.223 Remington

History

By the end of the Second World War, the effectiveness of the German MP43 assault rifle (see 7.62x39) had become well known. The major breakthrough in the MP43 design was the use of a scaled down version of the full powered 7.92 (8x57) German infantry cartridge. The resulting 7.92x33 Kurz cartridge enabled a trained soldier to maintain reasonable control of the MP43 rifle set to fully automatic fire. Ammunition for the MP43 was light to carry and the soldier could therefore carry more into combat. These factors combined made the MP43 an effective assault weapon.

Following the war, the major military powers of the world began experimenting with scaled down cartridges and prototype assault rifles. With the formation of the NATO pact alliance, members agreed to work towards a universal rifle and cartridge design for all allied infantry. After several design proposals allied powers found themselves divided into two camps. The countries of the commonwealth were very much in favor of a 7mm cartridge which would have duplicated today's 7mm08 while the U.S, the super power of the allied world, insisted on a .30 caliber cartridge, preferably a scaled down version of the .30-06.

Ultimately, the U.S ordnance department convinced all NATO pact members to adopt the T44 cartridge, now known as the 7.62 NATO or in its commercial guise, the .308 Winchester. Yet for all of the pushing for a .30 caliber cartridge, a sub committee of the U.S Ordnance department (project SALVO), continued to experiment with small caliber cartridges, leaning towards the .224 caliber.

After promising reports from project SALVO during the mid 1950's, the US Ordnance Department invited cartridge designers to develop a military round based on the .224 caliber with a prerequisite that the projectile must stay above the speed of sound at 500 yards. In 1957, Robert Hutton, technical editor of Guns and Ammo magazine designed a potentially suitable cartridge. Hutton's cartridge was based on a lengthened version of the .222 Remington, loaded with a 55 grain prototype bullet made for Hutton by Sierra Bullets.

By the later 1950's, firearms designer Eugene Stoner had achieved partial success with his AR 10 rifle. The Armalite AR 10 was radically different from other rifles of the day using a combination of alloys and polymers to create a light and compact assault rifle. Unfortunately for Stoner, the lightweight AR 10 chambered in 7.62 NATO produced too much recoil for controlled automatic fire however, the excellent rifle design was noted by various parties. After receiving the invitation to design a .224 caliber rifle, Stoner re-chambered the AR 10 to Hutton's .224 caliber cartridge and submitted the combination for testing during 1958. The combination was well received however the final decision would have to come from the upper echelons of the U.S government. By this time Armalite had lost a great deal of money through investing in Stoners AR 10 and AR 15 and decided to sell the rights to his designs. Colt firearms purchased these rights and continued to pursue marketing the AR 15.

In 1963, the communist conflict in Vietnam grew with rapid momentum. The U.S had so far committed a small force to Vietnam to inhibit the socialist movement however the Ordnance department did not have enough manufacturing resources to arm the full force that would soon be required. To this end U.S secretary of defense Robert McNamara made several major decisions that would dramatically alter U.S Ordnance permanently. The Springfield Armory and production of the M14 rifle was dissolved and rifle production turned over to the private sector. Colt was given the contract to supply the AR 15 rifle to U.S forces without further ado.

The AR 15 rifle and cartridge were formally adopted in 1964, designated the XM16E1 (common name M16) rifle and 5.56 Ball M193 cartridge. Velocity for the 55 grain bullet from the 20" barrel of the M16 was rated at a true 3200fps. The rifle was used in small numbers up until 1965 when both the war and production of the M16 rose dramatically.

From the very outset of its adoption the M16 was plagued with troubles. Stoner had designed the original AR 15 with a very slow barrel twist rate of 1:14 which was literally a doubled edged sword. By using a slow twist barrel the 55 grain bullet was only just stable in flight, producing a small degree of yaw. On impact the bullet would immediately tumble and render a wide, incapacitating wound. This was initially considered a brilliant design premise but some rifles produced too much yaw and were very inaccurate at longer ranges. McNamara ordered that the twist rate be changed to 1:12 before final adoption of the rifle in 1964. This cured longer range accuracy problems but completely destroyed the stopping power of the 55 grain bullet which now poked needle holes through its victims. Nobody questioned the potential consequences of this move and ignorant of the facts, Ordnance brass continued to believe and promote the M193 as a highly effective cartridge.

