Chapter 12 Tables, Charts, and Stuff

Whenever someone writes a book, especially if it is of a technical nature, an absolute requirement is that one section of the book must contain information that is truly useful to the reader; information such as how to convert feet to inches, how many gurgles are in one gulp, or perhaps how to estimate the speed and distance of an approaching steam locomotive by pressing one's ear to the railroad track.

Since I don't have any of that information I have decided to put forth what I do have. It may not be of much use but at least it will fill up some space and make me appear to be educated. While the title to this section is Tables, Charts, and Stuff I regret that I don't have any charts but should I find one I will include it at that time. And so, without further ado here is some random information that may be of some use. Proceed at your own risk.

Weight of Lead Balls

Dia. in inches	Weight in grains	Number/Lb.
.200	12.05	581.03
.240	20.82	336.25
.280	33.10	211.75
.300	40.66	172.16
.340	59.19	118.26
.360	70.26	99.63
.380	82.63	84.17
.400	96.38	72.63
.420	111.57	62.74
.440	128.28	54.57
.500	188.24	37.19
.540	237.13	29.52
.580	293.82	23.82
.600	325.28	21.52
.640	394.77	17.73
.660	432.94	16.17
.680	473.51	13.55
.720	562.08	12.45
.780	714.63	9.80
.840	889.80	7.86
1.000	1,501.27	4.66

American Bird Shot

Size	Dia. in inches	Number/Oz.
Fine dust	.030	Lots
Dust	.040	4,565
2	.050	2,385
11	.060	1,380
10	.070	868
9 1/2	.075	688
9	.080	585
8 1/2	.085	472
8	.090	409
7 1/2	.095	345
7	.100	299
6	.110	223
5	.120	172
4	.130	136
3	.140	109
2	.150	88
1	.160	73
B	.170	59
Air Rifle	.175	55
BB	.180	50

Many of the shot sizes listed here are no longer produced or will be hard to find. The smaller sizes are useful to adjust the weight of experimental bullets when you don't want to make new cores or can be used as core material in frangible bullets. The larger sizes can be used to make short range round ball loads for plinking or case forming. Some of the larger sizes make good close range defense loads. At one time shot was available in Western and Eastern sizes. The same numbers were used but the sizes are slightly different. Western sizes were discontinued and Eastern became known as American.

Buck Shot Sizes

Size	Dia. in inches	Number/Lb.
3	.250	280
2	.270	238
1	.300	152
0	.320	144
00	.340	128
000	.360	112

Many years ago Dr. Gorning came up with a formula for estimating the weight of a round ball. This is the sort of information that comes in handy at cocktail parties and so here is the good Doctor's formula. W = K times (D cubed) W is the weight of the ball in grains. K is a constant of 1502.6 and D is diameter of the ball in inches. This is for pure lead balls. It does not apply to billiard balls or a masked ball.

Another and more complicated way to figure the weight and number of balls per pound is to multiply the diameter cubed of the ball times .5236. (D cubed) times .5236. This gives the volume of the ball in cubic inches. Then multiply the volume of the ball by .4096 which is the weight per cubic inch of pure lead. Take that result and divide one pound by it and the answer is the number of balls per pound. Multiply the weight per cubic inch of one ball by 7,000 and you will have the weight of one ball in grains.

For example take a .840" diameter ball. The diameter cubed is .84 X .84 X .84 which is .5927. Multiply .5927 by .5236 to get .3103, the volume in cubic inches. Multiply .3103 by .4096, the weight of lead in pounds per cubic inch to get the weight of one ball, .127 pounds. Then divide 1 pound by .127 to get 7.87 balls per pound. Multiply the weight of one ball by the number of grains per pound, .127 X 7,000, to get the weight of one ball in grains, 889 grains.

Bullet Lubricants

Bullet lubricants are useful for reducing leading when lead bullets are being used. While there is a nearly endless supply of perfectly good commercial lubes available at reasonable prices there are a few brave souls who feel compelled to make their own. So for those intrepid adventurers here is some info on lubricants and old time lubes.

