

# .30-06 Springfield

<b>.30-06 Springfield</b>			
 <p>.30-06 Springfield cartridge with soft tip</p>			
<b>Type</b>	Rifle		
<b>Place of origin</b>	United States		
<b>Service history</b>			
<b>In service</b>	1906–present		
<b>Used by</b>	USA and others		
<b>Wars</b>	World War I, World War II, Korean War, Vietnam War, to present		
<b>Production history</b>			
<b>Designer</b>	United States Military		
<b>Designed</b>	1906		
<b>Produced</b>	1906–present		
<b>Specifications</b>			
<b>Parent case</b>	.30-03 Springfield		
<b>Case type</b>	Rimless, bottleneck		
<b>Bullet diameter</b>	.308 in (7.8 mm)		
<b>Neck diameter</b>	.340 in (8.6 mm)		
<b>Shoulder diameter</b>	.441 in (11.2 mm)		
<b>Base diameter</b>	.471 in (12.0 mm)		
<b>Rim diameter</b>	.473 in (12.0 mm)		
<b>Rim thickness</b>	.049 in (1.2 mm)		
<b>Case length</b>	2.494 in (63.3 mm)		
<b>Overall length</b>	3.34 in (85 mm)		
<b>Case capacity</b>	68 gr H <sub>2</sub> O (4.4 cm <sup>3</sup> )		
<b>Rifling twist</b>	1-10 in.		
<b>Primer type</b>	Large Rifle		
<b>Maximum pressure</b>	60,200 psi		
<b>Ballistic performance</b>			
<b>Bullet weight/type</b>	<b>Velocity</b>	<b>Energy</b>	
150 gr (10 g) Nosler Ballistic Tip	2,910 ft/s (890 m/s)	2,820 ft·lbf (3,820 J)	
165 gr (11 g) BTSP	2,800 ft/s (850 m/s)	2,872 ft·lbf (3,894 J)	
180 gr (12 g) Core-Lokt Soft Point	2,700 ft/s (820 m/s)	2,913 ft·lbf (3,949 J)	
200 gr (13 g) Partition	2,569 ft/s (783 m/s)	2,932 ft·lbf (3,975 J)	
220 gr (14 g) RN	2,500 ft/s (760 m/s)	2,981 ft·lbf (4,042 J)	

<i>Test barrel length: 24 inch 60 cm</i> <i>Source(s): Federal Cartridge<sup>[1]</sup> / Accurate Powder<sup>[1]</sup></i>	
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The **.30-06 Springfield** cartridge (pronounced "thirty-aught-six" or "thirty-oh-six"), **7.62×63mm** in metric notation, and "30 Gov't 06" by Winchester<sup>[1]</sup> was introduced to the United States Army in 1906 and standardized, and was in use until the 1960s and early 1970s. The ".30" refers to the caliber, and the "06" refers to the year of adoption, 1906. It replaced the .30-03, 6 mm Lee Navy, and .30 US Army (also called .30-40 Krag). The .30-06 remained the US Army's primary rifle and machine gun cartridge for nearly 50 years before it was replaced by the 7.62×51mm NATO (commercial .308 Winchester) and 5.56×45mm NATO, both of which remain in current U.S. and NATO service. It remains a very popular sporting round, with ammunition produced by all major manufacturers.

## History

Many European militaries at the turn of the 20th century were in the process of adopting service rounds loaded with pointed spitzer bullets: France in 1898, Germany in 1905, Russia in 1908, and Britain in 1910,<sup>[2]</sup> so when it was introduced in 1903, the .30-03 service round loaded with a 220-grain (14 g) round-nose bullet and achieving a muzzle velocity of 2,300 ft/s (700 m/s) was quickly falling behind the ongoing technical evolution.<sup>[3]</sup>

For these reasons a new case was developed with a slightly shorter neck to fire a spitzer flat-based 150 grains (9.7 g) bullet that had a ballistic coefficient (G1 BC) of approximately 0.405 and achieved a muzzle velocity of 2,700 ft/s (820 m/s) and muzzle energy of 2,428 ft·lbf (3,292 J). The M1903 Springfield rifle, introduced alongside the earlier .30-03 cartridge, was quickly modified to accept the new .30-06 Springfield cartridge, designated by the US military as the **M1906**. Modifications to the rifle included shortening the barrel at its breech and recutting the chamber. This was so that the shorter ogive of the new bullet would not have to jump too far to reach the rifling. Other changes included elimination of the troublesome 'rod bayonet' of the earlier Springfield rifles.

