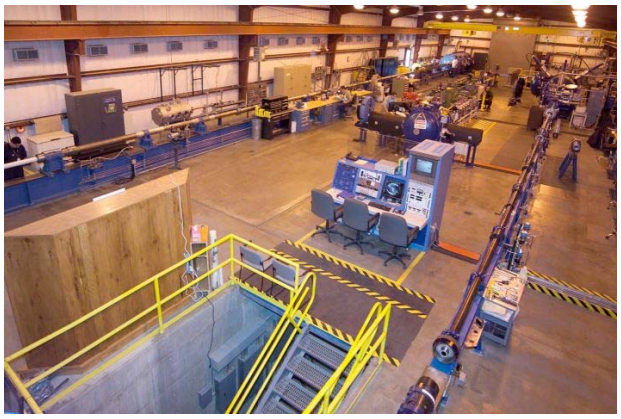
National Aeronautics and Space Administration

Hypervelocity Impact Testing

The White Sands Test Facility (WSTF) Remote Hypervelocity Test Laboratory (RHTL) is an access-controlled hazardous test area capable of simulating Micrometeoroid and Orbital Debris impacts on spacecraft materials and components. This unique NASA facility was designed to safely handle and test hazardous targets, and simulates impacts on shields, spacecraft, satellites, and spacesuits. Four Two-stage Light Gas Guns (2SLGGs) propel single 0.05 mm to 22.2 mm diameter projectiles to velocities in excess of 7.5 km/s.



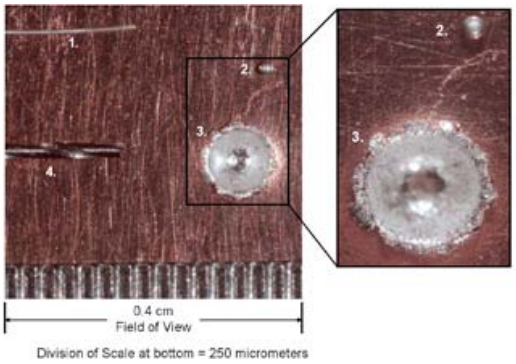
Because of WSTF's remote location and attention to safety, the RHTL is capable of implementing test programs that propel projectiles at toxic or explosive materials and components such as batteries, aerospace fluids, and pressurized containers in a controlled laboratory environment. Release energies up to 2.3 kg (5 lb) TNT equivalent can be accommodated within the facility's sealed target chambers.

Johnson Space Center

[Hypervelocity Impact Testing Overview]

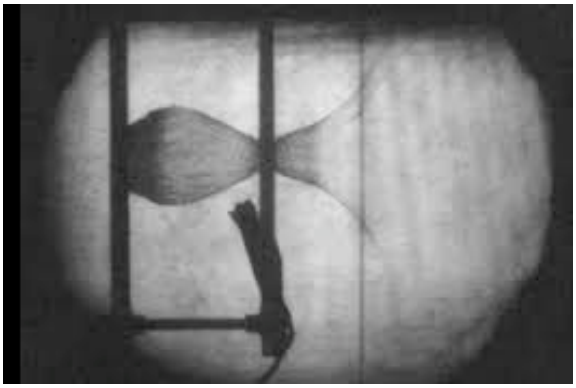
Services Provided

At the WSTF, there are 1 inch, .50 caliber, and .17 caliber guns. Firing these guns requires an extreme amount of energy release, thus requiring the facility to be remotely located, housing underground bunkers and following access control protocol.



The two-stage gun uses standard smokeless gunpowder as its first stage and highly compressible gas for the second-stage to launch the projectile package. The smokeless powder charge sends a polyethylene piston at 2500 feet per second down the pump tube, compressing hydrogen gas. The tapered high-pressure coupling section collects the gas until the pressure ruptures a stainless steel petal-valve, accelerating the launch package down the barrel. In the evacuated expansion chamber a stripper plate separates the launch package by capturing the sabot as the projectile proceeds in free flight to impact the test sample

Various high speed cameras are used, some capable of 200 million frames per second, to capture the target impact and debris cloud. Because of the speed of the projectile, measuring the velocity requires the use of laser intervalometers (automated shutter devices). The data acquisition must operate at a greater bandwidth to capture the diagnostic information from the light detectors and temperature, pressure, and shock measurement



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