M4/M16 6.35x45mm Medium Caliber Solution

The 6.35x45mm cartridge should be considered as an extremely advantageous replacement for the 5.56x45mm cartridge that has reached the limits of its performance envelope and despite all new materials, propellants, and other enhancements, still has not reached the desired consistent performance levels. It uses the same case as the standard 5.56x45mm, but uses at 6.35mm projectile. The advantages of this relatively small change are many.

The military considered a 6.35mm projectile alternate to the 7.62mm NATO during the SALVO and APHHW tests conducted during the late 1950's. Unfortunately, they seemed to incorrectly assume that the 6.35mm caliber would require an M14 style weapon and that while the 6.35mm proved substantially equally effective to and superior to the 7.62mm NATO in most instances and superior to the then termed ".22 caliber high velocity ammunition" particularly in reference to penetration. (AD317868). The ability of the 6.35mm to be flexible is also displayed in this report as they discuss the use of flechettes and other experimental projectile types that the 5.56mm are generally incapable of.

A significant adoption benefit is that the 6.35x45mm shares the same cartridge case from a "basic" case manufacturing standpoint. This means the base diameter, rim dimensions, shoulder location and angle, as well as, overall length are identical to the 5.56x45mm. This provides easy conversion without need to change bolt, links or linking machines, or significant magazine changes. The only required change is a barrel of the appropriate diameter. Possibly muzzle attachments as well, depending upon internal diameters. As barrels already required replacement at 10,000 to 12,000 rounds on average, this adoption can take place as a natural adoption as maintenance schedules dictate. Again, all standard 5.56x45mm parts, particularly on the M4/M16 platform are 100% compatible.

The advantage of the 6.35mm projectile vs the 5.56mm projectile is basically a 33% advantage across the board. The base provides 33% more area for tracer light emission. The volume of the available projectile space is likewise a 33% advantage. In practice the tested 90 grain 6.35mm projectiles which were compared vs the 62 grain projectiles of the SS109 5.56mm as both have approximately the same OAL and the SS109's performance is close to most current loadings and its data is publicly available. At 300m the 6.35mm had approximately 28% less drop, 36% higher velocity and over 160% more retained energy. All measured pressures were less than the current M885A1. Accuracy was also found to be sub-MOA in all loadings tested consistently, in all barrel lengths.

The propellent efficiency of the 6.35x45mm is a benefit that has only become increasingly more important given the requirements of and the results seen in the SURG project. The 5.56x45mm, particularly as it is pushed to its limits, has significant problems with unburnt propellant, pressure inconsistencies, further enhancement of its already significant muzzle flash, and gas blowback. The 6.35x45mm obtains 100% propellent efficiency in most carbine length and all rifle length barrels. Even without a flash hiders or suppressor the round emitted zero muzzle flash in most loadings. This permits the suppressors to do its job most effectively as it is working with almost entirely combusted gas and little particulate. The larger bored diameter also contributes to a lower pitch in the sound produced by

the cartridge which seems to be easier to suppress effectively. This efficiency which provided consistent energy to each projectile was seen in tight velocity dispersions with ammunition loaded on commercial equipment frequently yielding velocity spreads of less than 10 feet per second for 5 shot strings.

The only significantly noted disadvantage of the 6.35x45mm compared to the 5.56x45mm was the increased weight. Fortunately, this weight was entirely attributable to the weight differences of the projectiles tested. The approximate weight increase is 2 ounces per 30 rounds. This translates into a little more than 4 pounds per 1,000 rounds. However, this is significantly less than any other known possible alternative. Further, this weight gain is countered by a weight savings in the weapons platform as the larger volume bore decreases the weight of the barrel by approximately 5% or more, depending upon the profile. There is also an increase in recoil, but most participants in tests, which included experienced operators and trainers, rated the recoil to be no more than 10% more, with most failing to notice any difference in recoil. Interestingly, most participants indicated the test M4 based test platform seemed to both operate and feed more smoothly in the 6.35x45mm cartridge when compared to the 5.56x45mm.

The 6.35x45mm is the most practical and adoptable replacement the 5.56x45mm available, that permits the retention of the standard M4/M16 platform with the least alteration. The adoption, both in manufacturing and in the field, could be accomplished quickly, with the least cost. The significant cost savings over the M855A1 likely makes the adoption of the 6.35x45mm a significantly cheaper alternative over the longer term. Regardless, the ballistic advantages of the 6.35x45mm over the 5.56x45mm, in any configuration, are undeniable. The 6.35x45mm provides a flatter trajectory with a heavier projectile, which translates into more retained energy at all distances for a longer effective range, plus brighter tracer signature due to the larger surface area of the base of the projectile, and better sound suppression. The 6.35x45mm increases the potency of any platform now chambered in 5.56x45mm and will provide a significant tactical advantage due to the increase effective engagement ranges and accuracy at those ranges. This adoption of 6.35x45mm provides the only true redress to the inherent deficiencies of the 5.56x45mm that can be both manufactured and fielded expediently, without any significant interruption in weapons or ammunition manufacturing, and warrants serious testing and consideration.