and the introduction of women into combat roles[23] (a smaller round means less recoil, making weapons easier to handle for both men and women), it became clear that a reduction in caliber size was both logical and necessary. The switch to automatic personal small arms also abetted the development of smaller/lighter cartridges, as the use of such weapons tended foster a concomitant increase in ammunition expenditures.

Casualty creation is a function of the mass, shape, composition and speed of the bullet, the location of the impact, the track of the bullet in the body, and the yaw characteristics of the round in flight and in the body; together, these variables influence the amount of energy transferred to the target on impact. By and large, high velocity heavy bullets that expand or tumble when they hit a target produce more significant wounds. In this regard, bullet design is an important variable in assessing the wounding potential of ammunition. As a result of *The Hague Declaration* of 29 July 1899, which outlawed (in international conflict) the use of bullets which expand or flatten easily in the human body, military bullets have full metal jackets around the lead/metal core. Modern military rifles fire projectiles at a high velocity (around 3000 fps); bullets that have a full metal jacket are more accurate as soft point lead bullets may fracture either in the barrel or in flight due to heat generation and composition breakdown, thus upsetting their ballistic balance. Furthermore, a bullet lacking a full metal jacket may possess insufficient penetration capability, particularly at longer ranges or when engaging targets behind cover. The advent of military body armour makes the use of soft nosed bullets even more problematic, something which is in turn leading ammunition R&D to design new rounds capable of countering body armour.[24]

Developments in explosive ammunition intended to create shrapnel (such as fragmentation hand grenades and mortar bombs) have tended to focus on better fragmentation and dispersion patterns, as well as enhanced delivery systems designed to reflect the demands being made of small arms – that is, an ability to reach farther faster, and to be lighter, more accurate and more effective. One way of enhancing the likelihood of casualties is to ensure

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[23] According to the equipment procurement requirements of the Canadian Armed Forces, all equipment (including weapons) must be evaluated on the basis of a percentile range of human factors, including strength, weight and height; this is done in part with an eye to furthering the potential for increasing the numbers of women in the military. *Conversation* (16 March 1999).

[24] For a basic primer on wound ballistics and treatment, as well as a very basic primer on civilian personal firearms see *http://medstat.med.utah.edu/WebPath/TUTORIAL/GUNS*. Some of the information herein has been taken from that Web Site. Comparative wound ballistics science can be somewhat controversial, inconclusive, and subject to varying interpretation, particularly as it applies to the rules of war. See The Proceedings of the International Workshop on Wound Ballistics, held in Interlaken and Thun, Switzerland 8 - 9 October, 1997; M. L. Fackler, (M.D.), "What's Wrong With The Wound Ballistics Literature, and Why," *Institute Report No. 239 July 1987* (Letterman Army Institute of Research Division of Military Trauma Research Presidio of San Francisco, California 94219). For additional information see Peter Knudsen and Peter Theilade, "Terminal Ballistics of the 7.62 mm NATO bullets experiments in ordnance gelatin," *International Journal of Medicine* 108 (Spring 1995), pp. 62 -67; and "Memorandum of Law – Sniper Use of Open-Tip Ammunition," *The Army Lawyer* (Department of the Army Pamphlet 27-50-218 February 1991), pp. 86 - 89.