Many materials have been used for bullet lubes. Below is a list of commonly used lube ingredients.

Beeswax This is the basis of many lubes. Beeswax, as the name suggests, is made by hard working Honeybees solely for the benefit of shooters. OK, that might not be quite right, but we need to be thankful for Honeybees and the wax they produce. Remember these are not the nasty, just plain mean Yellow Jacket Wasps that are often called bees. Beeswax can be found in the natural or the refined and bleached condition. Other than color, there is little difference in the properties of the wax. Beeswax can be used as is by melting it and pouring it over the bullets. The bullets are cut out of the hardened wax using a cake cutter or a cartridge case. Beeswax and other waxes should be melted by indirect heat such as a double boiler. Overheating the wax can cause the fumes to flash with unpleasant results. Beeswax is usually softened by adding petroleum jelly or oil. The amount of softener depends on the lubricating machine being used, weather conditions at the range, and personal preferences.

This is one of the best waxes for lubricating bullets and can also be used to waterproof paper patched ammo.

Japan Wax This vegetable wax is also excellent but can be hard to find. It is obtained from a type of tree found in the Orient. It can be used straight like beeswax but is usually softened by adding oil or petroleum jelly. Japan wax is also sold as carnauba wax. Depending on who you ask Japan wax and carnauba wax are the same thing or totally different. Whether they are the same thing or not, they are interchangeable.

Ozocerite This is sometimes called earth wax because it is a mineral wax mined from Mother Earth. It is a good wax for bullet lubes but not as good as beeswax. Consistency will vary a fair amount and it will require a softener. Each batch of wax that you receive will be different so the softener will have to be adjusted to give the desired results. This was once a plentiful wax but can be hard to find today.

Ceresine This is an excellent wax and is refined ozocerite. It is quite hard and must be softened to be useable. Sometimes it is sold as fake beeswax. Because it is hard and lacks 'stickiness" it is useful as is on outside lubricated bullets as it is less likely to pick up dirt and grit. This wax was used to make common candles.

Carnauba This is a vegetable wax obtained from trees. It is a good lubricant but not as good as beeswax and it varies some in consistency. It is hard and not very sticky. A softener is usually needed. It is often found in a soft condition as furniture or floor wax.

Paraffin This is another mineral wax similar to ozocerite. It is hard and lacks the sticky quality required to keep the lube in the grooves of a bullet. It can be a good lube for bullets and is usually softened by adding petroleum jelly. A little paraffin can be used to harden lubes that are too soft. Paraffin is readily available.

Castor Oil Castor oil is a vegetable oil from the Castor Bean plant. Its use in lubes is quite common and it is a good material to use. It will sweat from the lube on hot days but not as much as the lubricating oils. Castor Oil can be obtained in various viscosities and in different degrees of purity.

Mineral Oil This oil works nearly the same as Castor Oil but it is greasier feeling. It is easily obtained from drug stores.

Whale Oil Sperm Whales were nearly hunted to extinction for this valuable oil. It is one of the finest oils once available for lubricating delicate mechanisms. It is no longer available but a lucky person might find a bottle on a back shelf in some out of the way and forgotten place. Jojoba (ho-ho-bah) and Meadowfoam plants yield a similar oil though probably not quite as good. Jojoba oil can sometimes be found in gunsmith supply catalogs and it's good for lubricating paper patched bullets.

Alox 2138F This is a heavy grease that was commonly used in many commercial greases. It is no longer produced but a substitute is available for it, or so I am told. Mixed with beeswax it was hard to beat.

Graphite Used in bullet lubes since the beginning of time it is still of some use. Most powdered graphite is quite fine and will stay in suspension while the lube is being mixed. Use about 10% graphite by volume.

Bullet cores can be rolled or tumbled in it and then swaged. Swaging the coated cores will press the graphite into the bullet's surface to reduce leading at low velocities. Under some conditions graphite is said to be slightly abrasive. Some old time shooters swore by it, others swore at it.

