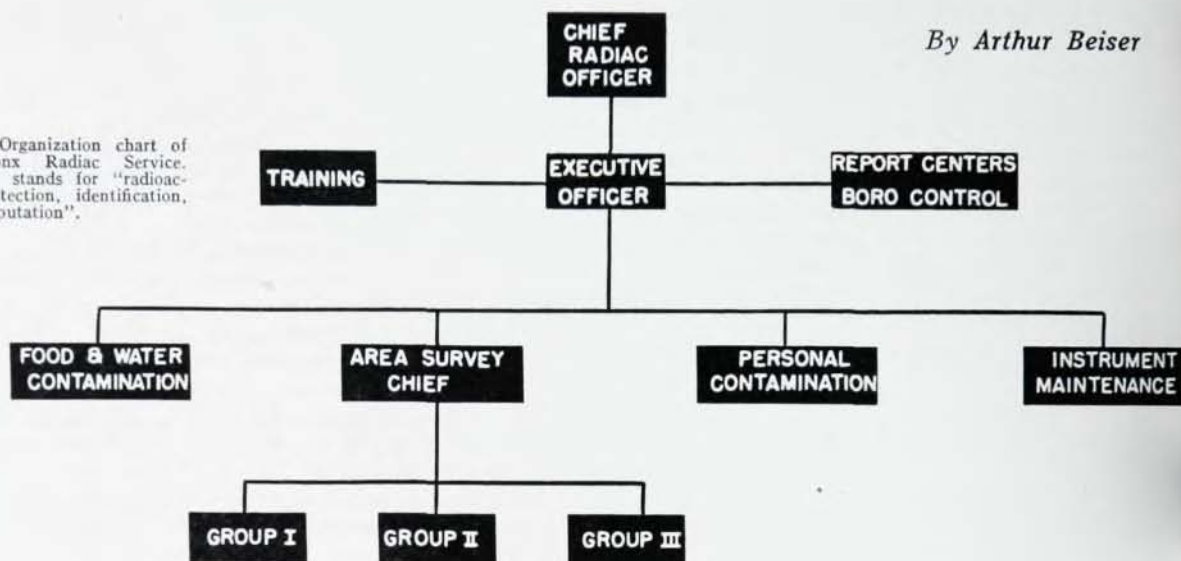


RADIAC

and CIVIL DEFENSE

By Arthur Beiser

Fig. 1. Organization chart of the Bronx Radiac Service. "Radiac" stands for "radioactivity detection, identification, and computation".



AN ESSENTIAL ELEMENT in any modern civil defense program is a radiological service, the principal function of which is the detection of radioactive contamination following the use of atomic weapons. As is the case with more conventional disaster emergencies, the medical, fire, and rescue units will have the greatest responsibilities in such an event, the radiological group being purely ancillary. The importance of the latter, while perhaps overemphasized in view of the properties of the "nominal" atomic bomb, still remains if for no other reason than the reassurance of the civilian population. Further, should radioactive warfare on a significant scale actually be employed, properly trained and equipped personnel could be very effective in minimizing casualties from that source. In this article the Bronx unit of the New York City Radiological Service (*radiac*) will be described, and it is hoped that this information may be of some assistance to physicists engaged in working with similar groups elsewhere.

There are two basic functions that radiac must carry out: contaminated areas must be discovered and individuals must be examined for contamination. In the former case the radioactive areas are to be suitably marked and their locations and the radiation levels reported to an appropriate control center. On the basis of

the levels encountered, the period of time during which other civil defense workers may safely work in such areas may then be calculated. If the evacuation of residents is necessary, this must be communicated to the police and public welfare authorities by radiac.

The examination of survivors of the blast for contamination is done by a personnel monitoring group. If radiation intensities exceeding a certain maximum (about 10 mr/hour) are found on an individual's skin or clothing, appropriate decontamination must be carried out. It is not expected that radiac personnel are to do the latter, since they will undoubtedly be swamped with other work, but rather that volunteers with the public health and welfare services will perform such functions.

Before describing the actual operation of radiac in an emergency it is appropriate to consider its structure. Figure 1 shows the table of organization of the Bronx radiac group as it is presently constituted. The chief borough radiac officer directs the overall operation of the group and, with the chiefs of the other boroughs and the director of radiac for the city, formulates the general policies and procedures to be followed. In his absence the alternate takes over his responsibilities. The executive officer actually handles the routine function-