Experience gained in World War I indicated that other nations' machine guns far outclassed American ones in maximum effective range. Additionally, before the widespread employment of light mortars and artillery, long-range machine gun 'barrage' or indirect fires were considered important in U.S. infantry tactics.<sup>[4]</sup> For these reasons, in 1926, the Ordnance Corps developed the **.30 M1 Ball** cartridge loaded with a new Improved Military Rifle (IMR) propellant and 174-grain (11.3 g) bullet with a 9 degree boat tail that had a ballistic coefficient (G1 BC) of approximately 0.560, that achieved a muzzle velocity of 2,640 ft/s (800 m/s) and muzzle energy of 2,692 ft·lbf (3,650 J). This bullet further reduced air resistance in flight resulting in less rapid downrange deceleration, less lateral drift caused by crosswinds, and significantly greater supersonic and maximum effective range from machine guns and rifles alike. Its maximum range was approximately 5,500 yd (5,030 m).<sup>[5]</sup> Additionally, a gilding metal jacket was developed that all but eliminated the metal fouling that plagued the earlier M1906 cartridge.

Wartime surplus totaled over 2 billion rounds of ammunition. Army regulations called for training use of the oldest ammunition first. As a result, the older .30-06 ammunition was expended for training; stocks of .30 M1 Ball ammunition were allowed to slowly grow until all of the older M1906 ammunition had been fired. By 1936 it was discovered that the maximum range of the .30 M1 Ball ammunition with its boat-tailed spitzer bullets were beyond the safety limitations of many ranges. An emergency order was made to manufacture quantities of ammunition that matched the external ballistics of the earlier M1906 cartridge as soon as possible. A new cartridge was developed in 1938 that was essentially a duplicate of the old M1906 round, but loaded with IMR 4895 propellant and a new flat-based bullet that had gilding metal jacket and a different lead alloy and weighed 152 grains (9.8 g) instead of 150 grains (9.7 g). This 1938 pattern cartridge, the **Cartridge .30 M2 Ball** achieved a muzzle velocity of 2,805 ft/s (855 m/s) and muzzle energy of 2,655 ft·lbf (3,600 J). Its maximum range was approximately 3,450 yd (3,150 m).<sup>[6]</sup>

## Firearms

In military service, the 30-06 was used in the bolt-action M1903 Springfield rifle, the bolt-action M1917 Enfield rifle, the semi-automatic M1 Garand, the M1941 Johnson Rifle, the Famage Mauser, the Browning Automatic Rifle (BAR), and numerous machine guns, including the M1917 and M1919 series. It served the United States in both World Wars and in the Korean War, its last major use being in Vietnam. Large volumes of surplus brass made it the basis for dozens of commercial and wildcat cartridges, as well as being extensively used for reloading. In 1908 the Model 1895 Winchester lever action rifle became the first commercially produced sporting rifle chambered in 30-06. It is still a very common round for hunting and is suitable for large game such as bison, Sambar deer, and bear, when used at close to medium ranges.

Ballistically, the 30-06 is one of the most versatile cartridges ever designed. With "hot" hand-loads and a rifle capable of handling them, the .30-06 is capable of performance rivaling many "magnum" cartridges. The .30-06's power (combined with the availability of surplus firearms chambered for it and demand for commercial ammunition) has kept the round as one of the most popular for hunting in North America. With appropriate loads it is suitable for any small or large heavy game found in North America.

## Performance

The .30-06 cartridge was designed when shots of 1,000 yards (900 m) were expected. In 1906, the original M1906 .30-06 cartridge consisted of a 150 grains (9.7 g), flat-base cupronickel-jacketed-bullet. After WWI, the U.S. military needed better long-range performance machine guns. Based on weapons performance reports from Europe, a streamlined, 173 grains (11.2 g) boat-tail, gilding-metal bullet was used. The .30-06 cartridge, with the 173 grains (11.2 g) bullet was called *Cartridge, .30, M1 Ball*. The .30-06 cartridge was far more powerful than the smaller Japanese 6.5×50mm Arisaka cartridge and comparable to the Japanese 7.7×58mm Arisaka. The new M1 ammunition proved to be significantly more accurate than the M1906 round.<sup>[7]</sup>

