NOMOGRAM SOLUTION OF NUCLEAR DEFENSE DECAY PROBLEMS

1. PURPOSE. Under certain conditions a nuclear attack may create a radiological hazard to personnel. Under such conditions, responsible authority will have need for a rapid method of determining such factors as radiological dosages, dose-rates, and lengths of time personnel may remain in the affected area without exceeding specified dosage limits. The mathematical solution of these quantities is not simple and is very time consuming. The following two nomograms are sufficient to solve these problems that may arise relating to radiological contamination.

2. INSTRUCTIONS. These nomograms are used in the same manner as other nomograms; i.e. connecting two different values with a straight line will give a third value. The Standard Intensity, which is the dose rate in roentgens per hour one hour after the detonation, is used as the connecting link between the two nomograms. The Pivot, a mathematical relationship (D/R), is used on the Dose Nomogram, only to relate dose and times.

Sample problems are provided on the back of the Dose Nomogram. Note: a) radiacs are not highly accurate instruments, b) these nomograms are based on an average decay rate, c) various individuals will read the nomograms differently; therefore rounding off answers on the safe side is a wise procedure. The information on the back of the Intensity Nomogram is unrelated to the use of these nomograms. The nomograms were supplied by the NBC Defense School, San Francisco.

3. RELATED INFORMATION.

a. Nomograms are of use only after the peak intensity has been reached and the decay period has started. The dose during the build up period may be calculated by the use of the following formula: $D = IT$

D - Dose received in roentgens.
T - Time in hours from arrival of fallout to peak intensity.
I - Average intensity in roentgens per hour; which will be the initial intensity added to the peak intensity and divided by 2.

This formula may also be used for any time period before or after the peak intensity.

b. Intensity of radiation will decrease with an increase in shielding.

This difference in radiation may be calculated with the aid of the following formula: $R = I/Io$

R - Residual Number; a ratio of intensities.
I - Intensity inside ship in roentgens per hour.
Io - Intensity outside ship in roentgens per hour.

Typical figures for R would be: wheel house 0.7; deep in the house structure 0.5; deep in the hull 0.3. Using these values for R, and knowing the intensity inside the ship, the outside intensity may be calculated.