

space sciences

Electronic control system tested on F-8

The first flight of an aircraft completely dependent upon an electronic system with no mechanical backup system took place May 25 at NASA's Flight Research Center at Edwards, Calif. The system is called digital-fly-by-wire and is adapted from the electronic system developed for the Apollo lunar module.

In current aircraft, a plane is controlled mechanically. When a pilot wants to open the flaps, for example, he turns a handle or a switch that activates a hydraulic line or a cable device which then opens the flaps. In the new system, the flaps are opened electronically. The key elements are a digital computer that controls the flying characteristics of the airplane and an Inertial Measurement Unit (IMU). The IMU is a sensing device that maintains an inertially referenced coordinate system for attitude control and accurate measurement of velocity changes. The IMU tells the computer how the craft is responding to the pilot's inputs. This information the computer compares with a stored program that tells the computer how the craft ought to respond. The computer digests the information from both sources and then electronically sends adjusted commands to the flight control surfaces. The net effect is to smooth out the ride. It takes out the external effects, for example, of wind buffeting. Calvin R. Jarvis is project manager at the center.

Nuclear system for conversion of wastes

A system that collects and recycles urine, washwater, spacecraft condensate, feces, cabin trash and food particles along with containers, plastic, clothing items and other nonmetallic scraps is now being tested at General Electric's Missiles and Space Division at King of Prussia, Pa. The system is fueled by plutonium 238 and was developed by the Atomic Energy Commission in cooperation with NASA and the Air Force.

The wastes are recycled into potable water and ash. At least 98 percent of all liquid waste processed is recoverable as sterile water. All moisture is removed from the solid wastes, which are then incinerated into ash having a volume about 100 times less than the original product. The system is being tested for long-duration space flight. Manned tests of the system will be held later. Commercial use of a similar system is currently being investigated, says Charles A. Berry of NASA.

NASA requests proposals for UV telescope

A small astronomy satellite called International Ultraviolet Explorer (IUE) is scheduled to fly in 1976. It will be built and operated jointly by NASA, the Science Research Council of the United Kingdom and the European Space Research Organization.

IUE will carry a 97-kilogram instrument package with a 45-centimeter ultraviolet telescope and spectrograph. Three television cameras are used to observe the star field and record the spectra for transmission to earth. The spectrum ranges are 1,190 to 1,920 angstroms, 1,130 to 2,110 angstroms, 1,830 to 3,080 angstroms and 1,750 to 3,360 angstroms. The resolution is 6 to 7 angstroms.

Proposals are now being accepted by Leon Dondey of NASA headquarters. The scientists chosen will form a user group of guest observers to help NASA, SRC and ESRO plan and conduct the program.

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What makes a river wander

Many explanations for the diverse types of paths rivers may follow have been advanced, none of which fit all observed patterns. Nor has anyone been able, in laboratory experiments, to make a channel follow the zig-zag meandering path often seen in nature.

S. A. Schumm and H. R. Khan of Colorado State University have found that the channel pattern depends on the slope of the channel bed and the amount of sediment. When certain thresholds in these variables are exceeded significant changes in the shape of the channel result. The engineers pumped water into the upper end of a channel dug down the center of a 100-foot flume filled with sand. At low slope and sediment loads, they report in the June *GEOLOGICAL SOCIETY OF AMERICA BULLETIN*, the channel remained straight. When the channel was graded so that elevation changed 0.002 foot for each foot of length, the deepest part of the artificial river zig-zagged, but the river as a whole remained straight. At a still steeper slope, the bottom of the channel assumed a braided appearance. The "river" meandered when suspended sediment was added.

Periodic sea-floor spreading

Movement of the earth's crustal plates is generally considered to be related to convection in the earth's mantle, though the details of the process have not been worked out. One type of convection that may occur in the mantle is Benard convection, in which material heated from below rises in the center of hexagonal cells and sinks at their edges.

According to Alan Rice of Columbia University, experiments show that the rate of Benard convection varies periodically. The reason for the periodicity, he suggests in the May 10 *JOURNAL OF GEOPHYSICAL RESEARCH*, is viscous dissipation, a factor usually ignored in theoretical models of convection.

Rice concludes that there may therefore be periodicity in sea-floor spreading rates. Spreading would proceed at a constant rate for a time and then increase abruptly. He calculates possible periods, depending on the depth of the convecting layer, temperature gradients and viscosity of mantle material.

Measurements in the quiet zone

Just off the eastern coast of the United States is a zone some 250 kilometers wide and 1,500 kilometers long where the magnetic anomalies usually associated with sea-floor spreading are absent.

Two oceanographers, P. T. Taylor of the U.S. Naval Oceanographic Office and David Greenewalt of the Naval Research Laboratory, recently made measurements of the magnetic field at the sea surface and at another level lower down in an area straddling the border of this quiet zone. They report in the May 22 *NATURE PHYSICAL SCIENCE* that within the quiet zone magnetization is uniform and of reversed polarity. A core taken from within the quiet zone suggests that sea-floor spreading occurred 155 million years ago during a period of normal polarity. It is possible, say the researchers, that there may once have been magnetic anomalies in the quiet zone but that the entire area was somehow demagnetized sometime after 155 million years ago, and then became remagnetized during a period of reversed polarity.

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