

EARTH SATELLITES

Navigation network

An electronic constellation of 21 satellites in 8,000-nautical-mile polar orbits to provide worldwide navigation facilities has been proposed to the Department of Defense.

The system could be used by anything from supersonic transports to commercial fishing vessels as well as fit into the air traffic control system. It could also have important military applications.

According to C. S. Constantino of RCA's Astro-Electronics Division, the system is based on a radio ranging concept which allows an aircraft, ship or land-based vehicle to calculate its latitude, longitude and altitude by receiving radio signals from any 4 of the 21 satellites. The user does not have to transmit to the satellite, which would send out continuous signals.

As well as being versatile, the system promises economy: Receivers would cost an estimated \$1,000; seven satellites could be launched at once, and only three United States-based ground stations would be needed for an approximate total cost of \$200 million.

MARTIAN MOON

A dark potato

Mariner 7 photos reveal the Phobos, one of Mars' two moons, is a potato-shaped satellite and the darkest body of any size yet observed in the solar system.

These unique features were reported by Prof. Bradford A. Smith of New Mexico State University in the May 15 SCIENCE.

In the photographs, taken 82,000 miles away from Phobos, the Mars satellite appears longer than it is wide. It measures about 11 miles from pole to pole and 14 miles in diameter at its equator. This shape suggests to Smith that it may have been captured by Mars in its present form rather than formed by a gradual accumulation of debris, which would, he believes, have resulted in a more spherical shape.

Its albedo, or brightness factor, is only 0.065. The albedo of Mercury, previously the darkest solar system body measured, is 0.100. Smith believes this may be due to a relatively dust-free surface under constant bombardment by meteoritic particles.

Deimos, Mars' smaller moon, was not identified in the Mariner photos.

SATURN II

A probable fix

During the launch of Apollo 13, the Saturn II center engine shut off 132 seconds early. It caused the four outer engines to run an extra 34 seconds and the third-stage Saturn IV-B to fire 12 extra seconds. Engineers at Marshall Space Flight Center, Ala., have pinpointed the cause of the center engine shut-down as excessive engine vibrations.

These vibrations, which have occurred on other launches, can accumulate as the engines begin moving up and down in the same pattern.

The Apollo 14 launch vehicle is already in the assembly building at Cape Kennedy, Fla. A correction

could be made in it by the installation of an accumulator in the center engine. This device is a gas-filled cavity placed in the propellant feed lines, to cushion the vibrations in structural and propulsion-system elements.

Several other solutions are being considered and will be submitted to Apollo managers in June.

SOLAR WIND

First look outside the ecliptic

Scientists are getting their first look at measurements of the solar wind outside of the ecliptic through observations of the Comet Bennett.

For some time, astronomers had believed that comets were surrounded by hydrogen clouds, but the hypothesis was verified only recently by a hydrogen-sensing device aboard the National Aeronautics and Space Administration's Orbiting Geophysical Observatory V. The Lyman-Alpha sensor, designed by Prof. Jacques Blamont of the University of Paris, measured the hydrogen cloud around Bennett to be 8 million miles across.

Between April 9 and May 1, as the comet moved from 38 to 50 degrees above the ecliptic, 25 more mappings were made of the cloud. During that time, substantial changes occurred in its shape which could be due to the effects of the solar wind, says Dr. Albert Opp of NASA.

SPACE APPLICATIONS

Geological photomaps

A huge photomap covering more than 140,000 square miles from the Pacific Coast south of San Diego to Shreveport, La., has been compiled by the U.S. Geological Survey from the unmanned 1968 Apollo 6 spacecraft photographs.

The map shows shorelines, drainage features, major roads, cultivated land, urban areas, airfields and other details. It provides a "vast synoptic regional setting rarely achieved with conventional aerial photos," says William A. Fischer, program manager of the Interior Department's Earth Resources Observation Satellite program.

SPACE SHUTTLE

Design contract awards

The National Aeronautics and Space Administration last week selected McDonnell Douglas Corp., St. Louis, and North American Rockwell Corp., Downey, Calif., to submit preliminary design studies for a reusable space shuttle.

The shuttle, envisioned as a two-stage vehicle of booster and orbiter, will be an integral part of an earth orbiting station (SN: 1/3, p. 21). It would be designed to take off vertically and land horizontally more than 100 times. It will be used to transport crews and cargo from earth to near space and back, or for short duration space flights. It could also have space rescue capabilities.

The awarding of the parallel 11-month contracts of \$8 million each is aimed at operation of the space shuttle by 1977.