Chapter 9

DEEP UNDERGROUND BASING

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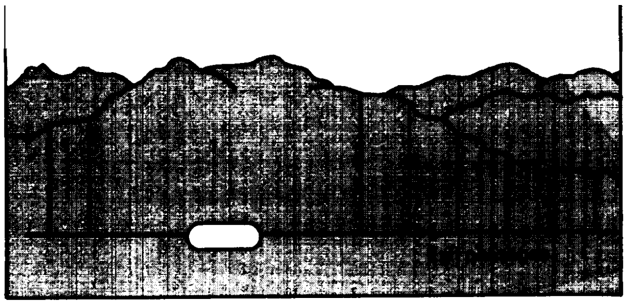
LIST OF FIGURES

DEEP UNDERGROUND BASING

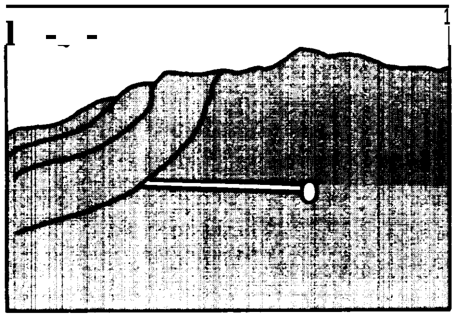
[illegible] the deployment of the missile force in deep mountain in tunnels, buried thousands of feet under the surface, thereby providing protection for the missiles from a nuclear attack. Such a facility would be manned and would have self-contained provisions for electrical power, life-support, and missile maintenance. Upon the command to launch, tunnels would need to be bored to the surface to give the missile outside access preparatory to being launched.

The limitations of such a missile deployment derive not from the technical feasibility of its construction, but from the time constraints of a reliable missile egress for launch A sc he-m,] t i c for two types of missile egress is i1-lustrated in figure 116A and B shows a number of completed vertical exit passages that are preconstructed. Missile egress through these passages could be rapid, but the exit portals could be easily attacked with nuclear weapons, which would deny then the ability to launch the missile. Even "hardened" exit portals would be vulnerable with today's missile accuracies. Moreover, attempts at constructing hidden exits would rely totally on keeping their locations secret for the entire course of deployment – a considerable risk