Motor Mica Another dry powder lube that may have some limited value. It is white in color and is made from powdered mica. I've used it the same way I would graphite but I think I prefer graphite.

Molybdenum Commonly called moly because hardly anyone can pronounce it correctly. Today it is viewed as somewhat of a miracle lube among shooters and is used for nearly everything. Claims made for moly would put a used car salesman to shame. But it can be used like graphite to give a little extra kick to your bullet lube.

Rosin Hardened sap from trees, usually pine trees. If an ancient bug is stuck in it then it's amber. This is powdered and added to the melted lube. Exactly what purpose the rosin served is a bit of a mystery. It was popular in some old time lubes but it is known to be a little abrasive. Probably the best thing to do with rosin is to let the other guy use it.

Bullet Lube Formulas

These bullet lube formulas that were once popular among the knowledgeable and well known shooters. They worked at one time and they might be worth revisiting.

When making bullet lubes remember that simpler is better. Throwing more stuff into a lube won't necessarily make it better. As a general sort of thing, leading is partly caused by lubes that are too soft. If leading occurs, add more wax or use less softener. Sometimes using a softer lead alloy will help to cure leading.

Another general sort of rule is to use petroleum based lubes with smokeless powder and vegetable or mineral based lubes with black powder.

In the old days hard lubes were used with soft bullets and soft lubes with hard bullets. Today with smokeless powder and higher velocities I'd probably start with a softer lube. When making up a lube use the word, "why". Why use two waxes? Why use graphite? Why use several things that do the same job? Change the ingredients one at a time and test fire to see if it helps or not. A great lube doesn't usually happen overnight and lubes can be less effective as weather conditions change.

Some of these old formula use questionable ingredients such as rosin. But the lubes were developed by some of our greatest shooters; maybe they did know something.

A warning worth repeating is to heat the waxes by indirect heat. A double boiler works well. Don't overheat them as the vapors can be quite volatile and can ignite. Like casting bullets making up lube is quite safe if a few precautions are taken.

H.M. Pope's bullet lube	**Basic bullet lube**	**A.O. Niedner's lube**	**Herrick's lube**
6 Oz. mutton tallow 4 Oz. bay wax 2 Oz. beeswax 2 Oz. steam cylinder oil 170 grs. Acheson's graphite	4 parts beeswax 1 part Vaseline Add graphite or moly if desired	½ lb. Japan wax 4 teaspoons graphite	Equal parts beeswax & Japan wax. Castor oil to soften
Mattern's lube	**Horace Kephart's lube**	**Leopold's wax wad**	**H. Donalson wax wad**
Cup grease (heavy grease) 10% graphite beeswax (paraffin or Japan wax Mix to desired hardness	3 Oz. ozocerite 2 parts Vaseline	5 Oz. Japan wax 5 Oz. beeswax 2 Oz. ozocerite 3 teaspoons graphite	2 Oz. rosin 4 oz. beeswax 3 Oz. Japan wax 2 Oz. tallow 2 Oz. graphite
Wotkyns/Sweany wax wad	**Ned Roberts wax wad**	**Phil Sharpe wax wad**	
1 lb. beeswax 4 Oz. graphite 4 Oz. castor oil	6 Oz. ozocerite 1 Oz. graphite 2 Oz. beeswax	4 gms. oildag 2 gms. Castor oil 4 gms. beeswax 12 gms. Japan wax 1 gm. Petroleum jelly	Oildag was a mix of 10% graphite. & mineral oil Gunslick gun. grease can be used instead

Useful Formulas and Other Stuff

When engaged in polite conversation with non-shooters talk sometimes turns to shooting and even to long range competition. When I mention that I've shot targets at a range of 1,000 yards the listener often has no idea of what that distance is. It's hard to visualize it when someone is thinking in miles and not used to thinking in yards.