Major troubles next appeared in 1965 when the M16 rifle was adopted en masse by the thousands of U.S soldiers entering Vietnam. Up to 50% of the rifles were jamming in the field and hundreds of U.S troops were killed while desperately trying to clear jammed chambers. Troops were further demoralized when neither the military brass or Colt would look into the problem seriously. Instead, troops were accused of not cleaning their rifles properly which had lead to powder fouling. The powder fouling was cited as the reason why cases were not being extracted from the rifle's chamber.

After continued complaints, both the Ordnance department and Colt representatives eventually began to look at the problem although still with a measure of apathy. The M16 then underwent some design alterations however, the cause of the jamming problem had still not been identified. A new model M16A1 now featured a chrome lined chamber and bore in an effort to produce smoother feeding. Other alterations were made to the M16, but without any true knowledge of the underlying problem, these added unnecessary weight to the rifle which was now only a shade lighter than the M14.

It was several years before the underlying cause of the M16's jamming problem was properly identified. Ordnance staff discovered that Stoner and ammunition manufacturers had initially tested the AR 15 using extruded (stick) powder but when the Vietnam conflict exploded, ammunition manufacturers adopted the more readily available ball powder. The ball powder produced a longer peak chamber pressure with dire effects. Normally upon firing, the cartridge should expand to seal the chamber (obturation), then contract and then be extracted. With ball powder, the case was still obturated due to the longer peak pressure. The ejector would then fail to extract the case, tearing

through the case rim, leaving the obturated case behind.

In 1970, the U.S government announced its standardization of the M16A1 rifle and cartridge to NATO allies. The news was received with a degree of resentment, especially for those countries who had committed precious resources to the T44 cartridge and rifles. Nevertheless, as finances allowed, all NATO pact members eventually adopted the 5.56mm cartridge. Most countries adopted the M16A1 rifle while a few worked with their own rifle designs.

During the 1980's, the 5.56mm cartridge was officially standardized as a NATO cartridge. A remaining weakness of the M193 load was its extremely poor penetration through heavy clothing at ranges of 500 yards and beyond. The Belgium military provided a solution with their 62 grain bullet design. The Belgium load became the standard NATO ball, designated the 5.56 NATO. Muzzle velocity is 3025fps from a 20" barrel. The M16 rifle then underwent a further upgrade to a 1:7 barrel twist rate to utilize the new load. The new model rifle was designated the M16A2.

Today, the M16 rifle design remains in service world wide. The current model is designated the M16A4 and features a Picatinny scope rail with most M16 rifles now wearing a scope. Several countries have however moved away from the M16 rifle, some towards more radical designs, notably Great Britain who utilize the SA80 along with Australia and New Zealand who currently use the Steyr AUG rifle.

The 62 grain load is still used by all NATO members however its shortcomings are a continual source of frustration to soldiers engaged in combat. Nevertheless, current allied military strategy does not require a great deal from infantry weapons. The standard operating procedure (SOP) used in the war against terrorism is somewhat simple and predictable. Allies are required to locate terrorists, surround the target and provide suppressive fire while awaiting either an air strike or artillery support. The 5.56 NATO is adequate for this role and also excels during house to house combat, at point blank ranges.

In 2002 the US military and Remington began experimenting with cartridges to deliver more effective power for special operations command (SOCOM) soldiers. Eventually the .270 caliber (.277" or 6.8 mm) was settled on, using a case based on the 30 Remington. In 2004 the new cartridge was announced as the 6.8 Remington. The 6.8 fires a 115 grain bullet at 2800fps, in 24" test barrels, and has a similar trajectory to the 7.62 (.308) with a substantial increase in energy at all ranges over the 5.56. The 115 grain bullet of the 6.8 has a ballistic coefficient of about .340 and is loaded to 55,000psi. This cartridge is still in an experimental stage of use (2009). Velocity from a 20" military barrel is probably much closer to 2650fps.

As a sporting cartridge, the 5.56 cartridge was adopted by Remington in 1964, the same Year McNamara officially adopted the cartridge for the U.S military. The sporting version was named the .223 Remington and promoted as a varmint cartridge, ironically, because almost every U.S state does not allow the use of .22 centerfires of medium game due to insufficient killing power. Nevertheless, the NATO standardization of this cartridge has ensured its long term popularity with hunters and the .223 Remington is now a major selling cartridge.

