
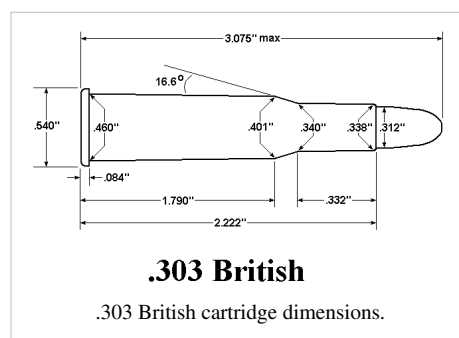


.303 British

.303 British (7.7×56mm Rimmed)			
 <p>.303 Cartridge (Mk VII), manufactured by CAC in 1945</p>			
Type	Rifle		
Place of origin	United Kingdom		
Specifications			
Case type	Rimmed, bottleneck		
Bullet diameter	0.312 in (7.9 mm)		
Neck diameter	0.338 in (8.6 mm)		
Shoulder diameter	0.401 in (10.2 mm)		
Base diameter	0.460 in (11.7 mm)		
Rim diameter	0.540 in (13.7 mm)		
Rim thickness	.064 in (1.6 mm)		
Case length	2.222 in (56.4 mm)		
Overall length	3.075 in (78.1 mm)		
Case capacity	55.7 gr H ₂ O (3.61 cm ³)		
Rifling twist	1-10 inches (250 mm)		
Primer type	Large rifle		
Maximum pressure	49,000 psi		
Maximum CUP	45,000 CUP		
Ballistic performance			
Bullet weight/type	Velocity	Energy	
150 gr (10 g) SP	844 m/s (2,770 ft/s)	3,463 J (2,554 ft·lbf)	
174 gr (11 g) HPBT	761 m/s (2,500 ft/s)	3,265 J (2,408 ft·lbf)	
180 gr (12 g) SP	783 m/s (2,570 ft/s)	3,574 J (2,636 ft·lbf)	
<i>Test barrel length: 24</i> <i>Source(s): Accurate Powder^[citation needed]</i>			

.303 British, or **7.7×56mmR**, is a .303-inch (7.7 mm) calibre (with the bore diameter measured between the lands as is common practice in Europe) rifle and machine gun cartridge first developed in Britain as a black-powder round put into service in December 1888 for the Lee-Metford rifle, later adapted to use smokeless powders. It was the standard British and Commonwealth military cartridge from 1889 until the 1950s when it was replaced by the 7.62×51mm NATO.



Cartridge Specification

Case measurements

The measurement .303-inch (7.7 mm) is the nominal size of the bore measured between the lands which follows the older black powder nomenclature. Measured between the grooves, the nominal size of the bore is .311-inch (7.9 mm). Bores for many .303 military surplus rifles are often found ranging from around .309-inch (7.8 mm) up to .318-inch (8.1 mm). Recommended bullet diameter for standard .303 cartridges is .312-inch (7.9 mm).^[1]

Gunpowder

The original .303 service cartridge employed black powder as a propellant, and was adopted for the Lee-Metford rifle, which had rifling designed to lessen fouling from this propellant. The Lee-Metford was used as a trial platform by the British Committee on Explosives to experiment with many different smokeless powders then coming to market, including *Ballistite*, *Cordite*, and *Rifleite*.^{[2][3][4]} *Ballistite* was a stick-type smokeless powder composed of soluble nitrocellulose and nitroglycerine.^[4] *Cordite* was a stick-type or 'chopped' smokeless gunpowder composed of nitroglycerine, gun-cotton, and mineral jelly, while *Rifleite* was a true nitrocellulose powder, composed of soluble and insoluble nitrocellulose, phenyl amidazobense, and volatiles similar to French smokeless powders.^{[3][4]} Unlike *Cordite*, *Rifleite* was a flake powder, and contained no nitroglycerine.^[4] Excessive wear of the shallow Lee-Metford rifling with all smokeless powders then available caused ordnance authorities to institute a new type of barrel rifling designed to increase barrel life; the rifle was referred to thereafter as the Lee-Enfield.^[2] After extensive testing, the Committee on Explosives selected *Cordite* for use in the Mark II .303 British service cartridge.^[2]

Bullet

The initial .303 Mark I and Mk II service cartridges employed a 215-grain, round-nosed, copper-nickel full metal jacketed bullet with a lead core. After tests determined that the service bullet had too thin a jacket when used with cordite, the Mk II bullet was introduced, with a flat base and thicker copper-nickel jacket.^[5]

History and development

During a service life of over 70 years with the British Commonwealth armed forces the .303-inch cartridge in its ball pattern progressed through ten marks which eventually extended to a total of about 26 variations.^[6]