So converting yards to miles is an easy way to help someone who isn't a shooter understand what is being said. To convert yards into miles just divide the range in yards by the number of yards in a mile. There are 5,280 feet per mile or 1,760 yards in a mile. A range of 1,000 yards becomes .568 miles.

When you say you are shooting at over one-half of a mile a glimmer of understanding will show on the listeners face followed by awe and astonishment.

On the Range

- When you are out at the range there are some interesting tips that have been passed down by other competitors. Some of these are of questionable value being based on mostly folk lore and unconfirmed data. But these are well proven and might be worth repeating. Besides it gives me a chance to use those cool bullet things before each tip.

- When using iron sights the light conditions will affect your shooting. On bright, sunny days the bright sun will cause a halo to form around the aiming black of the target. This will cause the bullseye to appear larger and will cause the shooter to aim lower. If the day is bright but cloudy the aiming black will appear sharper but also smaller. This will cause the shooter to hit higher. The old saying is, “Light up-sights up, light down-sights down.”

- On windy days (and what days aren’t?) the direction of the rifling twist will have an affect on whether your shot goes high or low at longer ranges. If the rifle has a right hand twist a wind moving from the right to the left as you face the target will tend to lift the bullet and cause it to strike higher. A wind moving from left to right will make your shot go lower. For a left hand twist the effect would be reversed. How much this affects your shooting will depend on the angle of the wind to the shooter, wind speed, and distance to the target.

- Mirage is a shooter’s friend if you learn how to use it. You can see mirage on a warm day with the unaided eye, through a rifle scope, but using a spotting scope works the best. Never focus the spotting scope on the target. Focus the scope about two-thirds of the way to the target. If there is no wind the mirage will appear in a twisting tornado like pattern that rises straight up. This is called a “boil”. Try not to shoot if the mirage is boiling. The wind conditions will usually change soon. When the wind speed is about five miles per hour the mirage or heat waves will appear moving from one side to the other but also rising. At ten miles per hour the mirage will be moving horizontally in what is called a flat mirage. At fifteen miles per hour the mirage will usually disappear. Thus mirage can be used to determine wind speed as well as direction. Watch the mirage and wait for the same condition or change the sights if need be.

- As most shooters know temperature will affect the rifle’s elevation setting. Every ten degrees of change in temperature will cause about one minute of angle change in elevation. At 1,000 yards that’s a ten inch change.