Performance

Like the .222, when using 40 to 55 grain projectiles, the .223 produces a broad but shallow wound channel at ranges less than 100 yards. Beyond 100 yards, especially between 200 and 250 yards wound channels tend to be much narrower than cartridges of 6mm upwards. A major difference between the .222 and .223 is that both Federal and Winchester produce loads for use on medium game. Nevertheless, if using the .223 on medium game, it is very important to try and avoid major shoulder bones to aid bullet penetration and ensure that wounding occurs exclusively within vitals.

As a varmint or target shooting cartridge, the .223 is an outstanding performer, inexpensive and capable of great accuracy. As a medium game cartridge, the .223 is under powered if fast killing is to be expected with ordinary chest shots. The one exception is when using tumbling FMJ ammunition which completely and utterly changes the performance of this cartridge on medium game.

The tumbling 55 grain bullet is truly violent and fast killing and is the most effective medium game hunting load for the .223. Exit wounds on medium game are often as wide as 3". However, it must be stated that when full metal jacket ammunition tumbles, the bullet also very gradually falls to pieces due to the unsealed base of the bullet allowing jacket core separation. Because the process is gradual, wounding occurs through vitals and bone, rather than on impact resulting in adequate penetration for all but tail on shots on medium game.

For many years all .223 caliber sporting rifles featured barrels with a twist rate of 1:12. Recently, some manufacturers have increased twist rates to 1:9. When 55 grain FMJ ammunition is used in either 1:12 or1:9 twist barrels, wound channels are extremely small, about 6mm in diameter with mild bruising around the wound (the former T44/7.62/.308 Winchester is no better in this respect). The one brand of 55 grain FMJ ammunition that does tumble is Norinco although the mechanism which initiates yaw on impact is difficult to ascertain.

In some cases, rifles with a 1:12 twist will produce tumbling on impact with 62 grain FMJ ammunition. The decision of whether a hunter can adopt such a load must be based on whether the rifle is capable of producing adequate accuracy. Many rifles can shoot around the 1MOA mark with 62 grain FMJ ammunition. A second factor is the stability of the load because in some cases, a projectile can be so carefully designed and engineered that it retains stability and fails to produce excessive yaw on impact despite an incorrect twist rate.

Hunters who wish to experiment with these loads are highly encouraged to do so but should first ascertain their barrel twist rate, either by studying the revolutions of a ram rod and cleaning patch or by consulting manufacturer's data. The use of FMJ projectiles can be significantly more effective than any available sporting .223 load.

Apart from the use of FMJ ammunition, hunters using the .223 on medium game will achieve best results with neck and head shots. Typical sporting loads with conventional soft point ammunition can penetrate through the chest walls of medium game but kills are always slow if the CNS is not destroyed. The .223 does not have the power to initiate hydrostatic shock. Using the .22 centerfires effectively on medium game requires a sound knowledge of game anatomy. Animals that are

presented at awkward angles may have to be passed up until a better shot presents itself.

Factory Ammunition

The two major sporting ammunition manufacturers that offer light medium game loads for the .223 are Federal and Winchester. Federal offer a 64 grain soft point at 3090fps, the 55 grain trophy bonded bear claw at 3100fps and the excellent 60 grain Nosler Partition at 3160fps although 22" barrels average 70fps below Federal test barrel specs. Winchester offer their traditional 64 grain power point at 3020fps. All of these loads are adequate for chest shooting lighter medium game but are very mild performers and are slow killing at ranges beyond 100 yards with a noticeable deterioration in killing power between 200 and 250 yards when chest shooting medium game.

One new comer on the international market is Fiocchi. Fiocchi produce a very basic 55 grain soft point load at 3180fps yet this bullet stays together extremely well when used on light medium game. The Fiocchi projectile is able to break both shoulders of animals weighing less than 60kg (130lb), much the same as the Federal Premium loads listed above. Nevertheless, kills can still be slow with ordinary chest shots, regardless of the excellent performance of this projectile.

Most other .223 loads are designed strictly for varminting and true muzzle velocities for all brands of 55 grain ammunition usually average around 3180fps from 22" barrels. Hornady have focused on the production of V-Max loads, starting at 40 grains up to the 55 grain V-max. Remington produce the 55 grain Accutip, a 55 grain hollow point and a conventional 55 grain soft point load. The softest of these loads are the V-max and Remington hollow point which are adequate for neck, head and meat saver shots on lighter medium game.

PMC, Highland and a great many other manufacturers also produce 55 grain soft point loads. All of the projectiles used in these designs are very soft and although expansion is violent, animals always run after being chest shot with these loads.

