

SPACE

Space Hops Are Research

The testing of boosters, vehicles and men in space is scientific research essential as preparation for travel to the moon and planets, Tove Neville reports.

► SENDING a U.S. astronaut into space is not just a spectacular stunt for prestige or propaganda purposes, it is research.

It may also be a question of United States survival. A House space committee has warned that control of earth may depend on power in outer space.

Space research consists in testing men and space vehicles until the quality of the vehicle, its systems and man's ability to handle them in space have been proved beyond reasonable doubt.

However, astronauts to follow the first U.S. space man, Cmdr. Alan B. Shepard Jr., are likely to carry out far more complicated tasks than he did.

The next astronaut, expected to take off after June 20, may control his capsule by looking out of a window. Horizon lines located on the window of the Mercury capsule in which the astronaut rides can be lined up with the real horizon the astronaut sees through the window. As he maneuvers the capsule, he can line up the lines on the window with the horizon according to the desired position.

This task will require close coordination of hand and eye by the operator under weightless conditions. Can he do it? Astronaut Shepard did not perform this task on his 15-minute trip. He controlled the capsule solely with instruments.

Maneuvered Capsule

Cmdr. Shepard made his capsule pitch (nose up or down), roll (spin like a top) and yaw (move from side to side) with his instruments. The next astronaut could be given the task to pitch, roll and yaw his capsule many more times than Cmdr. Shepard was instructed to and at different speeds, the National Aeronautics and Space Administration said.

Other important tasks of future astronauts are observations of cloud cover and studies of the horizon itself.

Cloud cover seen from space would be important in weather observations since the types of clouds observed could be correlated with the weather under the clouds.

By studying the horizon the astronaut might be able to determine directly how the atmosphere refracts light and what colors are dominant. Astronaut Shepard already determined that colors can be seen from space.

Cmdr. Shepard worked 127 controls to test his coordination in space while weightless and afterwards on his way back to earth. While performing these tasks, he changed his communications frequency and the environment, such as temperature, in his cabin. He also controlled the retro-rockets as a back-up for the control center and at times

checked with a receiver the systems on board the capsule. Whenever he got a green light from the ground, he also reported back to earth.

The space agency said the maximum information that could be expected was obtained from astronaut Shepard's 302-mile long flight, which was considered near perfect. The information from the first flight may be so complete that the predicted number of four suborbital flights can be cut down before the orbital flight around the earth is attempted.

An unmanned Mercury capsule, which failed to orbit on April 25, will also be given another whirl. At the time of the first shot when the Atlas missile misfired, the safety mechanism worked perfectly and released the capsule that was recovered from the water as it would be after a normal flight.

All suborbital shots are scheduled to be fired with Redstone rockets, as was astronaut Shepard's, whereas the orbital flights of the Mercury capsule will be boosted by the larger Atlas missile. A chimp will take the trip around the earth before man does.

The first manned shot will circle the earth three times and test man and capsule

for about four and a half hours. Previous suborbital flights will have trained the astronaut for survival if any of the systems fail.

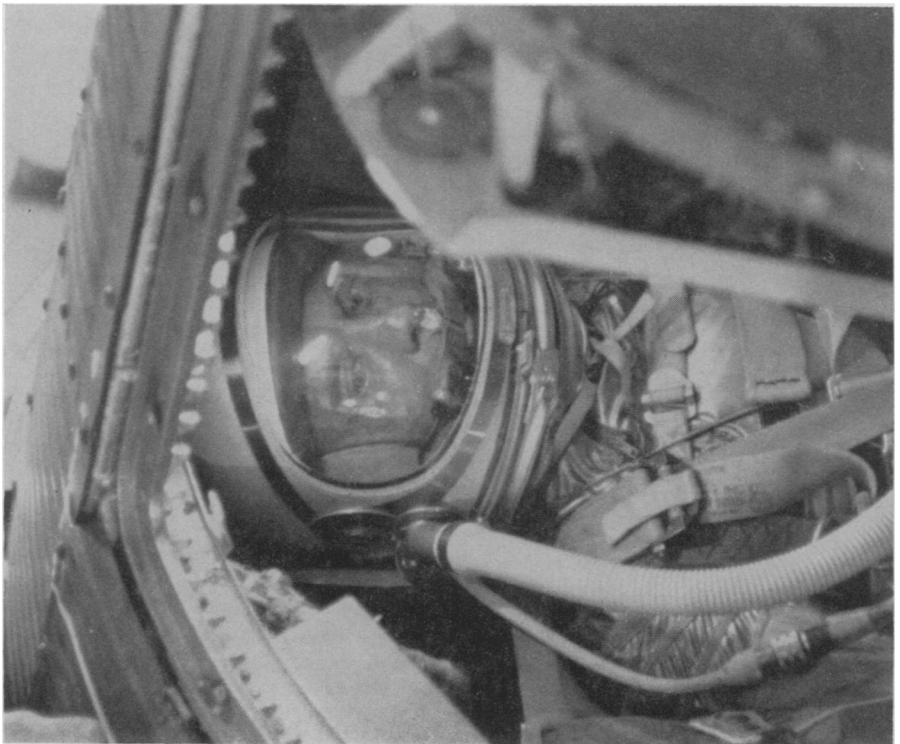
One of the prime purposes of the orbital flight is to study the effects of weightlessness on man during this long period of time. The Mercury capsule will return from the flight in a two-parachute fall similar to those of suborbital flights. The Apollo capsule, scheduled to orbit the earth with three men in 1965, if Congress votes a budget for an accelerated program, will use the same recovery approach.