Figure 116A. —Postattack Egress



116B



SOURCE" Office of Technology Assessment

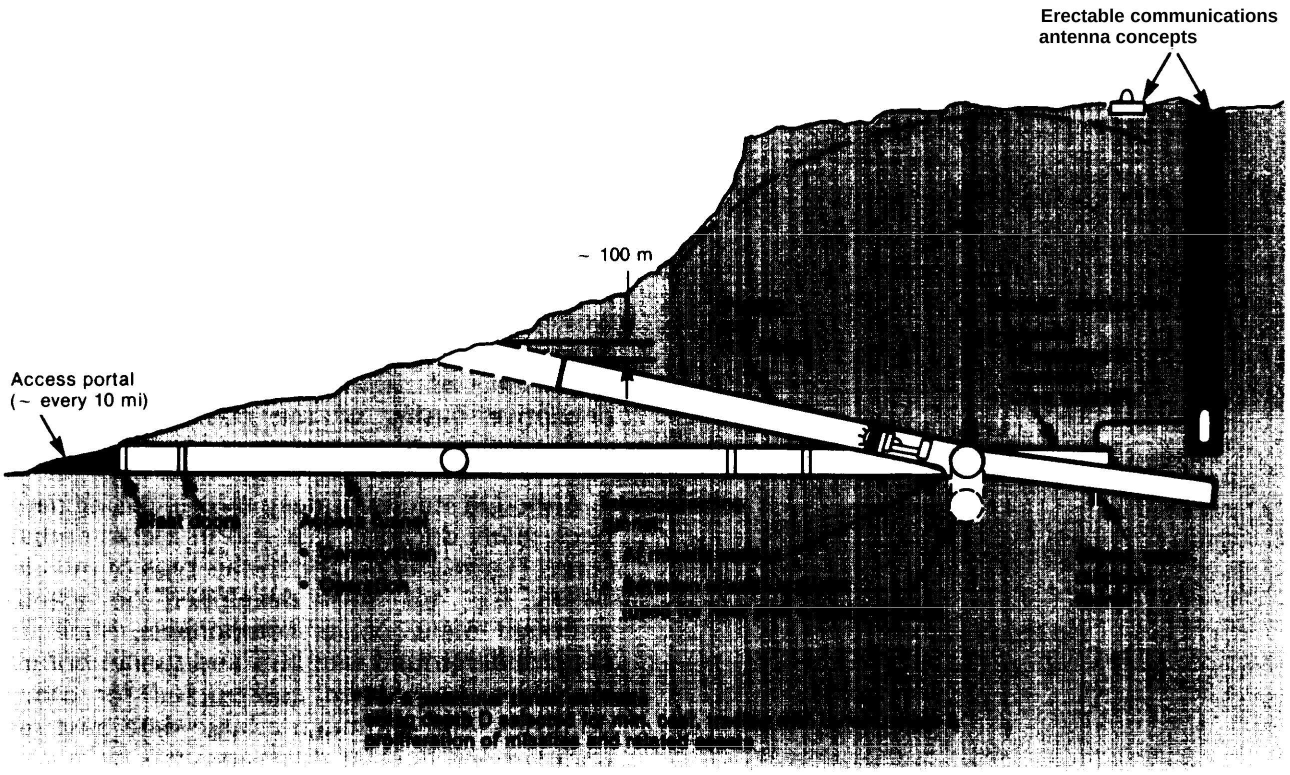
These observations have led to designs for deep underground basing without **precon-**structed exits (see fig. 116B). After the order to launch, large underground tunnel boring machines would clear a path to the surface from the partially completed tunnels. This method of launch would not be rapid, due to the lengthy excavation process, and could take a period of days to perhaps weeks; **in the meantime** work continues on devising a faster method for missile egress.

Clearly, this mode would not be suitable as a quick-response force for t i me-urgent missions a f te r the i n i t i a l a t ta c k — a major sta ted requirement for the MX missile. On the other hand, it could play a useful part in the overal l strategic nuclear force as a secure reserve force. Post-attack endurance might be very good, perhaps a yea r or longer. Further more, i t could have a stabilizing effect and serve as a deterrent to war due to its high survivab i l it y to nuclear attack Unlike fixed missile silos or multiple protective shelters, deep underground basing would be relatively insenitive to the increased accuracy of enemy misiiles, or the f rac-tionation of their pay load. Moreover, deceptive basing of the missiles would be unnecessary

Although studies of deep missile basing date back many decades, it is still in a conceptual stage. Hardware specific to this type of missile basing has not been developed or tested, a l though m a n y of its components, such as deep unclerground facilities and tunnel boring machines, have been constructed for other purposes. And, although a large data base on underground nuclear explosions has been collected over several decades, there is still a degree of uncertainty on the coupling of explosive energy of a nuclear surface burst to the underground. This knowledge would be important in determining the minimum tunnel depth for sure survival of the missile against a large nuclear attack.

