results achieved prior to that date; see also Capon et al. (1969), Lacoss (1969b), Liebermann and Pomeroy (1969), Basham (1969a, 1969b), Molner et al. (1969), Lambert et al. (1969), Liebermann and Basham (1970) and Evernden (1970c) for more recent results. In 1968, arguments were still raised about the validity of this criterion at low magnitudes: we now believe that there is clear proof (see, for example, Evernden, 1970c) that, provided the appropriate waves can be detected, the method works at least down to magnitudes below those considered in this report.

The form of M versus m for earthquakes and explosions and the separation between populations when plotted in this manner have been discussed briefly in section 7.3. Although the scatter of individual events with respect to average relationships of the forms of equations (5) and (7) is very large, and the regional variations in Rayleigh wave propagation phenomena produce large variations in the forms of equations (5) and (7), in all studies the populations of earthquakes and explosions are sufficiently separated to allow consideration of this criteria as the most successful positive identifier of shallow earthquakes and underground explosions. It is apparent from each set of research results that the magnitude threshold above which the criterion can be applied is (in the absence of interfering Rayleigh Waves) equal to the magnitude threshold at which the explosion Rayleigh wave can be detected. This occurs because, as explained in sections 5.3 and 5.4, the earthquake Rayleigh wave detection threshold is about $\delta m0.7$ higher than the P wave detection threshold and because, as explained in section 7.3, the explosion Rayleigh wave detection threshold is about $\delta m1.0$ higher than the earthquake Rayleigh wave threshold. Thus, the problem of discrimination using this technique reduces to one of detecting explosion Rayleigh waves and can be considered in the separate ways that Rayleigh wave detection has been considered in previous sections.

Consider first the 6 northern hemisphere specific sites in Table 5, and adopt 4-station thresholds with some azimuthal variation as adequate for identification purposes. The earthquake Rayleigh wave detection thresholds of m4.7 - m5.0 (see Table 7) increase to explosion detection and identification thresholds of m5.7 to m6.0, using the gross average properties of the earth and ignoring for the moment the advantages gained by R_g continental propagation and matched filter processing. The equivalent available empirical study supports this formal calculation: Basham (1969b) demonstrates positive identification of KAZ and NVZ explosions at a threshold of about m6.0 using relatively insensitive conventional Canadian stations; this threshold can, therefore, be expected to reduce to about m5.7 using more sensitive conventional and array stations from the 51-station LPZ network.

Applying matched filters to specific site explosions, the possible threshold reduction is $\delta m0.2$ to $\delta m0.3$, assuming each of the stations involved has the capability of applying the matched filtering process (see section 6.4). The only published result is, in effect, one-station coverage for which the threshold has naturally been reduced below the 4-station requirement we have adopted. Lacoss (1969a) demonstrates that applying matched filters to LAO data for KAZ explosion Rayleigh waves yields a 90 per cent probability of detection (and, therefore, of identification) at