TECHNOLOGY

Navigation by Satellites Possible From Airplanes

➤ EARTH-CIRCLING satellites can be used to fix the position of airplanes as they now tell ship captains the exact location of their craft at sea in any weather day or night.

Tests made by scientists at Johns Hopkins University Applied Physics Laboratory, Silver Spring, Md., have shown the satellite navigation system for ships also works for speedy aircraft. The problem had been that satellites are in view for such a short time from fast-moving airplanes, it was extremely difficult to fix their relative positions.

The ship location system uses the Doppler effect, commonly known from the change in pitch of a train's whistle as it approaches or recedes from a person hearing it. From the Doppler effect and the satellite message giving its position in orbit, U.S. Navy ships have been able to pinpoint their locations independent of any other radio or mechanical means.

The aircraft navigational fixes, made for the first time by means of satellite signals, were checked over measured courses and confirmed by tracking over ground-based markers.

New developments in measuring aircraft speed accurately paved the way for using satellites for all-weather airplane navigation.

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SPACE

Big Space Company Stuck On What to Do Next

➤ THE BUILDER of the world's biggest space booster is in trouble for lack of a future.

The space division of the Boeing Company, constructor of the huge first stage of the rocket that will take U.S. astronauts to the moon, is "foundering" because of a shortage of upcoming major projects, a company official told SCIENCE SERVICE.

Boeing's only major Government space contract, other than the S-1C booster, is the Lunar Orbiter, an $80 million award made in 1963.

Only limited numbers of people are involved in additional space reserach at Boeing, the official said, at least in part because of the unexpected prosperity of the company's aircraft division. Developmental work on the 737 and 747 jetliners has taken a large part of the company's emphasis, as have sales of the existing 707 and 727 jets, which have exceeded even Boeing's original predictions.

Another blow to the space division was the recent loss of the multimillion-dollar Apollo Applications Program (AAP) contract. Two contracts were awarded, one to Lockheed Corporation and the other to the Martin Company. Purpose of the AAP is to develop new projects that can be carried out with equipment designed for Apollo.

The National Aeronautics and Space Administration has been concerned about having its own appropriations cut unless it is able to come up with some clearly-defined programs to follow the manned Apollo moon landing. The AAP was a much-desired plum for space industries, since NASA's most likely choices for the future would be ones making use of existing Apollo hardware.

Boeing is not worrying yet, however. The company worriers will remain only at the nail-biting stage until early in 1967, when what could amount to the biggest contract decision of all time—the Supersonic Transport—will be awarded to either Boeing or Lockheed. Though it would not do a great deal for the space division's flagging morale.

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BIOTECHNOLOGY

Help Diagnose Cancer By Thermography

➤ SURFACE temperature patterns of the human body presented pictorially provide a new method of diagnosis of disease.

Engineers attending the International Convention of the Institute of Electrical and Electronics Engineers, Inc., were told in New York that the new discipline, called thermography, was felt to have value in many fields and conditions ranging from vascular disturbances to early cancer detection.

Thermography is already proving to be extremely valuable in the early detection of breast carcinoma and in human placental localization.

In a paper by Drs. Erich E. Brueschke, J. Gershon-Cohen and JoAnn D. Haberman-Brueschke of the Albert Einstein Medical Center in Philadelphia, it was emphasized that presently available scanning infrared radiometers provide medically useful thermograms if certain criteria are achieved. These include instrumentation technique, proper patient environment, and meaningful thermogram evaluation.

The authors stated that "the usefulness of thermography to medicine depends upon the physician's ability to accurately interpret the thermogram in relation to disease processes. This requires relatively rapid, high resolution infrared scanners and accurate methods of thermogram analysis based on basic scientific concepts."

The thermography technique is based upon the fact that the average internal temperature of the human body remains essentially unchanged in health at about 37°C. The temperature of the skin, however, fluctuates widely, depending on various internal and external factors.