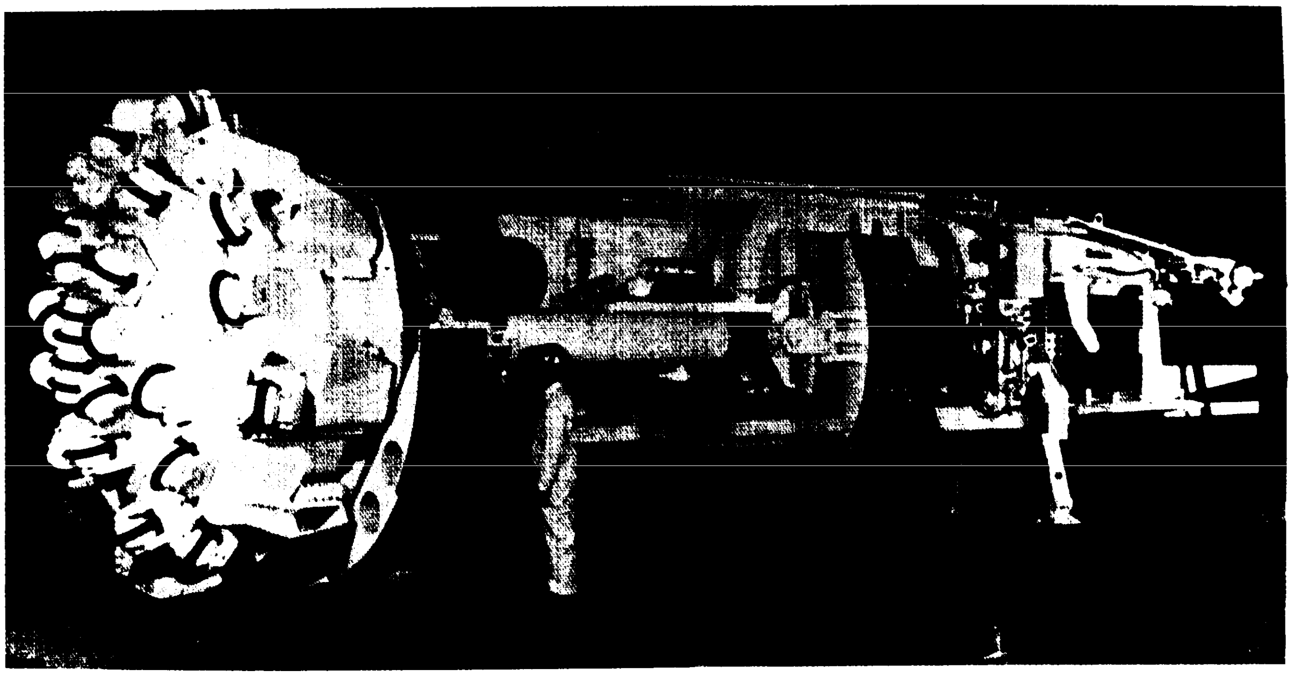
One concept for deep basing is illustrated in figure 117. This approach would utilize basing inside of a mesa, which, due to its relatively steep slope, has the advantage of providing a short tunneling length to the mesa face for missile egress. System burial would be typically several thousand feet. The exit route for the missile would be partially predug, with the remainder left to be dug by a tunnel boring reachine, after receiving the command to launch. In addition, a number of horizontal access tunnels would lead to the underground complex from the outside. These access tunnels, which would be required during construction, would also provide underground access during peacetime. Blast doors in these tunnels would be needed for protection of the underground complex during an attack. Storage cavities would be provided for crew quarters, a fuel cell powerplant and its reactants, waste disposal, and tunnel boring machines. (A typical tunnel boring machine is shown in fig, 118. It is constructed and sold for tunneling operations.) A reliable means of assuring a survivable communications link between the outside and the missile force has not yet been fully developed, although a number of possible candidate concepts do exist. One such concept involves the deployment of a large number of erectable communications antennas, as illustrated in the diagram. Assuring continuity of this link through the mesa during periods of attack is still a matter to be fully resolved, since resulting block movements inside the mesa may break underground cable links.

