CHAPTER X

RADIO AND RADAR EFFECTS

INTRODUCTION

RADIO BLACKOUT

10.01 The transmission of electromagnetic waves with wavelengths of 1 millimeter or more, which are used for radio communications and for radar, is often dependent upon the electrical properties, i.e., the ionization (§ 8.17), of the atmosphere. The radiations from the fireball of a nuclear explosion and from the radioactive debris can produce marked changes in the atmospheric ionization. The explosion can, therefore, disturb the propagation of the electromagnetic waves mentioned above. Apart from the energy yield of the explosion, the effects are dependent on the altitudes of the burst and of the debris and on the wavelength (or frequency) of the electromagnetic waves. In certain circumstances, e.g., short-wave (high-frequency) communications after the explosion of a nuclear weapon at an altitude above about 40 miles, the electromagnetic signals may be completely disrupted, i.e., "blacked out," for several hours.

10.02 In this chapter, the normal ionization of the atmosphere will be described and this will be followed by a discussion of the disturbances produced by nuclear bursts at various altitudes. Consideration will then be given to the effects of these disturbances on the propagation of electromagnetic waves in different frequency ranges. Apart from the effects that can be ascribed directly to changes in ionization, radio communications and radar signals can be degraded in other ways, e.g., by noise, distortion, changes in direction, etc. These disturbances, which cannot be treated in a quantitative manner, will be discussed briefly.

ELECTROMAGNETIC PULSE

10.03 Another consequence of a nuclear explosion that may cause temporary interference with radio and radar signals is an electrical (or electromagnetic) pulse of short duration emitted from the region of the burst. The most serious potential effects of this pulse are damage to electrical and electronic equipment, rather than to the propagation of electromagnetic waves. Hence, the electromagnetic pulse will be considered separately in Chapter XI.