The most useful FMJ designs to look out for are Norinco's 55 grain ammunition along with Federal American Eagle 62 grain ammunition. The Norinco cartridge is truly unique. Muzzle velocity is no less that 3300fps from barrels as short as 20". Accuracy is always around 1MOA and terminal performance is outstanding. Other 55 grain FMJ loads do not duplicate this performance. Please note: the cartridge case of the Norinco M193 ball is made to military dimensions which are slightly smaller than sporting ammunition dimensions in order to ensure smooth feeding in military arms. This can occasionally create problems in sporting rifles with maximum dimension chambers resulting in frequent misfires. This problem can be remedied by replacing the bolt spring with a heavier after market spring (Wolf Springs).

The 62 grain FMJ Federal American Eagle load is similar to Norinco in terminal performance so long as tumbling does actually occur on impact. Readers are reminded that the 62 grain bullet is designed for 1:7 twist military barrels. The new 1:9 twist sporting barrels also stabilize this load and produce poor terminal performance. By using the 62 grain FMJ in sporting barrels with the typical 1:12 twist, the shooter can in essence, attempt to duplicate Eugene Stoner's/ Hutton's original design premise. This requires experimentation on a rifle to rifle basis with regard to accuracy and

yaw.

Hand Loading

The .223 is generally easy to hand load for. Fast burning powders in the 4198 range produce the highest velocities without load compression. From 22” sporting length barrels, maximum safe working velocities include 3750fps with 40 grain varmint bullets, 3450fps with 50 grain bullets, 3300fps with the 53 grain Barnes, 3250fps with 55 grain bullets and 3100fps with 60 grain bullets. Readers will note that the velocity of 3250fps for the 55 grain bullet is 50fps below Norinco factory ammunition, nevertheless, in many rifles, case life is short when continually loading to 3300fps or higher.

Bullet choice for the .223 can be divided into two categories, explosive projectiles which require care with shot placement to avoid major bones and premium projectiles capable of breaking major bones on lighter medium game but should also be utilized carefully to ensure that wounding occurs in the forwards and largest portion of the lungs. In recent years, several manufacturers have produced 60 to 63 grain bullets which produce adequate penetration with shoulder shots but should never be regarded as fast killers.

Hornady projectiles include the 50 grain Super Explosive SP, a standard 50 grain soft point flat base bullet, the 50 grain V-Max, 52 grain A-Max, the 55 grain V-Max, 55 grain soft point flat base, 60 grain hollow point flat base, 60 grain soft point flat base, 60 grain V-Max, 75 grain A-Max and finally, the 80 grain A-Max.

When studying the performance of Hornady’s 55 grain bullets, there really isn’t a great deal of difference in penetration between the standard soft points, V-Max and the 52 grain A-Max. The major differences, are that the A-Max and V-Max produce much wider wounds than the standard bullets. On 60kg (130lb animals), the V-Max and A-Max normally produce a .224” entry wound, then immediately expand to produce a 2 to3” wound channel through onside muscle and bone. The wound extends to the vitals but usually goes no further, the remaining fragments arrest in vital organs with very few making it to the offside chest wall.

As bullet weight is increased, performance improves slightly and where twist weight allows, it is worth utilizing Hornady’s heavier bullets. The 60 grain projectiles, like their 52-55 grain counterparts are all prone to total disintegration however the reduction in muzzle velocity and slight increase in SD slow this process down, enabling deeper wounding. The 60 grain V-Max gives a good compromise between velocity and terminal performance while also being suitable for standard twist rate barrels.

Of the Hornady range, the heavy weight A-Max bullets are the best performers on lighter medium game but require fast twist rates of either 1:8 or 1:7. Although these start out slower than their lighter counterparts (around 2900fps), the heavy A-Max bullets have incredibly high BC’s. In the .224” caliber, most traditional soft point 55 grain projectiles have a BC of around .230. The 75 grain A-Max on the other hand has nearly double this at .435 while the 80 grain A-Max boasts a BC

of .473. Retained energy at 300 yards is vastly superior to other .224” loads. Some 1:9 twist barrels produce acceptable accuracy with the heavy A-Max but results are difficult to predict.

Sierra produce a 50 grain flat base soft point, a second FBSP but with a thin “Blitz” varmint style jacket, a 50 grain semi point soft point and the BTSP BlitzKing. The more typical .223 Rem projectile weights include the 55 grain Blitz (flat based), the 55 grain BlitzKing BTSP, 55 grain HPBT, 55 grain flat base soft point and 55 grain semi point. Heavy bullets include the 60 grain HP, 63 grain semi point and the very popular 65 grain BTSP GameKing. Sierra also produce a range of match bullets from 55 to 80 grains however these do not produce reliable expansion on game.