In 1938, the unstained, 9.8 grams (151 gr), flat-base bullet combined with the .30-06 case became the M2 ball cartridge. The M2 Ball specifications required 2,740 feet per second (840 m/s) minimum velocity, measured 78 feet (24 m) from the muzzle.<sup>[8]</sup> M2 Ball was the standard-issue ammunition for military rifles and machine guns until it was replaced by the 7.62×51 mm NATO round for the M14 and M60. For rifle use, M2 Ball ammunition proved to be less accurate than the earlier M1 cartridge; even with match rifles, a target group of 5 inches (130 mm) diameter at 200 yards (180 m) using the 150-grain (9.7 g) M2 bullet was considered optimal, and many rifles performed less well.<sup>[7]</sup> The U.S. Marine Corps retained stocks of M1 ammunition for use by snipers and trained marksmen throughout the Solomon Islands campaign in the early years of the war.<sup>[9]</sup> In an effort to increase accuracy some snipers resorted to use of the heavier .30-06 M2 armor-piercing round, a practice that would re-emerge during the Korean War.<sup>[10]</sup> Others sought out lots of M2 ammunition produced by Denver Ordnance, which had proved to be more accurate than those produced by other wartime ammunition plants when used for sniping at long range.<sup>[11]</sup> Commercially manufactured rifles chambered in .30-06 are popular for hunting.

Current .30-06 factory ammunition varies in bullet weight from 7.1 g to 14.3 g (110 to 220 grains) in solid bullets, and as low as 3.6 g (55 grains) with the use of a sub-caliber bullet in a sabot. Loads are available with reduced velocity and pressure as well as increased velocity and pressure for stronger firearms. The .30-06 remains one of the most popular sporting cartridges in the world. Many hunting loads have over 3,000 ft-lbs of energy at the muzzle and use expanding bullets that can deliver rapid energy transfer to targets.



Winchester .30-06 cartridge



From left to right 9.3x62mm, **.30-06 Springfield**, 7.92x57mm Mauser, 6.5x55mm and .308 Winchester



Eight .30-06 cartridges loaded to an *en bloc* clip for the M1 Garand

Bullet Weight (grains)	Commercial <sup>[12]</sup>	Hodgdon <sup>[13]</sup>	Speer <sup>[14]</sup>	Hornady <sup>[15]</sup>	Nosler <sup>[16]</sup>	Barnes <sup>[17]</sup>
110	N/A	3505	3356	3500	N/A	3471
125/130	3140	3334	3129	3200	3258	3278
150	2910	3068	2847	3100	3000	3031
165	2800	2938	2803	3015	3002	2980
180	2700	2798	2756	2900	2782	2799
200	N/A	2579	2554	N/A	2688	2680
220	2400	2476	N/A	2500	2602	2415

The table above shows typical muzzle velocities (in ft/s) available in commercial 30-06 loads along with maximum 30-06 muzzle velocities reported by several reloading manuals for common bullet weights. Hodgdon, Nosler, and Barnes report velocities for 24" barrels. Hornady and Speer report velocities for 22" barrels. The data are all for barrels with a twist rate of 1 turn in 10" which is needed to stabilize the heaviest bullets. The higher muzzle velocities reported by Nosler for 165 grain and heavier bullets use loads employing a slow-burning, double-base powder (Alliant Reloder 22).

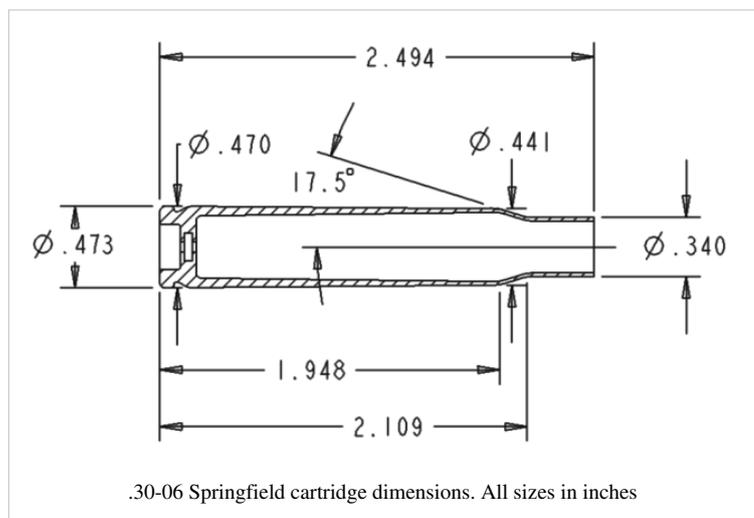
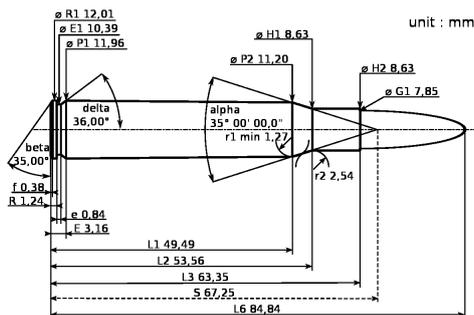
The newer 7.62x51mm NATO/.308 Winchester cartridge offers similar performance to standard military .30-06 loadings in a smaller cartridge. However, the greater cartridge capacity of the .30-06 allows much more powerful loadings if the shooter desires.

