

SPACE

Diurnal Cycles Studied

The Gemini 5 astronauts did not go to sleep according to program, thus raising speculation about disruption of diurnal activity and its effect on man in space.

► THE EIGHT-DAY FLIGHT of Gemini 5 has increased speculation about man's ability to adjust to 16 days and nights every 24 hours.

Lt. Col. Edward C. Knoblock of the Walter Reed Army Institute of Research in Washington, D.C., made the comment in a summation of biological evidence from American space flights. He was interviewed by SCIENCE SERVICE at the American Association of Clinical Chemists Convention in Chicago.

Astronauts L. Gordon Cooper and Charles Conrad did not go to sleep according to program, said Col. Knoblock, who also acts as consultant to the National Aeronautics and Space Administration's space medicine team. He thinks disruption of diurnal activity, the normal three-stage cycle of activity, relaxation and sleep, may be a problem in space. Seasons are known to influence the diurnal cycle.

Plants are known to react to light and dark, and a biosatellite program is scheduled to study their sensitivity. Col. Knoblock could not predict whether this would have any significance for man but he suggested that man's "biological clock" may be affected by light-dark changes.

Anyone who moves from one time zone

to another is aware of the adjustment to a new cycle. The kinds of cycles astronauts will establish is an interesting subject for speculation, said the colonel.

Many previous speculations did not turn out to be real problems on Gemini 5, said Col. Knoblock. Gross physiological changes such as hypotension from weightlessness did not develop. Col. Cooper had experienced hypotension (dizziness from low blood pressure) on his first flight (aboard Faith 7 in May 1963, the fourth orbital flight in the Mercury program), but it was eliminated this time, partly by increased water intake.

Physiological data from the flight will not be released for another three weeks, but Col. Knoblock noted that blood circulation does not seem to have been a problem. There was some change in the heart rate but no blackouts. If blood pressure had been very low, blackout would have occurred upon reentry with the shock of gravity.

Another difficulty ruled out by Gemini 5 involved the pure oxygen content of the capsule. There was some fear that movement might ignite the oxygen.

Further, there was a possibility that capsule tumbling would provoke nausea. Reports from Russia indicated that at least

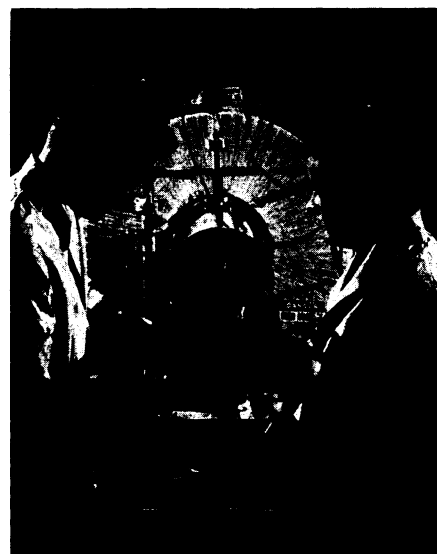
one of their cosmonauts had this problem. Gemini 5 tumbled but evidently not enough to nauseate the men, the colonel said.

Col. Knoblock, who helped set up the evaluation program for project Mercury, noted that the most important thing shown in flights to date is that "man can continue in space without paying a high biological price for it."

The effects of weightlessness, if any, on bone and calcium have not yet been measured. In-flight test equipment has only recently been developed and will first be used on the next flight, Gemini 6, with Astronauts Walter Schirra and Thomas Stafford aboard.

However, the scientist does not think a man is going to spend "two or three weeks in space and come back with limber bones." He doubted that a calcium deficiency, if it developed, would have permanent effect on the body.

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Sperry Rand

FUSION PLASMA SIMULATOR—A Thermally Operated Plasma System (TOPSY) is employed at the Sperry Rand Research Center, Sudbury, Mass., to simulate in small scale the hot, dense and large plasma, or ionized gas, necessary for the generation of a thermonuclear fusion reaction.

CONSERVATION

Reservoir Threatens Ice Age Flowers

► ICE AGE FLOWERS growing in Northern England are threatened by proposed construction of a reservoir.

The Tees Valley and Cleveland Water Board plans to build the reservoir in Upper Teesdale. Directly affected would be a square mile of country well known to naturalists since the 18th century.

Some 30 rare plants including the bog sandwort and the shrubby cinquefoil are in danger of being cut back or destroyed if the reservoir project succeeds.

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SPACE

Cold Welding Helpful?

► COLD WELDING, a process in which two pieces of metal fasten themselves together without any human interference in the cold vacuum of outer space, can be either a dangerous hazard or a time-weight-and-money-saver for space missions of the future.

Cold welding has already been responsible for several malfunctions aboard various orbiting satellites, the National Aeronautics and Space Administration, which has been studying the problem since 1961, believes.

The National Research Corporation, Newton, Mass., which has been investigating the phenomenon under various NASA contracts for the past four years, says that "as far as we know, there are no metals that will not cold weld." One of their recent studies, including such metals as copper, aluminum, steel and tungsten carbide, produced welded joints with shear strengths up to 10,000 pounds per square inch. Even a much weaker bond aboard a spacecraft or satellite could cause vital mechanisms or electrical contacts to stick shut.

To prevent cold welding, several paste or spray compounds such as molybdenum disulfide were applied to metal surfaces and baked on. Testing in high altitude simula-

tion chambers appears to indicate success, although the compounds have not been tried out in space.

Cold welding could be advantageous, however. Since the process often takes only seconds and requires no special equipment at all, it could become an invaluable technique in the construction of space facilities on the moon, in orbit around the earth, or anywhere outside of planetary atmospheres.

Only a few years ago, when cold welding was scarcely known, it used to play havoc with high altitude testing chambers, "freezing" components such as threaded bolts and leaving scientists baffled about the cause. Now such parts are simply built where they are not exposed to the chambers' vacuums.

It has been difficult to blame satellite failures on cold welding, simply because the satellites could not be reclaimed for investigation. One example (though NASA declines to say which one) concerned a satellite which was supposed to eject a capsule, presumably containing films or data records, but failed to do so. When the experiment was simulated in a test chamber, the same failure occurred, and was traced to cold welding.

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