The Sierra line of projectiles are rather generic. On light bodied medium game, performance of the 55-60 grain bullets is fair; wounds tend to be wide but shallow as with all soft point .224 bullets. The one Sierra projectile that stands alone is the 65 grain GameKing. This bullet has been used by hunters around the world to take countless light weight deer species. Again, as with all .224” projectiles, penetration is limited however, the 65 grain GK produces uniform wounds through vitals.

Speer make a wide range of .224 bullets from 30 to 70 grains. The Speer TNT bullets (30-55 grains) are extremely frangible and in no way suitable for use on lighter medium game. The TNT should be used as intended - on varmints Medium weight bullets include the traditional 50 grain soft point, 50 grain Trophy Bonded Bear Claw, 55 grain soft point, 55 grain soft point with cannelure (for slightly greater controlled expansion), the once popular 70 grain semi pointed soft point and lastly, the 75 grain BTSP.

Of the Speer range, the 50 grain TBBC is the toughest. This bullet (like the Barnes bullets) is capable of relatively deep penetration and will almost always exit lighter framed deer species. Penetration from raking shots can sometimes be quite impressive however, due to both the nature of this bullet design and limitations of the caliber, wound channels are not tremendously wide. For this reason, the TBBC does its best work inside 150 yards, steadily losing the ability to produce wide wounding thereafter.

The 70 grain Speer semi pointed soft point (SMP) was once one of the only readily available projectiles for hunters targeting medium game with .22 center fires. Furthermore not all rifles were capable of shooting such a heavy bullet due to the twist rates adopted in early days. The Speer was and still is, a relatively effective lighter medium game bullet. Like all .224” soft points, the 70 grain Speer is forced to dump its energy immediately. Wounds through vitals tend to be very broad, penetration is adequate for cross body or lightly quartering shots while exit wounding is rare. The BC of the 70 grain Speer is low at .219 however this bullet is adequate for chest shooting lighter medium game out to ranges exceeding 200 yards.

The Nosler 50 and 55 grain Ballistic Tip projectiles perform in much the same way as regular soft point .224” projectiles, wide wounding with shallow penetration. The 60 grain Nosler Partition on the other hand, is one of the most reliable .224” light medium game projectiles available. Like all .224” projectiles, penetration is limited and on light bodied animals exit wounds are rare, nevertheless this bullet penetrates vitals through relatively stout bone, produces wide lung wounds and ruptures off side chest cavities. Those who hunt light bodied deer with the .223 should never be

without a box of 60 grain Partition projectiles.

Barnes produce both frangible varmint bullets (30-50 grains) and stout TSX projectiles. The TSX is available in the weights 53, 55, 62 and 70 grains. For ordinary chest shots on light medium game, the 53 grain Barnes TSX produce far superior performance in comparison to all other bullet designs.

Unfortunately very few .224” fans appreciate the effectiveness of a stout bullet. Often if a slow kill is witnessed, the hand loader goes back to the bench, determined to find the most frangible bullet available in order to effect fast killing. Although frangible bullets are useful on medium game with heavy calibers, the same cannot be said for the .224”. Where bullets like the 80 grain A-Max can create quite a deep, wide wound, there is always an element of uncertainty towards the reliability of such a load across varying body weights. This is the reason why experienced .224” shooters tend to opt for neck and head shots. The 53 grain Barnes TSX is different in this regard and results are quite predictable. On game weighing between 60 and 80kg (up to 130lb), chest shots with the 53 grain Barnes are still within the realms of David versus Goliath however the Barnes renders a deep, adequately broad wound. The heavier Barnes TSX projectiles are even more effective, ensuring free bleeding exit wounds.

In recent years, Berger bullets have put a lot of research towards producing optimum BC .224” projectiles. Berger offer a wide range of bullet weights ranging from 30 to 90 grains. Berger do not recommend any of their .224” bullets as being suitable for use on lighter medium game and are instead offered as either match or varmint options.

Lastly, for those who are able to find a source, Norinco projectiles do appear on the market from time to time. These projectiles are often sold off, after the original load has been pulled and a new soft point projectile has been seated by an aftermarket manufacturer. The Norinco projectile is simply the most effective .224” bullet available for hunting lighter medium game and hunters should have absolutely no hesitation in trusting it beyond all other .224” offerings.

