OSAC RESEARCH NEEDS ASSESSMENT FORM

Title of research need: Probability of Randomly Acquired Characteristics

Keyword(s): RACs, probability, frequency, chance co-occurrence, position, shape, geometry

Submitting subcommittee(s): Footwear & Tire **Date Approved:** 24-Feb-2016

(If SAC review identifies additional subcommittees, add them to the box above.)

Background Information:

1. Description of research need:

Investigate the statistical probabilities of randomly acquired characteristics occurring in the same position and orientation on different outsoles and/or tires. Quantitative results should include data originating from both high quality exemplars and crime-scene impressions.

2. Key bibliographic references relating to this research need:

Cassidy, M. (1995). Footwear Identification. Published by Lightning Powder Company, Inc. in cooperation with the Royal Canadian Mounted Police. ISBN 0-9622305-8-8, pp. 1-176.

Stone, R. (2006). Footwear Examinations: Mathematical Probabilities of Theoretical Individual Characteristics. Journal of Forensic Identification. Vol. 56, No. 4. pp. 577-599.

Wilson, H. (2012). Comparison of the Individual Characteristics in the Outsoles of Thirty-Nine Pairs of Adidas Supernova Classic Shoes. Journal of Forensic Identification. Vol. 62, No. 3, pp. 194-203.

3a. In what ways would the research results improve current laboratory capabilities?

The day-to-day operations of the laboratory are not expected to change as a function of this research. However, the reporting structure, possible strength of conclusions, and analyst training may change over time to incorporate research findings. Downstream digital and web-based applications for data-analysis (of crime scene samples) are also foreseeable, but these would be long-term outcomes beyond the scope of this initiative.

3b. In what ways would the research results improve understanding of the scientific basis for the subcommittee(s)?

The basis of source identification in forensic footwear and tire comparison is a function of the perceived limits in chance co-occurrence of randomly acquired characteristics (RACs). However, the discrimination

potential ascribed to a single or combination of RACs is believed to vary as a function of RAC size, shape, quality, clarity and complexity. This research will serve to evaluate the leading hypothesis and quantitatively define the certainty to which a RAC (or RACs) can support source identification.

3c. In what ways would the research results improve services to the criminal justice system?

The potential for chance co-occurrence of randomly acquired characteristics directly impacts the degree of confidence to which a conclusion of source identification can be made. If this confidence can be described quantitatively, and/or illustrated using research examples, the trier of fact will have additional information and illustrations on which to evaluate the weight of evidence offered in criminal proceedings that include footwear and tire impression evidence.

4. Status assessment (I, II, III, or IV): I

	Major gap in current knowledge	Minor gap in current knowledge
No or limited current research is being conducted	I	III
Existing current research is being conducted	II	IV

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

Approvals:

Subcommittee	Approval date:	24-Feb-2016

(Approval is by majority vote of subcommittee. Once approved, forward to SAC.)

SAC

1. Does the SAC agree with the research need? Yes [x] No [ ]
2. Does the SAC agree with the status assessment? Yes [x] No [ ]

If no, what is the status assessment of the SAC: [ ]

Approval date: 17-Mar-2016

(Approval is by majority vote of SAC. Once approved, forward to NIST for posting.)