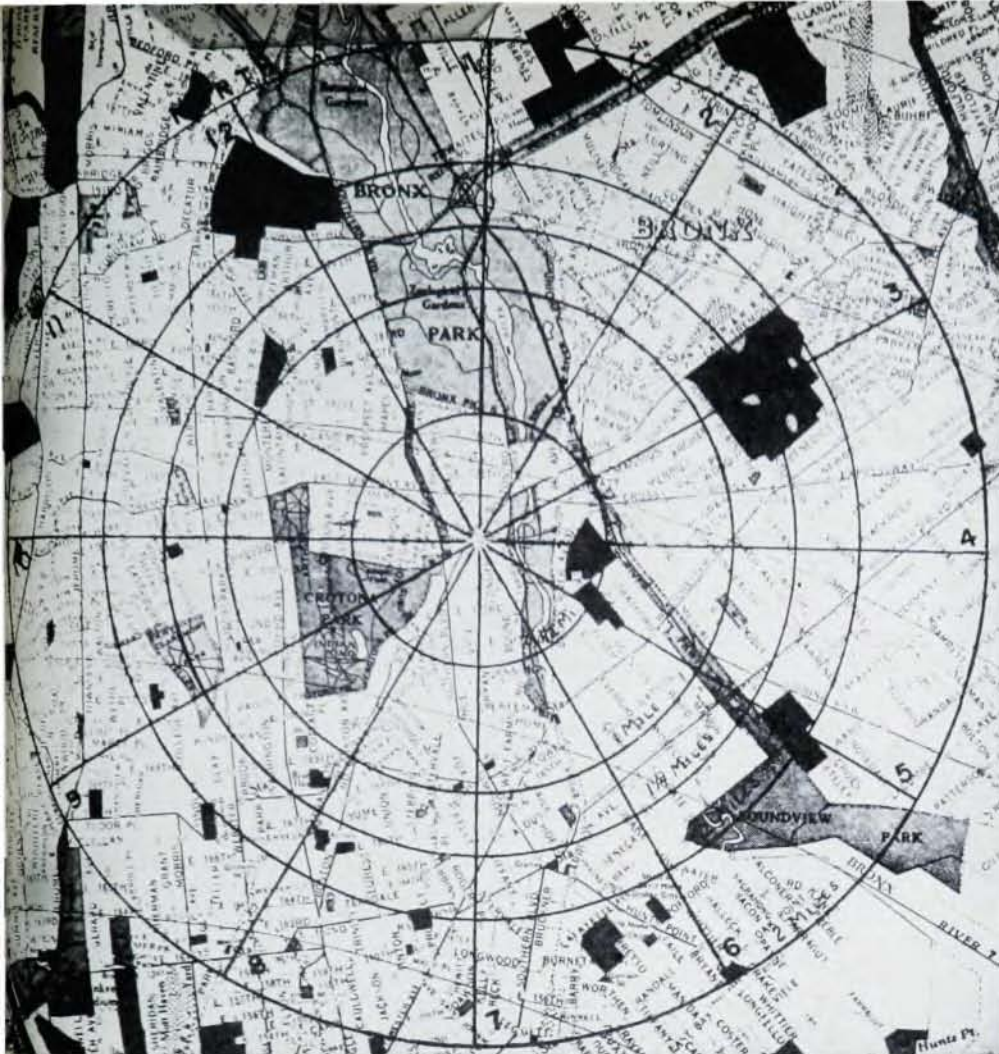


Fig. 2. Map of the Bronx, showing grid of sectors superimposed with the center at ground zero for recent practice drill.

ing of the group, coordinating the activities of the various sections and carrying out the directives of the chief through them. The special assistants act as observers, messengers, etc.

THE PERSON IN CHARGE OF TRAINING arranges for the giving of courses to new members and refresher courses for the existing personnel. Such courses involve about five or six hours of lectures on the atomic bomb and its effects, instruments for radiation detection and their use in the field, and the operation of the radiac service. At least a high school education is required, although some college work in physics is desirable. The lectures are usually supplemented by a practice drill with a radioactive source (0.1 to 1 curie of cobalt 60) hidden in a field for area survey experience and a number of phosphorus 32 sources of several hundred microcuries each concealed in the clothing of the instructor and that of some of the students for monitoring practice.

The report centers, whose duties are described below, each have assigned to them one person and one or more alternates. At present there are four such centers in the Bronx. The borough control staff usually consists of the chief radiac officer and an assistant, with his

