ENGINEERING

Radar Sees Over Horizon

RADAR STATIONS in London and New York may some day watch each commercial airliner every minute as it flies.

Should trouble develop and the plane crash, rescue craft could be dispatched promptly and told almost exactly where to look even if the pilot was unable to radio his position in a distress broadcast.

This is one possible future application of an experimental radar now undergoing tests at the Naval Research Laboratory in Washington, D. C.

The new radar was conceived by Dr. Robert M. Page, director of the laboratory. Unlike conventional radars, the radar is able to see beyond the horizon by bouncing its electric beam off the ionosphere, found 50 to 150 miles above the earth.

Known as Project Madre, the experimental radar already has detected from Washington unidentified moving objects in the vicinity of Cape Canaveral, Fla., during periods of rocket launchings, Dr. Page said. A full-fledged experimental installation is now under construction near Chesapeake Beach, Md. When completed this fall, its antenna, measuring 330 feet long and 150 feet high, will shoot 180 pulses of radar waves a second over the Atlantic at a peak power of 5,000 kilowatts.

Dr. Page said he hopes the radar, which has been proved in principle, will indeed be able to detect "a large plane" at distances varying from 500 to 2,600 miles. The actual range of the radar is unknown. The distance covered by the beam itself will vary between 500 and 1,000 miles. But whether the ground surveyed by the radar beam is near or far depends upon the height of the ionosphere.

The purpose of the Chesapeake Bay installation is to prove that the radar will work as well as the experimental evidence now indicates, Dr. Page said.

"We think it can see a large airplane. We hope it can see smaller targets. It would be wonderful if it could see a missile," he said. But he doubted that it would see a missile at 2,600 miles because "only a small warhead would be coming at you."

To operate in a frequency range of three to 30 megacycles per second, the radar would not have been possible ten years ago because electronic equipment lacked the sensitivity and power now available.

Also, ten years ago there was no means for comparing a received radar "echo" with the pulse that had been sent out. This is Madre's secret. The jumble of radio waves received is carefully compared electronically with the pulse that was sent out. If a similar signal is detected in the jumble, a target has been hit by the beam.

By comparing the amplitude of the received signal, a distance can be obtained. By comparing the phase shift of the received signal, an extremely exact measurement can be made on the speed at which the target is approaching or moving away from the radar transmitter.

Dr. Page termed "interesting" speculation that Madre radar some day might be shrunk in size so that airplanes might be able to "see" deeply into other countries.

Right now, he said, there is some conjecture as to whether the present equipment could be installed on a battleship. But he held out the possibility that some day someone might learn how to shrink the equipment to get it on a jeep.

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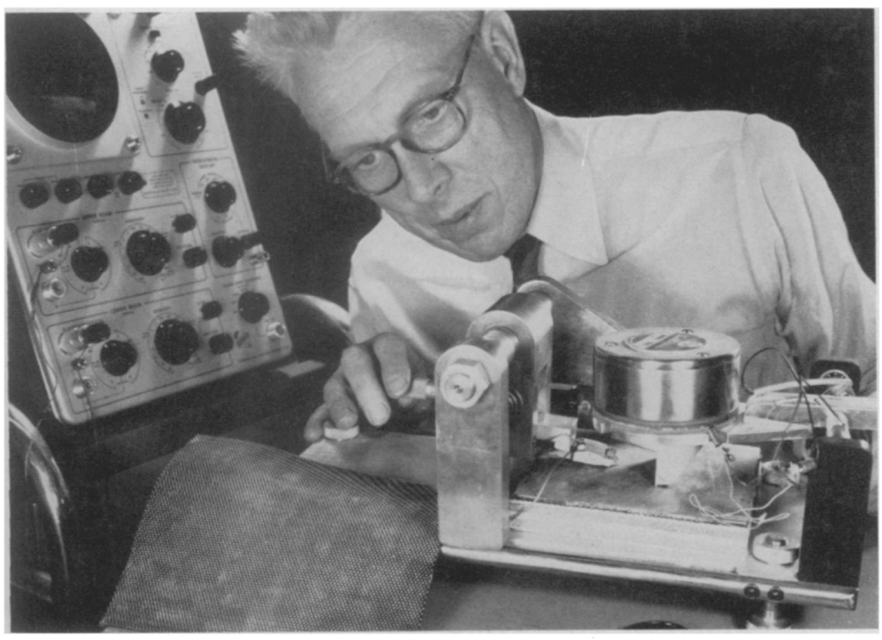

RUBBER COATING—Absorption of energy in Lamiflo rubber coating is measured by Dr. Fitzhugh W. Boggs, head of the team doing research at the United States Rubber Company on drag reduction in motorboats and submarines. The tiny pillars on the rubber coating help eliminate some of the turbulence normally created in water by boats.

ROCKETS AND MISSILES

Rocket Ignition System Foils Accidental Shoots

A BETTER ignition system for missile rockets has been developed. It prevents stray radio waves from accidentally blasting a missile into the wild blue yonder.

The "exploding bridgewire system" uses a small wire to ignite rocket fuel. To set off the rocket, a heavy charge of electricity is shot into the wire, causing it to explode. This charge is much heavier than would be received if a high-powered radar beam accidentally played upon the missile.

The EBW System, as it is called, was reported by Librascope, Incorporated, of Sunnyvale, Calif., a subsidiary of General Precision Equipment Corporation. The system is said to be useful also in separating rocket stages, in stopping rocket thrust and in destroying missiles upon command, providing at the same time "unequalled safety and reliability" along with weight and space savings.

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TECHNOLOGY

New Rubber Paint Speeds Submarines

A RUBBER paint has been developed that will give submarines a more-yielding "skin" and may enable ordinary submarines to slip through the water at speeds approaching 70 miles an hour.

Further perfection of the paint, plus coming engine improvements, might lead to passenger and cargo submarines that could race across the oceans at 207 miles an hour.

Developed by Dr. Max O. Kramer, vice president of Coleman-Kramer, Inc., Los Angeles, the new rubber paint cuts down water turbulence around a body moving through the water.

United States Rubber Company scientists, working with Dr. Kramer, compared the ship paint to the pneumatic tire that advanced land transportation.

The present paint consists of a thin layer of rubber supported on the boat's surface by "a multitude" of tiny rubber pillars. A freely flowing viscous liquid is able to flow through the tiny caverns created by the rubber pillars and enclosed by the outside rubber coat. These caverns give the coating flexibility, and the supple liquid provides the necessary damping to suppress turbulence.

In tests with submerged bodies, the coating has cut water resistance, due to turbulance, in half. But scientists hope to improve the rubber paint further, because most ships use 70% to 90% of their propulsive effort to overcome this drag. By reducing turbulence, more engine power can be used to speed the vessel.

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