

Other desirable features of the design are (1) capability for evacuating all sides of the target to avoid distortion, (2) breech mechanisms which can be precisely triggered and have fast opening times, and (3) quiet operation.

The breech mechanisms are described in detail in Section III. Two interchangeable breeches with different projectile firing mechanisms were designed and built because no single breech of an existing gun performs optimally throughout the desired velocity range (~ 0.1 to 1.5 mm/ μ s). Several new concepts for a breech design that would accommodate the complete velocity range were considered, but were rejected in favor of two breeches on the basis of simplicity and reliability.

The desirability of fast breech opening times was shown by computer simulation studies performed by Richard White.⁸ The results are shown in Fig. 3 and clearly indicate that, for maximum performance, the breech mechanism must provide unrestricted gas flow within a few milliseconds.

The low pressure breech (to 3000 psi) is of the wrap-around type developed by Muhlenweg at Sandia Corporation. This design is very convenient to use, employs no moving parts under pressure except the projectile itself, and is automatically fast-opening. Its only disadvantage is that the projectile must be strong enough to withstand the initial pressure and, therefore, the projectile mass is larger than would otherwise be required. Hence, the maximum velocity attainable is reduced.

To circumvent this limitation at higher pressures (to 6000 psi) a double-diaphragm breech was also built, also patterned after a Sandia design. It imposes no limitation on projectile weight, but is more expensive and less convenient to operate since two burst diaphragms must be inserted into the breech for each shot.

It is expected that the bulk of the research to be performed immediately with the gun will use the wrap-around breech and will be limited to velocities below about 1.0 mm/ μ s. The double-diaphragm breech is available, however, for work at higher velocities.