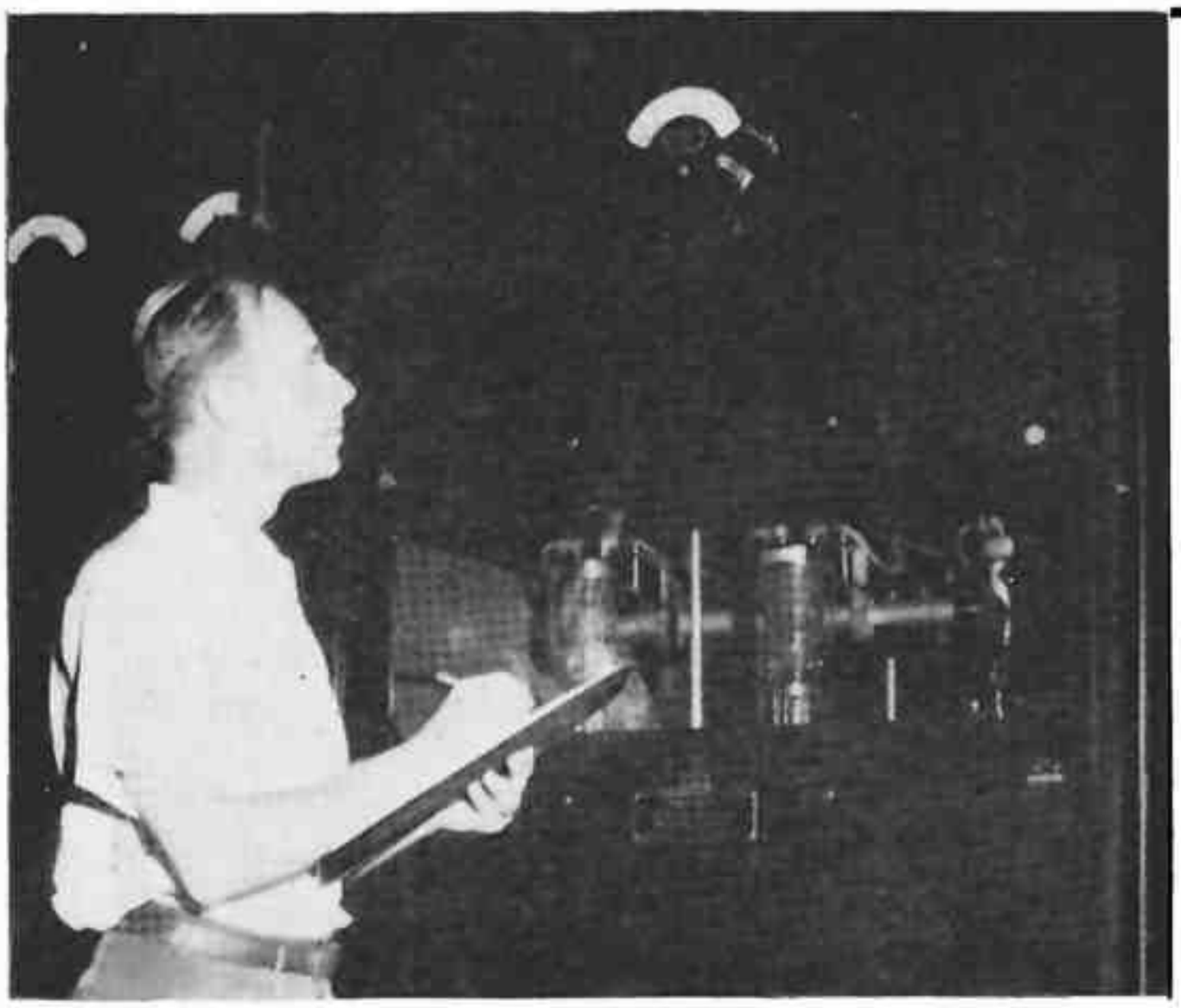
War-Emergency Operation



WOR has no trouble shifting frequency on its emergency Western Electric transmitter (above). Some other broadcasters will find the job difficult

IN EVERY RECENT period of national or local emergency, the broadcast stations have played an important part in keeping the public informed and in maintaining morale. At present, as during World War II, the chief concern is their possible secondary role as navigation aids to enemy aircraft. Recently, the Federal Communications Commission, acting as the appropriate government agency for the several agencies concerned, outlined the problem to the broadcasters with one possible solution.