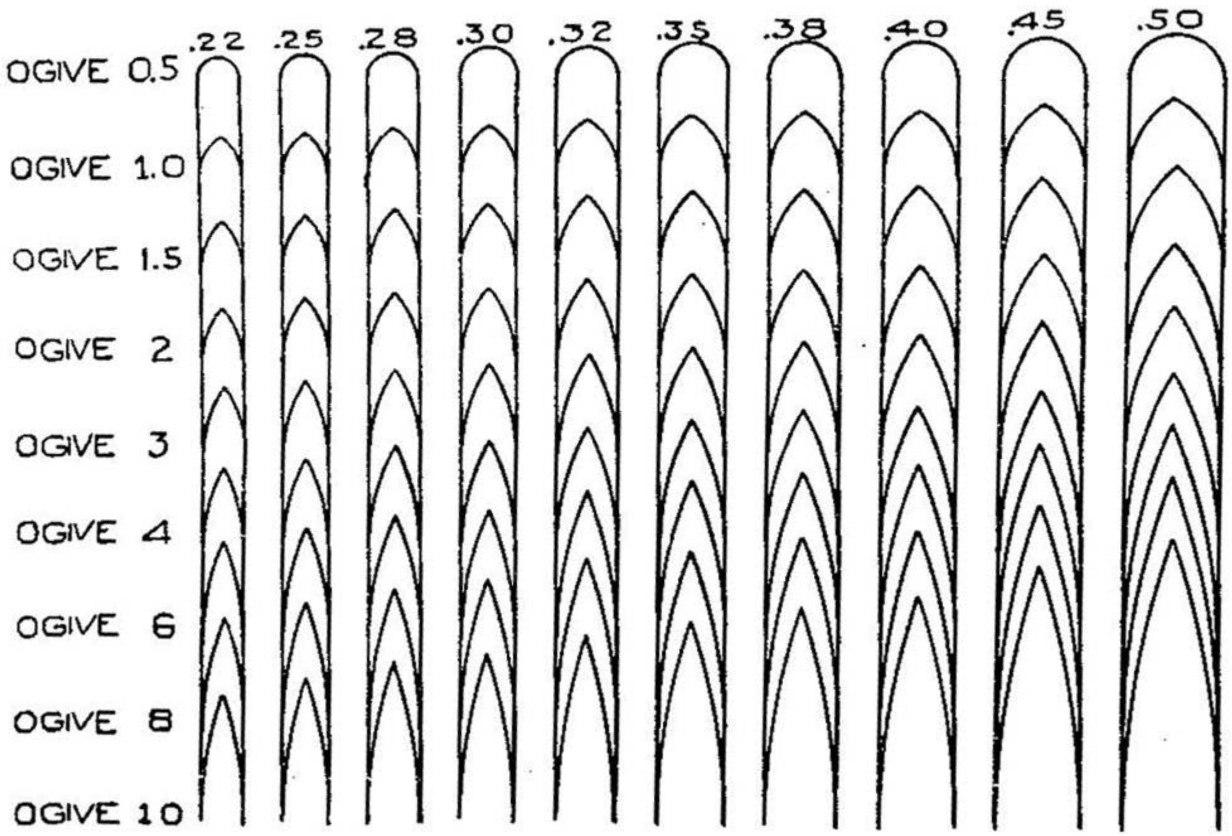
- If the range has wind flags or other flags the angle the flag is flying at can be used to estimate the wind speed. Estimate the angle the flag is at and divide that angle by four. The result is the wind speed. If a flag is flying at 40 degrees the wind speed is 10 miles per hour (40 divided by 4 = 10).

I knew that I would be able to get a chart to include in this chapter if I tried hard enough. This chart is useful for approximating the ogive of a spitzer bullet. To use the chart make sure that the .50 caliber ogives measure .500”. This will insure that the other calibers are the correct diameter as well. Then lay a bullet on the chart and while looking directly down at the chart slide the bullet up and down on the drawings until you get the best fit. That will be the radius of the ogive expressed in calibers.

The radius of the ogive is the diameter (not caliber) of the bullet times the ogive in calibers. A fifty caliber bullet with a 6S ogive would have an ogive radius of .500” time 6 calibers or .500” times 6 giving a radius of 3.0”.

Bullet diameters that are slightly smaller or slightly larger can be estimated by matching the bullet to the closest diameter on the chart. A .50 BMG bullet that is .510” in diameter can be matched up to the .500” drawings on the chart. Some error will result but not enough to worry about.

Note that as the ogive radius becomes greater the difference between the ogive shape becomes less and less. There is a noticeable difference between a 1 caliber radius and a 2 caliber radius but only a little difference between a 6 caliber and an 8 caliber radius. The difference between a 6 and 7 caliber radius or a 7 and 8 caliber radius is almost none. So when deciding on what radius to use for a bullet it is often better to jump one or even two calibers when choosing a long ogive. When dealing with long ogives the change and improvement in ballistics is slight unless big changes are made.



How to identify bullet swaging dies.

Probably one of the most vexing problems that people have to face is how to know what the tools they have are and what they do. Sometimes it's possible to figure out what they are by just examining them and making an educated guess. But it's tough to look at a die and know that it makes a .224 bullet or a .228 bullet. Some dies look remarkably the same and some don't seem to have any easily discernible purpose.

So it seemed that some way to mark and identify the dies and punches would be useful. Since there isn't room on the die or punch to write out a lengthy explanation of what the die is or does the following code was developed. The code is somewhat arbitrary but it will fit on the die and isn't without some logic.

The dies will be marked on the face of the die while punches are marked on the shank or on the head of the punch. The dies and punches will be marked with the bullet diameter but core swage dies may be marked with both the caliber and the diameter. A core swage die can often be used with more than one caliber.