The .303 cartridge has seen much sporting use with surplus military rifles, especially in Australia, Canada, New Zealand and to a lesser extent, in the United States and South Africa. In Canada, it was found to be adequate for any game except the great bears. In Australia, it was common for military rifles to be re-barreled in .303/25 and .303/22. In South Africa .303 British Lee Enfield rifles captured by the Boers during the Boer War were adapted for sporting purposes and became popular with many hunters of non-dangerous game, being regarded as adequate for anything from the relatively small impala, to the massive eland and kudu.^[7]

The Mk II round-nosed bullet was found to be unsatisfactory when used in combat, particularly when compared to the dum-dum rounds issued in limited numbers in 1897 during the Chitral and Tirah expeditions of 1897/98 on the North West Frontier of India.^[5] This led to the introduction of the **Cartridge S.A. Ball .303 inch Cordite Mark III**, basically the original 215-grain (13.9 g) bullet with the jacketing cut back to expose the lead in the nose.^[5] Similar hollow-point bullets were used in the Mk IV and Mk V loadings, which were put into mass production. The design of the Mk IV hollow-point bullet shifted bullet weight rearwards, improving stability and accuracy over the regular round-nose bullet.^[5] These soft-nosed and hollow-point bullets, while effective against human targets, had a tendency to shed the outer metal jacket upon firing; the latter occasionally stuck in the bore, causing a dangerous obstruction.^[5] The Hague Convention of 1899^[5] later declared that expanding bullets for use on humans were inhumane, and as a result the Mk III, Mk IV, and Mk V were withdrawn from active service. The remaining stocks (over 45 million rounds) were used for target practice.

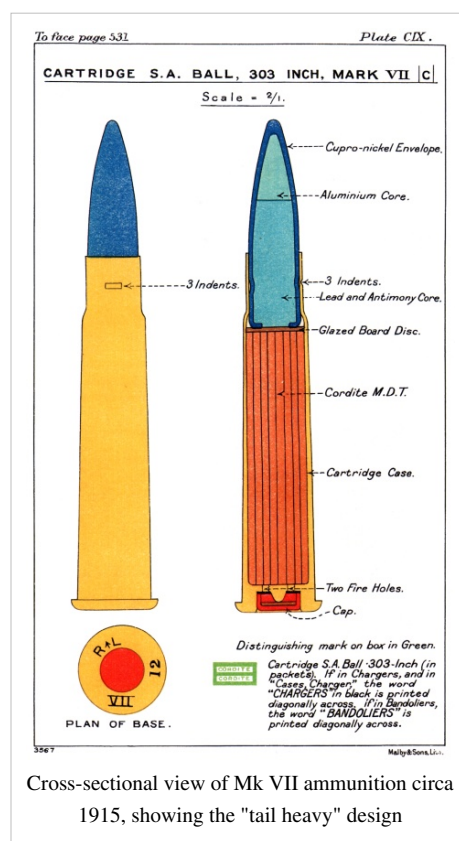
To replace the Mk III, IV, and V, the **Mark VI** round was introduced in 1904, using a round nose bullet similar to the Mk II, but with a thinner jacket designed to produce some expansion, though this proved not to be the case.^{[8][9]}

Mark VII

In 1898, APX (Atelier de Puteaux), with their "Balle D" design for the 8mm Lebel Cartridge, revolutionised bullet design with the introduction of pointed "spitzer" rounds. In addition to being pointed, the round was also much lighter in order to deliver a higher muzzle velocity. It was found that as velocity increased the bullets suddenly became much more deadly.^[10]

In 1910, the British took the opportunity to replace their Mk VI cartridge with a more modern design. The **Mark VII** loading used a 174-grain (11.3 g) pointed bullet with a flat-base which gave a muzzle velocity of 2,440 ft/s, (740 m/s) and a ballistic coefficient of .467.^[1] The Mk VII was different from earlier .303 bullet designs or spitzer projectiles in general. Although it appears to be a conventional spitzer-shape full metal jacket bullet, this appearance is deceptive: its designers made the front third of the interior of the Mk 7 bullet out of aluminium (from Canada) or *tenite* (cellulosic plastic), wood pulp or compressed paper, instead of lead and were autoclaved to prevent wound infection. This lighter nose shifted the centre of gravity of the bullet towards the rear, making it tail heavy. Although the bullet was stable in flight due to the gyroscopic forces imposed on it by the rifling of the barrel, it behaved very differently upon hitting the target. As soon as the bullet hit the target and decelerated, its heavier lead base caused it to yaw violently and deform, thereby inflicting more severe gunshot wounds than a standard single-core spitzer design.^[1] In spite of this, the Mk VII bullet was legal due to the full metal jacket used according to the terms of the Hague Convention.