Above: The tumbling 55gr FMJ Norinco. Aside from the brand of projectile, this is how Stoner and Hutton first intended the .223 to perform. The exit wound has been cleaned up for inspection. Below is a thumb of the carcass as it was initially found:

Closing Comments

The .223 Remington/5.56NATO certainly has an interesting military history. As a hunting cartridge, the .223 is a conundrum. Few people have witnessed or truly understand the vast difference between the dramatic terminal performance of tumbling military ball and the slower, lack luster killing which can occur when chest shooting game using conventional soft sporting ammunition. Along with this are the modern super explosive varmint loads, shallow but broad wounding.

In all cases a lot can and does occasionally go wrong when the .223 is used on medium game. It is

wise that many states of the U.S do not allow the .223 to be used on medium game. In more lax countries, the .223 is a cartridge that inexperienced shooters often look to when choosing a low recoiling medium game rifle. In truth the .22 centerfires loaded with ‘off the shelf’ varmint ammunition will work best in the hands of highly experienced hunters or youths who have hunted under such tuition in an ongoing manner.

As stated in the .222 text, accurate shot placement, realistic expectations and an understanding of limitations are the keys to success. More information regarding shot placement for the .224’s can be found in the within that text.

Tables & Diagrams

Suggested loads: .223 Remington					Barrel length: 22”	
No	ID		Sectional Density	Ballistic Coefficient	Observed MV Fps	ME Ft-lb’s
1	FL	55gr Remington SP	.157	.197	3180	1235
2	FL	60gr Federal/Partition	.170	.228	3020	1215
3	FL	55gr Federal/ Bear Claw	.157	.202	3180	1235
4	FL	64gr Winchester PP	.182	.233	3020	1295
5	FL	55gr Norinco FMJ	.157	.272	3330	1355
6	FL	62 Federal FMJ	.176	.254	3020	1255
7	HL	53gr Barnes TSX FB	.151	.231	3300	1280
8	HL	60gr V-Max	.170	.256	3100	1280
9	HL	80gr A-Max	.228	.473	2900	1494

Suggested sight settings and bullet paths							
1	Yards	100	125	209	241	300	350
	Bt. path	+1.9	+2	0	-2	-8	-16
2	Yards	100	125	205	237	300	350
	Bt. path	+1.9	+2	0	-2	-8	-16
3	Yards	100	125	205	237	300	350
	Bt. path	+1.9	+2	0	-2	-8	-16
4	Yards	100	125	205	237	300	350
	Bt. path	+1.9	+2	0	-2	-8	-16
5	Yards	100	125	229	265	300	350
	Bt. path	+1.7	+2	0	-2	-4.7	-10
6	Yards	100	125	207	240	300	350
	Bt. path	+1.9	+2	0	-2	-8	-15
7	Yards	100	125	221	256	300	350

	Bt. path	+1.8	+2	0	-2	-6	-12
8	Yards	100	125	215	249	300	350
	Bt. path	+1.9	+2	0	-2	-6.6	-13
9	Yards	100	125	212	247	300	350
	Bt. path	+1.9	+2	0	-2	-6.5	-12.4

No	At yards	10mphXwind	Velocity	Ft-lb’s
1	300	15.5	1860	423
2	300	13.5	1920	480
3	300	13.5	1860	423
4	300	13.5	1920	524
5	300	10.5	2225	605
6	300	12	1996	550
7	300	12	2121	530
8	300	11	2098	586
9	300	7	2289	930

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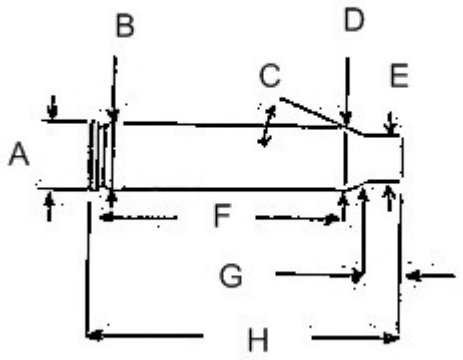

	Imperial	Metric
A	.378	9.60
B	.376	9.55
C	23deg	
D	3.54	8.99
E	.253	6.43
F	1.44	36.53
G	.203	5.16
H	1.760	44.70
Max Case	1.760	44.70
Trim length	1.750	44.45