PHYSICS

Study H-Bomb Effects

NEW EFFECTS of high-altitude hydrogen bomb tests such as the U. S. conducted in the South Pacific last August have been reported.

Three scientists present evidence strongly suggesting that the D-layer of the ionosphere, the lower part of earth's radio reflecting "roof," becomes electrically conductive to a higher degree than normal at distances from the explosion far greater than expected. Such effects mean a disruption of radio communications at certain frequencies.

The scientists say the effects had been noticed at places remote from the explosion. They had also been noted far from the area on the earth's surface at the opposite end from the explosion point for lines of force in the earth's magnetic field.

The increased ionization of the ionosphere was noted on three wavelengths at the Hiraiso Radio Wave Observatory in Japan, at 15 megacycles and 10 megacycles from Honolulu, and 13.75 megacycles from San Francisco. The disruption of communications at these frequencies was much more pronounced from the Aug. 1 blast than from the Aug. 12 explosion. The scientists offer no explanation for this difference.

Besides the increased ionization, the scientists also found an increase in the radio noise level at 28 kilocycles.

Both effects, they report, are "entirely similar to those accompanying sudden ionospheric disturbance due to a solar flare." The sun-caused disturbances are known to be due to increased ionization of the D-layer. High-altitude hydrogen bomb explosions cause the same effects.

Another scientist has said the ionosphere behaves as if the sun suddenly shown in the middle of the night.

Since the man-made effects are not confined to regions influenced by particles guided by the earth's magnetic field, they report that some other mechanism must also be involved.

Two possible mechanisms are suggested by Dr. T. Obayashi of Japan's Radio Research Laboratory, Nakimato-shi, Ibarakken, and Drs. S. C. Coroniti and E. T. Pierce of AVCO Research and Advanced Development Division, Wilmington, Mass.

One possibility is that the hydrogen bomb blast acts like a thunderstorm, including the direct production of ionization by the electromagnetic radiation of long wavelength generated by the explosion.

Another possibility, reported in *Nature* (May 23), is the production of shock waves by the blast. These shock waves would then interact with the earth's magnetic field to produce hydrodynamic effects. The Aug. 12 record at 13.75 megacycles shows "intriguing" violent oscillations hinting at such effects, they note.

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GEOPHYSICS

Challenge U. S. Engineers

IT MAY take real Yankee ingenuity to carry off the glamorous, much-publicized $5,000,000 project of pricking the earth's skin to sample its heart—known in scientific circles as "Project Moho."

The idea is to drill to the Mohorovicic Dicontinuity, a layer in the earth which separates the crust from the mantle. The Project is expected to yield information on "the most important unsolved problems of geophysics."

But drilling down 16,000 feet, especially from an ocean site, means many problems must be solved first.

Added urgency for the United States' success is being felt as Russia pressures its scientists to beat America at this project. This would give Russia a double-edged propaganda weapon as the first nation to launch a satellite, and the first to drill into an earth layer never before tapped by man.

It is known that the Soviet Academy of Sciences has set up a new branch in Novosibirsk and charged it specifically with solving the problems of deep drilling. Even as early as 1957, the Russians said they had the equipment and capability to do the job.

But does the U. S.? Two experts say a "Drilling Methods" panel has been organized by the American Miscellaneous Society (AMSOC) to devise new techniques or determine the best old ones that AMSOC can use on Project Moho.

Gordon G. Lill and Dr. Arthur E. Maxwell, writing in *Science* (May 22), say the earth's mantle is a depth of five kilometers (about 3.1 miles) below the Central Pacific earth floor—well within reach of present drilling equipment.

But it will take a "great deal of study," they say, to determine if drilling can be undertaken from a barge to depths of 16,000 feet below the sea floor, under water 15,000 to 18,000 feet deep.

A new, special drilling barge may have to be designed, they suggest. Heavy strings of drill pipe, maybe 30,000 feet long, will be required. No present drill barge can handle the lengths of pipe that will be needed, the two scientists report.

Furthermore, power supplies must be studied. Smooth delivery of power will be essential. They report a proposal has been made for supplying power right at the bottom of the ocean rather than from a barge at the surface. This would eliminate the 15,000 to 18,000 extra feet of drill stem needed to get through the water.

The drilling experiment has captured world-wide interest, and the American Miscellaneous Society has revealed itself as a colorful group. Although deadly serious over Project Moho, AMSOC perhaps has earned this reputation through such mottoes, quoted in *Science*, as: "The ocean's bottom is at least as important to us as the moon's behind!"

Mr. Lill, head of the geophysics branch of the Office of Naval Research, and Dr. Maxwell, an ONR oceanographer, say this motto merely is a reminder that much remains to be learned about the earth, as well as the new areas being opened by man's conquest of space.

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ENGINEERING

Transatlantic TV Within Five Years

A FIRST-CLASS radio link between the United States and Europe, via the moon, will be operated within three years. And the first television pictures may be beamed well within five years.

That is the belief of John Brinkley, managing director of Pye Telecommunications Ltd., Cambridge, England, who actively cooperated with scientists at Manchester University's Jodrell Bank radio telescope in sending the first signals 480,000 miles through space to the U. S. on May 15.

British telecommunication experts will now push on at top speed to design suitable equipment for an interference-free commercial link. Mr. Brinkley was delighted with the success of the Jodrell Bank experiment, in which conventional equipment of comparatively low power was used.

"The biggest attraction is the establishment of a first-class radio link with the whole of the British Commonwealth," he said. "It is easy to lay a submarine cable across the Atlantic, but not to Australia, New Zealand, Singapore and Hong Kong. Moon traffic means that the need for submarine cables will be removed."

Mr. Brinkley said that the first TV pictures across the Atlantic would probably be sent via metal-plastic balloons, 100 feet in diameter, suspended in space. Such balloons could already reflect the "wide band" frequencies used in today's TV transmissions.

Before the moon could be used as a TV reflector new "narrow band" transmitters have to be designed.

British scientists will now experiment by sending signals of ultra-high frequency via the moon to other parts of the world. For the higher the frequency the more "channels" of communications are opened up. At present, "channels" used by commercial cable companies are heavily overcrowded.

Communications with other parts of the world will depend on the moon's position in relation to the earth at certain times of the day. But there will be a period each day when Russia will be powerless to interrupt or jam communications between the U. S. and Britain.

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