

## Multi Environment Supercavitating Ammunition - New Capabilities and Enhanced Small Caliber Performance from Standard Weapons

Summary Multi Environment Ammunition™ works in air and in water, giving enhanced capabilities and increased performance with standard weapons, for example for 7.62mm: 1100 meters supersonic range in air, 30 meters effective underwater range, standard gun. Multi Environment Ammunition (MEA) is available in all calibers, including 5.56mm, 7.62mm, 9mm and 12.7mm, as well as larger calibers. Based on a phenomenon known as 'supercavitation', MEA bullets work in air and water, with extended range in air, improved armor and material penetration, even at low angles and delivering increased stopping power compared to conventional ammunition. The ammunition enables hitherto impossible applications, enhancing weapon operation in wet and even fully submerged condition, extending the capabilities of standard weapons into water, for firing from air at submerged targets and from water at targets either above or below the surface. Application areas enhanced by this technology include harbour protection, coast and river operations, diver offense and defense and the arming of Unmanned Underwater Vehicles. DSG Technology owns multiple patents or patents applied-for in the enabling technology of Supercavitation. Supercavitation - an introduction: In water, a suitably-designed projectile can form a 'cavity' around itself at velocities above 100 m/s. MEA rounds are designed to optimize the dimensions of this cavity so that it just exceeds the maximum outer diameter of the bullet at that point. In this way MEA rounds are stabilised in the water by the cavity wall itself and drag is minimized to such a level that the bullet is able to travel through the water. In air, MEA bullets are spin-stabilised through rifling in the normal way, which allows MEA rounds to operate in both air and water, in either direction. Increased Stopping Power: The Supercavitation effect and the creation of a vacuum cavity, with massive associated hydro-static shock, also occurs in soft tissue, giving MEA rounds significantly greater stopping power for any given caliber. Increased Range in Air: MEA design extends the supersonic phase of a bullet's flight, thus extending the effective range in air. In the case of 5.56mm, 7.62mm and 12.7mm sniper range can be typically extended by up to 25 per cent, just by changing to MEA rounds. This extended range may defer the need to move up to a larger caliber, or simply give more performance, versatility and capability with the smaller caliber. Typical performance of MEA rounds: 5.56mm: 700 meters supersonic range in air; 15 meters effective range underwater 7.62mm: 1100 meters supersonic range in air; 30 meters effective range underwater 12.7mm: 2150 meters supersonic range in air; 60 meters effective range underwater Underwater Performance: MEA rounds supercavitate in water, enabling them to hit targets beneath the water surface when fired on from air or from underwater, even with standard un-modified weapons. Although greater underwater range, of up to 30 meters effective range underwater with 7.62mm, is achieved with tungsten bullet cores, even relatively low-cost brass MEA rounds have underwater capabilities, extending the usefulness of standard weapons into water. With suitable standard weapons, MEA rounds are capable of being fired from wet barrels and fully submerged, so there is no concern about protecting the weapon from water ingress, allowing use from below the surface or immediately on leaving the water. Low Angles of Entry into Water (and from water): MEA rounds can enter (or leave) water at angles as low as 2 degrees in typical sea conditions and from 7 to 10 degrees in smooth water. This gives excellent practical applicability, enabling targets to be engaged from low banks or small vessels, without the need for elevated shooter positions. Increased Penetration of Armor, Windscreens: The unique design of MEA rounds enables exceptional armour piercing (AP) effect, even at acute angles of incidence. In the same way that MEA rounds are able to enter smooth water at very low angles (>7-10 degrees in smooth water) without deflection, so this same benefit is seen against targets attacked from acute angles, including automobile windscreens. This also means that cylinders, spheres and targets of similar form may be penetrated when other rounds would be deflected. Different Bullet Types for Specialist Applications : MEA rounds can be used as general purpose rounds for use in air and in water, using standard un-modified weapons. Low cost brass rounds, for example, give most of the performance benefits of steel or even tungsten rounds, but if AP effect is required, or maximum underwater range or other specialist requirements, then suitable MEA rounds are available. Other Applications Enabled by MEA: Harbor protection, armed UUVs, buried IED, submerged shooter positions against above water targets, such as when boarding hostile patrol boats.