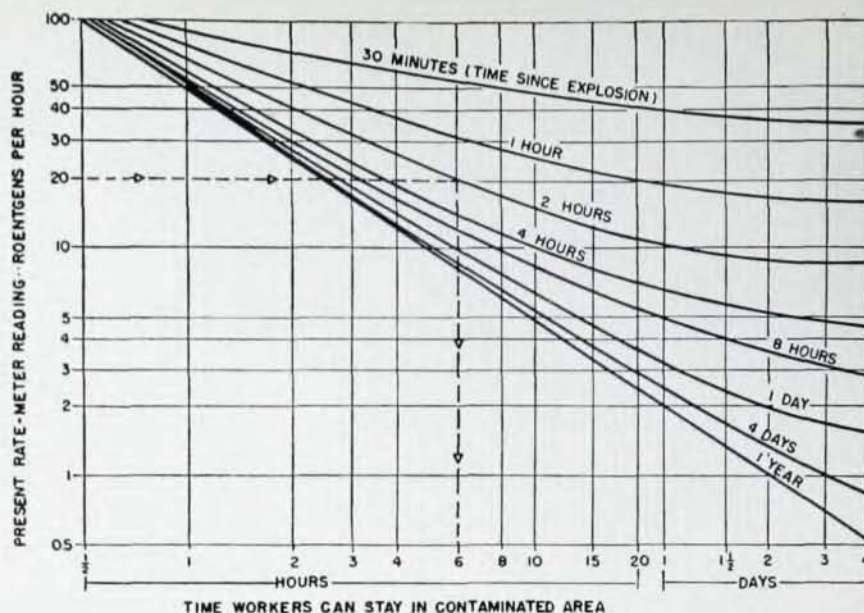
alternate or the executive officer serving in his absence. At least two alternates are desirable for the posts that are to be manned following a raid, since the ability of an individual to reach his assignment even if he survives is fairly uncertain.

The overall New York civil defense plan calls for at least one personnel contamination monitor per emergency medical and emergency welfare installation, with others being located at the various hospitals. Such monitors are organized into the personnel survey section and, unlike the area survey group, do no independent field work. The latter is composed of five-man teams, with several hospitals serving as assembly points and storage centers for a number of teams. It has been proposed that four men per team be equipped with radiation detection instruments and that the fifth, the leader, have a portable two-way radio for communications. Since the latter are not available at present all five now have survey instruments.

The work of the food and water contamination section involves, as the name implies, testing samples taken from the city's water supply and from unpackaged food for radioactivity. Since even minute quantities of cer-

The Bronx radiac unit was organized by Serge A. Korff and the author, both of the New York University physics department.

Fig. 3. Emergency permissible working time in contaminated areas, based upon a maximum safe dose of 50 roentgens and taking into account the expected rate of decay of the radiation following an atomic bomb blast.



tain active elements are dangerous when taken internally, the testing is to be done in laboratories already familiar with the appropriate precision techniques. Several hospital and university radioisotope laboratories have volunteered their facilities for this purpose. Food and beverages in sealed containers, especially bottles and cans, will of course ordinarily be entirely safe and require no testing.

The instrument maintenance section is composed of members of other groups within the organization who are qualified for this work. Electrical engineers and radio and television technicians and repairmen are especially suitable, and no difficulty was experienced in securing their services. This section tests the operation of each instrument at frequent intervals, replacing batteries and effecting repairs when necessary. In the event of serious trouble the defective instrument is returned to the manufacturer for servicing. In a short time the maintenance section will also have facilities for the calibration of the instruments, which is now being done by the city headquarters staff.

IN THE EVENT OF A RAID, assuming here that a single atomic bomb is dropped on the Bronx, the location of ground zero (the point on the ground directly below where the bomb has exploded) is first determined. The area involved is then divided by the borough control headquarters into twelve sectors radiating from ground zero (see Figure 2), each having a field headquarters. The report centers, located at various places in the Bronx, function immediately after the explosion and aid in the determination of ground zero and in assessing the approximate extent of the damage. When the sector headquarters are set up they supersede the report centers, which have virtually no further functions as far as radiac is concerned. Borough control orders teams from the various emergency services dispatched in accordance with their evaluation of the information received from the report centers and later from the sector headquarters.

The radiac personnel are expected to report as soon as possible after a bombing to the hospital assembly point nearest them, the first one to arrive remaining there to act as the dispatcher. The others form five-man teams as they arrive, securing instruments and other equipment from the supply there. The teams are then sent out for reconnaissance upon the receipt of instructions from borough control, and, if communications permit, they remain in either direct or indirect contact with borough control. The personnel survey people also report to the assembly points in order to secure instruments, and they then either remain at the hospital itself or proceed to the emergency medical and welfare stations that are being set up or to other hospitals.

The instruments employed by radiac are of two general kinds: ionization chambers and Geiger counters. The former, which can be obtained with broad-range (5 to 500 r/hour or more usable range) logarithmic scales, are used for area surveying where low radiation levels are of little importance. In conjunction with charts of permissible working times in radioactive areas (Figure 3) measurements made with these meters permit determining how long civil defense workers can safely remain in these areas. Geiger counters, which are useful in the approximate interval between 0.5 and 50 mr/hour, are necessary for personnel contamination inspections since even low rates of activity are harmful when on or very near the surface of the body.

In addition to instruments, respirators, and similar equipment already supplied it is hoped to equip each radiac member with an individual dosimeter to prevent his overexposure. Both electroscope and Land-type film packets are suitable, with the latter, being much less expensive, probably preferable for that reason. Indeed, if the cost is small enough, every civil defense worker in New York will be supplied with a number of film dosimeters for periodic inspection when and if it becomes necessary to work in the vicinity of an atomic bomb explosion.