For the broadcasters, the plan indicates in a general way how they will operate their transmitters and what their program fare must be during an alert. Whether they will operate at all depends upon their desire to cooperate in the overall system. At present, there is no plan for the operation of television or frequency-modulation transmitters after they have sent their initial warning message. Only amplitude-modulation transmitters are considered for alert operation.

The engineering details are more complex and many of them should not be freely revealed. However, the present plan has been designed to furnish at least a minimum of fairly good broadcast reception to most parts of the country and to deny navigational information to aircraft equipped with any type of modern direction-finding equipment. Its nature is such that even if every single detail of the operation were known, direction finders would still be unable to use the signals. Only widespread sabotage and enemy control of the broadcast plant can compromise the system.

Synchronous Frequency

The basis of the plan is operation by all participating stations upon a common or synchronous frequency. Provided each transmitter maintains a tolerance of ±20 cycles (as presently required under normal service) great difficulty is experienced in obtaining a line of position with d-f equipment. And broadcast reception of a common program is excellent. In actual practice, stations can be grouped on a geographical basis using two or more common frequencies throughout the country. By this means, a greater number of programs (appropriate to the various areas) can be presented, one to a group, with good reception in the coverage areas of each group. Navigational information is only very slightly enhanced using several common frequencies.

It is known, however, that a modern automatic direction finder will indicate the direction of the strongest signal in a common-frequency group. Given sufficient time, or with the aid of espionage, an aircraft could eventually determine the location of the strongest signal and from that, the orientation of the desired target.

Sequential and Pulsating

To overcome the vulnerability of simple common-frequency operation two other techniques can be added, either of which practically eliminates compromising the system for military security. These techniques have been termed sequential operation and pulsating power operation. It should be remembered that in every case, each station in a common-frequency group transmits exactly the same program from a common source.

Common-frequency sequential operation requires that each station of a cluster or group operate intermittently for about a minute. As the first station leaves the air, another immediately comes on. Ideally, the sequence in which the

BROAD PROBLEM

The problem of how to deny navigational aid to enemy aircraft in the event of war is tremendous. Just how complex it is becomes apparent to anyone glancing at an aeronautical chart, or listening for a quarter hour to airways communications channels. How can we, for example, silence radio ranges, beacons, loran and all the rest without jeopardizing our own transportation at sea and in the air?

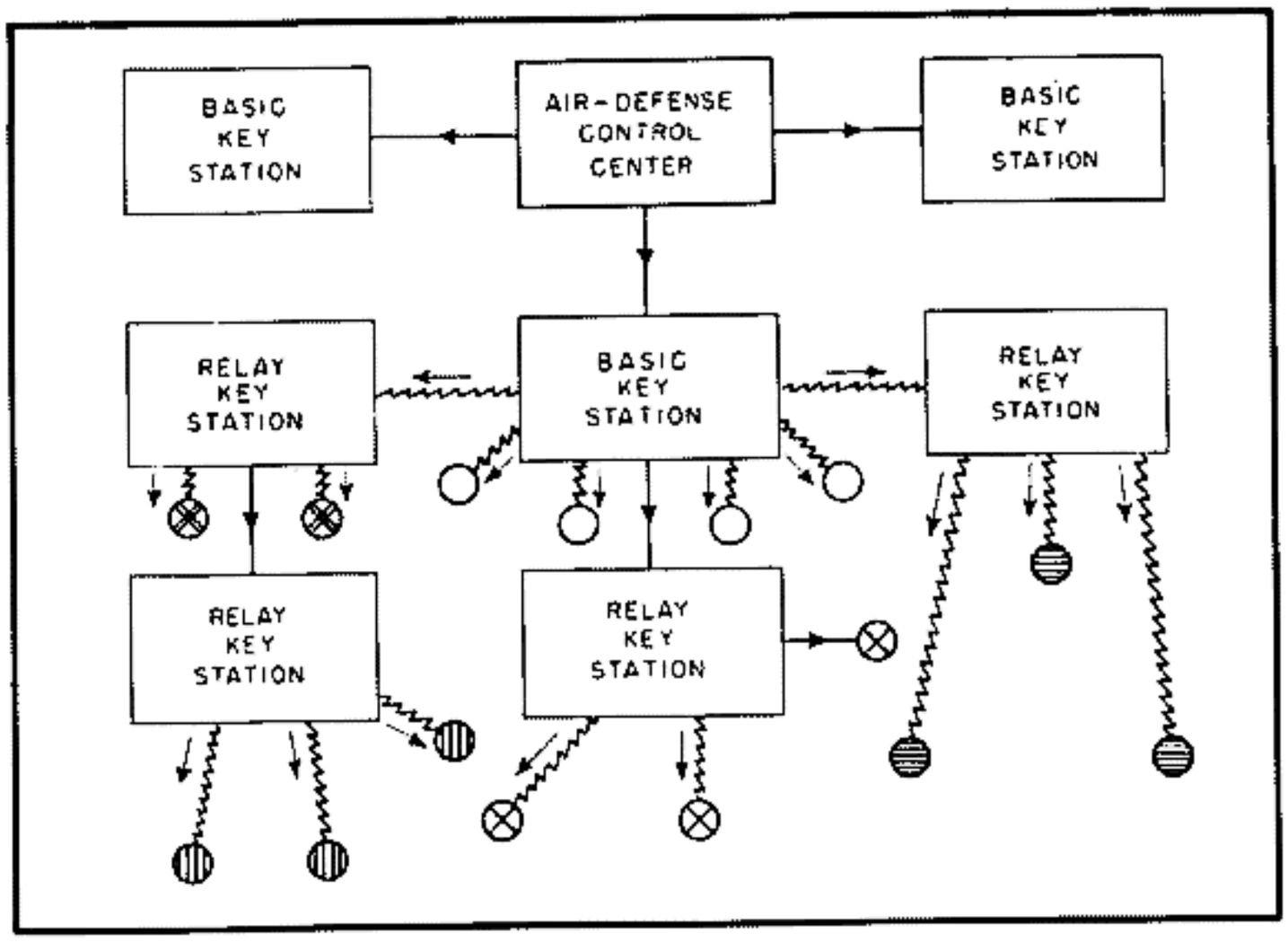
Making a minimum a-m broadcast service available at all times without offering aid and comfort to the enemy, and his missiles, is a small part of the whole task. The editors hope that this article may stir up ideas applicable to other services

