ELECTRONICS

Confuse Attacking Planes

Radio broadcasting stations operating normally provide enemy bombers with a "radio highway" to their targets. But Conelrad, developed by the FCC, fixes that.

By ALLEN LONG

See Front Cover

➤ SLEEK ENEMY planes zooming through the night toward America could speed straight to their bomb target as soon as they came within radio earshot of a commercial broadcasting station.

But the Federal Communications Commission, cooperating with the U. S. Air Force, fixed that. The Commission reached into its hat and pulled out Conelrad, a system of scrambling radio waves.

Meaning "control of electromagnetic radiation," Conelrad fouls the enemy's radio direction-finding equipment by putting all regular AM broadcasting stations on one of two defense frequencies. FM and TV stations are ordered off the air. Broadcasting stations used by police and firemen are supervised closely during the emergency and operate in a restricted manner.

What all that means to the listener is this: When an air attack seems to be coming, the radio program you are hearing will go off the air. The station will change its spot on your dial to either 640 or 1240 kilocycles.

If you retune your set, you can hear the Civil Defense messages being broadcast. Maybe you will hear a special program instead of Civil Defense messages.

Continuous Broadcast Heard

But all the while you are listening, the stations broadcasting that program will be going on and off the air. You will not notice it, though, because the stations will be ordered on and off the air on such a split-second schedule that one station takes up immediately when the other leaves off.

The stations will be given instructions from central dispatching points sprinkled throughout the country. Each central point will control a large "cluster" of stations. The clusters are further broken down into smaller clusters, the whole idea being to confuse the enemy thoroughly.

Ordinarily, the enemy would tune his direction-finding equipment to an AM broadcasting station in the target town. A compass-like needle would show him in which direction to fly to reach the city.

After getting there, the navigator might even be able to use the radio station to help him find his specific target. It might be a railroad yard, a dock or a war plant.

When radio direction-finding equipment is tuned to a commercial station, the antenna is told electrically to point to the direction from which the radio signals are coming. The antenna rotates until it is pointing to the station, and the compass-like needle turns likewise.

But under the Conelrad system, no radio broadcast stations would be on the air except those on the Civil Defense frequencies of 640 and 1240 kilocycles. The navigator thus would have to tune to one of those frequencies. He no longer would be able to single out a certain station in New York, Washington or Pittsburgh.

Confused Compass Needle

The navigator could tune his set to either of those frequencies, but the compass would tell him nothing. For as each station came on, the compass needle would swing to a different setting. Since the stations probably will broadcast for just a few seconds at a time, the compass needle will be kept in a high state of confusion.

To make it even more difficult for the enemy navigator to use his radio direction-finding equipment as a navigational aid, the stations will be ordered on and off the air in a random pattern. Thus, stations in Philadelphia might broadcast in one order, but on the next go-round they would be in a completely different order.

And to make it even tougher on the enemy, the setup is fixed so that some stations might be on 1240 kilocycles one night and on 640 kilocycles the next. The enemy never could be sure just where to find the desired station on his dial.

Sequential Broadcasting

Even if the enemy navigator knew exactly—to the second—when the station would be on the air and on what frequency it would be broadcasting, he could not use his radio direction-finding equipment with success. Interference from other clusters makes radio reception a jumble of noise about 30 miles away from cities.

Chances of the navigator's finding out when and where the desired station would be on the air are small, the FCC believes. High-level espionage would be required to give him that information.

After the FCC worked out the system of sequential broadcasting, as it is called, it was decided the enemy still might be able to use the radio stations as beacons if broadcasting power were not changed.

For instance, if the enemy knew New York had the strongest station in the area, he might be able to figure out that New York was broadcasting when he picked up exceptionally strong signals for a few seconds.

CONTROLLED RADIO BROADCASTS—Radio direction-finding equipment is rendered of no use to enemy aircraft searching for their targets by the new Federal Communications Commission's system. Here an Air Force corporal is shown watching hypothetical enemy planes approach while swift interceptors zoom to the scene.

The FCC solved that problem by scrambling station powers as well as frequencies. Now the enemy will not know where the strong stations are.

