

# aerospace

## CARTOGRAPHY

### U.S.-Mexican border mapped from space

Color photos taken from space by astronauts during the Gemini 4 and 5 missions, and automatically during the unmanned second flight of the Saturn 5 rocket, have been used to prepare a detailed geologic map of about 830 miles of the U.S.-Mexican border.

The map, including parts of Arizona, New Mexico and Texas, was refined from a more general photomap running from Abilene, Tex., to San Diego, Calif. The photos, taken from altitudes between 115 and 200 miles, have been correlated with data from ground explorations, as well as with sample profiles of surface deposits.

Features such as sand dunes, bedrock, flood plains and the sites of ancient marine beaches can be located in the photos, says project chief Roger Morrison of the U.S. Geological Survey. "Subtle color distinctions in the red to brown part of the spectrum are well displayed," he says, "and make it possible to recognize distinctions in surface soils."

Topography, climate, drainage, vegetation and other surface characteristics can be deduced from the map. "However," Morrison points out, "there are important features that cannot be determined directly from the photographs." These include the presence or absence of significant calcium carbonate accumulations, the color and thickness of subsurface layers, and the amount of very fine clay in the deposits.

## AERONAUTICAL RESEARCH

### X-15 grounded after 9.5 years

After almost a year on its deathbed (SN: 2/24/68, p. 188), the X-15 rocketplane has finally died.

Since the first X-15 flight on June 8, 1959, the almost wingless craft reached heights of more than 67 miles and a top speed of 4,520 miles per hour, 6.7 times the speed of sound. Together, the three X-15's (one of which was destroyed in a 1967 crash) have made 199 flights, logging slightly more than 30 hours of time in the air.

The National Aeronautics and Space Administration, which took over the plane's operation from the Defense Department in January 1968, was forced to decide in the same month to begin phasing it out of operation, due to budget problems. The final flight came on Oct. 24; what would have been the 200th mission, planned for five days before Christmas, was canceled, because of bad weather, and never rescheduled.

## DATA PROCESSING

### Coding doubles spacecraft data rate

A way of doubling the amount of data sent back from a spacecraft with no increase in power requirements is in practical operation for the first time aboard the Pioneer 9 sun-orbiting satellite launched Nov. 8.

Doubling the data rate at the same power level cuts the effective signal strength in half, which can raise the error rate to eight percent due to radio noise. The new system, developed by Dr. Dale Lumb of the National Aeronautics and Space Administration's Ames Research Center in Mountain View, Calif., simply adds a code

number for each data number transmitted. This cuts the signal strength almost in half again, but the resulting signal can be decoded so clearly that the error rate drops to less than one part per 100,000.

## COMMUNICATIONS

### Direct TV satellites studied

The possibility of launching controversial direct television broadcast satellites within as little as three years is being studied for NASA by General Dynamics Corp.'s Convair division.

Direct TV satellites could send programs to home receivers without the need for ground stations. Because they thus eliminate local controls, they have a potential as propaganda tools, a possibility that has caused some debate.

The study covers both manned and unmanned satellites, and goes into such detail as the costs of using black and white versus color programming.

## SPACE MEDICINE

### Bone minerals measured in-flight

A technique for measuring the bone mineral content of astronauts during space flights has been developed by scientists at the University of Wisconsin in Madison.

Lack of stress due to long periods of weightlessness has apparently caused pronounced calcium losses in the bones of astronauts. The space agency's only measurement techniques, however, have been the comparison of X-rays and urine samples taken before and after the flights.

The new technique, developed under the direction of medical physicist Dr. John R. Cameron, is called photon absorptiometry, and reportedly can measure bone mineral content to within two percent. A compact, portable device sends an X-ray beam of a single energy level through the bone to be measured, and a scintillation counter on the other side measures the radiation left after some has been absorbed by the bone.

Reportedly safer than conventional X-rays because it exposes tissues to less total radiation, the technique has already been used in growth studies of school children, and in anthropological measurements of the skeletons of Eskimos. It is now being considered by the space agency for manned flights lasting a month or more.

## COMMERCIAL AVIATION

### Jumbo jet goes quick-change

The Boeing 747 jumbo jet, which was not even scheduled to make its first flight until mid-January, has already been ordered by one airline in a quick-change version that can be rapidly converted from a passenger carrier to a cargo plane.

World Airways has ordered three of the convertible aircraft, which could carry either more than 400 passengers or 260,000 pounds of freight. Since the quick-change system was introduced on the 727 jet in late 1967 almost a fourth of Boeing's commercial aircraft sales have incorporated it.