### Recoil

One reason that the 30-06 has remained entrenched as an extremely popular round for so long is that the cartridge is at the upper limit of power that is tolerable to most shooters.<sup>[18][19]</sup> Recoil energy (Free recoil) greater than 20 foot pounds (27.1 joules) will cause most shooters to develop a serious flinch, and the recoil energy of an 8 pound rifle firing a 165 grain 30-06 bullet at 2900 ft/s is 20.1 foot pounds (27.3 joules). Recoil shy shooters can opt for lighter bullets, such as a 150 grain bullet. In the same 8 pound rifle, a 150 grain bullet at 2910 ft/s will only generate 17.6 foot pounds (23.9 joules) of recoil energy.<sup>[20]</sup> Young shooters can start out with even lighter bullets such as the 110, 125 or 130.

### Cartridge dimensions

The .30-06 Springfield has a 68.2 grains (4.43 ml ) H<sub>2</sub>O cartridge case capacity. The exterior shape of the case was designed to promote reliable case feeding and extraction in bolt action rifles and machine guns alike, under extreme conditions.



.30-06 Springfield maximum C.I.P. cartridge dimensions. All sizes in millimeters.

Americans defined the shoulder angle at  $\alpha/2 = 17.5$  degrees. According to the *Commission Internationale Permanente pour l'Epreuve des Armes à Feu Portatives* (C.I.P.) the common rifling twist rate for this cartridge is 254 mm (1 in 10 in), 4 grooves,  $\emptyset$  lands = 7.62 mm (.30 in),  $\emptyset$  grooves = 7.82 mm (.308 in), land width = 4.49 mm (.1768 in) and the primer type is large rifle. According to the official C.I.P. guidelines, the .30-06 Springfield case can handle up to 405 MPa (58,740 psi) piezo pressure. In C.I.P.-regulated countries, every rifle cartridge combination has to be proofed at 125% of this maximum C.I.P. pressure to certify for sale to consumers. The 8x64mm S is probably the closest European ballistic twin of the .30-06 Springfield.

## U.S. military cartridge types

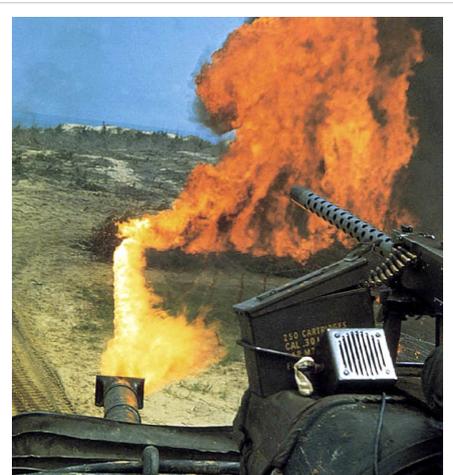
*Note:* .30-06 cartridges are produced commercially with many different bullets and to a number of different specifications.