All told, the system will cost commercial broadcasters about $1,500,000. The money will go for new electronic gear needed to change the station's spot on your dial during an emergency. More money will be poured into the communication system that will link the stations to central dispatching points throughout the country.

Of the 2,500 AM radio stations in the United States, over half already have endorsed the plan. The FCC hopes to enlist at least three-fourths of them by the time Conelrad is completely set up. Stations that do not agree to take part, of course, will leave the air during an emergency.

The Air Force asked the FCC to work out Conelrad after military leaders realized radio stations would be a weak link in America's defense preparations. Since the stations would be needed to carry vital civil defense information, they could not be taken off the air. The FCC's plan has been approved by the Air Force and tested under simulated conditions of national emergency.

In the early hours of the morning, Air Force bombers have set out to "blast" certain targets, using their radio direction-finding equipment to guide pilots to the goals. Radio stations in the target areas switched to the Conelrad frequencies and went on and off the air as instructed. Progress of the planes was plotted continuously. How an interception unit operates is shown on the cover of this week's SCIENCE NEWS LETTER.

During the tests, the Air Force checked the effectiveness of the system on its own dead-reckoning navigational aids. Both the bearing types (that use the compass-like indicator) and the homing type (that directs the pilot to fly right or left) were tested.

In typical non-committal language, the tests were proclaimed "satisfactory." But there was a thoroughly satisfied inflection in the voices of those reporting.

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HOME ECONOMICS

Freezers Not For Clothes

➤ THE IDEA that nylon hose last longer if frozen before wearing is debunked in a report from the U. S. Department of Agriculture in Washington.

Freezers are for food, not nylons and not winter clothes, Agriculture's home economists state.

Their reasons are:

1. Tests by nylon manufacturers showed that freezing does not make this fiber more durable.

2. It is poor economy to take up freezer space with clothes during the season for fruits and vegetables.

3. Fur experts advise against storing fur garments in home freezers. Fur that is stored for any length of time folded or rolled will come out creased or crushed, and then will need glazing or other treatment to lift and straighten fur fibers. If the pelt freezes stiff, it is likely to crack at folds, especially if any weight, like packaged frozen food, is placed on or against it. Finally, there is the risk of damage from dampness, either in the freezer or later when the fur is thawing out. Dampness may cause aging, fading, loss of lustre or even mildewing. Fur garments in commercial cold storage hang loosely so that air can circulate around them. Both temperature and humidity are carefully regulated to keep fur in best condition. Any fur worth home freezer space would seem to deserve expert commercial storage.

4. Clothes can be protected from moths without freezing or even refrigerating them, and the freezing treatment gives no protection when the clothes come out of the freezer.

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PSYCHOLOGY

Boys Fitting Into Army Take Authoritarian Ideas

➤ SIX WEEKS in the Army may make a boy shift toward acceptance of authoritarian ideology. So Dr. Richard Christie of the Research Center for Human Relations, New York University, told the American Psychological Association meeting in Washington.

The boy's political views before he went into service have nothing to do with this shift. What is important is how well he fits into military life and what his buddies and superior officers think of him. If he fits in well and makes a good soldier, then he tends to accept the authoritarian way of thinking.

Dr. Christie's conclusions are based on interviews with 182 inductees in an Army basic training center.

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SEISMOLOGY

Earth Has Hard, Dense, Solid Metallic Heart

➤ THE EARTH has a hard, solid heart.

Prof. K. E. Bullen, Sydney University mathematician, told the Australian and New Zealand Association for the Advancement of Science meeting in Sydney that his researches show that the earth's inner core, with a radius of about 800 miles, is solid with a density at the center about 18 times that of water. It is chemically distinct and consists of iron, nickel and probably some denser metals.

The rest of the central core, extending to 2,200 miles from the center, consists of a liquid form of silicate rock about 11 times the density of water, Prof. Bullen's work on earthquake vibrations has indicated.

Prof. Bullen has for some years been studying the density variations through the earth's interior by means of observations of earthquake waves. Earthquake vibrations travel right through the earth and vary in speed according to the density and elastic properties of the material encountered. By studying their times of arrival at different seismological observatories throughout the world, various properties of the earth's interior can be estimated.

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