Code letter	Description
S	S is for core swage, or core form. The die makes a uniform lead core from a cast or cut piece of lead wire. The bullet weight is controlled by the core swage die. It is essential to making accurate jacketed bullets.
C	C is for core seat. The core seat die is used to press the lead core into the bullet jacket. It is not normally used when making lead bullets
P	P is for point form. The point form die has the shape of the bullet machined and lapped into it. It gives the bullet its final shape and size.
L	L is for lead tip reform. The die is used after the point form to reshape a soft point. With a special internal punch it is used to slightly tighten the tip of an open tip bullet.
BT-1 BT-2	These two dies are used together along with a special point form external punch to make rebated boattail bullets. The BT-1 die starts the rebated BT-1 and the BT-2 die finishes it.
DDS	This die converts a normal bullet into a bore rider type.
J	This is a tubing jacket maker die. It is used to make bullet jackets from copper tubing.
LB	The lead bullet die is similar to a core swage die but makes a finished lead bullet. The base and ogive of the bullet are formed by two punches.

Core form dies and punches are marked with the bullet diameter, the letter S, and the diameter of the core that the die makes. For example a die might be marked 308 S 254. This would mean that the die is made for a .308 diameter bullet, the S is for core swage, and the diameter of the core is .254". Another die might be marked 44/45 S 380. This would mean that the die is a core swage that makes a .380 diameter core for use in .44 and .45 caliber jackets.

Flat base core seat dies are marked with the bullet diameter and the letter C. The core seat punches may also be marked with the tip diameter of the punch and/or the jacket thickness the punch is made for.

A core seat die for a .338 bullet would be marked 338 C. A die to seat a core in a flat base .50 BMG bullet might be marked 511 C. The internal punches in both examples would be marked the same as the dies. The external punches that seat the core in the jacket are marked the same as the die but may have additional information.

An external core seat punch for a .224 bullet might be marked: 224 C 196. This would indicate the bullet diameter, the letter C for core seat, and that the tip of the punch is .196" in diameter. Another punch could be marked 458 C 387 035. This would indicate the punch is for a .458 bullet, C for core seat, the punch tip is .387" in diameter and it is used with a jacket that has a .035" wall thickness.

Point form dies have the most information on them and need it the most. A point forming die would be marked with the bullet diameter, the letter P, the ogive style, and the size of the ejection pin. The external punch would be marked with the bullet diameter, the letter P, and sometimes BT for boattail. The internal punch, the ejection punch, is marked with the bullet diameter, the letter P, and the size of the ejection pin.

A 416 point form die could be marked: 416 P 4 134. This would show that the bullet diameter is .416, the die is a point form, the ogive is a four caliber spitzer, and the ejection pin has a .134" diameter wire. Another die might be marked: 452 P TC 22 161. This would show that the die is a point form to make a .452 diameter bullet, the ogive is a truncated conical with a 22 degree angle, and the ejection pin is .161". One more example might be a 308 P VLD 15-020 081. This would be a .308 diameter point form die that makes a VLD target bullet with a .081" ejection pin. The 15-020 describes the VLD ogive used.

Rebated boattail dies and punches are marked with the diameter of the bullet and either BT-1 or the BT-2 (sometimes just B-1 or B-2). The external punch is marked in the usual way for flat base core seat die. Sometimes a special preform punch is used with the BT-1 die and this punch would be marked with the bullet diameter, the word preform, and the tip diameter of the punch. Usually the jacket thickness would also be marked on the punch. An example would be: 366 preform 265 050.

Copper tubing jacket making dies are marked with the tube diameter, the letter J, and the ejection pin diameter. The internal or ejection punch would be marked in the same manner as the die. External jacket making punches would be marked with the tube diameter, the letter J, the diameter of the punch, and the length the copper tube is to be cut to.

