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Commentary

AK bullet (7,62 × 39 mm) ricochet off flat, wooden targets; A forensic-based study

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ABSTRACT

The ricochet behaviour of AK bullets (7,62 × 39 mm), one of the prominently reported bullet type in recent shooting incidents worldwide, has been examined on a range of different wooden surfaces in this study. The critical angles of AK bullets for teak, Jack wood, mahogany and pine were reported with close values ranging from 9.9 to 13.3- degrees, suggestive of being a valuable reference that can be used during AK bullet ricochet-related shooting investigations with similar conditions. The study also highlighted a significant phenomenon against the existing understanding on the wood hardness and the critical angles of bullets. The widths of the AK bullet wipe marks generated on the wood surfaces were highly consistent, regardless of impact angle, allowing an effective approximation of bullet caliber. Bullet tunnelling effect were also observed with pinewood samples in this study. The study also further highlights the great variability of bullet ricochet phenomena and the challenging nature of using the theoretical and experimental results relates to wood ricochet studies for shooting reconstructions.

1. Introduction

Bullet ricochet is a common occurrence in shooting incidents, and wooden surfaces are considered one of the most predominantly reported ricocheting target surface types, especially in urban shooting incidents. When bullet ricochet incidents with wooden surfaces are reported, shooting investigators use bullet ricochet theories and findings from wood related empirical bullet ricochet studies to estimate the possible trajectories of ricocheted bullets and reconstruct the incident that took place [1,2]. Additionally, attorneys and ballistic experts frequently refer to the ricochet theories and empirical findings during the court testimonies in shooting-related trials [2,3]. For this purpose, principal literature sources that explain ricochet theories [4] are frequently referred to in addition to the relatively few published wood ricochet studies that exist in the literature by few authors [5–11,12]. However, all these studies have focused on handgun ammunition, and no significant studies have been reported to explore the ricochet behaviour and associated visual evidence of rifle bullets on wooden targets.

In view of the above, this empirical study was designed to explore the ricochet behaviour of AK bullets (7,62 × 39 mm) on four flat wooden surface types predominantly found in Asian indoor and outdoor urban environments. The selected wood types for the study were teak, jackwood, mahogany, and pine, being the most commonly used construction materials for doors, windows, partitions, furniture, flooring, etc., and with great potential for fired bullets in an urban shooting incident to ricochet off these surfaces.

In addition to the absence of ricochet studies for high-velocity rifle bullet types on wooden surfaces, the selected rifle and bullet combination in this study has great practical significance. AK guns, which discharge 7,62 × 39 mm bullets, are frequently reported in shooting investigations of crime scene shooting and terrorist shootings, especially in the Middle East, the Asian region, and Europe [13], with increased popularity and continuing trend. Therefore the findings of this study will have great practical benefits to use in future AK-related ricochet investigations.

2. Methodology

An AK rifle (Type 56 – Mk II) was mounted on a solid steel stand and used to fire at four flat wooden target types (teak, Jackwood, mahogany and pine) placed at different angles on a target tray. An angle-adjustable target tray was pivoted to the solid steel base. Each

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