SPACE

Gemini 5 Set for Launch

One experiment to be carried out by the upcoming Gemini 5 flight will be the launch of a tiny satellite from the Gemini craft itself—By Jonathan Eberhart

➤ THE UPCOMING eight-day flight of Gemini 5 (GT-5) stands out as the closest any country has come to developing a manned space station.

The most publicized of GT-5's experiments, the launch and reapproach of a tiny satellite called REP (rendezvous evaluation pod), marks the first trial of docking maneuvers that will someday be vital for launching space flights from orbit. Though intended now only as early practice for the 1969 Apollo moon landing, docking will almost certainly be used again in programs much more advanced than MOL (manned orbiting laboratory).

One possibility is the National Multipurpose Space Station (NMSS), originally discussed for 1975 but probably delayed beyond that date by the budget drain of Apollo. Orbital docking of modified-Apollo-type spacecraft will become almost commonplace if NMSS ever gets off the ground, since its one-to-five-year lifetime will call for frequent resupply and crew rotation.

An orbiting laboratory would provide an ideal platform for observation and photography of earth and the surrounding space, and GT-5 Astronauts L. Gordon Cooper and Charles Conrad Jr. will be doing plenty of both.

Besides photographing the earth, the stars, the spacecraft and each other, the astronauts will try to measure just how good a watchtower an orbiting vehicle really is by peering "downward" at huge "eye charts" laid out on the ground in Texas and Australia.

The Australian chart, located on the west coast at Carnarvon (also part of the Deep Space Network that tracks all the Geminis during their flights), will consist of huge squares made out of sea shells. The squares will vary in size so that the smallest visible group of shells will indicate the quality of the "seeing."

The Texas version, at Laredo, will appear similar to the observers aboard Gemini, but will be made of gypsum.

Communications satellites such as Syncom and Early Bird may someday be replaced by huge orbiting communications centers, some scientists believe, capable of establishing links between land bases, ships at sea, airplanes, and even submarines.

The GT-5 crew will try its hand at this, too. Off the coast of California, many fathoms below the surface of the Pacific, Astronaut Scott Carpenter will be waiting in a diving bell for Gemini to pass overhead. At some point during its flight, GT-5 will attempt to carry on a two-way conversation between orbit and ocean.

Future space stations such as MOL may also benefit from GT-5's experience with power sources. Many of the experiments aboard GT-5 will be run by a chemical fuel cell that converts oxygen and hydrogen directly into electricity. However, problems still remain; as a matter of fact, the fuel cell is the main item that may delay preparations for the launch, now scheduled for August 19.

The GT-5 astronauts will spend more time in orbit than have any astronauts (or cosmonauts) so far. The effects of zero-gravity, cosmic rays, dehydration and a host of other influences will be monitored continually throughout the flight. However, data from this flight will by no means be the last word. The Air Force's MOL is planned for the very purpose of collecting more information of the same sort.

Gemini 5 is a spacecraft, but it will be performing as a space station. The U.S. post-Apollo space plans call for an increasingly thin line between vehicle and laboratory, with space stations being made out of modified spacecraft and spacecraft being assembled in orbit.

Not until GT-7, early next year, will there be a longer-duration American space flight. GT-7 is scheduled for as long as two full weeks.

• Science News Letter, 88:102 August 14, 1965

Lockheed Electronics

RADAR 'STRETCHER'—Leo Slobodin (left) and Abraham Reich, engineers at Lockheed Electronics research laboratory, Plainfield, N. J., examine the optical correlator they invented. The device increases radar performance by "stretching" short bursts of radar energy into long pulses.

MINERALOGY

Moon Miners to Find Many New Obstacles

See Front Cover

➤ MAN is still several years from his first venture to the moon, but he is now trying to find ways to tap lunar mineral resources.

Scientists at the Bureau of Mines research center in Minneapolis, Minn., are developing moon mining techniques. Since conventional mining will be impossible on the moon, they have discarded mining methods used on earth.

The men who will do the mining are also an important part of the mining itself. John B. Slight is shown on this week's front cover climbing out of a crater at the Lunar Topographical Simulation Area, Houston, Texas. The six degree of freedom simulator in which he is strapped produces the effect of lunar or one-sixth earth gravity on his body.

A test engineer with the National Aeronautics and Space Administration's Manned Spacecraft Center's Crew Systems, Mr. Slight is wearing an Apollo pressure suit and he carries a Jacob's staff to aid in walking.

Since lunar gravity is only one-sixth that of earth, blasting would be unpredictable on the moon. Too big an explosion could send whole boulders into orbit. Compressed-air equipment, standard for earth drilling, would be useless on the moon because there is no air.

Scientists are also quite apprehensive about the dust believed to cover the lunar surface.

The dust's adhesive properties could well cause it to stick to shovels, conveyor belts or any other conventional mining equipment.

Since there are so many unknowns concerning the moon's makeup, the scientists are first studying the basic nature of rock.

They will attempt to find out how the binding forces of component particles of rock-forming materials can change, break down and fail under stress.

Initial research tasks will include adding probable rock types to those already being tested. They will also investigate the use of explosive, thermal, electrical, chemical and mechanical energy for breaking rock.

The research, being done under a National Aeronautics and Space Administration contract, does not aim at supplementing the earth's supply of minerals, but rather helping man to use the moon's resources to survive once he gets there.

For fuel, lunar explorers might use acetylene, trapped in rocks from ancient volcanoes. Explorers might be able to build shelters with sulfur or stone from moon mines.

The rocks themselves might be forced to yield water by processes that break the chemical bond with which certain crystals hold water molecules.

In addition to being used for drinking, water could also, theoretically, be broken down into oxygen for breathing and hydrogen for fuel.

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