technology. Three kinds of ventures are mentioned: trips to the moon, space platforms in earth orbit, and exploration of Mars. The building of space platforms would stimulate development of cheaper and reusable vehicles, but this is essentially repetition. The trip to Mars would require development of complex life-support systems and probably various sources of nuclear power, and is a greater but more costly challenge.

In contrast to the diminished importance of man in space, the significance of unmanned-spacecraft efforts has risen. These vehicles are comparatively versatile and much less expensive. They are increasingly involved in many joint enterprises with other countries (70), in the form of communications satellites, weather satellites, and scientific experiments. New practical applications are appearing, such as a proposed use in air traffic control. The unmanned vehicles devoted to exploration of the distant parts of the solar system will stretch the technology. Finally, the unmanned program has been, and will continue to be, the more productive of scientific accomplishments.—PHILIP H. ABELSON