# Chapter 10
# Fallout Meters

## THE CRITICAL NEED

A survivor in a shelter that does not have a dependable fallout meter—or that has one but lacks someone who knows how to use it—will face a prolonged nightmare of uncertainties. Human beings cannot feel, smell, taste, hear, or see fallout radiation. A heavy attack would put most radio stations off the air, due to the effects of electromagnetic pulse, blast, fire, or fallout from explosions. Because fallout intensities often vary greatly over short distances, those stations still broadcasting would rarely be able to give reliable information concerning the constantly changing radiation dangers around a survivor's shelter.

Which parts of the shelter give the best protection? How large is the radiation dose being received by each person? When is it safe to leave the shelter for a few minutes? When can one leave for an hour's walk to get desperately needed water? As the fallout continues to decay, how long can one safely work each day outside the shelter? When can the shelter be left for good? Only an accurate, dependable fallout meter will enable survivors to answer these life-or-death questions.

Civil defense experts have long recognized the central importance of having an adequate number of fallout meters and enough people trained to use them intelligently. In 1953 the National Academy of Sciences' Advisory Committee on Civil Defense concluded: "The final effectiveness of shelter depends upon the occupants of any shelter having simple, rugged, and reliable dose-rate meters to measure the fallout dose rate outside the shelter."

Note that *dose-rate* meters are specified. A dose-rate meter (also called a survey meter) is a fallout meter designed to measure the roentgens per hour (R/hr) of fallout radiation to which it is exposed. The other important type of fallout meter used in civil defense is a dosimeter, which measures the total dose (R) to which it has been exposed since being charged, or the dose between readings.

## COMMERCIALLY AVAILABLE FALLOUT METERS

In 1979 an American does not have many choices if he wants to buy an off-the-shelf dose-rate meter suitable for measuring the high levels of fallout radiation that would result from a nuclear attack. Although inexpensive dose-rate meters and dosimeters have been under development by the military services and civil defense researchers for the past 10 years, they have not been produced commercially. Field tests of factory-produced models have not been completed at this writing.

An American instrument that satisfies most requirements of a wartime fallout meter is the Panoramic 470-A Survey Meter. This dose-rate meter is manufactured and sold by Victoreen Instrument Division, 10101 Woodland Avenue, Cleveland, Ohio 44104. It measures dose rates from 1 mR/hr to 1000 R/hr, is powered by 6 small batteries, and has modern integrated circuits that prolong battery life. The list price in 1979 was $810. Another American dose-rate meter is the RO-1 Survey Meter of Eberline Instrument Corp., P.O. Box 2108, Santa Fe, New Mexico 87501. This instrument measures dose rates from 0.2 mR/hr up to 500 R/hr and sold for $1125 in 1979.

A more rugged dose-rate meter, an instrument designed for wartime use that measures from 0.01 mR/hr to 300 R/hr, can be purchased from a Finnish manufacturer, Wallac Nuclear Instruments, P.O.

Box 10, 20101 Turku 10, Finland. Including import duties, the 1978 cost of the Wallac model RD-8 Universal Radiation Survey Meter was about $565. The author and an associate both have owned Wallac RD-8 rate meters for years, with no maintenance problems.

Commercially available dosimeters, which record the total dose received between readings, are not as expensive. In early 1978, high-range dosimeters retailed for about $70. A dosimeter sold by Dosimeter Corporation of America and by Victoreen Instrument Division measures doses up to 600 R. (Current price information can be obtained by writing to Dosimeter Corporation of America at P.O. Box 42377, Cincinnati, Ohio 45242 and to Victoreen Instrument Division, 10101 Woodland Avenue, Cleveland, Ohio 44104.)

A battery-powered charger must be used to operate all available dosimeters; one charger can be used for several of these instruments. A charger can be purchased from the same companies for about $70.

When the total dose shown on a dosimeter is observed to be increasing rapidly, a high-range dosimeter can be used to determine the dose rate, although this method is time-consuming. (If a 600 R dosimeter is exposed for 30 minutes and records a dose of 40 R, the dose rate is 40 R ÷ $^1/_2$ hr = 80 R/hr.)

Periodically, all commercially available fallout meters should be (1) supplied with fresh batteries, (2) checked with a radiation source (preferably each year) to see if they are still measuring radiation accurately, and (3) repaired if necessary.

The reader is advised to buy a good commercial dose-rate meter with which to quickly measure high levels of radiation, if he can afford one. A good commercial instrument, if properly maintained and calibrated, can be used for many years. However, the owner of a single expensive fallout meter would do well to make a KFM, the dependable homemade fallout meter described in Appendix C, for use as a back-up instrument in case of malfunction or breakage.

