

## Ma Bell's 'intelligent' switcher

At the same time that the Bell System is trying to develop radically new media for carrying the vast increase of telephone traffic expected over the next decades (SN: 7/19/75, p. 40 and 7/26/75, p. 60), the question naturally arises about how best to switch these calls, which would clearly overwhelm the relatively plodding capabilities of today's magnetic relay switching systems. Now, after a \$400-million investment by Western Electric and a five-year development period at Bell Labs, an all-electronic, computer-controlled switcher has been unveiled in Chicago.

Its prosaic name, "The No. 4 Electronic Switching System" (4E for short), belies the new switcher's revolutionary characteristics. By almost completely by-passing mechanical components, Bell Labs engineers have produced a machine that can handle 150 calls a second with two-thirds the power, one-third the maintenance cost and one-fourth the space of a comparable magnetic unit. As similar systems are installed around the country, customers will begin to notice a five-fold drop in the time required to complete a long-distance call (to an average of two seconds for direct dialing).

For their part, the Bell System hopes to save as much as \$1.5 billion a year, by 1985, because of the system. Much of this savings will come through a decrease in the circuit time wasted on uncompleted calls. The 4E uses a separate circuit for inquiring about availability of lines and whether the recipient's phone is busy; thus no "talking" circuits are monopolized unless a call is completed.

The secret of the 4E is an "intelligent" memory-logic system that stores information about a call, selects the best circuit and converts a voice signal to a sequence of pulses. Pulses for various conversations may be mixed and separated at will by time-sequencing, so that several calls can be transmitted at once. The special computer that does all this was made possible by advances in integrated circuitry (SN: 9/6/75, p. 154).

## State of the art

The January IEEE SPECTRUM offers the editors' annual review of the state of technology. Some gleanings:

- Half a dozen companies have come out with small, stand-alone computers aimed at the average businessman.
- In communications, say the editors, "the most significant and promising discovery, perhaps, is that of the 'optical transistor'" (SN: 10/25/75, p. 262).
- Electric stimulation will be used more extensively in pain control and for muscle activation during malfunction of the body's natural control system.
- Remotely piloted aircraft have "already added a new dimension to warfare." The United States leads the world.
- Air-cushion landing devices for large aircraft have passed their first demonstration trials.
- The "best guess" of the editors' sources is that Middle Eastern peace may eventually be monitored by U.S. civilians armed with a variety of sensitive electronic devices to detect troop movements.

## The limits of lithium

To technology planners fretting over materials shortages, a U.S. Geological Survey scientist adds a new worry: American supply of the lightest metal, lithium, may not be adequate to demand by the turn of the century. Lithium is expected to be a key ingredient in electric car batteries and fusion reactors, and geologist James D. Vine says consideration should already be given to stockpiling.

JANUARY 31, 1976

## Senate study of energy from space

Recent proposals for collecting solar energy with satellites and beaming it to earth via microwaves have been finding an ear in Congress, in the form of hearings last week by the Subcommittee on Aerospace Technology and National Needs of the Senate Committee on Aeronautical and Space Sciences. Although the ideas are expensive, ambitious and years in the future, says subcommittee chairman Sen. Wendell H. Ford (D-Ky.), "we find ourselves in this energy crisis through a lack of foresight. If these systems appear to be feasible and economically attractive, how can we not pursue them?"

Besides the far-future proposal of Princeton physicist Gerard K. O'Neill, in which power stations would be constructed and staffed from huge colonies in space, the senators also heard detailed proposals from the Boeing Co. and from Peter Glaser of Arthur D. Little, Inc. Glaser's concept, developed over several years, is basically that of a huge array of photovoltaic solar cells. The Boeing idea calls for large reflectors focusing the sun's heat onto helium-powered, closed-cycle thermal engines; it is scaled to provide 10,000 megawatts at the earth's surface, about twice the capacity of Grand Coulee Dam, using 12,000 acres of plastic film mirrors.

Either way, the economics are formidable, and the hearings included analyses by officials from the Energy Research and Development Agency, the National Aeronautics and Space Administration and Econ, Inc., a private consulting firm. Boeing estimates, for example, that development of the "powersats" would cost about \$60 billion, with another \$13 billion each for the operational satellites. The company estimates, however, that the costs could be amortized over 30 years (not atypical for large power plants) with charges similar to projected costs for nuclear power in the 1990's.

## The strongest talksat

A U.S.-Canadian project described by NASA as "the world's most powerful communications satellite" was launched Jan. 20 from Cape Canaveral. Known as the Communications Technology Satellite, CTS-A, it will be used in a variety of experiments by both countries, similar to those that have involved the Applications Technology Satellite ATS-6. The difference is that whereas ATS-6 achieves its high effective radiated power (ERP) with the aid of a huge, 30-foot-diameter parabolic antenna, CTS-A uses a powerful, 200-watt transmitter and a 28-inch antenna to produce nearly 10 percent more ERP.

The high power will enable a variety of experiments in direct broadcasting—without the use of large, expensive, centralized ground stations—including a planned test by Canadian Broadcasting Co. researchers of "direct-to-home" transmissions using receiving antennas only one meter in diameter with "simple, home-appliance-type equipment." Other tests will include a variety of educational, medical, remote-area access and "tele-conference" studies, among them an investigation of "whether a large and geographically dispersed industrial organization can substitute video and audio communication for travel."

## Milestone space camera turns off

One of the most famous pictures in the striking gallery of photography of the space age is the first color photo of the full, round earth from orbit, taken by the third Applications Technology Satellite on Nov. 10, 1967. Now that pioneering camera has been shut down, although the spin-scan technique it demonstrated continues in better systems aboard newer satellites, while ATS-3 sticks to a variety of communications tests and the relaying of weather-facsimile data.

73