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IN SCIEN

BIOCHEMISTRY

Toxin Causing Mussel Poisoning Isolated

➤ CALIFORNIA MUSSELS become poisonous because they consume the tiny organisms that cause the red tide.

A group of five scientists reported in Biochemistry, 5:1191, 1966, that the dinoflagellate, *Gonyaulax catenella*, an organism found all along the Pacific Coast of North America and especially along the coast of California is the cause of the paralytic poison that causes paralysis and death in man and animals. Poisoning in humans from eating toxic shellfish has occurred in many places throughout the world.

The presence of this organism in the ocean waters has always resulted in several species of shellfish becoming very toxic. The red tide becomes apparent when the number of *G. catenella* reaches 20,000 to 30,000 or more per milliliter but mussels may become too toxic for human consumption when the number has reached only 100 to 200 per ml.

The scientists isolated the organism in pure form and showed definitely that the poison from *G. catenella* cells obtained from a culture and the mussel poison, saxitoxin, are identical. The culture medium was made up of seawater collected near Ocean City, Md., and was supplemented with appropriate mineral salts and acidity.

Because of the similarities between mussel and clam poisons, studies were made to compare the *G. catenella* toxin with Alaska butter clam poison also, the scientists reported.

All the chemical reactions and physical measurements on the three poisons, were identical in every respect, they said, indicating that the chemical must also be identical, establishing the postulation previously made that mussels become poisonous because they consume *G. catenella*.

The scientists believe that the poison of the Alaska butter clams may also originate from the same organism as a result of the tests, although direct observance of this has not been made.

G. catenella poison and the shellfish poisons are among the most potent nonprotein poisons known.

The study was reported by Dr. Edward J. Schantz, U.S. Army Biological Laboratories, Fort Detrick, Frederick, Md., and the department of chemistry, University of California, Berkeley, Drs. Joseph M. Lynch, and George Vayvada, also of the U.S. Army Biological Laboratories, Ken Matsumoto, National Institutes of Health predoctoral fellow and Henry Rapoport, U.S. Army Research Office, Durham, N.C.

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CE FIELDS

MEDICINE

Protein Malnutrition Diagnosed in U.S. Child

➤ A FORM of malnutrition prevalent in poor nations but rarely seen in a prosperous society has been diagnosed in a 10-month-old child in the Bronx.

Kwashiorkor, a protein deficiency disease, has been reported in a 10-month-old boy at the Montefiore-Morrisania medical complex, Bronx, N.Y. Permanent brain damage and possible death may result from this disease in which loss of body tissue is replaced by fluid accumulation.

Drs. Leonard S. Taitz and Laurence Finberg said only two other cases of kwashiorkor have been reported north of the Rio Grande in the Western Hemisphere, but they suggested studies be made to see just how prevalent the disease may be in the urban ghettos of the United States. The presence of this disease "in the most affluent city in the world is a phenomenon which cannot be regarded with equanimity," they said.

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PHYSIOLOGY

Eyes See Depth As Lag in Time

➤ HOW DO EYES perceive depth? Obviously each eye sees from a different angle and together they draw a picture of a three-dimensional object. But the mystery has always been: how does the brain decode these messages meaningfully and determine distance?

In the last century, a German scientist theorized that the brain receives visual messages at slightly different rates depending on which part of the retina is stimulated. The part of the eye closest to the nose, for instance, conducts messages faster than other areas. Therefore, if one eye sees with its nasal sphere and the other with its temporal sphere, a tiny time lapse in nerve transmission occurs. This, combined with angle gives depth.

After nearly 100 years, an experiment conducted by T. G. R. Bower, a psychologist at Harvard University, has corroborated the theory.

By using white lines, polaroid filters and a tachistoscope, Dr. Bower was able to establish this time lag between the nasal and temporal areas. He found that nerve transmission speed differs by about 1.5 milliseconds. Significantly, when Dr. Bower filtered the white lines to offset the lag, by delaying nasal vision slightly, his subjects lost much of their depth perception.

