B166 Development of a New Standard Bullet for Ballistic Quality Control

Thomas B. Renegar, BS, NIST, 100 Bureau Drive, MS 8212, Gaithersburg, MD 20899; Xiaoyu A. Zheng, MS, NIST, 100 Bureau Drive, MS 8212, Gaithersburg, MD 20899; Robert M. Thompson, BS, NIST, Special Programs Office-Forensic Sciences, 100 Bureau Drive, MS 8102, Gaithersburg, MD 20899; Theodore V. Vorburger, PhD, NIST, 100 Bureau Drive, MS 8212, Gaithersburg, MD 20899; Junfeng J. Song, MS, NIST, 100 Bureau Drive, MS 8212, Gaithersburg, MD 20899; Johannes A. Soons, PhD, NIST, 100 Bureau Drive, MS 8223, Gaithersburg, MD 20899; and James H. Yen, PhD, NIST, Statisical Engineering Division, 100 Bureau Drive, MS 8980, Gaithersburg, MD 20878-8980*

After attending this presentation, attendees will understand the importance of the National Institute of Standards and Technology (NIST) Standard Bullet and how it relates to ballistic measurement quality control and traceability. Attendees will also understand polymer replication and metal-coating techniques.

This presentation will impact the forensic science community by demonstrating a method of ensuring quality control for ballistic measurements. This is important in how it relates to standardization organizations and laboratory accreditation.

This presentation describes the development of the next generation Standard Reference Material (SRM) Standard Bullet. The original Standard Bullet (SRM 2460) was developed by NIST to provide a standardized physical artifact for forensic laboratories to demonstrate quality control and measurement traceability.

Forensic laboratories that perform ballistic comparisons have come under scrutiny in recent years to ensure that sound scientific methods and quality control are followed in their measurements and analysis. For ballistics identifications, it is important that measurement equipment is operating properly and appropriate measurement practices are followed. The original NIST SRM Standard Bullet, developed more than ten years ago, has been an invaluable tool for forensic examiners.[1] By using the Standard Bullet, examiners ensure their measurements, comparisons, and analysis of bullet evidence are done properly. Examiners are also able to show measurement traceability, which allows measurement comparisons to be performed with other laboratories.

The original NIST SRM 2460 Standard Bullet is no longer available. A suitable replacement is needed that will meet the needs of forensic laboratories. The replacement Standard Bullet must meet several requirements: (1) it must have similar topography to that of the original Standard Bullet; (2) surface features (striations) must be consistent from one unit to the next so comparisons between laboratories can be performed; (3) it must be cost effective; and, (4) it must be durable for laboratory use. The original Standard Bullet was manufactured using a diamond turning machining process, which was time consuming and expensive. Therefore, an alternative manufacturing process was developed.

Polymer replications were produced from original master bullets using silicone molding and polymer casting techniques. Originally developed by the Bundeskriminalamt (BKA) in Germany and improved by NIST, a suitable manufacturing process was developed.[2] Several challenges that were faced will be discussed, including removal of micro-bubbles from the silicone and polyurethane mixtures. This is crucial to producing clean replications free of bubbles and other contaminations. Durability of the bullets is also important for laboratory use. Techniques used to harden the surface of the polymer replicas, including gold coating, will be presented. The manufacturing process for producing more than 100 bullets will also be discussed as well as the measurements/analysis performed to ensure the quality of all bullets produced.

Going forward, the new Standard Bullet will be a key part of ensuring bullet comparisons are performed using quality-control practices. This will be an important part of laboratory accreditation. New documentary standards that are currently being developed by the Organization of Scientific Area Committees (OSAC) will undoubtedly require laboratories to follow quality-control practices and demonstrate measurement traceability. The new Standard Bullet will help fulfill these requirements.

Reference(s):

1. Song J., Whitenton E., Kelley D., Clary R., Ma L., Ballou S., SRM 2460/2461 STANDARD BULLETS AND CASINGS PROJECT, *J. Res. Natl. Inst. Stand. Technol.*, 109, 6, p.533-542 (2004).
2. Koch A., Katterwe J. Castings of Complex Stereometric Samples for Proficiency Tests in Firearm and Tool Mark Examinations, *AFTE Journal*, vol. 39 (4), 2007

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*Presenting Author