A die might be marked 3/8 J 134 or perhaps ¼ J 120. This would mean that the die is a jacket maker used with 3/8" diameter tubing and has a .134" ejection pin. The second die is for ¼" diameter tubing and has a .120" pin. The ejection punch would be marked the same as the die.

The external punches support and form the tube into the jacket. A punch could be marked ½ J 035 1.125. This would mean that the punch makes a tubing jacket from ½" diameter tubing that has a wall thickness of .035" and the tubes must be cut to 1.125" in length. Another punch might be marked ¾ J 050 15/16. This punch would make a jacket from ¾" diameter tubing with a wall thickness of .050" and uses a 15/16" (.937") long tube.

One extra punch used with the jacket maker die is the end flattening punch. This punch is used with a flat base core seat die to flatten the jacket base. The punch would be marked with the bullet diameter, not the tube size, the letter E for end flattening, and the tubing wall thickness. The punch is universal regarding the jacket length so no length would be marked on it. A punch could be marked 316 E 032. The punch would be used in a .316 diameter die to flatten the base on a jacket with .032" thick walls.

Bullet resizer dies are marked with the beginning bullet diameter, the finished diameter, and the letter B. A die marked 357-355B would mean that the die reduces a .357 bullet to .355" diameter.

Jacket resizer dies are marked in the same way as bullet sizer dies except that the letter would be J for jacket. The draw punch would be marked the same as the die but with the wall thickness of the jacket. A die could be marked .510-488 J .065. The die would redraw a .510 diameter jacket to use in a .488 die and the jacket would have a .065" wall thickness. Note that the jacket will actually be a couple of thousandths smaller than the size on the die. This will let the jacket fit easily into the core seat die.

A glossary of bullet making words & terms

No book would be complete without a glossary that no one bothers to read. Still it helps if everyone uses the same terms and words to describe things. These definations are mine and I like them. They may not suit Dan Webster but they are commonly used in this field of endeavor and will usually be understood by people who know what they mean.

Bearing This is the straight section of the bullet that engages the rifling in the barrel.

Bullet This has to be the most mis-used word of all time. It means everything from a Steve McQueen movie, spent cartridge cases, loaded ammo, and sometimes even projectiles. When I say bullet I mean the projectile.

ogive Probably the most mispronounced word in the world. It sounds like, Oh-jive and refers to the nose of the bullet.

Bore The hole in a gun barrel before the rifling is put in. The bore is always smaller than the groove diameter of a barrel. The bore diameter is used to determine the diameter of a bullet to be paper patched while the groove diameter is used for metal jacketed bullets.

Bumping up A process where by the diameter of a bullet is increased. The diameter of a bullet can be increased a few thousandths this way and reasonably good bullets can be made.

Conical point This is basically a short, fat spire point. At some point the spire point becomes a conical point. Just where the change occurs no one knows and those who have gone to find out have never come back. But a typical conical point might have a 22 degree angle per side or a long conical point might be 15 degrees per side. It’s not a bad nose shape but isn’t used much.

Core This is a piece of cut lead wire or a cast lead slug. The core is the beginning of most bullets. Most often the core is pure lead but alloy lead or other materials can be used.

Core seat die This die is used when the swaged core is pressed into the bullet jacket. Core seat dies are very slightly smaller than the point form die that finishes the bullet.

Core swage die This die converts the rough core into a precision lead cylinder. Excess lead is bled off through a hole in the side of the die to control the weight of the bullet.

Cups Cups are made of plastic, paper, or ceramic. They are useful for holding coffee or other drinks. The only time they are used in making bullets is when a copper or brass disc, a blank, is drawn into a shallow shell. The shell is refered to as a cup. Later in the drawing process the cup becomes a bullet jacket and is called a jacket from then on.

External punch This punch fits into the punch holder in the top of the press. Sometimes it is referred to as a nose punch but this can be misleading.

Internal punch This punch fits in the back of the die and stays with the die. It usually but not always forms the base of the bullet. It is occasionally called a base punch but since it doesn't always form the bullet's base this is mis-leading.

