OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need:	Assessment of Examiners' Toolmark Categorization
Keywords:	Toolmarks, firearms, class characteristics, subclass

R&D Need Rank: Low, Medium, High	Medium	**SAC Approved Date:**	9/3/2025

Submitting subcommittee(s):	Firearms & Toolmarks

Research Need Summary:

The purpose of these research needs is to build a stronger scientific foundation for forensic science standards. The information provided herein will help to evaluate and strengthen existing standards, and/or fill any standards related gaps. In the space below, please provide a brief narrative of the need to be addressed. This should include:

- The identity of any specific standards that would be affected/improved/evaluated
- A discussion on gaps that exist within the standards or standards related gaps that need to be filled
- How this work would fill those gaps
- An overview of any current or past research efforts that may be relevant to this effort
- A discussion regarding how this research might improve current laboratory capabilities and/or forensic services within the criminal justice system
- Any relevant references

Often, class characteristic differences are clear, and research indicates accurate characterization (e.g., Keisler et al.). Other times, class-type features may be less discernible, not clearly reproduced, categorized differently (e.g., parallel vs. cross-hatch), and/or may not provide sufficient differences for reliable eliminations (e.g., land width differences of several thousandths of an inch). This is not an issue unique to firearms. For example, latent print examiners do not rely solely on differences of Level 1 detail (i.e., class) for elimination conclusions (Ray et al.).

A more nuanced understanding of examiners' toolmark categorization, especially focused on more difficult-to-discern class characteristics, will help laboratories and the subcommittee with laboratory protocol, method development, training, and quality control procedures.

References (not intended to be a comprehensive list on this topic):

- Best B, Gardner EA. "An Assessment of the Foundational Validity of Firearms Identification Using Ten Consecutively Button-Rifled Barrels." (2022) AFTE Journal 54(1), 28-37
- Keisler MA, Hartman S, Kilmon A, Oberg M, Templeton M. Isolated Pairs Research Study (2018) AFTE Journal 50(1), 56-58
- Marshall J, Galloway-Booth J, Laurier W. "Variation of Land and Groove Impressions on Fired Bullets" (2018) AFTE Journal 50(1), 3-12.
- Ray E, Dechant PJ "Sufficiency and Standards for Exclusion Decisions" (2013) 63(6) Journal of Forensic Identification

This research need has been identified by one or more subcommittees of OSAC and is being provided as an informational resource to the community.