Figure 11 7.—Mesa/Tunnel Concept Section View (not to scale)



SOURCE: Office of Technology Assessment

Figure 118.—Tunnel Boring Machine

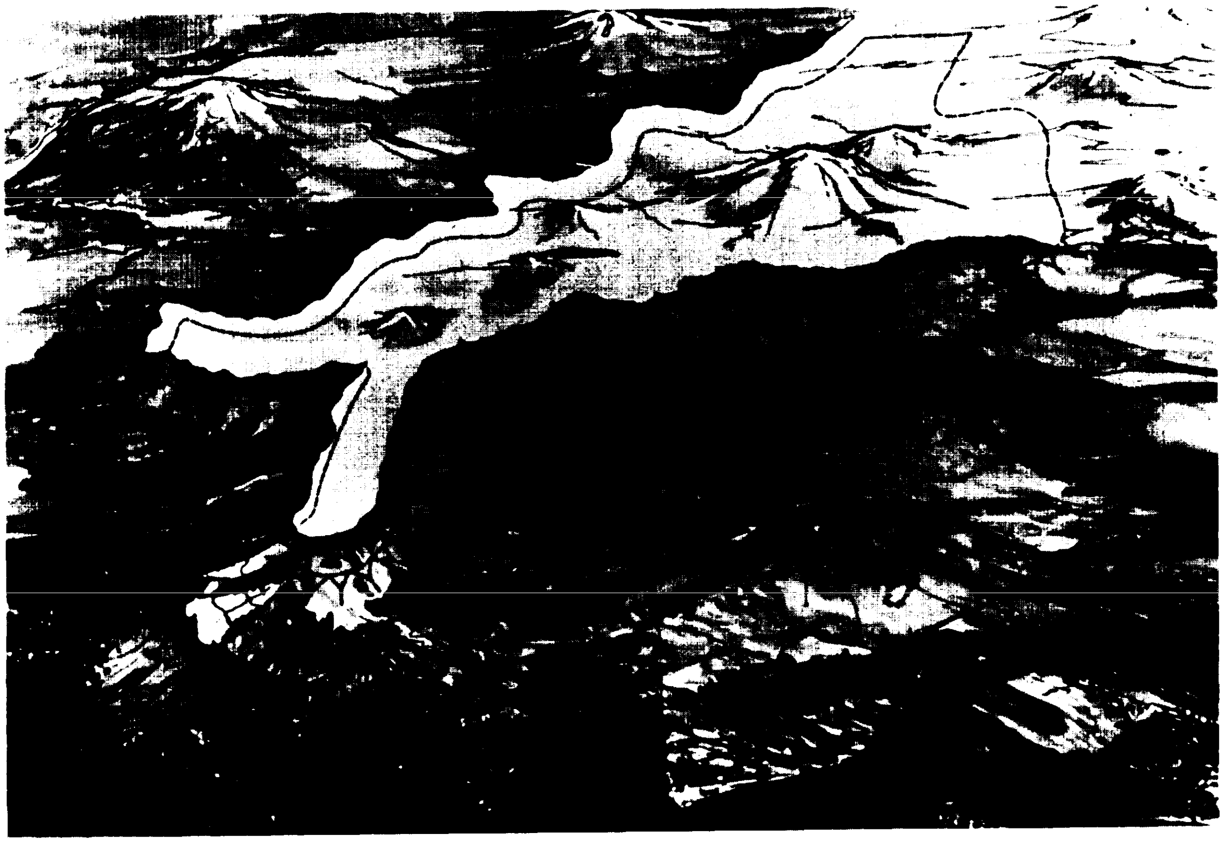


SOURCE: Robbins Co , Seattle, Wash.

An aerial view of the underground mesa-based force is shown in figure 119. The underground tunnels, shown as broken lines, form a closed complex around the mesa. An enlargement of a tunnel section is described in figure 120. The missile would be part of a launcher and transporter vehicle, as shown in figure 121, that resembles the vehicle used for buried trench basing, as discussed in chapter 2. For missile launch, after the tunnel boring machine cleared the way to the surface, the transporter-missile-launcher would move through the newly built tunnel to the surface, under its own power. This is illustrated in figure 122.

