

Letter to the Editor

Discussion of "Minimal Velocities Necessary for Perforation of Skin by Air Gun Pellets and Bullets"

Dear Sir:

I read with great interest the article by V. J. M. Di Maio et al, "Minimal Velocities Necessary for Perforation of Skin by Air Gun Pellets and Bullets" (Vol. 27, No. 4, Oct. 1982, pp. 894-898). However, I would like to note that the E/a ratios (where $E/a = wv/2gr$ where w = weight of missile, v = velocity, g = gravity, and r = radius) expressed in units of $m \cdot kg/cm^2$ are not dimensionally correct. E/a ratios that are dimensionally correct would be expressed in units such as $kg \cdot m^2/s^2 \cdot cm^2$, J/cm^2 , or $ft \cdot lb/in.^2$. A comparison of the term $m \cdot kg/cm^2$ with $kg \cdot m^2/s^2 \cdot cm^2$ reveals the dimensional difference to be a factor of m/s^2 (that is, an acceleration).

This dimensional discrepancy is a common problem when converting force units to mass units (grains or pounds to grams) or when "weighing" in grams and applying $m = w/g$ using "weight" in grams. The gram is a unit of mass, so a factor of $1/g$ is extraneously introduced. A dimensionally correct E/a ratio in J/cm^2 is obtained from $E/a = mv^2/2(\pi)r^2$ (m in kilograms, v in metres/seconds, and r in centimetres). The data in the referenced article and a previous article by Mattoo et al [1] can be dimensionally and numerically corrected by multiplying the given E/a ratios by $g = 9.8 m/s^2$ yielding units of J/cm^2 .

David C. Warniment
Firearms Examiner
Jacksonville Regional Crime Laboratory
P.O. Box 4999, 120 Plateau Rd.
Jacksonville, FL 32201

Reference

- [1] Mattoo, B. N., Wani, A. K., and Asgekar, M. D., "Casualty Criteria for Wounds from Firearms with Special Reference to Shot Penetration—Part II," *Journal of Forensic Sciences*, Vol. 19, No. 3, July 1974, pp. 585-589.