Bell Laboratories **RECORD**

Volume 39 • Number 6 • June 1961

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Cover

R. J. Brennan of the New Jersey Bell Telephone Company uses caulking gun to inject epoxy resin into the end of a multiple cable joint (see page 205).

When the first American orbits the earth, his capsule will be tracked from a 59,800 route-mile communications network recently completed by Western Electric for NASA.

MERCURY COMMUNICATIONS NETWORK COMPLETED

One of the most extensive communications projects ever undertaken—the globe-encircling ground tracking and ground instrumentation system for the National Aeronautics and Space Administration's manned space flight program—has been completed by Western Electric, the Bell System's manufacturing and supply unit. The 59,800 route-mile network was engineered and built for NASA which plans to orbit a manned spacecraft later this year.

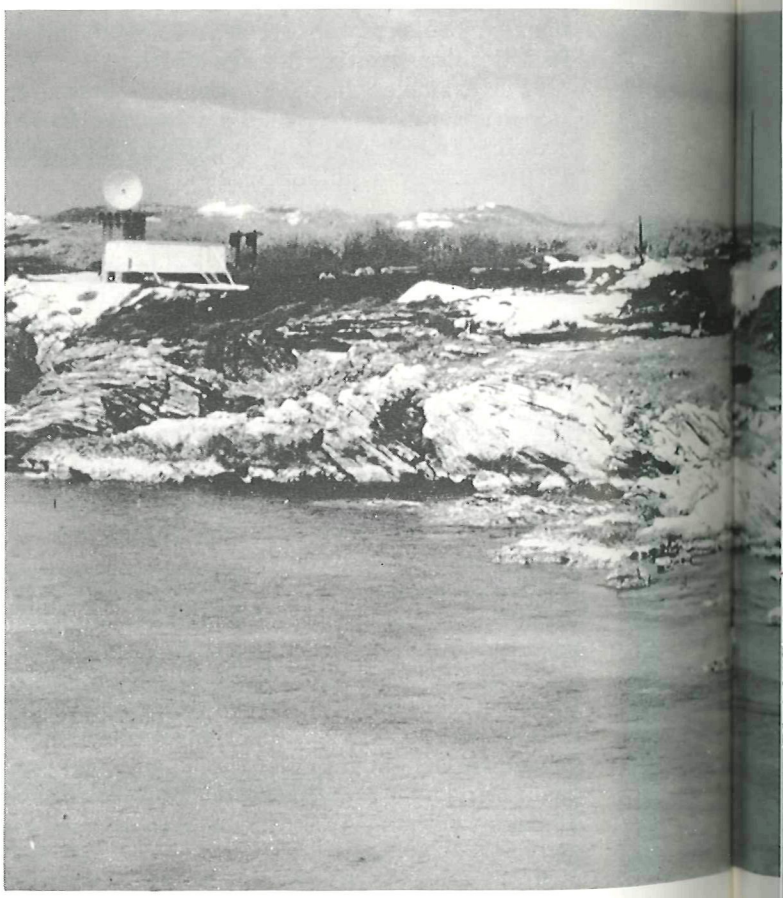
The vast system for Project Mercury—code name for the NASA project—uses virtually all types of modern communications technology to track and monitor the capsule's flight, obtain data on the vehicle's performance in space, transmit command signals to the 120-mile high capsule, and talk to the astronaut by radio during portions of his 17,000 mile-an-hour journey.

News of Space Research

Leased land lines and overseas radio and cable facilities from as many as 20 private and public communications services throughout the world are integral parts of Mercury's ground communications network, comprising more than 140,000 circuit miles of communications channels. Seven national governments are cooperating in the worldwide network, which spans the continents of North America, Africa and Australia and the Atlantic, Pacific and Indian oceans. Eighteen ground station sites—one of them the Mercury Control Center at Cape Canaveral—are linked into a single operating network through the Goddard Space Flight Center near Washington, D.C.

The responsibility for design, engineering and construction of this tracking and ground instrumentation system has been Western Electric's as leader of an industrial team brought together especially for the purpose. Other members of the group are Bell Telephone Laboratories, Bendix Corporation, International Business Machines Corporation, and Burns & Roe, Incorporated. Men from almost all of the associated Bell telephone companies were recruited by Western Electric to work on the project. As many as 630 first-line subcontractors also participated in developing the fully integrated system.

Among the highlights of Mercury communica-



This ground station in Bermuda may make "go no-go" decision if Cape Canaveral does not.

tions are new developments made at the Goddard Space Flight Center to assure rapid transmission of telephone and teletypewriter messages and high-speed electronic data. A new, specially designed switchboard called SCAMA (for "Switching Conference and Monitoring Arrangement") will permit Mercury's operating personnel at Cape Canaveral to talk simultaneously to all stations connected to the voice network. The Long Lines Department of A.T.&T. developed the SCAMA board expressly for this application in Mercury's ground communications network.

A global teletypewriter communications system will send and receive information from Mercury's ground stations on the progress of the spacecraft's flight. A transistorized IBM computer at Goddard will receive tracking data from field radar stations by teletypewriter. The computer uses. Among these will be the sending of tele- will process this data and convert it for various typewriter messages from Goddard to the next site in line with the capsule's predicted position, thus enabling men on the ground to be prepared for the space vehicle's appearance overhead.

Incoming data will also be processed by the Goddard computer for high-speed electronic transmission to the Cape Canaveral control center. Making use of Bell System data transmission circuits, information essential to various phases of the orbital journey—launching, overhead passes, return into the earth's atmosphere—will flow back and forth between Goddard and Canaveral at near-instantaneous speeds. During the launch phase, for example, Canaveral's antennas will pick up impulses from the capsule to be relayed to the Goddard computer, processed there and transmitted back to the Canaveral control room at speeds approximating 100,000 miles per second, or more than half the speed of light.

Intercom systems, using Western Electric telephone and PBX equipment, have also been installed at Mercury's stations to provide communications among operating and maintenance personnel.

Every feasible principle of operational integrity and safety has been engineered into Project Mercury's tracking and ground instrumentation system, now ready to play its important role in the government's effort to put the first American safely into orbit.