Technology

Military laser, CCD update

Last year the Navy and Air Force requested funds to begin installation of demonstration model antimissile lasers for use against the sensing devices of homing missiles (SN: 2/2/74, p. 74). Now comes word that the lasers have been made powerful enough to cause structural damage, as well as knock out sensors, on a missile. This means that lasers may someday be turned against the previously impregnable, internally guided ballistic missile.

According to ELECTRONICS magazine (Feb. 20), the Defense Department is asking Congress for between $23 million and $28 million for "prototype laser weapons," mainly deuterium flouride chemical lasers, with "very, very high outputs." Such lasers, which emit relatively high-frequency rays capable of penetrating long distances in the dense lower atmosphere, can reportedly "burn through heavy stainless nickel steel at range." That is, they may be capable of intercepting an incoming ballistic missile from the ground.

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One of the hottest topics of conversation in electronics circles concerns a new generation of miniaturized instruments containing charged coupled devices—CCD's, for short (SN: 2/22/75, p. 123). These inexpensive semiconductor chips can be used in small, sensitive cameras that replace bulky television equipment, or as digital information storage units. Most of the talk so far has involved potential uses, but according to a report in AVIATION WEEK AND SPACE TECHNOLOGY, the Navy has already employed CCD's in a novel application—as part of a television surveillance system mounted on an 8-inch howitzer shell.

The unit contains a 10,000-element CCD sensor and transmitter and was successfully test-fired at the Naval Surface Weapons Center, Dahlgren, Va. The Army is reportedly developing a similar system, involving a sensor package fired from a 155-mm howitzer, which is ejected during flight to parachute slowly, transmitting pictures.

'Microprocessors' to help save gas

Semiconductor chips may soon be used to control timing and fuel mixture in automobiles to help save as much as 40 percent on gasoline consumption, according to RCA president Robert W. Sarnoff. Several companies have begun to investigate the possible use of such devices in autos, and Chrysler Corporation is reportedly ready to install the miniature computers on a limited number of large-size cars.

Once mass production is attained, Sarnoff says, the so-called "microprocessors" should be available at about $100 a unit and could potentially save 500 million gallons of gasoline each year. The quarter-inch-square chips, containing 6,000 transistors, could also be used to save fuel in homes and office buildings.

Writing the password

The Air Force has announced development of a new personal identification system for use in security installations: Automatic Handwriting Verification. Rather than looking at the design of one's signature, the new concept involves recording the sequence of pressure changes involved during the signing. These changes, measured by a special ballpoint pen, are recorded and analyzed by computer for future comparison. The Air Force is also obtaining laboratory models of devices that automatically identify a person's fingerprints and voice.

Chemistry

Cracking the structure of saxitoxin

A bout of "red tide" is one of the worst fates than can befall a seashore. Millions of tiny, armored protozoa teem in every liter of water and give off a strong neurotoxin that can kill sea life and humans alike. One of the red-tide organisms is the dinoflagellate *Gonyaulaux,* and its weapon is the extremely potent saxitoxin. A team of chemists headed by Jon Clardy of Iowa State University and E. J. Schantz of the University of Wisconsin at Madison have now determined the exact structure of saxitoxin and report their work in the March 5 JOURNAL OF THE AMERICAN CHEMICAL SOCIETY.

The compound is a relatively small molecule, molecular weight about 400, and it is one of the most toxic nonprotein substances known. It is a purine derivative, a distant relative of the purine building blocks in nucleic acids. It blocks nerve transmission by preventing the necessary influx of sodium ions. Although the molecule had been partially characterized before, the team used X-ray diffraction to get a complete picture of the structure.

Biochemist F. M. Strong, a team member from the University of Wisconsin, says knowledge of the structure will be a useful research tool. Since saxitoxin interacts with membranes to block sodium passage, the exact structure of membranes at the sodium "port" might now be revealed. Chemists might be able to determine which sites on the molecule are responsible for the toxic activity, making the construction of antidotes possible. Also, Strong says, the U.S. Food and Drug Administration would like a more reliable method of testing for the presence of saxitoxin in sea foods and coastal water and knowing the structure might aid in this development.

Rotten news for apple exporters

A team of chemists has some bad news for Canadian apple exporters. Their study of a fumigant proposed for use on exported apples will essentially close some foreign markets before they are even opened.

E. J. Bond and T. Dumas of the Canadian Department of Agriculture's research institute studied the retention of ethylene dibromide by apple tissues. This fumigant, Bond says, is about the only substance that can kill European red mites and mite eggs—beasts that infect many U.S. and Canadian apple crops in the late summer and autumn. Their presence makes the raw fruit unexportable to certain countries that have managed thus far to avoid a red mite invasion. Since these countries will not allow unfumigated fruit to be imported, Canadian agriculturalists were hoping to find a safe, effective agent in ethylene dibromide. But, no such luck, the chemists report.

Bond and Dumas report in the JOURNAL OF AGRICULTURAL AND FOOD CHEMISTRY (23:95) that treatment of apples with ethylene dibromide leaves bromide residues in the apple tissues. The residue levels depend on the temperature in the fumigation chamber, the apple variety and the time elapsed since fumigation. Skin and pulp desorb the chemical more quickly than seeds, they found, and both inorganic and organic bromide residues (the ethylene form) were present as long as two weeks after fumigation.

The toxicity of low levels of organic bromide compounds in humans is not well established, Bond says, but it is known that high concentrations can cause tissue mutations. So for the present (and future, too, unless bromide residues are exonerated) raw apples won't be exported to certain parts of the world, Bond says.