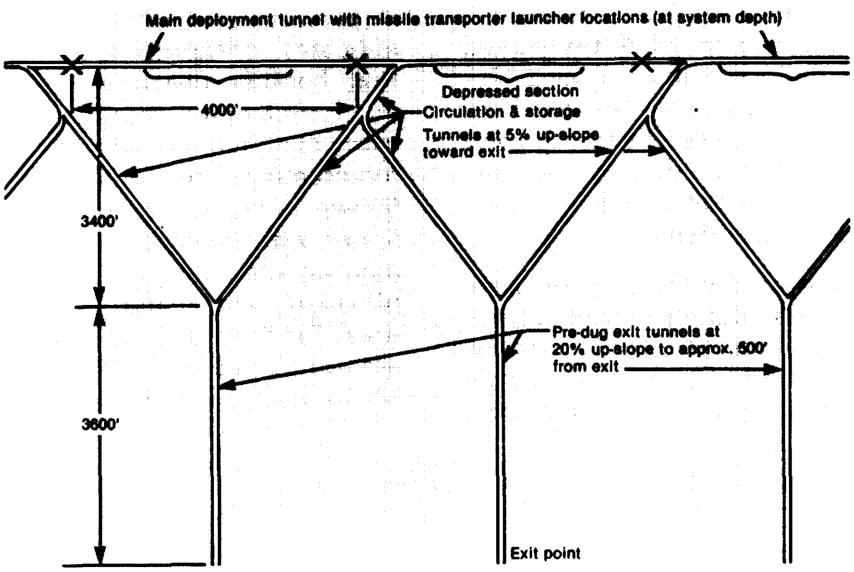
OTA has not analyzed either the environmental impacts or scheduling considerations for deep basing. A preliminary review does not indicate the likelihood of insurmountable problems, however. Estimates for system cost and construction time are highly tentative at this time. Much work on the detailed concept (particularly C^3), research and development, and validation of design would be needed. Moreover, delays in construction for this basing mode could be expected, as experience in previous underground excavation projects indicates unexpected geological conditions that hamper progress. On the other hand, much excavation experience is available from many commercial and civil projects. Land area requirements are likely to be relatively small. Shown in figure 123 is a map of the United States with deployment areas of the Minuteman missile fields, the proposed MX/MPS deployment area, and two candidate basing areas for deep underground basing, one in the area of Grand Mesa, Colo., and an alternative site in southern Utah.

