AERONAUTICS

Blueprint for Space Travel

The blueprint for space travel has been drawn: future satellites may orbit for thousands of years and remote-controlled science stations may explore the planets.

By ANN EWING

➤ THE BLUEPRINT for space travel by man has no timetable. But the first steps have already been taken with the tiny instrumented satellites now circling the earth.

Following further launchings of heavier satellites will come moon shoots. These lunar probes will be aimed both at hitting the moon's surface and circling the moon to take a look at its unseen side.

Next will come circling and hitting the planets, to be followed by exploration of the moon and planets using automatic sensing machines.

By then the problems of returning man safely through the earth's atmosphere will have been solved, and man will land and explore the moon for himself. Still later man will investigate the planets for himself.

These are the bold outlines of two scientific reports recently issued by two groups whose membership includes some of the nation's top scientists. One, President Eisenhower's Science Advisory Committee, is headed by Dr. James R. Killian. The other is the technical panel on the earth satellite program of the U.S. National Committee for the International Geophysical Year, a part of the National Academy of Sciences, with Dr. Richard W. Porter as chairman.

Space Age Infancy

The IGY marked the beginning of man's real exploration of outer space. The Space Age is now less than six months old, but it is a booming baby with a very promising future.

Whereas previously instrumented rockets had spent only a total of a few hours at the fringes of the earth's atmosphere, the several satellites now in orbit have and will spend months and years there. Tomorrow's satellites may orbit thousands of years, perhaps indefinitely.

This program of scientific exploration of outer space is on an international scale. The Russian and U.S. satellites will some day be joined by those made by other nations.

What scientists are learning from these first earth-circling moonlets helps in planning later flights, but quick rocket shoots through the atmosphere and back will still be needed for some time to come. Combined with extremely high-flying and very fast airplanes, sounding rockets will be the main method for solving the problems of returning objects through the atmosphere.

Recovering packages and even animal-containing capsules from rockets, which has been done, is much less of a problem than recovering them from satellites or space ships because of the speeds involved.

To orbit the earth, a satellite must be hurled into space with a velocity of 18,000 miles an hour. Although atmospheric resistance in space is slight, it is sufficient to cause a satellite slowly to spiral toward earth to meet a fiery death when the object comes low enough. Some way must be found either to reduce this speed before the satellite hits the more dense parts of the atmosphere or to insulate the satellite's interior from the searing heat.

Fortunately much that scientists hope to learn by exploring the moon and Mars can be gathered by instruments and radioed back to earth. Therefore, the re-entry problem need not be solved before earth's space neighbors are systematically searched.

Exploration by Remote Control

Mobile vehicles could be designed to land and crawl across the face of distant worlds, measuring, touching, looking, listening and reporting back to earth all the impressions gained. They could be remotely controlled, and thus act as hands, eyes and ears for an earth operator. Such robots could, moreover, be abandoned without a qualm when they broke down or ran out of fuel.

What scientists would like to know about the moon, besides having a look at its unseen far side, is whether or not it has a magnetic field, what its gravity or mass is, and of what its insignificant atmosphere consists. Of these, only the last would probably require landing on the moon.

The requirements for landing an instrument package gently onto the moon's surface are about equal in difficulty to those for placing the same weight of instruments on a collision course with either Mars or Venus. Only one-hundredth of one percent more velocity is needed to reach these planets than is necessary to reach the moon, but guidance and other problems differ.

Possibly the first non-lunar shoot will be to create an artificial "asteroid," a small object that would circle the sun in an orbit as planets do, but much closer than the millions of miles from earth where the natural asteroids are. This would give a precise determination of the astronomical unit, a basic unit of length in astronomy.

Using the improved value for the astronomical unit, the distances between planets in the solar system could be determined more accurately. From this, the planetary masses could be found more precisely, a necessity before space travel comes, even for unmanned vehicles.

Before actually landing on a planet, the behavior of an instrumented "re-entry body" should be observed. From a knowledge of its approach path, and a time history of altitude, deceleration and surface heating, the information necessary to design further vehicles could be determined.

To pave the way for landing on Mars and Venus by manned space ships, instrumented packages should first determine the atmospheric density, composition temperatures and winds near the surface, the kind of terrain and the composition of the crust.

Concerning the large outer planets, there may be no possibility of "landing" on their inner cores, which very possibly are not solid at all but may consist of a liquid center merging with a deep gaseous envelope. However, a vehicle might be designed to enter the planets' atmosphere, then settle to a certain density level where it would float.

For any space exploration, whether moon or planets, the most fascinating question to be answered is, "What forms of life, if any, do they have?"

The interests of human progress and national welfare demand that a long-term program of space exploration be formulated and pursued with the utmost energy. Although there will inevitably be benefits of a very practical nature from the program, the basic goal of this exploration must be the quest of knowledge about our solar system and the universe beyond.

The Goal: Knowledge

As President Eisenhower said when his Science Advisory Committee's space report was made public, all nations "have a great responsibility to promote the peaceful use of space and to utilize the new knowledge obtainable from space science and technology for the benefit of all mankind."

One benefit to be realized in the relatively near future will be using the satellites as world-wide communication links, including intercontinental television.

Another relatively near benefit from satellites is expected in weather forecasting. Even the very simple instruments already built for early launchings will yield information not now available to meteorologists.

One instrument will show the cloud patterns over the earth. This should allow weathermen to spot large storms, including hurricanes, in their early stages, to learn more about the broad patterns of weather flow and to study the effects of mountain barriers and large bodies of water.

Another instrument will measure the total heat and visible radiation balance of the atmosphere. The sun's incoming radiation is largely in the visible part of the spectrum, while that sent into space by earth is mainly in the infrared. These radiations can be measured to determine the earth's heat budget.

Later satellites will look out into space as well as down at earth. Some day telescopes on satellites will give mankind his first clear look at the universe around him.