TECHNOLOGY

A big ear in space

Dick Tracy's two-way wrist radio concept is really no longer just comic strip stuff. Already there exists the necessary miniaturized computer electronics, microprocessors. Now an antenna in space large enough to receive and retransmit very weak radio signals, such as those a tiny wrist radio might be expected to put out, is being developed by Lockheed. The antenna is envisioned to be about 300 meters in diameter, the size of the Houston Astrodome's roof, and designed so that it can be stored compactly enough to fit inside the space shuttle that will presumably launch it into orbit sometime at the end of this century.

The antenna is foreseen as a means to extend the range of routine and emergency communications from mobile units, such as automobiles, from cities that have suffered a power black-out and from persons in remote areas. In all these cases, the transmitter at hand is generally of modest size, capable of putting out only a weak radio signal. In another application, the antenna will be sensitive enough — greater than one-thousand times more sensitive than any antenna launched to date — to upgrade current satellite measurements of terrestrial microwave emissions. Measurements like these reveal among other things valuable agricultural information about an area's temperature and moisture content.

In order to fit into the shuttle's cargo bay, the antenna will be furled up around its central core. Anticipated to weigh about 200 pounds, the antenna will have ribs made of epoxy resin and a surface made of a metal-coated quartz material. Quartz is the choice tentatively because of its resistance to extreme thermal changes, such as can be expected in space.

In preparation for the construction of this huge antenna, Lockheed engineers are working on a demonstration model, a 55-meter, 30-degree section of the ultimate product.

According to Lockheed spokesman Roger Beall, even this test antenna's smaller size poses some problems. Since the final antenna will be weightless in space, it was not designed to bear up under its own weight. Consequently, Beall told SCIENCE NEWS, Lockheed people face a formidable engineering task just trying to mount the test antenna without its breaking up.

Devices that speak and see for us

Technology is creating means with which the severely handicapped can become increasingly independent. The latest evidence for this are two devices developed by the Veterans Administration's rehabilitative engineering program at the Georgia Institute of Technology.

A calculator-sized device capable of being programed with 112 different messages, such as "thank you," "I am hungry," and others more complex, will become available to the speech-impaired within two years. The device will be especially useful to people, such as those with cerebral palsy, who find it difficult to speak *and* control their motor reflexes in order to write clearly. The person need only tap out on a lever in Morse code the cipher that calls up the desired displayed message. The person may even spell out a message, letter by letter, that was not programed into the device beforehand.

For persons with poor or no eyesight, another device will help locate important places, such as restrooms, water fountains and building entrances and exits. This will be done by outfitting each such place with an inexpensive buzzer mechanism; the buzzer will be activated after the handicapped person, being within 100 feet of the place, punches the appropriate code on a handheld keyboard. According to the program director, Gary Kelly, the receiver and transmitter will cost about $15 and $20, respectively.

BIOMEDICINE

Eyeball to eyeball with the human fetus

Some of the most promising medical news in recent months has concerned the fetus, in terms of both diagnosis and treatment of abnormalities (SN: 8/1/81, p. 70). The latest advance, reported by Jason C. Birnholz of Harvard Medical School in the Aug. 7 SCIENCE, is the use of ultrasound not only to visualize and document the normal eye movements of the human fetus, but also to spot abnormal eye movements, which may indicate developmental problems.

Birnholz used ultrasound to visualize the eyes of 57 human fetuses at various stages of development and found that he was successful with 53 (93 percent) of them. Of the 53 fetuses, he was further able to visualize the actual eye movements in 33 (62 percent), which gave him an idea of what constitutes normal eye movements in fetuses at various stages of development. For instance, slow eye movements are present by 16 weeks' gestation, rapid eye movements occur between 23 and 35 weeks, and eye movements are rare after 36 weeks.

Birnholz then visualized the eye movements of eight fetuses with known brain malformations (also determined by ultrasound). He found that four of the eight had pathological eye movements for their particular stages of gestation, suggesting that abnormal fetal eye movements might be an indicator of other fetal developmental problems. If this finding is confirmed with further data, Birnholz believes that it will be a practical benefit for unborn children. For instance, abnormal eye movements might alert an obstetrician that a fetus needs a change in prenatal care, or that it may be at high risk during birth.

The Pill: A delayed heart attack risk

Medical researchers have known for several years that women are more likely to suffer heart attacks while using birth control pills than while they are not. But the researchers believed that the risk disappeared once women stop using the pills. This is apparently not the case, according to research results published in the Aug. 20 NEW ENGLAND JOURNAL OF MEDICINE by Dennis Slone of Boston University Medical School and colleagues.

Slone and his co-workers studied 556 women admitted to 155 hospitals with heart attacks and compared their oral contraceptive use with that of a randomly selected group of 2,036 women of the same ages. The investigators found not only that the longer women took oral contraceptives the greater was their risk of a heart attack, but that their increased risk persisted for as long as nine years after they stopped taking the drugs. The scientists say they do not have enough data to determine whether the heart attack risk persists past 10 years.

A laser blow in the gut

Lasers and clinical medicine are becoming increasingly comfortable bedfellows. For more than 15 years lasers have been used to surgically repair damage to blood vessels in the eye caused by diabetes (SN: 4/10/76, p. 232). During the past several years lasers have been deployed to eradicate cancerous cervical tissue and to surgically reconstruct obstructed fallopian tubes (SN: 2/7/81, p. 90). And now a laser technique to stop upper gastrointestinal bleeding has been developed by Albert M. Waitman of Beth Israel Medical Center in New York City.

The technique consists of passing a fiberoptic endoscope through the patient's mouth, down the esophagus and into the stomach and small intestine so that the physician can visualize a bleeding blood vessel. A laser beam is then passed through the endoscope to coagulate the bleeding vessel. So far Waitman has used the method to treat patients with life-threatening hemorrhage or with chronic blood loss from ruptured blood vessels.