- **Armor Piercing, M2** : This cartridge is used against lightly armored vehicles, protective shelters, and personnel, and can be identified by its black bullet tip. Bullet is flat base, weight 163-168 grains. Defense against the M2 projectile by name is one of the performance standards for Type IV body armor.<sup>[1]</sup>
- **Armor Piercing Incendiary, T15/M14 and M14A1**: This cartridge may be substituted for the M2 armor piercing round and is normally employed against flammable targets. The tip of the bullet is colored with aluminum paint. The M14A1 featured an improved core design and incendiary charge.
- **Ball, M1906** : This cartridge is used against personnel and unarmored targets, and can be identified by its silver-colored bullet. The M1906 has a 9.7 g (150 grain) projectile and flat base. Its jacket is a cupro-nickel alloy which was found to quickly foul the bore.
- **Ball, M1**: The M1 has a 11.2 g (173 grain), nine-degree boat-tailed projectile designed for aerodynamic efficiency. Though it had a lower initial velocity, velocity and energy were greater at longer ranges due to its efficient shape. The jacket material was changed to gilding metal to reduce fouling.
- **Ball, M2**: With a 9.8 g (152 grain) bullet based on the profile of the M1906, this cartridge incorporated the gilding-metal jacket of the M1 projectile combined with a slightly heavier, pure-lead core. It had a higher muzzle velocity than either of the earlier cartridges.
- **Blank, M1909**: This cartridge is used to simulate rifle fire. The cartridge is identified by having no bullet, and by a cannellure in the neck of the case which is sealed by red lacquer. This is still a current cartridge for ceremonial M1 Garands. Modern M1909 are rose crimped blanks, but they have the same designation.<sup>[21]</sup>
- **Dummy, M40**: This cartridge is used for training. The cartridge has six longitudinal corrugations and there is no primer.
- **Explosive, T99**: Development of a cartridge that contained a small explosive charge which more effectively marked its impact. Often referred to as an "observation explosive" cartridge, the T99 was never adopted.
- **Frangible, M22**: The bullet disintegrates upon striking a hard or armored target, leaving a pencil-like mark to indicate a hit during gunnery practice. The cartridge is identified by a green bullet tip with a white ring to the rear of the green color.
- **High Pressure Test, M1**: The cartridge is used to proof test 30-06 rifles and machine guns after manufacture, test, or repair. The cartridge is identified by stannic-stained (silvered) cartridge case.
- **Incendiary, M1917**: Early incendiary cartridge, bullet had a large cavity in the nose to allow the material to more easily shoot forward on impact. As a result the M1917 had a tendency to expand on impact. The M1917 had a blackened tip.
- **Incendiary, M1918**: Variant of the M1917 with a normal bullet profile to comply with international laws regarding open-tipped expanding bullets.
- **Incendiary, M1** : This cartridge is used against unarmored, flammable targets. The tip of the bullet is painted blue.

- **Match, M72:** This cartridge is used in marksmanship competition firing, and can be identified by the word "MATCH" on the head stamp.
- **Tracer, M1:** Tracer for observing fire, signaling, target designation, and incendiary purposes. The M1 has a red tip.
- **Tracer, M2:** Tracer for observing fire, signaling, target designation, and incendiary purposes. Has a short burn time. The M2 originally had a white tip, but then switched to a red tip like the M1.
- **Tracer, T10/M25:** Improved tracer over M1/M2. Designed to be less intense in terms of brightness than either the M1 or M2 tracers. The M25 had an orange tip.
- **Rifle Grenade Cartridges, M1, M2, and M3/E1:** These cartridges are used in conjunction with the M1 (for the M1903 rifle), M2 (for the M1917 rifle), and the M7 series (for the M1 rifle) grenade launchers to propel rifle grenades. The cartridge has no bullet and the mouth is crimped. The differences between the three cartridges have to do with the powder charge and the subsequent range of the launched grenade. The M3E1 featured an extended case neck.<sup>[22][23]</sup>

### U.S. military firearms using the .30-06 cartridge

- M1903/M1903A3 bolt-action rifle using Mauser-licensed stripper clips.
- M1917 Enfield rifle, loading from stripper clips.
- Gatling gun: Some U.S. Gatling guns were re-chambered for .30-06.
- Model 1909 Machine Rifle: The Benet-Mercie light machine gun was chambered for .30-06.
- M1917 Chauchat: The US used a mix of Chauchats in .30-06 and 8 mm Lebel.
- Lewis gun: The US used a limited amount of Lewis guns chambered in .30-06 in both WWI and WWII.
- M1917 Machine Gun water-cooled
- M1919 Machine Gun, M37 Machine gun, and AN/M2 Aircraft machine gun. All air cooled machine guns feeding from belts
- M1918 Browning Automatic Rifle, loading from detachable magazines.
- Marlin machine gun: Similar to the Colt-Browning machine gun ('Potato Digger'), but without 'digger' piston, and used mainly on aircraft.
- M1 Garand rifle, loading in an *en bloc* clip.
- M1941 Johnson Rifle, feeding from a 10 round internal rotary magazine, loading from stripper clips.
- M1941 Johnson LMG, feeding from magazine.



View from the turret of an M67 "Zippo". On the right is a mounted M1919 Browning machine gun with an attached box of linked .30-06 ammunition.

## References

### Notes

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