The Mk VII (and later Mk VIII) rounds have versions utilizing nitrocellulose flake powder smokeless propellants. The nitrocellulose versions—first introduced in World War I—were designated with a "Z" postfix indicated after the type (e.g. Mark VIIZ, with a weight of 175 grains) and in headstamps.^[11]



Cross-sectional view of Mk VII ammunition circa 1915, showing the "tail heavy" design

Mark VIII

In 1938 the **Mark 8** (Mark VIII and Mark VIIIz) round was approved to obtain greater range from the Vickers machine gun.^[12] Slightly heavier than Mk VII bullet at 175 grains (11.3 g), the primary difference was the addition of a boat-tail and more propellant (41 grains of nitrocellulose powder in the case of the Mk VIIIz), giving a muzzle velocity of 2,525–2,900 ft/s (780–884 m/s). As a result, the chamber pressure was significantly higher, at 42,000–60,000 lbf/sq in (approximately 280–414 MPa), depending upon loading, compared to the 39,000 lbf/sq in of the Mark VII round.^[13] Cross-sectional images of Mk VIII ammunition indicate that its boat-tail bullet was long and gently tapered, providing a very high ballistic coefficient. Mk VIII ammunition was described as being for "All suitably-sighted .303-inch small arms and machine guns" but caused significant bore erosion in weapons formerly using Mk VII cordite, ascribed to the channelling effect of the boat-tail projectile. As a result it was prohibited from general use with rifles and light machine guns except in emergency.^[1] As a consequence of the official prohibition, ordnance personnel reported that every man that could get his hands on Mk VIII ammunition promptly used it in his own rifle.^[12]

Tracer, armour-piercing and incendiary

Tracer and armour-piercing cartridges were introduced during 1915, with explosive bullets derived from John Pomeroy's work introduced as the Mark VII.Y in 1916.

Several incendiaries were privately developed from 1914 to counter the Zeppelin threat but none were approved until the Brock design late in 1916 as BIK Mark VII.K^[14] Wing Cmdr. Brock RNVR was a member of the Brock fireworks-making family.

These rounds were extensively developed over the years and saw several Mark numbers. The last tracer round introduced into British service was the G Mark 8 in 1945, the last armour-piercing round was the W Mark 1Z in 1945 and the last incendiary round was the B Mark 7 in 1942. Explosive bullets were not produced in the UK after 1933 due to the relatively small amount of explosive that could be contained in the bullet, limiting their effectiveness, their role being taken by the use of Mark 6 and 7 incendiary bullets.

In 1935 the .303 O Mark 1 Observing round was introduced for use in machine guns. The bullet to this round was designed to break up with a puff of smoke on impact. The later Mark 6 and 7 incendiary rounds could also be used in this role.

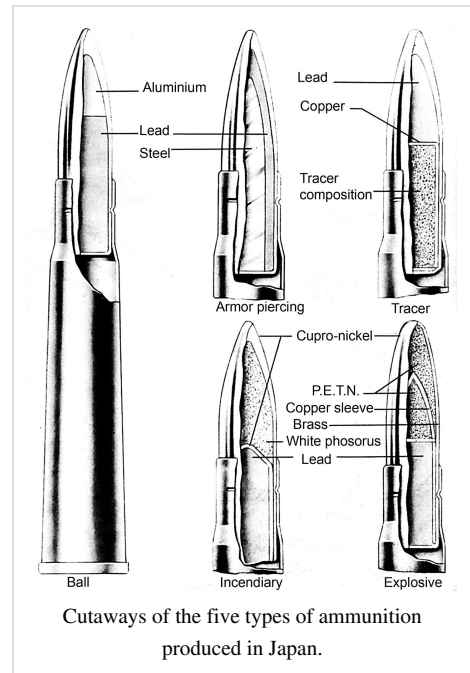
During World War I British factories alone produced 7,000,000,000 rounds of .303 ammunition. Factories in other countries added greatly to this total.^[1]

Japanese 7.7 mm ammunition

Japan produced a number of machine guns that were direct copies of the British Lewis (Japanese Type 92 machine gun) and Vickers machine guns including the ammunition. These were primarily used in Navy aircraft. The 7.7mm cartridge used by the Japanese versions of the British guns is a direct copy of the .303 British (7.7x56R) rimmed cartridge and is distinctly different from the 7.7x58mm Arisaka rimless and 7.7x58mm Type 92 semi-rimmed cartridges used in other Japanese machine guns and rifles.^[15]

- **Ball:** 174 grains (11.3 g). CuNi jacket with a composite aluminium/lead core. Black primer.
- **A.P.:** brass jacket with a steel core. White primer.
- **Tracer:** 130 grains (8.4 g). CuNi jacket with a lead core. Red primer.
- **Incendiary:** 133 grains (8.6 g). Brass jacket with white phosphorus and lead core. Green primer.
- **H.E.:** a Copper jacket with a PETN and lead core. Purple primer.