# of Broadcast Stations

Stations in the a-m band, which have proved our best source of public information during disaster and flood, must remain on the air for Civilian Defense. How to prevent their being used as targets for enemy missiles during an alert is explained

stations follow one another should be varied. It will probably be necessary during the initial stages of the plan for each station to be manually controlled and remain on the air for as long as two minutes. Tests show that transmission periods of less than half a minute result in greater deception. Eventually, electronic equipment may be available so that the group sequence can be controlled from a central point.

Pulsating operation can be employed either by single stations or groups of stations and requires reducing the output power of the transmitter over a 10-to-1 ratio, preferably in periods varying from less than half a minute to not more than a minute. It will obviously be quite a trick to reduce power from a 50-kilowatt transmitter down to 5 kw and this technique may not be applicable in many cases. However, it is planned generally to limit alert power to 5 kw in order to equalize signal strengths. Under common-frequency pulsating operation it may often be possible for stations in adjacent towns or cities, if not too close together, to transmit different program material.



Chain of command for alert warnings from air-defense control centers via basic-key and relay-key broadcast stations to satellites. Solid lines are telephone; broken lines are radio links. Circles represent stations in common-frequency groups

Overall Plan

The block diagram gives a representative picture of the various station interconnections that would be necessary. Orders originate in the various air-defense control centers, but their implementation will largely reside in the basic key stations and the relay key stations. Programs and control signals or orders will progress to each individual station by any one means or combination of several means, including land-line and direct pickup of broadcasts.

While there is presently no compulsion for any broadcaster to enter into these plans, it is obvious that the effectiveness of the system increases directly with the number of stations in a group. Therefore, it might be necessary for the FCC to draft certain broadcast facilities. It is likewise apparent that the plan will cost money. Estimates vary from about $500 for a small station to many times this amount for the big ones. Costs of new crystals and ovens, frequency changing systems, antenna switching and retuning mechanisms running into many dollars will be paid for by the broadcasters, according to the plan. In addition, each station must provide itself with an alert receiver to supplement wire lines. Since non-directional operation will be used during the alert, it may be less expensive to use existing auxiliary antennas or even to erect simple antennas where switching off all but one tower of a directive array might prove cumbersome and expensive.

The block diagram indicates that a large number of permanent telephone lines and additional toll calls will be required just to set up the system and rehearse operations. These facilities will be paid for by the government.

Operation of television and f-m stations (as well as isolated a-m stations) will be a matter for further study. The former classes of stations are generally operated in the heart of a city and, as is particularly true of the Empire State installations in New York City, present an excellent target under normal conditions of service. Besides, in the event of widespread power failures their utility would be limited because there are so few automobile or battery operated tv and f-m receivers in the hands of the public.