It is unreasonable, because of the distribution of available stations, to extrapolate to other northern hemisphere continental locations the R_g detection thresholds for NTS explosions achievable at nearby United States stations. However, the Canadian R_g results, an explosion identification threshold of about m5.0 (10 - 20 kilotons) for NTS at a mean distance of about 25°, may be possible on any northern hemisphere continental mass, although this result remains unproven as yet outside of North America.

This 10 to 20 kiloton hardrock explosion identification threshold for NTS using Canadian stations is some three times lower than the threshold obtained above in the illustrative example used to compare R_g and 20-second wave detection. This difference between one empirical result and a theoretical study demonstrates the conservative nature of the assumptions made in defining the 50 per cent interval probability of Rayleigh wave detection at a station in section 3.3.

8.4 Rayleigh Wave Spectral Ratio

The relative excitation of Rayleigh waves by earthquakes and explosions has been described in the previous section in relation to the P wave energy (or magnitude) of the events. Important differences between earthquakes and explosions have been shown to exist within the Rayleigh wave spectrum itself. This phenomenon was given brief coverage in the SIPRI document in diagrams illustrating the larger amount of longer period (30 seconds) Rayleigh wave energy in earthquakes compared to that in explosions. The discriminant has been quantified by Molnar et al. (1969) using new high-gain, long-period seismographs as a ratio of the energy in Rayleigh waves at periods of 19 to 22 seconds to the energy at periods of 40 to 60 seconds. Using special long-period seismographs installed in the eastern United States, this Rayleigh wave spectral ratio achieves complete separation of earthquakes and explosions in the western United States.

The special seismograph used by Molnar et al. is the first of a number of such systems planned by the United States for world-wide deployment. However, these systems have not been included in the United States UN return listing stations with guaranteed accessibility to data, and, therefore, cannot be considered as available to this study.

With further testing, the Rayleigh wave spectral ratio may prove to be an important discrimination criterion; the major difficulty apparent from the study by Molnar et al. is the rather high threshold of detection of the longer period Rayleigh waves, particularly for explosions. Using only the positive measurements presented by Molnar et al. (i.e., ignoring the noise-limited information on their figures), we estimate that using equipment of this type the thresholds of detection of Rayleigh waves are m3.6 and m4.9 for 20-second waves for earthquakes and explosions, respectively, and m3.8 and m5.3 for 40- to 60-second waves for earthquakes and explosions, respectively; this is for an epicentral distance of about 30°. The threshold of application of the Rayleigh wave spectral ratio will be at the larger set of magnitudes. Thus, the threshold of application of the positive ratio criterion is at a high