Note: standard Japanese ball ammunition was very similar to the British Mk 7 cartridge. The two had identical bullet weights and a "tail-heavy" design, as can be seen in the cut-away diagram.



Military surplus ammunition

Military surplus .303 British ammunition is often available, notably at gun shows and from online dealers. It may or may not have corrosive primers. Care must be taken to identify the round properly before purchase or loading into weapons. Cartridges with the Roman numeral **VIII** on the headstamp are the Mark 8 round, specifically designed for use in Vickers machine guns. Although Mark 8 ammunition works well in a Vickers gun, it should not be used in rifles because the boat-tailed design causes increased barrel wear. The boat-tailed bullet design of Mk 8 ammunition is not in itself a problem. However, when combined with the cordite propellant used in Mk 8 cartridges, which burns at a much higher temperature than nitrocellulose, there is increased barrel erosion. The cumulative effects of firing Mk 8 ammunition through rifles were known of during the Second World War, and British riflemen were ordered to avoid using it, except in emergencies. The best general-purpose ammunition for any .303 military rifle is the Mark 7 design because it provides the best combination of accuracy and stopping power. There is no problem with using ammunition loaded with corrosive primers, providing that the gun is thoroughly cleaned after use to remove the corrosive salts.

Headstamps and colour-coding

Headstamp ID	Primer Annulus Color	Bullet Tip Color	Other Features	Functional Type
VII or VIIZ	Purple	None	None	Light Ball
VIII Z	Purple	None	None	Heavy Ball
G1, G2, G3, G7 or G8	Red	None	None	Tracer
G4, G4Z, G6 or G6Z	Red	White	None	Tracer
G5 or G5Z	Red	Gray	None	Tracer
W1 or W1Z	Green	None	None	AP
B4 or B4Z	Blue	None	Step in bullet jacket	Incendiary
B6 or B6Z	Blue	None	None	Incendiary
B7 or B7Z	Blue	Blue	None	Incendiary
O.1	Black	Black	None	Observing
PG1 or PG1Z	Red	None	Blue band on case base	Practice-tracer
H1Z	None	None	Front half of case blackened	Grenade-Launching
H2	None	None	Entire case blackened	Grenade-Launching
H4	None	None	Case blackened 3/4" inch from each end	Grenade-Launching
H7Z	None	None	Rear Half of case blackened	Grenade-Launching (v.powerful load)

Commercial Ammunition and Reloading

Commercial ammunition for weapons chambered in .303 British is readily available, as the cartridge is still manufactured by major producers such as Remington, Federal, Winchester, Sellier & Bellot, Prvi Partizan and Wolf. Commercially produced ammunition is widely available in various FMJ, soft point, hollow point, flat-based and boat tail designs—both spitzer and round-nosed.

Reloading equipment and ammunition components are also manufactured by several companies. Dies and other tools for the reloading of .303 British are produced by Forster, Hornady, Lee, Lyman, RCBS, and Redding. Depending on the bore and bore erosion a reloader may choose to utilize bullet diameters of .308"-.312" with

.311" or .312" diameter bullets being the most common. Bullets specifically produced and sold for reloading .303 British are made by Sierra, Hornady, Speer, Woodleigh, Barnes, and Remington. Where extreme accuracy is required, the Sierra Matchking 174-grain (11.3 g) HPBT bullet is a popular choice. Sierra does not advocate use of Matchking brand bullets for hunting applications. For hunting applications, Sierra produces the ProHunter in .311" diameter. The increasingly popular all-copper Barnes TSX is now available in the



Commercial soft point .303 British loaded in a Lee-Enfield five-round charger.

.311" diameter as a 150 gr projectile which is recommended for hunting applications by Barnes.

With most rifles chambered in .303 British being of military origin, success in reloading the caliber depends on the reloader's ability to compensate for the often loose chamber of the rifle. Reduced charge loads and neck sizing are two unanimous recommendations from experienced loaders of .303 British to newcomers to the caliber. The classic 174-grain (11.3 g) FMJ bullets are widely available, though purchasers may wish to check whether or not these feature the tail-heavy Mk 7 design. In any case other bullet weights are available e.g. 150, 160, 170, 180 and 200-grain (13 g), both for hunting and target purposes.

