

CHAPTER K

SEISMIC SENSORS

Seismic monitoring as a verification technique is most frequently discussed in the context of a nuclear test ban. In this sense, seismic monitoring involves recording and analyzing ground shock waves at a considerable distance from the event. While such seismic devices could accurately be described as remote sensors and therefore included in Chapter J, because of the number of proposals abstracted and the restricted utility of the method, a separate chapter has been created. It should also be pointed out that short-range seismic detectors also exist which are discussed in Chapter I.

There are three main requirements for seismic monitoring. First, to detect a seismic event; second, to locate it; and third to identify whether it represents a natural event or a nuclear explosion. Because of limitations on equipment sensitivity there is a threshold magnitude of event which is detectable. Locating an event usually demands detection at two or more distantly separated locations (i.e. a detection network) and identification depends on the shock wave pattern or "signature" of the event.

The magnitude of the shock produced by a nuclear explosion varies according to its location and the type of earth or rock in which it is detonated. There is controversy over the minimum size of nuclear burst which can be detected and also over how far it is possible to disguise the "signature" of a burst to simulate a natural event.

There are two types of seismic detection networks relevant to monitoring a nuclear test ban: internal or "in-country" networks (identified in the Compendium as "intra-border stations") and external networks outside a nation's borders (identified in the Compendium as "extra-border stations"). The former type are more intrusive than the latter because they involve a state's granting foreign nationals access to its territory. It is possible, however, that internal seismic stations could be left unattended after they are established. Internal seismic detection networks appear able to provide better detection capabilities than external networks because they can be located nearer to the sources of potentially controversial seismic events.

Many countries possess seismic detection stations for earthquake monitoring and there are international data exchange networks. However, some countries notably the USSR have been reticent about contributing to such networks, leaving a significant gap in geographic coverage.

The Limited Test Ban Treaty of 1963 does not include specific provision for verification although it is written so as to ban only those explosions which it was believed could be detected. A very large proportion of the verification proposals in this chapter have been concerned with converting this limited test ban into a comprehensive test ban or at least extending the range of explosions banned, and with introducing adequate verification for such an extension. Whether an officially accepted and internationally operated verification network