## WARTIME RESERVES OF FALLOUT METERS

One important U.S. asset for surviving a nuclear war is the Defense Civil Preparedness Agency's supply of fallout meters. These instruments include approximately 660,000 dose-rate meters and about 2,900,000 dosimeters, all suitable for wartime use. In 1979 almost all these instruments are in good working condition. Unfortunately, most of them are in cities likely to be targeted, and are kept in existing shelters or stored in public buildings. If there were a sufficiently long, officially recognized period of warning before an attack, a large fraction of these fallout meters could be moved to locations outside areas of probable blast and fire damage and placed in officially designated fallout shelters.

It would be highly desirable for most families to have their own fallout meters. This is particularly true if they live in a region where chances of surviving a nuclear attack are good—or if in a crisis they plan to evacuate to such a favorable location.

## A HOMEMADE DOSE-RATE METER

The only homemade fallout meter that is accurate and dependable was invented and thoroughly tested at Oak Ridge National Laboratory.[31] It is called the Kearny Fallout Meter (KFM); one is pictured in Fig. 10.1. This simple electrostatic instrument is made with common, inexpensive materials found in millions of homes, requires no

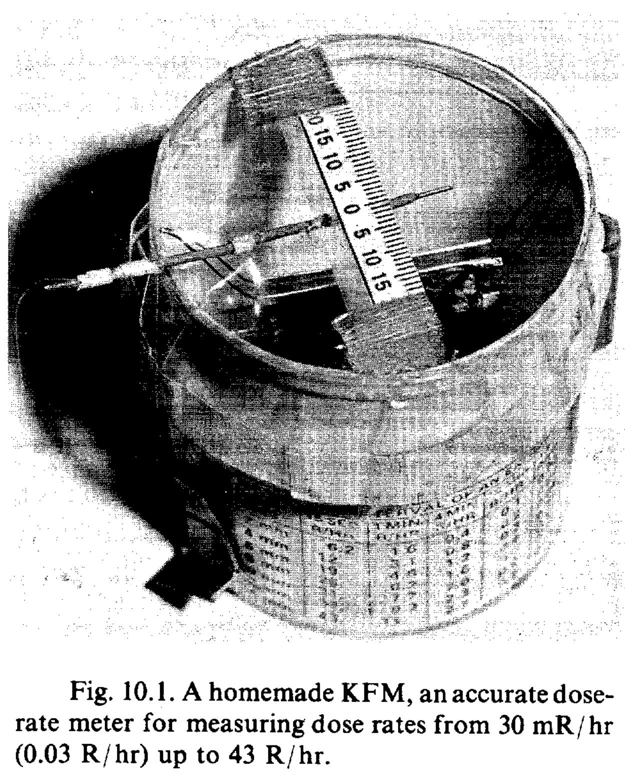


**Fig. 10.1. A homemade KFM, an accurate dose-rate meter for measuring dose rates from 30 mR/hr (0.03 R/hr) up to 43 R/hr.**

radioactive material to calibrate or check for accuracy, and needs no battery to operate. Detailed instructions that have enabled untrained citizens to make and use KFMs are given in Appendix C, along with an extra set of the cut-out patterns.

The preferred materials actually used in a KFM cost less than $2.00 in 1978. The materials to make a plastic "dry bucket," with a vinyl cover needed for charging a KFM in very humid conditions, cost about $3.50. In the unlikely event that a householder has to go out and buy all the materials needed for a KFM and its "dry bucket," it would cost less than $11.00. This sum will actually buy most of the materials for several KFMs. For example, only 39 square inches of ordinary aluminum foil is required to make the two "leaves" of this simple instrument. In 1979 ordinary (not "heavy duty") aluminum foil made in the United States weighed about 8.2 grams per 2 square feet. Variations in the weight of the foil used do not affect the accuracy of a KFM nearly as much as do changes in the dimensions of this instrument.

## ADVICE ON BUILDING A KFM

The reader is urged to set aside several hours in the near future for making a KFM and for mastering its use. During field tests, average American families have needed about 6 hours to study the instructions given in Appendix C, to make this simple instrument, and to learn how to use it. These several hours may not be available in the midst of a crisis. Higher priority work would be the building of a high-protection-factor shelter, the making of a shelter-ventilating pump, and the storing of adequate water. In a crisis it might not be possible to obtain some needed materials for a KFM.

It is very difficult to concentrate on unfamiliar details during a nerve-racking crisis, or to do delicate work with hands that may become unsteady. The best time to build and learn to use a KFM is in peacetime, long before a crisis. Then this long-lasting instrument should be stored for possible future need.