Figure 119.—Aerial View of Mesa-Based Force



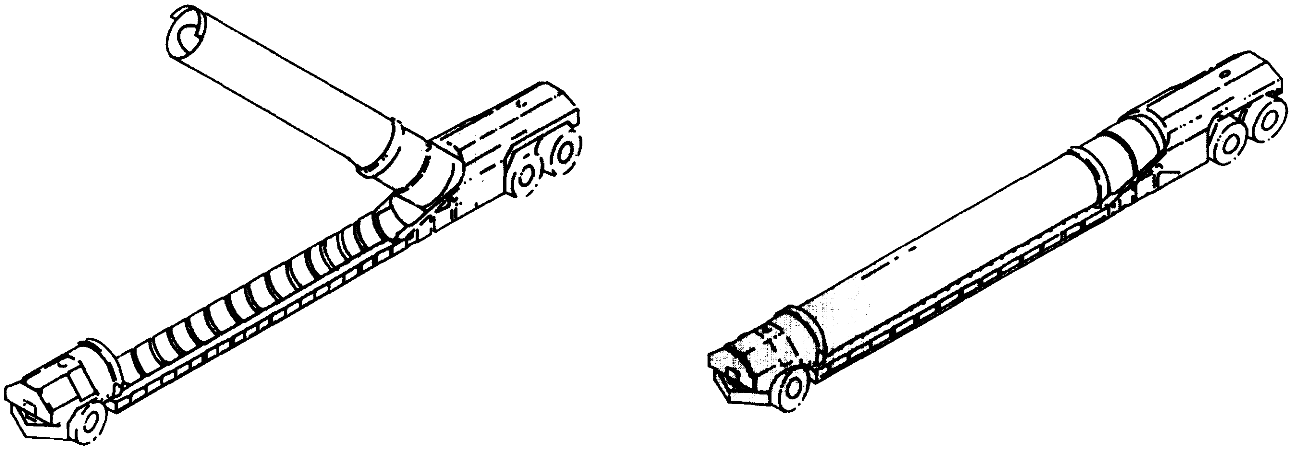
SOURCE: Office of Technology Assessment

Figure 120.—Mesa/Tunnel Concept Plan View Schematic



SOURCE: Office of Technology Assessment.

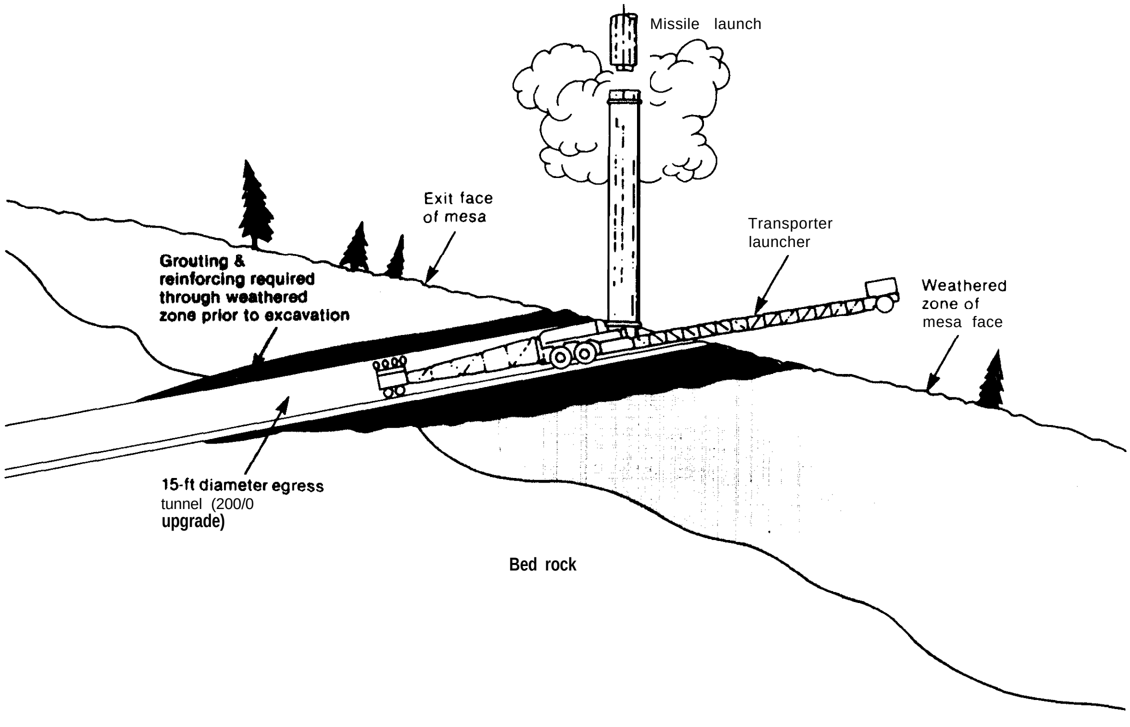
Figure 121.—Transporter Launcher



Length	- 35m	(115 ft)
Width	-	(11.5 ft)
Height	,	(17.5 ft)
Weight	135,000kg	(300,000lb
Drive motors (3)	350hp each	