Actually Dr. Bower's work adds to the already weighty evidence that the sensation of space and position reaches the brain in a "time of arrival" code. It has already been established that ears "hear by time." Depending on which ear receives the first message, an individual can tell the direction of the sound. Smell and skin sensations also are largely understood through a time factor. Now, it is apparent that eyes also see depth by time.

Depth vision, however, probably is influenced by another factor, first suggested in 1864. That is that various parts of the retina have permanent depth values. If seen with the nasal area, an object will appear further away. But if seen with the temporal area. it will appear closer.

This theory would explain the stability of depth perception, said Dr. Bower in Nature, 210:1081, 1966. If time coding were the only cue, he said, depth perception could be easily reversed and it is not.

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PSYCHOLOGY

Truth From Others Changes Self-Image

➤ HOW MUCH influence do other people have on someone's self-image? Evidently quite a bit, if one is told fully and openly how he appears to others, and the truth does not seem to hurt.

The direct relationship between "feedback" and changes in self-image was illustrated in a study of 20 middle-level businessmen.

A two-week course in human relations provided the setting for the study, conducted by John R. P. French Jr. and David L. Bradford of the Research Center for Group Dynamics at the University of Michigan, and John J. Sherwood of the department of administrative sciences and psychology at Purdue University.

At the start, the researchers had the businessmen rate themselves on 19 personal ability scales.

After a week of working together the men rated each other in descriptive summaries. However, each person was rated on only two of the 19 personality scales, so that his feedback came in varying degrees of completeness.

Where he had the fullest feedback, both written summary and face-to-face discussion, the man made a significant change in his impression of himself. Where he had less, either written summary or discussion alone, his change was also less.

The researchers observed that as they had expected, the unusual chance to get objective, outside appraisals of oneself most benefitted those who originally had the lowest opinion of themselves.

The study was reported in the Journal of Applied Behavioral Science, 2:210, 1966.

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MEDICINE

Hazards of Inactivity Seen in Nursing Homes

➤ INACTIVITY in nursing homes and in all types of retirement facilities can have a disastrous effect on the old folks, the American Medical Association warns.

Inactivity at any age has a bad effect on all the body organs. Astronauts use isometric and isotonic exercises such as pulling on a rubber bungee cord hooked around both feet.

Dr. Frederic J. Kottke of the University of Minnesota Medical School, Minneapolis, said in the Journal of the AMA, 196:825, 1966, that "total inactivity of muscle results in net loss of strength of approximately three percent per day."

Prolonged bed rest impairs neuromuscular and emotional control and intellectual performance, even though it may protect a damaged organ, Dr. Kottke reported.

Whether limited activity is enforced by a double hip cast for double fractures, by the need to rest a damaged heart or by a prolonged space flight, special efforts should be made to minimize the effects. Some regular exercises are possible in most cases.

New knowledge of the relationship of the heart to various physical activities can help in devising beneficial programs for the patient recovering from coronary thrombosis.

As Medicare increases demands for nursing-home facilities and services for people over 65, the AMA has expressed the hope that many physicians will supervise and even instruct the rapidly assembled staffs prepared to give mainly custodial care. Goals for desirable amounts of exercise and activity should be set.

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SPACE

One Space Vehicle Can Sense Another

➤ ONE SPACE VEHICLE can detect another by the weak electrostatic field that exists between them. Navy engineer Maxime G. Kaufman of the U.S. Naval Research Laboratory, Washington, D.C., reported experiments in which he recorded the electrostatic fields generated by jet aircraft passing over special detection devices.

He said that detection is possible by sensing the rate of change of the electrostatic field generated by the relative motion of the jet aircraft rather than by measuring the magnitude of the electrostatic field involved.

The electrostatic detection technique is passive; that is, it does not transmit a tell-tale electronic beam or signal that can reveal the location of the source of that signal.

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