Jackets Most modern bullets use some sort of metal jacket to cover the lead core. This permits higher velocities and pressures than a lead bullet can withstand. The most common jacket material is gilding metal which has a golden look and was once used to "gild" statues and other art work. Gilding metal is made from 95% copper and 5% zinc. Other bullet jacket alloys are also brass alloys running from 90/10 to 87/13 percent copper and zinc. Even cartridge brass, 70/30 percent copper/zinc, has been used as jacket material. Steel has been used for jackets, especially for military use with good success. It is often covered with nickel to prevent rust and many European hunting bullets use a steel jacket. Cupronickel, a copper-nickel alloy, was once used for bullet jackets. It worked OK but it has a strong affinity for brass and would bond strongly to the cartridge case. On firing the neck of the case would be torn off and many rifles were blown up because of it.

Lead bullet die This die is similar to a core swage die. An external and internal punch form the base and nose of the bullet. Since the bullet's nose is formed by a punch, a small step is left where the bearing and nose meet.

Meplat The tip or flat spot at the tip of a bullet.

Paper patch A paper patch is a piece of paper wrapped around a lead bullet to act as a jacket. Paper patched bullets can be used at velocities as high as 2,500 fps.

Point form die Sometimes called a nosing in die. This die has the shape of the bullet machined and polished into it. The point form die gives the bullet its shape and final diameter. A small hard wire pushes the bullet out of the die after the bullet has been swaged.

Round nose There are as many round nose shapes as there are people to make them. There is no standard round nose but there are some shapes that are commonly used. A round nose ogive that is one-half caliber long is a half sphere, a half ball. This is often found on bullets for the African trade. A three-quarter caliber long round nose is very useful in handgun bullets and somewhat useful for rifles. A one caliber long round nose is a good choice for light to medium weight bullets in rifles. It is usually too long for handgun bullets. Round nose ogives can be even longer than the one caliber ogive but the bullet weight has to be matched carefully to the ogive length.

Secant ogive This is not often used for civilian bullets but it is a good design and can be of use in special cases. The secant ogive bullet looks like a spitzer bullet but there is an abrupt change where the ogive and bearing meet. It does not flow evenly into the bullet's bearing. The secant ogive allows the designer to make a bullet with a sharp point while keeping the length of the bullet short.

Semi-wadcutter This is a type of bullet that has a small step where the ogive and bearing meet. Usually thought of as short range pistol bullets the semi-wadcutter (SWC) is also useful in rifles if the correct ogive is chosen.

Shouldered bullet This is my name for the SWC. Some folks will shoot and happily use a shouldered bullet but would not think of using a semi-wadcutter.

Spire point This is an ogive that is good but not used much. It looks much like the point of a sharpened pencil. This ogive is described in degrees. A spire point might have a 14 degree per side angle or perhaps a 12 degree per side angle.

Spitzer ogive This is a common ogive and is used in most modern bullets. The spitzer ogive is a smooth curve that is tangent or blends evenly into the bearing of the bullet. The spitzer ogive is described in calibers. A four S or four caliber spitzer ogive would have a radius that is four times the diameter of the bullet. A seven S ogive would be seven times the diameter of the bullet.

Swage die or swage This is the tool the bullet is formed in. The die can be bored through or can be nearly blind ended.

Swaging Often pronounced swagging. A swag is something made by hippies and used to collect dust while hanging a plant. Swaging sounds like aging. Swaging is a process used to reshape metal using only pressure.

Truncated conical This is the old conical bullet used in handguns but with the tip cut off to make a flat point. It is a very good design for revolvers and autoloaders and, because of the wide meplat, is a good defense bullet. There is no standard truncated conical (TC) bullet.

VLD ogive This is basically a secant type of ogive but instead of keeping the ogive of the bullet short the VLD ogive is usually rather long. The name, VLD, is a made up name and there is no standard VLD shape. It can be whatever the designer thinks is right and to his liking. VLD bullets can do good work but not all rifles will shoot them well.