Hunting Use

The .303 British cartridge is suitable for all medium-sized game, and is an excellent choice for whitetail deer and black bear hunting. In Canada it was a popular moose and deer cartridge when military surplus rifles were available and cheap; it is still used. It has been used as a hunting cartridge in many countries.

Weapons chambered for .303 British

- Bren light machine gun
- Browning Model 1919 machine gun aircraft version
- Canadian Ross Rifle Mk I through III
- Caldwell machine gun
- Charlton Automatic Rifle
- Farquharson rifle
- Globe Semi-Auto .303 rifle (modified SVT40 Tokarev)
- Hotchkiss .303 Mk I & I*
- Huot automatic rifle
- Jungle Carbine
- Lee-Enfield rifle
- Lee-Metford rifle
- Lewis gun
- Martini-Enfield rifle
- McCrudden light machine rifle
- Parker-Hale Sporter Rifle
- P14 rifle
- Ruger No. 1 rifle , 2010 limited edition
- Thornycroft carbine
- Vickers light machine gun
- Vickers machine gun
- Vickers K machine gun



Civilian soft point .303 ammunition, suitable for hunting purposes.

- Winchester Model 1895

References

- [1] Hornady Handbook of Cartridge Reloading, Rifle-Pistol, Third Edition, Hornady Manufacturing Company, 1980, 1985, p.253-254.
- [2] Chisholm, Hugh, *Encyclopædia Britannica* (11th ed.), New York: The Encyclopædia Britannica Co., Vol. 23, (1911) p. 327
- [3] Sanford, Percy Gerald, *Nitro-explosives: a Practical treatise Concerning the Properties, Manufacture, and Analysis of Nitrated Substances*, London: Crosby Lockwood & Son (1896) pp. 166-173, 179
- [4] Walke, Willoughby (Lt.), *Lectures on Explosives: A Course of Lectures Prepared Especially as a Manual and Guide in the Laboratory of the U.S. Artillery School*, J. Wiley & Sons (1897) pp. 336-343
- [5] Ommundsen, Harcourt, and Robinson, Ernest H., *Rifles and Ammunition Shooting*, New York: Funk & Wagnalls Co. (1915), p. 117-119
- [6] Temple, B. A., *Identification Manual of the .303 British Service Cartridge - No: 1 - BALL AMMUNITION*, Don Finlay (Printer 1986), p. 1. ISBN 0-9596677-2-5
- [10] http://www.chuckhawks.com/8mm_lebel.htm
- [12] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), p. 40. ISBN 978-1-884849-09-1
- [13] Dunlap, Roy F., *Ordnance Went Up Front*, Samworth Press (1948), ISBN 978-1-884849-09-1 p. 40: There appear to have been two distinct loadings of the Mark VIII cartridge: one small arms expert serving with the Royal Army Ordnance Corps at Dekheila noted that Mk VIIIz ammunition he examined had a claimed muzzle velocity of , furthermore, primers on MK VIII fired cases he examined looked "painted on", normally indicating a pressure of around 60,000 lbs. per square inch.
- [15] Walter H.B. Smith, *Small Arms of the World*, Stackpole Publications.

External links

- "Photos of the contents of different .303 British cartridges" (<http://www.theboxotruth.com/docs/edu30.htm>). Box of Truth website.
- "Photo of Sellier & Bellot 150 gr (9.7 g) .303 British soft-point fired into ballistic gelatin (bullet travelled right to left)" ([http://www.brassfetcher.com/Sellier & Bellot 150gr Soft-point.html](http://www.brassfetcher.com/Sellier%20%26%20Bellot%20150gr%20Soft-point.html)).
- "Photos of various different types of .303 ammunition" ([http://www.conjay.com/Ammunition for Armor Testing WW2 303.htm](http://www.conjay.com/Ammunition%20for%20Armor%20Testing%20WW2%20303.htm)).
- "African Hunter" (http://www.cybertorpedo.com/africanhunter/firearms/303_british_rifle_01.htm).
- ".303" (<http://www.snipercentral.com/303.htm>). Sniper Central.
- ".303 British" (<http://www.303british.com>). 303british.com.
- David Cushman. "Headstamps of various .303 ammunition producers" (<http://www.dave-cushman.net/shot/303headstamps.html>).
- 7,7 x 56 R Tipo 89 Giapponese (<http://www.worldwar.it/sito/munizioni/giapponesi/77-x-56-r-tipo-89-giapponese>)
- C.I.P. TDCC datasheet .303 British (<http://www.cip-bobp.org/homologation/uploads/tdcc/tab-ii/tabiiical-en-page74.pdf>)

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