Testing Mercury and Apollo

It is hoped that Mercury capsules will eventually make trips of up to 18 orbits each during the next two years. Testing of Mercury and Apollo capsules will probably overlap. The Apollo will be carried aloft by the Saturn booster, a six-cluster rocket with a thrust of 1,500,000 pounds, compared to the Atlas with 360,000 pounds of thrust and the Redstone with only 78,000 pounds.

The Apollo-Saturn combination is planned to send men for a week's trip around the moon. This could be achieved under a high-powered program between 1967 and 1969.

An actual moon landing is feasible by 1970, the space agency reported. The F-1 liquid-fuel rocket for the booster is now completed and ready for testing, but design



READY FOR FLIGHT—Astronaut Alan B. Shepard Jr. peers out of the Mercury space capsule that took him 115 miles up for the first U.S. suborbital space flight.

for the rocket and the space vehicle is still in the study stage. The next step: the planets.

Space research is pursued by scientists not for control of earth or space, or even for defense. Man has always been breaking new frontiers, always tried to overcome his environment and conquer the unknown, or pioneered out of curiosity "to see what he could see."

One of the earliest records left today that express man's desire to fly and leave the earth is the story from Greek mythology of Daedalus, an ingenious Athenian artist who made wings with feathers and wax for himself and his son Icarus to escape from Crete where he was held prisoner.

Man has always wanted to fly and often in tale and poetry envied the flight of the bird that has become symbolic for freedom. Many attempts at flying were made in man's early history, and in the 15th century Leonardo da Vinci, the Renaissance genius, even designed flying models and invented the propeller.

The first man-carrying free balloon ascen-

sion took place in 1783. This was followed by the first successful parachute jump in 1797. In 1810 came the first successful man-carrying glider. Steam-powered experimental planes and airships with internal combustion engine power, glider flights and analysis of the principles of flight were made during the rest of the 19th century.

Between 1898 and 1910 Alberto Santos Dumont built successful airships and airplanes which he flew himself. On Dec. 17, 1903, the famous flight was made by the Wright brothers, Wilbur and Orville, in their internal combustion engine biplane. This flight is generally accepted as the first successful flight of a powered aircraft.

Now, less than six decades later, two men within a month of each other have flown into outer space. On April 12, the Russian Yuri Gagarin circled the earth in 89.1 minutes, the USSR reported. On May 5, the first U.S. astronaut flew 115 miles into space on a down-range trip from Cape Canaveral to a spot near the Great Bahama Island.

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Russians' Space Schedule

► **RUSSIA'S SPACE SCHEDULE** in 1961 calls for at least two more manned space flights—one to circle the earth, the other, perhaps, to the moon.

In 1962, the Soviets are planning to set up on the moon one or two automatic stations that will send back information on temperature, landing and other conditions. If both the manned observation flight and the instrumented station landings are successful, the USSR will then try to place a man on the moon.

The predictions come from Dr. Grigori Aleksandrovich Tokaty, former chief scientist and deputy head of the USSR Long Range Rocket Group, who was responsible for much of the early Soviet rocket development before leaving the USSR in 1949 for ideological reasons.

Dr. Tokaty has been in this country for the past month as visiting lecturer in engineering at the University of California, Los Angeles, and consultant on American space problems. He is now a British citizen and heads the department of aero space engineering at Northampton College of Advanced Technology, London.

The current space race between the Soviet Union and the United States is only a warm-up for the real competition, which will start in five to seven years when both countries will try to place permanent space stations in orbit, Dr. Tokaty predicts.

Soviet engineers and scientists have been working intensively on this project for the last few years. Their plans, Dr. Tokaty reports, call for the orbiting of a 10- to 12-ton instrumented satellite, which will be joined by a second, manned vehicle. Rockets will send up additional instruments and materials, allowing the 10- to 15-man crew to construct an elaborate and practically permanent space station.

Dr. Tokaty attributes the success of the Soviets' space effort to complete centralization of all programs under one ministry, thorough theoretical proof for all projects before any experiments are started, and Russia's traditional excellence in mathematics and long history of rocket studies.

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USSR Sent Cloud Pictures From U. S. Tiros Satellite

► **CLOUD PICTURES** over the Soviet Union taken by the United States weather satellite Tiros have been sent to the Russians by the National Aeronautics and Space Administration. A polite note of thanks was received in return.

Future U. S. space efforts will include an ionosphere satellite launched jointly with the United Kingdom and an extensive program of scientific sounding rockets with more than a dozen Western allies.

The sounding rockets explore an area from 20 to 100 miles above the earth. NASA scientists have found for the first time evidence that heavy nuclei occur in the nitrogen region high in the earth's atmosphere. These heavy nuclei are believed to be released by the sun.

Another recent probe showed a distribution of energy in the Van Allen belts different than had been expected. The significance of this discovery is tied to the origin of the Van Allen belts.

NASA scientists at Greenbelt, Md., hope to extend the sounding rocket program to a global scale. But officials would not say whether they expect USSR participation in this program in the near future.

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