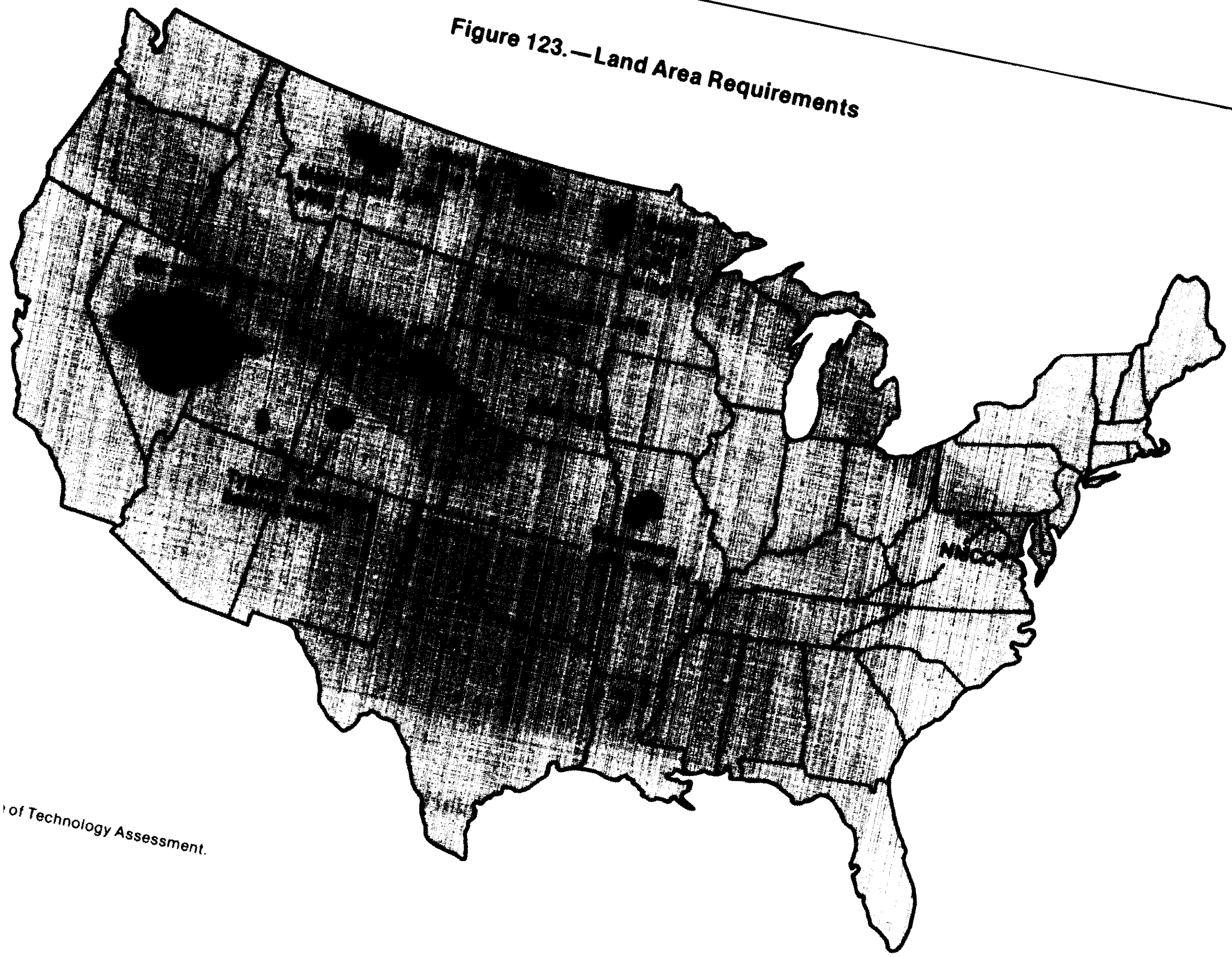
SOURCE Off Ice of Technology Assessment

Figure 122.— Missile Launch



SOURCE Off Ice of Technology Assessment

Figure 123.—Land Area Requirements



of Technology Assessment.