

THESIS

**A FORENSIC BASED EMPIRICAL STUDY ON ANALYSIS OF THE RICOCHET
BEHAVIOR AND RICOCHET IMPACT MARKS OF KALASHNIKOV BULLETS**

Submitted by

Lt Col N A B M S Nishshanka

FGS/09/PhD/01/2018/01

A thesis submitted to the Faculty of Graduate Studies, University of Kelaniya

in fulfilment of the requirements for the degree of

Doctor of Philosophy in Forensic Science



June 2021

This thesis has been accepted by the University of Kelaniya for the award of the Degree of Doctor of Philosophy (2022) It is not allowed to Publish this as a thesis accepted for the Degree of Doctor of Philosophy without the authority of the University



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Page 2

DECLARATION

I hereby declare that this thesis represents my own work which has been done after the registration for the degree of Doctor of Philosophy in Forensic Science at the Faculty of Graduate Studies, University of Kelaniya, and has not been previously included in a thesis or dissertation submitted to this or any other institution for a degree, diploma or any other qualification.

I have read the current research ethics and guidelines of the institute and accepted sole responsibility for the conduct of the procedures in accordance with the rules and regulations of the University of Kelaniya. I have attempted to identify all the risks related to this research that may arise in conducting the research, obtained the relevant ethical and/ or safety approval (where applicable) and acknowledged my obligations and the rights of the participants.

Signature: _____


N A B M S Nishshanka

Date: June 2021

SUPERVISOR STATEMENT

It is certified the thesis entitled "a forensic based empirical study on analysis of the ricochet behaviour and ricochet impact marks of Kalashnikov bullets" and submitted by N A B M S Nishshanka is an original work done by him under our supervision.

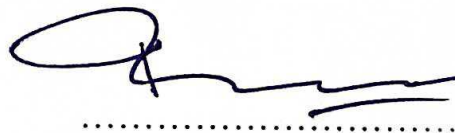
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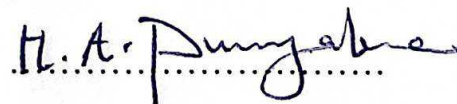
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ABSTRACT

Bullet ricochet is a common occurrence in shooting incidents where misaimed or accidentally fired shots ricochet off nearby surfaces and kill or injure victims. When a bullet ricochet incident has led to a death or injury of a victim, the case becomes more serious, and understanding of what exactly happened becomes critical for the investigation and for subsequent criminal trials. In such situations, shooting investigators conduct "*bullet ricochet analysis*" to understand the accurate ricochet event that transpired. The main objective of a ricochet analysis is to reconstruct the ricocheted bullet's trajectories and approaching angles using the ricochet evidence found in the scene. As ricochet angles and evidence production are unique to a particular bullet-target combination, empirical test results on bullet ricochet studies in the existing literature are considered the most reliable and scientific information to refer to during ricochet analysis.

This series of interrelated experiments investigated AK bullet's ricochet behaviours and ricochet-related scientific evidence with 13 different surface types prone to be encountered in bullet ricochet incidents. The study's outcome presents a series of groundbreaking novel findings that can be used in future AK gun-related investigations, fulfilling a most demanding need in the shooting investigation field. The study's results are a significant departure from the widespread beliefs, such as that ricochet is an unpredictable event and the previous experimental studies are always reliable to refer to during scene reconstructions. The findings highlight the complex and diverse ricochet phenomena of AK bullets with scientific explanations for each behaviour and the significant role play by the ricochet surface type and the bullet type for the subsequent ricochet behaviours. The study also emphasises the great uncertainties and possible errors that might occur even previous experimental studies are used for scene reconstructions. The novelty and the international significance of the findings of this study are evident of already published series of journal articles in the highest-ranked forensic science journals in the world.

Key Words

Firearm Investigations, AK Gun, Bullet Ricochet, Scene Reconstruction, Ballistics